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Import Dependency of Sectors and Major Determinants: An Input Output Analysis

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Abstract

Many efforts have been devoted to import dependency of economies. In this study, import effects of sectors and their determinants have been researched by using input output models. Main determinants of sectoral import dependency were classified as base of three elements such as intensity of imported input, share of sectors in output and inter sectoral linkages. By the use of National Turkish Input-Output Tables from 1995 to 2011 which have been published World Input Output Database, import dependency of Turkish Economy was examined by sectors. With respect to finding of the study; Turkish Economy has been more import dependent during this period and change in the import dependency of sectors exhibited large diversity during 1995-2011. Import multipliers exhibiting total import effects of sectors seem to have changed in narrow band and closer to each other in 1995-1998 while it has been observed an expansion of import multipliers band and an increase in differences among sectors after 1998.

Key words

Input Output Analysis, Import Dependency, Turkish Economy,

Jel Classifications

C67, F10, O50

1. INTRODUCTION

The body of empirical works on import dependency has been ever growing and several studies have been made to test import dependency of the economy by using input output model. Knuuttila et al. (2014) examined import dependency of food production by using Input Output Model. Bravo and Alvarez (2012) researched import dependency of the Spain Economy comparative to Germany, France and Italy). Östblom (1989) studied changes in the requirements of imports in the Swedish Economy. Marshall (2011) examined change in factor content of Chinese Economy. Paul (2014) examined trends and patterns of import intensity in India Economy. Loschky and Ritter (2007) studied import content of exports for Germany, Cuihong and Jiansuo (2007) revealed the dependency of Chinese export on import and Milner, Meng, and Zhihong (2010) studied import content of trade.

Within the literature, although input output analysis is widely used to study import dependency of both sectors and economies, there are a limited number of studies analyzing import dependency of Turkish Economy by using input output model. (Şenesen and Şenesen, 2003; Şenesen, 2005; Ersungur and Kızıltan, 2007; Ersungur et al., 2011; Demir and Kula, 2008; Eşiyok, 2008; Yükseler and Türkan, 2008; Saygılı et al., 2009, 2010, 2012; Saygılı and Saygılı, 2011; Aydoğuş et al., 2015). Most of the studies, searching this subject with input output model are based on the 2002 or/and previous input-output tables which were published by Turkish Statistical Association (TSA). Since these studies varies according to research period and sector classifications, it is difficult to compare to their results. The notable other studies that have examined the import dependency by using input output models are (Atan, 2011; Duman and Özgüzer, 2012; Şenesen and şenesen, 2001). Common

finding of these studies are; (1) İmport input intensity of output is generally high and has an upward tendency, (2) major changes observed in import intensity and import effects of sectors in Turkish Economy during research periods. As it known none of these studies used Turkish National Input Output Table published by World Input Output Database (WIOD). In this sense to the best of our knowledge, import dependency findings of input-output model for Turkish Economy are only available to 2002 and there is no study by using more up-to-date input-output tables. The Turkish Input Output Tables published by WIO have been used first time in this study to analyze import dependency of Turkish Economy.

The main objective of this article is to analyze the dependency of Turkish Economy on import in sectorial level between 1995 and 2011 by using input output models. This study also sheds light on the determinants of total import effect of sectors; such as import intensity, share of sectors in output and inter sectorial input output relations. For this purpose, recently available 17 National Turkish Input-Output Tables published in World Input Output Database (WIOD) from 1995 to 2011 were used in the study.

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2. INVESTIGATION IMPORT DEPENDENCY BY USING INPUT OUTPUT MODEL

Gross output which can be estimated by using both demand and supply side methods in input output models is a significant indicator of the economy. According to demand side methods, it is measured roughly as the sum of intermediate inputs and final demand while it is measured by sum of intermediate input and value added with regard to supply side methods. Seeing that value added elements (such as labor, capital etc.) and final demand elements (consumption, export) are determined outside of the production process and they are accepted as external factors. Since import dependency of the economies are mainly effected usage of intermediate imported inputs, the study focused on supply side models.

Since Input-Output Model is enable to estimate the economy wide (direct and indirect) effects and it is more commonly used for studying import dependency owing to its inter sectorial context, we examined import dependency of Turkish Economy by using Input Output Model. This model works with own data in the form of input output tables and each sector takes place two times in these tables. (Once in the row and once in the column). While row values show the distribution of sector outputs as demand factors, column values indicate sources of the output such as intermediate inputs (domestic and imported) and value added factors (labor and capital).

It is possible to formulate the demand equations of sectors using the Input Output Model which is an application of Leontief's basic model.

$$X_i = \sum X_{ij} + Fi \qquad (1)$$

In the equation; X_i: shows sectoral output, $\sum X_{ij}$: shows quantity of sectoral output which is demanded as intermediate input and F_j: shows final demand to outputs of sector. By dividing quantity of intermediate input demand of sectors by their total outputs, output coefficients (bij) are calculated and corresponded coefficients entitled as Direct Forward Linkage (DFL) coefficients.

$$b_{ij} = \frac{X_{ij}}{X_i} \qquad (i=1, 2, 3\ldots\ldots n); \qquad DFL = \sum b_{ij} \qquad (2)$$

Sum of the output coefficients exhibit quantity of the sectorial output which is demanded as intermediate input from other sectors in the economy. Other things are equal, DFL coefficients can be taken into account as indicator of intermediate supply capacity of sectors in the economy.

Output value of sectors composed of intermediate input and primary input (value added). Column values of input output tables present the input composition of sectorial output and sectorial output value can be formulated as follows in accordance with the input output methods.

$$X_j = \sum X_{ij} + V_j \qquad (3)$$

In the equation 3; X_j: shows output value of sector j, while $\sum X_{ij}$: indicates intermediate input demand of sector j, from other sectors of the economy and V_j : indicates sum of value added elements such as labor and capital to complete production process. By dividing quantity of intermediate input demand of the sector by their total output, input coefficients (aij) are calculated and these coefficients are also entitled as Direct Backward Linkage (DBL) coefficients (Ayaş, 2012; Chenery and Watanabe, 1958; Chenery and Clark, 1965).

$$a_{ij} = \frac{X_{ij}}{X_j} \qquad (j=1, 2, 3\ldots\ldots n) \quad ; \quad DBL = \sum a_{ij} \tag{4}$$

Sum of the input coefficients exhibit quantity of the input usage and also show intermediate input content of the sectorial output. Seeing that DBL coefficients exhibit, if the final demand of sectors increase one unit, how much output would be necessary from each of sectors to respond changing final demand also defined as direct production effects of the sectors. Total production effects which comprises of both direct and indirect effects are accounted by using Leontief Inverse Matrix (LIM). (Knuuttila et al. 2014; Ezzahid and Chatri, 2015). It is possible to calculate Leontief Inverse Matrix by making the necessary arrangements in Equation 1.

$$X = (I - A)^{-1}F \tag{5}$$

In the equation 5; X is the vector of output, F is the final demand, A is a matrix of input coefficients and I is the identity matrix. Leontief Inverse Matrix elements $(I - A)^{-1}$ indicates a multiplier used to calculate overall relationships in industrial output caused by final demand. The sum of the column elements of Leontief Inverse Matrix indicates total production effects in the economy, when one unit final demand of sector j increase and referred as production multipliers (Miller and Blair 2009).

The industry's output also contains imported input since intermediate input demand is responded from domestically or by way of import. In this case, it is possible to write sectorial intermediate input demand equation in the form of domestic and imported inputs as follows.

$$\sum X_{ij} = M_{ij} + D_{ij} \tag{6}$$

In the equation 6; M_{ij} shows quantity of imported input and D_{ij} shows quantity of domestic input. Import (domestic) input coefficients were obtained by dividing their imported input (domestic input) quantity to their total output (Aydoğuş 2010; Aydoğuş et. al. 2015; Boutoğlu 1990; Şenesen and Şenesen 2003).

$$m_{ij} = M_{IJ}/X_{IJ} \tag{7}$$

$$d_{ij} = D_{IJ}/X_{IJ} \tag{8}$$

Imported input coefficient (mij) indicates the import intensity of sectors and measures the only direct import requirement resulting from one unit increase in final demand. Both direct and indirect import effects are essential to evaluate dependency of the economy and detailed assessment of import dependency requires that total import effects are taken into account. Total import effects of sectors composed of direct and indirect import effects. Indirect import of sectors express distributed import impacts on the economy via industrial input output relations. When tracing indirect imports, all past imports are included in the supply chain from all the industries engaged in the production process. This provides a broader picture of a sector's total dependency on imports.

Total import effects composed of direct and indirect effects accounted for Import Inverse Matrix (IIM) coefficients and the method of the calculation is presented in equations 9 (Bravo and Alvarez 2012; Knuuttila et al. 2014; Şenesen 2001).

$$IIM_t = m_{ij} * (I - d_{ij})^{-1} \quad (9)$$

Import Inverse Matrix coefficients which are measuring dependency of the economy on imported input obtained by multiplying import coefficients with inverse matrix of domestic input. Sum of the column values of Import Inverse Matrix coefficients indicate dependency of sectors on imported input and termed as total import effects. Total import effects of sectors exhibit if final demand of the mentioned sector increase one unit, how much quantity import would be required both directly and indirectly to respond it.

Total import effects of sectors refer the capacity to affect the dependency of the whole economy. İn this sense while direct import effects are associated with only dependency of the sector, total import effects of the sectors are related to whole economy and they are impacted by share of sectors in total output and inter sectorial relations besides import content of the output. Import Inverse Matrix coefficients were valid if the economy would have been consisted of only one sector and share of sectors would have been 100% in total output. However, the real economy is comprised of many sectors having different share in output and Import Inverse Matrix coefficients ignore the weight of sectors in output. Import Multipliers (IM) coefficients takes share of sectors in total output into account and indicate absolute gross import effects. Therefore, it is possible to obtinate Import Multipliers by multiplying Import Inverse Matrix of sectors with their shares in output (Bocutoğlu 1990; Chenery and Clark 1965; Ersungur 2007; Şenesen 2005).

$$IM_t = IIM * {}^{Q_i}/_{Q_t} \quad (10)$$

A higher share of the import intensive sectors in the economy evokes more import effects while other things are equal. To assessment relative import dependency of the sectors with regard to average, also Normalized Import (NI) Coefficients are calculated in the study as follow.

$$NI = n*IMj / \sum IMj \quad (11)$$

In the equity 11; Normalized Import coefficients indicates normalized values of import coefficient, n, indicates number of sectors, IMj indicates import multiplier coefficient of sectors and ∑IMj exhibits sum of import multiplier coefficients of all sectors. Normalized Import coefficients change between 0-1 and values show total import effects of the sector with regard to national average. Higher values of Normalized Import coefficient than 1 means import dependency of the sector is over average while smaller than 1 refer under average. (Atan 2011).

3. ANALYSIS AND DISCUSSION

Change of intermediate input structure and import dependency of Turkish Economy during 1995-2011 period has been analyzed in accordance with the input output model which explained in section 2. Although calculations include all of sectors, emphasis is put on the top ten sectors having the greatest import impacts in 2011 seeing that the study focused on macro wide import dependency of the economy in recent years

3.1. The Input Structure of Turkish Economy (1995-2011)

Due to Turkey's GDP growth has depended more on imported input than domestic input increases in some strategic sectors, dependency of Turkish Economy on import is a growing concern in the literature. After 1980's outward-oriented and export-based growth strategy has been started to implement in Turkish Economy. Past developments such as custom union entering into force in 1996, trade liberalizations, falling transport costs and efforts of low-cost countries to integrate with the world economy caused to major changes in production structure of Turkish Economy. Increase in imported input intensity of output is important reflections of these changes.

Output value is composed of value added and intermediate input. Intermediate inputs are sourced from foreign or domestic markets. The decomposition of the output into components helps to understand the characteristics of the production structure. For this reason, total output decomposed into its main components such as value added, domestic intermediate input and imported intermediate input in order to understand how the production

structure of Turkish Economy changed between 1995 and 2011. Decomposition results were presented in Figure 1.

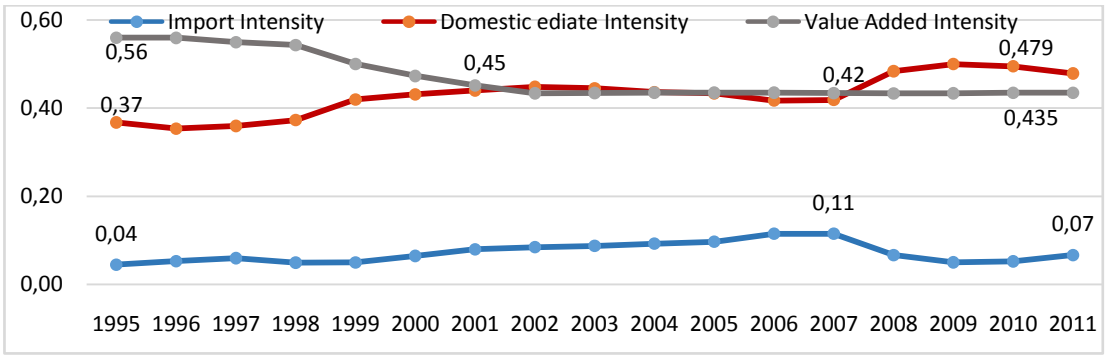

Figure 1. Factor Content of Output in Turkish Economy Between 1995 and 2011.

Value added and domestic input weighted production structure have been observed in Turkish Economy within the research period. By the input factors, there has been some changes in content of the output between 1995 and 2011. Value added and domestic input intensities of production were accounted for %56 and %37 while this percentage decreased to %0,04 for import intensity in 1995. Domestic intermediate input and imported input intensity of the output increased while value added content diminished in this period.

Import intensity increased from 0.04% to 0.7% between 1995 and 2011. Value of the import intensity is reached the highest peak in 2006 and 2007 with 0.11% in corresponded period. Upward trend in import content of output attended steadily to 2007 and began to decline after 2007. Although import intensity dropped to 0.7% in 2011, it is significantly higher than value of in 1995. If this period is evaluated as a whole; it is possible to say that, imported input intensity of Turkish Economy almost doubled its value within the period of 1995-2011.

Intermediate input supply and demand capacity of the economy is strongly associated with backward and forward linkages of the sectors. The high share of intermediate input intensive sectors which has strong backward linkage increase import dependency by enhancing intermediate input demand of the economy while the high share of sectors which having strong forward linkage supports input adequacy. In the study, intermediate input demand and intermediate input supply structures of the economy has been researched in the framework of forward and backward linkages with regard to input output model. Forward linkages exhibit the relative importance of the sector as supplier to the other industries in the economy while the backward linkages show importance of the sector as intermediate input demander.

To anticipate intermediate input demand capacity of Turkish Economy in the period of 1995-2011, average Direct Backward Linkage Coefficients (DBLC) of sectors exhibiting intermediate input intensity (intermediate input demand) were calculated and results presented in Figure 2.

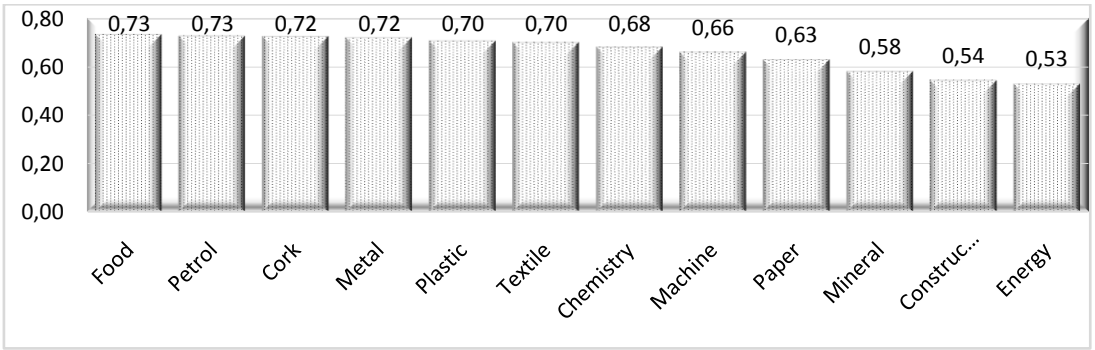

Figure 2. Average Direct Backward Linkages Coefficients between 1995 and 2011.

The graphical illustrations and analysis of DBLC show imported input dependency of Turkish Economy and allows insights at sectorial level. DBLC of sectors sign that, output of the many sectors are heavily on intermediate input usage and most of sectors (12 of 21) have high intermediate input intensity.

By the sectors, the biggest Intermediate input content were found in food, petrol, cork, metal, plastic and textile according to average of 1995- 2011 values. Intermediate input requirement was accounted for %70 and over for mentioned sectors above in this period. Both food and petrol used 0.73 unit intermediate input from other sectors to produce extra one unit product. Intermediate input requirements found 0.72 for metal and cork sectors, 0.70 for plastic and textile sectors. Average intermediate input requirement of an additional one unit output in energy sector was 0.53 in this period. Figure 2 also assigns that most of the intermediate input intensive sector is industrial sectors.

Intermediate input supply is also significant for import dependency of the economy. To analyze intermediate input supply characteristics of sectors, average of Direct Forward Linkage Coefficients (DFLC) reflecting capacity to produce intermediate input were calculated for the period of 1995-2011 and ranked with respect to their average DFLC in Figure 3.

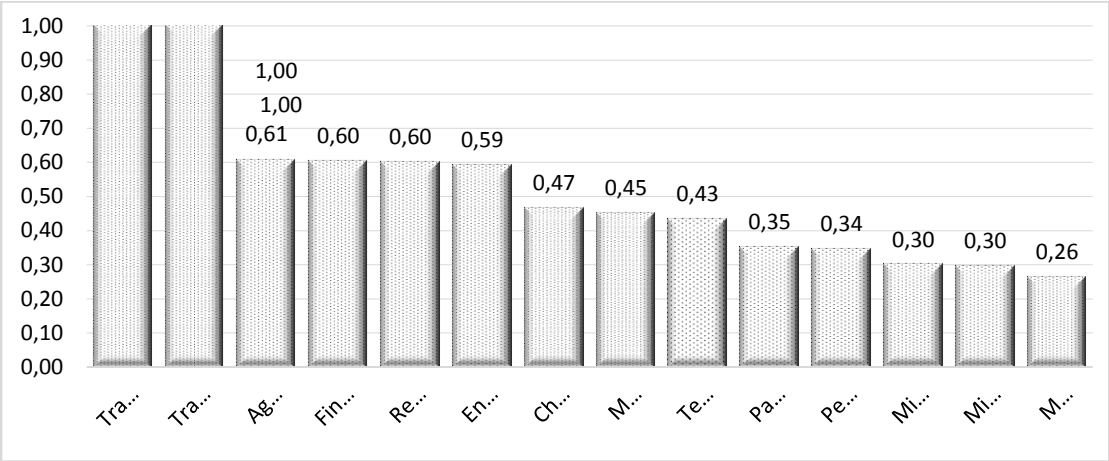

Figure 3. Average Direct Forward Linkage Coefficients between 1995 and 2011.

Figure 3 shows the range of sectors in terms of DFLC. More than 50% of outputs of 6 sectors were demanded as intermediate input in Turkish Economy in this period. Trade and transport sectors are the most significant suppliers of intermediate input and nearly whole of outputs of these sectors were demanded as intermediate input by the others. Also agriculture, finance, real estate and energy sectors found as the most significant input suppliers in this period. According to Figure 3 it is possible to say that most of the intermediate input suppliers was in service industry except agriculture.

These results express that intermediate input demand was greater than intermediate input supply in this period in Turkish Economy. Results also showed that service sectors were important intermediate input supplier while industry sectors were important intermediate input demander. In this sense Intermediate input requirement of industrialization needs transition from input demand weighted production structure to input supply weighted production structure in Turkish Economy.

3.2. Total Import Effects of Sectors: Import Multipliers

Import intensity coefficient of sectors indicating import content of sectorial output were defined as direct import effects while import multiplier coefficient exhibits total import effects if one unit final demand of sectors increased. Import Multiplier Coefficients were calculated as explained in section 2 and results for the most 10 import dependent sectors in the period of 1995-2011 presented in Figure 4.

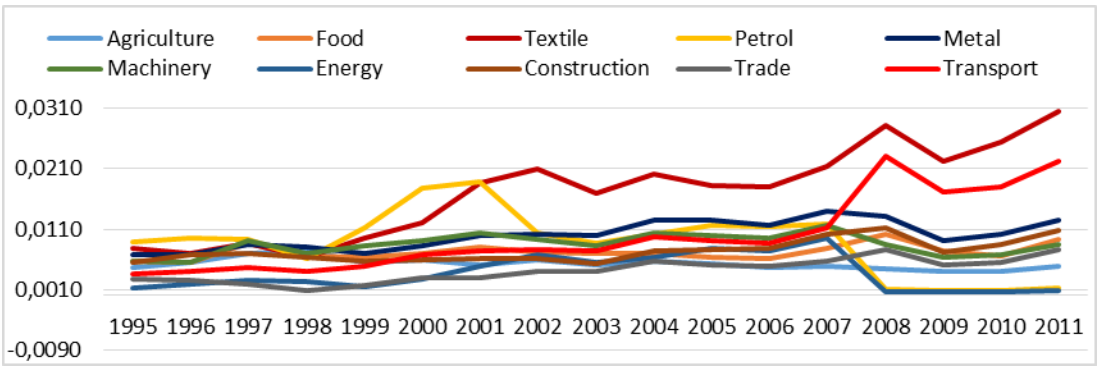

Figure 4. Import Multipliers for Some Sectors between 1995 and 2011.

Import multiplier of sectors between 1995 and 2011 has been seen clearly from the figure 4. The import multipliers of sectors seem to have changed in narrow band and closer to each other in period of 1995-1998 While it has been observed an expansion of import multipliers band and an increase in differences among sectors after 1998. As seen in Figure 4, the sector having the biggest total import effects was petrol in 1995. A rise in final demand of petrol led to 0.0088 unit increase in import in 1995. Reaching maximum values of import effects in 2000 (0.0177) and 2001 (0.0198), import multipliers of petrol decreased dramatically after 2002 (lower than 0.0100). Import multiplier of the petrol dropped to 0.0012 at the end of the period. Total import requirement of one unit final demand of petrol declined from 0.0088 in 1995 to 0.0012 in 2011. Shortly import effects of energy and petrol sectors decreased considerably after 2008 compared to 1995 in this period. The opposite situation has been observed for transportation. Import effects of transportation has increased significant rates after 2007.

Textile also one of the more import dependent sectors in this period. Opposite to petrol and energy, import multiplier of textile sector growth on a constant and steady rates since 1998. Total import requirement of one more unit final demand of textile rose from 0.0079 to 0.0305 unit in 1995-2011 period. To meet an additional one unit final textile demand required 0.0305 unit extra import in 2011. Import impacts of other sectors in 2011 were found as follows: 0.0222-unit for transport, 0.0124-unit for metal and 0.0108-unit for construction.

In order to determine sectors having the biggest import impact in 2011 and to evaluate changes in import dependency of sectors in this period, import multiplier coefficients in 1995 and 2011 years calculated and results were given in Figure 5.

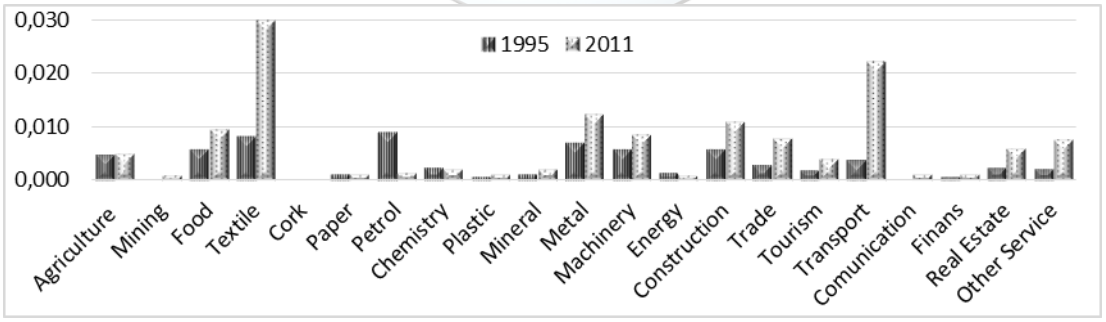

Figure 5. Import Multipliers of Sectors.

Import multipliers of sectors both in 1995 and 2011 are presented in Figure 5. We found that the top 3 sectors having the biggest import effects were ranked as petrol, textile and metal in 1995 while ranked as textile, transport and metal in 2011. Figure 5 also showed that food, textile, metal, machinery, and construction sectors had higher import multipliers in both 1995 and 2011.

To understand % changes in import effects of sectors between 1995 and 2011, growth rate of import multipliers in this period calculated and results presented in Figure 6.

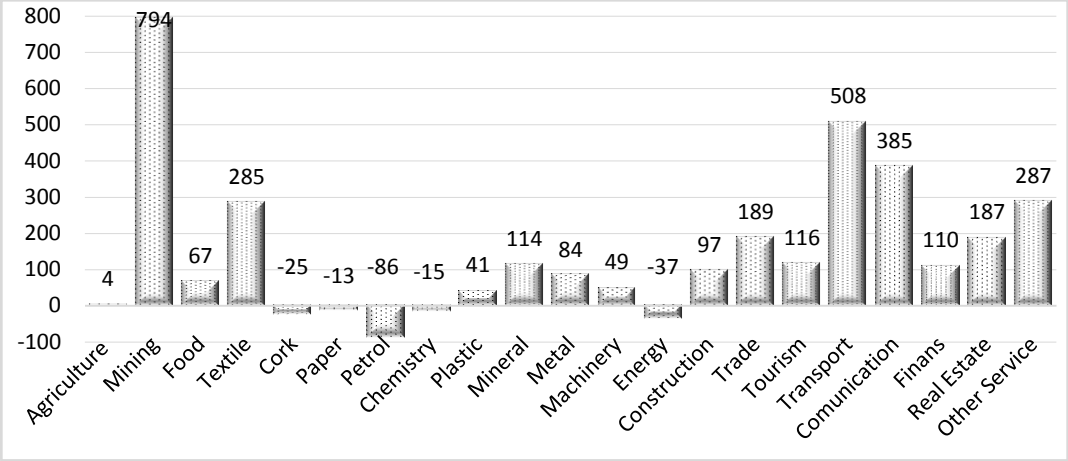

Figure 6. Change in Import Multipliers between 1995 and 2011 (in %).

Figure 6 indicates that, import multipliers of only 5 sectors diminished within the period of 1995-2011. The most decline observed in petrol. Import multiplier of sector considerably decreased in 2011 (86%). Other sectors having decrease in total import impacts are energy (37%), wood and cork (25%). Import multipliers of the others increased with different rates. The top 5 sectors having the most increase in import effects are mining, transport, construction, textile and trade. Even though mining had ignorable total import effects both in 1995 and 2011, the biggest increase observed in mining sector (794%) in this period in Turkish Economy. Import multipliers grew 508% for transport, 385% for communication and 285% for textile between 1995 and 2011.

For a detailed analysis of current import dependency, import multipliers of all of sectors in this year were calculated and sectors were ranked associate with their total import effects in 2011 in Figure 7.

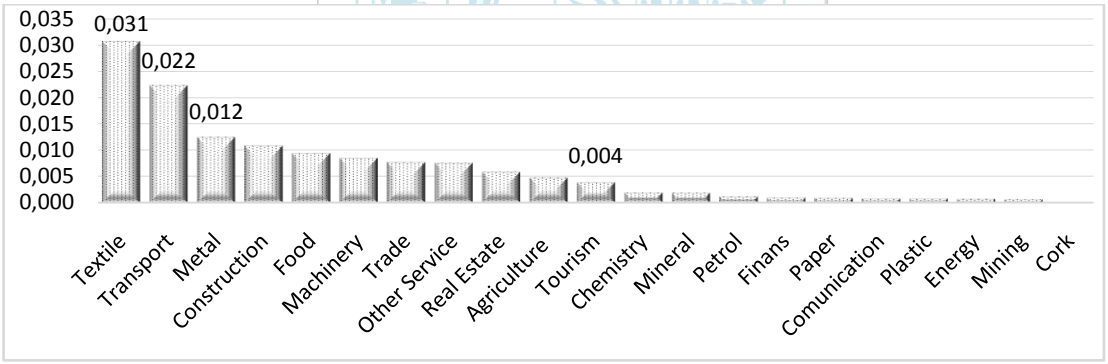

Figure 7. Import Multipliers of Sectors in 2011.

Import multipliers are changing between 0.031 and 0.001 in 2011. Textile sector found as the most import dependent sector in 2011 and import effect of the sector calculated as 0.031. To produce additional one unit textile output in Turkish Economy in 2011, evoked to 0.0031 unit increase in import. Total import requirement of additional one unit output calculated 0.022 for transport, 0.012 for metal and 0.011 for construction while import requirement for the rest of sectors are lower than 0.010 unit.

Status of import dependency of sectors with regard to average is essential from the point of sectorial incentive policies. In order to understand relative import dependency of sectors, normal import multipliers exhibiting relative positions of each sector for the period of 1995-2011 were calculated and calculations were given in Table 1.

Table 1. Normal Values of Import Multiplier in 2011.

Sectors	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Agriculture	1,08	1,31	1,61	1,72	1,30	1,37	1,19	1,38	1,20	1,33	1,24	1,06	1,14	1,04	0,97	0,93	1,12
Mining	0,29	0,27	0,29	0,29	0,52	0,88	0,95	1,06	1,06	1,43	1,67	1,59	2,08	2,18	1,89	1,99	2,56
Food	0,97	0,93	1,49	1,12	1,10	1,18	1,37	1,24	1,17	1,20	1,07	1,05	1,34	1,75	1,27	1,12	1,61
Textile	0,57	0,50	0,63	0,45	0,68	0,87	1,34	1,50	1,21	1,45	1,31	1,29	1,54	2,02	1,60	1,83	2,19
Cork	1,19	1,05	1,07	0,89	1,33	1,49	1,43	1,37	1,21	1,49	1,71	1,65	2,06	0,82	0,63	0,72	0,89
Paper	0,94	0,93	1,15	1,17	1,23	1,48	1,47	1,63	1,39	1,67	1,66	1,61	1,75	0,74	0,64	0,71	0,82
Petrol	1,24	1,35	1,31	0,86	1,57	2,48	2,65	1,46	1,20	1,42	1,62	1,61	1,66	0,15	0,11	0,13	0,18
Chemistry	1,17	1,09	1,53	1,21	1,14	1,25	1,45	1,41	1,19	1,51	1,50	1,45	1,73	0,92	0,69	0,76	0,99
Plastic	0,87	0,80	1,09	1,03	1,10	1,25	1,45	1,43	1,26	1,60	1,58	1,52	1,81	1,13	0,87	0,97	1,23
Mineral	0,84	0,92	1,07	1,00	0,82	1,03	1,06	1,26	1,04	1,29	1,42	1,37	1,63	1,68	1,30	1,47	1,79
Metal	0,83	0,83	1,05	1,00	0,85	1,01	1,22	1,25	1,23	1,53	1,52	1,44	1,73	1,62	1,13	1,24	1,53
Machinery	0,84	0,80	1,33	1,02	1,19	1,30	1,49	1,35	1,22	1,52	1,45	1,39	1,69	1,24	0,93	0,99	1,24
Energy	0,41	0,68	0,86	0,79	0,50	0,89	1,58	2,27	1,81	2,09	2,60	2,46	3,14	0,24	0,21	0,22	0,26
Construction	0,92	1,11	1,18	1,06	0,95	0,99	1,03	1,02	0,89	1,25	1,28	1,30	1,69	1,88	1,23	1,42	1,81
Trade	0,79	0,75	0,54	0,26	0,49	0,88	0,90	1,17	1,19	1,68	1,48	1,45	1,68	2,29	1,47	1,67	2,29
Tourism	0,96	1,11	1,14	0,89	0,81	1,06	1,20	1,18	0,98	1,17	1,04	1,03	1,20	2,04	1,78	1,36	2,07
Transport	0,45	0,51	0,59	0,51	0,59	0,83	0,92	0,95	0,91	1,21	1,11	1,07	1,38	2,86	2,13	2,22	2,75
Comunicat,	0,37	0,42	0,37	0,13	0,50	0,93	1,32	1,73	1,49	1,86	1,70	1,65	2,03	1,86	1,42	1,42	1,78
Finance	0,64	0,88	1,65	2,31	2,46	1,58	1,54	0,87	0,67	0,87	0,70	0,69	0,94	1,32	1,33	1,22	1,33
Real Estate	0,65	0,77	0,46	0,34	0,88	1,16	1,23	1,06	0,92	1,26	1,38	1,41	2,13	1,85	1,88	1,78	1,85
Other Serv,	0,51	0,59	0,48	0,36	0,79	1,01	1,45	1,52	1,23	1,63	1,37	1,33	1,79	1,68	1,68	1,63	1,97
Normal values of 1 refers on the average while bigger than 1 over the average and smaller than 1 below the average.																	

Table 1 assigns that import dependency is changing both by years and sectors. In comparison with average, only import multiplier of four sectors (petrol; 1.24, cork; 1.19, chemistry; 1.17, and agriculture; 1.08) found above the average while the rest of the others were far below average in 1995. Petrol having the biggest value, were 1.24 times more import dependent than average of the economy in 1995. Cork (1.19), chemistry (1.17) and agriculture (1.08) were also more import dependent sectors than national average in this period.

Vital change has been observed in relative import dependency of sectors in this period. For example, output of the mining sector having the smallest normal import multiplier in 1995 found more import dependent in 2011 and value of normal import multiplier of sector rose from 0.029 in 1995 to 2.56 in 2011 while position of petrol changed opposite direction. Normal import multipliers of petrol diminished from 1.24 to 0.18 in this period. While total import effects of the petrol were 1.24 times more than average in 1995, this value dropped in 0.18 in 2011.

Normal values of textile assign that total import effects of corresponded sector are 2.19 times more than average in 2011. Approximately same explanation can be made for metal sector. Metal sector has been more import dependent since 2000 and total import effects of the sector is bigger 1.53 times more than average in 2011 year. The most import depended sectors compare to national average in recent years are food, textile, metal, construction, trade and transport sectors.

According to Table 1, if taken both the whole economy and entire period into account, it is concluded that the most import dependency observed between 2001 and 2007 years during research period. Both number of import dependent sector and size of the import multipliers of the particular sectors increased in this period. It is clear that, import dependency deepened and expanded in this period except a few service sector. Even though both number of import dependent sectors over the average and import deepening of sectors decreased between 2008 and 2011, import dependency of many sectors found greater than their values of between 1995 and 2007.

3.3. Determinants of Total Import Effects of the Sectors

This section provides an overview total import dependency drivers of entire economy. Total import effects of the sectors have been examined associate with three elements widely used in the input output literature. Main elements of macro wide import dependency according to input output approach are imported input intensity, output share of sectors and sectorial input output linkages.

3.3.1. Imported input intensity of sectors

mport intensity is highly significant for both individual import dependencies of sectors and macro wide import effects of them. Methodologically we measured import intensity of sectors by means of the import coefficients. To examine dependency of each sector and to understand the role of them in import dependency of the entire economy, import coefficients of sectors having the biggest total import effects in 2011 were calculated and results presented in Figure 8.

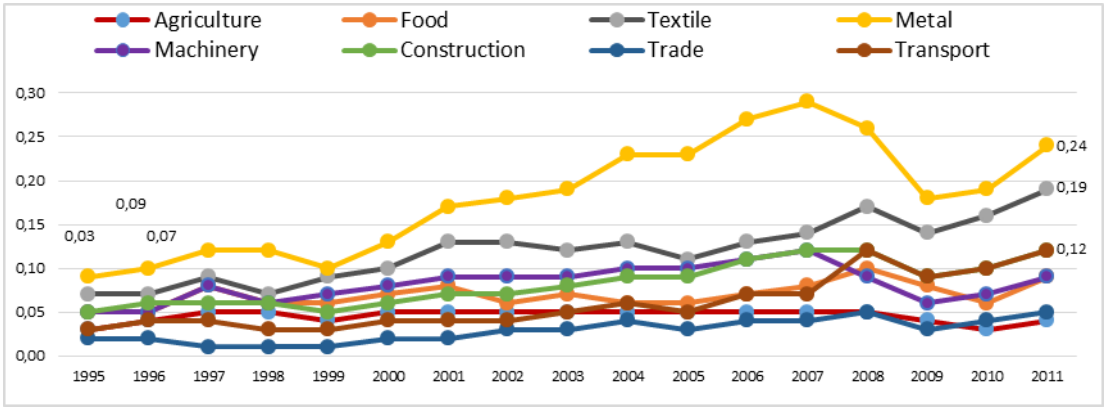

Figure 8. Import Intensity of Some Sectors between 1995 and 2011

Figure 8 exhibits that there was a considerable heterogeneity in intensity of imported inputs among sectors. Analysis of the data in input output tables revealed that, metal production depended mainly on imported inputs and had higher import intensity than the others in the period of 1995-2011.

It is clearly seen that imported input intensity of the metal and textile sectors found both high and tend to rise. Import multiplier of the metal sector having the biggest import intensity increased from 0.09 to 0.24 while import multiplier of the textile which was the second import intensive sector rose from 0.07 in 1995 to 0.19 in 2011.

Sectors having the lowest imported input intensity are agriculture and trade in this period. İmported input intensity of these sectors were calculated less than 0.05 during this period. As a result, it is possible to conclude that, imports coefficients in most of the sector indicates a growing trend in import intensity in Turkish Economy between 1995 and 2011.

Besides the level of imported input intensity of sectors, its rate of the change is also an important issue for import dependency. Change in imported input coefficients within the period of 1995-2011 were calculated and results presented in Figure 9.

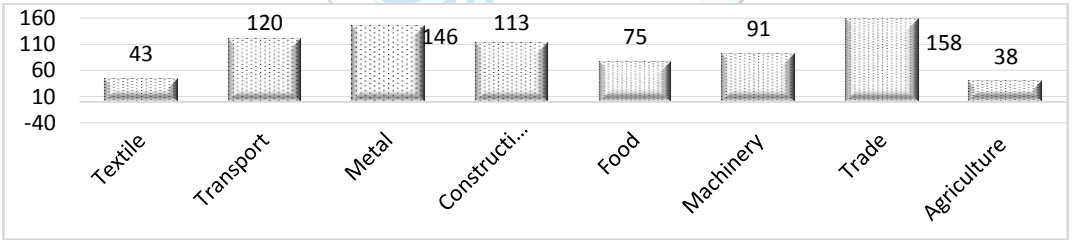

Figure 9. Change in Import Intensity between 1995 and 2011 (in %).

Figure 9 shows the change in imported input intensity of sectors which are having the biggest increase in import intensity between 1995 and 2011. Some sectors such as trade, metal, transport and construction exhibited significantly increase in their import requirements between 1995 and 2011. Trade is the sector which experienced the maximum increase with respect to change in import intensity in this period. İmported input intensity of the corresponded sector increased in 158% in this period. İncrease in imported input intensity found 146% for metal, 120% for transport and 113% for construction while this value was lower than 100% for the other sectors. Import intensity of textile which has the greatest import effect in 2011, grew only 3% in this period. This is good sign of import dependency of Turkish Economy.

3.3.2. Output Share of Sectors

Import intensity is not strong indicator of the total import effects of sectors. The second element impacting economy wide import dependency is the relative significance of each sector in terms of its weight in total output. To see size of sectors in economy, output share of sectors were calculated and results presented in Figure 10.

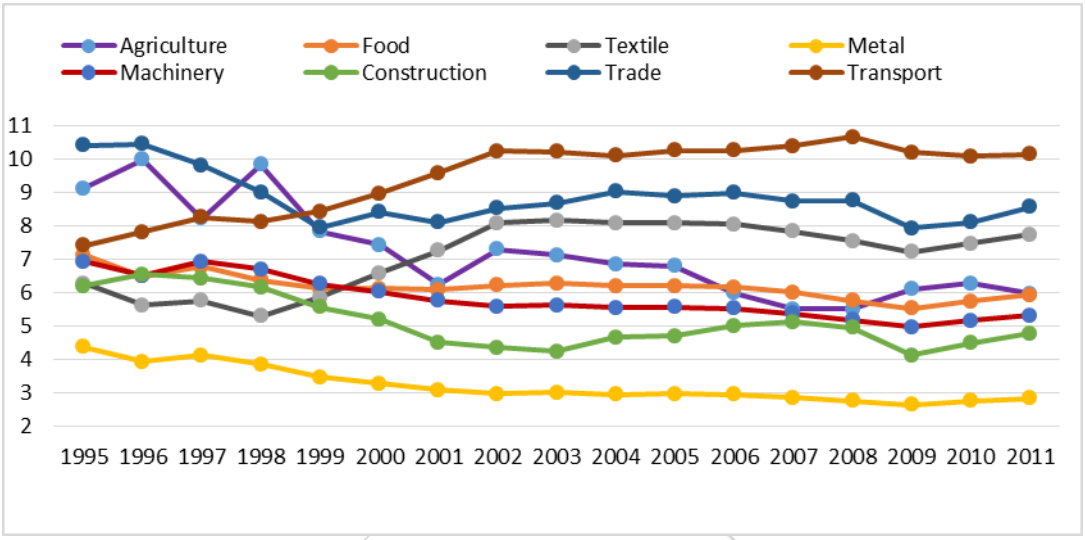

Figure 10. Share of Sectors in Output between 1995 and 2011

Figure 10 shows that, trade agriculture and transport sectors were 3 major sectors of Turkish Economy in 1995 according to output share. While trade and transport sectors sustained relatively high share in production, share of agriculture in economy dropped considerably in 2011. The share of the transport increased from 7.4% in 1995 to 10.15% in 2011 while share of trade and agriculture diminished in this period. Although share of trade diminished, trade sector was still the second sector in 2011. Share of textile sector showed considerable development since 1998. Transport, trade and textile sectors were in absolute terms top-3 weighted sectors since 2001 with respect to output share.

Metal sector having the highest import intensity during this period, had the lowest share in total output and tended to decrease in this period. Share of metal in output dropped from 4.36% in 1995 to 2.82 % in 2011. Construction and machinery sectors also has small share in total output between 1995 and 2011.

Besides output share of sectors, change of their rates are also important. Percent change of sectorial output share within 1995-2011 period were calculated in order to predict import dependency of the economy in the future and results presented in Figure 11.

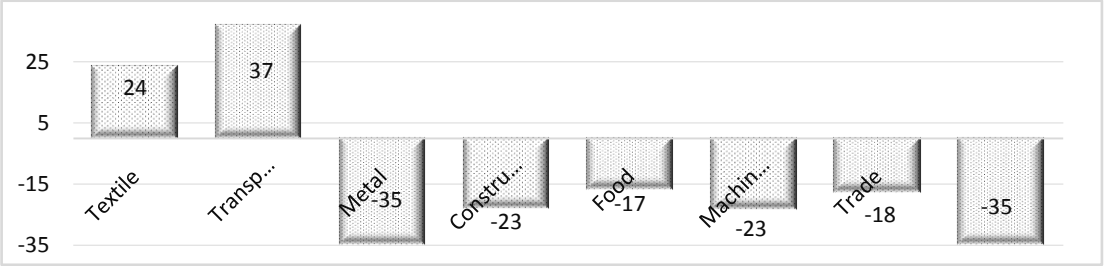

Figure 11. Change in Share of Output for Some Sectors Between 1995 and 2011 (in %).

Transport and textile sectors are only 2 of the 8 sectors have increasing trend in terms of output share among sectors which having the biggest total import effects in 2011. Having 37% growth rate textile found most rapidly growing sector in this period while second growing sector was transport with 24% growth rate.

As seen from figure 11, share of the output of some sectors which having high import multipliers tended to decrease in this period. Fall of the output share varied to some extent between sectors. The greatest fall in output share observed both metal and agriculture sectors (35%). Other sectors losing weight in output were construction (23%), machinery (23%), trade (18%) and food (17%) during this period.

Also growth rate of sectors having high import impact is essential from the point of future-oriented improvement of import dependency. Rapid growth of sectors having high import effects leads to a further increase in import dependency of the economy in the future. Growth rates of sectors between 1995 and 2011 were calculated and results presented in Figure 12.

Figure 12. Output Growth of Some Sectors between 1995 and 2011 (in %).

Figure 12 indicates that all of the chosen sectors grew positively between 1995 and 2011. Transportation sector is the fastest growing sector with 418% growth rate while as a second growing sector textile has 367% growth rate. Both 418% and 367% are rather high rate of output growth among sectors. If taken significant import effects of textile and transport sectors into account, it can be concluded that Turkish Economy maintenance to grow imported input base next years. Food and trade sectors grew by 214%, and 210%, while metal had the lowest growth rate with 144% in this period.

3.3.3. Inter-Sectorial Input Output Linkages

After imported input intensity and share of sectors in output, the third element impacting import dependency of the economy is inter-sectorial input output linkages. Methodologically we measured sectorial linkages by means of the total backward coefficients since these coefficients present requirement of total intermediate input needs if final demand of the sector increased one unit. Total Backward Coefficients of sectors were exhibited in Figure 13.

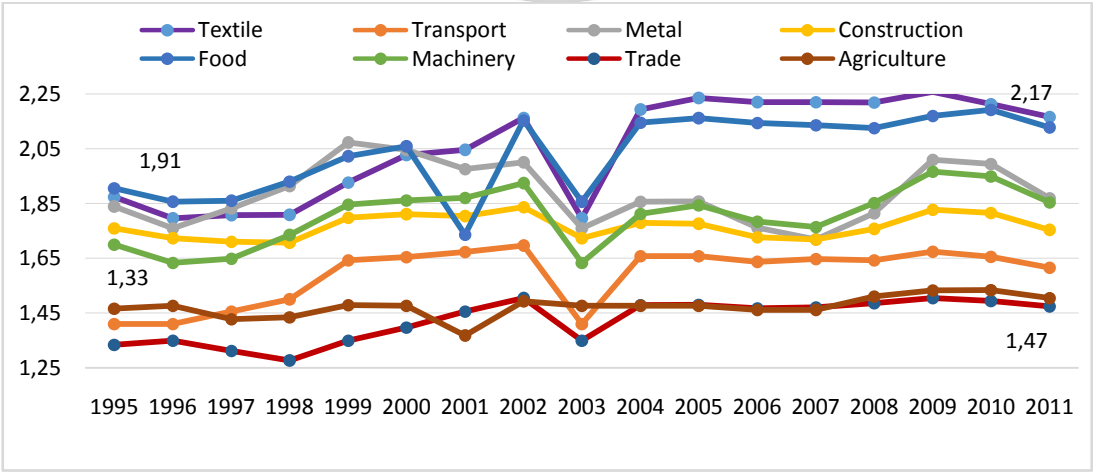

Figure 13. Total Backward Linkage Coefficient of Sectors between 1995 and 2011

Figure 13 shows that total backward linkage coefficients of sectors changed between 1.33 and 1.91 in 1995. Food sector has the highest total backward linkage coefficient in 1995. When the final demand increases one-unit in this sector, an additional 1.91-unit intermediate input demand emerged throughout the economy. It is seen that; total backward linkage coefficients rose up to 1.47-2.17 band in 2011. Textile, food and metal

sectors has high backward linkage coefficients while trade, transportation and agriculture sectors has low total backward linkage coefficients in this period.

Besides total backward linkages of sectors, rate of the change in coefficients is also important. Change of the total backward linkages between 1995 and 2011 were calculated in order to predict change in capacity of impact to import dependency of sectors and results presented in Figure 14.

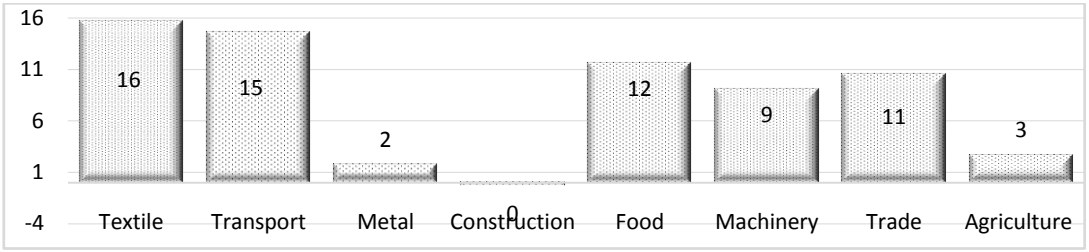

Figure 14. Change In the Total Backward Linkage Coefficients of Sectors between 1995 and 2011 (in %).

Figure 14 presents that total backward linkages of the most import dependent sectors changed positively. This change exhibits that, capacity of the chosen sectors to impact entire economy expanded in this period. The maximum change in backward linkages observed in textile (16%). The rates of increase in backward linkages were 15% for transport, 12% for food, 11% for trade and lower than 10% for the other sectors between 1995 and 2011.

4. CONCLUSION

Since production and trade structure has been changing in globalization economic area, even if production and exports increases, economic impacts of their change cannot be always positive. This is also valid for Turkish economy. Despite growing output and exports volumes, maintaining problems such as unemployment, foreign trade and current account deficits shows that Turkish economy hasn't been taken advantage of foreign trade benefits. One of the basic reason of this situation is to substitute imported inputs for domestic inputs caused multiplier mechanism to diminish. In this study, 17 input-output tables published by WIOD for Turkish Economy (from 1995 to 2011) were used. Empirical evidences found in the study summarized as below. One conclusion which emerges from the results of the study is that, the production structure of Turkish Economy changed between 1995 and 2011. While both imported and domestic input intensity of the output increased, value added intensity of production diminished in this period. An economic structure that heavily intermediate input demanding and inadequate intermediate input supplying dominated in Turkish economy. This structure increased the dependency of Turkish Economy on imported inputs. Therefore, it is essential to stimulate sectors producing intermediate input particularly in manufacturing sector and also encourage to use of domestic intermediate input in Turkish Economy. Total import effects investigated on sectorial basis. Textile sector found as the most import dependent sector in 2011. When researched sources of the import dependency of the sector, it is found that both the imported input intensity and share of the sector's in output are relatively high. Consequently, both textile's own import dependency and capability of stimulate national import demand increased within this period. Similar issues are also true for the transportation sector. Since these sectors being also the fastest growing sectors of Turkish Economy, it seems import dependency of Turkish Economy will continue to increase in the future.

Metal has been found as third sector according to total import effects in 2011. İmported input intensity which indicates import dependency of sector found high and in upward trend. However, due to decreasing output share and unchanged backward linkages, total import effects of metal diminished in this period. Construction sector was also another sector who's of total import effects decreased although import intensity increased between 1995 and 2011.

Diminishing the imported input usage in economy would have some beneficial results such as increase in employment, increase in domestic input and decrease in current and foreign trade deficits. If Turkey aims to be a developed country, production structure must change from the unsustainable and imported input base model to high domestic input growth model in the near future.

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Appendix 1. Import Multipliers Coefficients (1995-2011)

	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Agriculture	0,0046	0,0056	0,0069	0,0074	0,0056	0,0059	0,0051	0,0059	0,0051	0,0057	0,0053	0,0046	0,0049	0,0045	0,0041	0,0040	0,0048
Mining	0,0001	0,0001	0,0001	0,0001	0,0001	0,0002	0,0003	0,0003	0,0003	0,0004	0,0005	0,0004	0,0006	0,0006	0,0005	0,0006	0,0007
Food	0,0057	0,0055	0,0087	0,0066	0,0064	0,0069	0,0080	0,0073	0,0069	0,0070	0,0063	0,0061	0,0078	0,0102	0,0075	0,0066	0,0094
Textile	0,0079	0,0070	0,0087	0,0063	0,0095	0,0121	0,0187	0,0209	0,0169	0,0202	0,0183	0,0179	0,0214	0,0282	0,0223	0,0255	0,0305
Cork	0,0002	0,0001	0,0001	0,0001	0,0002	0,0002	0,0002	0,0002	0,0002	0,0002	0,0002	0,0002	0,0003	0,0001	0,0001	0,0001	0,0001
Paper	0,0011	0,0011	0,0013	0,0014	0,0014	0,0017	0,0017	0,0019	0,0016	0,0019	0,0019	0,0019	0,0020	0,0009	0,0007	0,0008	0,0010
Petrol	0,0088	0,0096	0,0093	0,0062	0,0112	0,0177	0,0189	0,0104	0,0086	0,0101	0,0116	0,0115	0,0119	0,0010	0,0008	0,0009	0,0012
Chemistry	0,0023	0,0022	0,0031	0,0024	0,0023	0,0025	0,0029	0,0028	0,0024	0,0030	0,0030	0,0029	0,0034	0,0018	0,0014	0,0015	0,0020
Plastic	0,0006	0,0006	0,0008	0,0008	0,0008	0,0009	0,0011	0,0010	0,0009	0,0012	0,0012	0,0011	0,0013	0,0008	0,0006	0,0007	0,0009
Mineral	0,0009	0,0010	0,0011	0,0011	0,0009	0,0011	0,0011	0,0014	0,0011	0,0014	0,0015	0,0015	0,0017	0,0018	0,0014	0,0016	0,0019
Metal	0,0068	0,0068	0,0085	0,0081	0,0069	0,0082	0,0099	0,0102	0,0100	0,0124	0,0124	0,0117	0,0140	0,0131	0,0091	0,0101	0,0124
Machinery	0,0057	0,0055	0,0092	0,0070	0,0082	0,0090	0,0103	0,0093	0,0083	0,0104	0,0100	0,0095	0,0116	0,0085	0,0064	0,0068	0,0085
Energy	0,0012	0,0020	0,0026	0,0024	0,0015	0,0027	0,0048	0,0088	0,0055	0,0063	0,0078	0,0074	0,0095	0,0007	0,0006	0,0007	0,0008
Construction	0,0055	0,0067	0,0070	0,0063	0,0057	0,0059	0,0061	0,0061	0,0053	0,0075	0,0076	0,0078	0,0101	0,0112	0,0073	0,0085	0,0108
Trade	0,0027	0,0025	0,0018	0,0009	0,0017	0,0030	0,0030	0,0040	0,0040	0,0057	0,0050	0,0049	0,0057	0,0077	0,0050	0,0056	0,0077
Tourism	0,0018	0,0021	0,0022	0,0017	0,0016	0,0020	0,0023	0,0023	0,0019	0,0022	0,0020	0,0020	0,0023	0,0039	0,0034	0,0026	0,0040
Transport	0,0037	0,0041	0,0047	0,0041	0,0048	0,0067	0,0074	0,0077	0,0074	0,0098	0,0090	0,0086	0,0112	0,0231	0,0172	0,0179	0,0222
Communication	0,0002	0,0002	0,0002	0,0001	0,0003	0,0005	0,0007	0,0009	0,0008	0,0010	0,0009	0,0008	0,0010	0,0009	0,0007	0,0007	0,0009
Finance	0,0005	0,0007	0,0012	0,0017	0,0019	0,0012	0,0012	0,0007	0,0005	0,0007	0,0005	0,0005	0,0007	0,0010	0,0010	0,0009	0,0010
Real Estate	0,0021	0,0024	0,0015	0,0011	0,0028	0,0037	0,0039	0,0034	0,0029	0,0040	0,0044	0,0045	0,0067	0,0059	0,0060	0,0056	0,0059
Other Service	0,0020	0,0023	0,0019	0,0014	0,0031	0,0039	0,0056	0,0059	0,0048	0,0053	0,0053	0,0051	0,0069	0,0065	0,0065	0,0063	0,0076

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The Use Of Membrane Processes To Promote Sustainable Environmental Protection Practices

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Abstract

The aim of this study is to promote membrane employment for sustainable environmental protection practices in terms of retaining the depletion of natural resources at a grade less than their proportion of renewal and consumption and employment of as much renewable resources as possible instead of depletion of unrenewable resources. Furthermore, information on life cycle assessment of products and manufacturing systems is provided. Energy and water are the indispensable resources for the mankind wealth. The increased energy needs arising from developing technologies, increasing population and limited resources have led people to turn to sustainable methods, especially in the case of limited water resources. There has been growing rate of interest for biological wastewater treatment methods by membrane employment. Separation of solid-liquid mixtures is implemented in the way of biological wastewater treatment; especially MBRs have critical role for treatment processes. MBR operations allow biological treatment and disinfection without utilization of chemicals and the amount of produced sludge is less due to unemployment of SRT. Although membrane technology still needs to be improved regarding energy consumption, membrane and/or module manufacturing costs, durableness and expertise, it has an important place in the energy-efficient sustainable water supply, industrial wastewater management processes and energy production. In addition to this, they are flexible and adaptable for module modification and latest novelties. In literature, limited researches have been practiced so far dealt with the issue of public acceptance of certain methods being applied. Future research may focus on overcoming the issue of membrane fouling, by devising methods for efficient cleaning, preferentially without employment of dangerous chemicals, as well as by investigating new types of membranes.

Key words

Biological treatment, MBR, Renewable and sustainable environmental protection

1. INTRODUCTION

Increased use of water and energy

Energy a word with simple meaning in linguistic but an issue for scientists. Societies grow in number as technology solves the equation for longer life, however planet has specific amount of energy. This is much true and also complicated in water sector as we realize that it possesses both life and energy. It is an awe-inspiring idea to develop a system to explore the energy stored in water and wastewater. There has long been a controversy surrounding what would be an ideal system to purify used water, as known it wastewater, and also reuse the impurity separated from. In 1969, Budd et al. [1] used ultra-filtrated membranes as a solution for high removal efficiency and also to separate sedimentation tank from activated sludge in water treatment plants. They reached an effluent with BOD under 5 mg/l and nearly no sign of coliform bacteria. This processes had some advantages such as low sludge production, high quality water production and low maintenance. However, high operation costs prevented its wide spread application. A group of Japanese researchers [2] installed Hollow-Fiber (HF) membranes inside an activated sludge reactor and operated a suction pump directly over the membrane to catch the permeated water. Treated water was produced at low suction pressure (13 kPa), short hydraulic retention times (4 h), high loading rate (1.5 kg COD/m3·days), and relatively long operating periods (120 days). This study was the beginning of wide-spread usage of MBR for treatment of both municipal and industrial wastewaters as it possessed the possibility to produce much cleaner water with low energy demands.

Life cycle assessment of products and manufacturing systems

Sustainability is principally defined as the appropriate integration of environmental fineness, economic affluence and socialeven-handedness [3,4]. In fact, it refers to the equilibrium between environment, industry and economic. Various tools have been developed to assess the behavior of industries and their associated manufacturing processes, among which Life Cycle Assessment (LCA) is the most popular and at the same time most reliable method. It is a structured and analytical procedure that provides detailed assessment for environmental sustainability. Unfortunately, LCA has been applied to MBR systems only in a few cases for treating urban wastewater [5, 6, 7]. It should be mentioned that the comparison of the results of different LCA studies, cannot be direct, since each study has a different goal and scope definition, different impact assessment methods are used, the assumptions made are not totally equivalent, while also the energy mix and the geographical location of each study are different [5]. In the study, the environmental impacts of an MBR used for the treatment of domestic wastewater were compared with those of three other treatment technologies (reedbeds, membrane chemical reactor and green roof recycling system) [8]. In addition, according to Ortiz et. al. [6] both externaland submerged MBR systems have lower environmental impacts than a CAS system followed by tertiary treatment, for the treatment of domestic wastewater. Hospido et al. [9] studied the footprints of four different MBR configurations. Their study indicated that electricity consumption and agricultural application of sewage sludge are playing the most important role as the environmental impactswere identical for all four MBR configurations.

Renewable energy sources and sustainable environmental protection

It is critical to remind that energy is a fundamental source for us in terms of development. It has been thought that present resources were found as abundant for a long time. Augmentation of the population in the world and also technological progresses swapped-in throughout the industrial revolution, demand to the energy swelled and it was hinged upon the inadequacy [10]. However, utilization and increment of the energy in the world ensured from petroleum, petroleum derivatives, coal, natural gas and electricity produced from the nuclear power plants (NPP). Since all the energy resources from underground are not being virginally comprised, they are once for all limited.It is estimated that energy demand will enduringly increase in following years which will be resulted as a prevailing need for the fertile use of it. Such resources which can be used under the name of renewability are differentiated as biologic entries for sustainability and acceleration of their expansion in a positive axis is worth of note. To provide sustainability, renewable energy sources can be listed as power from wind, water, biomass, solar light and photovoltaic energy, wave, tide, earth that provides geothermal energy and etc. [11]. Renewable energy sourceshave tremendous potential as a clean and environment friendly energy source and throughout its energy production, no irrecoverable pollution can occur [12]. Thus, they pave the way for sustainability of the environmental protection. In this context, membrane technologies, especially membrane bioreactor (MBR) systems, have great importance in water and energy sustainability. Although MBR operations have some handicaps, such as cost, energy consumption, maintenance etc., it has significant importance for productive land utilization, simple operation and applicability [13].

2. MEMBRANE TYPES AND PROCESSES

MBR systems generally integrate the employment of bio-processes and membrane engineering to refine wastewater. In late nineteenth century, employment of the treatment method, regarding upon biological way, can be observed but being a model procedure for the treatment of the wastewater begins from the 1930s [14]. Industrial and municipal wastewater samples are exposed to treatment processes in terms of having better permeate quality by employment of aerobic and/or anaerobic treatment processes [15]. When the soluble matter that can be degraded in biological way eliminated from the environment, generation of the biomass requires an entanglement from the liquid flow to ensure necessary permeate quality. Exposing permeate to the gravitational force in secondary tank, operation called traditional process, paves the way for the final separation of the solid/liquid mixture that is frequently a barrier for the permeate quality [16]. There are different types of materials in use for the selection of the membranes. Due to the congruity, only a few membrane typesare widely used and it is known that there are several limitations that diminish the number of materials in use. Membranes should have high acidic, basic, chemical and mechanical endurance properties and they should be performed in the pH range between 4-10. However, 1-12 pH is also employed during the membrane reuse and cleaning. There are still unknown

toxic chemicals, oxidants, and membrane materials which may be subjected to these chemicals by providing high shear force from water and air, throughout the process. Some of the polymers used as a membrane material are listed as following; polysulfone (PSF), polyethersulfone (PES), polyolefins: polyethylene (PE), polypropylene (PP) and polyvinylchloride (PVC), polyvinylidene difluoride (PVDF), polytetrafluoroethylene (PTFE) and cellulose acetate (CA) [17, 18, 19]. Membrane processes diverse in each other according to density and porous structure. Pressure driven membrane operations are reverse osmosis (RO), nanofiltration (NF), ultrafiltration (UF) and microfiltration (MF). However there are extractive and/or diffusive membrane operations such as; electrodialysis (ED), pervaporation (PV), membrane extraction (ME) and gas transfer (GT).

A brief definition for every type of membrane processes

There are different types of membrane processes employed according to their type and pore size diameter which is directly dependent to the semi-permeability of a membrane in MBR systems. Biggest pore size and, thereby, lowest permeability property belongs to the microfiltration (MF, >50 nm)(IUPAC, 1985) and it provides a separation process for suspended solids (SS) by sifting through over the membrane pores. Controversially, RO has the highest semi-permeability characteristics and even single charged ions, like alkali metals/halogens, can be retained [20]. Nonetheless, it ensures that dividing the dissolvability and diffusion rate of solver and solute inside of the water. Therefore, RO and NF (<2 nm) are used for the solute elimination. While NF is called as 'leaky' RO, disentanglement succeeded throughout the combination of charge denial. In addition to this, MF and UF (2–50 nm), which are mostly used due to biological justifications, is employed for the small colloidal particles removal [21]. One of the fundamental extractive or diffusive membrane process is electrodialysis (ED) which is actually used for the separation quality of ionic size, charge and solute ions' density in terms of charge. On the other hand, since pervaporation (PV) represents the same principal with RO, it actually deals with the partial vacuuming of volatile constituents, which are tent to evaporate partially, on the surface of the membrane. Membrane extraction (ME) method interests the concentration of the matter which cannot be filtrated and effluent part of the membrane. Nevertheless, in gas transfer (GT) process, gas is transported under at significant rate of pressure into/out of liquid in molecular manner [17].

Membrane processes main applications

MBR system modifications have been applied in various industrial processes wastewater such as food industry, petrochemical industry, dying wastewater, hospital wastewater, and textile industry. The reasons for the wide usage of MBR processes in industries are the resistance of toxic substances, high heavy metal removal capacity and treatment ability of refractory substances [22, 23, 24]. In drinking water treatment operations, coagulation, flocculation, sedimentation, filtration and disinfections processes can be integrated into a single process with MBR systems [24]. Besides wastewater treatment, one of the main applications of membrane processes isbiofuel (bioenergy) production in the form of bioethanol, biogas (methane and hydrogen), and biodiesel. Biofuels are designated as first, second or third generation based on the raw material they are produced from. First generation biofuels are derived from sugar, starch and vegetable oil [25]. Second generation biofuels are produced from the stalks of wood, wheat, corn, and some non-food based feedstocks [26]. Algae are the raw material for the third generation [27]. The process of biomass conversion to biofuel requires appropriate separation technologies. Some of the membrane processes that are applied in the process of bioenergy production are: microfiltration (MF), ultrafiltration (UF), nanofiltration (NF), pervaporation (PV), membrane distillation (MD), etc. [28]. Due to the properties of ethanol, the most suitable processes for its obtainment are PV and MD. In the case of biogas and biodiesel, those are MF and UF, and for the latter product also NF. The most common configurations applied are flat sheet, tubular, hollow fiber, plate-and-frame, capillary and spiral wound [28].

3. SUSTAINABLE ENVIRONMENTAL PROTECTION AND MEMBRANE PROCESSES

Membrane processes receive a growing amount of interest due to their advantages over conventional systems. MBR systems have an extensive usage field from water treatment to water reuse, because of high quality effluent, high biomass capacity, low space requirement, low sludge production, high chemical durability of some membrane types and high disinfection capacity [29]. MBR systems have increasing importance in municipal water treatment and water supply all around the world. MBR systems are defined as the "best available technology" for many industries, because of the reuse potential of MBR effluents [30]. MBR systems are used for municipal and domestic wastewater treatment systems, because of high removal capacity of organic matter, suspended solids, phosphorus and nitrogen [24]. Furthermore, they contribute to a sustainable environmental protection through their role in biofuel production, a renewable energy source.

Advantages and disadvantages of CAS, MBR and D-MBR associated with sustainable environmental protection

Scientists and researchers are directed to alternative energy sources due to previous uncontrolled usage of fossil fuels and current rapid growth of the world population, advancing technology and energy storage ideas for the future. In this context, MBR and D-MBR systems have attracted to increasing interest and it become more of the issue for both academic and commercial environment in wastewater treatment with respect to energy saving over the conventional activated sludge system (CAS systems). Sustainable environmental protection is the most important issue connected with energy saving. Especially, MBR and D-MBR systems play a significant role for both wastewater and drinking water applications to provide sustainable environmental protection. The membrane bioreactor (MBR) employed for microfiltration (MF) / ultrafiltration (UF) support materials are used to provide solid and liquid separation in the bioreactor, and the reaction eventually does not require secondary clarifier. In this context, when comparison is made among CAS, MBR and D-MBR, use of membrane filtration for solid–liquid separation ensures higher effluent quality for wastewater reclamation and reuse. MBR and D-MBR have many advantages such as, higher biomass concentration, smaller footprint, lower sludge production

and rejection of SS (effluent from SS is close to zero) [31]. Especially, MBR and D-MBR systems' features, such as less treatment time, less manpower and less energy consumption, can be evaluated in the sustainable environmental protection when compared to the CAS. Also, D-MBR and MBR systems can be affected by the amount of biomass, the metabolic activities of the microorganisms and the microbial products of the biomass. In a struggle to understand the latter, a range of molecular microbial ecology methods have been developed [32] corresponding with sustainable environmental. MBR and D-MBR systems have been widely applied in full scale and laboratory scale wastewater treatment process thanks to supply higher MLSS concentration, better control of SRT, higher volumetric loading, production of high-quality effluent when compare with CAS [33]. However, the application of MBR is restricted by its high membrane module cost and membrane fouling [34]. So, many researchers attempted to use cheap covered material for replacing the expensive micro-/ultra-filtration membrane for decrease the high cost [35]. Despite it is claimed advantages of better treatment method performance and occupation of much less land, broader application of MBRs is still hindered by their relatively high construction cost and energy consumption [36]. For these reasons, in recent years done extensive research on D-MBR instead of MF and UF membrane is trying to eliminate the cost of the MBRs. Dynamic membrane is formed on the underlying a support materials when filtering the wastewater from the reactor, so is also called secondary membrane [37]. Mesh, woven and nonwoven fabrics are used instead of MF or UF [38] in the D-MBR, by this means operating costs of D-MBR are much lower than the CAS and MBR systems, also environmentally friendly practices from the point of view sustainable environmental protection. Based on the findings of several studies in the literature about the considering the relative advantages and disadvantages of MBR, D-MBR and CAS systems general information , Sustainable environmental protection taking into account, are tabulated in the Table 1.

Table 1: The comparison of comparatively advantages and disadvantages of *MBR, D-MBR and CAS*

MBR		**D-MBR**		**CAS**	
Advantages	**Disadvantages**	**Advantages**	**Disadvantages**	**Advantages**	**Disadvantages**
High MLSS	----------	High MLSS	----------	----------	Lower MLSS
Low footprint	----------	Low footprint	----------	----------	Large footprint
Higher volumetric loading	----------	Higher vol. loading	----------	----------	Lower vol. loading
Fine control of SRT	----------	Fine control of SRT	----------	----------	Workload for SRT control
----------	Greater operational and process complexity	----------	Greater ope. and process complexity	Easier ope. and process complexity	----------
Lower sludge production	----------	Lower sludge production	----------	----------	Higher sludge production
----------	Higher capital Low ope. costs	Low capital Low ope. costs	----------	----------	Higher capital High ope. costs
----------	Greater foaming propensity	----------	Greater foaming propensity	Lower foaming propensity	----------
Treated water that reusable	----------	Treated water that reusable	----------	----------	----------
Unlimited by settling due to gravity	----------	Unlimited by settling due to gravity	----------	----------	It is limited by settling due to gravity
----------	High Module Cost	Low module cost	----------	----------	----------
Sample TMP control based on constant flow	----------	----------	Complex TMP control based on constant flow	----------	Indifference
Sample fouling control	----------	----------	Complex fouling control	----------	Indifference
Chemical wash easer applied	----------	----------	Chemical wash not easily applied by taking into account microorganisms	----------	Indifference
Very high physical disinfection performance	----------	Normal physical disinfection performance	----------	----------	Indifference
Affected undirectly by Bulking problem	----------	Affected undirectly by Bulking problem	----------	----------	Affected directly by Bulking problem

Chemical treatment is not preferred because it is a secondary cause pollution. At this point, D-MBR systems have importance for used only microorganisms for wastewater treatment. But, D-MBR systems have also some disadvantage as fouling. The main fouling reason was reported in the previous studies due to increased bacterial growth [39]. So, they do not frequently needed to chemical and physical cleaning [40]. Despite physical operations such as, water backwashing , air back washing, brushing, intermittent suction (relaxation) and cross flow are enough for MBR and D-MBR sysmtens, sometimes these operations temporarily cause to effluent quality (high MLSS). In the light of all these findings, although D-MBRs are more advantageous compared to MBR and CAS, some disadvantages associated with the cake layer develop on the the membrane surface. So, a well-defined and systematic comparison of D-MBR, MBR and CAS about wastewater treatment, must be of fundamental importance, thoroughly and meticulously [41]. The main advantage of MBR and D-MBR systems is sludge retention time (SRT) can be controlled easly as completely independent from hydraulic retention time (HRT). So, a very long SRT can be operated resulting in the complete retention of slow-growing microorganisms such as nitrifying or methanogenic bacteria and this results in greater flexibility of operation sustainable environmental protection taking into account [42].

Involvement of MBR systems in the sustainable environmental practices

Sustainable environmental practices is getting importance with each passing day. Development of green built environments is one of the most important sustainable environmental act. The main purpose of green buildings act is eliminated negative impact of buildings on their environments, and create eco-friendly, energy-efficient buildings for future green eco-cites [43]. In this connection, water management and wastewater treatment have vital importance for future [28]. Hybrid membrane techniques like MBR methods and their sub-categories have an important role in green design for urban and municipal applications, because of membrane systems advantages such as cost-effectiveness, user-friendliness and eco-friendliness [43].

4. CONCLUSION

Membrane-based methods play an increasingly important role in sustainable processes such as renewable energy production and wastewater treatment. Their main advantages are high processing efficiency, lower energy consumption over conventional systems, high chemical durability as well as wide applicability. Membrane systems are available in various configurations and are based on different principles, and as such are not without drawbacks - the main being membrane fouling. Further R&D will surely build upon the current findings and provide even more advanced solutions for sustainable environmental protection and biofuel production.

5. PERSPECTIVES FOR THE FUTURE

Since membrane fouling is the main challenge associated with the use of membrane-based systems, future research has to be focused on controlling this phenomenon. This can be achieved by careful optimization of operating conditions, such as backwashing/scouring aeration, SRT, HRT and TMP (transmembrane pressure). This is significant not only for the increase in the membrane life and the decrease in washing frequency, but also for efficient energy consumption. Furthermore, different materials should be investigated so as to find more efficient and/or cheaper alternatives to the currently used ones. Additionally, integration of different membrane methods into one system may contribute to the maximization of efficiency and minimization of the flaws the methods display when applied solely. Besides the technical aspects, room for improvement is also present on the biological side. Research into new sprecies/strains of microorganisms should lead to the discovery of more efficient and adaptable types. Alternatively, known species may be genetically engineered to improve their properties. The properties to be targetted hereby would be: process efficiency, adaptability to various conditions, adaptation time, requirements for optimal growth etc.

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Changed Circumstances as Ground for Non-Performance of Contracts (An Overview of Macedonian Contract Law)

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Abstract

The purpose for which parties enter into a contractual relationship is to create relevant rights and obligations, which means that the interest of these parties is that the created obligations must be performed as agreed. As such, this purpose is supported since Roman law, through the principle of pacta sunt servanda. This principle meant that a party to the agreement is responsible for non-performance, while not entering into the reasons, respectively to the nature of the impediments that led to that non-performance. However, the case law quickly proved that the implementation of this principle frequently charging the party with responsibility for which it cannot really be responsible. After the conclusion of the contract but before the contract is performed a party's situation may change due to changed circumstances, change that make it impossible or excessively difficult to perform for any of the parties. Which means, the situation and circumstances have changed since the moment of signing the contract, that the parties would not have entered into the contract, or would have made it differently had they known what was going to happen. This paper examines exclusion of party's liability due to changed circumstances by provisions in the Law on Obligations of the Republic of Macedonia. The review includes the conditions that must be met to consider as changed circumstances, the obligation to give notice to the other party, and excluding the possibility of invoking the changed circumstances.

Key words

Changed circumstances, Law on Obligations

1. INTRODUCTION

The purpose of the signed contract is to define the rights and obligations of the parties of that contract. The interest of both parties, at least at the time of concluding the contract is, the contract to be performed as agreed, i.e. in accordance with generally accepted principle pacta sunt servanda. The parties are strictly bound to respect their obligations and deemed to have foreseen events which could interfere with the equilibrium of the contract. However, this principle of strict respect of the agreed obligations, reached its review in the modern laws. This is so because the fact that today's trade is increasingly characterized by complexity, dynamism, flexibility and uncertainty. Although the cases in which a party that does not performs is exempt from responsibility for non-performance of contractual obligations are not the same in all national legislations, considering the events that could lead to discharge in the legal doctrine and almost all legal systems distinguish between events that absolutely prevents the performance of obligations; and events that not prevent, but significantly hamper or hinder the performance. The first ones are covered with the institute of force majeure, while the latter with the institute of changed circumstances.

As force majeure (vis maior or casus maiores) are considered all the circumstances that could not be foreseen, the consequences that could not have been avoided even if they are foreseen: quibus humana infirmitas resistere non potest – that led to their inability to perform obligations and then the obligations of the debtor terminated and he was not forced to perform the promised obligation. For the case law, legal doctrine and the legislations, force majeure is the main reason for exemption from liability. On the other hand, after the conclusion, but before the performance of the contract, the situation of one of the parties may change due to changed circumstances, particularly where the contract need to be performed within a specified period of time or in the distant future. In accordance with what can be called the foundation of contract law – pacta sunt servanda – however, it will not be considered reasonable if it required the party to perform the contract, regardless of what happens.[1] This led to the emergence of the clause rebus sic stantibus, to protect the party where the performance of the contract has become excessively onerous or difficult for one of the parties due to unforeseen circumstances after the conclusion of that contract. This situation today is covered by the doctrine of so-called hardship in common law, imprévision in French law and Wegfall der Geschäftsgrundlage in German law.

2. NOTION

Unforeseeable changed circumstances are probably one of the major problems parties – especially those who are party to a long or longer term complex contract – may face in international trade. Indeed, with globalization these problems are increased as the involvement of more and more countries in production and procurement entails even greater imponderables.[2] Changed circumstances create a situation in which it is clear that the contract no longer meets the expectations of the parties and due to the general opinion it would be unfair the contract as such remains in force.[3] This situation causes disruption of the equilibrium of the contract. Specifically, the equilibrium of the contract can be affected in two principal ways. First, the cost of performance to one of the contracting parties can increase. Second, the equilibrium can be affected as a result of a diminution in the value of performance to a contracting party.[4] According to some legal systems, the unforeseen changes in circumstances that make the contract excessively onerous, but not impossible for performance, authorize the party to as for termination or to renegotiate the contractual terms. The paradigm of pacta sunt servanda or sanctity of contract simply places the burden of such a change of circumstances upon the party on which it falls. However, since the old Roman days the principle of impossibilium nulla est obligatio, or there is no obligation to perform impossible things, has been recognized.[5]

3. THE APPROACH OF MACEDONIAN LAW

Law on Obligations of the Republic of Macedonia does not contain specific provisions for the definition and regulation of the institute changed circumstances. It speaks for this institute within the part in which regulates the termination of the contract, provided certain articles (five of them) under the common title "Termination of the contract or modification due to changed circumstances." The provisions contained in these articles after giving the definition of changed circumstances, they directly released into the consequences that arise, respectively the rights arising for the party affected by such circumstances, as well as the conditions to be satisfied that the party concerned may rely on them. Although these provisions do not expressly exclude the possibility of changed circumstances being invoked in respect of other kinds of contract, changed circumstances will normally be of relevance to long-term contracts, i.e. those where the performance of at least one party extends over a certain period of time. According to the first sentence of the article 122: "If after the conclusion of the contract occurred such circumstances that hinder the performance of the obligation of one party, or if because of them it cannot be realized the aim of the contract (…)." In international terms, a precise definition may found in the Principles of International Commercial Contracts (PICC): "There is hardship where the occurrence of events fundamentally alerts the equilibrium of the contract either because the cost of a party's performance has increased or because the value of the performance a party receives has diminished."[6]

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[1] Niklas Lindström, "Changed Circumstances and Hardship in the International Sale of Goods", *Nordic Journal of Commercial Law* (2006/1), http://cisgw3.law.pace.edu/cisg/biblio/lindstrom.html, [12 May 2016]

[2] Ingeborg Schwenzer, "Force Majeure and Hardship in International Sales Contracts", 39 *Victoria University of Wellington Law Review*, 709-725, 709.

[3] Article 122 of the *Law on Obligations of the Republic of Macedonia*, No. 18/2001. Amended by the Law amending the Law on Obligations, Official Gazette, No. 4/2002, No. 5/2003, No. 84/2008, No. 81/2009, No. 161/2009. Decision of the Constitutional Court of Republic of Macedonia, No. 121/2001, No. 78/2001, No. 67/2002, No. 59/2002.

[4] Stefan Vogenauer, Jan Kleinheisterkamp, *Commentary on the UNIDROIT Principles of International Commercial Contracts (PICC)*, New York: Oxford University Press, 2009, 717-718

[5] Ingeborg Schwenzer, op. cit., 709-710.

[6] Article 6.2.2 of PICC.

3.1. Circumstances should arise after the conclusion of the contract

The general condition is that circumstances must have occurred "after the conclusion of the contract", i.e. not have existed at the time of conclusion of the contract.[7] This is the position taken from article 6:111(1) of the Principles of European Contract Law (PECL) "(…) if performance has become more onerous (…)." If that party had known of those events when entering into the contract, it would have been able to take them into account at that time. In such a case that party may not subsequently rely on changed circumstances.

3.2. Circumstances could not reasonably have been taken into account by disadvantaged party or to have avoided or overcome them

Even if the change in circumstances occurs after the conclusion of the contract, paragraph (2) of article 122 makes it clear that such circumstances cannot cause changed circumstances if "they could reasonably have been taken into account at the time of the conclusion of the contract, or have avoided or overcome by the disadvantaged party." This second condition, which the circumstances to cause an exemption will have to fulfill, describes in a very flexible manner the criterion of foreseeability.[8] This does not necessarily mean that the provision can only apply to circumstances that arise after the conclusion of the contract. It may be the case that the circumstance already existed at that time, but that it was not recognisable to the party.[9] The reference here is thus the reasonable person (bon père de famille), in accordance with the general concept of the Law. The element of foreseeability in judicial and arbitration practice proved to be the most difficult for the non-performing party to prove. All potential circumstances to the performance of a contract are foreseeable to one degree or another.[10]

The circumstances must also be unavoidable. The non-performing party must have been reasonably unable "to have avoided or overcome" the circumstances. To "avoid" means taking all the necessary steps to prevent the occurrence of the impediment. In most cases, it will coincide with the idea of "beyond his control."[11] To "overcome", on the other hand, means to take the necessary steps to preclude the consequences of the impediment. It is closely associated with the condition of the external character of the impeding event. The attention here should be focused on the behavior of the non-performing party.[12] This rule reflects the policy that a party who is under an obligation to act must do all in his power to carry out his obligation and may not await events which might later justify his non-performance. This rule also indicates that a party may be required to perform by providing what is in all the circumstances of the transaction a commercially reasonable substitute for the performance which was required under the contract.[13] Generally, it is suggested that the party will only be excused where extraordinary expenses and effort would be required in order to overcome the occurred circumstances.[14]

3.3. Circumstances should not occur after the period of time for performance of contract's obligation

Paragraph (3) provides that the circumstances which prevents a party from performing exempts the non-performing party from liability for damages only if the these circumstances occurred within the period of time for performance of contract, i.e. "A party may not invoke the changed circumstances which occurred after the deadline fixed for the fulfillment of his obligations." This rule, even though not with the desirable clarity as to the substance and the legal techniques, has the effect of termination or modification of the obligation to perform as it is often prescribed in international economic contracts and in some instances also in laws as the primary consequences of changed circumstances.

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[7] Peter Schlechtriem, Ingeborg Schwenzer, *Commentary on the UN Convention on the International Sale of Goods (CISG)*, second edition, New York: Oxford University Press, 2005, 812-813.
[8] Fritz Enderlein, Dietrich Maskow, *International Sales Law: United Nations Convention on Contracts for the International Sale of Goods : Convention on the Limitation Period in the International Sale of Goods (Commentary)*, New York: Oceana Publications, 1992, 323.
[9] Peter Huber, Alastair Mullis, *The CISG: A New Textbook for Students and Practitioners*, München: Sellier European Law Publishers, 2007, 262.
[10] Paragraph 5 of article 65 [draft counterpart of CISG article 79] of the Secretariat Commentary of the 1978 Draft of the CISG, http://cisgw3.law.pace.edu/cisg/text/secomm/secomm-79.html, [02 May 2016].
[11] Cesare M. Bianca, Michael J. Bonell, *Commentary on the Internacional Sales Law*, Milan: Giuffrè, 1987, 581.
[12] Ibid.
[13] Paragraph 7 of article 65 [draft counterpart of CISG article 79] of the Secretariat Commentary of the 1978 Draft of the CISG, http://cisgw3.law.pace.edu/cisg/text/secomm/secomm-79.html, [02 May 2016].
[14] Peter Huber, Alastair Mullis, op. cit., 262.

3.4. The creditor has no right to terminate if the other party offers or agrees modification of contract's terms

Pursuant to paragraph (4) "The contract will not be terminated if the other party offers or agrees fairly changing of certain contract's terms." Paragraph (4) effectively provides that the debtor's right to change certain contract's terms takes precedence over the creditor's right to terminate the contract. As long as the debtor has a right for modification of contract's terms the buyer cannot rightfully and effectively terminate the contract.

3.5. Duty of notification

The party entitled to ask due to changed circumstances, termination of the contract is obligated for its intention to termination the contract to inform the other party after he knew that occur such circumstances and if fails to do so he will be liable for damages which the other party has suffered.[15] Through this provision, the Law expressly proves that it not allows the ipso facto termination, but the termination by declaration which notifies the other party for the termination of the contract. It should be noted that the damages for which the party is liable are only those arising out of the failure of the other party to have received the notice and not those arising out of the non-performance.[16]

4. CONCLUSION

From the examination of the changed circumstances in contracts under regulations prescribed by the provisions of the Law on Obligations of the Republic of Macedonia, some conclusions emerge. The provisions regarding the institute of changed circumstances are included in the section titled as "Termination or modification of the contract due to changed circumstances." As it can be seen by the place where they are assigned concerning the Law, but also by the name of the part that contains these provisions, it can be concluded that the changed circumstances are dedicated exclusively to the cases of termination or modification of the contract, and not conceived as an exception from liability that will be generally available for contracts. The second criticism that can be made to this section is that although its name includes the renegotiate of contract's terms due to changed circumstances, inside it does not regulate the authorization which is recognized as the various domestic legislations, as well as international convents and other international documents (such as ICC Hardship Clause 2003). Such a lack of principle do not contribute at all the accepted principle in legal doctrine, legislation and legal practice that the contract should be maintained in force as far as possible – favor contractus.

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[15] Article 123 of the Law on Obligations of the Republic of Macedonia.
[16] Paragraph 15 of article 65 [draft counterpart of CISG article 79] of the Secretariat Commentary of the 1978 Draft of the CISG, http://cisgw3.law.pace.edu/cisg/text/secomm/secomm-79.html, [02 May 2016].

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A Case Study of Installation of a Wind Power Plant in the Sinop Province, Turkey

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Abstract

World energy demand has been increasing very rapidly, resulting in environmental issues such as the greenhouse effect and air pollution. This situation stimulates the developing countries to benefit more efficiently from alternative energy sources. In parallel to this policy, Turkey as a developing country has been increasing incentives and investments to wind power conversion systems. Thanks to these investments, the numbers of the wind power plants (WPP) have been increasing in the country each passing day. In this study, the Sinop Province where wind potential is high, is analyzed in terms of establishment of a WPP. Four years of hourly average wind speed data of the selected region are applied to the Windsim software: annual energy production, capacity factor and also power and energy curves of selected wind turbines are obtained as output. The study shows that a WPP that has approximately 29 GWh/y annual energy production and 33% capacity factor can be operated with five Vestas V90 commercial wind turbines.

Keywords

Renewable Energy Sources,The Sinop Province, Wind Energy, Wind Power Plant(WPP)

1. INTRODUCTION

Renewable energy technologies including solar, wind, biomass, geothermal, etc., have become more important since they are clean, sustainable and efficient energy sources. In addition, renewable energy sources are seen as a hope todecreasethe use of global fossil fuel. Wind energy as a renewable energy source has shown a remarkable growth all around the world [1]. Turkey as a developing country, has been investing in wind energy by increasing incentives and investments. As it can be seen from Figure 1, Turkey's installed wind power capacity has been increasing consistently. According to the wind statistic report published by the Turkish Wind Energy Association, installed wind capacity of Turkey has reached 4,718 MW by January of 2016 [2]. It is predicted that Turkey's technical and economical wind energy potential are 83,000 MW and 10,000 MW respectively [3]. However, Turkey is a foreign dependent country in terms of the energy sector and it imports almost 70% of current energy resources to meet the current energy demand [4]. Also, this issue causes severaleconomic problems such as current deficit, soaring inflation etc. Moreover, it leads to a decrease of the competitive power of Turkey. When considered from this aspect, investment in renewable energy technologies is inevitable for Turkey's future.

In this study, the Sinop Province which is located in the most northern edge of Turkey is studied for WPP investment. The wind atlases developed by the Turkish Electric Affairs Etude Administration are used to evaluate the wind power potential of the Sinop Province. Wind data of the selected region areobtained through the met mast ofthe Turkish State Meteorological Service. In addition to that, four years of hourly average wind speed data of the selected region are applied to the Windsim software; annual energy production, capacity factor and power curves of selected wind turbines are obtained as output.

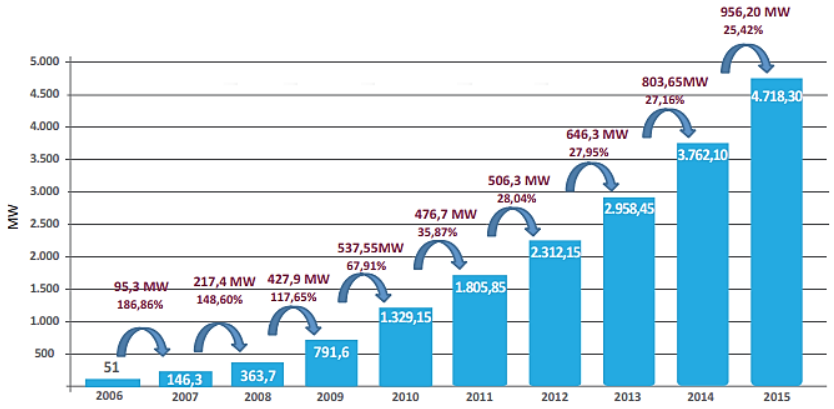

Figure 1.Cumulative installations for wind power plants in Turkey by years (MW) [5].

2. MATERIALS ANDMETHODS

In this section, firstly wind potential of Turkey is evaluated by using wind atlases. Secondly, wind power potential of the Sinop Province is analyzed for aWPP investment. Finally, terrain selection for the WPP is performed by considering wind power potential, accessibility and distance to energy transmission lines (ETL).

2.1. Assessment of Turkey's Wind Power Potential

Turkey is located in the northern hemisphere between the 36°-42° northern parallels and the 26°-45° eastern meridians. Turkey has a significant wind energy potential when compared with most European countriesthanks to its unique geographical position [3]. Turkey has realized this remarkable wind potential in recent years. According to Turkey's 2023 vision, Turkey is planning to supply 30% of its total energy demand from renewable energy sources [6]. Thus,wind energy comes into prominence for Turkey's future. The wind energy investments in Turkey are generally made in the western and southern regions [7]. Wind atlases as shown in Figure 1 and Figure 2 were developed by the Turkish Electric Affairs Etude Administration in order to determine the wind power potential of Turkey.

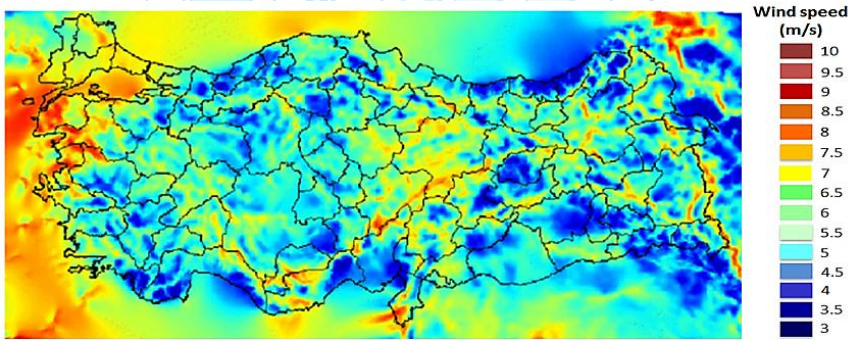

Figure 2.Yearly average wind speed distribution map of Turkey (50m) [8].

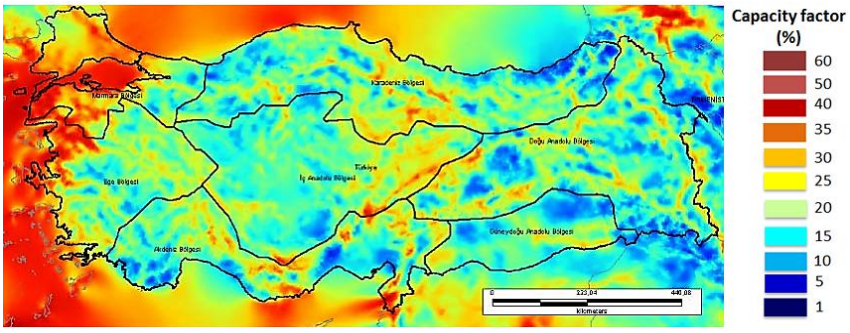

Figure 3.Average wind capacity factor in Turkey (50m) [8].

According to Figure 2, the annual average wind speed at 50 m elevation is approximately 7.0m/s throughout the country. Also, average wind capacity factor is almost 35% for most northern parts of Turkey including the Sinop Province. It can be concluded that Turkey is a rich country in terms of wind power potential.

2.2 Assessment of Wind Power Potential in the Sinop Province, Turkey

Sinop is a province of Turkey and it is located the most northern edge of the Turkish side of the Black Sea. The surface area of the city is 5,862 m^2, equivalent to 0.8% of Turkey's surface area. The borders of the city are 475 km and it consists of 300 km of land and 175 km of seaside borders [9].

Figure 4.Location of the Sinop Province in Turkey [10].

The wind atlas of Sinop is analyzedto evaluate the wind power potential of the SinopProvince. Yearly average wind speed and capacity factor distribution at 50 m elevation for the Sinop Province are given in Figure 4 and Figure 5. When the wind atlases oftheSinop Province are evaluated, it can be said that the northern part of the city is more convenient for WPP investment. In the northern part of Sinop, hourly average wind speed changes between 6.5 and 7.0 m/s. Besides, average wind capacity of northern part of the province is approximately 35%. For economical WPP investments, 35% or more capacity factor is required for the selected site [11]. When considered from this point of view, the northern part of the Sinop Province is rather suitable for a WPP establishment.

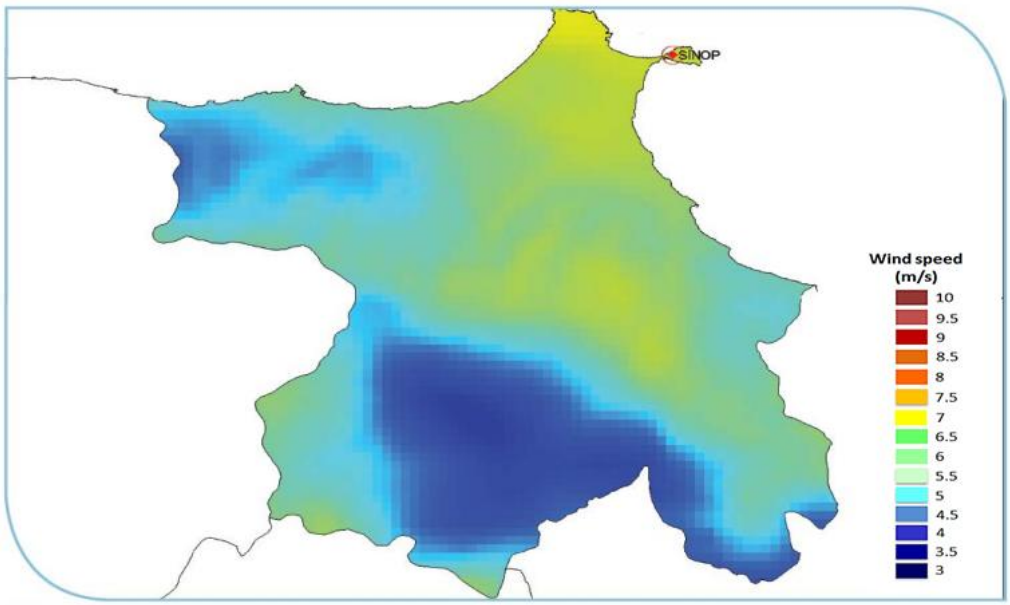

Figure 5.Average wind speed distribution map of the Sinop Province (50m) [12].

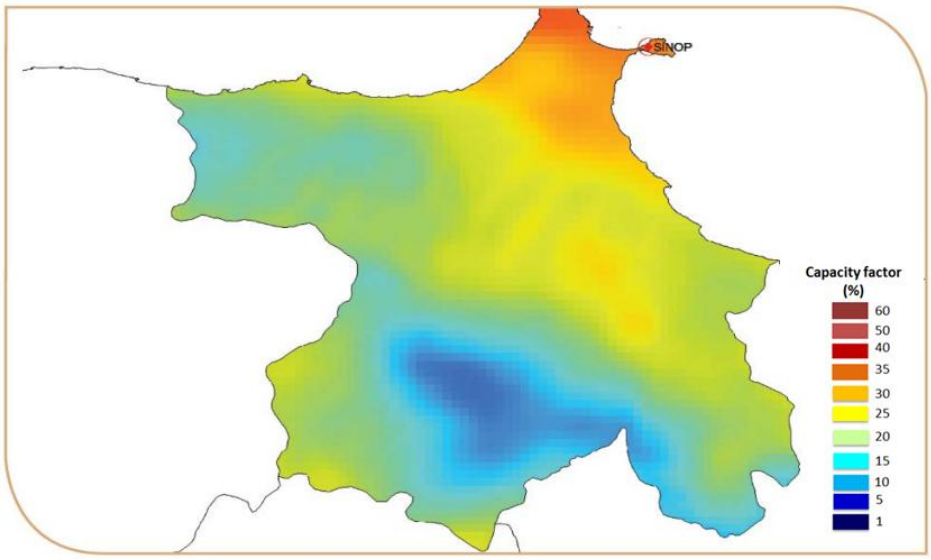

Figure 6.Average wind capacity factor in theSinop Province (50m) [12].

2.2. Site Selection for the Wind Power Plant

Modern wind turbines are installed near the coasts, on the hills, and the open valleys through the sea to obtain maximum efficiency [13]. Sinop is a coastal city on the Black Sea and thanks to this characteristic feature; the coastal terrains of the province are pretty convenient for WPP investment. Unusable lands for WPP investment are shown in Figure 7. According to Figure 7, most areas of the Sinop Province are inconvenient for WPP investment since there is asignificant amount of forestland in the northern part of the province. When ETL parameter is evaluated for WPP investments, it can be seenfrom Figure 8, there is a transformer station close to the city and it can reduce the initial investment cost of the WPP.

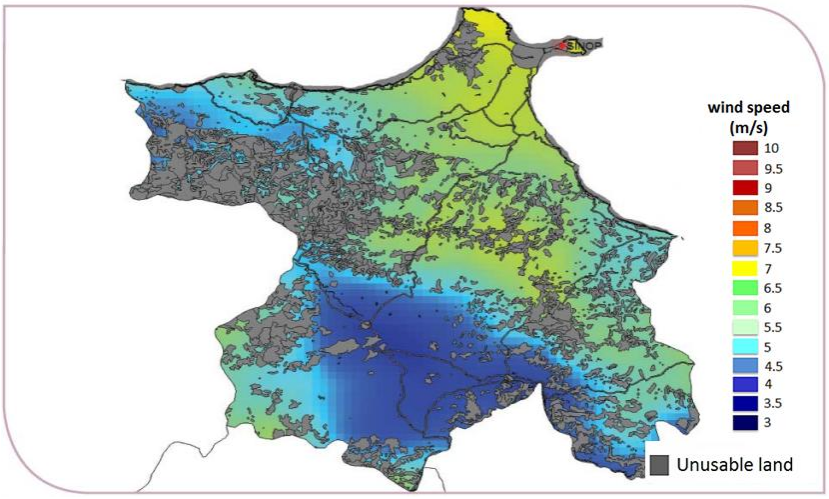

Figure 7.Unusable fields for the WPP in the *Sinop Province [12].*

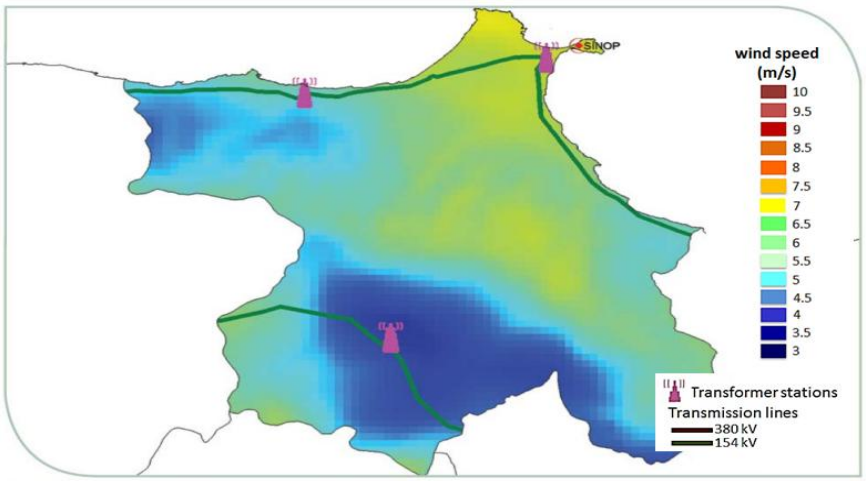

Figure 8.ETL and transformer stations in the *Sinop Province [12].*

When these parameters are considered, the wind farm site selection is carried out in theSinop Cape as shown in Figure 9. As can be seen in Figure 9, there is no settlement in the selected site and it is a big advantage for the operational security of transmission grids. In addition to that, the commercial wind turbines have a serious noise problem during operation. This noise problem is caused from mechanical and aerodynamic effects [14]. In this context, it can be concluded that the selected site is feasible in terms of noise and environmental issues.

3. DESIGNOF THE WIND FARM LAYOUT

In this section, wind farm layout design is carried out for the Sinop Cape using Windsim software. Five number of commercial Vestas V90 wind turbines are installed in the region by considering wake affect. In addition, Weibull distribution is obtained for the region, its parameters are calculated for all sectors and calculated values are compared with the wind atlas.

Figure 9.Selected wind farm site in the Sinop Province [12].

3.1 Wind speed assessment by Computational Fluid Dynamics (CFD) method

CFD approach is a numerical method used generally tosolve the problems that include fluid flow. Awind resource assessment by CFD models is performed by solving the RANS (Reynolds Averaged Navier-Stokes) equations with a turbulence closure. In this study, the Windsim software is used to solve the RANS equations and the k-ε turbulence model is used as a turbulence closure since it is common in CFD application.In the first analysis, the siteis divided into 172,800 cells as shown in Figure 10. Then, the model is solved under the fixed pressure boundary condition.

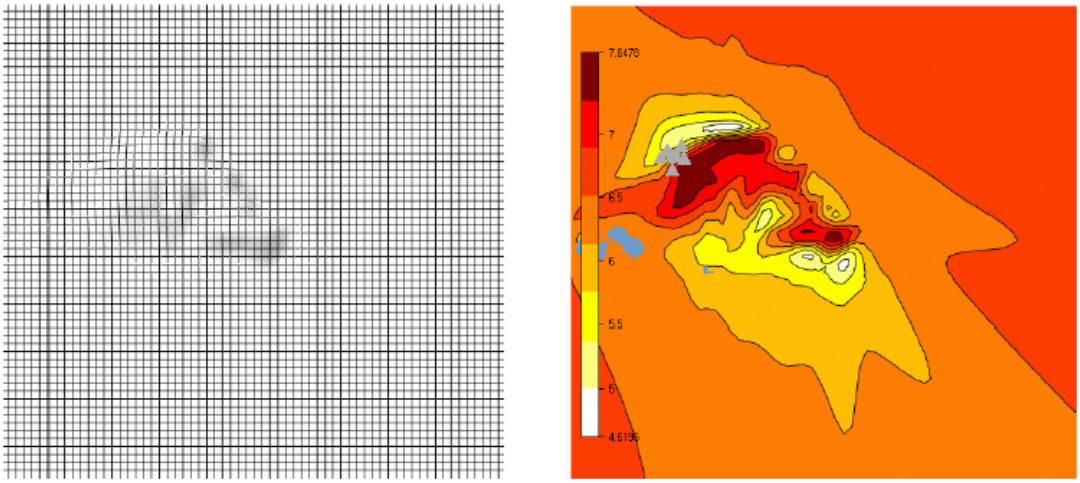

Figure 10.Cell structure of the region and wind resource map at the hub height of 80 meters (m/s).

According to CFD results presented in Figure 10, average wind speed in the wind farm site is almost 6.5-7 m/s. When the CFD result is compared with the wind atlas of the Sinop Province, it can be seen that the results are quite similar.

3.2 Assessment of Wind Power Potential by Weibull Distribution

Weibull distribution is one of the most popular statistical methods used in engineering and it also is widely used for modeling wind speed data [15]. The Weibull probability density function is given by Equation 1 where k and c are the Weibull parameters and v is wind speed [16]. Weibull distribution of the wind farm site is also obtained as shown in Figure 11.

$$f(v) = \frac{k}{c}\left(\frac{v}{c}\right)^{k-1} \exp\left[-\left(\frac{v}{c}\right)^{k}\right] \quad (1)$$

According to the Weibull distribution, average wind speed is 6.49 m/s for 80 m elevation. Also, Weibull parameters shape factor and scale factor were calculated as 1.37 and 6.97 respectively. When these calculated values are compared with the CFD analysis and wind atlas, it can be said that the results match pretty well.

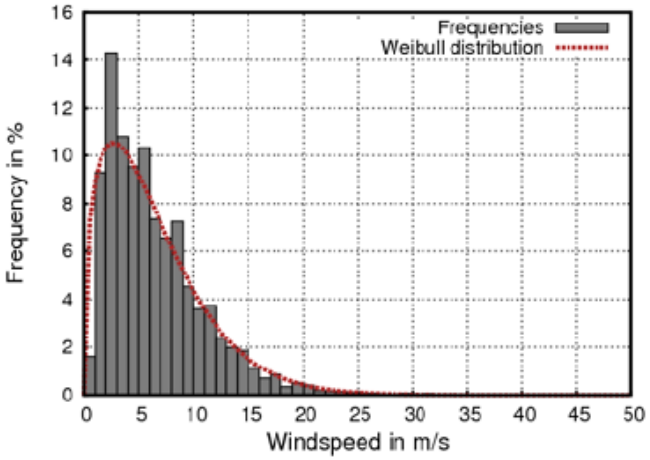

Figure 11.Weibull Distribution for all sectors.

In this study, wind farm design is carried out by considering wake affect. As shown in Figure 12, wake effect occurs when the wind turbines embower themselves and it causes a negativeeffect on wind farm efficiency. In this study, the Jensen wake model is selected due to the fact that it is widely used, quitesimple and effective [18].

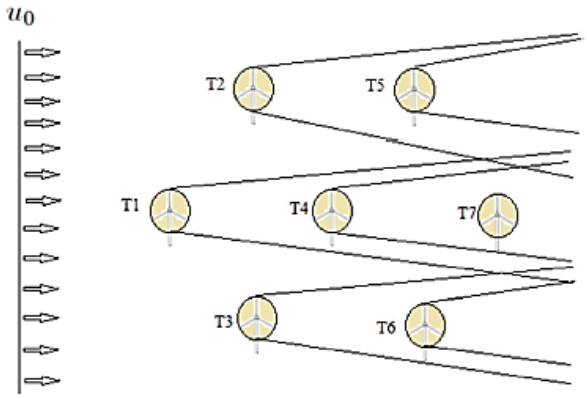

Figure 12.Multiple wake effect in the wind farm [17].

Adequate separation distance at the dominant wind direction must be ensured among the wind turbines in order to prevent wake affect, As shown in Figure 13, all turbines are installed horizontally and the distance between two adjacent wind turbines is set as 400 m. Thus, wake loss is calculated as 0.2% of the total energy production and this value is rather satisfactory in terms of wake effect.

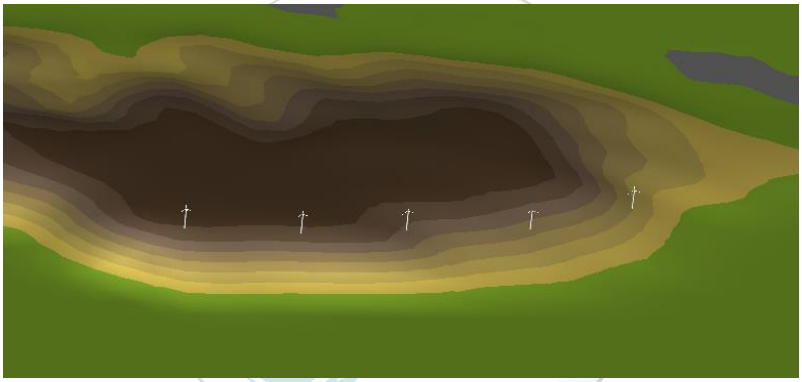

Figure 13.Wind farm layout.

4. ENERGY ANALYSIS

In this section, wind farm energy analysis is performed considering wake affect and air density change. In this study, the US Standard Atmosphere Model is used to calculate the air density change with elevation. The US Standard Atmosphere Model is given in Equation 2 where ρ and z are density and elevation respectively [19].

$$\rho = 1.225 - (1.194 \times 10 - 4) \times z \tag{2}$$

After this step, the model is applied to the Windsim software and then it issolved.According to the first analysis, AEP and capacity factor are calculated 28.7 GWh/y and 32.8% respectively. Also, wake loss is obtained as 0.4%. Hereupon, a new analysis is run by 239,800 cellsin order to ensure the mesh independent result.In second analysis, AEP, capacity factor and wake loss are calculated as given in Table 1.When the analysis results are evaluated, AEP value is same for all analysis. Also, when the first and second analyses are compared, it can be seen that relative error for capacity factor is 0.6%. Finally, it can be concluded that, establishment of a WPP that has 28.7 GWh/y AEP, 33% capacity factor and 0.2% wake loss is feasible in the Sinop Cape.Furthermore, energy curves of the selected wind turbines are obtained as given in Figure14.

Table 1.Energy Analysis Results

Cell Number	AEP(GWh/y)	Capacity Factor (%)	Wake Loss (%)
172,800	28.7	32.8	0.4
239,800	28.7	33.0	0.2

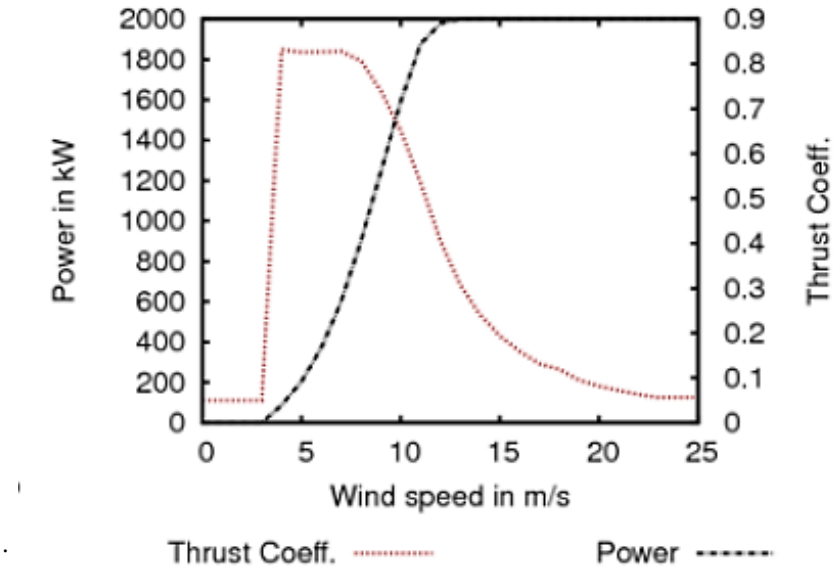

Figure 14.Turbine characteristics with power and thrust coefficient.

5. RESULTS AND DISCUSSIONS

Turkey's economy has been growing significantly and this development brings serious energy challenges for Turkey's future. According to Turkey's 2023 vision, the main target is to increase the share of renewable energy sources to at least 30% [20]. In the current situation, Turkey's installed wind power plant capacity is 4,718 MW [2]. When viewed from this perspective, investment in renewable energy sources should be increased to accomplish this objective. In this context,theSinop Province becomes important since it has remarkable wind power potential. Currently, there is a licensed WPP named Fener WPP in Sinop. The Fener Wind Energy Plant project will have a 5 MW installed power with 2 Enercon turbines, each 1,000 kW. It is expected that, 17.2 million kWh of electricity will be produced in a year [21]. However, this investment is not enough for harnessing the wind power potential oftheSinop Province. The number of the WPP should be increased to benefit the wind potential of the province.

In this case study, capacity factor and AEP of the designed WPP were calculated by Windsim using software considering wake affect.The wind data were obtained from the Turkish State Meteorological Service mast in Sinop. However, height of this measurement mast is only 10 meters and it is required to extrapolate the data to the hub height of wind turbine. In this context, the Wind Power Law was used for this aim.However, this approach caused some errors in the results. If a special measurement mast whose elevation is the same with the hub height of the turbines d installed in the wind farm site, more reliable data could be acquired. Although the data were extrapolated for 80 m elevation, a good convergence was handled. Thus, CFD result, Weibull distribution results and the wind atlas values were obtained fairly similar. Moreover, AEP and capacity factor were calculated as 28.7 GWh/y and 33.0% respectively. On the other hand, cost analysis such as the cost of turbine acquisition, installation and running cost, along with grid connection,were not taken into account in this study. If these parameters were considered, more reliable results could be obtained.

6. CONCLUSIONS

In this work, a case study of installation of a WPP was revealed for theSinop Province, Turkey. The study shows that hourly average wind speed is 6.5-7.0 m/s at 80 meters elevation in Sinop and this wind speed is satisfactory for a WPP investment in the region. In addition, the regions located near the coast side of the Sinop Cape are pretty convenient in terms of roughness formation and distance to ETL. The study also indicates that establishment of a WPP which has 28.7 GWh/y energy production capacity is feasible by five Vestas V90 commercial wind turbines. Also, the capacity factor of the designed wind farm was calculated as 33% and this value is convenient for an economic investment. The main objective of this study is providing inputs to the investors and the policy makers for harnessing the wind potential of the region.

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Linking Urban Security and Regional Development: Operationalizing Security-Development Nexus within Regional Development Agencies

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Abstract

This paper aims to present a conceptual framework for incorporating urban security concerns into regional development so as to operationalize security-development nexus within Regional Development Agencies (RDAs). The security issues pertinent to urbanization pose severe threats to individuals' and community's safety as a whole. Nevertheless, it seems that putting security into regional development agenda has been relatively ignored. Now that we have RDAs to promote development on a regional basis, security can be addressed as a part of regional development. In this study, it is argued that urban security can be embedded into RDA structure. Doing so, urban security can placed within regional development practices as a functional and structural component. In this study, primarily, conceptual linkage between urban security and regional development is demonstrated. Then an Urban Security Ecosystem is defined in order to identify stakeholders of governance. Consequently, incorporating urban security into RDA relating it with Urban Security Ecosystem, it is suggested that security-development nexus can thus be operationalized. This study does not suggest a "one size fits all" model. However, a conceptual framework could be useful to further pertinent discussions and policy implementation.

Key words

Regional Development, Regional Development Agency, Security-Development Nexus,Urban Security

1. INTRODUCTION

There has been a consensus within development community on linking security and development since 1990's (UNDP, 1994). This approach requires that both development and security policy making processes be merged to yield policy coherence. In this new understanding, providing security has been declared to be a precondition for reducing poverty and achieving the Millennium Development Goals adopted by United Nations (Denney, 2011; Boemcken, 2011).

Security-development nexus is based on the proposition that "*there can be no development without security and no security without development*" (Duffield, 2010; World Bank, 2011; Jackson, 2015). In other words, as Schnabel (2012) argues: "*(...) security-development nexus posits that there is an interaction between the security situation and development outcomes, between the development situation and security outcomes (...)*." As a result, security and development policies have been broadened to handle common issues in such a way that reinforces each other (Nikolaisen, 2011).

The security-development nexus *does not apply automatically across policy arenas or across levels of policy implementation* (global, national, and local) and has no clear policy frameworks (International Peace Academy, 2004). Then the question should be, as Chandler (2007) asked: *What should be integrated with what?* It is obvious that conjoining security and development policymaking processes has both organizational and functional dimensions. Organizational

dimension denotes merging security and development organizations focusing on coordination, coherence and cooperation between them. Accordingly, functional dimension necessitates performing security related functions within and between development organizations.

Urban security is one of the sub-themes of urbanization studies. It encompasses a wide range of concerns and issues related to urbanization ranging from basic needs, such as food, health and shelter, through protection from crime and the impacts of technological and natural hazards, to collective security needs, such as protection from urban terrorism (UN-Habitat, 2007). These threats have been observed to have arisen from rapid urban growth and the interaction of social, economic and institutional aspects of urban life, as well as environmental ones.

Urban security, as a multifaceted issue, has to do with various policy areas. According to Recasens *et al* (2013), "*to achieve reasonable implementation of these policies, it seems necessary seriously to rethink the structures and models of security at all levels*". In this study, as well, urban security is handled as a prospective component of regional development policy and organization. Emerged in the late 20th Century, recent regional development approach has been placed upon *re-scaling* the development process. Unlike nationwide central planning, regional development emphasized competitive advantage and governance structures encompassing a wide range of actors to stimulate development at regional basis. By freeing regions in motion, it has been aimed to enhance multi-level ecosystems structured to promote development and contribute national wellbeing.

In order to link urban security and regional development, that is, to incorporate urban security concerns into regional development one may search for entry points within existing structures. This study asserts that Regional Development Agencies (RDAs) constitute the appropriate structural entry point. But there has been no example in the literature as to how these two policy areas are to be converged within RDAs. Here, it is endeavored to constitute a conceptual framework/model to operationalize security-development nexus within RDAs. In order to integrate urban security concerns into regional development and operationalize security-development linkage, this paper aims at;

- Conceptualizing linkage between urban security and regional development,
- Defining urban security ecosystem in relation with RDA,
- Defining structural and functional components to be embedded within RDAs,
- Associating RDA to urban security ecosystem.

In this study, primarily, conceptual linkage between urban security and regional development is demonstrated. Then an Urban Security Ecosystem is defined in order to identify stakeholders of governance. Consequently, incorporating urban security into RDA relating it with Urban Security Ecosystem, it is suggested that security-development nexus can thus be operationalized. The study has no "one size fits all" approach. That is, here it is not endeavored to propose a uniform model for urban security-regional development nexus. Nevertheless, in order to structure this relationship so as to commence a policy debate and contribute to security-development nexus policy efforts, I argue that a pertinent conceptual framework is required as a starting point.

2. CONCEPTUAL FRAMEWORK

2.1. Urban Security

The world is moving to an age of intense urbanization with considerable growth in urban population. In this context, world's population is projected to be more than half urban by 2020 (UN-Habitat, 2007). Virtually uncontrollable, this phenomenon has implications for both peoples and their governments. Putting the urbanization issues on top of the international policy agenda, this phenomenon poses a serious challenge for present and future urban residents thus leading to urban based policymaking processes and paradigm shifts.

Increasing poverty, housing and employment needs and lacking adequate infrastructure and social services, such as healthcare and education, constitute the main causes of safety and security problems in urban areas (UN-Habitat, 2007). Therefore, urban security, macro-economic growth, scale and density of cities are regarded as the primary variables of the same equation. In some cases urban insecurity can be seen as an obstacle to macro-economic growth while in others, scale and density of cities and macro-economic growth pose a threat to urban security concurrently.

According to European Forum for Urban Security (EFUS), Eur*opean and national institutions now recognize cities as essential partners. Being the closest to the citizens, they combine competencies in solidarity, prevention and sanction with expertise in the management of everyday problems*" (European Forum for Urban Security, 2012: 2-4). Thus it is argued that security policies should be designed and constructed based on citizens' individual and collective needs with a participative approach rather than just focusing on public institutions'. We can conclude from abovementioned approach that urban security is not just of criminal case but of a larger societal and economic policy issue requiring organized efforts of public and private entities located in cities (Recasens *et al*, 2013; Gressgård, 2015).

Urban security refers to *the right to security in urban space, in relation with direct and indirect prevention of crime and violence* (European Forum for Urban Security, 2006). According to UN-Habitat (2007: 17-19), urban security has three dimensions, *crime and violence*, *tenure security and forced eviction*, *natural and human made disasters*. Taking policy measures against these challenges to urban security depend on sound policy making, adequate institutional capacity at both national and local government levels.

According to European Forum for Urban Security (2012), urban security should be a part of a *strategic plan*, which relies on cooperation among all local actors. Strategic plan is a gate to cooperation of local actors because of its rationale in recent development thinking. Security policy and planning have become more decentralized (Boddy, 2008; Coaffee *et al*, 2009; Nemeth, 2010) as a result of this strategic approach. Decentralization has occurred as shifting decision making process relatively from national to local level and transferring control from public authorities to public-private partnerships.

Local actors have gained roles in providing urban security throughout this process as well as local policies have emerged as response to urban security needs. So, urban security is, inter alia, one of the fields of urban planning with participatory governance strategies (Friedman, 2005; Dupont, 2006; EFUS, 2006; 2012; UNODC and UN-Habitat, 2011). Participatory governance strategies rely on involving the population in local decision-making and governance structures and processes, such as participatory budgeting, local assemblies sponsored and supported by the government. Another dimension of urban security is technology. Little (2004) argues that response to urban security issues necessitates flexible and agile structures, asserting that investments in emergency response technologies, strategies, and organizations are those of cost effective ones because they are relatively independent of time and place. Given the security threats to people in urban areas such as terrorism and organized crime, structuring technology intensive security is considered to be an efficient response to rapidly changing security environment (Mallik, 2004). As mentioned so far, urban security is a multifaceted issue most of which is related to development concerns. Particularly, it can be said that consequences of rapid urbanization has paved way for security-development nexus studies and the nexus between security and urbanization has been one of the research areas (Beall, 2007). In this study, security-development nexus is handled at regional basis in order to put into practice it within RDAs and ensure coherence between urban security and regional development policy.

2.2. Regional Development and RDAs

Regions within countries may be defined based on a number of characteristics, ranging from administrative areas to shared geographic, cultural or socio-economic features, such as their landscape, climate, language, ethnic origin or shared history. Regions based on these features generally do not fit that of public administrations. Therefore, administrative regions, which are administrative division of countries, may differ from regions based on other features (Cooke and Leydesdorff, 2006). According to Ahmad and Bajwa (2005), the region is the *physical, economic, social and institutional environment* in which development occurs at both national and local level. Regional development theory relies heavily on neoclassical theory and growth theory. Those theories constitute the conceptual basis of regional development thinking (Dawkins, 2003: 134). For example, regional development thinking asserts that central, local and regional authorities may plan at regional scale in order to attract investments from outside and national and local benefit may be realized at the same time. Furthermore, in countries where market mechanisms dominate the economy, planning is seen to be local and urban. (Ahmad and Bajwa, 2005). Regional development has two prime components (Adams et al, 2016): regional policy, regional planning. Regional policy is a way of national government intervening in the distribution of various activities between its different regions, and has usually focused on the distribution of economic activities. Regional planning is comprised of decision making at the regional level. Regional policy focuses on inter-regional issues, while regional planning deals with broader set of issues within a region. The mechanisms for regional planning and the necessary institutions vary. Regional planning may be carried out by decentralized administrative bodies of central government or by elected regional governments. OECD (2010) puts forward the paradigm shift concerning regional development thinking (see Table-1). These change demonstrates also the basis upon which security-development nexus can be built. By giving basic principles of regional development approach, Table-1 draws a conceptual framework for establishing urban security-regional development nexus. Thus it provides with an appropriate point of departure to match urban and regional scales.

Table 1.Paradigm Shift of Regional Development Policy

Dimension	Old Paradigm	New Paradigm
Problem Recognition	Regional disparities in income, infrastructure stock, and employment	Lack of regional competitiveness, underused regional potential
Objectives	Equity through balanced regional development	Competitiveness and equity
General Policy Framework	Compensating temporally for location disadvantages of lagging regions, responding to shocks (Reactive to problems)	Tapping underused regional potential through regional programming (Proactive for potential)
Instruments	Subsidies and state aid (often to individual firms)	Mixed investment for soft and hard capital (business environment, labor market, infrastructure
Actors	Central government	Different levels of government, various stakeholders (public, private, NGOs)

Source: OECD (2010).

In this new paradigm, *unit of policy intervention is functional areas* rather than administrative areas of old one. Taking into account Table-1 and OECD (2010) recommendations, it is likely to extract structural and functional aspects to be embedded within RDAs in order to operationalize security-development nexus. In political discourse, RDAs are regarded as the operational arm of regional development. A RDA is defined as "*a regionally based, publicly financed institution outside the mainstream of central and local government administration designed to promote economic development through an integrated use of predominantly soft policy instruments*." (Halkier and Danson, 1998). According EURADA (1999), "*RDA is an operational structure that identifies sectoral or overall development problems, chooses a range of opportunities or methodologies (…)*".

What is expected in this structure is *semi-autonomous* character and *a broad range of policy instruments* (including "soft" ones) (Halkier *et al*., 1998). Because RDAs are considered to be inducive to bridging the gap between economic policy and other policy domains at regional level (McMaster, 2006; Syrett and Silva, 2001). According to Danson and Halkier (2005), a RDA is expected to develop a comprehensive approach and integrated strategy that primarily aims at strengthening the indigenous sector of the *economy.* Then the central task of this structure is to draw up a long-term overall *strategic plan*.

RDAs provide three basic services: *advice*, *finance* and *infrastructure* (Halkier and Danson, 1998). As the RDA structures have evolved, their new functions have emerged over time as a response to rising challenges (EURADA, 1999). What has not been addressed seems to be the security-development nexus. Regardless of their varying types and backgrounds, RDAs must be complemented by security-development nexus as sustainable development demands. It does not mean that national context will be ignored. On the contrary, national context is considered to be the framework for security-development agenda.

RDAs vary according to their structures. One of the determinants of structure is RDA's autonomy with respect to central and local state authority. And that determines the organization of RDAs. Given that security is almost a public good today, it seems apparently that giving an executive authority to RDAs in enforcing security rules at regional level is controversial. Then we require to incorporate some advisory and joint planning roles/functions into RDAs in accordance with national security priorities and local security needs. That is, RDAs will play a mediating and bridging role in aligning national and local levels.

3. OPERATIONALIZING URBAN SECURITY-REGIONAL DEVELOPMENT NEXUS

3.1. Establishing Urban Security-Regional Development Linkage

Linking urban security and regional development should start from macro-level establishing relationship within and between security and development. Figure 1 represents how to establish this relationship. Each policy/strategy/plan/agency/document are prepared accordingly so that policy coherence could be realized. Since urban development is considered to play a vital role regional development (European Commission, 2009), urban security is taken as a prospective component of regional development organization/planning in this study as well.

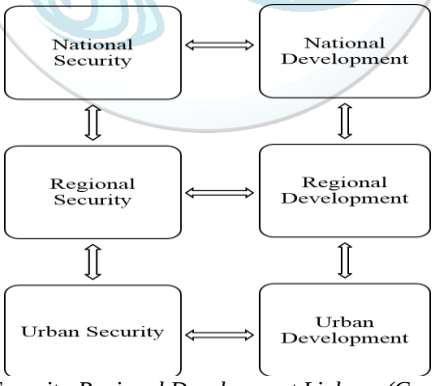

Figure 1.Urban Security-Regional Development Linkage (Conceptual Model)

What is lacking in present security structures is (sub-national) *regional security* approach. In establishing a linkage between urban security and regional development, we need regional security thinking. I argue that regional security approach should denote a security thinking at regional level in its regional development ecosystem. Here, regional security structure comprises of a variety of urban security challenges. In other words, it can be said that regional security approach plays a mediating role between urban security needs and national security priorities.

According to Figure 1, security needs must be defined at regional basis in accordance with national security and regional development process, and getting input from urban security needs as well. And regional development process should be conducted by incorporating regional security concerns. In this way, both national security and development processes can be merged to yield policy coherence and alignment.

In this context, it is possible to connect regional development process directly to urban security as well. Nevertheless, backed by a comprehensive regional security policy/strategy/plan/agency/document, urban security needs could be optimized among region's competing development and security concerns. One might talk about building *Regional Security*

Agencies (RSAs). Even this might be useful. But building security agencies at regional basis tied to central government creates another structure to be coordinated with RDAs.

3.2. Identifying Urban Security Ecosystem (USE)

An ecosystem, when it is defined in social science terms, refers to a complex set of dynamic relations and interactions among its components in an environment (Moore, 1993; Basole *et al*, 2015). That is, security bodies evolve in changing conditions that result from continuous interactions of a variety of factors. In an ecosystem, there is competition as well as cooperation. An ecosystem can be defined as *a set of interconnected security/security related actors, organizations, institutions and processes* (Mason and Brown, 2014).

Ecosystems, composed of both public and private bodies, are dependent on both external and internal factors. External factors, such as resources, government regulations etc. control the overall structure of an ecosystem and the way things work within it, but are not themselves influenced by the ecosystem (Pfeffer and Salancik, 1978). Internal factors not only control ecosystem processes but are also controlled by external factors and are often subject tofeedback. While theresourceinputs are generally controlled by external processes, the availability of these resources within the ecosystem is controlled by internal factors.

Since regional development approach cover whole region comprised of both urban and rural areas without making any physical distinction, urban security in the sense of regional development refers to a specific (urban) piece of land. To start, we need to define actors and their interrelations of security environment at urban scale, which I call it as *Urban Security Ecosystem (USE)*. In this context, USE should include both public and private security bodies interacting in a given security environment. Figure 2 demonstrates Urban Security Ecosystem, which I suggest it is useful to link urban security and regional development.

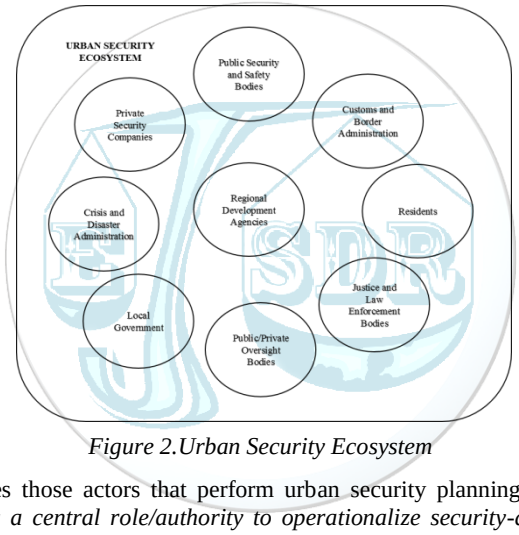

Figure 2.Urban Security Ecosystem

USE, shown as Figure 2, includes those actors that perform urban security planning, implementation, monitoring and evaluation. In the USE, *RDA has a central role/authority to operationalize security-development nexus*. That is, urban security process is oriented within broader framework of regional development.

3.3. Incorporating Urban Security into RDA

Giving RDAs a central role in performing urban security necessitates an inner structure to orient process. For instance, UNODC and UN-Habitat (2011) assert that building *planning commissions* comprised of both security and development personnel at regional or provincial level can combine expertise areas in making decisions of urban security. Below discussed are the dimensions of operationalization of the nexus.

Policy Coherence

The central theme of security-development nexus is *policy coherence*. Policy coherence can be achieved by harmonization through both security and development policy processes (OECD, 2015). Given that this study focuses on embedding security into development at structural basis, here it suggests that nested sub-structures of security-development nexus in RDAs will serve to its operationalization. Those structures are essentially will be composed of both security and development experts.

Organization

Here, I suggest that creating a joint structure, as an *institutional mechanism* envisaged by OECD's policy coherence approach based on policy interaction (OECD, 2015) in RDAs should start from planning process so that policy coherence can be achieved subsequently (see Figure 3).

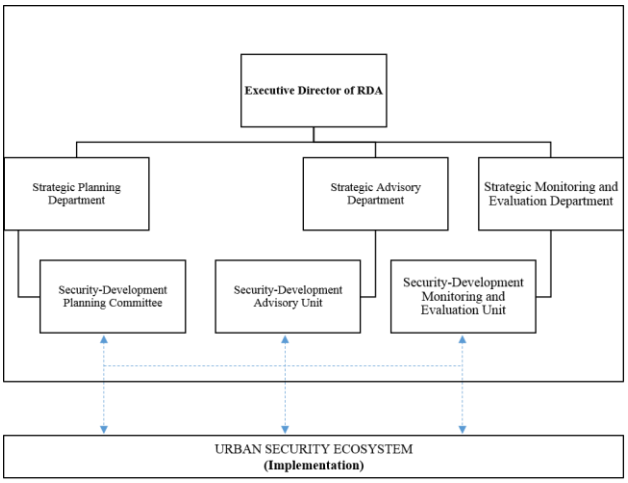

Figure 3. Security-Development Organization in RDAs (Suggested)

Planning

As mentioned above, one of the prime functions of regional development policy is planning. For this study, as well, planning process is the starting point of operationalizing and establishing security-development nexus. That is, establishing *joint planning committees of both security and development experts* are appropriate for the task. As shown in Figure 3, the planning committee is subordinated to one of the main functional components of RDAs, Strategic Planning Department. And planning committee has strategic planning task regarding security-development issues.

Advising

Advice is a *form of relating personal or institutional opinions, belief systems, values, recommendations or guidance about certain situations relayed in some context to another person, group or party often offered as a guide to action and/or conduct* (www.en.wikipedia.org, 05.07.2016). A RDA should and can identify security sector problems as well. In terms of policy instruments, as a requirement of security-development nexus, soft policy instruments have the potential to address policy problems. One of the soft policy instruments is *advice*, as Halkier *et al*. (1998) argued. RDAs can give advice to security institutions at regional level regarding development aspects of security. This policy instrument requires a responsible unit, that is, *Security-Development Advisory Unit* within RDAs.

Monitoring and Evaluation

Monitoring and evaluating the progress based on sound data is one of the targets of development cooperation and sustainable development (United Nations, 2015). As shown in Figure 3, monitoring and evaluation processes are aligned with development planning. Policy targets and indicators of security-development nexus are embedded into existing monitoring and evaluation framework. So, developing indicator sets is one of the primary tasks of operationalizing the nexus in monitoring and evaluation framework. Established subordinated to strategic monitoring and evaluation department of RDA, Security-Development Monitoring and Evaluation Unit would conduct this process based on security-development policy targets and indicators.

Funding/Budgeting

It is apparent that both international development cooperation and 2030 Sustainable Development Agenda demand public-private partnership in funding policy programs (United Nations, 2015). Security-development programs can be funded within existing budgeting process. What is to be taken into account here is how and at what level public and private funding could be merged. Funding mechanisms may vary from public funding pools of development and security allowances to project-based public-private funds (World Bank, 2013). Consequently, it will depend on the degree of decentralization of administration in a given country.

4. CONCLUSION

Security-development nexus is an attempt to integrate development and security policies. The need for integration has arisen from the notion that both security and development constitute the preconditions of each other. One of the major issues in this regard is policy-practice gap. In other words, operationalizing security-development nexus awaits to be addressing. This study aims to make a contribution to bridging the gap between policy and practice.

This entails an operational-level thinking which is based on identifying security-development nexus components. In this context, the first contribution of this study is building a conceptual model of security-development linkage. Secondly, the urban security ecosystem is defined in order to recognize actors that are supposed to interact. RDA holds relatively the central place in this ecosystem since security-development nexus is constructed inside of it. Thirdly, security-development organization inside the RDA should be related to urban security ecosystem as well as to each other.

The structural components of security-development nexus within RDA have been determined according to both urban security and regional development approach. Structural components are *policy coherence*, *planning*, *advising*, *monitoring and evaluation*, and *funding*. These components also reflect sustainable development policy targets, which emphasize

policy coherence, partnership and governance. The study is not a "one size fits all" work. Security-development structures can be built outside the RDA organization. In this case, it should be noted that some fragmentation and coordination problems may occur hindering policy coherence, alignment and harmonization.

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Data Mining Techniques in Database Systems

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Abstract

At the current stage the technologies for generating and collecting data have been advancing rapidly. The main problem is the extraction of valuable and accurate information from large data sets. One of the main techniques for solving this problem is Data Mining. Data mining (DM) is the process of identification and extraction of useful information in typically large databases. DM aims to automatically discover the knowledge that is not easily perceivable. It uses statistical analysis and artificial intelligence (AI) techniques together to address the issues. There are different types of tasks associated to data mining process. Each task can be thought of as a particular kind of problem to be solved by a data mining algorithm. The main types of tasks performed by DM algorithms are: Classification, Association, Clustering, Regression, Anomaly Detection, Feature Extraction, Time Series Analyses.

In this paper we will perform a survey of the techniques above. A secondary goal of our paper is to give an overview of how DM is integrated in Business Intelligence (BI) systems .BI refers to a set of tools used for multidimensional data analysis, with the main purpose to facilitate decision making. One of the main components of BI systems is OLAP. The main OLAP component is the data cube which is a multidimensional database model that with various techniques has accomplished an incredible speed-up of analyzing and processing large data sets. We will discuss the advantages of integrating DM tools in BI systems.

Key words

Data Mining, BI, OLAP, AI, OLAM

1. INTRODUCTION

Data mining is the process used to describe knowledge in databases. Data mining process is very much useful for extracting and identifying useful information and subsequent knowledge from large databases. It uses different techniques such as statistical, mathematical, artificial intelligence and machine learning as the computing techniques. Its predictive power comes from unique design by combining techniques from machine learning, pattern recognition, and statistics to automatically extract concepts, and to determine the targeted interrelations and patterns from large databases. Organizations get help to use their current reporting capabilities to discover and identify the hidden patterns in databases. The extracted patterns from the database are then used to build data mining models, and can be used to predict performance and behavior with high accuracy [2]. Descriptive and Predictive data mining are the most important approaches that are used to discover hidden information[1] Data Mining has become an established discipline within the scope of computer science. The origins of data mining can be traced back to the late 80s when the term began to be used, at least within the research community. In the early days there was little agreement on what the term data mining encompassed, and it can be argued that in some sense this is still the case. Broadly data mining can be determined as a set of mechanisms and techniques, realized in software, to extract hidden information from data. The word hidden in this definition is important; SQL style querying, however sophisticated, is not data mining. By the early 1990s data mining was commonly recognized as a sub-process within a larger process called Knowledge Discovery in Databases or KDD. The most commonly used definition of KDD is that attributed to (Fayyad et al. 1996).. The nontrivial process of identifying valid, novel, potentially useful, and ultimately understandable patterns in data" (Fayyad et al. 1996). As such data mining should be viewed as the sub-process, within the overall KDD process, concerned with the discovery of hidden information". Other sub-processes that form part of the KDD

process are data preparation (warehousing, data cleaning, pre-processing, etc) and the analysis/visualization of results. For many practical purposes KDD and data mining are seen as synonymous, but technically one is a sub-process of the other. There are two important models in Data Mining: The Descriptive Model and The Predictive Model.

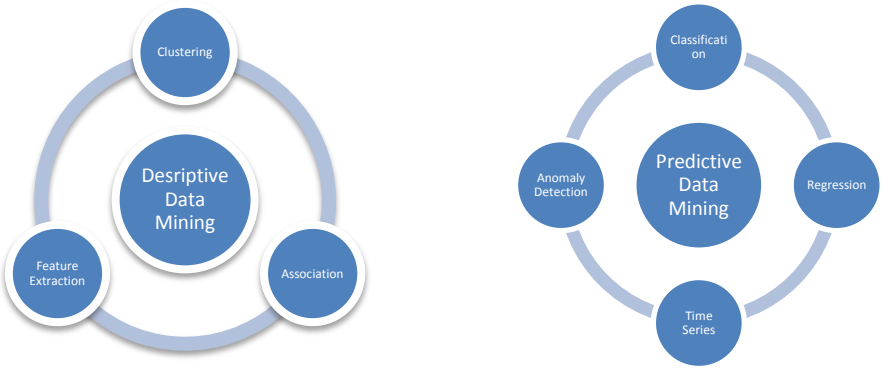

Figure 1. Descriptive (unsupervised) and Predictive (supervised) Data Mining

Descriptive model looks at data and analyzes past events for insight as to how to approach the future. This technique is also known as unsupervised learning. Descriptive analytics looks at past performance and understands that performance by mining historical data to look for the reasons behind past success or failure. Almost all management reporting such as sales, marketing, operations, and finance, uses this type of post-mortem analysis. Descriptive models quantify relationships in data in a way that is often used to classify customers or prospects into groups. Unlike predictive models that focus on predicting a single customer behavior, descriptive models identify many different relationships between customers or products. Descriptive models do not rank-order customers by their likelihood of taking a particular action the way predictive models do. The Descriptive model uses techniques as Clustering, Association Rules, Summarizations, and Feature Extraction.

Predictive models turns data into valuable, actionable information. Predictive analytics uses data to determine the probable future outcome of an event or a likelihood of a situation occurring. This technique is also known as supervised learning. Supervised data mining techniques are appropriate when you have a specific target value to predict about your data. The targets can have two or more possible outcomes, or even be a continuous numeric value.In business, predictive models exploit patterns found in historical and transactional data to identify risks and opportunities. Models capture relationships among many factors to allow assessment of risk or potential associated with a particular set of conditions, guiding decision making for candidate transactions. The Predictive data mining model includes Classification, Anomaly Detection, Regression and Analysis of Time Series.

2. THE DESCRIPTIVE MODEL

There are 3 important techniques used in the descriptive model: Clustering, Association, Feature Extraction.

2.1. Clustering

Clustering is an important technique in data mining and it is the process of partitioning data into a set of clusters such that each object in a cluster is similar to another object in the same cluster, and dissimilar to every object not in the same cluster. Dissimilarities and similarities are assessed based on the attribute values describing the objects and often involve distance measures. Clustering analyses the data objects without consulting a known class label. This is because class labels are not known in the first place, and clustering is used to find those labels. Good clustering exhibits high intra-class similarity and low inter-class similarity, that is, the higher the similarity of objects in a given cluster, the better the clustering. The superiority of a clustering algorithm depends equally on the similarity measure used by the method and its implementation. The superiority also depends on the algorithm's ability to find out some or all of the hidden patterns. The different ways in which clustering methods can be compared are partitioning criteria, separation of clusters, similarity measures and clustering space. Clustering algorithms can be categorized into partition-based algorithms, hierarchical-based algorithms, density-based algorithms and grid-based algorithms.

Table 1.Some of the most used Clustering Algorithms

Partition-based algorithms	Hierarchical-based algorithms	Density-based algorithms	Grid-based algorithms
K-Means	Agglomerative(BIRCH,CHAMALEON)	DBSCAN	STING
K-Medoids(PAM,CLARA)	Divisive	DENCLUE	CLIQUE

These methods vary in (i) the procedures used for measuring the similarity (within and between clusters) (ii) the use of thresholds in constructing clusters (iii) the manner of clustering, that is, whether they allow objects to belong to strictly to one cluster or can belong to more clusters in different degrees and the structure of the algorithm[3].

2.2. Association

Another important data mining technique is association rule mining. Association rule technique searches for relationships among variables. For example, a shop might gather data about how the customer is purchasing the various products. With the help of association rule, the shop can identify which products are frequently bought together and this information can be used for marketing purposes. This is sometimes known as market basket analysis. The patterns discovered with this data mining technique can be represented in the form of association rules. Rule support and confidence are two measures of rule interestingness. Typically, association rules are considered interesting if they satisfy both a minimum support threshold and a minimum confidence threshold. Such thresholds can be set by users or domain experts.

Definition. Let $I=\{I_1, I_2, ..., I_m\}$ be a set of items. Let D, the task relevant data, be a set of database transactions where each transaction T is a set of items such that $T \subseteq I$. Each transaction is associated with an identifier, called TID. Let A be a set of items. A transaction T is said to contain A if and only if $A \subseteq T$. An association rule is an implication of the form $A \rightarrow B$, where $A \subset I$, $B \subset I$ and $A \cap B = \Phi$. The rule $A \rightarrow B$ holds in the transaction set D with support s, where s is the percentage of transactions in D that contain $A \cup B$. The rule $A \rightarrow B$ has confidence c in the transaction set D if c determines how frequently items in B appear in transactions that contain A .That is, support$(A \rightarrow B)$ = Prob$\{A \cup B\}$ and confidence$(A \rightarrow B)$ = Prob$\{B/A\}$.[4]

Table 2. An example of market basket transactions

TID	Item
1	{Jeans,T-Shirt,Shoes,Chocolate}
2	{Jeans,Shoes,Coat,Sunglasses}
3	{Watch,Bag,,Jeans,T-Shirt}
4	{Belt,Jeans,Shirt,Shoes}

Lets assume that that itemset A includes {Jeans,T-Shirt} and itemset B includes {Shoes}.The rule {Jeans,T-Shirt}$\rightarrow${Shoes} has a support value of 2/4 =0.5 and a confidence value of 2/3=0.67. Rules that satisfy both a user-specified minimum support threshold and a minimum user-specified confidence threshold (minconf) are called strong.

Some of the most important association algorithms are : AIS, SETM, Apriori, Aprioritid, Apriorihybrid, FP-Growth. From the recent studies it is observed that, FP-growth performs better ind terms of speed and accuracy than the older AIS, SETM, Apriori, Aprioritid, Apriorihybrid [5]

2.3. Feature Extraction

Feature extraction creates new features based on attributes of your data. These new features describe a combination of significant attribute value patterns in your data. Models built on extracted features may be of higher quality, because the data is described by fewer, more meaningful attributes.. Unlike feature selection, which ranks the existing attributes according to their predictive significance, feature extraction actually transforms the attributes. The transformed attributes, or features, are linear combinations of the original attributes. Representing data points by their features can help compress the data (trading dozens of attributes for one feature), make predictions (data with this feature often has these attributes as well), and recognize patterns. Additionally, features can be used as new attributes, which can improve the efficiency and accuracy of supervised learning techniques (classification, regression, anomaly detection, etc.).

Some of the most commonly used techniques for feature extraction are: Principal Component Analysis (PCA) and Linear Discriminant Analysis (LDA) .Principal Component Analysis (PCA) is the most popular statistical method. This method extracts a lower dimensional space by analyzing the covariance structure of multivariate statistical observations.Linear Discriminant Analysis (LDA) technique mainly projects the high-dimensional data into lower dimensional space. LDA aims to maximize the between-class distance and minimize the within-class distance in the dimensionality reduced space. [6] Many extensions to of LDA technique have been proposed in the past like NLDA(Null space LDA) and OLDA (Orthogonal LDA).An asymmetric principal component analysis (APCA) was proposed by Jiang et 2009 to remove the unreliable dimensions more effectively than the conventional PCA.

3. THE PREDICTIVE MODEL

There are 4 important techniques used in the descriptive model: Classification, Regression, Time Series and Anomaly Detection.

3.1. Classification

Classification techniques in data mining are capable of processing a large amount of data. It can be used to predict categorical class labels and classifies data based on training set and class labels and it can be used for classifying newly available data. The term could cover any context in which some decision or forecast is made on the basis of presently available information. Classification procedure is recognized method for repeatedly making such decisions in new situations. Creation of a classification procedure from a set of data for which the exact classes are known in advance is termed as pattern recognition or supervised learning. Contexts in which a classification task is fundamental include, for example, assigning individuals to credit status on the basis of financial and other personal information, and the initial diagnosis of a patient's disease in order to select immediate treatment while awaiting perfect test results. Some of the most critical problems arising in science, industry and commerce can be called as classification or decision problems.

Classification consists of predicting a certain outcome based on a given input. In order to predict the outcome, the algorithm processes a training set containing a set of attributes and the respective outcome, usually called goal or prediction attribute. The algorithm tries to discover relationships between the attributes that would make it possible to predict the outcome. Next the algorithm is given a data set not seen before, called prediction set, which contains the same set of attributes, except for the prediction attribute – not yet known. The algorithm analyses the input and produces a prediction. [7]For example in a hospital where the target attribute is the illness of the patient, in the hospital database the training set will include the symptoms of the previous recorded patients and the illness as a target. The algorithm than is given a prediction set with the data from the new patient except the illness which is the one attribute needed to predict. The prediction accuracy defines how "good" the algorithm is.How well predictions are done is measured in percentage of predictions hit against the total number of predictions. A decent rule ought to have a hit rate greater than the occurrence of the prediction attribute.

The commonly used methods for data mining classification tasks can be classified into the following groups [8] .

- Decision Trees (DT's)
- Support Vector Machine (SVM)
- Genetic Algorithms (GAs) / Evolutionary Programming (EP)
- Fuzzy Sets
- Neural Networks
- Rough Sets

Multi-Objective Genetic Algorithms (MOGA) have been also used recently to address classification data mining tasks.

3.2. Regression

Regression is a data mining (machine learning) technique used to fit an equation to a dataset. It is more used when the target attribute has a numeric value. It can be used to model the relationship between one or more independent variables and dependent variables. In data mining independent variables are attributes already known and response variables are what we want to predict. The main types of regression methods are:

- Linear Regression
- Multivariate Linear Regression
- Nonlinear Regression
- Multivariate Nonlinear Regression

The simplest form of regression, linear regression, uses the formula of a straight line ($y = mx + b$) and determines the appropriate values for m and b to predict the value of y based upon a given value of the coefficients, *m* and *b* (called *regression coefficients*),specify the slope of the line and the *Y*-intercept, respectively. Multivariate linear regression is an extension of (simple) linear regression, which allows a response variable, *y*, to be modeled as a linear function of two or more predictor variables [11].

Often the relationship between x and y cannot be approximated with a straight line. In this case, a nonlinear regression technique may be used. Alternatively, the data could be preprocessed to make the relationship linear. Nonlinear regression models define y as a function of x using an equation that is more complicated than the linear regression equation. The term multivariate nonlinear regression refers to nonlinear regression with two or more predictors (x_1, x_2, …,x_n). When multiple predictors are used, the nonlinear relationship cannot be visualized in two-dimensional space.

Unfortunately, many real-world problems are not simply prediction. For instance, sales volumes, stock prices, and product failure rates are all very difficult to predict because they may depend on complex interactions of multiple predictor variables. Therefore, more complex techniques (e.g., logistic regression, decision trees, or neural networks) may be necessary to forecast future values. The same model types can often be used for both regression and classification. For example, the CART (Classification and Regression Trees) decision tree algorithm can be used to build both classification trees (to classify categorical response variables) and regression trees (to forecast continuous response variables). Neural networks too can create both classification and regression models.

3.3. Time Series

A time series is a collection of observations made sequentially through time. At each time point one or more measurements may be monitored corresponding to one or more attributes under consideration. The resulting time series is called univariate or multivariate respectively. In many cases the term sequence is used in order to refer to a time series, although some authors refer to this term only when the corresponding values are non-numerical.

The most common tasks of TSDM methods are: indexing, clustering, classification, novelty detection, motif discovery and rule discovery In most of the cases, forecasting is based on the outcomes of the other tasks. A brief description of each task is given below. [12].
Indexing: Find the most similar time series in a database to a given query time series.
Clustering: Find groups of time series in a database such that, time series of the same group are similar to each other whereas time series from different groups are dissimilar to each other.
Classification: Assign a given time series to a predefined group in a way that is more similar to other time series of the same group than it is to time series from other groups.
Novelty detection: Find all sections of a time series that contain a different behavior than the expected with respect to some base model.
Motif discovery: Detect previously unknown repeated patterns in a time series database.
Rule discovery: Infer rules from one or more time series describing the most possible behavior that they might present at a specific time point (or interval).
This method of DM, unveils numerous facets of complexity. The most prominent problems arise from the high dimensionality of time-series data and the difficulty of defining a form of similarity measure based on human perception.

3.4. Anomaly Detection

Data object is considered to be an outlier if it has significant deviation from the regular pattern of the common data behavior in a specific domain. Generally it means that this data object is "dissimilar" to the other observations in the dataset. It is very important to detect these objects during the data analysis to treat them differently from the other data. Anomaly Detection is the process of finding outlying record from a given data set. This problem has been of increasing importance due to the increase in the size of data and the need to efficiently extract those outlying records which could indicate unauthorized access of the system, credit card theft or the diagnosis of a disease.

Anomalies can be classified into either point anomalies contextual anomalies or collective anomalies. The earlier is when single data records deviate from the remainder of the data sets. This is the simplest kind and the one which is most addressed by the existing algorithms. Contextual anomalies is when the record has behavioral as well as contextual attributes. The same behavioral attributes could be considered normal in a giving context and anomalous in another. Whilst the collective anomalies is when a group of similar data are deviating from the remainder of the data set. This can only occur in data sets where the records are related to each other. Contextual anomalies can be converted into point anomalies by aggregating over the context. The algorithms implemented in the extension all explicitly handle point anomalies [10].

According to the anomaly detection survey [9] the techniques can be grouped into one of the following main categories *classification based*, *nearest-neighbor*based *,clustering based* and *statistical based*. Classification based algorithms are mainly supervised algorithms that assumes that the distinction between anomalous and normal instances can be modeled for a particular feature space. Nearest-neighbor based algorithms assume that anomalies lie in sparse neighborhoods and that they are distant from their nearest neighbors. They are mainly unsupervised algorithms. Clustering based algorithms work by grouping similar objects into clusters and assume that anomalies either do not belong to any cluster, or that they are distant from their cluster centers or that they belong to small and sparse clusters. Statistical approaches label objects as anomalies if they deviate from the assumed stochastic model.Anomaly Detection methods are widely used for fraud or suspicious transtaction detection in finanacial organizations.

4. DATA MINING TOOLS IN BI SYSTEMS

BI(Business Intelligence) refers to a set of tools used for multidimensional data analysis, with the main purpose to facilitate decision making. One of the main components of BI systems is OLAP(Online Analytical Processing). The main OLAP component is the data cube which is a multidimensional database model that with various techniques has accomplished an incredible speed-up of analyzing and processing large data sets. In our last paper [13]. we studied OLAP and compared different implementations of it such as ROLAP,MOLAP,HOLAP in terms of performance and data accuracy. Inoursimulationswecompared twotechnologies: ROLAPthatperformsqueryagainstDWandHOLAPwhich usesintelligentcubes . It was highlighted the efficiency of these intelligent cubes that reduced drastically the response time of the system. They also use a very good compression and the space occupied in memory is small. As the cubes are stored on the OLAP server, which means that will take reports even if the server where the database is hosted is down.

Generally the usage of intelligent cubes when databases are large increases the efficiency, the performance and allows to have reports at any time even with the disadvantage of a memory occupied larger.

Another fundamental advantage of OLAP tools is that the user gets a multidimensional information and the reporting is flexible.

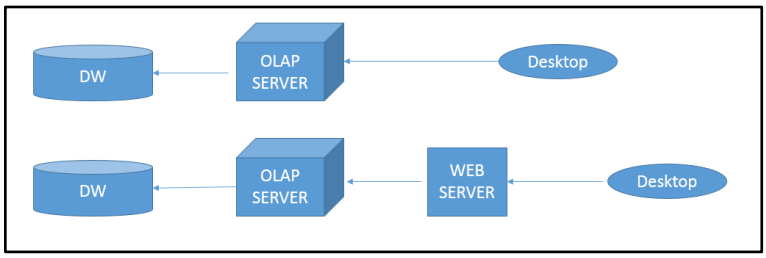

Figure 2. OLAP architecturewiththreeandfourlevels

We concluded that OLAP is powerful tool for data extraction in BI systems and has a very good time efficiency in queries against large databases (data warehouses). OLAP is very flexible with columns and rows, and it is possible to report in several dimensions. Although small organizations with a limited database might not need all the capacity of OLAP tools.

OLAP applications are widely used by Data Mining techniques. In OLAP database there is aggregated, historical data, stored in multi-dimensional schemas (usually star schema).The star schemas in data warehouses increases the performance due to the small number of connections that have to do to get a report.Several works in the past proved the likelihood and interest of integrating OLAP with data mining and as a result a new promising direction of Online Analytical Mining (OLAM) has emerged. The term OLAM was frstly introduced by Han in [14].Issues for On-Line Analytical Mining of Data Warehouses were analyzed by HAN,Chee and Chinag in[15].The purpose of integrating OLAP with data mining is because of the high quality of data in data warehouses,available information processing infrastructure surrounding data warehouses,OLAP-based exploratory data analysis and on-line selection of data mining functions..An architecture that integrated OLAP and OLAM was proposed in this paper.

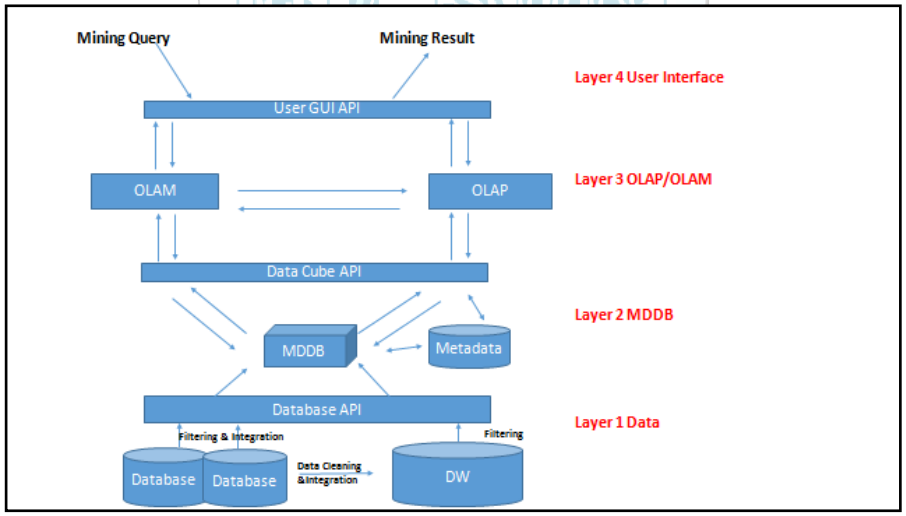

Figure 3. OLAM Architecture

Hua [16] proposed and developed an interesting association rule mining approach called Online Analytical Mining of association rules. It integrated OLAP technology with association rule mining methods and leads to flexible multidimensional and multi-level association rule mining. Dzeroski et al. [17] combined OLAP and Data Mining in a different way to discover patterns in a database of patients. Two data mining techniques, clustering and decision tree induction were used. Clustering was used to group patients according to the overall presence/absence of deletions at the tested markers. Decision trees and OLAP were used to inspect the resulting clustering and to look for correlations between deletion patterns, populations and the clinical picture of infertility. Dehne et al. [18] studied the applicability of coarse grained parallel computing model (CGM) to OLAP for data mining. Authors presented a general framework for the CGM which allows for the efficient parallelization of the existing data cube construction algorithm for OLAP. Experimental data showed that this approach yield optimal speed up even when run on a simple processor cluster via a standard switch. The study shows that OLAP and data mining, if combined together, can produce greater benefits in a number of diverse

research areas. Usman and Asghar in [19] combined enhanced OLAP and data mining techniques but their main focus was on a particular data mining technique known as Hierarchical Clustering. Furthermore, they used data mining as a pre-processing step to get better understanding of data before passing it to the automatic schema builder and which then generates schema for OLAP engine. They proposed an integrated OLAM architecture which integrates enhanced OLAP with data mining and to provide automatic schema generation from the mined data. This proposed architecture improved the performance of OLAP and added extra intelligence to the OLAP system.Experimental results proved that the proposed architecture improved the cube construction time, empowered interactive data visualization, automated schema generation, and enabled targeted and focused analysis at the front-end.

Although there is little research in this area recently and integration of other different techniques of data-mining with OLAP needs to be done. One of the largest computer technologies companies Oracle has integrated OLAP and data mining capabilities directly into the database server. Oracle OLAP and Oracle Data Mining (ODM) are options to the Oracle Database.

5. CONCLUSION

Data mining offers numerous ways to uncover hidden patterns within large amounts of data. These hidden patterns can potentially be used to predict future behavior. Good data is the first requirement for good data exploration. There are various techniques and algorithms that can be used to perform data-mining but their use depends on the application. Predictive data mining techniques are appropriate when you have a specific target value you'd like to predict about your data. Predictive analytics can be used for forecasting customer behavior and purchasing patterns to identifying trends in sales activities. On the other hand descriptive data mining does not focus on predetermined attributes, nor does it predict a target value. Rather, descriptive data mining finds hidden structure and relation among data. Descriptive analytics are useful because they allow us to learn from past behaviors, and understand how they might influence future outcomes. In this a paper a survey of the most important data mining techniques and algorithms for both models was made.

Also a review of the existing work in combining different techniques of Data Mining with OLAP was made and the advantages were mentioned.Combining OLAP and data mining techniques can provide a very effective way for extracting hidden or useful information in large datasets .This combination gives us an intelligent system improved in performance with data mining capabilities. We conclude that there is little research in this area recently and integration of other different techniques of data-mining with OLAP needs to be done.Our future work consists in combining and testing various data mining techniques in combination with OLAP in databases and comparing their efficiency in terms of data retrieval speed and data quality.

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Single and Combined Effects of Copper and Nickel on Nitrification Organisms in Batch Units

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Abstract

Nickel and copper are widely encountered in the industrial wastewaters. The purpose of this batch experimental study was to evaluate single and combined effects of copper and nickel on the nitrification organism activities. Trace amounts of Cu2+ stimulate the activity of nitrifiers and ARRs increased from 0.225 to about 0.5 mg NH4-N/mg MLSS.day on the first day by elevating Cu2+ concentrations from zero to 0.05 mg/L, respectively. Nitrification inhibition was not observed during the experimental studies for the studied Cu2+ concentrations. The ARRs of the nitrification organisms were also found to have decreased by about 16 to 21 fold upon addition of Ni2+. Additions of Ni2+ negatively affect the ammonium oxidation and reaction was not detected during the operations of third day. The ARR values for the studied initial Ni2+ concentrations were lower than the blank sample. The simultaneous presences of Ni2+–Cu2+ negatively affect the activity of nitrification organisms. In order to achieve the same ammonium oxidation level as compared with the blank sample, it needs more reaction times. The experimental results indicated that it is possible to treat industrial wastewater Ni2+ and Cu2+ with individually or together. The toxicity of heavy metal could be minimized by increasing the microorganisms in the biological reactor.

Key words

Copper, Nickel, Nitrification

1. INTRODUCTION

Nitrification involves a sequential conversion of ammonium–nitrogen (NH_4^+–N) to nitrite– nitrogen (NO_2–N) and nitrate–nitrogen (NO_3–N), and the process is carried out by ammonia-oxidizing bacteria (AOB) and nitrite-oxidizing bacteria (NOB), respectively. Because of low growth rate of nitrifying bacteria and their high sensitivity to external factor, nitrification is the controlling step in biological nitrogen removal process [1, 2]. Nitrification is the most sensitive process in the biological wastewater treatment plants, with the autotrophic nitrifying biomass being about 10 times more sensitive than its aerobic heterotrophic part [3]. It has been reported by many researchers that nitrification activity can easily be inhibited by heavy metals and organics [1].

Biological treatment of industrial wastewater presents some difficulties due to its composition. In practice, wastewater treatment plants may be impacted by a stream of shock loading of industrial wastewater containing high concentration of heavy metals and caused deterioration in the performance of biological wastewater treatment systems [1,4]. Metals exist in wastewater in a soluble and particulate form. Settleable fractions of metals and their interactions with various components of water are removed in a primary settling tank. While 40–70% of cadmium, chromium, copper and lead is typically removed, the removal of nickel and manganese is significantly lower (20–30%)[5]. The aquatic life in water bodies receiving treated water include heavy metals is harmed to a great extent. Also, biological waste sludge fertilizers containing heavy metals lead to accumulation of metals in soil and cause harmful effects on vegetation, animals and humans along the food chain [4,6,7].

The presence of heavy metals in the industrial wastewater affects the microorganism activities in the biological wastewater treatment plant. Deterioration of heavy metals on the microorganism are usually overcome by adopting microorganism [4,7–9], applying various reactor types [10], low pollutants loads, and physical-chemical units with an increase in treatment costs [11].

Experimental studies on heavy metals inhibition on the biofilm and suspended growth systems have shown different results. The biofilm system was found to be 2-600 times higher capacity to resist heavy metals stress than suspended growth process. Nitrification organisms in biofilm were more tolerance than organisms in suspended flocs when subjected to shock loads of heavy metals [12]. Lee et al. [12] reported that the biofilm system was able to tolerate a higher total copper concentration (about more than 1.6 times higher) than suspended growth system. Due to the conventional wastewater treatment methods may partially remove heavy metals, residue of heavy metals in the treated waters cause serious problem to the aquatic organisms.

Nickel and copper are widely encountered in the industrial wastewater. Although trace concentrations of copper and nickel have been identified as micronutrients for microorganisms and stimulate the microbial activity, they are both growth inhibitors at high concentrations. Most of the industrial wastewaters usually contain more than one heavy metal. However, most countries have set the maximum acceptable heavy metal concentrations in the water for each heavy metal alone [13]. Nitrifying bacteria are considered as more susceptible to heavy metals toxicity than heterotrophic microorganisms [14,15]. Compared with Zn, Ni, Cd and other kinds of metals, Cu is considered as more toxic due to it may induce rapid loss of membrane integrity, so longer time is required for natural recovery after inhibition [1]. The molar inhibitory effect of heavy metal toward ammonium oxidation was reported as Cu^{2+}>Zn^{2+}> Cd^{2+}> Ni^{2+} by Hu et al.[16].

The purpose of this experimental study was to determine single and mixture effects of copper and nickel on the nitrification organisms in a batch unit.

2. MATERIALS AND METHODS

2.1. Feed wastewater

The synthetic wastewater contained micro and macronutrients were used throughout the experimental studies. Microorganisms, which were drawn from the nitrification unit of domestic wastewater treatment plant, were acclimatized to NH_4-N with medium solution prepared daily in a tap water. The inoculation conducted in a 5 L mixing and aerated vessel. The inoculation lasted approximately one month for microbial growth with daily replenishment of medium solution.

Table 1. Synthetic wastewater constituents

chemicals	concentrations (mg/L)	chemicals	concentrations (mg/L)
NH_4Cl	50-70	$CoCI_2.6H_2O$	0.0119
Na_2EDTA	4.83	$Na_2MoO_4.2H_2O$	0.066
$CuSO_4$	0.0046	$MgSO_4.7H_2O$	36.97
$ZnSO_4.7H_2O$	0.023	$NaHCO_3$	226
$CaCI_2.2H_2O$	36.74	$FeCI_3.6H_2O$	0.316
H_3BO_3	1.0	KH_2PO_4	1920

2.2. Batch Experiments

In order to determine the effects of single and mixture of Ni^{2+} and Cu^{2+} concentrations on the nitrification bacteria, batch experiments were carried out in 500 mL glass bottles, containing medium solutions and NH_4-N. After adding acclimated microorganisms into synthetic wastewater, the pH of mixed liquor was adjusted to 7.5 using alkaline solution of 10 N NaOH and bicarbonate buffer was added into the batch unit. The total volume of liquor was 200 mL. The dissolved oxygen concentration was kept over 2.0 mg/L throughout the experimental periods. Experimental studies were performed by varying the concentrations of Cu^{2+} (0.005–2.0 mg/L) and Ni^{2+} (0.005–2.0 mg/L) in three batch units for each concentration. Combined effects of heavy metals were investigated at various initial concentration ratios of Ni^{2+}/ Cu^{2+} (I: 0.00/0.00– II:0.01/0.2–III: 1.0/1.0– IV: 0.5/1.5– V: 2.0/2.0, and VI: 3.0/3.0 mg/L).

In order to compare the results, three blank samples (without heavy metals) were used through all batch procedures. Acclimated nitrification microorganisms about 50 mg/L were included for each batch units.

Batch units were placed on a shaking incubator at 150 rpm and constant temperature of 35 ^{0}C. The samples were withdrawn daily from batch units and filtered using 0.45 µm filters. The pH and DO level of solutions were checked daily. Concentrations of NH_4-N, NO_3-N, and NO_2-N in the clear samples were analyses at least three times.

The batch experiment was completed when the concentrations of NH_4-N was lower than 0.5 mg/L for each heavy metal concentrations. Concentrations of NH_4-N, NO_3-N and NO_2-N in the clear samples were measured with the Merck photometer (Nova 60 Model) using analytical kits; NH_4-N (14752), NO_2-N (14776) and NO_3-N (14773).The mixed liquor suspended solids (MLSS) analysis was carried out according to APHA [17].

3. RESULTS AND DISCUSSION

When the pH of mixing solution decreased to 7.0±0.1 because of the conversion of NH_4-N to NO_2-N and NO_3-N, pH was increased to about 7.5±0.1 by using alkaline solution in a day. Batch experiments at various single and mixture of Ni^{2+} and Cu^{2+} concentrations were carried out to highlight the differences between nitrification rates with and without heavy metals.

3.1. Effects of Copper Concentration

Effects of copper concentrations on the ammonium removal rates (ARRs) are presented in Figure 1. Considerable ARR difference between 0.005 and 0.04 mg Cu^{2+}/L were not observed. Trace amounts of Cu^{2+} stimulate the activity of nitrifiers and ARRs increased from 0.225 to about 0.55 mg NH_4-N/mg MLSS.day on a first day by elevating Cu^{2+} concentrations from zero to 0.05 mg/L, respectively. Up to the initial concentration of 0.05 mg/L, nitrification reaction was complete in five days. Further increase the concentrations of Cu^{2+} from 0.05 mg/L to 2.0 mg/L, the ARR steadily decrease and NH_4-N oxidation was almost completed in seven days. Due to the residue NH_4-N concentration in the solution decreases, the ARRs value decreased. The lowest ARRs value was observed at the concentration of 2.0 mg Cu^{2+}/L.Nitrification inhibition was not observed during the experimental studies for the studied Cu^{2+} concentrations. The concentrations of NH_4-N were lower than 0.5 mg/L for each Cu^{2+} concentration at the end of the experimental study.

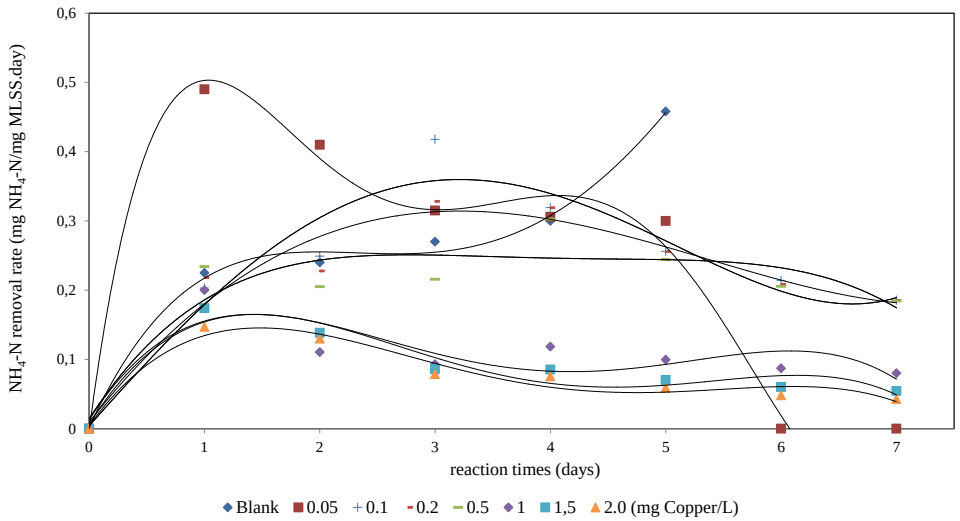

Figure 1.The ARRs variation at different Cu^{2+} concentrations.

3.2. Effects of Nickel Concentration

As can be seen in Figure 2 that, the NH_4-N oxidation steadily decreased significantly as the applied Ni^{2+} concentration to the nitrifying biomass increased. The AARs of the nitrification organisms was also found to have decreased by about 16 to 21 fold upon addition of Ni^{2+}. On the first day of operations, oxidation of NH_4-N was not detected for the studied concentrations of Ni^{2+} while ARR was 0.16 mg NH_4-N/mg MLSS.day for the blank sample. Additions of Ni^{2+} negatively affect the ammonium oxidation. The ARR values for the studied initial Ni^{2+} concentrations were lower than the blank sample. Until the third day of reaction, ammonium oxidation was not observed. The ARR values steadily decreased by increasing the initial Ni^{2+} concentrations in the solution.

The highest ARR of 0.45 mg NH_4-N/mg MLSS.day was observed when the nitrification culture was exposed with 0.05 mg Ni^{2+}/L.

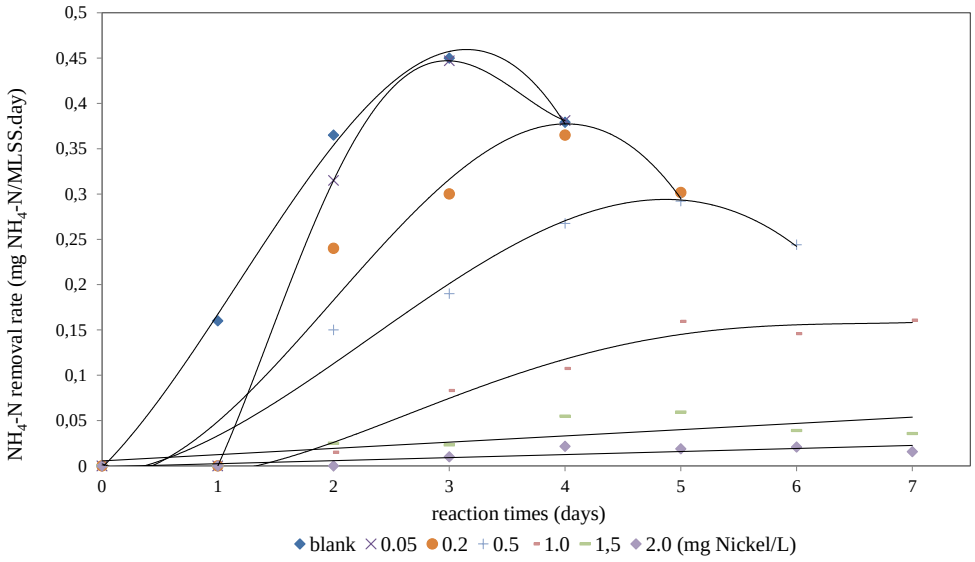

Figure 2.Effects of Ni^{2+} on the ARRs.

3.3. Effects of Cu^{2+} and Ni^{2+} mixture on the nitrification process

Batch experiments were carried out with various combinations of Ni^{2+}– Cu^{2+} for the initial MLSS concentrations of 100 and 200±10 mg/L. The effects of Ni^{2+} and Cu^{2+} mixture on the ammonium oxidations are depicted in Figure 3 and 4. The simultaneous presences of Ni^{2+}– Cu^{2+} negatively affect the activity of nitrification organisms. In order to achieve the same ammonium oxidation level as compared with the blank sample, it needs more reaction times. Although no significant difference was found between the removal efficiency of blank and 0.2–0.01 mg Ni^{2+}– Cu^{2+}/L mixtures, the NH_4-N removal efficiency was decreased with increasing of Ni^{2+}– Cu^{2+} concentrations. The ARRs decreased with increasing Ni^{2+}–Cu^{2+}concentrations from zero to 3.0–3.0 mg/L.

As shown in figures the inhibition level of heavy metal mixture was strongly dependent on the MLSS concentrations. Adding of Ni^{2+}– Cu^{2+} together resulted in decrease activity of nitrification organisms and NH_4-N oxidation rate was decreased. A decrease of 99.9% to 57% of NH_4-N oxidation was observed when the mixture concentrations were increased from zeroto 3.0 mg Ni^{2+}/ 3.0 mg Cu^{2+}/L. Removal efficiencies of NH_4-N increased about 10% with increasing MLSS concentration at all studied Ni^{2+}/Cu^{2+} combinations.

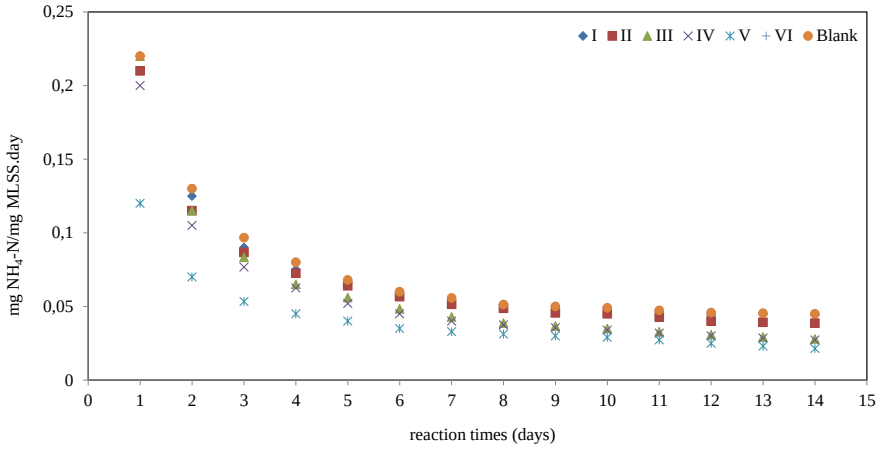

Figure 3. Combined effects of Cu^{+2} and Ni^{+2} on ARR_S

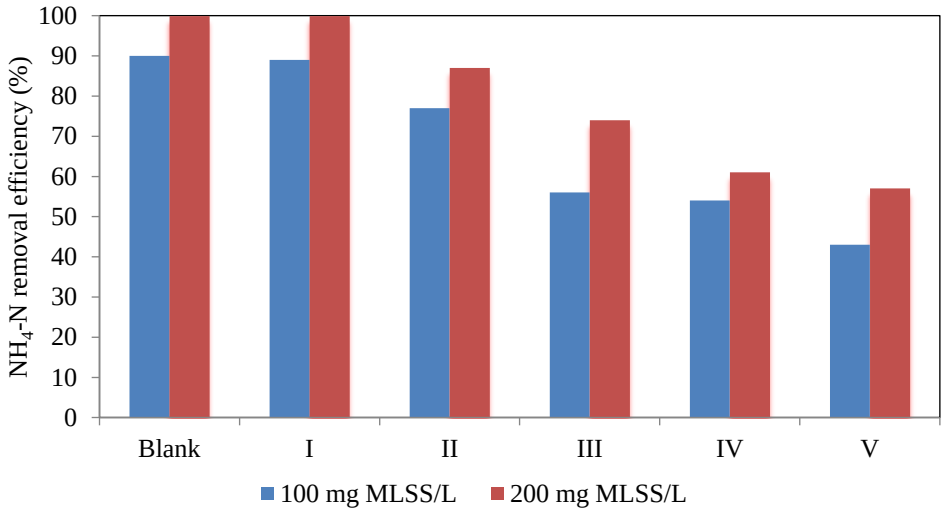

Figure 4. Combined effects of Cu^{+2} and Ni^{+2}at various MLSS concentrations

4. CONCLUSION

The effect of single and mixtures of Cu^{2+} and Ni^{2+} on the nitrification process were investigated. When the individual effect of nickel was studied, no nickel concentration causing any stimulation was observed, as happened with 0.05 mg/L of Cu^{2+}. The toxic inhibitory effect of nickel was found to be considerably higher than that of copper for the studied concentrations in the experiments. Combinations of Cu^{2+} and Ni^{2+} introduced to the wastewater might produce serious upsets in the nitrification process. Results showed that the toxicity of heavy metal could be minimized by increasing the microorganisms in the biological reactor

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Bacillus thuringiensis Parasporins and Their Use in Controlling Cancer Cells

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Abstract

Parasporins are Cry proteins produced by Bacillus thuringiensis (Bt) strains during sporulation processes and notable for targeting the cancer cells with their unique cytotoxicity mechanism without exerting haemolytic effect on normal cells. Parasporins are specifically produced by Bt strains with non-insecticidal effect. Although the studies on parasporins go back to the 1970s, comprehensive scan about the cytotoxicity of parasporins was performed by Mizuki and colleagues. Considering that these proteins exhibit selective toxicities on human cancer cell lines but not on normal cells, detailed studies about the mode of action of anti-cancer effect was investigated in several countries. Specificity and abundance of parasporin producing Bt species in nature brought them into an important position in terms of developing anti-cancer agents. Parasporins are classified into six groups by the committee of parasporin classification and nomenclature as parasporin-1 (PS1), PS2, PS3, PS4, PS5, and PS6 by taking the amino acid homology into account. Activated parasporins display cytotoxicity at varying degrees in different cancer cell lines. There are numerous studies about promoting the use of Bt parasporins as anti-cancer agent in human, but in depth studies should be carried out about their usability in model organisms. Researches should also be deepened especially in vivo due to production of different types of parasporins with different mechanism of action by different Bt strains. Clarification of the molecular mechanisms of toxicity for every candidate parasporin on cancer cell lines may ease the development of anti-cancer agents. Thus, the present study was conducted to provide a review about the cytotoxic impacts of Bt parasporins on human cancer cell lines

Key words

Bacillus thuringiensis, cancer cells, parasporin

1. INTRODUCTION

1.1. Bacillus thuringiensis and an Overview of Its Toxin Proteins

Bacillus thuringiensis (*Bt*) is an aerobic, Gram (+) and spore forming entomopathogenic bacterium belonging to *Bacilluscereus* group together with *Bacillus anthracis* [1], [2]. It was first discovered in diseased larvae of the silkworm, *Bombyxmori* by Ishiwata and characterized by its well-known insecticidal δ-endotoxin proteins [3]. It has a simple life cycle and under appropriate environmental conditions and nutrient supply their spores germinate and go into vegetative form. But, if one or more of compounds as carbohydrates, oxygen, amino acid or others are insufficient in their nutrient; they form parasporal bodies together with spore and delta endotoxins (Figure 1).

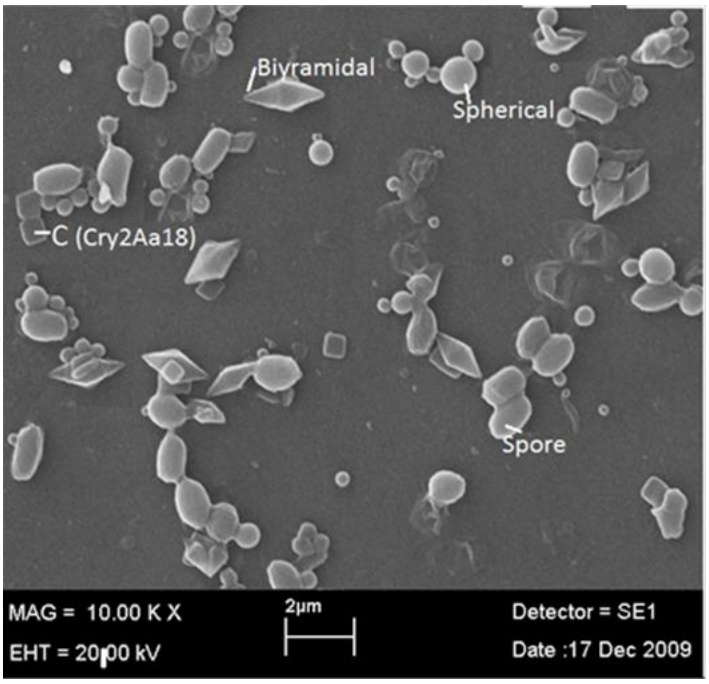

Figure 1. SEM view of Bt SY49.1 spore crystal mixture [4]

Cry proteins are widely used worldwide as insecticidal biopesticides in agricultural fields. But, it was also reported that the number of non-insecticidal strains of *B. thuringiensis* in natural environments are more widely distributed than insecticidal strains [5], [6]. Mizuki et al., [7] observed the first group of functional Cry proteins, known as parasporins, in non-insecticidal *Bt* stains. Parasporins are grouped into six family as PS1-PS6 by the parasporin nomenclature committee [8]. They specified as non-haemolytic and preferentially kill cancer cells [9]. *Bt* 89-T-34-22 isolate belonging to serovar*shandongiensis* revealed at least three potent toxicity on human leukemic T cells [10], [11].

1.2. The Discovery of PSs

Parasporins are the type of δ-endotoxins produced as Cry proteins by *Bt* species. The most prominent feature of parasporins is that they don't exhibit insecticidal activity but prefer cancer cells to control. They are firstly discovered in non-haemolytic and non-insecticidal *B. thuringiensis* isolates A1519 and A1190 by Mizuki et al. [12] after an extensive scanning program and named as parasporin proteins. Studies revealed that they have cytotoxic activity on leukemic T cells and some other human cancer cells [7]. The first discovered protein was named as PS1Aa1 [8], and discovery of new proteins are followed by scientists in Vietnam [13], Canada [14], Malaysia [15] and Japan [16]. It was indicated that spore morphology and some other characteristic properties of parasporin producing *Bt* strains are different from their Cry producing counterparts [17]. Parasporins exert their cytotoxicity on cells without any serious deterioration on cell surface. It was reported that parasporins thought to have disruptive effect on cells via more specific mechanism other than known colloidal-osmotic swelling of cells and fragmentation caused by Cry proteins [18]. In a screening study carried out on sheep erythrocytes, potent proteins was obtained from more than 60 *Bt* isolates with strong haemolytic effect on organisms ranging from vertebrates to invertebrates [19]. Likewise, some of the parasporins with nonhaemolytic and non-insecticidal activity was found to have cytocidal effect against MOLT-4 (human leukemic T-cells) [12]. When PS1A1 was applied to cell lines from mosquito (*Aedesalbopictus*) cultures (NIASAeA1-2) and cells from *B. mori* (BMN), sensitivity was not observed [7]. However, in more detailed studies using parasporins high cytocidal effect was observed on HeLa, MOLT-4 and human lung cancer cells at various levels [12]. Such a situation revealed that parasporins have varying degrees of specificity on a wide variety of cancer cells.

1.3. Mode of Action and Target Specificity

High doses of parasporins result in cessation of respiratory activity in variety of cells (Caco-2, MOLT-4, HL60, Jurkat, HC TCS, HepG2, MRC-5, Sawano, HeLa and A549) following large morphological alterations and subsequently swell, begin to separate from holder and come apart before cell death is realized [20]. Due to death of the cells at high doses before the start of apoptosis, these morphological events are the indication that cytotoxicity is not an apoptotic result. The researchers also specified that every toxin protein have unique and specific target spectrum in mammalian cells because of their receptor recognition property. Wong et al. [21] studied the binding behavior of purified parasporins and put forth that product of *Bt* 18 has quite high affinity against CEM-SS (leukaemic cell line) cells. Heterologous competitive binding analysis revealed that parasporins attach to distinct positions in different cancer cells and thus may have disparate mode of action. PS1 group of proteins demonstrate their cytocidal effect through apoptosis [22]. PS1Aa3 and PS1Ab1 without any insecticidal and haemolytic effect, indicate a considerable toxicity on HeLa cells (human uterus cervix cancer cells), but, not on uterine smooth muscle cells (UtSMC) [23]. In studies with simultaneous application of parasporal proteins and commercial anti-cancer drugs as doxorubicin, cisplatin, navelbine, etoposide, and methotrexate on CEM-SS cell lines,

competitive relation was not reported. That's why it has great importance to clarify *in vitro* differential activity mechanism of every parasporin on different types of cancer cell lines.

Cytotoxic action was not evident upon application of 16 and 60 kDa parts of PS1Ac2 separately on HeLa and MOLT-4 cells; however, their mixed application resulted in cytotoxicy on HeLa cells but not on MOLT-4 cells [24]. Such a case has been attributed to refolding activity of proteins. These researchers suggested that depending on the lack of intracellular LDH release, the mode of action of PS1Ac2 was not associated with pore formation in cell membrane, but directly related with the start of apoptotic signal in susceptible cells through Ca^{+2} influx. While PS2Aa1, PS3Aa1 and PS4Aa1exhibit their cytotoxicity in 1h on susceptible cells, PS1Aa1 reveal in 8-10h on the same cell types [25], [26]. The situation shows that parasporal proteins can structurally be different from each other and reveals that mode of action of PS1Aa1was considerably different from other parasporins [7]. PS1Aa1 doesn't cause pore formation in cell membrane but rapidly increase the concentration of intracellular Ca^{+2}concentrations and physiologically result in a considerable decrease in DNA and protein synthesis [22]. PS2 structurally resemble to aerolysin-type β-pore-forming toxins [27] and exerts its cytocidal effect through lysing the cells [28]. But PS2 may also induce caspase activity at low doses [20]. The first step of PS2Aa1 in cytotoxicity is its specific connection with an undetermined putative receptor in cell membrane and increase in membrane permeability. With the production of PS2Aa1 oligomers, pores are formed and cells become lysed [9]. Despite the lack of detailed information about the mode of action of PS3Aa1, the 3-domain structure of this protein as in Cry proteins suggest that it can perform the cytotoxic effect on cancer cells through pore formation [26]. In some data it was stated that PS4 has pore forming activity similar to PS2 [29], but, these two proteins have different target cell spectrum and exhibit varied cytocidal activity mechanisms [30]. Sensitive CACO-2 and MOLT-4 cells and resistant HeLa cells were subjected to various concentrations of PS4 and seen that wide pore formation on target cell membranes were induced [29]. PS4Aa1 differs from other parasporins in many aspects and also thought that it has different mechanism in terms of mode of action [9]. However, there is no detailed information as in PS3.

1.4. Types and Specifications of Parasporins

Parasporins are characterized by their non-hemolytic but preferentially cancer killing properties. So far as noted in Table 1, a total of 19 parasporin proteins have been isolated from 17 *Bt* strains and classified into 6 groups as PS1-PS6 [8]. Parasporins need to be activated proteolytically for exhibiting toxicity on cancer cells [20]. PS1, PS3, and PS6 are three domain proteins with five block conserved sequences. PS1 is the most well studied protein with 81kDa precursor structure and 15-56 kDa active heterodimer [27]. PS3 is similar to PS1 with 88 kDa inactive and 64 kDa active forms [26]. PS6 is a protein with 84 kDa inactive form and 73kDa active forms with 14-56kDa heterodimers [31]. On the other hand, PS2 is a low molecular weight (37 kDa precursor, 30kDa active forms) protein with unconserved three-domain structure [27]. PS4 is the protein with molecular weight of 30 kDa inactive form and 27 kDaproteolytically activated form [32]. PS5 is also low molecular weight protein which lack five block conserved sequences [27].

Table 1: Known parasporin proteins

Type of Parasporin		Corresponding Cry No.	*Bt* source strain	Reference
Parasporin 1	PS1Aa1	Cry31Aa1	A1190	[7]
	PS1Aa2	Cry31Aa2	M15	[14]
	PS1Aa3	Cry31Aa3	B195	[33]
	PS1Aa4	Cry31Aa4	Bt 79-25	[34]
	PS1Aa5	Cry31Aa5	Bt 92-10	[34]
	PS1Aa6	Cry31Aa6	CP78A, M019	[31]
	PS1Ab1	Cry31Ab1	B195	[33]
	PS1Ab2	Cry31Ab2	Bt 31-5	[34]
	PS1Ac1	Cry31Ac1	Bt 87-29	[34]
	PS1Ac2	Cry31Ac2	B0462	[24]
	PS1Ad1	Cry31Ad1	CP78B, M019	[31]
Parasporin-2	PS2Aa1	Cry46Aa1	A1547	[20]
	PS2Aa2	Cry46Aa2	A1470	[35]
	PS2Ab1	Cry46Ab1	TK-E6	[36]
Parasporin-3	PS3Aa1	Cry41Aa1	A1462	[26]
	PS3Ab1	Cry41Ab1	A1462	[26]
Parasporin-4	PS4Aa1	Cry45Aa1	A1470	[37]
Parasporin-5	PS5Aa1	Cry64Aa1	A1100	[27]
Parasporin-6	PS6Aa1	Cry63Aa1	CP84, M019	[31]

Available at: http://parasporin.fitc.pref.fukuoka.jp/list.html

1.5. Haemolytic and Cytotoxic Effects of PSs

There are large number of isolates without haemolytic activity and high selective toxicity to a wide variety of mammalian cells lines. For example, while PS2Aa1 selectively kill liver and colon cancer cells, it didn't exert cytotoxicity on non-neoplastic cells, chronic inflammatory cells or blood vessels in the same organism [20]. Cytotoxicity spectrum of parasporins from these isolates exhibit heterogeneity. While some of them have toxicity over a wide range of human cells, others are strictly specific to few cells [38]. Ito et al. [20] revealed that cytotoxicity levels of recombinant parasporin vary from cell to cell. Among the cells that they examined, while the highest toxicity was observed on MOLT-4, Jurkat, Sawano, and HepG2 with 10-40 ng/ml concentrations, MRC-5, HC, TCS, A549, and HeLa cells were reported to be resistant. Nevertheless, a clear common characteristic among susceptible and resistant cell lines couldn't identified, but, it was clear that tumor cells are more sensitive compared to normal cells. Different anti-cancer cytotoxicity spectrum and activity levels of parasporins on human cell lines are their most striking features. Some PS2 and PS4 types reported to have broad spectrum of activity through indicating lethal effect on six of the nine cancer lines [20], [22], [26], [32]. However, PS3 exhibits moderate cytotoxicity with narrow spectrum in a limited number of cancer cells. It is also interesting that Jurkat, TCS and HeLa cell lines were reported to have monosensitivity against one of PS1Aa1, PS2Aa1 and PS4Aa1[20].

In a study carried out with recombinant PS5, while quite high toxicity (EC50<0.1 µg/mL) were evidenced on HepG2, COS7, HeLa, MOLT-4, TCS, Vero, and Sawano cells, weak toxicity (EC50, 0.1 to 1 µg/mL) was seen on Jurkat, CACO-2, NIH3T3, MRC-5, CHO-K1, and UtSMC cells. On the other hand, cytocidal activity was not observed on U937 and HC cells (EC50>10 µg/mL) [27]. Therefore, a determined specific toxicity mechanism was not proposed for PS5.

2. CONCLUSIONS

Bacterial parasporins provide promising results for decelerating or preventing the proliferation of cancer cells. In this respect, parasporal proteins with different activity spectrum on cancer cell lines can be obtained from a variety of bacterial species. Thus, screening studies should be conducted to find new putative parasporins and their mechanisms of cytotoxicity have to be elucidated on variety of cancer cell lines.

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Effects of Ensiling Duration on Chemical Composition of Maize Silages

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Abstract

The present study was conducted to investigate the effects of ensiling durations on nutritional composition of maize silage. For this purpose, chopped maize samples were ensiled in 3-liter glass jars for 7, 14, 21, 28, 35, 42, 49 and 56 days. Ensiling duration significantly increased crude protein (CP) and crude oil (CO) CP contents of maize silage ($P<0.05$). The initial pH value of 4.43 decreased to 3.87 at the end of 56 day ensiling period. On the other hand, there were not any significant changes in dry matter (DM), crude ash (CA), ADF and NDF content of maize silage throughout 56-day ensiling period ($P>0.05$). Current findings revealed that increasing ensiling durations created significant decreases in pH contents and increases in CP and CO contents. It was concluded that minimum ensiling duration for maize silage should not be less than 40 days.

Key words

Maize, Silage quality, Ensiling duration, Conservation, Nutritional composition

1. INTRODUCTION

Meat, milk and egg-like animal products have a great place in human nutrition. In Turkey, feed costs constitute the primary input of livestock facilities (50-70%). Quality roughage plays a significant role especially in feeding of high-yield animals. About half of total daily feed needs of dairy cows is met with roughage. In this way, well operation of anima digestive system is provided and with created nutrient balance it is possible to get desired quality and quantity yield. Quality silage is quite rich in energy and more delicious and nutritious than the other feeds. Silage is also an economic feed source and may significantly reduce the production cost of meat and milk [1].

With several benefits, silage is an essential nutrient source for ruminant feeding. Therefore, the quality and nutritional composition of silages are quite significant issues for livestock facilities. There may be some nutrient losses during the ensilage period. Such losses may vary based on silage structure and silage material, harvest period of the material, the way of ensilage and the other conditions to be obeyed during the ensilage. These losses generally observed at different stages throughout the ensiling period. They may be experienced at field while harvest and chopping of the green herbage, on the way to the silo while transporting them, or in silo during the fermentation of the material. All these losses may sometimes reach to 25-30% of the total material in weight and may also result in serious quality losses [2]. It is evident that the silage with great losses in nutrients may not provide any benefits in reaching desired milk or meat needs.

The present study was conducted to investigate the variations in nutrient composition of the maize silage throughout the ensiling period and to determine potential losses. Experimental outcomes will provide significant contributions for better management of silage processes.

2. MATERIALS AND METHODS

The maize to be ensiled was supplied from the fields of Agricultural Research and Implementation Center of Erciyes University. Samples were taken from maize plants before making the silage. Then the plants were chopped in 3 cm pieces. They were homogenized and placed in 3-liter glass jars. Lids were tightly closed as not have any air. A total of 24 silage were prepared.

The silage samples were opened at 7, 14, 21, 28, 35, 42, 49 and 56th day in 3 replications. About 25 g samples were taken from each jar in accordance with the method specified as in [3]. They were mixed in 100 ml distilled water for 5 minutes, homogenized and pH values were measured. Dry matter (DM), crude protein (CP) crude oil (CO) and crude ash (CA) analyses were performed in accordance with the methods specified in [4]. Acid detergent fiber (ADF) and neutral detergent fiber (NDF) analyses were performed in accordance with the principles specified as in [5].

Experimental data were subjected to statistical analyses with SPSS (Statistical Package for the Social Sciences, version 14.0) software. Single-way ANOVA analysis was performed to compare the groups and multiple range tests were used to identify the differences between the groups.

3. RESULTS AND DISCUSSION

The effects of fermentation (ensiling) duration on nutritional composition of maize silage are provided in Table 1.

Table 1. The effects of fermentation (ensiling) duration on nutritional composition of maize silage

		Ensiling duration (days)									
		0	7	14	21	28	35	42	49	56	SEM
Parameters	DM (%)	35.76	35.54	35.46	35.21	34.95	34.78	34.42	34.19	33.94	0.369
	pH	4.43^{a}	4.34^{a}	4.21^{ab}	4.16^{ab}	4.10^{ab}	4.03^{b}	3.98^{b}	3.93^{bc}	3.87^{c}	0.098
	CP (% DM)	5.65^{d}	5.73^{cd}	5.79^{c}	5.82^{c}	5.97^{bc}	6.07^{ab}	6.18^{ab}	6.24^{ab}	6.30^{a}	0.140
	CA (% DM)	4.55	4.52	4.60	4.57	4.50	4.45	4.46	4.39	4.40	0.111
	CO (% DM)	2.57^{c}	2.62^{bc}	2.67^{bc}	2.74^{b}	2.80^{b}	2.88^{b}	2.94^{a}	3.03^{a}	3.09^{a}	0.164
	ADF (% DM)	21.59	21.46	21.37	21.28	21.22	21.17	21.08	20.91	20.87	0.233
	NDF (% DM)	42.55	42.41	42.47	42.34	42.25	42.18	42.05	41.87	41.69	0.301

$^{a, b, c, d, e, f}$: The difference between the means indicated with different letters in the same line is significant; SEM: Standard Error of Means; DM: Dry Matter; CP: Crude Protein; CA: Crude Ash; CO: Crude Oil; ADF: Acid Detergent Fiber; NDF: Neutral Detergent Fiber.

As seen in Table 1, fermentation duration did not have significant effects on DM content of maize silage (P>0.05). On the other hand, fermentation durations had significant effects on crude protein (CP) and pH values of maize silage (P<0.05), but did not have significant effects on crude ash (CA) contents (P>0.05). Again as seen in Table 1, fermentation durations had significant effects on crude oil (CO) contents of maize silage (P<0.05), but did not have significant effects on ADF and NDF contents of silage samples (P>0.05).

There was a decrease in DM contents of silage samples with increasing ensiling durations, but such a decrease was not significant (P>0.05). The initial DM content of 35.76% decreased to 33.04% at the end of 56 day fermentation period. The pH values also decreased throughout the ensiling period and the initial pH value of 4.43 decreased to 3.87 at the end of 56 day ensiling period. The decrease in pH was found to be significant (P<0.05). Similar decreases in pH values with increasing ensiling durations were also reported by previous researchers (e.g. [6], [7]).

Similar to findings of some previous studies (e.g. [8], [9], [10]), the initial CP content of 5.45% increased to 6.70% at the end of 56th day and such an increase with increasing ensiling durations was found to be significant (P<0.05). The effects of fermentation durations on CA contents were not found to be significant (P>0.05). There was an irregular increase in crude ash contents of samples with increasing ensiling durations.

Effects of fermentation durations on crude oil (CO) contents of maize silage were found to be significant (P<0.05). The initial CO value of 2.47% increased to 3.36% at the end of 56 day ensiling duration. Similar increases in CO contents with increasing ensiling durations were also reported by [11] and [12]. Finally, the effects of fermentation duration on ADF and NDF contents of maize silage were not found to be significant (P>0.05).

4. CONCLUSIONS

Considering the current findings, it was concluded that while increasing ensiling durations created significant decreases in pH values of maize silage, but increased CP and CO contents of the silage samples. It was finally concluded that the minimum ensiling duration for maize silage should not be less than 40 days.

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Effects of Iron Chloride/Zeolite on GST of Rainbow Trout (Oncorhynchus mykiss)'s Kidney Tissue

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Abstract

Aquatic ecosystems have been negatively affected by the contamination of ground and surface waters as a result of various activities. Due to the ferrous chloride ($FeCl_2$), which is used as the reducing agent for the organic synthesis reactions in the contamination of water column and sediment, iron salts may be very toxic for some aquatic organisms. In order to minimize these effects, natural products such as zeolite have been widely used in recently years. For this reason, rainbow trout were exposed to $FeCl_2$ and/or zeolite (($FeCl_2$ (0.002 mg/l)(A), $FeCl_2$+zeolite (0.002 mg/l+1 gr/l) (B), zeolite (1 gr/l) (C) and control (without $FeCl_2$ and/or zeolite (D)). At the end of the exposure time, 28 days and their oxidative stress responses were investigated. At the end of the treatment period, glutathione-S-transferase (GST) activity was determined in the samples taken from kidney. GST values for kidney tissues were found statistically important in the control and treatment groups ($p<0.01$).

Key words

Ferrouschloride, Zeolite, Fish, Toxicity, Oxidativestress, Enzyme, Detoxificant

1. INTRODUCTION

Pollutant aspects which accumulate in seafood and which are hazardous to health and which also destroy the ecological balance can be identified as pesticides, some organic materials, industrial wastes and artificial agricultural fertilizers [1]. These chemicals, either natural or synthetic, are known to have toxic effects on both humans and other organisms [2]. Contamination from xenobiotics, a threat to the aquatic ecosystems, affecting nontarget inhabitants or causing ecological imbalances [3]- [5]. Aquatic organisms especially fish can also serve as a sensitive bioindicator of environmental contaminants, including the presence of xenobiotics, toxins, and other alterations in natural water quality parameters [2]. Because they can be found everywhere in the aquatic environment and they play a major role in the aquatic ecosystem. [6].

Living things are equipped with an antioxidant defense system (ADS) in order to be protected against oxidative stress. Oxygen is a very reactive molecule due to its electron affinity, and more reactive intermediate compounds are formed during the reduction of O2 into H2O. Antioxidant enzymes are components which are induced by oxidative stress, and consist of endogenous enzymes (Superoxide dismutase (SOD), Glutathione peroxidase (GSH-Px), Glutathione-S-Transferase (GST), Catalase(CAT), Mitochondrial cytochrome oxidase system, hydroperoxidase) and exogenous enzymes (Vitamin E and C, some drugs) [7].

Ferrous molecule (Fe^{+2}), which has important roles in the living organism system, is found in different forms in the nature and mostly taken in through drinking water and food. It is known that the increase of Fe molecule in the body increases the radical production and also has a role in the increment of the hydroxyl radical, which is effective particularly in the lipid peroxidation of $FeCl_2$, and hydroxyl- like radicals. Interest for the natural products has increased in order to prevent the negative effects of materials such as iron and aluminum in the regulation of water quality parameters, and studies on the utilization of alternative products have intensified. Among these products zeolites, which are found in large reserves in

nature, are widely used for the elimination of heavy materials in water thanks to their sodium aluminoslicade and clay minerals, their ability of ion exchange and detraction of cations and their low cost [8] -[11].

The objective of the current study was to investigate the chronic sub lethal effects of iron chloride/zeolite, using oxidative stress response as an ecologically relevant endpoint. This study is a contribution for aquatic toxicological risk assessments study.

2. MATERIALS AND METHODS

2.1. Fish maintenance and experimental design

Fish were obtained from Ataturk University,Faculty of Fisheries, Inland Water Fish Applicationand Research Center and the study was conducted atFisheries Application and Research Center'sToxicology Experiment Unit during 28 days.Fiberglas tanks of 1 m diameter and 1 m depth withinclined tube drainage system and 40 rainbow trout(*Oncorhynchusmykiss*) of two years old and 165±25g weight were utilized in the research.Filtered water was distributed to the tanks as noless than 0.5 l/min for kg fish. During the research,water temperature was measured as 11.5±2.5 ^{o}C, pHwas 7.4 and dissolved oxygen was 9.1 mg/l. Fishwere randomly distributed to 8 tanks with 5 fish pertank. Two of the tanks were determined as controland the other 6 tanks were the treatment groups.

$FeCl_2$ application dose $LC50_{96}$ value was utilized and ½ (0.002 mg/lt) of this dose was applied to tanks[12]. Stock solutions of$FeCl_2$, obtained from a company (Sigma), wereprepared with ultra distilled water and were appliedto the tanks with determined water volume accordingto the experiment procedure of renewed environmentin the concentration to form this dose once every 12hours. Zeolite was determined as 1 g/lt covering thetank floor [8]. Control and treatmentgroups were designed as ($FeCl_2$ (0.002 mg/lt)(A),$FeCl_2$+zeolite (0.002 mg/lt+1 gr/lt) (B), zeolite (1gr/lt) (C) and control (without $FeCl_2$ and/or zeolite) (D). Enzyme activity of GST was determined in kidney tissues for all groups.

2.2. Enzyme Analyses

At the end of the trial, treatment and controlgroup fish were euthanized by cervical section, theirkidney tissues were taken and freezed inliquid nitrogen and then tissue samples were waited at-86 °C. These tissue sampleswere storaged in ice for 5-15 min at room temperatureto thaw, afterwards, weighted on a precision scalebetween the ranges of 0.5-1 g and completely washedin 0.9% NaCl solution. KH_2PO_4 buffer solution ofthree times weight of the sample was added on thetissue samples splintered into small pieces. Sampleswere homogenised and centrifuged at 13000 rpm foran hour at 4^{o}C. Supernatants were taken and theirenzyme activities were measured [13].

GST activity was assayed by the method of Habig et al. [14]. Using 1-chloro-2,4-dinitrobenzene (CDNB) as substrate; the final reaction mixture contained 1 mM CDNB and 1 mM reduced glutathione (GSH) as determined at 340 nm. Malondialdehydeseconder product is formed as a result ofmalondialdehyde (MDA) lipid peroxidation. Themeasurement is based upon the absorbancemeasurement of the pink complex at 532 nm, formedas a result of the incubation of MDA withthiobarbituric acid (TBA) at 95 ^{o}C [15]. According toBradford [16], protein levels of each sample weredetermined spectrophotometrically at 595 nmwavelength were recorded by determining the bovineserum albumin (BSA) as the standard.

2.3. Statistical Analyses

The obtained data were expressed as mean±SEM.Statistical analysis of data was done using Duncantest and analyzed using SPSS version 10.0 software.A value of $p < 0.01$was considered statisticallysignificant.Lowercase superscripts (a, b) indicate significant differences among experimental treatment group, Each value is the mean±SEM of five individual observations. Enzyme is EU mg protein^{-1}, MDA (nmol/mg prot.).

3. RESULTS AND DISCUSSION

The results of this study indicate that treatment of $FeCl_2$ and/or zeolite in *O. mykiss* did cause a significant alteration on GST enzyme activities in the treatment groups (A, B, C), compared to the non-treatment group (D: control) at the end of the 28 days. At the end of the chronic exposure, the activity of GST enzyme activities in the kidney tissues were increasedin $FeCl_2$+zeolite group (Fig 1). In contrast, MDA content in the tissue decreased due to $FeCl_2$+zeolite (Fig 2).

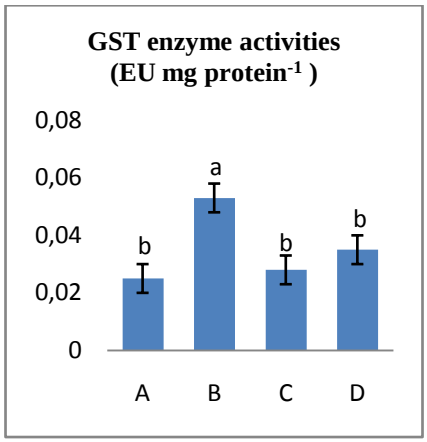

Figure 1. GST activity in kidney

Inthisstudy, the GST activity of rainbowtrout, whichwasexposedto $FeCl_2$orzeolite in differentoncentrations, decreased in smallconcentrationswhiletherewasnodifference in groups.

Manyorganisms have unique systems for protecting themselves against the damaging effects of activated ROSs[17]. SOD, CAT and GSH cycles (glutathioneperoxidase, glutathionereductase, Glutathion S- transferase) convert the well-recognized reactive oxygen radicals into less toxic products. Inourstudy, emphasiswas put on the GST enzymeactivity and MDA levels of the liver. Glutathioneconjugate GST, which is considered as thefirst step in thedetoxification of contaminants, is produced in theliver of someanimals. The most important characteristic of ADS is that all components of the system function mutually against (ROS). Therefore, antioxidant enzymes play a vital role in there gulation of cellular balance and their induction is the result of a reaction against, while antioxidant enzyme activities and lipidperoxidation are importantindicators in analysingcellulardamage in toxicologicalstudies[7].

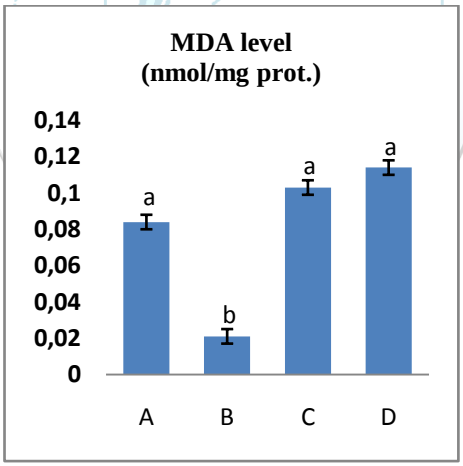

Figure 2. MDA level in kidney

In the present study, exposure to $FeCl_2$+zeolite decreased the MDA levels in the kidney tissues of rainbow trout, which suggests that $FeCl_2$+zeolite, in applied concentrations, reduce peroxidative tissue damage. Decreasing of MDA suggests that ROS inhibited damage may be one of the main detoxic effect of $FeCl_2$+zeolite. The lipid hydro-peroxides formed as a result of lipid peroxidation are broken down to form aldehydes which are mostly biologically active materials. These compounds are either metabolized at the cellular level or they will diffuse from their initial effective region to spread the damage to the other sections of the cell. In determination of these damages, malondialdehyde (MDA) is used, which is a substance that can be frequently measured with thiobarbituric acid. MDA is not a specific or a quantitative indicator of the oil acid oxidation, but it shows a good correlation with lipid peroxidation. The highest MDA values for kidney tissues of rainbow trout have been received in the $FeCl_2$ or zeolite treatment groups and the differences between the $FeCl_2$+zeolite groups have been found to be statistically meaningful.

4. CONCLUSION

The data of this study will help in understanding the biochemical basis of responce of rainbow trout treatment $FeCl_2$or/and zeolite detoxic mechanism. More investigations must be performed to better understand the specific oxidative stress and toxic response of aquatic organism.

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An Evaluation on the Attractiveness of Turkish Economy in Terms of Foreign Direct Investments

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Abstract

Today, foreign direct investment is one of the most important tools that allow countries to make progress in the economic development processes and to integrate with the world economy. Countries that can correctly construe the advantages offered by the globalization process are looking for a way to make their national markets attractive for foreign investors. Turkey is also one of the countries that make efforts in this regard. The fact that Turkey was declared to be a candidate country to the EU in 2005 encouraged foreign direct investments to tend towards Turkey. However, the fact that Turkey has been exposed to internal and external political developments in the last decade negatively affected the amount of financial resources coming to Turkey through foreign direct investment.

Key words

Foreign Direct Investment, Place of InvestmentPreference, Turkish Economy,Developing Countries

1. INTRODUCTION

Today, the benefits offered by the foreign direct investments including providing financial resources constitute a quite wide range. While multinational companies get a significant opportunity to get into the target market through foreign direct investments, the country where market is located is also transferring technology and improving its human capital. The accelerating effect of foreign direct investments on the economic development process increases if countries make their economic, legal, social and cultural structures closer to international norms.The foreign direct investments that find the said properties in further industrialized countries have also tend towards the developing regions of the world since the 1990s.

Turkey began to follow an outward-oriented economy model since 1980 but was able to make the institutional arrangements which were attractive to foreign investments by the end of the 1990s. Foreign direct investments have come to the forefront after 2000 among the external resources coming to Turkey. The fact that Turkey was declared to be a candidate country to the EU in 2005 was considered as an important step in the process of Turkey's economy's articulation with one of the world's most stable markets by foreign investors, and the amount of foreign direct investments that turned to Turkey was highly increased after this date. However, the foreign investments coming to Turkey have also been affected by the problems experienced in the regional and global economy within the last 10-year period. There have been fluctuations in source entry to Turkey in the form of foreign direct investments due to internal and external political and economic instabilities particularly due to the slowdown of EU membership process.

This study aims to reveal under the influence of which factors the foreign direct investments coming to Turkey are made during 2004-2014 period and to examine the factors that make the national market attractive from the current perspective.

2. THE CONCEPT OF FOREIGN DIRECT INVESTMENT, ITS DEVELOPMENT IN THE WORLD AND TURKEY

Foreign direct investments began in the period after the Second World War in the World. Foreign direct investments began to gain importance along with the increasing liberalization in the post-war period. After the 1950s, Multinational Corporations emerged and played an active role in the world economy. Foreign Direct Investments, Multinational Companies and other forms of international production began to gain importance along with the gradual change of the international economy since the 1960s [1].Towards the end of the 1970s, the number of MNC increased rapidly and international production gradually began to grow further [2].

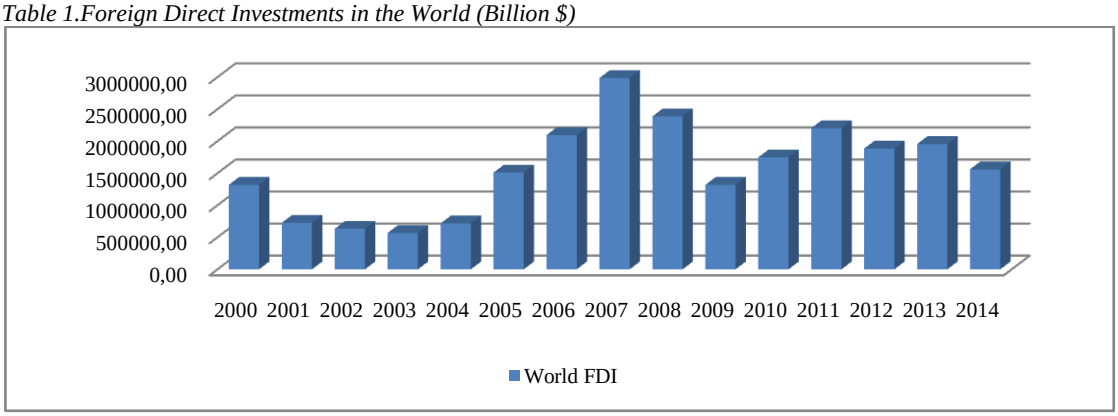
2.1.Conceptual Framework of Foreign Direct Investments

Foreign direct investment is a quite comprehensive concept that should be addressed with multiple dimensions. Foreign direct investment "is the fact that a company establishes a production facility or purchases the production facilities in countries outside its headquarter in order to spread its production beyond the borders of the country where it is established" [3]. According to Karluk, foreign direct investment, which is an important tool for the articulation of national economies into the global economy from this aspect, is "the fact that the foreign investor brings along the management information and technology in addition to the purchase of a company or increase of an existing company's capital" [4].According to the International Monetary Fund, foreign direct investment is "a form of investment across national borders in which a business in a country seizes the control of a business in another country or has a significant effect in the control of that company" [5]. According to this definition, foreign direct investment is realized in four different ways including the establishment of a business in a foreign country or the purchase of at least 10% of the shares of a business which is already established, the investment with the profits of a business in a foreign country in that country and increase in the parent company's shares in the business where it has a share in the foreign country [6]. The foreign direct investment is defined as "the international investment made by the resident investor in an economywith an organization resident in another country in order to establish a permanent benefit relationship" in the sources of Organization for Economic Cooperation and Development [7].
According to new 'Foreign Investment Law' No. 4875 that came into force in 2003, foreign direct investment is defined as "the profits used in reinvestments within the country, rights associated with the extraction and use of natural resources, new companies and branches established, company partnerships that accord the right to vote 10% in addition to cash capital, marketable securities, machinery and equipment, property rights brought from abroad by foreign investors" [8]. In addition, the fact that the foreign investor makes an investment using the internal resources of the country is not an obstacle for the said investment to be considered as a foreign investment [9].
Portfolio investments are the investments outside of the foreign direct investments made on financial instruments such as stock shares and bonds in a foreign country[1]. Portfolio investments are different from foreign direct investments because they are the investments made on attractive areas without intending to intervene in business management. Countries can benefit from portfolio investments to the extent that they can liberalize their economies and make their internal market attractive for foreign investors. However, applications have shown that extreme liberal policies and strict protectionist policies did not give the expected results. The adequacy of the economic infrastructure and the suitability of the social and legal environments are determinants in the preferences of portfolio investments.

2.2. Development of Foreign Direct Investments in the World

Although a rapid increase was observed in the global foreign direct investments in 1979-81 period, foreign investments increasingly began to enter into developing countries since the 1990s [10]. 94.2% of the regulations regarding the investment climate in developing countries were in favor of foreign direct investments in the 1990s. It increased rapidly since the mid-1990s and reached 202 billion dollars [11].

Table 1.Foreign Direct Investments in the World (Billion $)



Source: World Bank WDI, 2016 [12].

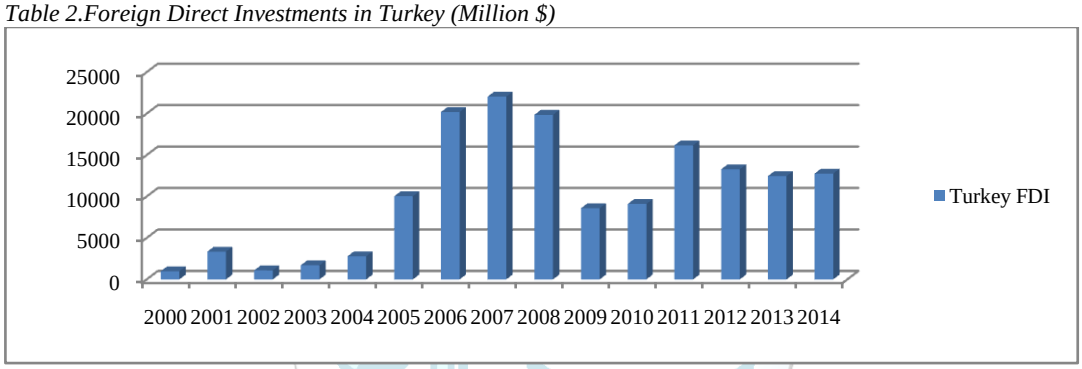
[1]On the other hand, "foreign direct capital investments are the most persistent foreign resource coming to thecountry. The foreign sources coming through borrowing and portfolio investment leave the country at a small increased risk and are interested in the country's economy or politics unless they negatively affect the investment. However, foreign direct capital investors are closely interested in the progress of the country and become defenders of the country because a problem that would arise will negatively affect their long-term profits http://www.radikal.com.tr/haber.php?haberno=207721). Access: 10.04.2016.

The development of net capital movements net capital movement from the 2000s until today is presented in Table 1. The amount of foreign direct investment, which was 1,319 billion dollars in 2000, remained in lower amounts until 2004 and increased to 716,659 billion dollars in 2004. Following the increasing trend in the period after 2004, it decreased by 15% compared to the previous year along with the effect of the global crisis in 2008. The reduction in capacity to make an investment due to the constraints in access to financial resources, decrease in investment trends due to the negative expectations for growth and the declines in merger and procurement transactions due to the liquidity squeeze in the financial markets are among the factors causing this decrease [13].
According to the report published by UNCTAD in 2014, foreign direct investment flows that increased by 4.6% in 2013 around the world decreased by 16.4% and fell to 1,561 billion dollars due to the macroeconomic vulnerability and policy uncertainties and geopolitical risks in 2014. Developing countries leave behinddeveloped countries in terms of the place where investment is made and continue to expand the investments they realize in the rest of the world year by year in terms of the investors [14].

2.3. Development of Foreign Direct Investments in Turkey

Turkish economy failed to make a significant progress until the early 1980s. The macro-economic environment related to investments and the protectionist trade regime which was followed until the end of the 1970s in Turkey have a big role as well as around the world. Thebeginning of 1980 was a historic milestone in terms of foreign capital investments. As 24th January 1980 Decisions, the reform program that passed into the historyof Turkish economy aimed at outward growth and transition to industrialization strategy[15]. Along with the January 24th Decisions, efforts made to overcome the economic crisis, ensuring stability in domestic politics and stable attitude regarding the continuation of economic reforms increased the confidence of foreign investors in Turkey's economy [16]. The foreign direct investments which were negatively affected by the economic crisis that emerged in the mid-1990s have shown rises and falls by the years[17].

Table 2.Foreign Direct Investments in Turkey (Million $)



Source: World Bank WDI, 2016 [18].

The fact that a significant change occurred in 2001 is seen in Table 2 when the development of foreign direct investments in Turkey in the 2000s is examined. The sharp increase in foreign capital investment inflows is a remarkable result although Turkey experienced economic crisis in 2001. The foreign direct investments exhibiting a remarkable increase by increasing from 982 million dollars in 2000 to 3,352 million dollars in 2001 decreased significantly due to the financial crisis seen towards the end of 2001. It is seen that the year of 2004 constitutes a significant threshold in terms of hot money coming to Turkey to make speculative portfolio investments. The international direct investments for Turkey entered into increase trend especially since 2005 and reached its highest level, 22,047 million dollars in 2007, but Turkey was also affected by the global direct investment flows decreasing due to the economic crisis which affected the whole world since 2008. The international direct investments that began to increase as of 2010 reached a high value by 16,176 million dollars in 2011 but remained below this figure and at the levels close to each other in 2012, 2013 and 2014.

Table 3.Direct Investment Components in the 1996–2014 Period (Million dollars)

	1996-2005(Cumulative)	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**
Direct Investment	23,184	20,185	22,047	19,851	8,585	9,099	16,176	13,282	12,457	12,765
Capital (Net)	18,064	16,982	18,394	14,713	6,184	6,221	14,146	10,126	9,298	8,454
Entry (Investment)	19,605	17,639	19,137	14,748	6,266	6,256	16,137	10,759	9,866	8,708
Output	1,541	657	743	35	82	35	1,991	633	568	254
Other Capital *	938	281	727	2,201	619	384	17	520	110	-236
Real Estate (Net)	4,182	2,922	2,926	2,937	1,782	2,494	2,013	2,636	3,049	4,321

*The credit received by international capital companies from their foreign partners
Source: T. C. Ministry of Economy [19].

The foreign direct investment components in Turkey are presented in Table 3. Accordingly, regarding the international direct investment that realized in the amount of a total of 12,765 billion dollars in Turkey in 2014, 8.5 billion dollars of which consisted of capital component and 4,321 billion dollars of which consisted of the purchase of real estates by foreigners.

3. PLACE OF PREFERENCE OF THE FOREIGN DIRECT INVESTMENTS AND COUNTRY ATTRACTIVENESS

Foreign direct investments are the part of the international economy and the locomotive of economic development especially in developing countries. Due to foreign direct investments, technology is transferred to the country attracting investment, country's competitiveness is increased, domestic production become acquainted with new management techniques and human capital is developed. Experiences have demonstrated that the benefits of investments to the countries are much more although inconveniences that may arise in terms of the countries attracting investment were seen in some instances [20].

3.1. Foreign Direct Investments and Country Attractiveness

The nonhomogeneous distribution of foreign direct investments in the world indicates that some regions and countries are more attractive than the others in terms of the firms making investments. This situation indicates that the investments tend depending on the features of the places of investments.

3.1.1. Place of Investment and Attractiveness

The place of investment primarily refers to an area specified by the boundaries. In the most general sense, the area is a socialized place with boundaries and administrative structure on which a nation or community takes shelter [21]. In this context, area also refers to a social structure that represents the communities living in it and reflects the economic, ideological and political features [22]. It is possible to talk about a few key features of the area based on the definitions made to express it as a term [23].

- A localized, technological and external system.
- Social and economic relations system.
- A local management system.

Along with the elimination of the boundaries in the globalization process, the areas on which nations or communities take shelter have become the center of attraction of the appreciation of other nations or firms. Economic integration efforts are examples of the attempts to increase the attractiveness on a regional basis. Like in the example of EU, when it comes to economic and monetary union, the purpose is to become the center of attraction of economic activities rather than increasing the foreign trade volume and competitiveness of the member states [24].

Area attractiveness can be defined as the capacity of a place to attract foreign investments. This can be understood as the fact that a foreign business succeeds in being in the first place in investment preferences and also as the fact that a readily available foreign investment make reinvestments by profits or ensure that they would not leave there.

Therefore, today, the place of investment is among the study subjects of many disciplines including sociological, anthropological and historical as well as geographical features. In terms of economics, the place of investment refers to many values such as geostrategic importance, underground and aboveground resources as well as geographical coordinates.

3.1.2. Factors Ensuring the Attractiveness of a Place in terms of Investments

The fact that the investments are not evenly distributed in the world brings attractive aspects of some regions or countries into the forefront compared to others. Many EU member countries are perceived as a center of attraction for foreign investors because they are included in the common market. The factors affecting the attractiveness of France located both in the EU and European regions are defined as follows in the reports prepared about the subject:

- Area, people and quality of life,
- Research-development and vocational training activities,
- Taxation, social and legal environment [25].

While geographical location, human capital and quality of life increase the attractiveness of France in terms of investments, its taxation and social security system decrease the attractiveness of the country. When it comes to Turkey, the fact that Turkey gained the EU candidate status has increased the attractiveness of the country in terms of foreign investors since 2005[2].

Different methods are used to measure the attractiveness of the countries in terms of foreign investments. In addition to the questionnaire studies performed on the actors of the sector each year, econometric analyses are also performed by using macro-economic indicators. Besides, indicators established by international organizations are also the referenced sources. In this sense, United Nations Conference on Trade and Development (CNUCED) specified the following 12 indicators from among numerous criteria used.

- GDP per capita
- Growth rate of GDP per capita in the last 10 years
- The share of export within GDP
- The number of fixed-line and mobile phone used in the country
- Energy consumption per person in the private sector
- The share of research and development expenditures of public and private sectors in the country within GDP
- The share of import within GDP
- The share of the country among the foreign investments entered on a global scale
- Country Risk
- The share of graduate and doctoral students within the total population

[2] The analyses performed have indicated that the fact that Turkey was declared as the candidate country in the EU membership process is a motivating factor for foreign investors. See for one of the studies on this issue: İlhanGüllü and NazifeÖzgeKılıç et al. "A researchtodeterminethe role of process of Turkey'sentrytoEuropeanUnion on theforeigndirectinvestment" Procedia 2013.

- The share of country's market within global services export
- The share of country's market within the import of automobile spare parts and electronic products on a global scale

However, foreign investments' reason of preferring a country to the others is not completely based on the attractiveness of the country. Investor businesses develop strategies depending on the market size, the costs of the production factors, the number of businesses that exist in the area, policies to attract foreign investors implemented by the local authorities [26].
In this context, based on these criteria, under the influence of which factors the foreign direct investments coming to Turkey are realized and how the factors that make the national market attractive have remained since Turkey's European Union membership process were analyzed in the last section of the study.

4. DEVELOPMENT OF TURKISH ECONOMY IN TERMS OF THE ATTRACTIVENESS OF THE PLACE OF INVESTMENT

Turkish economy is among the group of middle income countries between developing countries along with its some unique features. In addition to income status of the countries, it is obvious that other features are taken into consideration by foreign investors. Therefore, it is possible to reveal how the attractiveness of Turkish economy has developed in terms of foreign investors in the last decade by addressing certain criteria set by (CNUCED).

4.1.GDP per capita

Although GDP per capita was accepted as a significant indicator in determining the place of a country in the economic development process once upon a time, it makes sense in conjunction with other criteria in our day. However, today, the size of GDP per capita is the indicative of the size of the volume of potential customers in terms of foreign direct investors who want to produce new goods and services. GDP of Turkey and the development of GDP per capita in the ten-year period are presented in Table 4.

Table 4.GDP in 2004-2014 Period (at current prices) and per capita Income (Dollars)

2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
GDP (%)										
6.8	6.9	4.7	0.7	-4.8	9.2	8.8	2.1	4.2	3.0	4.0
Per Capita Income (Dollars)										
4,215	7,727	9,310	10,382	8624	10,112	10,538	10,539	10,800	10,304	9,130

Source:The World Bank WDI, 2016 [27].

Turkish economy is the seventh largest economy in the world's top ten which reached the GDP volume at about 810 billion dollars as of 2014. This feature represents a significant demand size in terms of foreign investors.
GDP which was around 390 billion dollars in 2004 has increased by approximately two-fold at the end of the last ten-year period and reached 810 billion dollars. However, it cannot be said that GDP followed a regular course in the said process. GDP which was increased at the rates of 6-7% until the mid-second millennium has decreased by the effect of the crises which were firstly experienced in Turkey in 2007 and then on a global scale in 2008-2009. It could not maintain its sudden increase following the end of the global crisis in the subsequent process.

4.2. Growth rate of GDP per capita in the last 10 years

Although the size of GDP per capita is the indicative of the size of the volume of potential customers in terms of foreign direct investors who want to produce new goods and services, its mode of development is also important. According to CNUCED, multinational company managers determine their business growth strategy in the future by looking at the past growth trend of the national economy. GDP per capita firstly exceeded the threshold of 10,000 dollars in 2008, made no substantial progress in later years and has been around 10 thousand dollars since the last seven years. GDP per capita growth rates in Turkey between 2004-2014 are presented in Table 5.

Table 5.GDP per capita Growth Rate (%)

2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
7.87	6.98	5.58	3.44	-0.52	-6.05	7.57	6.98	0.30	2.31	1.29

Source: The World Bank WDI, 2016 [28].

The development of GDP per capita of Turkey emerged depending on the course of the GDP during the period. It is seen that Turkish economy was negatively affected by the global economic crisis in 2008 and 2009 and then achieved a growth rhythm but could not maintain at a high level.
This situation faced by Turkey around 10 thousand dollars indicates that the potential demand in the current market would not exhibit a significant increase in the coming years in terms of foreign investors.

4.3. The Share of Export within GDP

In general, foreign trade (export and import) has a big share within GDP in small economies. Turkey adopted the development strategy by increasing exports along with the implementation of 24th January 1980 Decisions and made significant progress to remove the barriers to foreign trade. Turkey realized an export of about 160 billion dollars as of 2014, and increasing this figure up to 500 billion dollars is among 2023 targets. The share of export within GDP is presented depending on the years in Table 6.

Table 6.The Share of Goods and Service Export within GDP (%)

2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
23.55	21.85	22.66	22.32	23.90	23.31	21.20	23.97	26.29	25.63	27.88

Source: The World Bank WDI, 2016 [29].

As it is seen in the Table, while the share of export within GDP was 24% in 2004, this rate increased to about 29% at the end of a ten-year period. Turkey's export capacity increased during the period, however it is necessary to ensure an annual export growth rate of over 13% to achieve the export level of 500 billion dollars. On the other hand, when the last 35-year period was evaluated, the share of export within GDP was 14.6%, the share of import was 23.2% [30]. The ratio of export to GDP reached its highest level in 2014 but decreased in 2013 compared to the previous year. However, the performance displayed by export in this way encourages foreign direct investments.

4.4. The Number of Fixed-line and Mobile Phone used in the Country

The telecommunications sector has an important place in the development process of a country, and the level of development indicates the presence of modern infrastructure for information and communication in the country. In this context, Table 7 shows the ratios of fixed, mobile phones and internet subscriptions in Turkey.

Table 7.Number of Subscriptions

Years	Fixed Phone	Mobile phone	Internet
2004	19 125 163	34 707 549	1 474 590
2005	18 978 223	43 608 965	2 248 105
2006	18 831 616	52 662 709	3 180 580
2007	18 201 006	61 975 807	4 842 798
2008	17 502 205	65 824 110	5 804 923
2009	16 534 356	62 779 554	8 849 779
2010	16 201 466	61 769 635	14 443 644
2011	15 210 846	65 321 745	22 371 441
2012	13 859 672	67 680 547	27 649 055
2013	13 551 705	69 661 108	32 613 930
2014	12 741 947	71 908 742	39 037 692

Source:Dünya, 2016, [31].

As it is seen from the Table, while the mobile phone ownership and internet usage rates over the years increased, the ratio of using fixed lines entered into a downward process.

Today, more than half of Turkey's population has internet access. While about 1.5 million internet subscriptions corresponded to approximately 10% of the population in 2004, the number of subscribers around 40 million corresponded to more than half of Turkey's population as of 2014. Mobile phone entered into Turkey in 1994, and the number of its users is over 70 million in our day. While the internet usage developed depending on the increase in computer usage at the beginning, it has made progress in direct proportion to the investments in mobile phone technology especially smartphones especially in recent years.

The increase in the number of fixed-line and mobile phones in Turkey indicates the baud rate which is considered indispensable by Multinational Companies, technological support for transport services and the country's ability to articulate with the international market.

4.5. Energy Consumption per person in the Private Sector

Energy has been one of the key elements of the economic development process, coal constituted the industrialized world's energy source until the end of the nineteenth century, and petroleum maintained its place during the twentieth century. Today, although there is a wider range in terms of ensuring the sustainability of development, the use of electrical energy has an important place. Power consumption also shows the importance of traditional infrastructure except information and communication. Turkey's installed electric power is 75081.48 MW as of 2016, sources such as hydraulic dams and rivers, natural gas, coal andwind constitute the significant portion of this. Table 8 shows Turkey's electricity consumption depending on the years.

Table 8.Turkey's Electricity Energy View (GWh).

Years	Consumption	Consumption Growth Rate
2004	150,018	6.3%
2005	160,794	7.2%
2006	174,637	8.6%
2007	190,000	8.8%
2008	196,085	4.3%
2009	194,079	-2.0%
2010	210,434	8.4%
2011	230,306	9.4%
2012	242,370	5.2%
2013	246,357	1.6%
2014	257,220	4.4%

Source: http://www.enerji.gov.tr/Resources/Sites/1/Pages/Sayi_11/Sayi_11.html#p=20[32].

Turkey meets 65% of its energy needs from abroad, and the electricity consumption has increased by 5.5% on an average in the last 14 years. The increase in electricity consumption indicates that the capacities of businesses producing goods and services in the country have increased, and the introduction of technology into the industry has been accelerated. As it is seen in Table 8, Turkey's energy consumption has made progress with ups and downs depending on the growth rate. The electricity consumption rate provides foreign investors opportunity to interpret Turkey's growth rate in the economic development process.

4.6. Research and Development Expenditures of Public and Private Sectors

The share of research and development expenditures of public and private sectors in the country within GDP gives opportunity to measure the technological capacity of the country. The share allocated by Turkey for the research and development activities within GDP has remained very modest for many years but has gained importance in recent years. The development of R & D expenditures in Turkey is presented in Table 9.

Table 9.The Share of R & D Expenditure within GDP (%)

2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
0.52	0.59	0.58	0.72	0.73	0.85	0.84	0.86	0.92	0.95	1.01

Source: The World Bank, WDI, 2016 [33].

The share of research and development expenditures within GDP in Turkey increased by 18.8% in 2014 compared to the previous year and realized as 17 billion 598 million TL. When we examine Turkey's R & D expenditures, the following three points draw attention as a priority: Firstly, The share of R & D expenditures in GDP has increased by two times since 2004. Secondly, the course of this increase is regular. In other words, the importance attributed to technological developments among the development policies followed has continued to increase even a little in the last decade. Another point is that the share of R & D expenditures within GDP which was 0.95% in 2013 increased to 1.01% in 2014. In 2014, commercial sector realized about 50% of R & D expenditures, higher education sector realized 40% of it and the public sector realized 10% of it (34).

However, Israel that allocated a share of over 4% in this field in the world is taken into account, it appears that Turkey should make further efforts in this direction. Failure to develop new products based on new technologies due to the lack of R & D activities is one of the main problems of Turkey especially in the industrial sector.

4.7. The Share of Goods and Services Import within GDP

The share of goods and services import within GDP of a country shows that country's level of integration with the international production process. The increase and decrease in the capacity of Turkey's economy in this area give information about the increase or decrease in the economic activities in the country as well as the degree of integration with the world economy. The fact that Turkish economy has a structure that needs energy and input of intermediate goods has led to the parallelism between its developments in import volume and the development of economic activities. The share of goods and services import within GDP of Turkey by years is presented in Table 10.

Table 10.The Share of Goods and Services Import within GDP (%)

2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
26.18	25.35	27.58	27.48	28.34	24.42	26.75	32.64	31.45	32.17	32.12

Source: The World Bank, WDI, 2016 [35].

While the share of goods and services import within GDP was about 26% in 2004, it realized around 32% in 2014. In the last ten-year period, the import has increased during the periods in which economic growth was achieved, but it has decreased during the periods in which serious constrictions were experienced. The import has increased from 69 billion dollars to 202 billion dollars and also showed a decrease of around 30 percent due to the global crisis in the 2003-2008 period. Turkey's import realized as 242 billion dollars in 2014. The article in which the imports were made at the most was

the mineral fuels and oils with 55 billion dollars, this was followed by boilers, machinery, mechanical appliances and tools [36].

4.8. The Share of Foreign Direct Investments within GDP

The size of the share of the foreign direct investments within the GDP of the country indicates the country's capacity to integrate with the global economy, protectiveness of the policies implemented, development of financial markets and the richness of production factors in terms of amount and efficiency. The fact that the share of the foreign direct investments entering into a country within GDP is high naturally motivates the other investors. It is an indicative of the current attraction that arouses the image of the fact that the country is convenient in terms of foreign investments. Table 11 shows the development of the share of the foreign direct investments entering into Turkey within GDP.

Table 11.The Share of the Foreign Direct Investments within GDP (% of GDP)

2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
0.710	2.076	3.802	3.406	2.718	1.396	1.244	2.088	1.683	1.504	1.567

Source: The World Bank, WDI, 2016 [37].

The share of the foreign direct investments coming to Turkey within GDP has increased by about two fold in the last decade. The share of the foreign direct investments was 0.71% in 2004 and significantly increased and reached the level of 2% in 2005. The fact that Turkey was declared to be the EU candidate country at the beginning of 2005 increased the availability of Turkey in terms of foreign investors. The share of foreign direct investment within GDP was the highest in 2006, the international capital entering the country led to a substantial increase in the economic growth until 2008 in which global economic crisis was effective. These growth figures also helped increase in the international capital inflows. The share of foreign direct investments within GDP showing a steady increase until 2008 began to decrease as of this year.

4.9. Country Risk

Country risk refers to the whole economic, political and social risks that foreign investors may face in the country where they would make the investment. Country risk factor affects all investors evaluating investment opportunities in a foreign country. Country risk is divided into three main categories:These are economic, political and social risk factors [38].
The country risk of a country is calculated according to following formula:

Country Risk $_{(X)}$ =0.5(Political Risk +Financial Risk + Economic Risk)

The value of (theoretically) 100 to be calculated from the formula indicates the minimum risk, and (theoretically) 0 indicates the highest risk. As in all risk categories and factors, there is an inverse relationship between the calculated numerical country risk value and country risk level. In other words, the country risk level of a country is low to the extent how high the numerical country risk value calculated for that country is. In contrast, the country risk level of a country is high to the extent how low the numerical country risk value calculated for that country is. The following values are used to scale the countries fallen within the scope of PRS-ICRG (Political Risk Services-International Country Risk Guide) assessment according to their scores they take from the country risk assessment.
Very High Risk: 00.0/49.5

High Risk: 50.0/69.5
Intermediate Risk: 60.0/69.5
Low Risk: 70.0/79.5
Intermediate Risk: 80.0/100 (http://www.mevzuatdergisi.com/2006/06a/01.htm) [39].

Table 12.Country Risk

2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
64.27	67.89	66.37	65.27	63.33	60.89	63.33	62.60	61.89	63.43	60.56

Source:http://epub.prsgroup.com/the-countrydata-gateway[40].

According to this calculation, the country risk was 63.62 between the years of 2004-2014 in Turkey. Turkey is in a moderate risk group according to the accounting statement created within the scope of the PRS-ICRG assessment. Like in the development of the foreign direct investments coming to Turkey, the development of country risk was also affected by the developments at the local and global scale. The country risk was reduced at the least in 2005 in which Turkey was declared to be a candidate country to the EU and began to increase as of 2008 in which global financial crisis emerged. In 2014, it approached the high risk level although it was in the moderate risk group by 60.65 level.

4.10. The Share of Graduate and Doctoral Students within the Total Population

The share of graduate and doctoral students within the total population provides opportunity to measure the highly qualified labor force potential in the country. The extension of the duration of education in society through the increase in the number of graduate and doctoral students indicates that the qualities of the human capital needed by economy have improved. It indicates the adaptation to the changes in business life, the use of new technologies and the individual improvement in income distribution. In this way, the improvement in human capital increases the country's capacity to produce high-tech goods. The excessive number of students in higher education institutions constitutes a positive opinion

that the labor force needed by foreign companies investing in the country could be met. Table 13 shows the development of the number of graduate students in the last decade.

Table13. 2004-2014 Number of Graduate Students

Year	Number of Graduate Students	Number of Doctoral Students
2004	21850	2838
2005	23009	2838
2006	27734	2594
2007	15595	4748
2008	28758	3754
2009	33697	4253
2010	42760	4684
2011	27626	4653
2012	25813	4506
2013	36674	4873
2014	41842	4516

Source: https://istatistik.yok.gov.tr/[41].

In Turkey, governments began to allocate greater shares for education from the budget since the 2000s, and this also allowed educational institutions to develop in terms of quality and quantity. The fact that the high school education was increased from three years to four years as of the 2005-2006 academic year also affected the number of those who graduated from undergraduate and graduate education in later years. Since 2007, the increase in the number of universities in Turkey has encouraged graduate education.

4.11. The Share of Country's Market within Global Services Export

The added-value created by the services sector in GDP and the excessive employment opportunities make great contributions to the development of the national economy through international trade. The development of the manufacturing industry has increased the level of welfare, and the resulting high income level has increased the importance of service sectors such as banking, transportation and health. Therefore, the development of the service sector is unique to developed countries. In the world market, while more developed countries export services, developing countries import services. Services have been the fastest growing sector in the world economy in the last thirty years. The improvements such as the acceleration of the globalization process and the reduction of barriers to international trade have led to the growth of services sector. The service sectors such as tourism, transport, construction, trade, finance and health generate the highest added value among sectors.

Table 14.Turkey's Global Services Export (Billion $)

2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
23.1	27.8	26.0	29.9	36.9	35.6	36.9	40.8	43.2	46.6	50.3

Source: http://www.turob.com[42].

North America, Western Europe and Asia regions perform the largest portion of world service trade. Turkey's trade in services and consequently exports of services are specific to developing countries and doubled during the period 2004-2014. The export which was 23.1 billion dollars in 2004 regularly increased in the following years, but it was negatively affected by 2009 global crisis. It grew significantly after 2010 and reached to 50.3 billion dollars in 2014. Turkey's exports of services at the end of the 2004-2014 period indicate that Turkey's capacity of integration with the world economy increased as a result of the globalization process, and the diversity in production and specialization in the system also improved. The free trade agreements made with many countries in recent years have played an important role in this.

5. CONCLUSION

In Turkey, the import-substitution growth model was put into practice by adopting protectionist foreign trade policies before 1980. The foreign direct investment inflows were also realized as limited because the economic policy implemented during this period was built on a self-enclosed economic structure. 24th January 1980 Decisions also increased foreign direct investments by providing a change of many economic policies in Turkey. While a rapidincrease was seen in the global foreign direct investments after 1980, foreign investments increasingly began to enter into developing countries since the 1990s. Turkey could not get the share the desired from the foreign direct investments among developing countries until the end of 2004 despite having a great potential in terms of foreign direct investments. The factors such as inflation, fluctuations in exchange rates, high interest rates, uncertainty in the region, political and economic instability, uncertainty in relations with the European Union and bureaucratic barriers can be included in the reasons of this. However, the fact that Turkey got the status of a candidate country to the European Union in 2005 increased the country's attractiveness for foreign investors.

Various methods are used to measure the attractiveness of the countries in terms of foreign investments. In one of them, based on the indicators determined by the United Nations Conference on Trade and Development (CNUCED), what should the factors that make the national market attractive be in Turkey's effort to attract foreign investments.GDP per capita firstly exceeded the threshold of 10,000 dollars in 2008, made no substantial progress in later years and has been around 10,000 dollars since the last seven years. This situation faced by Turkey indicates that the potential demand in the current market would not exhibit a significant increase in the coming years in terms of foreign investors. The lack of research and

development activities poses a threat for foreign investments because it leads to the problem of being unable to develop new products based on new technologies. When we look at the country risk, it was reduced at the least in 2005 in which Turkey was declared to be a candidate country to the EU and began to increase as of 2008 in which global financial crisis emerged. In 2014, it approached the high risk level although it was in the moderate risk group by 60.65 level. In this context, Turkey will increase its share in the world stock of foreign capital by achieving a more stable economy through solving economic and political problems in terms of attracting more foreign investments. It is thought that the foreign direct investments for Turkey will increase along with the incentive measures to be implemented for foreign direct investments and effective promotional activities as well as the elimination of existing problems and deficiencies.

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The Effects of Building Materials on Building Biology and the Resultant Air Quality

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Abstract

The basic need of a human being is to lead a healthy life. Since people spend 90% of their life indoors, the main function of a building should be providing a healthy environment for its occupants. A building should meet its occupants' biological, psychological, social needs through its quality indicators related to the outdoor-indoor environmental characteristics. Buildings, which are designed, constructed and presented in a health supporting condition, may lose their healthiness over time. The reason for this is that the quality indicators' may change over time (aging of the building and the user) and circumstances (function, environmental characteristics, characteristics of the user). Building Biology can be defined as the study of the relationships between people and their constructed environment. It is a science that leads to natural healthy ecological buildings that exist in harmony with the planetary environment. The main aspects of building biology are interior climate, heat and moisture comfort, air quality, radioactivity, electro-climatic pollution, acoustic violence and natural lighting conditions and its effects. According to the studies, 65% of our buildings are polluted, sometimes as much as five to ten times higher than outdoor city pollution. The harmful gases, volatile organic compounds, particulate matter, lead, asbestos and dust have been receiving considerable interest in indoor air field studies because of their high emission rates from materials used in indoor environments. They can cause diseases such as cancer, asthma, allergic reactions, pulmonary fibrosis and many more.

In this study; the definition of building biology, types and sources of indoor air pollutants and the impact of materials on indoor environment and human health are discussed in detail.

Key words

Building Biology, Building Materials, Human Health, Indoor Air Quality

1. INTRODUCTION

People, by nature, tend to create a shelter by using materials readily available to them. With the help of technology and the expansion of the available resources, societies developing and gaining more information day by day, have been constructing more practical structures but sometimes they are more threatening also to human health. Because of the improved industry, rise of the economic inadequacy and the awareness of the work variety, villagers who have fewer materials and opportunity moving to the bigger cities; have enabled the rapid growth of the urban areas. Population growth and industrial development have caused a decline in the quality of the urban environment. Due to industrial development, natural materials have simulated using artificial materials. Biological structures that are made of artificial materials have begun to adversely affect human health.

Indoor air quality has a significant influence on the main purpose of a building which otherwise is providing a comfortable environment that meets the need of human beings [1]. Human and environmentally friendly buildings, should be able to take part in the ecological cycle of the local topography and should not stand as a foreign object, instead it should reflect its

locale. In this respect, the building has to be constructed with the natural materials that were provided from where building will stand. In order to design a healthy building, the users have to take part in every stage of the construction. In today's world, people still tend to buy psychologically, sociologically and biologically unhealthy materials which adversely affect their health.

Researches proved that indoor air quality is polluted by the harmful materials used in construction. On this matter "Sick Building Syndrome (SBS)", resulting from the building lived in, is mainly caused by poor indoor air quality. It is possible to avoid the pollution by reviewing material sources. The concept of Building Biology arises at this point. With the help of this concept, the principle of human guides himself to nature not the vice-versa has become important. [2].

The aim of this paper is to describe the definition of the Building Biology, the effects of building materials on indoor air quality, human health, and to determine the points to take into consideration when selecting materials.

2. THE DEFINITION OF BUILDING BIOLOGY

Every living creature adapts to its own environment and is affected by it in a good or a bad way. All mammals start life in a womb that is their first environment. This environment has positive effects to sustain life features and at the same time it would damage the child if negative traits were present. Environmental conditions are very important for people to live a healthy life. The relationship of a building with the human and the environmental structures can be considered as a micro-ecosystem. In this micro-ecosystem, the building is in a harmonious relationship with people and nature. Therefore, the building must be designed to be environmentally friendly and protect human health [2].

Since we spend a large part of our lives in buildings, it is not enough to focus only on heat insulation, water insulation, acoustical conditions and so on for comfortable conditions. Building and interior elements must be in harmony with human health and nature. In the light of this, a science called "Building Biology " has developed as a new branch [3].

The first studies in Turkey on building biology were initiated in 1989 by And Akman. According to him, building biology has adopt convenience of technological values to ecosystem and the human nature (bio) in stucture (building) and spiritual values in a cultural way (logi) as the principles [2] (Table 1).

Table 1 The semantic expansion of building biology [2].

Building	Bio (Biyos)	Logi (Logos)
skin, home, nest, motherland, settlement, habit, security, welfare, shelter, shell, protection	vitality, life, natural, guidance, habitat	attitude, creativity, power, incarnation, modularity, the world order, universe, holism, integrity

Here are a few definitions for the sicence of Building Biology;

Ersoy (1994) describes the building biology as;

"It is the science which works on the harmony of the human health and the nature of which interior conditions must have in the building [3]".

Akman (1990) describes the building biology as;

"It is the science from the researches that it effects on occupant's physical, mental and spiritual health of the built environment and the alternative structures in this direction [4]".

Güler (2005) describes the building biology as;

"Arising from poor quality materials and unqualified implementation, It is a science that examines the causes and the effects of buildings, spaces, building materials and equipments on people [5]"

Based on all these information, building biology can be defined as: Building Biology is a science that eliminates the negativity which will affect human life by connecting people with building and its environment, produces and controls the formation and usage of the building which will direct the human health [6].

3. HOW BUILDING MATERIALS EFFECT THE INDOOR AIR QUALITY AND THE HUMAN HEALTH

The air in nature is continually being renewed and refreshed. Fresh air physiologically contains the proper amount of coli basileus, and ions that are in optimal proportions. It does not contain harmful gasses and its scent doesn't annoy [7]. Most of the chemicals in building materials, furniture, paints and polishes and most of the cleaning materials used indoor for cleaning purposes spread harmful gasses year by year. Adequate ventilation of closed space helps to eliminate air pollution

spreading from the materials. It is estimated (thought) that a human being needs 30/ m³/hour of fresh air in order to feel comfortable. The above value (30/ m³/hour per person) would be optimal if using natural building materials, whereas when using plastic materials, the value goes up to, 60/ m³/hour per person [3]. The Union of American Allergists stated that occurrence and spreading of an illness is 50 percent caused by indoor pollution; and 1/6 of patients, complaining from allergies consult doctors for medical treatment. These kinds of problems are mostly caused by unfavorable indoor air quality, they present as allergies, muscle pains, fatigue, respiratory tract infections even toxicity health problems [8; 9].

Problems of indoor air quality are recognized as important risk factors for human health in both low and middle countries. A report prepared by World Heath Organisation (WHO) in 2012 shows the death percentage due to indoor air pollutants in some countries (Figure 1).

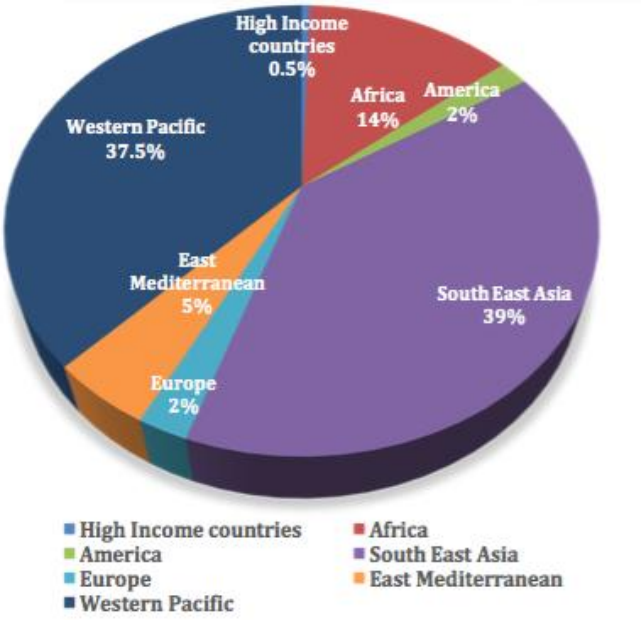

Figure 2 Death percentage due to indoor air pollution [10]

According to the research by Masters in 1998, people are affected by indoor air pollution caused by building materials; through inhalation, digestion, and the skin. The indoor air polluters differ due to physical conditions indoors, the design of the buildings, environmental features that exist in the building and also the behavior of the people living there [11]. Research has shown that, healthy circumstances cannot be maintained in buildings that are newly developed or improved; furthermore, it is reported that 30% of the buildings caused "Sick Building Syndrome" [12]. In addition, it is estimated that about half of all buildings (structures) in the United States have indoor environmental drawbacks. [13].
The main air polluters affecting air quality in buildings are:

1. Harmful gases (Carbon dioxide, Carbon monoxide, Nitrogen oxides, Ozone, Sulphur oxides, Radon)
2. Bioaerosols (Biological Contaminants)
3. Volatile Organic Compounds (Formaldehyde, Benzene, Chloroform, Toluene, Xylene, Pesticides)
4. Particulate Matter
5. Lead
6. Asbestos
7. Dust
8. Odors

Some of the hazardous effects of these substances on health are known; however, many have likely not yet been documented. Indoor air polluters' potential sources and affects on people's health are shown in Table 2.

Table 2: Indoor air pollutant's potential sources and their impact on human health [1; 14; 15; 16; 17; 18; 19; 20; 21]

Pollutant	Potential Source	Impact on Human Health
Carbon dioxide	Gas boilers, oil boilers, chimneys, HVAC system	Respiratory stimulant effects, reducing the ability to perform strenuous tasks in humans, calcification in the kidney and pulmonary alveoli, muscle pain, fainting, spasm, death
Carbon monoxide	Water heaters, ovens, wood heaters, chimneys, HVAC system	Strengthens the drowning effects for the patients, reducing the workforce for healthy men, headaches, eye shrinkage, faults in the cardiovascular system, electrocardiographic abnormalities, strengthening the heart-lung mismatch on patients, nausea, fainting, death
Nitrogen oxides	Non-ventilated gas stoves, kerosene heaters, chimneys	Reductions in lung function in asthmatics, affecting lung functions of children and adults, preclusion of the smell, airway complaints
Ozone	The combustion of sulfur-containing fuels, office sets, photocopy machines, HVAC system, air cleaning appliances	Reduction of the oxygen pressure on the artery, changes in lung function parameters, decrease of the night view
Sulphur oxides	Stoves, the combustion of coal and fuel, HVAC system	Increased respiratory symptoms in patients with chronic bronchitis, increase in the frequency of asthma attacks, negative effect on respiratory systems
Radon	Building materials based on soil and rock, underground waters	Lung cancer
Bioaerosols	Pillows, beds, curtains, carpets, dust, wet or moist materials, draped armchairs, walls and floors of the basement, window frames, washing machine and the back side, kitchen, wallpaper, HVAC systems, upholstery	Infectious diseases, allergic reactions; toxic effects.
Formaldehyde	Particleboard, fibre board, plywood	Allergic reactions, lacrimation, nose and throat irritation, contagion of the smell, asthma attacks, drowsiness, lack of energy, memory loss, sneezing, skin rash, cough, chest tightness, chest pressure, head pressure, heartthrob, pulmonary edema, and infection, death
Benzene	Dissolvents, paints, varnishing, printers pastes including latex, water based adhesives, wood panels, carpets, vinyl floor coverings, fabric cleaners foamed plastics and synthetics	Short-term inhalation results in loss of consciousness, drowsiness, dizziness, headache, skin and respiratory tract irritation; red blood cells as a result of long-term inhalation, aplastic anemia, leukemia and other blood diseases.
Chloroform	Coatings, adhesives	Affects the circulatory, immune, fertility system, blood diseases, cancer, activity on liver, kidney, stomach and intestinal, death
Toluene	Upholstery (vinyl, wood, carpet), office sets, wall and ceiling coverings furniture, treated timber dissolvents and adhesives	lung injury, asthma, eye diseases, insomnia and incoordination
Xylene	Upholstery (vinyl, wood, carpet), office sets, wall and ceiling coverings furniture, treated timber dissolvents and adhesives	Lung plunge, renal impairment, mucous membrane irritation, circulatory disorder, headache, nausea, fatigue and lethargy
Pesticides	Wallpaper adhesives, paints, and plasters	Poisoning and sensitising the brain and the liver
Lead	Paints based on lead	Effect on kidney, nervous system and the blood cells
Asbestos	Pipe and boiler insulation, ceiling and the floor boards, decorative sprays, roof coverings, wall coverings	Mezotelis

According to Table 2; indoor air quality is polluted by materials such as paints, wood panels, carpets and plastics we use in everyday life. Health problems like allergic reactions and cancer occur by using artificial materials. adhesives, polishes and protectors.

4. MATERIAL SELECTION ON BUILDING BIOLOGY

It is important to consider biological aspects when selecting building materials. According to Akman, apart from the materials that differs with climate, 30-40 % organic materials (i.e wood, straw, reed) and 60-70% inorganic materials (i.e brick, tile,natural stone, lime) were used at buildings. Nowadays, especially in modern buildings in larger cities, materials used are 90-100 % artificial, foreign to nature, life and to human metabolism. Indoor air pollution, caused by building materials, is due to material structure, application, usage, and having completed its service life. Therefore, at the time of selection, building materials should be described with all features, positive and negative, so that those choosing can

minimize harm to the environment throughout the life cycle of the material, This creates an environment that would least threaten human health.

The selection of materials considered for Building Biology should include the following:

- Durable materials
- Biologically demountable materials
- Materials that reduce energy consumption in their application,
- Formation of low - energy materials
- Materials with the least environmental impact
- Materials from the manufacturers that were taken by material recycling programmes
- Materials that reduce the urban heat island effect
- Certified wood
- Materials that emit very low levels of radiation
- Materials produced and used in local topography
- Materials that reduces water consumption in their application
- Materials with the least water pollution impact
- Materials produced from renewble sources
- Reprocessed materials
- Minimum processed future materials
- Materials that can be recycled or have the potential to be recycled
- Materials that do not contain harmful chemicals as pigments, thickeners, fire retardant [22; 23; 24; 25].

Unfortunately, these criteria are not known well enough to be applied. Research about ecological buildings has been made by Krusche and friends in 1982 for the classification of building materials. They specified materials which must be used and which mustn't be used.

Materials that must be used are:

- Pressed brick and wood as facade materials
- Wood, brick and adobe as wall structure materials
- Wallpaper, natural and artificial wood panels, wainscot, surface fabric coatings
- Stone, wood and linoleum as flor covering
- Wool and linen carpets
- Wood wool and chaff as insulation materials
- Natural paints such as water based oil paints.

Materials that must not be used are;

- Tuile
- Aluminium, zinc, lead, sheet metal, cement, mineral based materials like asbestos boards
- Synthetic carpets
- Fibreglass, expanded perlite, polystyrene foam, synthetic foam
- Synthetic resin based paints.

5. CONCLUSIONS

It is essential to provide basic principles so that humans can continue their vital activities and maintain optimal health. These basic principles which occur with the help of Building Biology (biological, psychological and by meeting social needs) accelerate the process of creating a positive environment for people. To create livable environments on behalf of future generations, using material that not only looks beautiful but also is environmentally friendly, durable, recyclable, energy-efficient, and economical, thoughtful material selection is necessary. Studies have proved that unnatural environmenral conditions created by unhealthy building materials spread various pollutants threatening human health. These contaminants which disrupt indoor air quality causing "Sick Building Syndrome", must be considered beginning with the design of the structure and in order to maintain the occupants' health.

To create better environments and protect human health;

- Enhance the awareness of Building Biology by means of presentations, media, books, leaflets etc..
- It should be make compulsory by all the governments for the production of environmentally friendly materials.
- People should be encouraged to use natural materials as much as possible.

- Checklists about the specifications of the building materials and their effects should be made by the people (users, architects, producers, inspectors, advisers, etc.) who plays part in the design of the building.
- Every material has to have material data sheets (MSDS) and should be clearly understood and accessible.

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BIOGRAPHY

Nil Kokulu is an architect who graduated from Bahcesehir University with a bachelor degree in 2013. The degree included an internship in Montevarchi in Italy for a year. The internship project was shown in Venice Biennale. She worked with Polimeks Construction, Yalın Tan and Partners and Tabanlioglu Architects where she took part in big projects such as Eskişehir Bademlik Rixos Hotel, Astana Railway Station, Yenitepe Kadıköy Urban Transformation project. Even through, these experiences, her dream was to learn more about the specifications of building materials. While working for Tabanlioglu Architects, she entered İstanbul Technical University and met with her thesis adviser, Seden Acun Özgünler who affects her life positively. She will graduate with a Master's Degree of 'Material Selection on Building Biology' in December 2016.

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Influence of Early Ottoman Urban Pattern in Bursa on the Balkan Cities: Skopje Case

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Abstract

Bursa, as the first capital of Ottoman State, is a peculiar Anatolian city representing unique urban development of Early Ottoman Era. Various studies have depicted that there was an established Ottoman model for the development of new towns and agreed that the Early Ottoman urban pattern beginning with Bursa influenced the development of Balkan cities that were conquered during the 14th century. This study focuses on the effects of urban development idea of Early Ottoman State on Bursa and Skopje. Skopje is one of the Balkan cities conquered by Ottomans following Bursa. The city of Skopje, displayed similar characteristics with Bursa in terms of its topography and urban pattern. Although their development differed after the Ottoman sovereignty ended, their early development displayed some similarities. The settlement pattern, during Early Ottoman Era, can be characterized with an existing citadel, a bazaar and neighborhoods called 'mahalle'. These neighborhoods were developed around a nucleus composed of religious, commercial, social and cultural buildings called 'kulliye'. Within the scope of this study, the similar urban pattern of Bursa as the first Ottoman capital and Skopje, as one of the earliest Balkan cities conquered by Ottomans is analyzed. There are various studies focusing on Early Ottoman urban pattern in Bursa and Skopje separately. However, the similarities of the development of these two cities are rarely studied. Therefore, this study aims to depict these similarities and the effect of Early Ottoman urban pattern on these two cities.

Key words

Ottoman Era, Urban Pattern, Bursa, Skopje

1. URBAN PATTERN IN EARLY OTTOMAN ERA

There was an established Ottoman model for the development of new towns. So cities in Ottoman Empire had idiosyncratic social and physical organizations. The buildings and streets were not placed randomly. The city organization in Ottomans comprised of layered structure whose components were religious center, commercial center and housing zone.

The religious center and the commercial center which located out of the fortress, on slope of fortress hill made up Ottoman's city center [1]. The commercial center consisted of bazaar and closed bazaar called 'bedesten'. It was clear that a common settlement plan was applied in Ottoman's bazaar. The producer or seller of the same goods took close places to each other in the bazaar. The members of every profession (blacksmiths, shoemakers etc.) located different parts of bazaar. The commercial and religious center was focus point of Ottoman cities. Besides bazaar, the inns were also a commercial component which strengthened Ottoman economy. In Ottoman cities the main commercial axis which called long bazaar, began from 'bedesten'. The long bazaar was a place which all kinds of goods and services were sold.

Neighborhoods (Mahalle) which located around a religious building or a small bazaar were the basic housing settlement of the Ottoman city [2]. 'Mahalle' was a social, cultural and physical unit which consisted of people who were responsible of each other's behaviors and social, cultural solidarity [3]. People who had same profession lived in neighborhoods (Mahalle) which identified with their profession again. (For example neighborhood of blacksmiths or shoemakers)

However there were non-Muslim neighborhoods where non-Muslim people lived. The coexistence of people belonging to the same ethnic group didn't break their relationship with other people in the city. So the neighborhoods had never been autistic units.

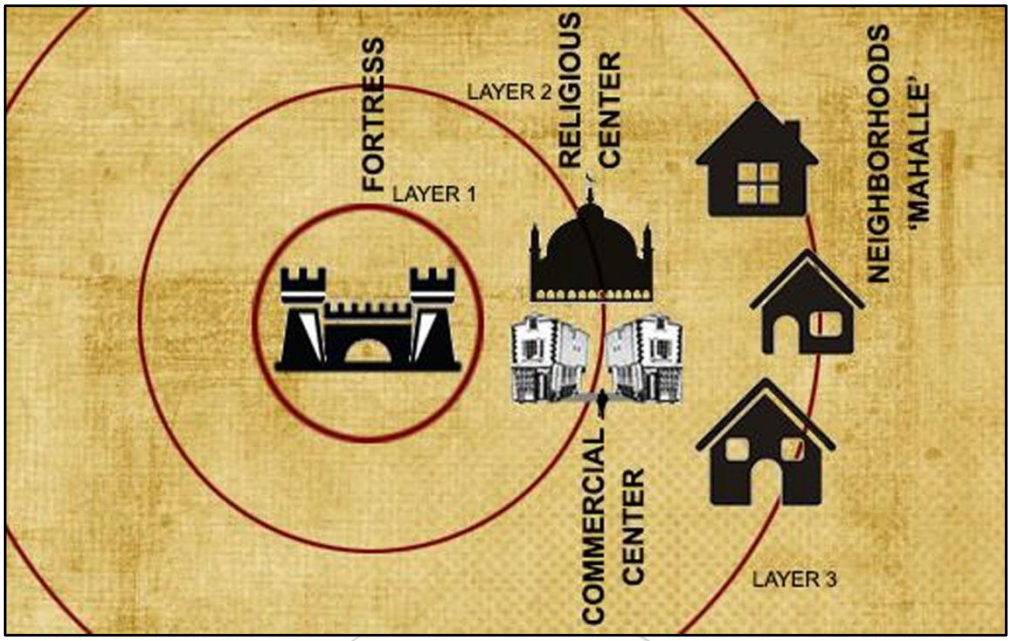

Figure 1. Urban Layers of Early Ottoman City

The residential part of the Ottoman towns separated from commercial areas. The quite modest form of the houses was the result of functional action. The houses in same character generated narrow and uneven roads. In Islamic cities, dead end streets were special roads which reached from main lines to houses [4]. There was no planned square in Ottoman cities. Mosques, bake houses, fountains were places where people meet.

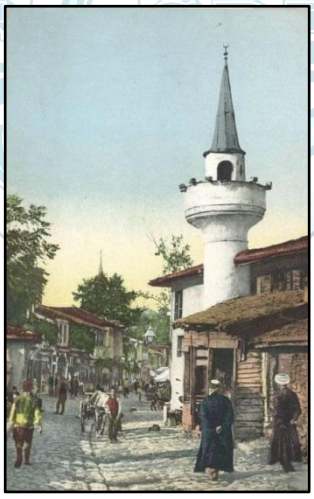

Figure 2. A View from Early Ottoman City [5]

2. BURSA CITY STRUCTURE IN EARLY ERA OF OTTOMAN EMPIRE

2.1. Bursa in Ancient Times

Bursa's history depends on to Romans, Byzantines. Bursa was conquered by Orhan Gazi (the second monarch of Ottomans.) in 1326. The city of Bursa located in a limited area in the fortress before the Ottoman Conquest. There were a library, stadium, bath, hippodrome, and colonnaded area (just like all big Roman cities) in Bursa in Roman era [6]. The most important development in Byzantium era was building an inner fortress next to the palace. The palace was used in Ottoman era as long as Bursa was the capital of Ottomans.

2.2. Bursa during Early Ottoman Era

After Orhan Gazi had conquered Bursa city, it was decided that the inner part of the fortress was remained and new settlements for providing house to new Turkish tribes in Anatolia were established out of the fortress. On the other hand inns, baths and almshouses, mosques were built from Çakırhamam to Setbaşı in Orhan Gazi era. The buildings which were

made by Orhan Gazi determined the main axis and center of Bursa city. The city center was a strategic focus which was the end of trade routes.

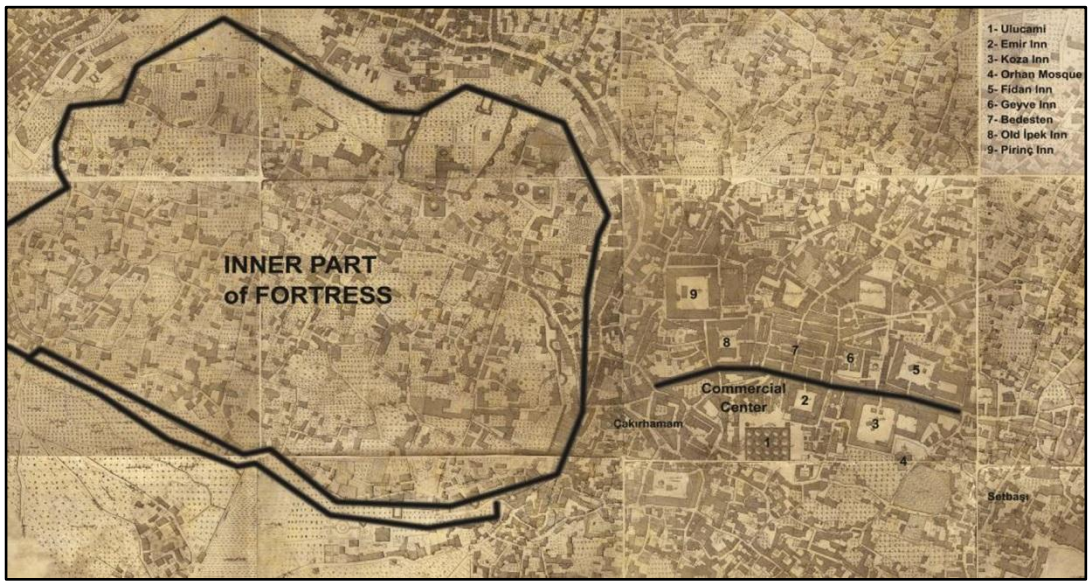

Figure 3. The Buildings which were constructed after Orhan Gazi period in Suphi Bey Map-1862 [7]

Monarchs (Sultans) who ruled the Ottomans after Orhan Gazi; continued to construct "Kulliye" in different part of Bursa city. This kind of buildings contributed to developing of the city. So and so, residential areas began to exist around "Kulliye" and city pattern of Bursa shaped. On the other hand Monarchs (Sultans) who ruled the Ottoman after Orhan Gazi constructed new buildings such as inns, bedesten (closed bazaar), and shops on the trade line to develop and strengthen the trade center.

The main dwelling units were neighborhoods in Early Ottoman era Bursa. The neighborhood was generally established around a bazaar or religious building. Neighborhoods in Ottomans were a whole unit with its activities and spiritual properties.

People in same neighborhood were interdependence with same religious belief, having same profession and other features which separate them other neighborhoods. But there were no wide squares for people's meeting just like European cities. Thus churches, mosques and bazaars were common places for inhabitants of the neighborhoods. These places were used for different aims if it was necessary [8].

Figure 4. A residential area in Bursa which remained from Ottomans [9]

The narrow and irregular streets went towards to mosque, bazaar or church in neighborhood. There was only one main road one neighborhood to another neighborhood. This case was the proof of separated neighborhoods.

As well as ‘Kulliye’, the places where were settled by dervishes were established as neighborhood too. The travelling dervishes played a major role in Ottoman’s conquest policy. Travelling dervishes had visited the places to conquer and prepared mentally to local people for conquest. These Ottoman’s conquest policy provided to emerge new kind of mosque which shaped as ‘Reverse T’ plan type.

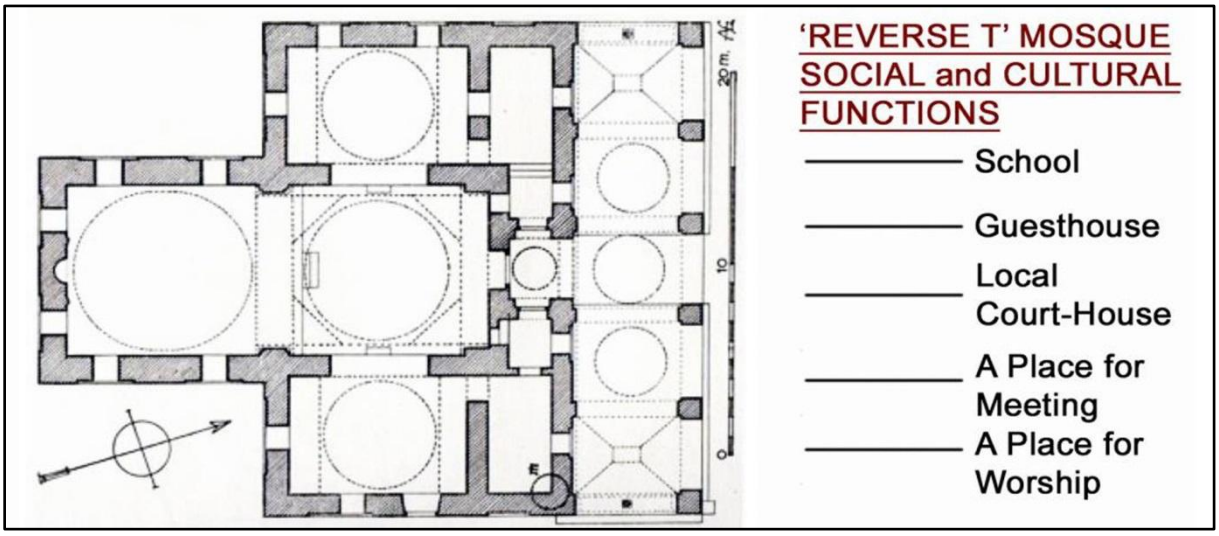

Figure 5. A Reverse T Mosque Example [10]

3. SKOPJE URBAN PATTERN IN EARLY OTTOMAN ERA

3.1. Skopje City and Geographical Features

Skopje is the capital of Macedonia and located the north part of the country. Geographical features of the city have influenced the city character. First of all the city of Skopje located in a valley which consisted of surrounding mountains and cross rivers. Vodno Mountain on south, Suva Gora Mountain on southwest and Skopska Crna Gora Mountain on north encircled the city of Skopje.

The ground of Skopje occurred with alluvium which deposited by rivers such as Treska, Lepenec, Sereva and Vardar. Thus the district of Skopje has had fertile lands and has been a suitable place to settle since ancient times. The humid Subtropical Climate is effective in the region. So it is hot, humid in summer and usually mild to cool in winter. Dominant wind direction is from north to east just like flow direction of Vardar River.

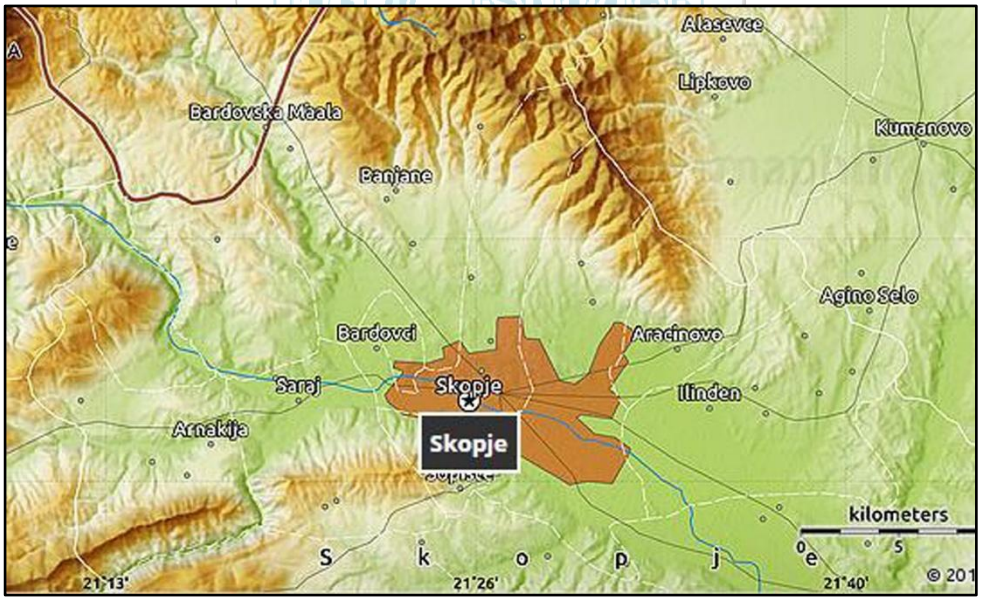

Figure 6. Location of Skopje City [11]

3.2. Road Networks of Skopje

The Valley of Skopje has been used as living space since ancient times. The Via Egnatia was a road which connected Roma to Istanbul. The road crossed the Roman provinces such as Macedonia. In this context, the Skopje Valley which located around Via Egnatia Road had a strategic position.

Figure 7.Position of Egnatia Road [12]

In 1928 Map, we can observe that local transit highways crossed via Skopje. So the city of Skopje located another important trade route from Middle-East Europe to Salonika (Aegean). On the other hand, the main highways on Skopje Valley followed Northwest-Southeast direction (Flow direction of River Vardar).

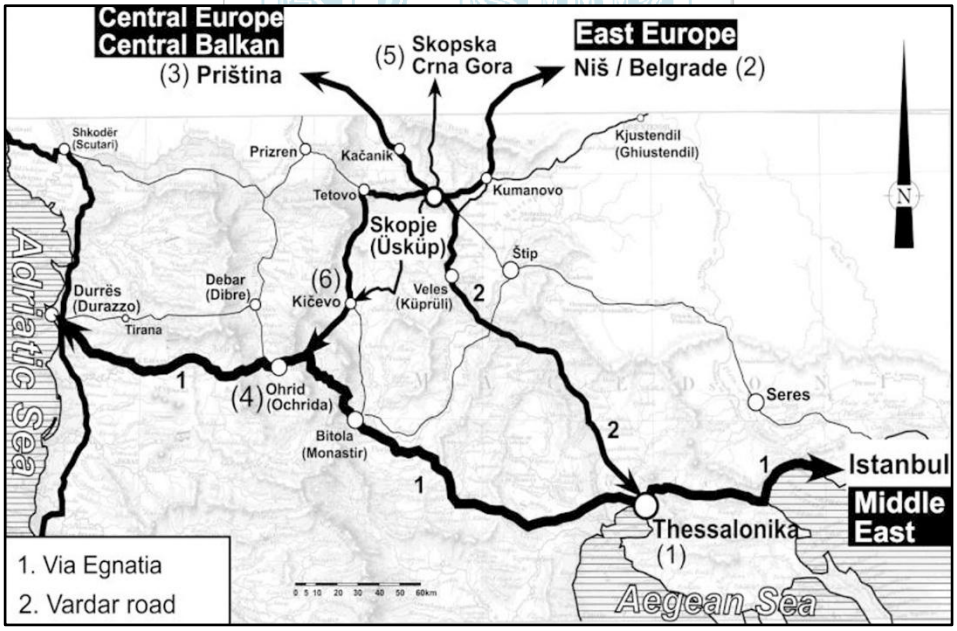

Figure 8. Road Network of Skopje in 1928 Map [13]

3.1. Urban Fabric of Skopje in Early Ottoman Era

According to Stern, the fabric of Islamic cities is different from the cities in Europe because of lack of square and municipality [14]. Thus lack of square surrounded with public buildings caused a different urban structure in Ottoman cities.

Before Ottoman Empire, the city of Skopje was under the rule of Byzantium, Bulgarian and Serbia. In spite of having limited knowledge concerning this period, it was thought that the city of Skopje was composed of four urban zones.

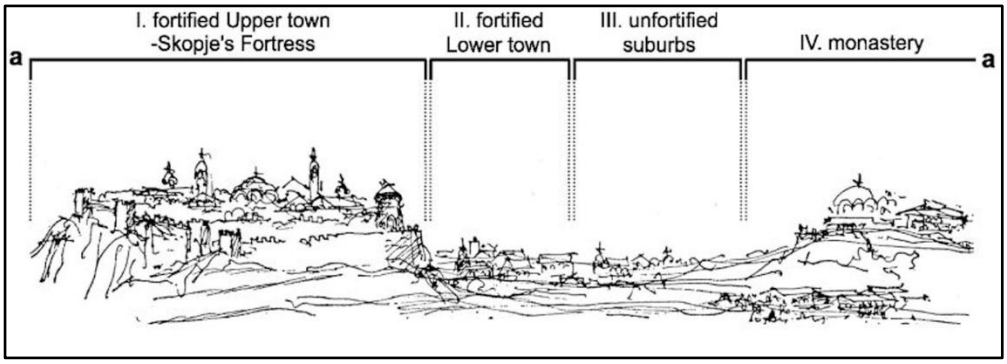

Figure 9.Urban Zones of Skopje before Ottomans [15]

After the city of Skopje had been conquered by Ottomans in 1392, the city developed according to Ottoman's urban principle and character. According to these principles the city of Skopje consisted of three urban layers:

- The fortress which was built on fortress hill
- The main mosque and the bazaar (consisted of inns, bedesten and shops) which was built on east slope of fortress hill
- Neighborhoods (Mahalle) which surrounding the city center

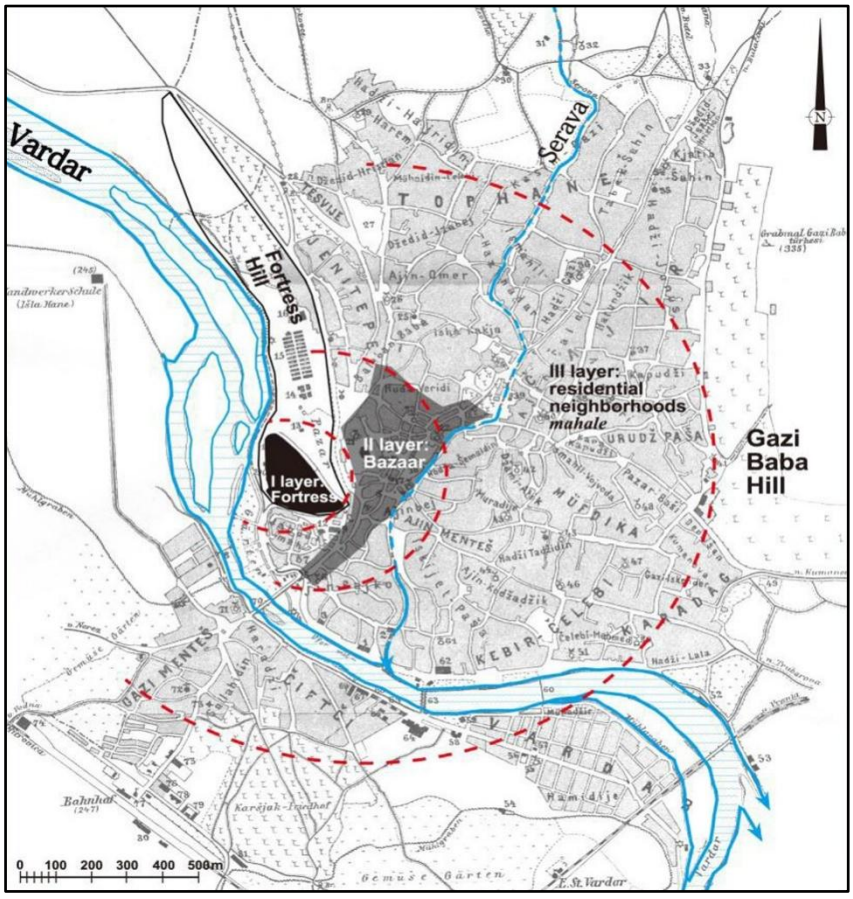

Figure 10.Urban Zones of Skopje in Early Ottoman Era [15]

The city of Skopje in Early Ottoman Era was located between Fortress Hill on West and Gazi Baba Hill on East. Sereva River flowed parallelly to main axis of city (long bazaar) between these hills and disembogued to River Vardar. The geographic features of fortress hill made here a perfect defense point.

Ottoman Bazaar played a major role in development of Skopje. The buildings such as inns, mosques, baths, Bedesten which were built out of the fortress formatted the religious and commercial focus of the city.

Also neighborhoods were situated encircling the religious and commercial center. The neighborhoods where houses located on were living spaces for people who had same cultural, ethnic specialty. The neighborhoods had a small center which consisted of a mosque, a bake house or a church.

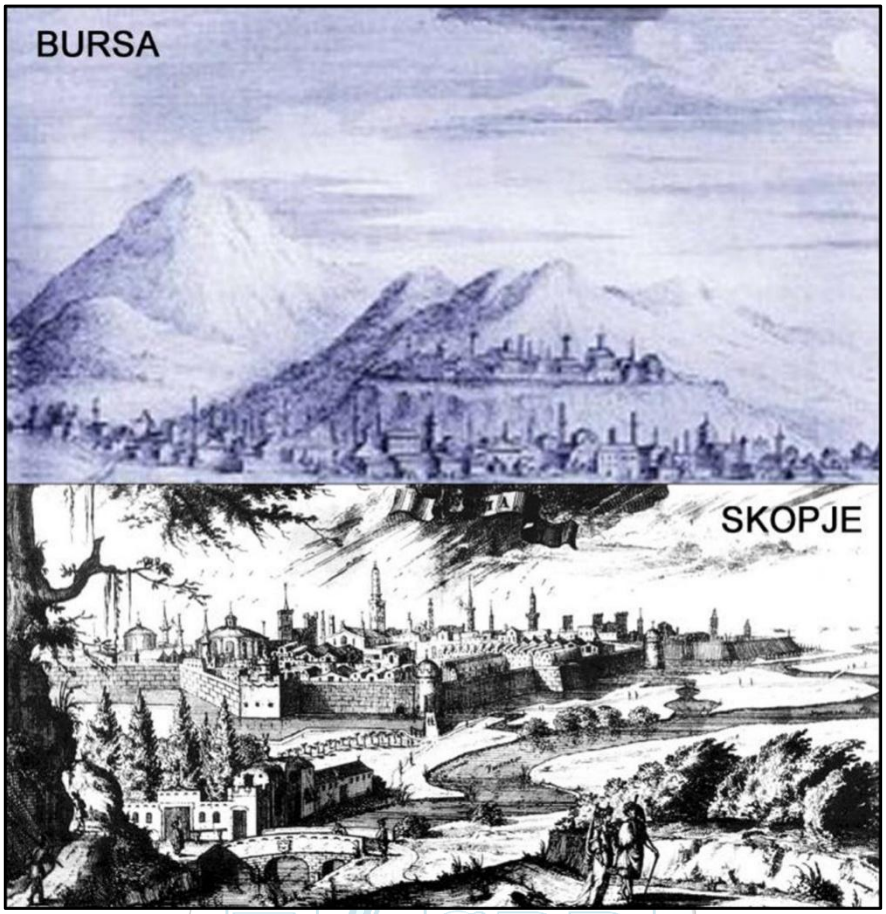

Figure 11.Comparison of Bursa and Skopje [16a and 16b]

4. RESULTS

The Ottoman urban strategy which can be observed in Bursa urban fabric in Early Ottoman Era such as developed an urban zone (consisted of bazaar and main Friday Mosque) in the city center and residential neighborhoods around community centers(mosques, churches, school etc.) in the outskirts of the city also constituted the main character of Skopje City. Moreover facilities such as Bedesten (special buildings for trade), inns, baths, and mosques are common components of bazaar of Bursa and Skopje. In addition to all of these, the construction of special commercial building Bedesten in Skopje bazaar in 1438 following Bursa (1400) was supporting fact that Bursa urban pattern influenced Skopje city structure in early Ottoman Era.

One of the prominent buildings of Early Ottoman Era was 'T Shaped Mosques' which were used multipurposely for worship, meeting, education, judgment or hospitality. This type of buildings were found in firstly Bursa and around. Besides Bursa, 'T Shaped Mosques' could also observed the cities which ruled by Ottomans such as Edirne, Filibe, Skopje.

Finally it can be said that Bursa urban fabric set an example for Skopje city center in the Early Ottoman Era. So there is a strong influence of Bursa city creations on Skopje city center. It is possible to see the effect in the historical city centers even today.

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The Impact of Macroeconomic and Bank Specific Factors on Albanian Non-Performing Loans

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Abstract

Credit risk measurement of the banking system, the dominant component of the financial system of a country, is an important aspect where the interest of academics, economic agents and other professionals has been considerably increased, especially following the global financial crisis. In the last decade, non-performing loans have been in the spotlight almost all over the world, since their large and uncontrolled increase would lead to the eventual bankruptcy of the banking system as a whole. Analysis of the factors affecting credit risk for the banking system is an important analysis and can be seen as the key for credit risk management. This starts by the identification of direct and indirect determinants which exhibit an impact on credit risk, followed by the assessment of the impact (negative or positive impact). The main objective of this paper is to analyse the link between the macroeconomic developments and the banking credit risk in Albania, recently affected by unfavorable economic and financial conditions and to which, on this matter, the literature has not given a particular attention yet. The econometric model used is that of multiple linear regression where as the dependent variable is obtained the indicator of non-performing loans of the Albanian banking system and as independent variables are chosen a number of macroeconomic indicators and indicators of assets and liabilities of the system itself. Employing data approaches to this country over the period 2005-2014, I conclude that the banking credit risk is significantly affected by the macroeconomic environment: the credit risk increases when GDP growth, credit growth rate and the share price indices decrease and rises when the interest rate and loan to deposit ratio increase. Moreover, it is also positively affected by an appreciation of the real exchange rate.

Key words

Banking System, Credit Risk, Macroeconomic Determinants, Non-Performing Loans

1. INTRODUCTION

"*It is well enough that people of the nation do not understand our banking and monetary system, for if they did, I believe there would be a revolution before tomorrow morning*!" Henry Ford

The purpose of this article is to provide a comprehensive statement of theoretical and applied problems in the Albanian banking system. Regardless of Ford's fear, I don't think that reading this paper will cause a revolution, but at least, I hope to provide an enjoyable and interesting image of banking activity.

It is not necessary to be a specialist in the field of banks, in order to understand the importance of the banking system in our everyday life. We participate almost daily in activities in which this sector plays an important role. The mission of a performant banking system is to allocate the capital exclusively in profitable projects. To succeed, banks must be able to

determine which projects are profitable and which are not. If they do this correctly, then the economy has all the chances to work properly.

In the Albanian banking system, exposure to credit risk is the main risk from which the system is exposed to. Loans compose the majority of the banking system assets. Furthermore, in the last years, loan portfolio quality has been significantly deteriorated, which can be easily understood from the increase in non-performing loans. The main objective of this paper is to analyse the link between the macroeconomic developments and the banking credit risk in Albania, starting by the identification of direct and indirect determinants which exhibit an impact on credit risk. The econometric model used is that of multiple linear regression where as the dependent variable is obtained the indicator of non-performing loans of the Albanian banking system and as independent variables are chosen a number of macroeconomic indicators and indicators of assets and liabilities of the system itself. The method applied is the method of least squares and the model is tested in advance via EViews software for basic assumptions of the method.

2. MATERIALS AND METHODS

2.1 Literature Review

In the last decade, non-performing loans have been in the spotlight almost all over the world, since their large and uncontrolled increase would lead to the eventual bankruptcy of the banking system as a whole. Many researchers confirmed that the cause for a bank bankruptcy is also the quality of assets, which is an important predictor of its insolvency. Developments in the global economy and particularly the global economic crisis are exerting a negative impact on the Albanian market and are causing the contraction of the credit market. In the last years, credit growth decelerated progressively starting from the fourth quarter of 2008, from +5.02% to -1.86% in the third quarter of 2013.

According to the surveys conducted by the Bank of Albania, there are several reasons that forced commercial banks to constrain credit standards in the last five years, especially in the sector of small and medium enterprises, but also in the large enterprises sector. These reasons are also related with the increase in non-performing loans in the Albanian banking system. Firstly, this trend is related to the financial difficulties of the construction sector, processing industry and trade, repair of motor vehicles and household appliances. These sectors represent the largest share of the distribution of credit by economic sector and inevitably had a negative impact on the increase of non-performing loans. The recent published data of the World Bank, classify Albania as one of the countries with the highest level of non-performing loans among developing economies in Europe and Asia, with 18.2% of the total portfolio of loans granted at the end of 2015. In the meantime, the decrease of remittances has contributed, directly or indirectly, in the reduction of the solvency of the Albanian customers, without neglecting the large decline of the pace of economic growth in Albania, which has brought the weakening dynamism of the economy and economic operators. Finally, another reason is the outstanding liabilities of the government to private businesses for the public affairs committed. Buying financial products with high risk, strengthening banking supervision and screening of banks, taking decision based on a strong analysis of the cost-benefit, etc. are the suggestions provided by some economic experts, associated with the decrease of non-performing loans.

Table 1. Non performing bank loans in relation to total gross loans. Source [18]

NON-PERFORMING LOANS IN RELATION TO TOTAL LOANS (2010-2015)						
Country	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**
Albania	14.0%	18.8%	22.5%	23.5%	22.8%	18.2%
Greece	9.1%	14.4%	23.3%	31.9%	33.8%	34.7%
Kosovo	5.8%	5.7%	7.4%	8.5%	8.3%	6.2%
Macedonia	9.0%	9.5%	10.1%	10.9%	10.8%	10.3%
Montenegro	21.0%	15.5%	17.6%	18.4%	16.8%	13.4%
Serbia	16.9%	20.0%	18.6%	21.4%	21.5%	22.3%

From the region, Greece has recorded the highest value of non-performing loans with 34.7% of the total gross loans at the end of 2015, which can be easily understood by the debt crisis this country is still facing. Serbia has registered 22.3% of total gross loans, ranking first among West Balkan countries. After these two countries, Montenegro is ranked with 13.4%, followed by Macedonia with 10.3%. Of all the countries presented, Kosovo is the only country in the region which has managed to keep the percentage of non-performing loans in the single digits, while it managed to reduce this percentage even further at the end of 2015 if compared to the two previous years.

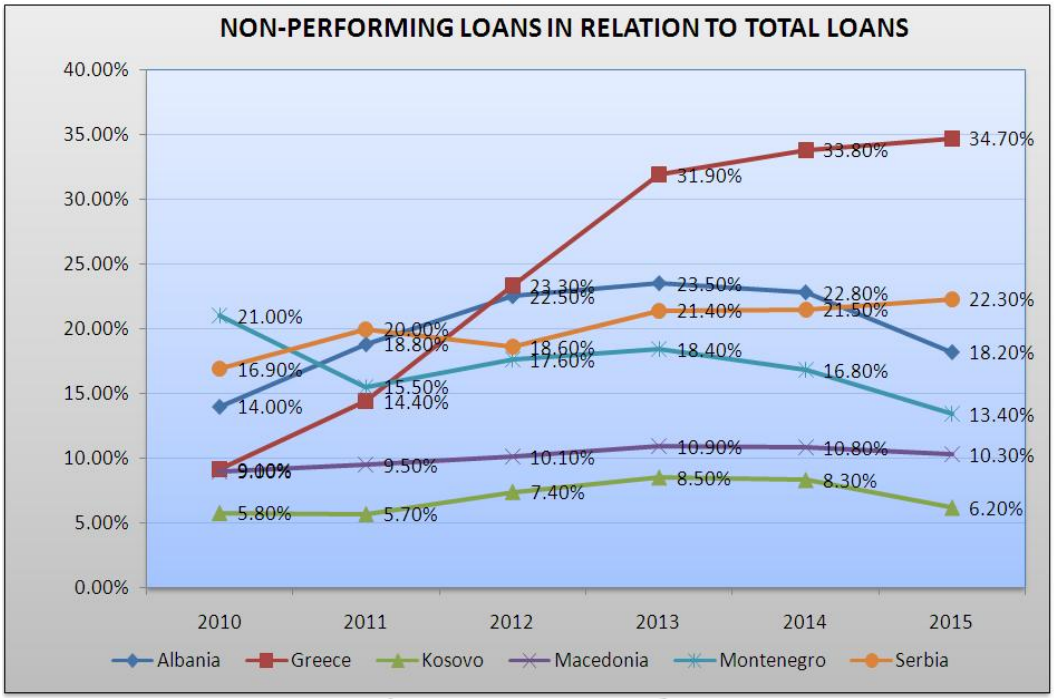

Figure 1. Non performing bank loans in relation to total gross loans.

Figure 1 shows fluctuating trends of non-performing loans percentages of countries that Albania is bordered with and Serbia. The trend of NPLs of the banking system in Albania is higher than other Western Balkan countries in 2013 and 2014, but it's seen a progress in 2015 as this percentage has decreased.

Based on a detailed literature review on loans and factors influencing their level, it's observed that most researchers distinguish two categories of factors: external factors and internal factors. The external factors are generally associated with the country's macroeconomic indicators, such as the GDP, unemployment rate, inflation rate, etc. whereas the internal factors are related to specific banking factors, such as credit growth, loan interest rate, loans to assets ratio, the quality of credit monitoring service, etc.

Keeton and Morris [14] in a study on 2470 US banks tried to understand why the level of losses on loans differs from one bank to another. Some banks have higher losses by chance, others by the weak management of the process of lending and some others have created a well-diversified portfolio, which allowed them to maintain a lower risk and facilitate lending standards. Another explanation of high losses on loans is the occurrence of banks in areas with poor economic conditions, suggesting that banks would be less vulnerable to these losses if they would lend loans to a wider geographical area. An increase in loan growth is likely to lead to higher loan losses only if the source of the faster loan growth is a shift in the supply of bank credit, related to the fact that banks become more willing to lend and they ease their credit standards [15]. As a key factor influencing the level of non-performing loans is the composition of the loan portfolio, which plays an important role as an indicator of banking risk profile. Inefficient banks, which perform a weak review and pursuit of the borrowers, will have a lower portfolio quality. Generally, the competitive environment in which banks operate can affect the level of credit risk they want to undertake [5]. Hess, Grimes and Holmes [8], analysed determinants of bank credit losses in Australasia, dividing them in two categories: macroeconomic and banking factors. Analysis was based on a comprehensive dataset retrieved from original financial reports of 32 Australasian banks (1980- 2005). Credit losses rise when the economy is weak. Larger banks provide more credit losses while less efficient banks have greater asset quality problems. The empirical results of the research made by Boudriga, Taktak and Defi [2], indicate that higher capital adequacy ratio (CAR) and prudent provisioning policy seems to reduce the level of non-performing loans and the effective way to reduce them is through strengthening the legal system and increasing transparency and democracy, rather than focusing on regulatory and supervisory issues. In their paper, Louzis, Vouldis and Metaxas [4] used dynamic panel data methods to examine the determinants of non-performing loans in the Greek banking sector. Both macroeconomic and bank specific factors have an effect on loan quality and these effects vary between different categories of loans (consumer, business and mortgage loans). The results showed that non-performing loans in the Greek banking system can be explained mainly by macroeconomic variables such as: GDP, interest rates, unemployment and management quality.

According to Bofondi and Ropele [11], the quality of lending to households and firms can be explained by a small number of macroeconomic variables, mainly related to the general state of economy, the cost of borrowing and the burden of debt. Similarly, Carlos [3] investigated the macroeconomic determinants of non-performing loans in Italy and Spain for the period from 2004 to 2012. The macroeconomic variables used were: credit growth, inflation, wage, unemployment and GDP. The results suggested that a shift in unemployment has a faster impact on non-performing loans in the Spanish economy than in the Italian economy. This variable had a positive and significant correlation for the both countries data. On the other hand, GDP variable had a positive correlation for the Italian data and a negative one for the Spanish data. Another study of Jakubik and Reininger [6], based on quarterly data of some European countries (Bulgaria, Croatia, Czech Republic, Hungary, Poland, Romania, Russia, Slovakia and Ukraine), confirmed a negative statistically significant correlation between non-performing loans and economic growth. The study refers to the correlation between non-performing loans and the following indicators: loans deferred (lagged) (positive correlation), real GDP (negative correlation), stock index (negative correlation), loans in the private sector compared with GDP (positive correlation) and nominal exchange rate (positive correlation). In a similar study, Klein [7] evaluated the macroeconomic and bank specific determinants of non-performing loans in Central, Eastern and South Eastern Europe over 1998-2011. The author's results confirmed that the level of non-performing loans tends to increase when unemployment rises, exchange rate depreciates and inflation is high.

I[1] have also studied, by using a multiple regression model, the impact of macroeconomic determinants on the level of non-performing loans for Romanian banking system, over the period 2006-2011. My results showed a positive statistically significant correlation between unemployment and non-performing loans and a negative correlation of them with the interest rate.

Outside of Europe, Jordan and Tucker [1] examined the impact of non-performing loans on economic growth in The Bahamas utilizing a vector correction model. The main findings revealed that growth in macroeconomic activity tends to lead to a reduction in non-performing loans.

In the case of Albania, Mancka [10] estimated that exchange rate Euro/All and Euro/$, as well as a variable that measures the global financial crisis are factors that affect the severity of non-performing loans. The analysis was based on data from 2002 to 2010. In another study, Shingjergji [13] analysed the impact of the macroeconomic variables on the non-performing loans level in the Albanian banking system, using quarterly data from 2005 to 2012. From the regression analysis is noticed a positive correlation between NPLs ratio and GDP growth, interest rate of four quarters lag and foreign exchange rate Euro/All. In the same year, the author [12] wrote a paper in which he analysed the relationship between the NPLs ratio and several bank specific variables in order to understand at what extent the banking variables will be able to explain the NPLs ratio. By testing the model resulted a positive correlation of the loan's level and net interest margin with NPLs ratio and a negative one between NPLs ratio and the loan to asset ratio, ROE and capital adequacy ratio (CAR). In a more recent study, Kurti [9] studied the determinants of non-performing loans in Albania during 2000-2013, with the purpose to give recommendations of what actions should be taken to reduce the level on these problematic loans. The results were in the same line with those of Shingjergji.

There are a lot of studies on these issues from different authors around the world. Despite the fact that the authors have found different ways to explain the level of non-performing loans depending on macroeconomic and banking variables, the results obtained from their studies tend to converge to these key correlations:

Table 2. Correlation between NPLs ratio and other variables

Positive Correlation with NPL	**Negative Correlation with NPL**
Unemployment	GDP Growth Rate
Interest Rate	Inflation
Credit Growth Rate	ROE
Fluctuating Exchange Rate	Capital Adequacy Ratio (CAR)
Loans to Assets Ratio	
The margin of intermediation	

[1] Klejda Gabeshi, *The Structure of the Romanian Banking System and Its Influence on the Prospect of Banking Products and Services,* Bachelor thesis, Bucharest 2011.

2.2 Econometric Framework and Model Specification

Analysis of factors affecting the credit risk for the banking system is an important analysis and can be seen as the key for credit risk management. This starts by the identification of direct and indirect determinants which exhibit an impact on credit risk, followed by the assessment of the impact (negative or positive impact).

The econometric model used is that of multiple linear regression where as the dependent variable is obtained the indicator of non-performing loans of the Albanian banking system and as independent variables are chosen a number of macroeconomic indicators and indicators of assets and liabilities of the system itself. The method applied is the method of least squares and the model is tested in advance via EViews software for basic assumptions of the method. Different reports of the Bank of Albania [16] and published data of the Institute of Statistics [17] are used for quantitative data collection. All the independent variables, such as the dependent variable are considered for a period of ten years with quarterly data, starting from the first quarter of 2005 to the fourth quarter of 2014. This period has been considered as starting from 2005 the data for the banking system have been more complete and more accurate.

As mentioned above, the dependent variable of the econometric model is NPL, which represents the ratio of bank non-performing loans to total gross loans (%). Instead, the independent variables are classified into two groups: macroeconomic factors and bank specific factors. After an analysis of research in this field as macroeconomic factors, are selected indicators of interest to the context in which our country is. These factors are:

- ✓ *Return on Equity (ROE).* ROE is expressed as a percentage and calculated as the ratio of net income to shareholder's equity. ROE is the amount of net income returned as a percentage of shareholders equity. Return on equity measures a corporation's profitability by revealing how much profit a company generates with the money shareholders have invested.
- ✓ *Gross Domestic Product Growth Rate (GDP). Gross domestic product* is the monetary value of all the finished goods and services produced within a country's borders in a specific time period. Though *GDP* is usually calculated on an annual basis, it can be calculated on a quarterly basis as well.
- ✓ *Inflation Rate (INF), consumer prices (%).* Inflation is the rate at which the general level of prices for goods and services is rising and, consequently, the purchasing power of currency is falling.
- ✓ *Fluctuating Exchange Rate Euro/Leke (Eur_Lek).* A floating exchange rate is a type of exchange rate regime in which a currency's value is allowed to fluctuate in response to foreign exchange market mechanisms.

Banking group of factors includes many indicators, but by detailed review of the literature and in the current context will be used the following banking indicators:

- ✓ *Credit Growth Rate (Cred_Grow).* Credit Growth refers to the growth/increase in the amount of credit that banks lend to the companies, business man, individuals, institutions, etc. either in the form of retail loans or institutional loans or any other form of loan or credit.
- ✓ *Bank Size (SIZE).* It is an indicator that is measured by the natural logarithm of total assets, which is expected to have a positive impact on the profitability of banks, as it shows the level of banking activity in the country.
- ✓ *Loan to Deposit Ratio (LTD).* The loan to deposit ratio is used to calculate a lending institution's ability to cover withdrawals made by its customers.

The aim of this study is to determine and analyze the relationship between the dependent variable (NPL) and independent macroeconomic and bank variables in the banking system. This study is based on establishing some hypotheses that are expected to be certified through the regression model to be used.

- ➢ Null Hypothesis ($\mathbf{H_0}$): None of the independent variables has any impact on the level of non- performing loans.
- ➢ Alternative Hypothesis ($\mathbf{H_a}$): At least one of the independent variables has an impact on the level of non-performing loans.

Theoretically it is expected an inverse relation between the level of ROE and the level of non-performing loans. An increase of the non-performing loans would lead banks to a reduction in the level of ROE. Banks have difficulty in recovering these loans and as a result it would lead to a deterioration of their performance, which ultimately will be translated into a lower ROE indicator. There is significant empirical evidence of a negative relationship between the growth in GDP and the level on non-performing loans. Indeed a strong positive growth in GDP is usually translated into an increase of the income of a country in general. Revenue growth means that both businesses and individuals have more income available, which means that now they are able to repay their loans and as a result is expected to be a decline in the level of non-performing loans. This means that strong performance in the real economy results in lower non-performing loans. Furthermore, it is expected an inverse relation between the inflation rate and the level of non-performing loans and in fact an increase in inflation would lead to a decrease in the real value of the principal remained unpaid, so the borrower will have more opportunities to pay their loan repayments, which would lead into a lower level of non-performing loans. There is also evidence in the literature of a positive association between the level of non-performing loans and real effective

exchange rate. This connection is explained by the fact that if the other conditions are kept unchanged and if there is an increase of the exchange rate Euro/All for loans granted in euro, the payment of instalments will be more difficult because borrowers will pay higher instalments due to the increase in the exchange rate. Excessive lending by commercial banks is often identified as an important determinant of NPLs. We expect Credit Growth Rate to have a significant positive relationship with NPLs since the literature shows that rapid credit growth is often associated with higher non-performing loans. The empirical evidence relating to the impact of bank size on NPLs appears to be mixed. For instance, some studies report a negative association between NPLs and bank size. According to these studies, the inverse relationship means that large banks have better risk management strategies that are usually translated into more superior loan portfolios vis-à-vis their smaller counterparts. There are also studies which provide evidence of a positive association between NPL and bank size. Moreover, it is expected a strong positive relationship between NPL and the loan to deposit ratio. The supporting argument is that banks that value profitability more than the cost of higher risk (represented by a high loan to deposit ratio) are likely to incur higher levels of NPLs during periods of economic downturn.

3. RESULTS AND DISCUSSION

To test the level of statistical importance of the independent variables, is analysed the critical probability (P-value or Prob). If the probability is below the level of importance, which we choose to work with (1%, 5% or 10%), the null hypothesis is rejected and the coefficient is considered statistically significant. While F test measures how well the independent variables explain the dependent variable performance. Another indicator used to analyse whether the model is good or not is determined R^2. This indicator takes values from 0 to 1 and shows the percentage of variation of the dependent variable explained by the considered independent variables. Durbin Watson statistics also, must have a value between 1.8 and 2.2 in order not to have autocorrelation of errors. After running the regression analysis with the EViews program is obtained this equation:

NPL = -1.122033488 - 0.481702279*ROE - 0.1649856551*GDP + 0.6555248997*INF + 0.02690422082*EUR_LEK - 0.8618194031*CRED_GROW + 0.2281798887*SIZE + 0.4340209706*LTD (1)

As seen from the above equation, an increase in INF, Eur_Lek, SIZE and LTD, will increase the NPL ratio and an increase in ROE, GDP and CRED_GROW will decrease the NPL ratio. The empirical results, however, reveals that Inflation Rate and GDP Rate are not important determinants of NPL in the Albanian Banking System. This result is related to the fact that during the study period inflation rate has been very stable, fluctuating within the objectives of the Bank of Albania, whereas the level of non-performing loans has increased progressively from 2008 until 2014. Hence, for more relevant results, these two independent variables will be excluded from the model and the other variables will be tested again. The final equation of the econometric model has the following form:

NPL = -1.067434138 - 0.4648956634*ROE + 0.03024846568*EUR_LEK - 0.9006674825*CRED_GROW + 0.2192877302*SIZE + 0.4203013116*LTD (2)

While the output of the regression model is given in the following figure:

Dependent Variable: NPL
Method: Least Squares
Date: 06/04/16 Time: 19:29
Sample: 1 40
Included observations: 40

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-1.067434	0.216415	-4.932344	0.0000
ROE	-0.464896	0.147689	-3.147802	0.0034
EUR_LEK	0.030248	0.028124	3.075546	0.0497
CRED_GROW	-0.900667	0.242412	-3.715438	0.0007
SIZE	0.219288	0.031155	7.038540	0.0000
LTD	0.420301	0.085048	4.941905	0.0000
R-squared	0.915826	Mean dependent var		0.122220
Adjusted R-squared	0.903447	S.D. dependent var		0.084387
S.E. of regression	0.026222	Akaike info criterion		-4.306991
Sum squared resid	0.023377	Schwarz criterion		-4.053659
Log likelihood	92.13982	F-statistic		73.98476
Durbin-Watson stat	1.866302	Prob(F-statistic)		0.000000

Fig 2. Output evaluation in EViews

The determination coefficient ($R^2 = 0.9158$) shows that independent variables in regression explain 91.58% of the variation of the dependent variable, i.e. the level of non-performing loans. Adjusted R^2 is 0.9034. About the statistical significance of the econometric model we reviewed indicated F-statistic, which has a value F = 73.98 with a level of probability p = 0.000, which confirms that the model is statistically significant because of the high value of F-test and the probability is below the level of importance α =0.05. Durbin Watson statistics is equal to 1.866, which means that residuals are not correlated, pointing their independence as a completion of one of the conditions of the least squares method.

C coefficient is the intercept that represents the NPL ration when all the independent variables are equal to zero. The other coefficients are the expected slopes of how much the NPL ratio will change, for one percent of change of each independent variable. Thus, an increase in ROE with one percent will decrease the NPL ratio with 46.49%. This result is in line with the studies conducted in this area, as an increase of the non-performing loans would lead banks to a reduction in the level of ROE. Also, the data from the Albanian Banking System show that profitability measured by ROE, has suffered a major decline especially after 2008 global financial crisis. On the other hand, an increase of the exchange rate with one percent will increase the NPL ration with 3.02%, suggesting that the international competitiveness of the local economy is an important determinant of credit risk. This result is based on the performance of the exchange rate during the study period, noted that from 2002 to 2014 the exchange rate has increased by nearly 15%. This is a very important fact considering that in the banking system almost 60% of total credit is in euro and this affects the proliferation and accumulation of non-performing loans in this currency. Regarding the specific bank factors, growth in loans exhibits a fairly strong negative relationship with non-performing loans. An increase in Credit Growth rate with one percent will decrease the NPL ration with 90.07%. While the literature suggest a positive correlation, my peculiar results probably reflects the conservative lending stance adopted by the Albanian commercial banks in the last years, due to their bad lending experience with the increase of non-performing loans. The variable SIZE, which represents the Bank Size, is positive, meaning that an increase of it by one percent will increase the NPL ratio with 21-93%. The major banks of Albania, even if they have greater profitability, face a higher level of non-performing loans. This evidence which is inconsistent with previous studies can mean that large banks are not necessarily more effective in screening loan customers when compared to their smaller counterparts. Finally, an increase in Loan to Deposit rate with one percent will increase the NPL ratio with 42.03%. This result for Albania is consistent with previous studies, meaning that banks with a bigger risk "appetite", are likely to face higher levels of NPLs.

4. CONCLUSIONS

The increase of non-performing loans in the Albanian banking system has made many banking field researchers try to find the key factors that have brought this progressive and disturbing augmentation. Based on a detailed literature review on loans and factors influencing their level, it's observed that most researchers distinguish two categories of factors: external factors and internal factors. The external factors are generally associated with the country's macroeconomic indicators, such as GDP, unemployment rate, inflation rate, etc. whereas the internal factors are related to specific banking factors, such as credit growth, loan interest rate, loans to assets ratio, the quality of credit monitoring service, etc.

The results of the econometric model showed a direct, statistically significant link between the level of non-performing loans and factors such as fluctuating exchange rate, bank size and loan to deposit ration. This means that a unit growth of each of these variables will increase with β (corresponding coefficient for each variable) units the level on non-performing loans. The exchange rate has increased by nearly 15% from 2002 to 2014. This is a very important fact considering that in the banking system almost 60% of total credit is in euro and this affects the proliferation and accumulation of non-performing loans in this currency. The major banks of Albania, even if they have greater profitability, face a higher level of non-performing loans. This evidence which is inconsistent with previous studies can be interpreted by the fact that large banks are not necessarily more effective in screening loan customers when compared to their smaller counterparts.

On the other hand, the results of the econometric model showed an indirect, statistically significant link between the level of non-performing loans and factors such as ROE and credit growth rate. This means that a unit growth of each of these variables will decrease with β units the level on non-performing loans. The data from the Albanian Banking System show that profitability measured by ROE, has suffered a major decline especially after 2008 global financial crisis. This result is in line with the studies conducted in this area, as an increase of the non-performing loans would lead banks to a reduction in the level of ROE. While the literature suggest a positive correlation, my peculiar results probably reflects the conservative lending stance adopted by the Albanian commercial banks in the last years, due to their bad lending experience with the increase of non-performing loans.

Buying financial products with high risk, strengthening banking supervision and screening of banks, taking decision based on a strong analysis of the cost-benefit, etc. are the suggestions provided by some economic experts in order to decrease the level of non-performing loans in the Albanian banking system, which remains among the highest in the region, at about 19%.

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A Collaborative Study on the Physical and Social Meaning of Doorbell: Problems and Solution Suggestions

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Abstract

Doorbell is both a physical and social link between indoor and outdoor environment of people. Since its first usage, people benefit not only from its physical properties, but also from its social and emotional properties. In this study, current usage of the doorbell, further usage scenarios of it, the ways of sustaining its physical and social meaning while applying new technological developments to it will be discussed and handled as a design problem. Problem field is tried to be determined with the help of the design thinking approaches and methods. Detailed information about the determined problem has been collected and solution suggestions and alternatives tried to be improved. In every stage of the study like problem definition, detailing or suggestion, co-working constituted the main path of the study. In order to do that, workshops were made. So, problem has been analyzed in a more detailed way. In this study, current problem, user profiles, suggestions to the current problems of the doorbell are shared systematically. The data, gathered by this study, can form the research basis of a product development activity of a doorbell. Needs, applied solutions and suggestions of different user groups on mentioned subject has made this study valuable.

Key words

Design Thinking, Doorbell, Design Methods

1. INTRODUCTION

This study is carried out within the context of Design Thinking course as part of the ITU Industrial Design graduateprogram in 2015-2016 Fall Semester. The course has continued once in every week for 3 hours long. Theoretical part of the course has been handled shortly by the nature of design thinking and at the beginning of the term students were asked to define a problem and study subject on that problem by applying different design thinking methods and approaches. “A day in a life” method has been used for basing the problems on daily life and easing the problem definition stage. The study has been tried to be improved by weekly works done within and after the course hours. Thinking and practice stage which was very raw at the beginning, has begun to be matured by time. Inner and outer works of the course, such as workshops and literature reviews develops maturing process. At literature review stage, design thinking methods have been searched and the most suitable method to be applied to define and solve the problem have been focused on.

The researchers have found the preliminary data, gained by “a day in a life method”, as insufficient to define the problem and afterwards he preferred to reveal the problem by co-working in order to achieve anonymous problem. By so, researchers would be able to focus on a problem which has broader social and cultural context and to focus on an object that works as a medium for cultural sustainability. In total, 3 workshops were done. First one was focused on problem definition with a broader context. At second and third ones problem zone tried to be examined in a more detailed way. At first workshop, a series of methods were applied one after another to create a harmony/composition, possible alternatives of

problems were gathered by co-working. Outcomes of the first workshop were shared in the lecture by the researcher, afterwards one of the alternatives were focused on, and at the same lecture second lecture were done by graduate students taking the same course. Most of the graduate students taking the course had an undergraduate degree in Industrial Design, for that reason more conscious critiques and feedbacks were given on methods, approaches and usage about the problem. Third workshop was done also in lecture time as the second one according to the feedbacks. Out of the alternative problems of first workshop, front door bell was chosen as the problem area by the researcher.

2. LITERATURE REVIEW

Design thinking uses methods as tools, which can be used by everybody like professional designer, manager, students etc. For design thinking it is important to put on other's shoes, to see other's eyes, to reveal their stories and to share their world [1]. Understanding their emotions, ideas, desires make the designer reach to their conscious and make it easier to emphasize.

Methods are the guides for avoiding unnecessary efforts and taking the right action instead of the wrong one. Method is defined by the Turkish Language Association (1974) as: "a regular path consciously followed or chosen to solve a problem, to result an experiment, to learn or to teach a subject". If we look at the design thinking with the help of this definition, we primarily come across its being a solution and idea development focused methodology. Design thinking is the approach of solving complex problems in a human centered way. It follows cooperative, team based, and interdisciplinary processes. Tim Brown [2] mentions about three basic stages of the design thinking. Inspiration; the stage in which experiencing the triggering problem or opportunity occur. Ideation is the stage in which ideas are developed and tested. Implementation is the stage in which the new thing is presented to the market. Products can pass these stages more than once and cycle of the stages can be completed more than once. Since every stage differs from each other, applied methods have been specified to the related stage. Methods used in practical part of this study, in other words in workshops, carries the properties of the first and second stages.

Curedale's [1] "Design Thinking Process and Methods Manual" is benefitted to choose the suitable methods to be applied. The author divides the methods into five subtopics. These are:

- Ice Breaking (IB): Team Building Exercises.
- Defining the Vision (DV): What we are looking for?
- Know People and Context (KPC): What is needed?
- Explore ideas (EI): How is this idea to start?
- Prototype and Iterate (PI): How can we make it better?

Below table summarizes the methods of the workshops (Table1). Methods are derived from various design thinking resources [3], [4], [5].

Table 1. Used methods during the workshops

Workshop 1	**Workshop 2**	**Workshop 3**
Milestone (IB)	5 WH (DV)	5WH (DV)
Add object (IB)	Focus Group Discussion (KPC)	Group Sketching (EI)
Grouping		
635 Method (EI)		

3. WORKSHOP SERIES

In this study, the researchers aimed at working in a collaborative manner, they preferred to work with a team in every stages of the process such as problem definition, framing it, etc. all. Duration of the study had been limited by the course term since this study was done within the context of the course. At the end of the 2015, September works to determine the problem was begun and the study process continued till the end of December and at the end of the December study has finished. Within the scope of the course, "a day in a life method", which was given as a submission by the lecturer, had been used to ease the determination of the problem. The results of the application of this method were mainly focused on the daily furniture used by the researcher himself. Mostly ergonomic problems of the furniture were obtained and reported by the application of the problems. At that point, the researchers noticed the challenge of generalization of the result and misleading candidates of the problems, thus he wanted to work collaboratively in determining the problem alternatives. For that reason, first workshop was organized.

3.1. Workshop 1

Undergraduate industrial design students of ITU made first workshop. 6 students were participated in the workshop and it took approximately 2 hours. Participants were in their 5th or upper terms, so it might be assumed that all participants had a designer approach by means of handling the problem and using methods. The researchers aimed at applying a composition of several methods for the first workshop. By usage of icebreaking methods, both warming up the environment and revealing the topics to talk about by participants was targeted. At first "Milestone" method was used. Participants were asked to mark 3 milestones of their life on the given time table by post-its. Moving to another city was one of the prominent answers. Establishing own business, marriage, earthquake, and family issues were other remarkable answers. Secondly, "Add Object" method was used. Every participant was asked to share their association about the 3 milestones, which were not written down by themselves. Because of having more answer related to moving, objects related to moving had been higher. Bus, car, luggage can be given as an example to this. Other answers were such as magnifiers, binoculars, first aid kit, orange, etc. al. Motivations behind writing these objects were argued together and their wide perspective on matching milestones and objects was revealed. For example, a participant, at first stage, had shared moving to Antalya as a milestone, another participant, at second stage, matched it with the orange, because of the city's fame. In another example, '99 earthquake had been mentioned as a milestone, another participant matched the first aid kit with it. As seen in first example, milestone-object matches can be indirect and as seen in the second one can be direct. Third stage is grouping. Shared objects were tried to be grouped to set a meaningful unity or a story. "Bed, bell, pink shades", "magnifier, microscope, binocular", "luggage, bell, bus" were some examples of this grouping. Grouping was done more than once at that level. Grouping similar objects or gathering different objects to form a story were two different methods applied by the participants. Before passing to another level, participants were asked to take one of the problematic objects of their life and sit down their chair. For last, "635 Method" was used. Participants were asked to write down or sketch about the problematic objects that they choose to an A5 size paper. At the beginning of this level, participants were informed to share their ideas only by writing or sketching, never by talking (Figure1).

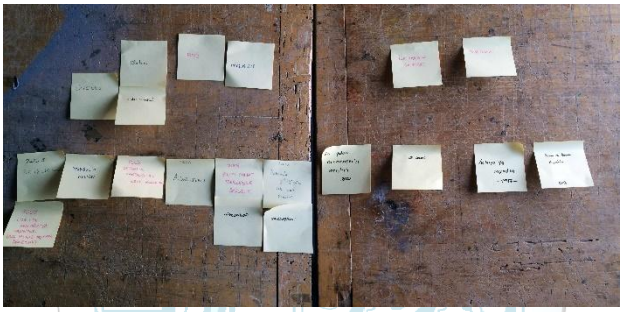

Figure 1: Workshop 1 (milestone & add object method)

After 5 minutes, every participant was asked to give his or her paper to the clockwise participant. Every participant continued to design process incrementally by using another A5 paper for their friend's problem and after 5 minutes again transferred his / her paper to next friend. This action continued, till every participant had shared a solution on the every problem, 5 minutes long periods repeated for 6 times. 6 different problem fields were looked through and discussed. The researchers had chosen the doorbell as the problem field for the next stage. A doorbell's qualifications like being used by almost everyone in their daily life, diversity of being used by different personas, being a passive object while used in an active action and its usage by at least two people, tangible and intangible problems related with the doorbell were some reasons for the researcher to work with this object (Figure2).

Figure 2. Workshop 1 (635 method & discussions)

After one week from the first workshop, a written feedback was asked from the participants, four of them had returned. According to the feedbacks, participants were seemed pleasant about the process and collaborative work; however they mentioned some unity problems of the process, especially between third and fourth level. In addition to that two of the participants shared their wishes to have had one or more levels to materialize their ideas.

3.2. Workshop 2

Second workshop was organized by 10 students taking Design Thinking graduate course at 26th November 2015. Before beginning to second workshop, process, outcomes, problem field, feedbacks of the first workshop were briefly mentioned to students and the lecturers and their opinions and critiques were taken. 5WH method was tried to be applied in this second workshop. One A4 sized paper was sliced into two on its short side, and 6 separate cells were defined on its long side. In every cell, within order, below questions and explanations was placed.

- Who? (is concerned, actor, group of people, responsible,…)
- What? (action, object, transaction,…)
- Where? (place, area affected by subject, step, …)
- When? (timing, duration, time,…)
- How? (necessary means, methods, materials, procedures, …)
- Why?

Every participant was given one of the above-mentioned form and asked to fulfill it within the context of a ringing doorbell. Every participant was asked to transfer their form to the next participant by folding their answer and for every cell this action was repeated. In every form, in every datum were collected independently. With the help of this work, asymmetric matching of the informations was aimed and possibility of dealing with the problem without applying standard approaches was questioned (Figure3).

Figure 3. Workshop 2, 5WH method

At the end of the work information about the actors of the ringing the bell action (the one ringing and the one being rung) and place, form, time, reason of the action were gotten. Since in every form was fulfilled with different person, there was no meaningful unity, there were even funny scenarios for some forms. After this work, a focus group discussion was made with the lecturer and the other students, their opinions on both workshops and chosen topic had discussed. At first, participants were mentioned to be able to share a case by fulfilling the form on their own. This revision need noted by the researcher and applied in third workshop. To prevent the disconnection seemed in grouping of the objects in first workshop, constituting personas and directing the workshop through these personas was advised. Another important issue from the discussion was, possible linkage between cultural and human centered values and doorbell. Putting on cards to door when someone could not find the host in bairams, two different door knockers for different genders in old houses, seeing the guest off to the out of the home and welcoming guests outside of the home were shared by participants as an example. Integration of doorbells with digital technologies has formed another field. Another important gain from discussion was participant's sharing their own experiences and problems related with the doorbell.

3.3. Workshop 3

Third workshop was made 17th December 2015 in approximately 20 minutes. Most of the participants were the participants of the second workshop and the number of them was 10. At first, revised version of the second workshop's form was asked to be fulfilled by the participants (Figure4). By approaching through the door and bell problem field, participants were asked to set a meaningful case by answering "who, with whom, where, when, why, how?" to find cultural and social values of the doorbell. They could answer the questions in one sentence if they wish. As a result, real and possible scenarios of our daily lives were revealed. So, qualities of doorbell, which make it a medium of social and cultural sustainability, are analyzed.

Figure 4. Workshop 3

At the end a short initial idea sketching was made. Participants were asked to create ideas and offer improvements especially on doorbells which are at outer surface of the apartments. Participants expressed themselves by words and sketches. Every data collected in all three workshops will be analyzed in a detailed way in the next part.

4. RESULTS OF WORKSHOPS

This Bell's being a problematic area as a result of the first workshop and asymmetric informations like users, aim of the usage, usage scenarios are tried to be visualized below (Figure5).

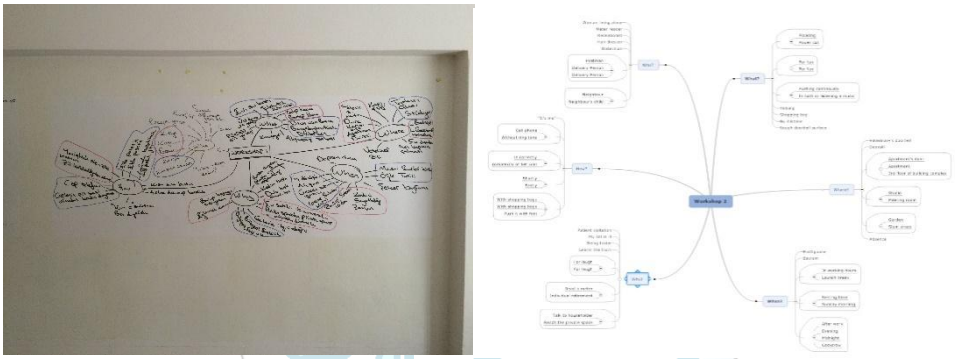

Figure 5. Results of 5WH Method in Workshop 2

Since every cell of the 5WH was completed by different people, gathered information could not form a case. As shown in the above, related answers are grouped. Although bell concept was mentioned to be handled in a broader perspective at the beginning of the study, study has been focused on the daily usage of the doorbell based on its intense usage on that field.

Number of the answers related with duration or timing is higher than others. Bell's ringing within working hours, in the evening and night, while resting are formed main grouping fields related with time. Reasons of ringing bell are seen as meter reading of electricity or water, or undesired guests like dealers or pollsters in some answers. Interface problems or problem of ringing the bell while your hands are full are the prominent answers given in "how" part. Deliveryman or neighbors are dominant answers in "who" part. Extensive usage of online marketing can be linked with the frequency of "deliveryman" as the answer. Bell's ringing while you are unavailable or fake ringing constitute another intense area.

In the focus group discussion, which was made immediately after the second workshop, participants shared experienced and potential problems of their own and talked about possible solutions on these problems. Below table summarizes this discussion. The person who interacts with bell, possible problems, and possible solutions are placed in different columns. In each rows, different scenarios are formed.

Table 2. Cases obtained focus group discussion in Workhop 2

Person	**Problem**	**Solution**
Deliveryman	Not being home	Deliveryman leaves note
Woman living alone	security	Does not fully write her name at the door
Guest visiting a family with a baby	Disturbing baby	Using whatsapp instead of the bell

Friend/ Relative	Not being able to find at home at bairam visit	Leaving a note or card
Doorkeeper	Disturbing the houseowner when he/she does not order anything	Not opening the door as if it was not heard
Guest	Not remembering your friends' door number	Making a phone at the front gate to inform the house owner.
	Accidentally pushing the wrong button	
	Kids' fake ringing	
	Tidying the house before the guest arrives	Chasing the approaching person with apps like Yandex
	Meter readers' pushing a random door number	Random button to open the front gate for everytime

Some cells in the table are intentionally left blank. Last two rows include fictional solutions. Fully filled rows are the shared scenarios of the participants (Table2).

With the help of the ideas created at focus group discussion of second workshop, third workshop has been formed. Participants were asked to constitute a sentence about a case or situation related with the doorbell by answering the questions in 5WH method. Similar elements like time/ subject/verb etc. are written with the same color in order to visualize the case.

- Daughter of the upstair neighbour pushes our button continuosly to invite the "gün".
- I rang the bell of the lady in next door to invite her for drinking tea after the dinner.
- Mrs. Ayşe pushes the button for 2 short and 1 long time to inform her neighbor about that she was at the door before going to the public market.
- Dealers or pollsters ring my grandmom's bell, who is living in upstairs, and she always opens.
- Water deliveryman brings the water bottle to the front door of the old lady.
- The boy playing at the street rings his own bell to want some money since his mother could not hear him.
- I ring my cousin's door bell at the front gate, which has an interesting encoded system.
- "Bakkal Hilmi abi" tries to push the button of the doorbell while his hands are full of orders of "Halime abla".
- Deliveryman pushes the button of the bell with his nose in the morning time while his hands are full with the boxes.

In the last part of the third workshop, which involved the sketching activity, participants were asked to share existing problems and possible solutions related with the doorbell by drawing (Figure6).

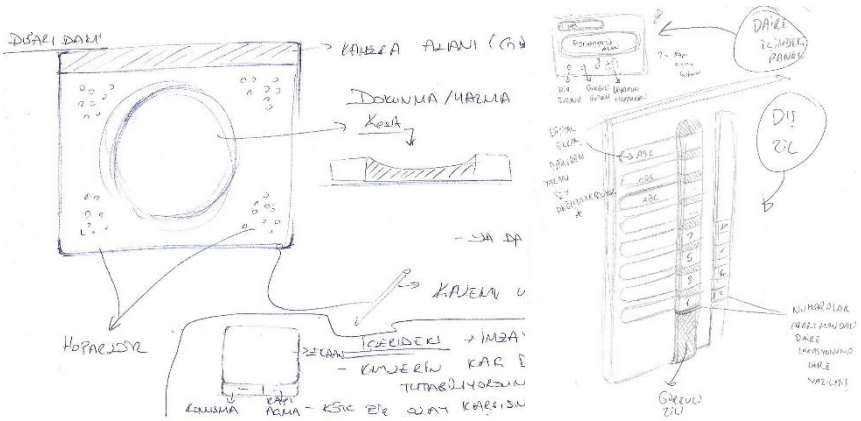

Figure 6. Initial Idea Sketches in Workshop 3

At that stage, potential solutions to current problems of the doorbell are offered. To specify these;

- With the help of integration of digital places for touching or writing onto the front gate doorbell panel, leaving a note or signing can be done with the bell.
- Front gate doorbell panel can reflect the building's floor plan in order to provide information about the number and floor of the desired apartment.
- By using apps/ cellphones guests can be seen before they come.
- Nametags at the front gate doorbell panel can be digitalized and changed by the house owner from their home.
- Visual tags can be used instead of using names.
- Bells can be controlled by the foot pedal while someone can't use her/his hand.

5. DISCUSSION

One of the main results of this study is that doorbells go beyond being a simple product with only one function. It starts interaction and creates primary communication between at least two people. Communication methods are specific to the cultures and societies. In example, in workshops, most of the new doorbell offerings add doorbell note taking function. This is highly related with Turk's traditional bairam visits. Another important aspect focused on the workshops is that different user groups in our daily lives also use it frequently. Elderly people, kids, friends, neighbors, and deliveryman, meter readers are mentioned as the ones who ring the bell in workshops. In general we can divide the bell ringers into two groups as the ones we know and we don't know. According to the gathered data from workshops, in some cases, it seemed that the bell carries additional meaning to the user beyond its main function. In some cases, it seemed that digital interface causes some ergonomic and usage problems. Problems based on the digitalized versions, are offered to be solved by dominantly digital improvements, here occurs a contradiction. However, improving visuality and functionality of the bell can be easier by the mediums of the digital world. Another frequent wish on bell's functions is seemed as not functioning every time. In some cases, bells that provide interaction between private and public spaces, are wanted to prevent this interaction while someone is resting or does not want to be disturbed for some reasons. Another problematic area of the bell is related with its physical being and usage. There are several ideas on being able to use the bell while someone cannot use his/her hands. In that part, some prominent and dominant aspects of problems related with the doorbell are emphasized. To sum, doorbells should carry some properties, which meet general usage tendencies and cultural values of a society.

6. CONCLUSION

In this study, design thinking methods and approaches are applied from problem definition to product suggestions. In first workshop problem area has been defined, in the second one study area has been narrowed down, in third workshop data have been collected systematically and productively. As a result, required data for the design stage is gathered. With the help of the results of this study, user groups can be narrowed down and persona or personas can occur. With the help of these personas, existing problem areas and solution suggestions can be narrowed down, thus basis for potential designs can be prepared within the harmony of social rules and culture of the target group. All stages of this study, which involves research processes prior to design practice, are run as a group work with the help of some specific methods. It carries the quality of a sample process for collaborative working.

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Mineral Contents of Weed Crops In Central Anatolian Region

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Abstract

Objective of the research is to determine the mineral contents of weed crops intensively grazed by livestock of Central Anatolian Region. A total of 11 weed crops (*Sinapisarvensis, Lamium album, Malva* spp., *Convolvulus arvensis, Chenepodium album, Alhagi* spp., *Sanguisorba minor*Scop.,*Amaranthus* spp., *Taraxacumofficinale, Polygonumcognatum* and *Sorghum halepense*) collected from pastures and field of Kayseri were used as the material of the research. Plant samples were collected at blooming periods during June of the year 2011. Samples were dried and mineral contents were determined with 3 replications. Statistical analyses were performed based on randomized block design. Phosphorus, Calcium, Potassium, Nickel, Cadmium, Lead, Copper, Manganese, Sodium, Zinc, Iron, Magnesium and Boron were determined in the weed plants in dissimilar numbers. The close analysis indicated that the weed seeds contained Cu 8.115-9.360, Mn 65.905-77.890, Zn 30.405-42.105, Fe 254.0-290.5, Mg 2118.0-2414.0, B 6.385-9.655, Ni 0.2305-0.2945, P 2640.5-3307.5, Ca 8193.0-8965.0, K 10221.51-12332.0, Cd 0.1625-0.2235, Pb 0.3345-0.4160 and Na 1181.51-1475.5 mg kg-1, respectively. Results indicated that weed plants of Central Anatolia were rich in trace elements and there was no need for supplemental trace elements.

Key words

Weed, Mineral Content, Correlation, Biplot

1. INTRODUCTION

Pecora browsing indicates a system of land admin in non-farm marginal fields, but, on grassland pecora browsing indicates the most appropriate terrain use (Jones and Martin 1994). Weeds are important feed source for ruminants grazing over the rangelands of Turkey. However, there are limited studies about nutritional values of these weeds. Alternative feed sources are widely used as regional feed sources without reducing the livestock performance. They can reduce feeding costs through providing a full or partial alternative to forage graminae or concentrate feed (Sallam, 2005). It is usually thought that weeds had low nutritional values and were not grazed by livestock; therefore, expensive and time-consuming methods were used in weed control (Marten and Andersen, 1975). Some of these weeds are poisonous and toxic to farm animals and some others result in decreasing feed consumption. Several weed species have thorns and hard leaves, so may injure animal mouths and they even cause eye diseases ending up with blindness. Some weeds may cause to have undesired odor or taste in meat and milk. Weeds mostly contest with culture products and forage crops for water, sunlight and nutrients. On the other hand, some weeds have quite high nutritional values and digestibility (Lewis and Green, 1995). This research was carried out to detect nutritional values of common weeds in range lands of Turkey (Bosworth et al., 1985).

Both warm- and cool-season weeds contained enough calcium for moderate producing cattle. Warm-season broadleaf weeds were high in calcium. In contrast, sicklepod, tall morningglory, cutleaf evening primrose, wild rye, and little barley were down in P and suboptimum for superior-producing cattle. Magnesium content of warm-season weeds was adequate. Most cool-season weeds tested were low enough in magnesium to be considered possible inducers of grass tetany if used as the sole source of feed. Henbit at 0.4% and primrose at 0.3% were unusually high in magnesium. Potassium levels of both weeds and cultivated forages were well above nutrient requirements (Hoveland, 1995). There are some literatures about our studied plants for some quality properties. Akubugwo et al. (2008) have stated that elements in *S. nigrum* but only for Sodium, Calcium, Iron and Magnesium in *Amaranthushybridus* L. Sodium/Potassium and Calcium/Phosphorus rates varied between 0.13 and 0.14, and 1.24 and 1.28 in *Amaranthus* h. L., while amounts for *Solanum nigrum* L. were 0.70 and 0.80, and 0.21 and 0.24, respectively, in all the treatments. Sultan et al (2008) detected macro (Calcium, Phosphorus, Potassium and Magnesium) and micro (Copper, Zinc, Manganese and Cobalt) nutrients in plant samples taken from 10 different freely-grazed rangelands. Early-blooming period Ca, P, K and Mg contents were respectively observed as 0.26±0.022, 0.025±0.004, 0.69±0.113 and 0.044±0.006. Early-blooming Cu, Zn, Mn and Co contents were respectively observed as 22.75±2.671, 14.70±2.065, 10.12±1.770 and 0.023±0.003. Ripening period Ca, P, K and Mg contents were respectively identified as 0.30±0.049, 0.031±0.006, 0.68±0.108 and 0.028±0.004. Ripening period Cu, Zn, Mn and Co contents were respectively observed to be 29.8±2.962, 8.96±2.0701, 6.14±1.034 and 0.029±0.005. Krishnaiah et al. (2008) have pointed that the element content of some weed plants Eucheuma, Sargassum,Caulerpa, Gracilaria, Gelidiella, Kappaphycus and Ulva was examined. The Fe content was rich in the line of Gelidiella>Caulerpa>Sargassum>Eucheuma and its interval was identified to be 6.6-10.9 mg/100g dry weight. The large etesian variation was determinate to be 9.3% Magnesium, 6.4% Calcium and 5.3% Iron. There a few studies performed to determine the mineral contents of weed crops. Therefore, aim of the research was set as to detect mineral contents of weed crops with a significant role in ruminant livestock feeding.

2. MATERIAL AND METOD

2.1. Plant Materials

A total of 11 weeds were used as the plant material of this research. Plant samples were collected from pastures and field of Kayseri Province and analyzed in laboratories of Biology department of Erciyes University Natural Sciences Faculty. Surface area of Kayseri is 16.917 km^2 with an altitude of 1050 meters. Cold terrestrial climate is dominant in Kayseri. Summer is hot and dry and winter is cold and snowy. The province has an annual precipitation of 366 mm with the highest precipitation in March, April and May and the lowest in June, July and August. Extreme temperatures were recorded as between –32.5 °C and +40.7 °C. Experimental year generally had similar temperatures and to precipitations long-term averages. Relative humidity levels of the experimental year was generally lower than the long-term averages.Soils of the experimental site are classified as sandy- loamy sampled at 0-30 cm depths. Calcareous and salt were low while potassium and phosphorus were rich in the soil. Soil pH was slightly alkaline but organic matter content was quite low. Plant samples were taken in June during the flowering periods of the plants. Samples were dried at 70 ^oC for 48 hours, granulated in crusher with 1mm screen and arranged for chemical analysis.

2.2. Mineral Analysis

The weed samples were run across wet-ashing continuum with hydrogen peroxide (2:3) in 3 dissimilar paces (First paces: at 145 ºC 75% microwave force for five minutes, second paces: at 80 ºC 90% microwave power for ten minutes and third paces: at 100 ºC 40% microwave force for ten minutes) in a wet-ashing monad (speed wave MWS/2 Berg. prod. + Instru. Harres.1. 72800 E. Gernmany) durable to 40 bar compression (Mertens, 2005a). Then macro and micro nutrient (Phosphorus, Potassium, Calcium, Magnesium, Sodium, Iron, Manganese, Zinc, Nickel, Cadmium, Copper, Lead and Boron) content of weed plants were detected by using ICP/OES spectrophotometer (Perkin-Elmer, Opt. 2100/DV, ICP-OES, Shel., CT/06484/4794, USA) (Mertens, 2005b).

2.3. StatisticalAnalysis

SAS (SAS Inst., 1999) was used to perform variance analysis on experimental data and Duncan testing was usage to test the importance of variations among means.Biplot Analysis was performed using mineral content as variables and *Astragalus* species as classification criterion (Yan and Kang, 2003).

3. RESULTS AND DICCUSSION

3.1. Mineral Contests of Weed Crops

Highly significant differences were observed in mineral contents of weed plants (Table 1). While the lowest P (2640.5 mg kg^{-1}), Ni (0.2305 mg kg^{-1}) and B (6.385 mg kg^{-1}) contents were obtained from *Sanguisorba minor*Scop., the highest P content (3307.5 mg kg-1) was seen in *Sorghum halepense*, the highest Ni value (0.2945 mg kg^{-1}) in *Alhagi* spp. and the highest B value (9.655 mg kg^{-1}) in both *Sinapisarvensis* and *Chenepodium album*. The lowest Ca content was obtained from *Convolvulus arvensis*, the highest Ca content (8965.0 mg kg^{-1}) was observed in *Alhagi* spp. Elements of Ca and P are significant in bone, teeth and muscle metabolism (Dosunmu, 1997; Turan et al., 2003). Ca acts as a co-factor for additional celled proteins and enzyme (Krishnaiah et al., 2008).

While the lowest Mg (2118.0 mg kg^{-1}), Cu (7.115 mg kg^{-1}) and Cd (0.1625 mg kg^{-1}) contents were obtained from *Chenepodium album*, the highest Mg value (2414.0 mg kg^{-1}) was seen in *Convolvulus arvensis*, the highest Cu value (9.360 mg kg^{-1}) in *Malva*spp. and the highest Cd (0.2235 mg kg^{-1}) in *Sorghum halepense*. Magnesium plays a significant role in cardiovascular function. Copper-like micro elements exist in structural, regulatory and catalisator functions, nucleic acids

and hormones stabilizing membranes. These elements also increase pigmentation in eye, hair and skin, blood-clotting and energy transformation and they have a potential economic significance (Levine 1984; Phillips 1995; Moy and Walday 1996; Krishnaiah et al. 2008). Minson (1990) noticed that growing Mo intromission intercepted Copper toxicity in farm animals. Same researchers also indicated increased Cu concentrations with increasing soil temperatures from 12 to 20°C.

With regard to Na contents, the lowest (1181.5 $mgkg^{-1}$) and the highest (1475.5 $mgkg^{-1}$) values were observed respectively in *Alhagi* spp. and *Polygonumcognatum*. Sodium acts as electrolyte balance. Na content of weed plants was considerably lower than that obtained by Krishnaiah et al. (2008). This might be due to differences in plants species. The lowest Mn content (65.905 $mgkg^{-1}$) was found in *Malva* spp. and the highest (77.890 $mgkg^{-1}$) in *Sorghum halepense*. The Manganese ingredient in independent grassland grasses was enough to meet the pecora necessities (Perveen 1998).

While the lowest K, Zn and Pb contents were observed in *Amaranthus* spp. (10221.5, 30.405 and 0.3345 mg kg^{-1}, respectively), the highest K content (12332.0 mg kg^{-1}) was seen in *Lamium album*, the highest Zn value (42.105 mg kg^{-1}) in *Alhagi*spp. and the highest Pb value (0.4160 mg kg^{-1}) in *Malva* spp. Humphreys (1984) reported K concentration of tropical graminae plants ranged from 0.6 to 1.2%. Potassium was reported to activate several enzyme system effecting plant growth (Humphreys 1984) (Hussain and Durrani 2007; Khan et al. 2007; Sultan et al. 2007; Sultan et al. 2008a; 2008b; Inam-Ur-Rahim et al. 2008). The lowest Fe content (254.0 mg kg^{-1}) was obtained from *Convolvulus arvensis* and the highest value (290.5 mg kg^{-1}) was observed in *Sorghum halepense*. While zinc exist in regular function of immune system, Fe present in structure of hemoglobin, energy metabolism and regular function of nervous system. (Shills and Young 1988; Adeyeye and Otokiti 1999; Ishida et al. 2000).

Mineral contents may vary based on crop type and species, time of harvest, soil and climate conditions and stress factors (Gralak et al., 2006). Soils of Central Anatolia Plateau are rich in soluble salts and lime. Beside this, boric acid may be accumulated within sedimentary deposits of volcanic sites (Sonmez and Beyazgul, 2012). In present study, Na, Ca and B levels were found to be at desired levels with regard to animal feeding. Mineral contents of the present study were above the values recommended by National Research Council (1985) for ruminants but were below the critical values.

Table 1. Mineral contents of weed plants

WeedPlants	**P**	**Mg**	**Ca**	**K**	**Na**	**Mn**	**Zn**	**Fe**	**Cu**	**Ni**	**Cd**	**Pb**	**B**
	mg kg^{-1}												
Sinapisarvensis	2876.5ab	2270.5f	8701.0b	10580.5ı	1261.5h	69.760h	31.465h	270.5d	8.915b	0.2405e	0.1815g	0.3455h	**9.655a**
Lamiumalbum	2956.0ab	2243.5h	8612.5c	**12332.0a**	1430.5b	68.540ı	32.910g	274.5c	9.345a	0.2540c	0.1885e	0.3635f	9.535a
*Malva*spp.	2986.5ab	2394.0b	8321.5h	12125.5b	1405.0d	**65.905l**	36.440de	270.5d	**9.360a**	0.2605b	0.1935d	**0.4160a**	9.360a
Convolvulusarvensis	3111.5ab	**2414.0a**	**8193.0j**	11187.5e	1420.0c	70.685g	38.965c	**254.0h**	7.550g	0.2455d	0.1855f	0.3460g	9.035ab
Chenepodiumalbum	2988.0ab	**2118.0k**	8230.5ı	10363.5k	1267.5g	72.805d	34.320f	271.0d	**7.115j**	0.2355f	**0.1625ı**	0.3685e	**9.655a**
*Alhagi*spp.	3212.0a	2332.5e	**8965.0a**	10783.0h	**1181.5l**	72.255f	**42.105a**	281.0b	8.270e	**0.2945a**	0.2040c	0.4150a	9.140ab
SanguisorbaminorScop.	**2640.5b**	2342.0d	8551.5e	11353.0d	1215.5k	73.035c	35.105ef	265.0e	7.450h	**0.2305g**	0.2145b	0.3915b	**6.385b**
*Amaranthus*spp.	2914.0ab	2192.5ı	8404.0g	**10221.5l**	1218.0j	72.405e	**30.405h**	262.5fg	8.625d	0.2335f	0.1765h	**0.3345ı**	9.325ab
Taraxacumofficinale	3111.5ab	2132.5j	8596.0d	10954.5g	1307.5f	68.105j	37.645cd	254.5h	8.905b	0.2550c	0.1760h	0.3730d	8.715ab
Polygonumcognatum	3236.5a	2384.5c	8232.5ı	11634.5c	**1475.5a**	75.235b	40.515b	264.5ef	7.230ı	0.2550c	0.1945d	0.3855c	9.380a
Sorghumhalepense	**3307.5a**	2266.5g	8412.0f	11084.5f	1355.5e	**77.890a**	36.685d	**290.5a**	7.620f	0.2450d	**0.2235a**	0.3930b	9.570a
Significance Level	***N.S.***	***	***	**N.S.**	***	***	***	***	***	***	**N.S.**	**N.S.**	***

*P<0.05; ** P<0.01; *** P<0.001; N.S: Not Significant

3.2. Correlations among Mineral Content of Weed Plants

As indicated in Table 2, positive and significant correlation between Na-K, Zn-Mg, Ni-Zn, Cd-Mg, Cd-Fe, Pb-Zn and Pb-Cd contents and a negative and significant correlation between Cu-Mn contents of weed plants ($p<0.05$) were observed.

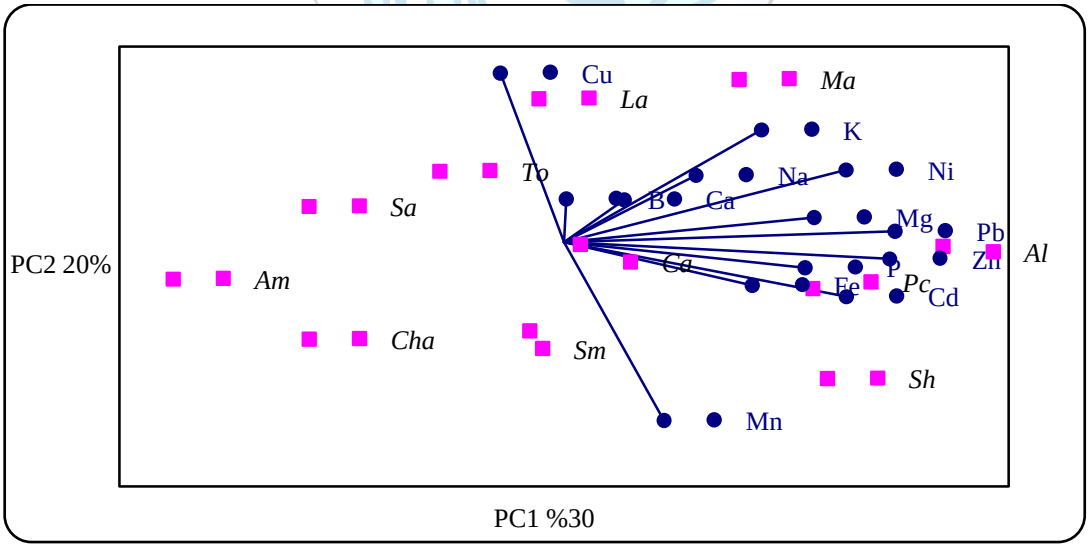
Table 2. Correlations among minerals contents of weed plants

	P	Mg	Ca	K	Na	Mn	Zn	Fe	Cu	Ni	Cd	Pb	B
P	1												
Mg	0.027	1											
Ca	-0.126	0.165	1										
K	-0.014	0.567	0.044	1									
Na	0.361	0.444	-0.380	**0.735**	1								
Mn	0.287	0.227	0.075	-0.176	0.002	1							
Zn	0.572	**0.581**	0.220	0.295	0.295	0.318	1						
Fe	0.283	0.110	0.394	0.125	-0.065	0.466	0.110	1					
Cu	-0.175	-0.181	0.308	0.247	-0.012	**-0.757**	-0.387	-0.039	1				
Ni	0.549	0.193	0.422	0.197	-0.007	-0.209	**0.607**	0.271	0.281	1			
Cd	0.102	**0.648**	0.407	0.430	0.128	0.568	0.467	**0.579**	-0.232	0.145	1		
Pb	0.227	0.553	0.360	0.496	0.145	0.219	**0.723**	0.487	-0.130	0.516	**0.680**	1	
B	0.557	-0.072	-0.033	-0.035	0.370	0.038	0.004	0.327	0.210	0.213	-0.260	-0.109	1

In bold. significant values (except diagonal) at the level of significance alpha=0.050 (two-tailed test)

3.3. Analysis of Biplot

Analysis of biplot was used to contrast the mineral contents of the weeds and to define weed plants and groups (Yan and Kang 2003). Biplot was able to represent 50% of total variation in mineral contents of 11 different weed species. Two perspectives were taken into consideration in biplot application as of (i) the positive relationship among Mn, Fe, Cd, P and Zn; positive relationship among Pb, Mg, Ca, Na, Ni and K; positive relationship between B and Cu, (ii) the negative relationship between Cu and Mn.



Sa:*Sinapisarvensis,* ***La:****Lamium album,* ***Ma:****Malva*spp,***Ca:** *Convolvulus arvensis,* ***Cha:** *Chenepodium album,* ***Al:****Alhagi*spp,***Sm:****Sanguisorba minor* Scop,***Am:****Amaranthus*spp,***To:** *Taraxacumofficinale,* ***Pc:****Polygonumcognatum,* ***Sh:** *Sorghum halepense,*

Figure 1. Biplot polygon for mineral contents of weed plants

Second, it represents the feature side views of the weed plants, especially those that are established over far from the biplot source. For instance, it represents that *Sinapisarvensis, Lamium album, Taraxacumofficinale* and *Malva* spp. had extremely high Cu but low Mn; *Polygonumcognatum* had extremely high P but low Cu; and *Sorghum halepense* had

extremely high P, Mn, Fe and Cd but lower levels for Mg, Ca, K, Na, Ni and Cu. *Amaranthus* spp. *Chenepodium album* and *Sanguisorbaminor*Scop the poor crops in mineral content, except phosphorus and boron (Table 1 and Figure 1).

4. CONSLUSION

It was observed in this study that some weeds had quite high nutritional values and even higher than some culture crops. In general, the greatest Mn, Fe, Cd and P contents were observed in *Sorghum halepense* plants, the greatest Pb and Cu contents in *Malva* spp. plants, Ca, Ni and Zn contents in *Alhagi* spp. plants, Mg content in *Convolvulus arvensis* plants, K content in *Lamium album* plants, Na content in *Polygonumcognatum* plants and B content in *Sinapisarvensis* and *Chenepodium album* plants. It was concluded herein that weeds may constitute a low-cost feed source and may provide several macro and micro nutrients.

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The Role and the Impact of Digital Certificate and Digital Signature in Improving Security During Data Transmission

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Abstract

This paper is cryptographic oriented research, aiming to describe the notion, role and impact of digital signature and digital certificate for the wide audience. Security improvement during data transmission comes as a result of the huge growth of electronic communications. While one party is trying to secure these data, there is always another party trying to reach and use them in several cases, so understanding the importance of digital security is quite important for everyone using a computer nowadays. Thus, the research explains the need for these types of technologies. Reading the paper, you will meet a comparison between paper and digital signature and digital certificate compared to digital signature. During this research were used Observational and Correlational research methodologies. As a conclusion, we can say that electronic signatures and certificates are making life easier for organization leaders, HR and all of other company sectors in a variety of industries, allowing them to freely announce, communicate or exchange several documents or high sensitive data.

Key words

Cryptography, Digital Certificate, Digital Signature, Private Key, Public Key

1. INTRODUCTION

Increased use of water and energy

Digital signature notion was first used and described in late 1976 by Whitfield Diffie and Martin Hellman, although it was still just an assumption. Soon after that, RSA algorithm was invented by Ronald Rivest, Adi Shamir and Leonard Adleman, which, in that time, produced only primitive digital signature. Only in 1989, the first widely marketed software package using RSA algorithm was released. It was called *Lotus Notes 1.0.*

Later on, there were more digital signature schemes developed, such as *Lamport signatures*, *Merkle signatures* – also known as *Merkle trees* or *Hash trees*, and *Rabin signatures*.

In the other hand, *digital certificate* is an electronic document which is used to prove ownership of a *public key*. It contains information about the key itself, information about owner, and the digital signature that verifies correctness of certificate's content. In other words, the digital certificate is an electronic passport that allows information exchange securely over the Internet using the *public key infrastructure* (PKI).

Digital certificates are handled by a trusted *certificate authority* (CA). Thus, to provide validity of the certificate, it is digitally signed by a root certificate that belongs to these CA. Operating systems and browsers maintain lists of trusted CA root certificates so they can verify that the certificate is issued and signed. [1]

2. DIGITAL SIGNATURE

Digital signature is a mathematical technique for validating the authenticity and integrity of several electronic components, such as messages, software or digital documents.

It is intended to ensure that there will be no tampering or impersonation while communicating in electronic way.

2.1. How it Works?

Digital signature technology is based on public key cryptography, also known as *asymmetric cryptography*. The most used algorithm in this type of cryptography is RSA, where one can generate two linked keys: *private key* and *public key*. First, there is created a one – way hash of the electronic data that is required to be signed. The private key is used to encrypt this hash. Thus, encrypted hash – along with the rest of the information represent the digital signature.

- *But, why encrypting the hash instead of the entire message or document?*

Because, encrypting the entire document costs a lot of time. The hash function can convert an input into a fixed length value, which, compared to the document length, is much shorter.

The value of the hash is unique. It means that for a given amount of data, there is one and only one unique hash value. Changing a single character or a single bit of that data means a completely different hash value. Thus, using the signer's public key, the other party can decrypt the hash, and validate the integrity of the data. So, if the decrypted hash is computed again, and it matches with the first one, it means that the data has not changed after signing. In the other hand, if the decrypted hash does not match, it means that there has either been tampering in the data, or the signature was created with a private key generated separately from the public key used to decrypt these data.

But, all of this said above, does not mean that the message or the document has to be encrypted. Instead, the digital signature works with both, encrypted and decrypted messages or documents. It is meant to ensure that the sender of these messages or documents is the one expected to send.

Modern data – transmitting software, such as mail applications support the use of digital signature and certificate.

2.2. Application

The most common application of digital signature is authenticating the source of the message, ensuring message integrity and ensuring that the sender will not deny authenticity.

2.2.1. Authentication

Although digital messages contain information about the sender, these information may ofter be incorrect or not accurate. In this case, digital signature allows to make sure that the sender of a message, is the one we think it is. If a user is the owner of a digital signature secret key, a valid signature ensures that the message is sent by that user. The most sensitive is the financial section, where the importance of high confidence in sender authenticity is obvious. For example, if a branch of some bank requests from the central office to make changes in the balance of an account, acting on such a request, not being sure that the request comes from a known and authorized source could be a fatal mistake.

2.2.2. Integrity

During data transmition, there is always potencial risk that the transmited data can be altered in the meanwhile. Even if the message is encrypted, it can be altered without knowing its meaning or what is being changed. There are just a few algorithms that can prevent this scenario, but the most of them can not. However, if the message is digitally signed, every minor possible change of that message is detected. Additionally, because of the hash function, there is no way to produce a new message with a valid signature, after it has been signed.

2.2.3. Non – Repudiation

Non – repudiation is also an important reason to use digital signature. This property aims to make sure that, the entity that once has signed some information, can't deny it at a later time. Furthermore, having access to the public key only, does not allow someone to create a fake valid signature. [2]

3. DIGITAL CERTIFICATE

Digital certificate is some kind of certificate issued by trusted Certificate Authorities (CA) aiming to verify the identity of the certificate holder. Typically, a digital certificate contains the following information: unique *serial number* used to identify the certificate, identified *entity* or *individual* by the certificate, *the algorithm* used to create the signature, the *CA* that verifies the information in the certificate, period of time including *starting date* and *expiry date* of validity of the certificate, *public key* and *the thumbprint* (to make sure that the certificate is not modified "itself").

3.1. Application

Digital certificates are very important component of *Transport Layer Security* (TLS), also known as SSL (*Secure Socket Layer*), preventing cyber attackers from impersonating a website or server. Additionally, they are used in email encryption or code signing.

3.1.1. Website Security Using Digital Certificate

Web browsers validate that a TLS web server is authentic, so the users can feel secure in their interaction with the website, ensuring it does not have any third party listener and it is who it claims to be.

To get the certificate, a website operator must apply to a certificate provider with a *certificate signing request*. This request is an electronic document containing website name, contact email address, company information and the public key. The private key is not required for security issues. The certificate provider signs the request, producing a public certificate.

Before issueing the certificate, the provider requests the contact email address from a public *domain name registrar*, and ensures that published address matches with email address provided by the applicant.

So, when a user connects to a website who uses a link such as *https://www.example.com*, if the browser does not give any certificate warning message, then the user is good to go.

3.2. Public Key

Public key is very familiar notion in cryptography. It is a public value that is used for two main purposes: *authenticating* messages or other data originated with a holder of the paired private key; *encrypting* a message to ensure that only the holder of the corresponding private key can decrypt it.

3.2.1. Public Key Infrastructure (PKI)

A public key infrastructure supports the distribution and identification of public key encryption, enabling users to securely exchange data over network and verify the identity of the other party.

In other words, PKI is an arrangement that binds public keys with respective identities of entities. The binding is established through a process of registration and issuance of certificates at and by a CA. During registration process, *registration authority* (RA) makes sure that the registration is valid and correct. RA is responsible for accepting requests for digital certificates and authenticating the entity making the request.

A typical PKI consists of hardware, software, policies and standards to manage the creation, administration, distribution and revokation of keys and digital certificates.

3.2.2. Public Key Cryptography

Also known as *Asymmetric Cryptography*, it is a cryptographic technique that uses private and public keys to encrypt and decrypt data. The keys are not identical large value data, usually, 128 or 256-bit strings generated by random generator methods. They are mathematically linked between them.

The public key is meant to be shared, while the private key must be kept secure.

Using this technique, everyone can encrypt a message or data using the public key of the receiver, but that encrypted message or data can only be decrypted with the private key.

Unlike *symmetric key algorithms*, public key algorithms does not require a secure channel to exchange keys between communicating parties.

Authentication of messages is done by hashing messages to produce a unique value of the message, which is encrypted using the private key and produces a digital signature.

There are several manners to verify the signature, as mentioned in the sections above.

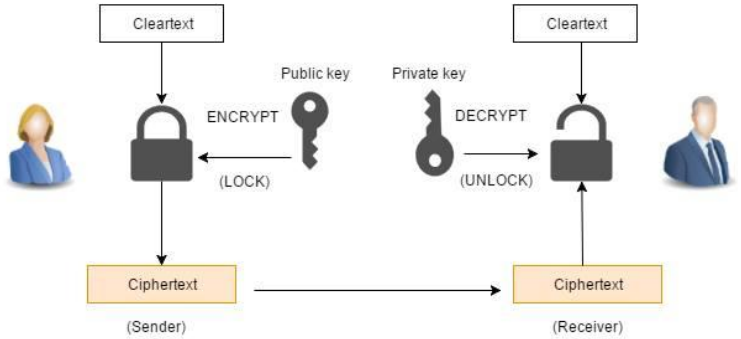

Figure 1: Encroytion/Decryption process using Public/Private Key

4. COMPARISON

In this section, readers will have the chance to read and see comparison between traditional and digital signatures, and also the comparison between digital signature and digital certificate.

4.1. Comparison Between Digital and Traditional Signature

A person's signature is a very personal thing. Unique to handwriting, it may be the full name, a portion of the name or just the initials, but it can also include various loops and flourishes.

Like digital signature, the traditional one is developed as a way to create a unique identifier for each community member. For the most part, they are associated with written documents, although they may be added to just about anything. When they are added to paper, their main purpose is to signify some kind of approval or consent to what has been captured on that document.

However, adding signature to documents in not the perfect signature solution, because they can be very easily forged or copied. For example, Joseph Cosey was a famous forger that mastered the signatures of many famous figures, including Ben Franklin. Today, his forgeries are as famous as originals he doubled.

Below this paragraph is represented a table of comparison between digital and traditional (paper) signature.

Table 1: Comparison table of signatures

Property	Traditional	Digital
Can be applied to electronic documents and transactions	No	Yes
Signature verification can be automated	No	Yes
Signature automatically detects alterations to the document	No	Yes
Can be used to signify a commitment to a contract or document	Yes	Yes
Can be augmented by use of a witness to the signature process	Yes	Yes
Recognized by legislation	Yes	Yes

4.2. Comparison Between Digital Certificate and Digital Signature

Digital signature is a mechanism that is used to verify that a particular digital document or message is authentic, whereas digital certificates are used mainly in websites to increase their trustworthiness to its users. When digital certificates are used, the assurance is mainly dependent on the assurance provided by the CA. With digital signatures, the receiver of the message can verify that the information is from a trusted sender or is not modified.

5. RESULTS

Although digital certificates are widely used by large corporations, the practices may not be totally secure. Even though these certificates guarantee equity for the user of a website, the relation between the certificate owner, website operator and website owner might be ambiguous and thus, not guaranteed. Researches and studies have proven that authentication and authorization should be separated, although digital certificates adapt information with authorization inside their scope.

A digital signature is a mathematical scheme for demonstrating the authenticity of a digital message or document. A valid digital signature gives a recipient reason to believe that the message was created by a known sender, and that it was not altered in transit.

In some countries, including the United States, India, and members of the European Union, electronic signatures have legal significance. However, laws concerning electronic signatures do not always make clear whether they are digital cryptographic signatures in the sense used here, leaving the legal definition, and so their importance, somewhat confused.

Digital signature scheme is secure because these schemes are based in encryption supported in a secure way by concrete algorithms. The most common algorithm for digital signature should provide assurance that the signature guarantees non – repudiation, non – recidivist and the message can't be changed. For furthermore, the signature should be able to resist all possible attacks.

6. CONCLUSION

After the effort put on this paper, we can freely say that security in electronic communicating is improving in a good rate, but there are a lot of things that require much more work and attention.

Cryptography may be a trending technology, but since security is an issue that lacks from humans, it is only as good as the practices of the people who are in touch with it. Normal users write keys everywhere, choose easy-to-remember ones or don't even change them for life. The complexity of cryptography effectively puts it outside of most people, and thus, motivation for the practices of cryptographic security is missing.

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From Balcony to French Window: Effects of Urban Transformation on Local People of Suadiye and Bostancı Districts

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Abstract

This paper aims to discuss the effects of urban transformation on local people of Suadiye and Bostancı Districts in Kadıköy - İstanbul regarding people's life styles, habits, and relation with built environment. After the 17th August 1999 earthquake, the government has supported urban transformation for risky and dangerous buildings even in some cases for the whole of a district. As a result of this support, especially more profitable districts have undergone a rapid environmental change. Suadiye and Bostancı are the two examples of this situation. In this paper, general characteristics of urbanization and urban transformation and their relation with the socio-cultural sustainability in the Suadiye and Bostanci are analysed by design thinking methods. In order to understand the governmental aspects of urban transformation, at first urban transformation laws are expressed briefly. After the brief explanation, effects of urban transformation on local people are discussed. The discussion is supported by the observations, desktop research, self-experiences and literature review. The discussion is especially focused on the shift from the balcony to French windows because of implicit and explicit meanings of the balcony. Consequently, environmental stress depending on the urban transformation on local people of Suadiye and Bostancı is emphasized and concerns about the losing certain cultural values of the districts are shared.

Keywords

Urban Transformation, Environmental Stress, Istanbul

1. INTRODUCTION

This research is a continuation and evolved version of a previous study, which has been prepared within the context of Environment Behavior Theories Course, which is one of the graduate level courses of ITU Architectural Design PHD Program, for 2015-2016 Fall Semester. As part of the course, participants, including me as the author of this paper, were asked to study on the traces found on both human behaviors and environment by considering the intersection of socio-behavioral phenomena, place and people at present time. According to the given task, Suadiye and Bostancı districts have been determined as the "place", local people have been chosen as the "people", transformation of open spaces of the buildings from the form of balcony to French window has been put as the "socio-behavioral phenomena". Here, transformation of open spaces of the buildings from the form of balcony to French windows could be seen as an element related solely with the form of the buildings and its visual characteristics. However, for the determined area, for local people this spatial transformation in their home means a change in their relation with the outer environment, and thus indicates changes in their behaviors dependent upon their environment. This study aims to discuss the effects of urban transformation of the determined districts on the local people focusing on the environment and behavior relations and socio-cultural sustainability.

In order to state a clear discussion, this study has been divided into three main parts. In the first part, general characteristics of the determined place and people are mentioned with an urban transformation centered manner and urban transformation laws are briefly mentioned. In the second part, the discussion is structured around the previously expressed data and the

analysis of the current urban transformation of the districts, which is made by self-observations and application of suitable theories. In the third part, environmental transformation of the districts and behavioral change of local people will be analyzed within the context of socio-cultural sustainability.

2. GENERAL CHARACTERISTICS OF URBANIZATION AND URBAN TRANSFORMATION IN SUADİYE AND BOSTANCI

In this part, general information about the Suadiye and Bostanci districts and their inhabitants, the reasons behind the urbanization process of the area, and legislations related with the urbanization process in the area are expressed briefly.

Understanding urbanization process of the districts is important to understand the effects of urban transformation specific to them. Urban transformation is a redesign action on urban scale. Although physical dimensions of the two are very different, there are many similarities between redesigning of a product and redesigning an area. Both of them require analysis of the existing conditions, require defining the new problems, and require correct market analysis. After redesigning a product, manufacturers expect to increase sales rate and profit while preserving and pleasing their old customers. Similar to it, in urban transformation, contractors expect to increase number of apartments that they sold and their profit while preserving and pleasing the old inhabitants. After redesigning a product, loyal customers expect to experience their product in a similar way as in the previous version of the product. Similar to it, after urban transformation, local people expect to experience their environment in a similar way as in the previous version of it. Obviously, there are certain differences between redesigning the product and redesigning the environment in terms of their impact range depending the scale of the redesign act. However, these differences are ignored now to transmit the general information about the districts more comprehensively.

Depending on the similarities between redesigning a product and urban transformation, 5WH method, which is an old journalism method and counted as a design thinking method, is applied to understand the general characteristics of urbanization process and urban transformation process in Suadiye and Bostancı (Table 1). Information shown in the table and summarized here is derived from the master thesis of Arıkan, who studied the urban space transformation in Feneryolu [1]. The answers of the question “when”, show the important dates in the urbanization process of the districts. There are six periods of urbanization process in Suadiye and Bostancı. These are determined according to drastic environmental and social changes, governmental regulations and separated as “Early 1900s, 1930s - 1964, 1965-1973, 1973-1985, 1985-early 2000s, 2000s-now”. The answers of the question “why”, explain why these dates are important for the urbanization process of the districts. In early 1900s period, two main roads, the railway and seaway transportation developed. In 1930s-1964 period, increasing population and parceling the large grounds occurred, new development plan law prohibited usage of wooden structure, 13.11.1952 dated, 1/2000 scaled Bostancı--Erenköy plan limited height at 12.5 meters. In 1965-1973 periods, property ownership law and related legal regulations permitted building apartments up to 12.5 meters and apartment houses has begun to emerge. In 1973-1985 period, 25.04.1973 dated, 1/5000 scaled development plan did not limit the height of the building, it determined the height by “TAKS” and “KAKS”,in other words by floor area ratio. In 1985-early 2000s period, 08.1985 KAKS was increased from 1,8 to 2,07 (higher apartments) and By 1990 regulations open and closed attachments were included into the construction field. From 2000s to now, after 1999 earthquake, urban transformation rate has increased and in 11.05.2006 dated development plan net construction square meters has been increased. The answers of the question “who” indicate the general position of the inhabitants in social strata. In Early 1900s period, inhabitants of the districts were from upper and upper middle class. In 1930s -1964 period, they were from upper middle class and middle class,. In 1965-1973; 1973-1985 and 1985-early200s periods, they were from middle class. However, this has begun to change after 2000 to upper middle class and middle class. The answers of the question “where” defines the place that people lived. From 1st to 6th period, places that people lived are in order: wooden mansions, concrete single houses, concrete 4 floored apartments, concrete 4-8 floored apartments, high rise apartments, high(er) rise apartments. The answers of the question “what”, informs us about the general properties of the residential areas. In 1st period, houses had large gardens, away from the streets and almost all of them served as summer mansions. In 2nd period, houses have smaller gardens, closer to streets and used as summer mansions and permanent residences. In 3rd period, houses had very small gardens, served for permanent living and had direct interaction with streets via balconies. In 4th period, houses had smaller gardens, backyards as car parks, and direct interaction with the street via balconies. In 5th period, houses had larger car parks, decreased balcony areas. In 6th period, houses have had bigger car parks, and lost the balconies and french window has been used to serve like a balcony. The answers of the question “how” shows us the ways of interaction between people and environment. In 1st and 2nd period, local people had spent time in gardens, beaches and gotten together in the commercial center of Kadıköy. In 3rd and 4th period, people worked in closer districts, spent time in coastal road, summer cinemas and in balconies. In 5th period, people worked in both close and further areas and spend time in coastal roads, city centers, other districts. In 6th period, people have worked in both close and further areas and spend time in both inner and outer environment with new technological devices. As mentioned, there have been certain changes between from a period to another one, in terms of general characteristics of the people, houses and lifestyles.

Table 1. 5WH of urbanization in Suadiye and Bostancı

WHEN	Early 1900s (1900s-1930s)	1930s-1964	1965-1973	1973-1985	1985-early 2000s	2000s- now
WHY	Two main roads, the railway and seaway transportation developed	*Increasing population and parceling the large grounds *New development plan law prohibited usage of wooden structure *13.11.1952 dated, 1/2000 scaled Bostancı--Erenköy plan limited height at 12.5 meters	*Property ownership law and related legal regulations permit building apartments up to 12.5 meters *Emergence of apartment houses	*25.04.1973 dated, 1/5000 scaled development plan does not limit the height of the building, it determines the height by "TAKS" and "KAKS",in other words by floor area ratio	* 08.1985 KAKS is increased from 1,8 to 2,07 (higher apartments) *By 1990 regulations open and closed attachments are included into the construction field	*1999 earthquake *in 11.05.2006 dated development plan net construction square meters is increased.
WHO	*Upper middle class *Upper class	*Upper middle class *Middle class	*Middle class	*Middle class	*Middle class	*Upper middle class *Upper class
WHERE	Wooden mansion	Concrete single house	Concrete, 4 floor apartment houses	*Concrete, 4-8 floor apartments	*High rise apartments	*High(er) rise apartments
WHAT	*Large gardens *Summer mansions *Away from the streets	*Smaller gardens *Summer mansions and permanent houses *Closer to streets	*Very small gardens *Permanent houses *Direct interaction with the street via balconies	*Smaller gardens *Backyards as car park *Direct interaction with the street via balconies	*Bigger carparks *Decreased balcony areas	*The Biggest car parks *French windows, absence of balconies
HOW	*Spend time in gardens, beaches *Get together in the commercial center of Kadıköy	*Spend time in gardens, beaches *Get together in the center of Kadıköy and local cafes	*Work in closer districts *Spend time in coastal road, summer cinemas *Spend time in balconies	*Work in close districts *Spend time in coastal road, summer cinemas *Spend time in balconies	*Work in both close and further areas *Spend time in coastal roads, city centers, other districts	*Work in both close and further areas *Spend time in both inner and outer environment with new technological devices

The below elevations (Figure1) [1], belonging to the Feneryolu districts, can be helpful to demonstrate the urbanization process of Suadiye and Bostancı.

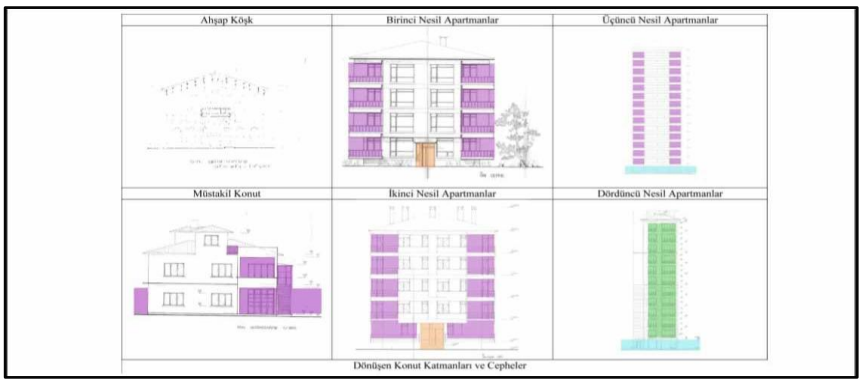

Figure 1. Transformation in facades of houses in coastal districts of the Kadıköy

3. EFFECTS OF URBAN TRANSFORMATION ON LOCAL PEOPLE OF SUADİYE AND BOSTANCI

This discussion part is separated into two parts. In the first part, effects of current urban transformation in the Suadiye and Bostancı are tried to be analyzed based on the self-observation of the author. In the second part, findings and observations of the author is evaluated based on the environment-behavior theories and socio-cultural sustainability.

3.1. Traces of Urban Transformation

To find the traces of urban transformation in Suadiye and Bostanci districts, as being an inhabitant, the author has searched the area on foot. The author has chosen to study this issue based on her experiences. In that sense, this study is a reflection of her awareness with the surrounding environment. The study begins with the quest for her neighbor.

When the building opposite of the author's apartment dealt with a constructor and the new building has arisen, the author realizes that there is not any balcony in the new building. (Figure2) Old building was an apartment with two floors and two large balconies at facade. House owners were two siblings and had owned the house from its first construction. So, they were well adapted to the environment, their daily life in home had been shaped according to their house. They were prone to live in their balconies in a Mediterranean way for every season. Thus, new form of the transformed building has not fit the old habits of the neighbor. They could not find a chance to sustain their daily routine, their way of communication in the new apartment.

Figure 2. Neighbor of the author with their new house

Before the transformation, the author used to see her neighbors almost any time when she comes and goes to her apartment. She interacted with them and involved in their lives via their balconies. However, after transformation, she realized she had never seen her or talked with her. The author has realized that her neighbors were trying to follow their old habits coming from their balconies in front of the French windows. Putting flowerpots, hanging laundries, two chair and one coffee table in front of the window to see the street can be counted as the old traces in the new building. Thus, author has begun to search for the meanings of balconies in old apartments, tried to identify if the transformed buildings supply any places to transfer the meanings of the balconies. Below pictures exemplifies the different functions and attributed meanings of the buildings with balconies (Figure3).

Figure 3. Different functions of balconies in Suadiye and Bostancı districts

As shown in Figure3, balconies are used for eating, cooking, hanging laundry, storage, mobility and they are also used for reflecting self-identity, shaping interaction between inside and outside. So, balcony becomes a cultural medium for its owner. It gives clues on daily routine of the owner and his/her way of thinking and living. However, the author realizes that old inhabitants could not find a place for continuing their old habits linked with the balconies (Figure4).

Figure 4. Buildings after urban transformation

3.2. Meaning of Traces

If we are to examine the topic of this study, we see that transformation of balconies to French windows is specifically emphasized. The reason behind it that, balconies are the intersections of home and the surrounding environment. Thus so, it becomes an interface for reflecting the self-identity of the house owner to the environment and an interface for environment and society to the house owner. However, extinction of the balconies in new high-rise apartments causes a system failure in this interface. In terms of environment and behavior studies, this situation originates sudden changes in behavioral settings, person-environment fit, and identity. All of these aspects cause cultural change for the inhabitants.

As it mentioned before, houses in Suadiye and Bostancı districts have characteristics of the summer resorts with respect to its historical roots and being a coastal region. These characteristics have been adapted to the buildings from the different stages of urbanization process in Suadiye and Bostancı till now. Since the urbanization process of the districts is young and construction of the first multiple floor apartments is younger, Mediterranean way of life is inherited from the older urbanization stages. Populations of the house owners are constructors and alive witnesses of the urbanization process in the districts. So they developed certain behavior settings in balconies. Based on the Barker's [2] definition of behavior settings as its being a medium for achieving multiplicity of satisfactions, we can say that new buildings make the old house owners unsatisfied because of losing a behavior setting. At that point, operations related with the balconies are tried to run in front of the French windows or in houses or similar to it emotional attachments to balconies are tried to be made with the new house, and so person-environment fit ratio changes. If we apply PE fit theory that Caplan [3] explained, when the old house owner contact with a new apartment, which is designed for the future inhabitants, degree of adjustment of the old house owner should be expected at a lower level comparing to his/her old house.

As it has been seen in the figures, people are using their balconies to reflect their ideas, they hang flags, put posters or objects to express themselves, etc. As the dwellings and domestic objects cast implicit, non-verbal meanings about the owner's identity or social group [4], balconies function as a medium for expression of one's self to the surrounding environment. So, in new houses, this medium has been broken. So, sustainability of the local culture has been interrupted. To conclude, traces found with observations, indicate negative trends in environment and behavior relation and cultural sustainability of the old inhabitants of the Suadiye and Bostanci.

4. CONCLUSION

This study is generally structured on the tacit knowledge and observations of the author and tried to be supported by basic theoretical works in the immense field of environment and behavior studies. Effects of urban transformation in Suadiye and Bostancı districts on local people are discussed by focusing on the transformation of balconies. Loss of personal identity reflected through the balconies, not fitting the new environment, tension in behavior patterns are asserted as the possible negative impacts which are highly related with the cultural sustainability of the local people. However, this study should be continued with a comprehensive fieldwork and enriched in terms of theoretical background.

As a result, although this study is a sketch of a comprehensive research, highlighting the reckless urban transformation in the districts is valuable.

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Agricultural Diffuse Pollution and Sustainability in Ergene Basin

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Abstract

Limited waters sources in the world are consumed rapidly, it has been seen that water sources should be examined with its basin holistically. When Ergene Basin is examined holistically, it seems to have agricultural area approximately 76% of the area and a significant production value (64% sunflower and 50% rice) in grain production in the country. When total consumption of chemical fertilizers and pesticides in agriculture are analyzed according to the years, an increase is observed. In this study, it is aimed to determine the long term nutrient (total nitrogen- TN and total phosphorus- TP) loads and consumption of pesticides in Ergene Basin by years. For this purpose, nutrient loads from agricultural diffuse sources have been estimated by using chemical fertilizer amounts and conversion factors, animal numbers and emission factors. The loads from chemical and natural (animal) fertilizers are 26960 tons/year TN and 3650 tons/year TP in the year 2015. Also in this study, monitoring stations have been proposed for the determination of nutrients and other pollutants loads considering sub-basins and pollution sources for the water sources, air and soil can be monitored simultaneously. When the effects of nutrient loads and pesticides at surface waters and soils in Ergene Basin are considered both ecologically and socio-economically, it has been identified that intended use of water sources was changed, agricultural and aquatic production was negatively affected by deteriorated ecological balance at surface water. Also, the diffuse pollution from agricultural sources causes soil contamination. Ecological and economic sustainability of Ergene Basin are considered to be under a certain threat.

Keywords

Agricultural diffuse pollution, nutrient load, pesticide, sustainability

1. INTRODUCTION

Surface waters are polluted by point and diffuse sources resulting from natural and anthropogenic effects. Nutrient loads coming from both sources have become one of the major ecological issues which also affect aquatic ecosystems. Furthermore, they lead to ecologic and economic losses. Nutrient loads vary by different parameters like precipitation and discharge, water temperature, biological activities in the water masses, conditions of other water quality parameters, natural and chemical fertilizer practice rates, life standards of the communities, wastewater collection systems and water treatment technologies, regulations on the control of nutrient emissions, non-phosphated detergent production, limitations on fertilizer usage, etc [1], [2], [3]. The accelerated eutrophication of freshwaters and to a lesser extent some coastal waters is primarily driven by phosphorus (P) inputs. While efforts to identify and limit point source inputs of P to surface waters have seen some success, diffuse sources remain difficult to identify, target, and remediate. As further improvements in wastewater treatment technologies becomes increasingly costly, attention has focused more on diffuse source. Phosphorus inputs to fresh waters can accelerate eutrophication. Although nitrogen (N) and carbon (C) are also essential to the growth of aquatic biota, most of the attention has focused on P because of the difficulty in controlling the exchange of N and C between the atmosphere and water, and fixation of N by some blue-green algae [4].

Diffuse source pollution from agricultural land use is a complex issue to mitigate due to their storm-dependent and diffuse nature for the management of freshwater worldwide, and improvements in the chemical and/or ecological quality of many waterbodies impacted by farming still need to be achieved. This may be because; controls over nutrient transfers from agricultural land are not yet strict enough, or have not been implemented for long enough or sufficiently widely; agricultural nutrient loads and/or their ecological relevance are overestimated relative to other sources; and other site and environmental factors are more important than nutrient status in determining ecological status [5].

Agriculture clearly needs to remain a viable, productive and profitable industry and it is important to establish clear evidence of the eutrophication impacts of farming so that sustainable solutions that do not unreasonably affect farm profitability can be found. Measures to reduce nutrient emissions to water may be costly to implement, and so it is important to take account of factors that affect their potential effectiveness when implemented. As nutrient inputs to agricultural systems may increase in the future to grow more food and biofuels, and as hydrological patterns may become more extreme under climate change, it will also become increasingly important to identify where water quality and the provisioning of agricultural goods and services are incompatible. The success of diffuse source measures also relies heavily on farmer engagement and skill, and needs to be tailored to suit specific site requirements, which will vary from farm to farm. Soils, fresh application of fertilizers/manures and farmyards are all potential sources of nutrients that will deliver variable N and P loads depending on the type of farming system, soil type and site hydrology. Transfers of legacy nutrients will dilute the beneficial impacts of controls over current activities, and strategies to reduce legacy nutrient inputs will clearly not bring immediate benefits. Controlling nutrient loads from agriculture therefore depend not only on how much the inputs can be reduced, but how those inputs are managed on the farm and how cultivation and cropping practices can be adapted to reduce the mobilization and transport of legacy soil nutrients through runoff and erosion. Critical source areas and delivery pathways of P transfer on farms are numerous, dynamic and complex, and will clearly differ between landscapes with permeable and impermeable soils, crop factors, including soil P sorption capacity, crop type, P application type, method and rate, and land management, influence plant uptake of P and only their accurate identification will provide a sound basis for the implementation of effective options to mitigate P transport [4], [5].

Fertilization increases efficiency and obtains better quality of product recovery in agricultural activities. Chemical fertilizers mainly contain phosphate, nitrate, ammonium and potassium salts. But agro-chemical-based intensive agriculture has contributed substantially to the emission of the very powerful greenhouse gases CH4 and N2O, and the entry of pollutants (excessive nitrogen and phosphorus, pesticide and heavy metals) into water bodies and soils. These pollutants have adverse effects on environmental quality and public health, for example, eutrophication of lakes and streams, soil salinity, soil contamination by heavy metals, groundwater accumulation of nitrate and the accumulation of pesticide residues in food [6], [7].

Nitrogen in agricultural areas reach the water environment by three ways: Drainage, leaching and flow. Even in ideal conditions, plants use 50% of nitrogenous fertilizers applied to soil, 2-20% lost evaporation, 15-25% react organic compounds in the clay soil and the remaining 2-10% interfere surface and ground water [6]. Especially in spring and in the beginning of summer, mass fertilizer usage generally leads to an increase in the nutrient concentrations [3], [5]. Depending on the nutrient concentrations, sediments become the secondary nutrient pollution sources [8]. Continuous use of acid-forming nitrogen fertilizers causes a decrease in soil pH, liming, if not carried to prevent the declining efficiency of field crops [6]. Excessive N inputs are often one of the main reasons for the high incidence of pests and diseases in vegetable production, and in turn, this commonly leads to farms using even more pesticide, resulting in high-pesticide residues on vegetables and in the environment. The excessive and unbalanced inputs of chemical fertilizers can cause the damage to soil structure and soil quality. Unbalanced nutrient ratios in mixed chemical fertilizers can cause both biological and physicochemical damage to soils, leading to acidification, secondary salinization and reduction of microbial activity. This damage lowers crop yields and may lead to farmers applying even more fertilizers to try to compensate for the reduced soil productivity and thereby intensify NPS pollution and the cycle of environmental degradation [7].

Pesticides are one of the vital components of modern agriculture practices. Adoption of modern agricultural practices of highly intensive nature to feed the ever increasing population of the world resulted in the widespread pollution of synthetic pesticides in the environment. Thus the presence of these compounds is ubiquitous, often contaminating surface and ground

waters as they migrate from their point of application. Pesticides can reach surface water through runoff from treated plants and soil. Contamination of water by pesticides is widespread. Heavy treatment of soil with pesticides can cause populations of beneficial soil microorganisms to decline [9]. Microorganisms are important inhabitants of aquatic ecosystems and soils, where they fulfill critical roles in primary productivity, nutrient cycling, and decomposition. Microorganisms are exposed directly to the pesticides because of the direct and indirect input of the pesticides. Though certain pesticides are known to elicit a variety of chronic and acute toxicity effects in microorganisms, some of them still have the ability to accumulate, detoxify, or metabolize pesticides to some extent. It is supposed that detrimental effects of pesticides on microbial species may have subsequent impacts on to higher trophic levels [10], [11].

In basins, where pollutants are carried into the surface waters, nutrient control is possible with a good basin management. The concept of "Sustainable Basin Management" has gained great importance, and it is now necessary to understand socio-economic function of the region as well as its natural, physical, chemical and ecologic processes. Monitoring is critical to addressing the main objectives of diffuse sources management strategies, and present unique challenges to reliably represent site-specific variations in time and space. Monitoring programs are designed to identify nutrient losses and their sources areas, quantify the effects of mitigation measures, and document conservation program effectiveness. However, there is a cumulative uncertainty associated with water quality monitoring. This uncertainty is derived from stream flow measurement, water sample collection frequency, sample preservation and storage, and analysis. Water quality data must further be related to information on catchment characteristics (e.g., soil properties, drainage conditions, contribution from point sources) and on agricultural activities such as crops grown, fertilization regimes, and soil cultivation practices. Access to such data is crucial for the interpretation of water quality data. Thus, the inherent landscape and management characteristics of monitored catchments must be stated, so that they can be related to surrounding agricultural areas where less information on agricultural management and nutrient loads are available. This would improve the applicability of monitoring results for larger agricultural areas [12].

This study aims to determine the nutrient loads and consumption of pesticide coming from agricultural diffuse sources of Ergene Basin by years. For this purpose, nutrient loads were estimated depending on some assumptions. As a result of all obtained data and estimations, it is aimed to determine the effects of nutrient loads and consumption of pesticide on the ecosystem and socio-economic structure. Besides these, monitoring stations have been proposed for the determination of nutrients and other pollutants loads considering sub-basins. These stations are supposed to include water, air and soil monitoring simultaneously.

2. MATERIALS AND METHODS

Ergene Basin spreads throughout an area of 10733 km2 between Northern Marmara Basin, Meriç Basin and Bulgarian border; it is an inland basin surrounded by coasts of the Black Sea in the northeast, and Marmara and North Aegean Sea (Gulf of Saros) in the south as shown in Figure 1. The main river in Ergene Basin is the Ergene River with 282 km length and 28.73 m3/s average annual flow-rate. Average rainfall in the basin is 602.18 mm [3].

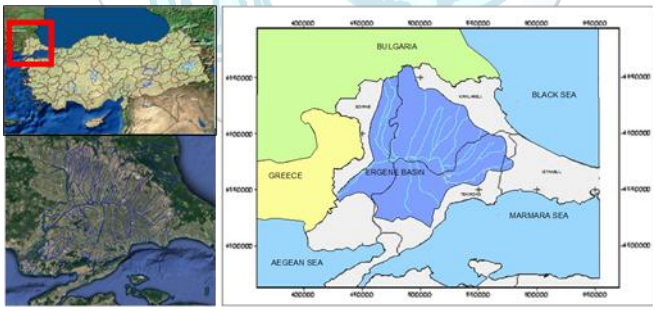

Figure 1. Geographical location of Ergene Basin (26o35'- 42o06')

The Thrace sub-region (Edirne, Kırklareli and Tekirdağ provinces), where Ergene Basin is located, constitutes one of the significant agricultural and livestock production centers. While the total cultivated area of the sub-region is 1.239.102 ha, only 65.1% of this area is used for agricultural purposes. Monoculture agriculture and burning stubble applied for many years remove organic matter in the soil and thus plant-available nitrogen is caused to decrease year by year. This is the region which uses the most fertilizer per unit area, with an average of 145 kg per hectare (2-fold that of Turkey average). Approximately 20% of the fertilizer especially nitrogen fertilizers consumed in Turkey is used in the region [3], [13]. There are 14 surface waters monitoring stations in the basin [14].

Point sources which result in surface water pollution in Ergene Basin are domestic and industrial pollutant sources. Diffuse sources are agriculture areas (chemical and natural fertilizers), meadow and forest areas, urban and rural settlements, vehicle emissions, and irregular solid waste landfills [2], [3], [15]. Between the nutrient loads coming from point and diffuse sources in Ergene Basin, diffuse sources have a considerable share (Table 1), and TP load is considerably low compared to that of TN [2].

Table 1. Distribution of point and diffuse pollutant loads in the basin [2]

TN (24 000 tons/year)		TP (2700 tons/year)	
Loads from Diffuse Sources	Loads from Point Sources	Loads from Diffuse Sources	Loads from Point Sources
86 % (82% from *agriculture)*	14 %	83 % (92% from *agriculture*)	17 %

It is seen that diffuse sources' contribution to the nutrient load in the basin is 86% for TN and 83% for TP, which are both considerably high. Considering the load distribution of the diffuse sources in the basin, it is seen that the chemical and natural fertilizers constitute nearly the total load (83% TN, 93% TP).

Diffuse sources which lead to the pollution of the surface water sources in Ergene Basin are agricultural areas (chemical and natural fertilizers), meadow lands and forests, urban and rural settlements, industrial areas, vehicle emissions, and leachate of "wild dumping" areas [2], [3].

In order to determine the nutrient loads from agriculture and examine the change by years, the number of animals (cattle, small cattle, poultry) obtained from Turkish Statistical Institute, unit loads, type and amount of chemical fertilizers obtained from the Provincial Directorate of Food Agriculture and Livestock of Edirne, Tekirdağ and Kırklareli, and active nitrogen and active phosphorus conversion factors [16] were used. Since it is not accurately possible to determine the size of the diffuse loads, in an attempt to estimate the nutrient loads caused by the use of fertilizers, some assumptions were made during the practice of selected estimation methods (Table 3). Nutrient (N and P) loads of agricultural diffuse sources were estimated to be the total annual load based on the variety of transport mechanisms within the annual water cycle [17], [18]. Data on use of fertilizers were obtained on the basis of administrative boundaries (Edirne, Tekirdağ and Kırklareli). In the calculation of nutrient loads from agricultural areas, chemical and natural fertilizers and losses were taken into account. Nutrient loads of diffuse sources were deemed to expand homogenously throughout the basin, and not to change from its source to surface water.

Table 2 - Land-use in Ergene Basin [3]

Type of land-use	Area (ha)	Area (%)
Agricultural areas	819862	75.7
Forests	168778	15.6
Urban settlements	51669	4.8
Rural Settlements	25630	2.3
Meadows	11459	1.1
Industrial areas	5075	0.5

Table 3. The assumptions made in the calculation of TN and TP loads [2]

	TN	TP
Cattle Unit loads (kg/animal/year)	10	5
Small cattle Unit loads (kg/animal/year)	5	1
Poultry Unit loads (kg/animal/year)	0.2	0.05
Losses from soil to receiving environment	% 15	% 3

In order to examine the consumption of pesticide in the basin by years, pesticide sale amounts were obtained on the basis of administrative boundaries from the Provincial Directorate of Food Agriculture and Livestock of Edirne, Tekirdağ and Kırklareli.

3. RESULTS AND DISCUSSION

In Ergene Basin, we can see that agricultural areas have the highest usage share (rate of 75.7%) (Table 2). It is seen in Table 1 that nutrient loads from diffuse sources in the basin is 86% for TN and 83% for TP and the chemical and natural fertilizers constitute nearly the total load (83% TN, 93% TP). In other studies [19]-[21], it is stated that the agricultural activities have been historically, and the dominant nitrogen sources as well.

We can see the chemical fertilizer consumption in Ergene Basin from 1994 to 2015 in Figure 2.

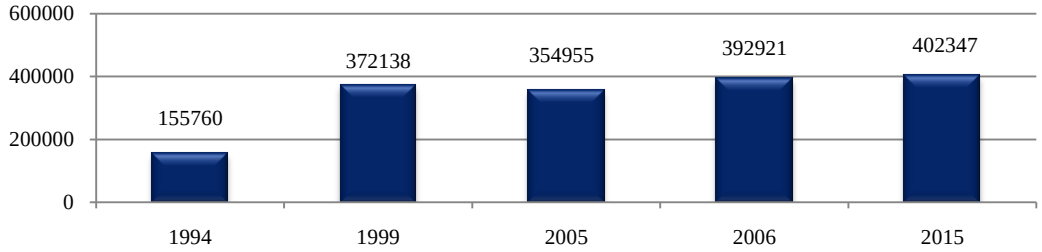

Figure 2. Chemical fertilizer consumption in Ergene Basin by years (tons)

When we examine the amount of chemical fertilizers used in the basin in the 20-year period (Figure 2) we can see an increase. In this case, N and P load is considered to be increased by years as we see in Figure 3.

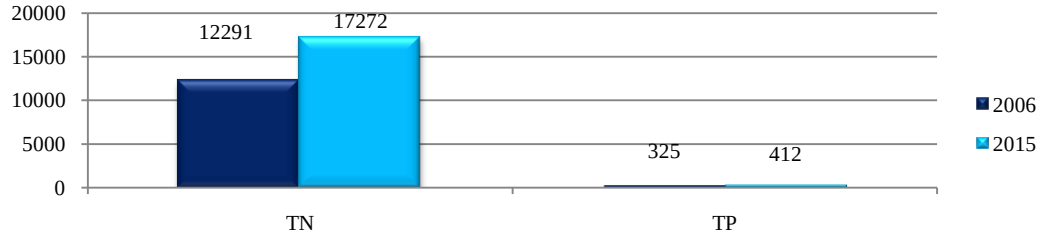

Figure 3. Nutrient loads from chemical fertilizers in Ergene Basin from 2006 to 2015 (tons/year)

When we examine the Figure 3 we can see an increase 41% of TN and 27% of TP. We can see the nutrient loads from natural fertilizers in Ergene Basin from 2001 to 2015 in Figure 4.

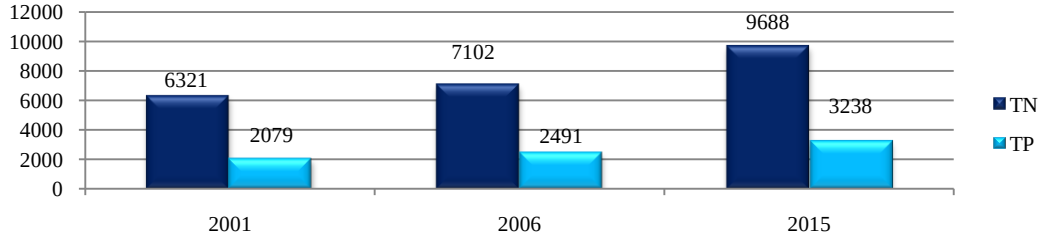

Figure 4. Nutrient loads from natural fertilizers in Ergene Basin by years (tons/year)

When we examine the nutrient loads from natural fertilizers in Ergene Basin by years (Figure 4), by almost 55% increase for both of TN and TP are seen in recent 15 years. We can see the total nutrient loads from diffuse sources in Ergene Basin from 2006 to 2015 in Figure 5.

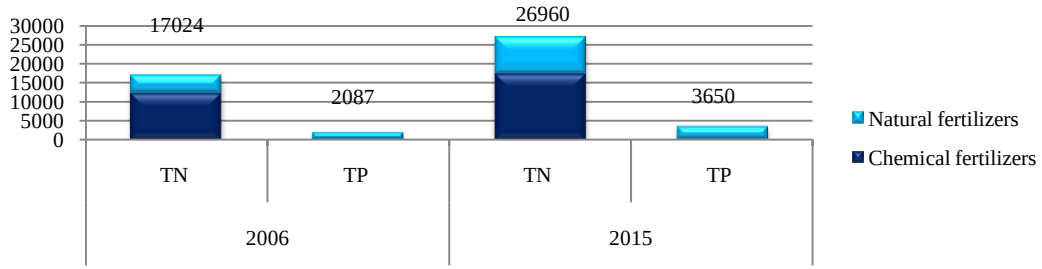

Figure 5. Total nutrient loads from agricultural sources in Ergene Basin from 2006 to 2015

When we examine the total nutrient loads from diffuse sources in Ergene Basin in the 10-year period (Figure 5) we can see an increase 58% of TN and 75% of TP.

Agricultural activities have decreased in the basin where the fertilization is 2-fold that of fertilizer consumption in Turkey [2], [13]. However, agriculture sector is still among the most important factors that shape socio-economic structure of the basin. Furthermore, it is estimated that fertilizer usage will continue at significant rates. When we consider the fact that the global climate change affects the hydrological cycle and nutrient transport, it seems that the fertilizer usage control is vital for agricultural production [2], [22], [23].

In order to decrease nutrient loads from natural and chemical fertilizers in agricultural areas, farmers should be informed; good agriculture practices and organic agriculture should become widespread, incentives for the recycling of organic

manure should be improved; fertilizer management system should be used to prevent excessive fertilizing for plants and tighten the regulations and national standards on organic waste disposal and pesticides use [4], [7], [24], [25]. To protect the water and soil we can enhance plant nutrition through balanced measures that include crop rotations with N-fixing crops, judicious use of organic and inorganic fertilizers. Besides lime can be used to regulate high soil acidity; a protective organic cover on the soil surface must be enhanced and maintained by using cover crops and crop residues [26]. Being an important environmental problem in the basin and increasing the transportation of nutrient materials, erosion should be decreased by means of afforestation, meadow development, tillage and crop residue management, buffer strips, riparian zones, terracing, contour tillage, cover crops, impoundments, wetlands and suitable agricultural methods. These practices tend to reduce rainfall impact on the soil surface, reduce runoff volume and velocity, and increase soil resistance to erosion. The response to management change can range from months to centuries and differ along the soil (5 to 15 years), river (1 to 5 years), and lake (10 to 30 years) watershed continuum [4], [12].

We can see the pesticide consumption in Ergene Basin from 2001 to 2015 in Figure 6.

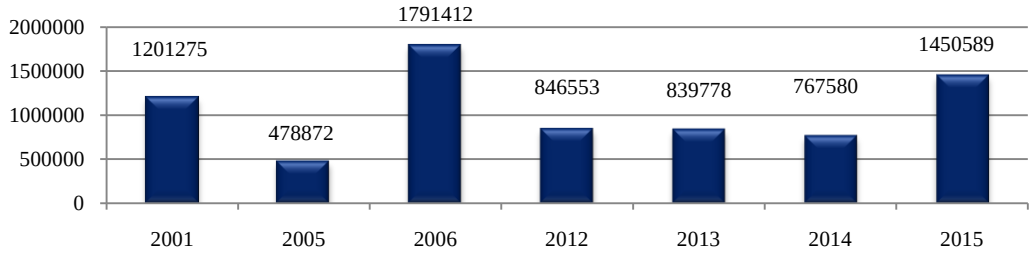

Figure 6. Pesticide consumption in Ergene Basin (kg-lt)

When we examine Figure 6, an increase from 2001 to 2006 and a decrease from 2006 to 2014 are seen. This decrease may be due to the trainings and regional studies of the Ministry of Food, Agriculture and Livestock. But off the record fertilizer and pesticide use in the region is also known. But a significant increase (89%) is observed the last 1-year period. However, because of the incorrect and intended land use the agricultural fields have been decrease and amount of fertilizers and pesticides used per area have been increase. Pesticides are often considered a quick, easy, and inexpensive solution for controlling pests. However, pesticide use causes a significant cost. The economic impact of pesticides in non-target species (including humans) has been estimated at approximately $8 billion annually in developing countries. Pesticides have contaminated almost every part of our environment. Pesticide residues are found in soil, air, in surface and ground water across the countries. Pesticide contamination poses significant risks to the environment and non-target organisms ranging from beneficial soil microorganisms, to insects, plants, fish, and birds. What required is to weigh all the risks against the benefits to ensure a maximum margin of safety. All activities concerning pesticides should be based on scientific judgement and not on commercial considerations. The best way to reduce pesticide contamination (and the harm it causes) in our environment is for all of us to do our's part to use safer, non-chemical pest control (including weed control) methods [9].

Long-term monitoring is essential; which should include baseline, extreme, and representative sites. Also, it was suggested that a few selected sites should be intensively monitored in conjunction with a larger number of less intensively monitored sites. Adequate long-term (10 years) monitoring of catchments is essential to reliable model calibration; however, there is often a limited amount of long-term water quality data that would be sufficient to estimate nutrient and sediment loads in streams (representative of storm and base flow). A well-distributed network of monitoring stations across all land uses, topographic conditions, and sub-catchments of the larger catchment would assist in model evaluation and verification when estimating at smaller scales. Legislation to ensure the continuity of long-term monitoring, cross-media monitoring at different scales such as field, farm catchment, sub-basin and basin and detailed information on soil and farm management are needed [2], [3], [12].

Despite 14 surface waters monitoring stations exist in the basin [14], there is no long-term, systematic water quality monitoring data. Similar studies [2] and [12] highlight the importance of the need for systematic monitoring in order to determine the trends and achieve reliable results. Not only the water quality data but also the other media (soil, air) should be monitored simultaneously in the basin by environmental information systems. Determination of surface water quality is not capable alone. Therefore; the necessary data for future studies in Ergene Basin must define the land use, all water resources in the basin of the river sub-basin scale, quality, quantity and usage patterns in a systematic way by using geographic information systems. In order to obtain the water quality data systematically, water quality monitoring stations should be established at intervals to show the characteristics of the basin; water and sediment quality and hydrology parameters of the river and its tributaries should be measured regularly. At the same time water quality monitoring stations should be in the same zone with stream gagging station [24], [27]. Water quality data must further be related to the information on both catchment characteristics (e.g., soil properties, drainage conditions, contribution from point sources) and agricultural activities such as crops grown, fertilization regimes, and soil cultivation practices. Access to such data is crucial for the interpretation of water quality data. Thus, the inherent landscape and management characteristics of monitored catchments must be stated, so that they can be related to surrounding agricultural areas where less information on agricultural management and nutrient loads are available. This would improve the applicability of monitoring results for larger agricultural areas [12].

4. CONCLUSION

In this study, it is aimed to determine the nutrient loads from agricultural diffuse sources of Ergene Basin by years; it is found that the data of annual TN and TP loads increased. In order to decrease total annual loads, first of all, land-uses should be proper and suitable for the usage purposes; this is only possible by means of a sustainable basin management. Proper land usage ways should be determined by urban and local planners, and local decision-making mechanisms in accordance with national plans and regulations. In addition, there should be important sanctions for auditing the performance of these plan stipulations. In order to prevent the environmental pollution, development policies should be improved and basin management must be operated based upon those policies. In Turkey, basin management is a new concept and it is not implemented nationwide. Integrity of the Ergene River ecosystem has long been under pressure for the last three decades of the all pollutant sources from the basin and, in fact, the river ecosystem has suffered a collapse in the downstream region. The change in Ergene River does not only affect its own ecosystem, it also ruins three different ecosystems as well. Nutrients, organic substances, suspended solids and specific pollutants are carried by Ergene River through the Meric River, Lower Meric Delta and Aegean Sea (Gulf of Saros) ecosystems [28]. Lower Meric Delta is one of the important bird areas and any changes in the area based on the nutrients will affect the aquatic life, food chain will be destroyed, and biological diversity will be adversely affected. A decrease in the biological diversity will result in the extinction of predators and the decrease of performance in the natural and cultural production; thus, the use of chemicals in the agricultural production will increase.

Sustainable agriculture outcomes can be positive for food productivity, reduced pesticide use and carbon balances. Also it will minimize specific soil threats such as soil erosion by wind, water, and tillage, and soil compaction and physical deterioration and the loss of biodiversity from the soil. Significant challenges, however, remain to develop national and international policies to support the wider emergence of more sustainable forms of agricultural production [29].

Spatial and temporal distribution of pollutant sources should be determined within sub-basins through periodic monitoring, and water quality model studies should be conducted on Ergene River and its reaches. In this way, the changes by biochemical processes from the source of total loads to the receiving environment will be taken into account, and the detected process schemata will be a useful tool for basin management. It is believed that the non-ecologic basis of the land-use and consideration of administrative boundaries rather than sub-basins in basin management, lead to management failures in determination, management and audit of pollutant sources.

It is assumed that it will be a great step in the basin management to estimate the total ecological costs (agricultural, economic and social) caused directly or indirectly by the nutrients and other pollutant loads in Ergene Basin; and to place these values into national and regional development plans.

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Data Rate Measures For 4G Mobile Networks In Albania

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Abstract

Companies of mobile telephony operate in a highly competitive market. Subscribers, with the possibilities given to them to change the operators, can easily change network based on the services offered to them. Due to this, all mobile operators which aim to grow and establish a better position in the market they operate, are involved permanently in offering better services for their current and pretended subscribers. The quality, the speed and all related values to data offered are fields which the operators in Albania aim to improve. From 4 Mobile Operators in Albania, 3 of them offer 4G LTE data service. This paper focus on measuring how real the data values declared by them are and how good is the quality of 4G LTE service offered. Through this paper we will discuss over different measures made in Tirana city related to rate fluctuation of uplink and downlink throughput of data service. The measures are located in 6 different points in Tirana city, which are chosen based on the traffic rate. Measures (made at the same day and time for all the operators in order to have equality) are realized through a Huawei LTE modem for FTP DL/UL.

Keywords

4G LTE, Data Throughput, LTE modem

1. INTRODUCTION

The mobile telecommunication industry operates in a high speed growing market. This is a dynamic area in which every operator needs to stay up to date in order to be competitive and to get as soon as possible competitive advantages. Based on the services offered in this industry the one which has had the most frenetic growth and is growing more and more is the data service offered to subscribers. The data network is developing with galloping steps. In a short period of time we have been witness of going through 2G to 3G and now a days Albanian operators offer 4G LTE technology.

LTE is a network with only eNode-B nodes, and it can be considered as a changed core network that has replaced GPRS core network made from the GGSN (Gateway GPRS support node) and SGSN (Serving GPRS support node) nodes.

In this core network we face some other nodes like: MME (Mobility Management Entity), HSS (Home Subscriber Server), SGW (Serving Gateway) etc. In Albania the number of internet users and specifically of 4G LTE users has seen a growth from year to year. Related to the number of internet users in mobile phone, it varies from 45% to 50% of population. In Albania there are 4 mobile operators, from which 3 of them offer 4G.

This paper will concenter in the upload and download speed offered from the operators. The tools used for the drive test and the further analysis are as per below:

- TEMS Investigation Software
- Two Samsung Galaxy Note 4 mobile phones, 1 x PCTelscanner, 3 x Huawei LTE modem.
- One Laptop Computer, 1 x GPS, TemsDiscovery Tool, ActixTool

2. TEST METHOD

- Huawei LTE modem used for FTP DL/UL in six different points in Tirana City with same radio conditions for 3 operators.
- One scanner for LTE network.

USB LTE stick E3272 [1] supports the maximum speed 150 Mbit/s downlink and 50 Mbit/s in the uplink, which corresponds to LTE category. For its use are needed some drivers (which installs on the first usage), for further connections there are not needed further actions.

- Huawei E3272 can use worldwide:
- LTE: 800/900/1800/2100/2600 MHz
- UMTS: 900/2100 MHz
- GSM: 850/900/1800/1900 MHz

It can be used with both Windows and Mac OS like Windows system from XP (Service Pack 3), Windows Vista (Service Pack 1), to Windows 7 or Windows 8, alternatively you can of course also use it with MAC OS.

We have used TEMS Investigation [2] because it supports the most part of recent technologies, thus it has been seen as the most appropriate tool for this kind of test. It is relatively easy to be used since it can be positioned by the device that was used to make the measure and then with very simplicity the test maker could make the test. It can be used for specific and updated to customer need scenarios like in our case.

3. RESULTS

All measures are made in 45 points in the city of Tirana. 45 points are grouped in 5 main divisions. Grouping is realized according to similarities of the measure points. So the results are expressed analyzed and grouped in the following main divisions: Coffee area, Hotel, Residential Area, Shopping Mall and University. All the measures are made in Tirana city, which is the capital city of Albania. Tirana [3] has a population of 811,649 persons with a density of about 450/km2. Tirana is the most populated area in Albania where the migration process is very high.

Measures are made during 1 week and take in consideration only 3 (Eagle Mobile, Vodafone, AMC) from the 4 mobile operators because only 3 of them offers 4G [4].

The below graph shows the information related to Ping Avg.:

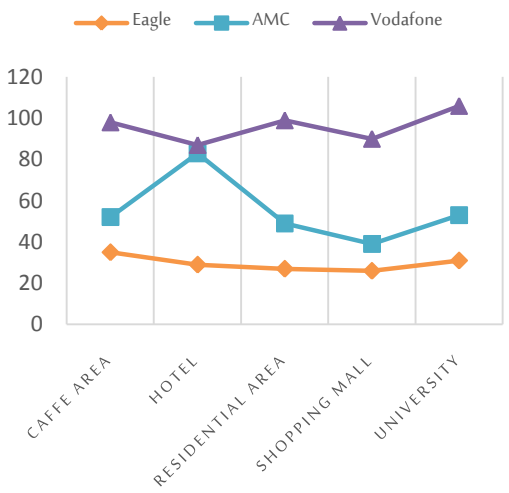

Figure 1. Ping avg.

From the graph we can easily see that the best connection with the antennas belongs for Vodafone operator, then it comes AMC and the last is Eagle Mobile.

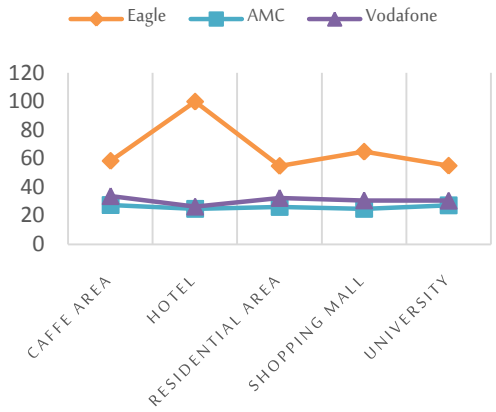

Figure 2. Information related to dl max throughput (Mbit/s)

Related to DL it is seen that the Max Throughput is in the Hotel area and belongs to Eagle Mobile operator. It has a value of 99.93 Mbit/s.

Figure 3. Information related to dl avg. throughput (Mbit/s)

Also it is seen that the highest average throughput related to DL belongs to Eagle Mobile operator. In all the 5 divisions this operator has an upper DL throughput than the other operators.

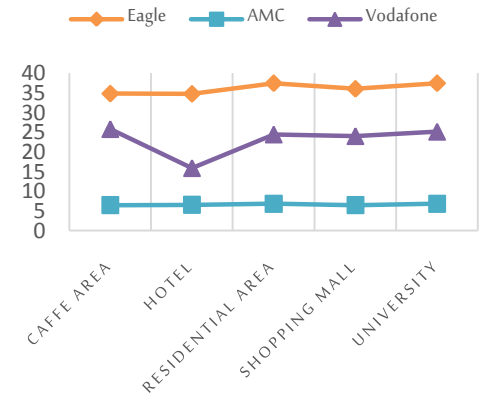

Figure 4. UL max throughput (Mbit/s)

In the UL throughput we have noticed a smaller fluctuation. The values are closer to each other. Even in this case Eagle Mobile operator has the highest values where the max value reached in the residential area with 37.46 Mbit/s.

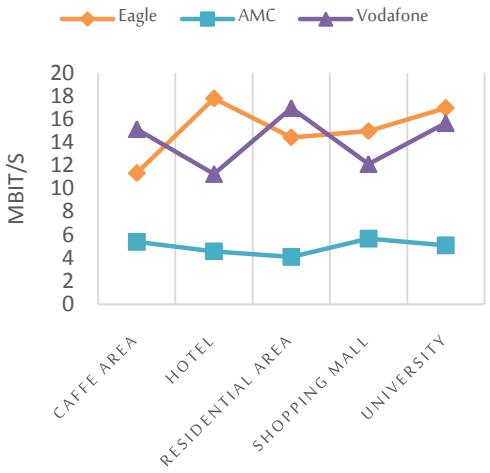

Figure 5. UL avg. throughput (Mbit/s)

In the average throughput of UL there are 2 operators which alter with one another for the highest values (EM and Vodafone). The areas with the highest values are Hotel and Residential areas.

3.1. ANALYSIS

The above table shows information related to mean, median, standard deviation, max and min of measured values. Median values are chosen because since the measures are made in different locations and with irregular schedule the median value describes better the average trends of distributions of both DL Avg. Throughput (Mbit/s) and UL Avg. Throughput (Mbit/s). Standard deviation shows how spread are the values measured. Maximum and minimum data shows the upper and the below value that are measured. From the measured we have noticed that the max values for DL Avg. Throughput (Mbit/s) are measured in Hotel area and belongs to Eagle Mobile operator (60.36 Mbit/s). The min values for DL Avg. Throughput (Mbit/s) are seen in Residential areas
(17.1 Mbit/s). The max values for UL Avg. Throughput (17.81 Mbit/s) are measured in Hotel area and the min values for UL Avg. Throughput (4.09 Mbit/s) are seen in Residential area.
The area with the maximum standard deviation is the hotel area and the area with the least standard deviation is the University area.

Even though we have measured some cases of good UL or DL throughput the averages of all areas are not excellent all the cases, related to the values of 4G LTE that the operators claim to have in the best scenario (100 Mbit/s in downlink and 50 Mbit/s in uplink).

Table 6. Analysis table

AREA		MEAN	MED.	ST.DEV	MAX	MIN
Caffe	DL	23.56	21.31	3.62	28.67	20.71
Hotel	DL	33.21	20.80	19.22	60.36	18.48
Residential	DL	23.70	24.65	5.04	29.34	17.10
Shop.Mall	DL	27.09	23.79	7.08	36.93	20.55
University	DL	24.67	24.29	0.97	26.00	23.72
Caffe	UL	10.63	11.35	4.00	15.14	5.41
Hotel	UL	11.22	11.27	5.40	17.81	4.58
Residential	UL	11.83	14.44	5.57	16.96	4.09
Shop.Mall	UL	10.93	12.13	3.89	14.98	5.69
University	UL	12.58	15.66	5.32	16.99	5.10

4. CONCLUSION

Through this paper we have displayed the results of different measures made in Tirana city for 3 mobile operators who offers 4G LTE data service. From the measures we have analyzed the data and have deducted the standard deviation for the areas under control and also the max and min uplink and downlink throughput for all the locations.

So for a summary we can say that the values that we have measured have reached the max values in DL and UL. But this values are measured only in one area, from one operator. Meanwhile the values in the other areas are far away from the

rates of 4G LTE (100 Mbit/s in downlink and 50 Mbit/s in uplink). But we deduct that for a better analysis and for deeper information an analysis in a longer period of time and with more samples should be made.

ACKNOWLEDGMENT

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An Engineering Approach to Develop a Mathematical Model for Sustainable Population

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Abstract

Sustainability has been linked with every aspect of present day civilization except size of human population. We talk about sustainable environment, sustainable economy, sustainable education, etc. and end up listing "… and also human population" at the end of the causes of environmental degradation, bad economy, inadequate education etc. Practically, the study of natural ecosystems alone is not getting us anywhere. We have to discuss these aspects for each political ecosystem as defined by the geographical boarders of states as recognized by the UN and consider the human population in each state and determine the sustainability of its size. Political states and their populations have been suffering from the consequences of overpopulation for a long time. Indications of their continuously degrading environment, poor economy and unemployment are undeniable. On the other hand the size and distribution of the population of each state is well documented. Our primitive population model is considering the population distribution diagrams as a basic block with the net births each year as input to this block and the number of people that retire each year as the output. The difference between these numbers for each state will be the number of people that are expected to be unemployed when they reach the age 21 or 22 for university graduates plus the age group (15-24) that has not gone to university. We make a case study for some states and compare their present day unemployment. We open the development of unemployment mathematical model to other interested researchers for further development and collaboration.

Keywords

Demographic distribution, Engineering model, Sustainable population, Unemployment

1. INTRODUCTION

Increased use of water and energy

Sustainability has been linked with every aspect of present day civilization except size of human population and the human population density which can be measured as average population/km2 for each country. We talk about sustainable environment, sustainable economy, sustainable education, etc. but never sustainable population. Is this intentional or merely a coincidence is not very clear.

Countries are ecosystems or parts of a larger natural ecosystem, surrounded by their political boundaries. Their populations are (or should be) responsible for the safety of their part of the natural ecosystem. It is clear however, that global warming and pollution, which seem to be here to stay for a long time, are resulting due to lack of responsibility of world countries (their populations)! It is obvious that if world population was one billion instead of 7.3 billion, no country would dare to burn so much fossil fuel since doing that would not be profitable! Also, we would not be facing such a big unemployment problem for so long. It seems that unemployment especially among the young is also here to stay. It also seems that global warming and the degradation of the environment is also here to stay [1].

Looking at the latest available data on youth unemployment [1] we see that unemployment rates for the European area countries is about 23% and that of France is nearly 25%, well above the present general unemployment rate of the respective countries which is about 10% [2]. Also way above the acceptable rates for countries which have "free" economies, which is about 5% [3]. These countries are considered "developed" countries, and the birth rates in most of them are below 1%.

However, the average population density of most of these countries is above 100 person/km2, (usually assumed as a norm in sustainability quantitative analysis purposes). Examples, France 122, Hungary 109, Italy 207, Portugal 113, etc. These countries are overpopulated and their birth rate is not an issue at present [4].

We shall try to open the way to quantitative analysis to be able to say about resilience what other workers in the area of sustainability have already discussed and predicted qualitatively [5], [6].

In this work we shall use an engineering approach to determine the number of relevant extra births for a country that would contribute to the young unemployment of that country. We assume that the country of concern has no migration (to or from) for that particular year.

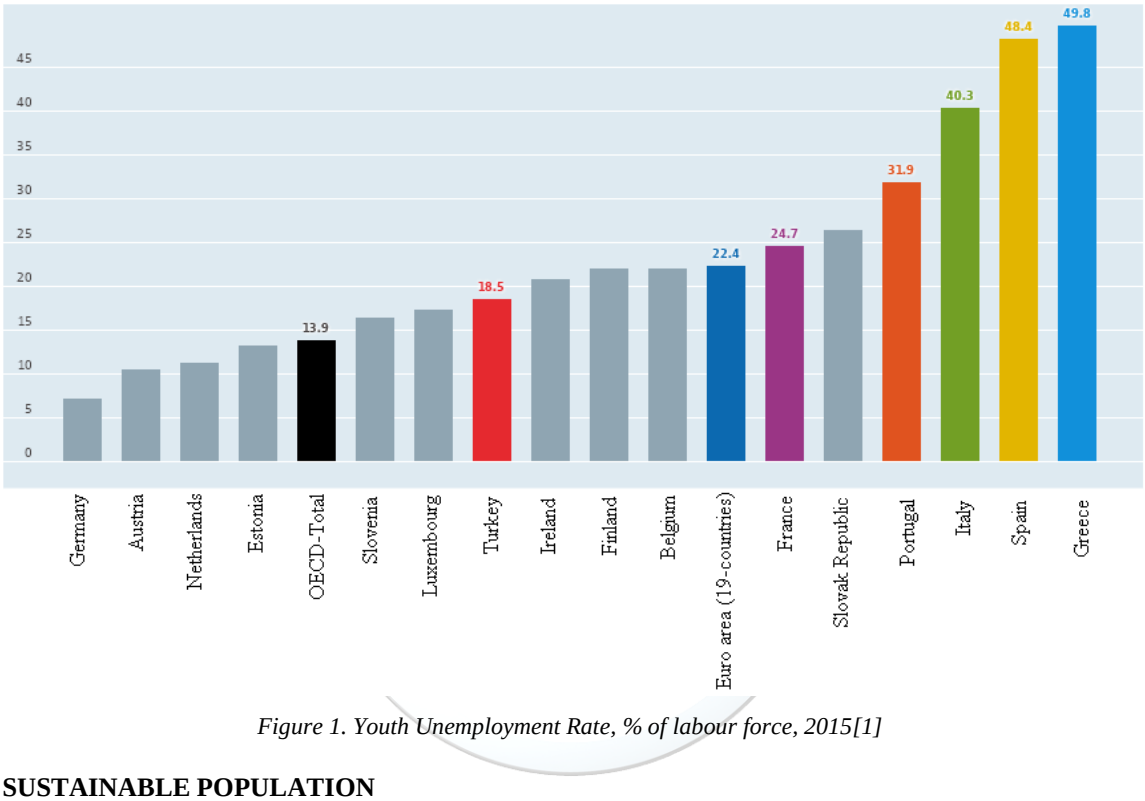

Figure 1. Youth Unemployment Rate, % of labour force, 2015[1]

2. SUSTAINABLE POPULATION

We shall explain our engineering approach by illustrating the steps to be taken for the calculation of extra yearly births that contribute to young unemployment. We shall consider in particular European area countries that have low birth rates but have exceeded the assumed carrying capacity of their ecosystems (100/km2 or there about). These countries are, France, Hungary, Spain, Italy and Turkey. The details will be worked out according to available demographic data. When exact data is not available we shall make reasonable assumptions (such as averaging some figures etc.).

Consider the demographic distribution of a particular country for a particular year. Taking the number of young people who are 15 that year to be (15-24)/10 as input to the work force and the number of population reaching the age of 65 as output from the work force, we see the following three possibilities (we assume equal yearly births and survival numbers (advanced stable population);

1) If population @ 15 = population @ 65 in number there will be no contribution from the 15 year olds to young unemployment.

2) If population @ 15 > population @ 65 there will be contribution to young unemployment, which also means that more births took place 15 years ago.

3) If population @ 15 < population @ 65 then fewer births have taken place 15 years ago.

   This also means that there is more money available for the young employed (resulting from larger number of retired people), hence positive contribution to economic growth.

It is obvious that comparing the numbers of jobs being made available to the age 15 group to jobs becoming available due to retirement of age 65 does not mean that a job vacancy of a 65-year-old will be given to a 15-year-old. What this implies is that the budget resulting from 65-year-old retirement shall be used to create appropriate jobs for the 15-year-old.

3. THE PROPOSED MATHEMATICAL MODEL

From the information we gather from yearly published data on population demographics we can generate Table 1, with the following columns:

a) The first column we list % of young (15-24) unemployment a particular year, say the year 2015.

b) Knowing the population distribution for the year 2015, we determine the total number of young population (15-24) as listed in column (b).

c) From (b) we find the number of unemployed young by multiplying (a)&(b).

d) Consider the number of births @ year 2000 to determine population overshoot contribution.

e) Assuming no input from migration, subtract one tenth the number of (c) from (d) to find the population overshoot due to too many births.

NOTE: This calculation can be made more accurate detailing yearly demographic, but it is not necessary for our purposes in this work.

The calculations above have been made for the European area, France and Turkey as shown in Table 1 below.

Table 1. Year 2000 Population overshoot for some countries

Country	(a)%	(b)(15-24) Persons	(c)(15-24) Unemployed	(d)2000 Births	(e)Overshoot
France	24.68	11,640,263	2,872,817	774,782	487,500
Hungary	17.30	1,669,624	288,845	98,000	69,116
Spain	48.35	6,449,045	3,118,113	397,632	85,821
Italy	40.33	8,372,141	3,376,484	543,039	205,391
Turkey	18.52	20,701,736	3,833,962	1,389,000	1,005,604

4. CONCLUSIONS

From the table it is clear that economic crisis resulting from high unemployment follows from high birth rates. Now it could be argued that birth rates cannot be controlled because of human rights. But human responsibility is also a virtue which is granted for humans only. So why not remind the human race of this virtue.

It is clear that the political ecosystems occupied by countries presently indicate that their carrying capacity is exhausted. An international call should be made to all countries to assume responsibility.

We should remember that throughout history humans have come together to form families, groups, clans, nations which are extinct today. It is obvious from historical findings that the previous human societies were not resilient. If we can predict that a flat tire in a highway can deter our journey (thus we carry a spare tire) we should also be able to predict that if we do not save enough natural resources in our ecosystems, then we cannot continue the journey of civilization. It will be interrupted for sure and the human offspring will have to start all over again!

Finally, we see that a simple input – output model can help to have a bird's eye view of population progress in a human society and helps to predict what actions need to be taken for longevity of our ecosystem.

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Quantitative and Qualitative Aspects of Remittances, Comparative Analysis of Albania and Macedonia

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Abstract

The issue of emigration is a very important concern for Albania and Macedonia due to the fact that a high percentage of their population has left the countries in the last two decades, making these two countries one of the countries with the highest emigration percentage flows in the world. Migrant remittances are an increasingly important source of income for both countries. For these two economies, remittances are the largest type of international financial inflow and are larger than either capital inflows or official development assistance. These remittance inflows have allowed domestic consumption and investment to be substantially higher than what would have been possible otherwise and have contributed significantly to the developmental prospects of these two economies. In addition, the outflow of labor from these economies has helped to relieve chronically high unemployment which has characterized them since the transition process began in the early 1990. This paper analyses the quantitative and qualitative aspects of the remittances flows and highlight migration issues that are of specific context for Albania and Macedonia, respectively.

Keywords

Remittances, Migration, Quantitative, Qualitative, Albania, Macedonia

1. INTRODUCTION

Increased use of water and energy

Remittances have grown rapidly in recent years and have proved to be a stable source of finance for many countries, which can be of relief during difficult economic times. Albania and Macedonia are interesting case studies for various reasons. Firstly, they are countries that have experienced extensive emigration. Large number of Macedonia's and Albania's populations has emigrated. Secondly, South-Eastern Europe is the region that receives one of the highest amounts of remittances in the world. Albania and Macedonia, as small Southeast European economies, have been receiving a growing amount of remittances throughout the years. There are a high percentage of remittance-receiving households at national level in both Albania and Macedonia.

2. LITERATURE REVIEW

Migration and remittances may have important economic consequences. It is widely acknowledged that remittances have positive effect on the receiving country. Money sent by emigrants can reduce the poverty and generate substantial welfare gains for migrants and their families (WB, 2006). Large size of remittances relative to other external flows and to the GDP indicates that macroeconomic effects are also substantial. Remittances flows can influence the foreign exchange rate, domestic interest rates, and the balance of payments. Large inflows can also have some undesirable side effects weakening the institutional capacity of the state.

Earning remittances through emigration is seen by most Albanians as the most effective way of coping with the country's very difficult economic conditions and ultimately to escape poverty at the individual and household level (De Soto et al., 2002). Albanian migrants working abroad have sent home remittances variously estimated (because of the uncertainty over the volume of unrecorded transfers) to be somewhere between $300 million and $1 billion per annum: the country's major source of external income after aid. Put another way, the remittances sent by one Albanian migrant are equivalent to 2.5 times the sum of the average wages of all members of a family (Misja and Misja, 1995).

Connected to a long lasting migration history, remittance flows into Macedonia are remarkable. However, as in many other remittances receiving countries in the world, official data on remittances are scarce and they may significantly underreport actual money transfers, as many migrants send remittances via informal channels. By definition of the IMF and the World Bank, official remittances data include migrants' transfers in addition to workers' remittances and compensation of employees. This data cannot be calculated in the case of Macedonia, because the Macedonian national bank records migrants' transfers as part of cash exchange which also incorporates payments for unrecorded trade and services. An estimation which included all three remittances categories found remittances in Macedonia to amount to 15.2% of GDP in 2004 (Mansoor and Quillin, 2007).

3. QUANTITATIVE ASPECTS OF REMITTANCES

3.1. QUANTITATIVE ASPECTS OF REMITTANCES IN MACEDONIA

Remittances constitute an increasing source of revenue for many families in the former Macedonia. At a macro level, remittances finance the balance of payment (i.e. without remittances the current account balance would deteriorate) (Markiewicz, 2006). In fact, is among the top 30 developing countries with respect to the highest remittances received as a percentage of GDP, 11th, and with the highest remittances per capita, 278th in 2002 and that makes it the 14th, (OECD, 2006).

What constitutes remittances varies from one source to another. For example, the figures show different amounts when considering the National Bank of Macedonia (NBM) and the World Bank (WB) data. The difference lies in the definition adopted. The WB one is much broader and is the summation of three components, namely: workers' remittances, compensation of employees and migrant transfers. In other hand NBM, the migrant transfers include in the cash exchange. Since this category includes also payments for unrecorded trade and services, the realistic estimate of migrants' transfers is somewhere within this range (Markiewicz, 2006).

This difference becomes even more complex when considering other sources, such as the IMF data. The figures on remittances as percentage of GDP and of exports vary dramatically according to the source. For instance, in 2002 remittances amounted to 15.2% of GDP according to the Center for Research and Policy Studies in Skopje, whereas in 2003 this constitutes only 3.7% (Schorooten, 2005). For 2005, Joanne Van Selm cites IMF figures on remittances as high as 18% of GDP. This is mainly due to the slightly different definitions of remittances of IMF: the sum of the compensation of employees, worker's remittances, and other current transfers in other sectors (Van Selm, 2007).

*Table 1: Annual remittance flows for Macedonia (BPM5 Framework)**

(US $, millions)

	Inflows				Outflows			
	Workers' remittances	Compensation of employees	Migrants' transfers	Migrant remittances	Workers' remittances	Compensation of employees	Migrants' transfers	Migrant remittances
2000	80.5	0.4	0	80.9	14.2	0.0	0	14.2
2001	68.0	5.4	0	73.4	20.5	0.0	0	20.5
2002	92.4	13.5	0	105.9	22.5	0.7	0	23.3
2003	145.7	27.9	0	173.7	15.4	0.6	0	16.1
2004	161.1	52.0	0	213.0	14.7	1.4	0	16.2
2005	169.4	57.2	0	226.6	14.0	1.5	0	15.5
2006	197.6	68.9	0	266.6	15.6	2.2	0	17.8
2007	239.2	105.8	0	345.0	22.3	2.5	0	24.9
2008	266.1	140.5	0	406.6	28.2	4.8	0	33.0
2009	260.1	121.0	0	381.2	22.3	4.0	0	26.3
2010	259.9	128.1	0	387.9	19.3	3.4	0	22.6
2011	271.3	162.4	0	433.7	20.7	3.6	0	24.3

Source: National Bank of Republic of Macedonia, Statistics, Balance of Payments Database
* BPM5: The sixth edition of the Balance of Payments and International Investment Position Manual (BPM6, the Manual) published in 1993 serves as the standard framework for statistics on the transactions and positions between an economy and the rest of the world.

Most remittances are sent from Western Europe. Based on the World Bank's estimates, more than 70 percent of remittances come from Western Europe (more than 60 percent from EU countries). While Germany, Switzerland, and Italy are undoubtedly the most prominent contributing countries, other survey-based sources also list the United States as a secondary remittance sending country (see, for instance, Roberts et al., 2008).

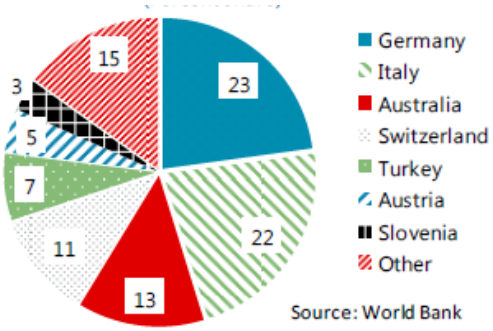

Figure 1 Origin of Remittances, 2012 (Percent share)

3.2. QUANTITATIVE ASPECTS OF REMITTANCES IN ALBANIA

The Bank of Albania calculates remittances as the difference between foreign currency coming in and foreign currency going out. This calculation does not exclude the possibility that income from suspicious activities, such as trafficking, is also taken into account.

Table 2: Annual remittance flows for Albania (BPM5 Framework)

(US $, millions)

	Inflows				Outflows			
	Workers' remittances	Compensation of employees	Migrants' transfers	Migrant remittances	Workers' remittances	Compensation of employees	Migrants' transfers	Migrant remittances
2000	530.8	67.0	0.0	597.8	0.0	0.0	0.0	0.0
2001	614.9	84.4	0.0	699.3	0.0	0.0	0.0	0.0
2002	643.4	90.1	0.0	733.6	0.0	0.0	0.0	0.0
2003	778.1	110.6	0.0	888.7	0.0	4.1	0.0	4.1
2004	1,028.4	132.3	0.0	1,160.7	0.0	4.9	0.0	4.9
2005	1,160.7	129.0	0.0	1,289.7	0.0	6.5	0.0	6.5
2006	1,175.6	183.9	0.0	1,359.5	0.0	26.5	0.0	26.5
2007	1,304.6	163.5	0.0	1,468.0	0.0	9.9	0.0	9.9
2008	1,225.5	269.5	0.0	1,495.0	0.0	15.9	0.0	15.9
2009	1,091.2	227.3	0.0	1,318.5	1.4	8.6	0.0	10.1
2010	924.3	231.7	0.0	1,156.0	8.9	15.3	0.0	24.2
2011	965.0	196.8	0.0	1,161.8	7.0	14.2	0.0	21.2

Source: IMF Balance of Payments Database

With over a million Albanians living outside of the country, it is no surprise that both research and politics increasingly pay attention to the role of these emigrants. Many emigrants send remittances, with an immediate impact on the disposable household income of family members left behind. Indeed, remittances have been considered a major factor for boosting consumer expenditure in Albania, and are widely credited for fuelling the construction sector in the country. Figure 2 shows that the total amount of remittances sent to Albania has steadily increased between 2001 and 2008. Very broadly, this increase seems to correspond to the increasing number of Albanian emigrants. The highest amount of remittances recorded was in 2008 with 1,495 million USD. This is equivalent to 11.5 percent of the annual GDP that year, highlighting the important role that remittances play in the Albanian economy.

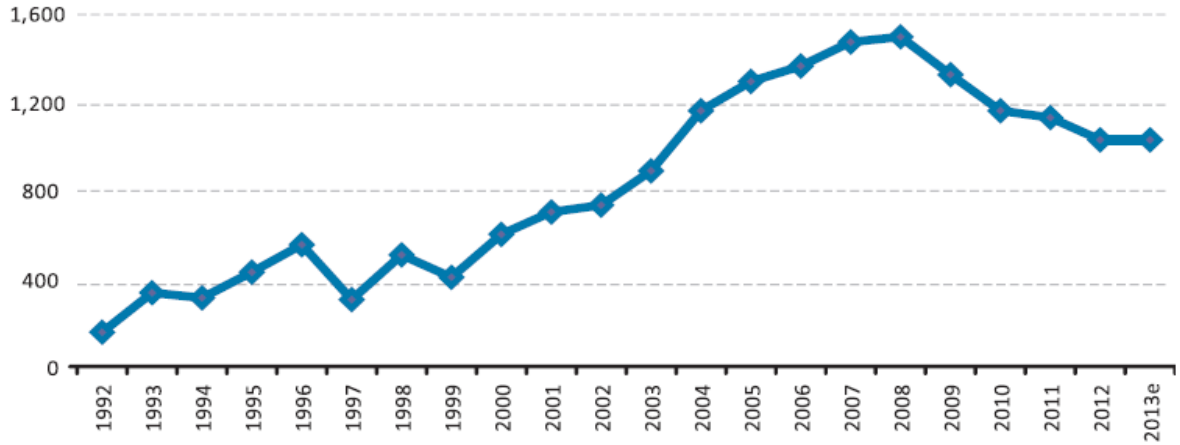

Figure 2 In-flow of remittances, 1992 – 2013, in millions of USD
Source: World Bank: Migration and Remittances data (updated as of January 2014).

During the same period, Albania enjoyed considerable and uninterrupted economic growth at an average of 5.9 percent annually (2003 – 2008). In the wake of the Great Recession, as Figure 3 illustrates, the flow of remittances has clearly decreased. This is directly related to the economic situation in Greece and Italy, the two countries accounting for the largest shares of remittances. Figure 3, illustrates that Greece and Italy jointly account for 85 percent of the remittances. This compares to around 85 percent of the emigrant stock in these two countries.

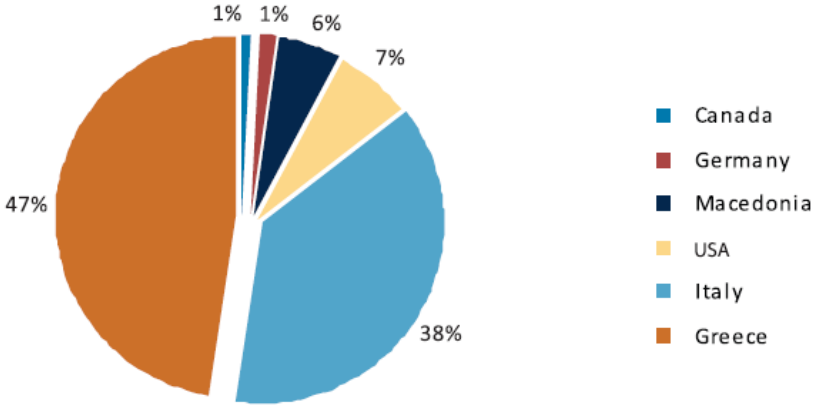

Figure 3 Remittances in 2011 by country of origin, in (%)

Source: World Bank

4. QUALITATIVE ASPECT OF REMITTANCES

4.1. QUALITATIVE ASPECT OF REMITTANCES IN MACEDONIA

There is no official governmental measurable feature of the qualitative aspect of remittances in Macedonia. However, the study done by the Center for Research and Policy Making (2007), estimates that only 15% of the financial transfers were made through official channels (i.e. banks – there is no mention of money transfer operators). The study estimated that the remainder is brought in the country either by migrants themselves or through "couriers" such as friends, relatives, coach carriers or other private tour operators, but no figures are provided. The Macedonian migrant sends home remittances very often, i.e. on a monthly or bimonthly basis. 32.4% of Macedonian Migrants are estimated to be remittance senders. Male migrants are more likely to send home remittances, although the gender discrepancy in this case is rather small. The same source reveals that 33% of the migrants believe remittances are important to their families and a World Bank study estimate that remittances constitute up to 5% of the total household expenditure (Mansoor and Quillin, 2007).

4.2. QUALITATIVE ASPECT OF REMITTANCES IN ALBANIA

The amount of remittances to Albania is three times as high as foreign net direct investments and nearly twice as much as the official development aid received by Albania (Social Policies Institute, 2007). Albanian emigrants mainly send remittances through informal channels (77.4%) – primarily by hand; and less with the formal ones (22.6%) - the banking system remaining the least preferred formal channel (World Bank, 2006). Due to geographical locality Albanians residing in Greece or Italy travel an average of 2-3 times per year to Albania and bring the money with them.

Money Transfer Operators (MTOs) dominate the formal market for money transfers to Albania from Italy (WB, 2006). The MTOs have advantages compared to the banks, such as faster transfer services, and no requirement for a bank account for

the sender. In addition, recipient migrant households in Albania lack easy access to the banking sector. The results of the emigrant households' survey undertaken by IOM in Albania in 2005 indicate that emigrant households in Albania show little familiarity with the banking system in Albania. Only 45.3% of all households in Albania maintain a bank account. When only emigrant households residing in rural areas are considered, the percentage is even lower (IOM, 2005).

Overall, the following factors seem to limit the formal transfer of migrant remittances to Albania: difficulties in accessing banking services by migrant senders in the host country, relatively slow speed of bank transfers, little trust in the Albanian banking services among senders and recipients of remittances, high transfer fees, and the strength of an informal money exchange market in Albania (De Zwager, 2005).

68.6% of emigrants send remittances back to Albania. The most common recipients are the parents of the sender, then spouse and children, followed by extended family. Financing the families' daily needs is the primary use of remittances, followed by construction, upgrading and furnishing homes; and investment in real estate. According to the results of the Living Standard Measuring Survey (LSMS) in 2002, remittances from emigrants represented 13% of the average household income, while for recipient households they represented 47% of the household income. The average size of monthly remittances was 13,600 Lek or USD 95 (IMF, 2005).

Using data from the LSMS 2012, with regard to remittances, it is possible to describe the flow of remittances from the perspective of households that receive them. The households were asked about members that were currently abroad to get information on the status of employment, remittances and some demographic characteristics. As Figure 4 illustrates, about 46 percent of current migrants send remittances at home, mostly in cash (35 percent) but also in kind, or both. The figures are well related with the status of employment, those who are currently working accounting for 66 percent.

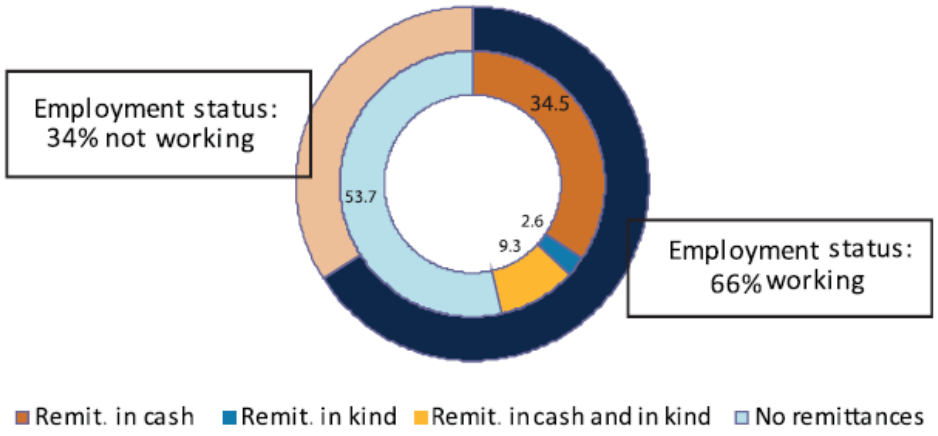

Figure 4 Flow of remittances to households during 2012 and employment status of current migrants, in (%)
Source: LSM 2012, INSTAT

Data from LSMS 2012 show that remittances are used for household expenditures and a small part is dedicated to the remittance sender's use. Only 3 percent of the migrants living currently abroad seem to send money for their own use (according to the declaration of the household). When it comes to how these remittances for the sender's use are used once sent to Albania, nearly 80 percent of the money is invested in construction work, with another 16 percent invested in business development. These estimates correspond with other studies that report that between 10 and 12 percent of remittances are invested rather than spent on household expenditure (LSMS 2002, ETF 2007, de Zwagger et al. 2010). With so much money invested in property; it is easy to see why remittances and the construction sector are seen as closely linked in Albania. These are forms of investment where remittances add to long-term development in some form, in the sense that almost all the money is invested in potentially durable products – as opposed to direct consumer spending. This said, with the figures presented here it is impossible to establish the quality and sustainability of the investments undertaken. A new building in the wrong location may end up unused, hence making no durable contribution to the country. By contrast, investments in buildings where members of the family live in reflect upgrades in living standards that are a sustainable contribution to the family and the country more widely. For example, investments in sanitation will have direct benefits for the health of the family, which indirectly benefits the country by keeping healthcare costs down.

5. CONCLUSIONS

Private transfers including remittances are a major source of financing for the large trade deficit in Macedonia. Private transfer inflows have represented a stable and major source of financing of external accounts over the past decade. The amount of private transfers in percent of GDP, in the last ten years, has fluctuated between 13 and 21 percent of GDP.

Macedonia is also an exceptional case insofar as remittances and other private transfer inflows are large enough to almost cover the entire trade deficit, thus making a key contribution to reserve accumulation and external stability in the context of the peg to the euro. Other than exports, private transfers constitute the largest source of foreign exchange for Macedonia. As a fairly stable source of financing, private transfers have contributed to the economy's resilience to the crisis.

During the last two decades, Albania received large amounts of remittances and became a main source of financing the great imbalance between the exports of goods and imports of services, by reducing the current account deficit. Inflow of remittances affects economic growth positively improving the balance of payment position and reducing dependence on external borrowing.

Remittances are an important economic source for many Albanian families too, and it appears that a significant part is invested – particularly in buildings – rather than simply spent on consumer goods. This suggests that in many cases, migration does indeed improve livelihoods with wider benefits for society such as in terms of improved health and welfare. These trends are reflected in lower poverty rates in households involving migrants, although differences may be less pronounced than they were in the past.

Both, for Albania and Macedonia, the proper measurement of remittances are essential for estimating their impact on the economy and making optimal policy decisions. There is broad consensus in the literature as well as at policy-making levels on the uncertainty of the true magnitude of remittances. Considering the critical nature of remittances for the Albanian and Macedonian economy, domestic surveys on recipient households should be conducted on a more frequent basis. These should be combined with a comprehensive census of the diaspora through consular offices, so as to allow a better understanding of the location, skills, and experience of migrants.

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Evaluation of Accounting Education Offered in Formal Education in Turkey in Terms of Infrastructure and Human Standards

-A Model Practice in Erzurum-

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Abstract

With the new Turkish Trade Act, which was introduced in 2011 in Turkey, organisation of accounting records and financial statements must be based on the International Accounting and Financial Reporting Standards. These standards are constituted and accepted on a global scale. In order to practice standards and make it the foundation for desired right evaluations, it is very important to organise accounting records and financial statements according to these standards. Ensuring compliance with standards on a global scale will allow comparable and objective accounting records and financial data to be created in the world. As a result, it will be possible to base financial and economical evaluations on right foundations. Schools' physical infrastructure, students' educational infrastructure and competency of human factors that provide and support accounting education is critically important in order to be able to provide education in compliance with these standards. In this study, we tried to determine how students, who receive accounting education in Turkey's formal education institutions, receive this education in terms of educational infrastructure and competency in humane standards by conducting a survey. With the pilot application in Erzurum city, how the competency in terms of infrastructure of accounting education and human standards is perceived in all formal education levels by people who receive this education. The survey was conducted among students who received accounting courses in high school, college, faculty, master's and doctoral level. Thus, perceptions of students, who have received accounting course in every level of formal accounting education, educational infrastructure and physical infrastructure and competency in terms of human standards were measured.

Keywords

-Accounting, Financial Statements, Accounting Education, IAS, IFRS

1. INTRODUCTION

With the introduction of new Turkish Trade Act in 2011, compliance with the International Accounting and Financial Reporting Standards became compulsory in accounting records and organising financial statements. Compliance with these standards will allow accounting records and financial data to be more comparable and lead to more accurate evaluations at a national and global level. Ensuring compliance with these standards, educational infrastructure, the physical infrastructures of institutions where accounting education is offered, and standards of human factors which affect the accounting education offered directly and indirectly, are important. Students' educational infrastructure in the beginning of the accounting education, the suitability of

accounting content to the level of education of students, efficiency of physical infrastructure of the educational institution and more importantly, competency of human factors that have direct and indirect effects on accounting education offered are important.

Achieving a high level of success in an education system depends on using several factors together and accurately. Use of all factors that produce success in education will increase the overall quality. It is the same for accounting education.

For the success of accounting education, it is important to create course content in compliance with these standards, students' infrastructures in the beginning of education and the physical infrastructure of education institutions in addition to other factors. The quality and efficiency of educators, administrators and other support staff in providing services have important effects on the quality of education. For these reasons, previous education background of students who are receiving accounting education and physical infrastructure of institutions where accounting education is offered, competency of educators and other personnel and their performance in providing services have a high impact on the quality of accounting education.

2. APPLICATION OF INTERNATIONAL ACCOUNTING AND FINANCIAL REPORTING STANDARDS IN TURKEY

With the introduction of new Turkish Trade Act in 2011, compliance with the International Accounting and Financial Reporting Standards became compulsory in accounting reacords and organising financial statements (TTA, article 64, 68, 69, and 1534). These standards are the International Accounting and Financial Reporting Standards. These standards were translated into Turkish and are accepted as Turkish Accounting Standards and Turkish Financial Reporting Standards (Akdogan, Sevilengul, 2007, 31). International accounting and financial reporting standards published within this context are translated into Turkish and published as national standards and application of these standards are obligatory since 2013. Accounting education at the high school and associate degree level are conducted within the scope of "Vocational and Technical Training Regulations" and the other legislation regarding education (www.tesk.org.tr). Accounting education at the undergraduate and graduate level is conducted within the scope of the other legislation of Higher Education and the regulations of associate, undergraduate and graduate education (Dizman, 2015, 16). Accounting education is generally offered in high school, associate, undergraduate and graduate institutions specified in the Law number 1739, Article 36. Education offered in regards to accounting standards will improve accounting applications (Yukcu et al., 1997, 20).

3. STUDENTS' EDUCATIONAL BACKGROUND IN THE BEGINNING OF ACCOUNTİNG TRAINING

The starting point of the accounting training in formal education in Turkey is the education offered in vocational high schools and high schools with multiple programs that are specified in the article 29 in the law number 1739. Previous education level of students is important for the success of accounting training because when the accounting training is given to students with strong background, the efficiency reaches to a higher level. Therefore, students' previous education background will impact the quality of education.

4. PHYSICAL INFRASTRUCTURE OF INSTITUTIONS WHERE ACCOUNTING TRAINING IS PROVIDED

Schools and places in these schools where accounting training is provided have impact on the quality of education. Physical characteristics and equipment of these places impact the quality of education. Classrooms and other units where education is provided (labs etc.) need to be designed accordingly with structure and student capacity. The number of students should be appropriate and the physical capacity needs to be adjusted according to the number of students.

5. HUMAN STANDARDS IN ACCOUNTING EDUCATION

As in education in general, in accounting education both students receiving the education, educators who are providing it, administrators and other support personnel need to have certain standards.

These standards are the education that students received previously to gain competency in order to be able to receive accounting training. In other words, students need to receive formal education previously and this education needs to have certain standards in order for the student to receive accounting training.

Educators need to have the formation, education background and up-to-date-information to offer the accounting education accurately. Educators need to be competent enough to provide accounting training by using the most accurate methods, techniques and techologies.

Administrators and other support personnel need to be supportive for the accounting training to be provided under the most suitable conditions. Administrators have the highest responsibility to create the infrastructure needed for training to be offered in suitable conditions. Administrators who undertake these responsibilities successfully in terms of physical infrastructure and equipment increase the quality of accounting education.

Technical and other support personnel have an impact on the increase of the quality of accounting training by supportive works they do. For instance, in computerized accounting classes, having computers ready for class in terms of equipment and software, providing cleaning services on a timely and accurate manner.

6. A MODEL PRACTICE IN THE CITY OF ERZURUM WHICH COVERS ALL STAGES OF FORMAL ACCOUNTING EDUCATION

6.1. Research Objective

The research objective is to determine the competency of previous education background of students who had taken accounting courses, the competency of the infrastructure of schools where accounting training is provided, the competency of accounting instructors, administrators and other support personnel, and to provide solutions.

6.2. The Scope of Research

The research is a survey application for students who have taken accounting courses in 2 Trade Vocational Schools, 2 Colleges, Faculty of Economics and Administrative Sciences of 2 universities and in master's and doctoral programs of a university in Erzurum.

6.3. Methodology of the Research

In this research, students were asked 10 survey questions about education background, school infrastructure, competencies of educators and other personnel. They were asked to answer these questions in a 5 point Likert scale.

6.4. Results of Survey Evaluations

Students were asked to answer 10 questions in 5 point Likert scale. Answer options for the questions and the percentages of answers (%) are provided below.

1 Strongly Agree 2 Agree 3 Neutral 4 Disagree 5 Strongly Disagree

Infrastructure of Accounting Education and Human Standards Survey Results (%)

Table 1. Physical environments where accounting training is done are appropriate for this training. (%)

Options	1	2	3	4	5	Total
High Schools	17	35	34	10	4	100
Colleges	14	31	32	14	9	100
Faculties	10	32	29	19	10	100
Master	10	30	40	20	0	100
Doctorate	0	10	40	40	10	100
Toplam	51	138	165	103	33	500
Average %	10	28	33	21	8	100

Table 2. The number of students per classrooms where accounting training is done is appropriate for this training. (%)

Options	1	2	3	4	5	Total
High Schools	19	40	26	13	2	100
Colleges	6	39	33	14	8	100
Faculties	9	35	25	20	11	100
Master	10	20	20	40	10	100
Doctorate	10	20	20	40	10	100
Toplam	54	154	124	127	41	500
Average %	11	31	25	25	8	100

Table 3. Formal education we receive before accounting training is sufficient to understand accounting classes. (%)

Options	1	2	3	4	5	Total
High Schools	17	42	30	9	2	100
Colleges	18	27	33	17	5	100
Faculties	6	28	29	23	14	100
Master	0	30	40	20	10	100
Doctorate	0	40	0	30	30	100
Toplam	41	167	132	99	61	500
Average %	8	33	27	20	12	100

Table 4. The content of accounting classes provided are appropriateto my education level. (%)

Options	1	2	3	4	5	Total
High Schools	23	43	23	6	5	100
Colleges	6	37	37	14	6	100
Faculties	8	33	29	22	8	100
Master	10	40	20	20	10	100
Doctorate	10	40	20	20	10	100
Toplam	57	193	129	82	39	500
Average %	11	39	26	16	8	100

Table 5. Accounting training is done in accordance with methods and techniques that make learning easier. (%)

Options	1	2	3	4	5	Total
High Schools	19	36	31	9	5	100
Colleges	9	34	37	13	7	100
Faculties	7	27	31	22	13	100
Master	0	20	20	40	20	100
Doctorate	10	30	10	30	20	100
Toplam	45	147	129	114	65	500
Average %	9	29	26	23	13	100

Table 6. The accounting knowledge of accounting instructors is sufficient. (%)

Options	1	2	3	4	5	Total
High Schools	18	36	29	12	5	100
Colleges	11	35	31	16	7	100
Faculties	9	36	27	18	10	100
Master	10	40	10	30	10	100
Doctorate	0	20	40	30	10	100
Toplam	48	167	137	106	42	500
Average %	10	33	27	21	9	100

Table 7. Teaching of accounting instructors is understandable and effective. (%)

Options	1	2	3	4	5	Total
High Schools	21	38	29	8	4	100
Colleges	5	37	37	15	6	100
Faculties	10	32	28	17	13	100
Master	0	20	30	30	20	100
Doctorate	0	30	10	40	20	100
Toplam	36	157	134	110	63	500
Average %	7	31	27	22	13	100

Table 8. Our administrators have the necessary elements ready on a timely manner and at a sufficient level. (%)

Options	1	2	3	4	5	Total
High Schools	21	37	25	12	5	100
Colleges	9	26	39	17	9	100
Faculties	7	27	31	24	11	100
Master	10	40	20	20	10	100
Doctorate	10	20	20	30	20	100
Toplam	57	150	135	103	55	500
Average %	11	30	27	21	11	100

Table 9. Technical personnel keep necessary equipment for accounting training ready in a timely manner consistently. (%)

Options	1	2	3	4	5	Total
High Schools	25	35	28	9	3	100
Colleges	5	37	31	19	8	100
Faculties	7	32	31	18	12	100
Master	0	30	20	40	10	100
Doctorate	0	10	20	30	40	100
Toplam	37	144	130	116	73	500
Average %	7	29	26	23	15	100

Table 10. Other personnel (officers, attendant, etc) do the necessary work consistently and at a sufficient level in order for the accounting training to be provided under appropriate conditions.

Options	1	2	3	4	5	Total
High Schools	24	31	27	10	8	100
Colleges	5	30	38	18	9	100
Faculties	6	30	33	21	10	100
Master	10	10	30	30	20	100
Doctorate	10	10	40	30	10	100
Toplam	55	111	168	109	57	500
Average %	11	22	34	22	11	100

Table 11. All Schools (%)

Options	1	2	3	4	5	Total
High Schools	21	37	27	10	5	100
Colleges	9	33	35	16	7	100
Faculties	8	31	30	20	11	100
Master	6	28	25	29	12	100
Doctorate	5	23	22	32	18	100
Toplam	49	152	139	107	53	500
Average %	10	30	28	21	11	100

Survey questions in high schools were accepted at a high level. In terms of all the survey questions, "strongly agree" suggestion received the highest support in high schools with 21%. Again, the support for "Agree" suggestion occurred the most in high schools with 37%. The support ratio to survey suggestions in colleges is lower than high schools. The support ratio to suggestions in faculties is lower than colleges. Master's and Doctoral education show the same decrease. The higher the level of accounting education, the lower the support ratio in survey suggestions. This shows that as the education level of students who receive this education goes higher the ratio of their satisfaction decreases in accounting education in terms of infrastructure and human standards. As the level of infrastructure and human standards increase, they are seen as more incompetent by students. Generally the support average to the survey suggestions were evaluated with all schools together, "Strongly Agree" received 10% and "Agree" received 30% support. In other words, survey suggestions are supported by 40% of students. The percentage of neutrals is 28%. When this ratio is distributed based on the ratio supported by the suggestions, the support ratio is 55.5%. The percentage of students who answered the questions as "Strongly Disagree" is 11%. The ratio of "Disagree" is 21%. The ratio of the studens who did not support the suggestions is a total of 32%. When neutrals are added based on the ratio of who did not support the suggestions, the ratio of students who did not support the suggestions is 44.5 %. In other words, competencies in infrastructure and human standards included in the survey suggestions were supported by 55.5 % of participants while found incompetent by 45.5%. The highest support rate was found in high schools while the lowest is in doctoral education. In other words, the satisfaction rate in universities decreases as the stage of education increases.

7. CONCLUSION

The results of this study which evaluated the accounting training in terms of infrastructure and human standards, showed that 55.5% of students who received accounting training find the education competent in terms of infrastructure and human standards while 45.5% find it incompetent. With these ratios, the ratio of students who supported the suggestions is 10% more than the ones who did not support, it should be seen as competent. The highest support for the survey suggestions came from high schools. In other words, students who find the accounting education positive in terms of infrastructure and human standards are high school students in a high ratio because when neutrals are distributed in proportion to the students who supported the suggestions, total support reaches to 79% in high schools. In other education stages, this ratio decreases. In college, faculty, master's and doctoral stages the ratio tends to decrease respectively. The lowest ratio is in doctoral education. The total support ratio in this education level is 28%. When neutrals are distributed based on the support, the total support ratio goes up to 36%. This ratio shows that doctoral students find accounting education incompetent in terms of infrastructure and human standards.

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A Three-Dimensional Model of Single PEM Fuel Cell Having Triple-Serpentine Flow Channel Developed with CFD

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Abstract

In this investigation, a three dimensional, single-phase proton exchange membrane (PEM) fuel cells with triple-serpentine flow channel was studied numerically, evaluating reactant gas humidification, water management and cell performance. The model equations were solved using CFD software ANSYS Fluent® 16.2 with Gambit® (2.4.6) as a pre-processor. This 3-D model with 19x50 mm2 active layer used to investigate the performance of fuel cell by determining the current density, oxygen, hydrogen and water molar concentration distributions took into account the mass, momentum, energy, species, charge conservation equation as well as combines electrochemistry reaction inside the fuel cell. The simulation results were illustrated polarization curves including I–V and I–P curves. Various properties of the GDL such as permeability, porosity, tortuosity and the hydrophobic texture can affect the flooding at flow channels. In this study, the effect of GDL porosity on flooding was investigated with different operating conditions. From the results, for lower operating voltages, as the cathode and anode relative humidity increases, the cell performance is enhanced because the cell performance is mainly dependent on the cathode mass transport limitations due to the liquid water blockage effect. As decreases, the oxygen concentration in the reactants increases and the water concentration on the cathode side decreases, this reduces flooding and improves the cell performance. Also, analysing the polarization curve it can be said the performance of the PEM fuel cell was improved by increasing the reactant gases humidification

Keywords

Flooding, Gas Diffusion Layer, Humidification, PEM Fuel Cell, Performance

1. INTRODUCTION

Fuel cell is an electrochemical device that continuously changes the chemical energy of a fuel (hydrogen) and oxidant (oxygen or air) directly to electrical energy and heat, without combustion. The proton exchange membrane fuel cell (PEMFC) is considered to be a promising power source, especially for transportation and stationary cogeneration applications due to its high efficiency, low operating temperature, high power density, low emission and low noise. A PEMFC is composed of the catalyst layers, membrane, gas diffusion layers and bipolar plate. The GDL have two major functions. First, the reaction gases can successfully diffuse into the catalyst layer and uniformly spread thereon because of the porous structure of the GDLs. Second, the electrons generated by the anode catalysis are drained from the anode and enter the external circuit. Bipolar plates are designed to accomplish many functions, such as distribute reactants uniformly over the active areas, remove heat from the active areas, carry current from cell to cell and prevent leakage of reactants and coolant.

The performance of a PEMFC is affected by many factors such as temperature, pressure, relative humidity, mass flow rate of feed gases, channel geometries in current collector plate and the characteristics of the membrane, catalyst layer, and gas diffusion layer. In literature, several modelling and experimental work has been investigated in order to understand the

effect of channel geometries in bipolar plate including, serpentine flow channels, parallel flow channels, interdigitated flow field, flow field with pins and the influence of these parameters to the fuel cell performance. Because experimental work is costly, numerical modeling becomes an efficient and convenient approach to fuel cell analysis. For the last decade, much effort has been involved in the development of a numerical model. However few studies have been reported on the flow field designs and the bipolar plates in the literature [1–7].

Xing et al. [1] developed a fully coupled 2D, along-the-channel, two-phase flow, non-isothermal, CFD model. In their results thinner GDL could result in more non-uniform and more significant temperature rise at high current densities. Also a new channel design featured with multi-inlets and outlets is proposed to reduce water flooding improve the cell performance.

Sierra et al. [2] in their research a 3D numerical study on a PEM fuel cell model is focused on the performance evaluation of three flow fields with cylindrical geometry (serpentine, interdigitated and straight channels) in a fuel cell. The results showed that the tubular design with the straight channels presented the lowest pressure drop in the flow channels, the interdigitated tubular design had the highest water generation at the cathode, the serpentine design presented the most uniform distributions of hydrogen concentration, temperature and current density on the active area of the cell.

Iranzo et al. [3] presented in this work a validation that was performed by comparing the local liquid water distributions obtained from the CFD model with experimental measurements developed CFD model for a 50 cm2 PEM fuel cell. Major conclusion of the study was that the CFD model used is not able to reproduce the liquid water accumulated in the channels, clearly observed in the neutron radiographs but not in the CFD results, given the treatment of the multiphase flow model.

Rahimi-Esbo et al. [4] in their paper seven flow fields were analyzed and their performances were investigated at the optimum channel to rib ratio. A novel serpentine flow field design aimed at effective water removal is introduced and examined. The results showed that 2-1-serpentine flow field has the highest performance especially at high current densities. It was founded that for operating voltages over 0.5 V, the geometry of the flow channels did not have a significant effect on performance.

Saco et al. [5] carried out a numerical analysis on scaled up model of PEM fuel cell (225 cm2) with four flow channel models. The study was mainly conducted to find the impact of flow field design on the performance of PEM fuel cell. From the results it was found that the current and power density of the straight zigzag flow channel was quite high compared to all other flow channels due to better consumption of hydrogen and oxygen molecules, better water removal rate in the flow channels.

Rostami et al. [6] studied a three-dimensional numerical model to understand the effect of bend sizes on a PEM (polymer electrolyte membrane) fuel cell in this work. The obtained results showed that as bend size increases from 1 mm to 1.2 mm, not only did the over potential reduce significantly but temperature gradient was also alleviated. Moreover, it was shown that the serpentine flow channels with 1.2 mm square bend size acted successfully in preventing secondary flows internal thereby decreasing pressure drop about 90.6% compared to serpentine flow channels with a bend size of 0.8 mm.

Vazifeshenas et al. [7] employed a novel compound flow field design concerned in PEM fuel cell to investigate the effectiveness developed with computational fluid dynamics (CFD). A typical serpentine and parallel flow field designs was verified through three dimensional simulations. From the results, the parallel design had the lowest current density and power in comparison with the other designs. Compound design could perform as well as the typical serpentine design, and also in some aspects could be a better choice than the serpentine one.

The goal of this study was to present the effects of various operating factors on the performance of a PEMFC with the most common bipolar plate design that is the triple serpentine flow field in fuel cells. In this design the gas flows through the channels circulating throughout the active area of the fuel cell. The polarization curves of the fuel cell were plotted under similar operating conditions with different GDL porosity.

2. ANALYSIS OF MODEL

In this study, the model presented is a three-dimensional, isothermal, single-phase, steady-state model that resolves coupled transport processes in membrane, catalyst layers, gas diffusion layers and reactant flow channels of a PEM fuel cell (Fig.1). Operating conditions and general geometrical properties of the PEM fuel cells components are given at Table 1 and Table 2.

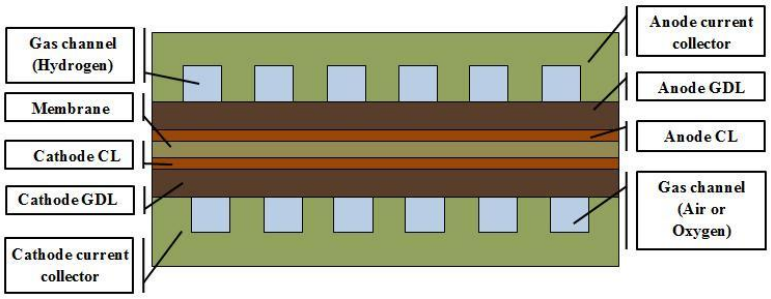

Figure 1. Schematic of the PEM fuel cell Geometry of Model

Table 1.Operating conditions of PEM fuel cell model

Parameters	Units	Value
Operation pressure	kPa	200
Cell temperature	K	343
Cathode stoichiometric ratio	-	2
Anode stoichiometric ratio	-	2
Cathode terminal	V	0.4-0.9
Anode terminal	V	0.0
Cathode mass flow rate	kg/s	calculated
Anode mass flow rate	kg/s	calculated
Cathode RH	-	10%,50%,100%
Anode RH	-	10%,50%,100%

The geometric model is created in Gambit 2.4.6. ANSYS-Fluent 16.2 PEMFC module is used in this research to compile the appropriate user-defined functions for a PEMFC. In this model, the numerical domain is a single-cell geometry domain. Pure hydrogen and air are used as reactant gases in the model. The inlet flow velocity was controlled by stoichiometry numbers of 2 at the anode and 2 at the cathode. The operating pressure was 200 kPa absolute at the exit of the cell. The active surface area is 19x50 mm², with triple-serpentine flow field configuration. The channels are 1 mm in width and 1 mm in depth. The width of the rib is 1 mm. Also the flow channels are shown in Figure 2.

Figure 2.The bipolar plate flow channel pattern

Table 2. General geometrical property of the PEM fuel cells components

Parameters	Units	Value
Channel width	mm	1
Channel length	mm	50
Gas diffusion layer thickness	mm	0.27
Catalyst layer thickness	mm	0.02
Membrane thickness	mm	0.127
Active area	m^2	0.00095

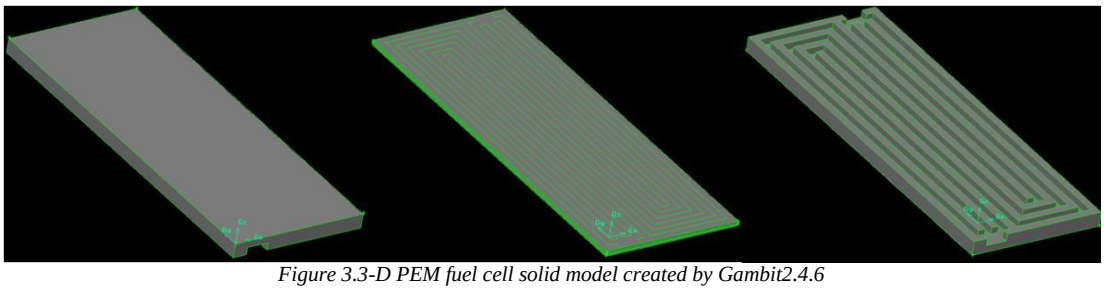

Figure 3.3-D PEM fuel cell solid model created by Gambit2.4.6

2.1. Theoretical Formulation

Basic equations used during fuel cell operation are as follows:

Conservation of mass equation:

$$\nabla.(\rho\vec{u}) = S_m \tag{1}$$

So the source terms are;

$$S_m = S_{H_2} + S_{wv_p} + S_{wl_p} + S_{awv_e} \tag{2}$$

$$S_m = S_{O_2} + S_{wv_p} + S_{wl_p} + S_{cwv_e} \tag{3}$$

$$S_{H_2} = -\frac{M_{H_2} A_{cv} I}{2F} \tag{4}$$

$$S_{O_2} = -\frac{M_{O_2} A_{cv} I}{4F} \tag{5}$$

Momentum transport equation:

$$\nabla.(\rho\vec{u}\vec{u}) = -\nabla P + \nabla.(\mu\nabla\vec{u}) + S_{p,i} \tag{6}$$

Here $\beta$is the permeability. $S_{p,i}$is the sink source term for porous media in x, y and z-directions;

$$S_{p,i} = -\left(\sum_{j=1}^{3} \frac{1}{\beta_j} \mu u_j\right) \tag{7}$$

Species transport equation:

$$\nabla.(\rho m_n \vec{u}) = \nabla.(J_n) + S_s \tag{8}$$

Here *n* denotes for H_2-O_2water vapor and liquid water. The source terms are the same as those of the conservation of mass equation. The diffusion mass flux (*J*) of species *n* in n-direction is:

$$J_{\xi,n} = -\rho D_{\varepsilon,n} \frac{\partial m_{K,n}}{\partial \xi} \tag{9}$$

Energy equation:

$$\nabla.(\rho\vec{u}h) = \nabla.(k\nabla T) + S_h \tag{10}$$

The source term S_n can be obtained by energy losses and heat source by phase change. The heat source from the electrochemical reaction:

$$S_{he} = h_{rxn}\left[\frac{IA_{cv}}{2F}\right] - IV_{cell}A_{cv} \tag{11}$$

The local current density of the cell is calculated from the open circuit voltage (V_{oc}) and the losses;

$$I = \frac{\sigma_m}{t}\{V_{oc} - V_{cell} - \eta\} \tag{12}$$

Where *t* is the membrane thickness and $\sigma_m$is the membrane conductivity and defined as;

$$\sigma_m = \left(0.514\frac{M_{m,dry}}{\rho_{m,dry}} C_{wa} - 0.326\right).exp\left(1268\left(\frac{1}{T_0} - \frac{1}{T}\right)\right) \tag{13}$$

2.2. Numerical Solutions

The procedure to model PEM fuel cell is;

1) Creating and defining the geometry of the fuel cell with Gambit 2.4.6
2) Creating an appropriate mesh for geometry with Gambit 2.4.6.
3) Assigning zone names and types that is required in the FLUENT PEM fuel cell add-on module.
4) Importing the mesh file into FLUENT.
5) Defining fuel cell parameters, setting up of the case and then running calculations.
6) Postprocessing the results.

The model equations were solved using the commercial computational fluid dynamics (CFD) software ANSYS Fluent®16.2 with Gambit® (2.4.6) as a pre-processor. The CFD code has an add-on module for fuel cells, which has therequirement of the source terms for species transport equations, heat sources, and liquid water formation (ANSYS 2015). Afinite volume method was used for solving the problem. The conservation of mass, momentum and energy equations weresolved until the iterative process meets the convergence criteria.(Fig.4) The number of iterations was determined as 200. AHP-PC-Intel®Xeon® CPU E5-2650v2@2.6 GHz, 2.6 GHz, 64 GB was used to solve the set of equations.

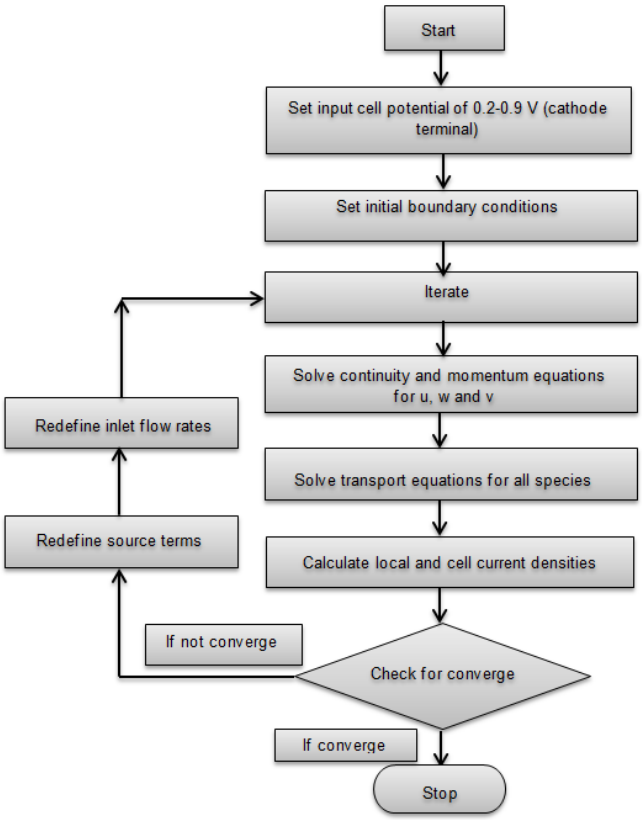

Figure 4.Solution Algorithm

3. RESULTS AND DISCUSSION

3.1. Relative Humidity Effect at Anode Side

In order to reach good cell performance, there must be water balance between anode and cathode. When hydrogen at the anode inlet is fully humidified, the humidity of the membrane can be well maintained. However if hydrogen is insufficiently humidified, membrane dehydration could occur on the anode side. The problem of water deficiency on the anode side of the membrane can be solved by humidification of hydrogen flow at anode side. For each of the gas humidification configurations for the double-serpentine PEMFC model, it was investigated the water accumulation in the membrane operated with constant operating conditions. In Fig. 5 it is shown that I–V and I–P curves anode RH =10%, 50%, 100% respectively. According to the simulated results in figure, as anode relative humidity increase, the overall water uptake in the system increases. This increase enhances the cell performance. Maximum power density was reached at 0.7 V, 1.136 A/cm^2 with the value of 0.4754W/cm^2.

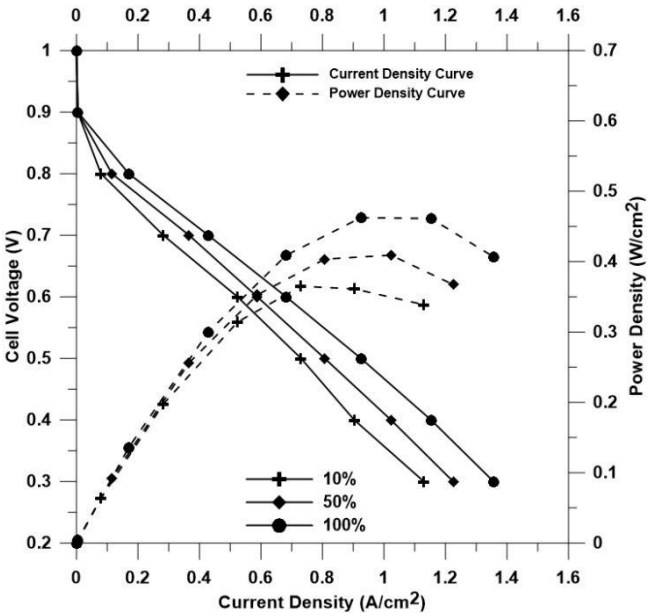

Figure 5.I–V and I–P curves cathode RH= 100% and anode RH =10%, 50%, 100% respectively

As mentioned above, the reason for this decrease is that diffusing the oxygen from channel through the GDL in order tooccur the electrochemical reaction. As shown in the Fig. 6, it is also noted that the optimal oxygen consumption of thechannels was achieved at 100% relative humidity obtained the maximum current and power density to improve the performance of fuel cell.

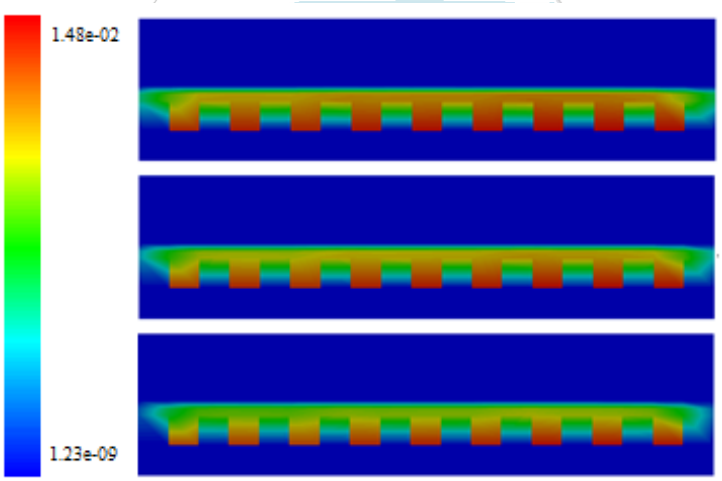

Figure 6. Contours of oxygen molar concentration distribution (kmol/m3) in the middle of model with different relativehumidity at x-z plane, 0.6V, (a) 10%, (b) 50 %, (c) 100%.

Fig. 7 displays the distribution of the H_2O molar concentration through the membrane domain with different relative humidity. The simulated results showed that water distribution and membrane conductivity in the fuel cell depended onanode humidification and the related water management. The increase of concentration of water at membrane is significant when the relative humidity is increased from 10% to 100%.

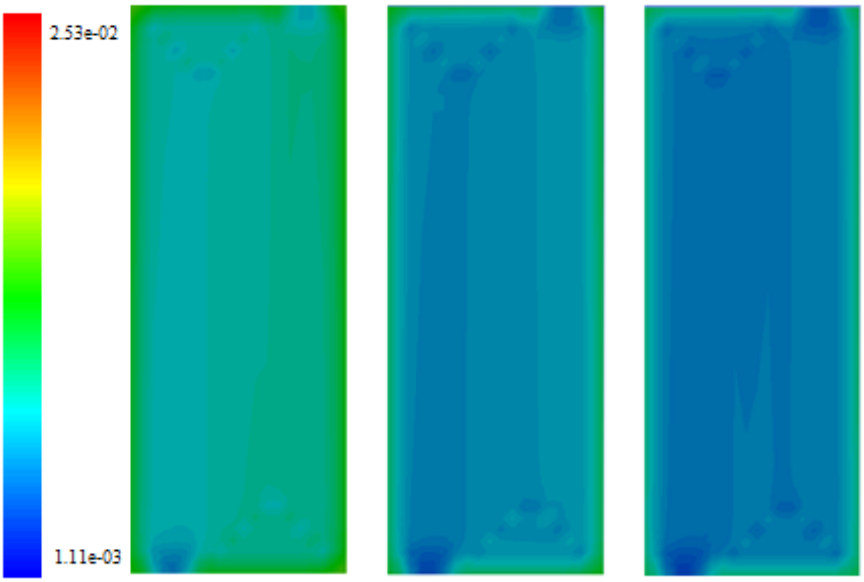

Figure 7.Contours ofmolar concentration distribution of H_2O (kmol/m^3) in membrane with different relative humidity at x-x-y plane, 0.6 V (a) 100%, (b) 50 %, (c) 10%

3.2. Relative Humidity Effect at Cathode Side

The water generated at the cathode must be transported away from the catalyst layer by evaporation, water–vapor diffusion and capillary transport of liquid water through the GDL into the flow channels of the flow field. If this does not occur, excess water exists at the cathode side and condenses. This causes blocking the pores of the GDL and reducing the active sites of the cathode catalyst layer. This phenomenon is known as "flooding", and is an important limiting factor of PEM fuel cell performance. The extent of flooding and the effects of flooding depend on the operating conditions and the properties of PEM materials like bipolar plates, MEA. In Fig. 8 it is shown that I–V and I–P curves anode RH= 100% andcathode RH =10%, 50%, 100% respectively. However, it is clearly seen from the figure that the current density is increased by the increasing cathode relative humidity.

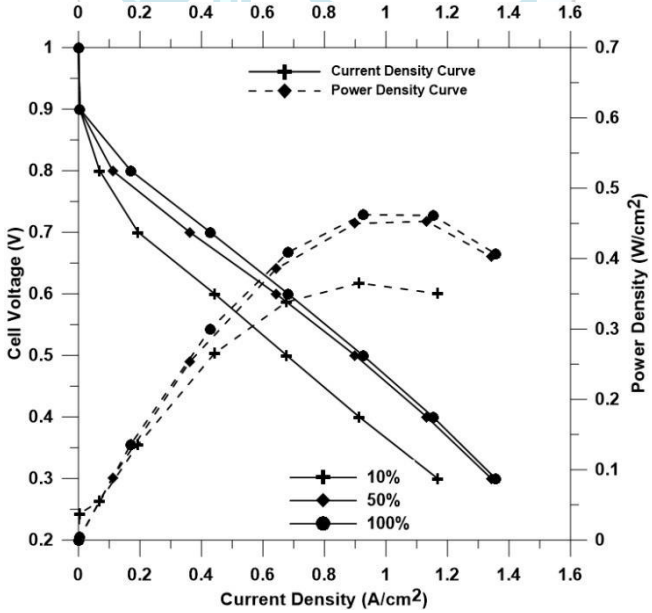

Figure 8.I–V and I–P curves anode RH= 100% and cathode RH =10%, 50%, 100% respectively

3.3. Effect of Cell Voltage on Water Content

The effects of cell voltage on the fuel cell performance have been shown that include the membrane and cathode channel water content of the in Fig.9 and Fig.10 at different cell voltages. It can be seen in both figures the water content increases with increasing the voltage value. After the voltage rises to a certain value, the increase of cathode humidification adverselyaffect the cell performance due to a decrease in current density. As mentioned above, the reason for this decrease is thatmuch water, because of water production in the electrochemical reaction at the cathode and excessive humidification

of thecathode side, will stay in the porous cathode GDL, preventing the oxygen from diffusing through the GDL to catalyst layer. And this causes flooding at porous sides of fuel cell. Consequently the best performance occurs at 0.6 V

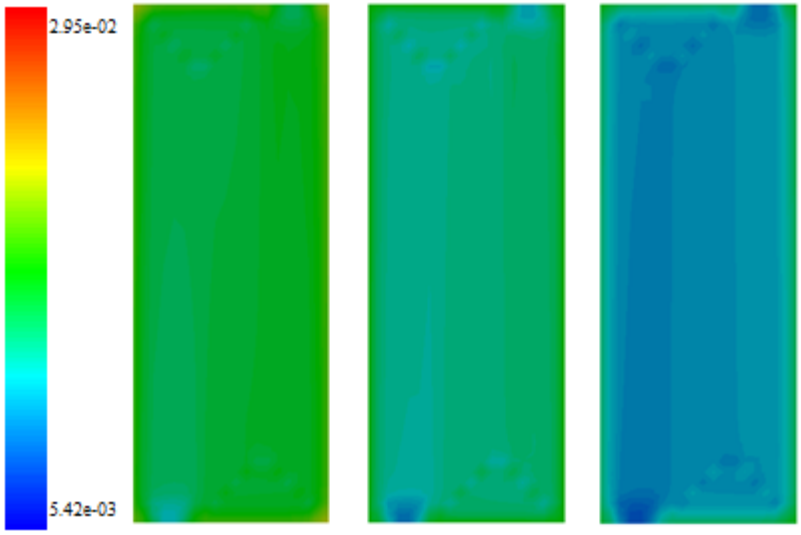

Figure 9.Contours ofmolar concentration distribution of water (kmol/m^3) in membrane with different cell voltage at x-y plane (a) 0.3V, (b) 0.6V, (c) 0.9V

As the cell voltage decreases, the cell performance is enhanced because the cell performance is mainly dependent on thecathode mass transport limitations due to the liquid water blockage effect. The water concentration in the reactants decreases. This reduces means that the cathode flooding is prevented and it improves the cell performance.

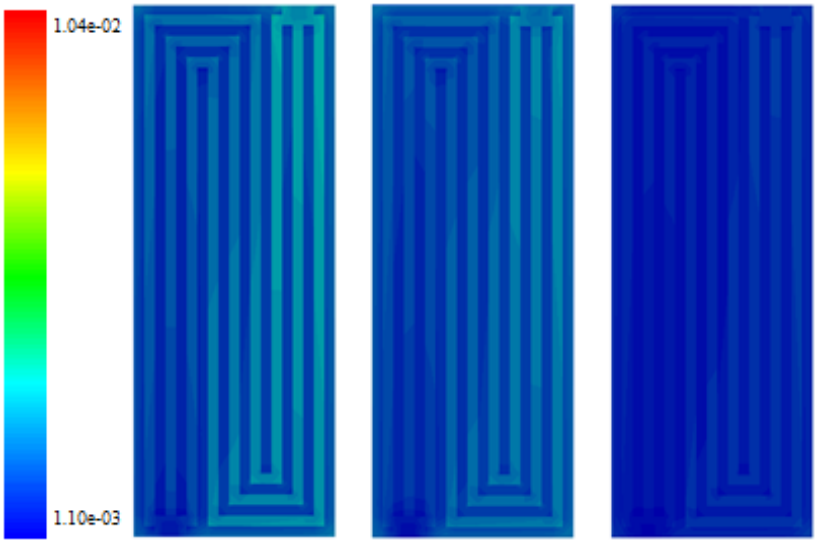

Figure 10.Contours ofmolar concentration distribution of water(kmol/m^3)in cathode channel with different cell voltageat x-y plane (a) 0.3V, (b) 0.6V, (c) 0.9V

3.4. Effect of GDL Porosity on Current and Power Density

In Figure 11 the I–V curves demonstrate that a better performance can be obtained by using a gas diffusion layer of higher porosity. A gas-diffusion layer of higher porosity has an ability of stronger diffusion transport, which is beneficial in that it supplements the reactant gas to the catalyst layer. Increasing operation temperature is helpful to enhance electrochemical reaction rate and ionic transport in PEMFC, and the cell performance.

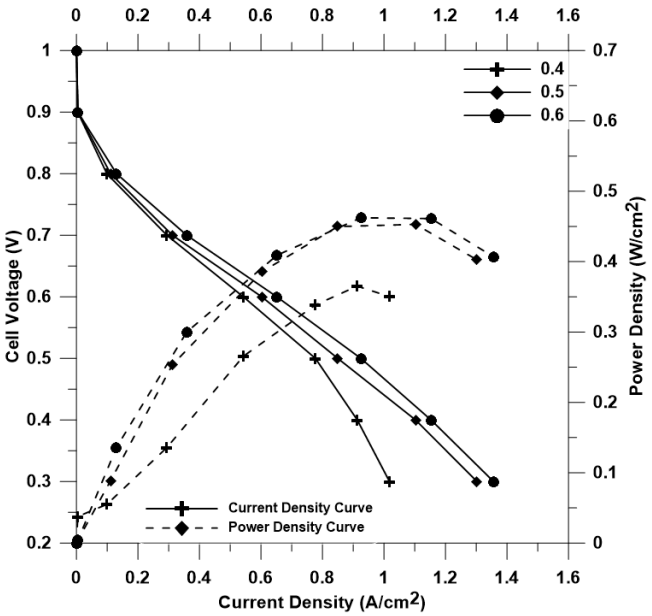

Figure 11.I–V and I–P curves of the effect of GDL porosity on current and power density with ε=0.4, 0.5, 0.6 respectively

4. CONTENT

A three-dimensional computational fluid dynamics model of a PEM fuel cell with triple-serpentine flow channels was developed to investigate the effects of cell voltage, gas diffusion layer porosity and reactant gases humidification on performance. Using a single-phase, steady-state, three-dimensional model of PEM fuel cell, the following conclusion was obtained; the humidity in the reactant gases is an important factor to consider for improving the cell performance. As the relative humidity of anode side increases, both the chemical reaction and mass transfer of hydrogen are enhanced due to the increase of water content in the membrane, which leads to a better cell performance. The maximum power density for thehighest performing was 0.4754 W/cm^2 and occurred at maximum anode /cathode humidification with 0.6 GDL porosity at 0.6 cell voltage.

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The Future of Organic Fibers

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Abstract

Organic fibers which are produced without chemical fertilizer , pesticide and genetically modified seeds (GMO) under the certification for organic fibres processing and these are generally natural fibers. Organic fibers require much more time, labour, cost value, care and special agriculture areas than conventional fibers. Organic fibers are not enough to make the cloth safe since finishing treatments may entail some additional toxic effects. Therefore Global Organic Textile Standard (GOTS) which includes environmental and social aspects of whole production has been accepted recently. Organic textile production has environmental- ecological, economical, social positive impacts: Environmental- ecological impacts: Prevention of the pollution of natural sources by ceasing chemical fertilizer; chemical pesticide; contribution to prevention of global warming; decrease of consumption of the natural sources: soil, water, weather; decrease of energy requirement; standards for the protection of human health and biological diversity by textile standards; decrease of waste such as biological degradation, recycling; Economical impacts: Cost value of organic fibre production and selling; Social impacts: Promotion of organic fibres, management of organic fibres. The future of organic fibers in the world depends on some dimensions such as textile, agriculture, environment- ecology, social life, economy etc. It is as follows mainly that the amount of consumption of organic fibers in textile area instead of other fibers; the growing possibilities of organic fibers in agriculture; positive impacts of organic textiles to environment and ecology; people becoming conscious about their health and environment by wearing organic textile products; buying capability of consumers to wear these organic textiles which are more expensive than conventional ones etc. will determine the future of organic textile production in the world. A brief review will be done on environmental subjects above and the future of organic fibers will be revealed at above conditions.

Key words

Organic fibers, Organic textiles, Organic cotton, Environmental protection, Pesticide, Fertilizer, GOTS Standard

1. INTRODUCTION

Natural textile fibres are obtained from vegetable sources such as cotton, kapok, linen, ramie, hemp, jut, sisal; from animal sources such as wool, mohair, cashmere, silk, spider silk. Viscose, cupra, acetat rayons from wood and linters; kazein from milk, silkool from soya, zein from maize, ardil from peanut are also obtained from natural sources but they are not in fibre form, then they are extruded into fibres after required special treatments and these are called as regenerated fibres. Polyamide, polyester, polyacrylonitrile, polyurethane, polyvinylchloride, polyethylene, polyprophylene, polybenzimidazole etc. are synthetic fibres produced by synhetizing chemicals obtained from petroleum and then they are extruded into fibres after required special treatments. Even though natural fibres are dated to B.C.8000 and still are being used; regenerated and synthetic fibres has begun to be produced since A.C. 19. Century e.i since Industrial Revolution. Industrial Revolution has

brought also environmental pollution while industrial production has being increased by using industrial chemicals ; fosile fuels such as petroleum, coal, and natural gas has being begun to be used in industry, thereafter nuclear, wind, sun, bio, geothermal etc. energies has begun also to be used in industry [1].

Industrial revolution improved in all industrial areas quickly, The World was polluted and changed in a huge ratio as never seen before such as thinning ozon layer; destruction of ecological life; pollution of weather, water and soil; global warming; climate change; melting icebergs in Poles; increasing waste etc. It may be added to these, the increase of people population in the world. The interest in environmental pollution increased in 80's all over the world in all areas, in textile as well. Some precautions are thought in textile area such as using natural fibres instead of synthetic fibres; producing organic fibres, ecotextiles, recycled fibres; dyeing by natural dyes; not using chloride bleaching agent etc. [2].

Organic fibres are the special production of conventional natural fibres which do not use chemical fertilizers; toxic pesticides (insecticides, herbicides or fungicides, defoliants) and genetically modified seeds (GMO). Organic fibres follow also a certification for organic fibres processing [3].

Application of the amount of chemical fertilizers and pesticide are very important since their excessive use entails quite harmful effects by degrading the soil, reducing its nutrient and water retention capacity; by decreasing the crop yield; by contaminating their toxic effects on waters which they pass through; by polluting weather with solvants or volatile compounds when pesticides are applied; by increasing global warming occurred nitrogen oxide (N2O) since the excessive use of nitrogen originated fertilizers; by exposing farmers and living creatures these toxic chemicals; by creating toxic effect on crops from pesticide residue etc.The goal of organic fibre production is to protect the natural sources and people health besides all living creatures and their sustainable life conditions [3] [4]. Certification of organic fibres needs some hard procedure such as ceasing the use of pesticides, chemical fertilizers before three years followed by organic cultivation; using only permissible substances; covering physically the borders of cultivation fields; cultivating some trap plantes if necessary; using organic manure etc.; enrichment of soil organically etc. [5].

It was true that only natural fibres were produced up to Industrial Revolution and they were organic. Organic fibres has begun to be produced since 80's again and encouraged by public actions who were aware of 'green' and 'sustainable production'. It is expressed that organic fibres such as cotton, linen, hemp, jute, wool, mohair, silk were produced in some parts of the World. But despite of these intensive environmental action, it is not registered a significant improvement for 30- 40 years. For example organic cotton, the leading of organic fibres was only produced 0.7% of conventional cotton in the world in 2012 [6]. The other organic fibres such as linen, hemp, wool , silk etc. are produced only in a small ratio. Organic cotton has currently been grown in 23 countries, mainly India, China, Turkey, Tanzania, USA etc.

Organic fibres which are produced all over the world

Organic cotton: Conventionally cotton in the world uses % 25 of pesticide (16% of all the insecticides and 6,8% of all herbicides used) [7] and cotton is in the 4th place in the use of chemical fertilizers in the world, and needs 33% fertilizer of raw cotton weight during cultivation [8] Even though GMO seeds are forbidden in organic cotton, GMO seeds are used in the organic cotton production in USA [7]. The production of conventional and organic fibres in the world is given in Table 1 [6] [7] [9] [10].

Table 1: Conventional and Organic Fibres in The World

	Conventional Cotton Lint			**Organic Cotton Lint**		
	Production (M ton)	Cotton % among fibres	Cotton cultivated area M Ha	Production (ton)	Organic Cotton %	Organic Cotton cultivated area Ha
1960	10,113	67,5	30-36			
1999-2000	20,2	37,5		7545	0.04	
2000-2001	18,869	38,1		6480	0.03	
2001-2002	21,281	38,4		18000	0.08	
2003/2004	21,135	36,9		25394	0,10	
2005/2006	26,532	38,6	30-36	37799	0,14	
2006/2007	26,751		34,36	57931	0.20	
2011/12	27,100		35,52	139000	0.50	317000
2013/14	25,700			116974	0.40	220765
2015/16	21,87		30,49			

As can be seen in Table 1; conventional cotton production is about 25 M tons during 2000's and it is consumed about 38% among other fibres involving nearly 30-36 M Ha cultivation field in the world which corresponds aproximately 2.5% of agricultural areas of the world. When it is glanced organic cotton; total production is about 6500-139000 tons during 2000's and it is produced about 0.038-0.5% of conventional cotton (0.7% also suggested [6]), 317000 Ha (2012) cultivation field in the world. These results show that organic cotton had not registered promising progress for 30-40 years.

Organic linen: Linen is made from flax, a crop that requires very little pest-controlling chemicals. Flax plant is harvested for its fibers, seeds, and seed oils. It's also best when it's a teeny bit wrinkly, so you can conserve energy by putting away the iron [11].

Organic Hemp: The hemp plant is harvested for its fibers, seeds, seed meals and seed oils including narcotic property. Oil is produced from females which have been left to stand after the fiber-producing males have been harvested. **It is easy to grow hemp organically,** since it **does not require herbicides and fertilizers** and hemp does not have a high water requirement. It has a root system that aerates the soil and draws nutrients and water from deeper soil layers, so the requirement of fertilizers and irrigation decreases [12].

Organic Wool: Organic wool requires strict regulations such as feeding sheep from the last third of gestation must be certified organic; prohibiting synthetic hormones, genetic engineering of the sheep, synthetic pesticides on pastureland, and also parasiticides on sheep [13].

Organic silk: Organic silk would involve growing the mulberry trees organically, without chemicals, and raising the silkworms humanely and without hormones [14]. Peace silk or vegan silk permits the moth to make a hole on cocoon, ceasing its death in cocoon, despite of the decrease of fibres quality [11] .

Alpaca: Organic alpaca sheeps do not require insecticides to be injected into their fleece, are fairly self-sufficient, do not need to be treated with antibiotics. It seems that they are good for environment [11].

2-IMPACT FACTORS OF ORGANIC TEXTILE

Organic textile production has environmental- ecological, economical, social positive impacts:

Environmental- ecological impacts: Prevention of the pollution of natural sources by ceasing chemical fertilizer; chemical pesticide ; contribution to prevent global warming; decrease of consumption of the natural sources : soil, water, weather; decrease of energy requirement; standards for protection of human health and biological diversity; decrease of waste such as biological degradation, recycling;

Economical impacts: Cost value of organic fibre production and selling;

Social impacts: Promotion of organic fibres, management of organic fibres.

2.1. Preventing the Pollution of Natural Sources by Ceasing Chemical Fertilizer

All vegetable natural fibres need some inorganic compounds, organic compounds, water, CO_2 , sun light, seed, and soil treatments to grow up. As example, cotton plantes requirement under irrigation are 100–180 kg/ha nitrogen (N), 20–60 kg/ha phosphorus (P), and 50–80 kg/ha potassium (K) compounds; chemical fertilizers to supply these compounds are added to fields for the cuiltivation of conventional fibres[15]. But these chemical fertilizers are forbidden for organic agriculture since their excessive use creates harmful effects such as soil degradation, reduction of its nutrient and water retention capacity, salinization, erosion, eutrophication, the overextraction of water and the reduction of ecologic diversity as well as human health on the agricultural area. Carbon nutrient amount 0.5 to 5 % of the soil, has also crucial importance[4]. Excessive use of nitrates, phosphates fertilizers and pesticides which occur methane and nitrous oxide gases by spreading air and their solutions in ground and surface waters which entail also environmentally and ecologically harmful effects [15]. 1 kg of cotton lint requires 350 g chemical fertilizer and cotton is in the 4^{th} order in the use of synthetic fertilizers [8]. Natural organic fertilizers such as organic manure, compost of green leaves, stalks, roots etc. manure, mulch, liquid organic manure such as (biogas) slurry and micronutrient were used instead of chemical fertilizers to meet the requirement of cotton fibre growth [4] [16]. Crop rotation is also an alternative practice to fertilize application for the achievement of soil fertility. It helps prevent soils, occurence of critical pest populations and also diseases and weeds from leaching. It is important to grow cotton in rotation with leguminous plants such as beans, peas or soya beans. Because they fix nitrogen from the air and make it available to the plant, thus improving soil fertility [4] .

2.2. Preventing the Pollution of Natural Sources by Ceasing Pesticides

All crops are under the biological effects such as animals, insects, beetles, bacteria, fungi, weed etc. as well as physical and chemical effects. These biologically living beings can give damage to natural fibres resulting the decrease of yield, the quality of fibres, and the increase of difficulties in fibre processing. To prevent these biological effects pesticides, insecticides, fungicides, herbicides, defoliants are used during the cultivation of crops. Natural vegetable fibres also require pesticides, a leading of natural fibre cotton only consumes 25% of pesticide consumption in the world since it is highly susceptible for pests and diseases. But these pesticides and solvants are quite toxic and excessive use of pesticide depletes the soil nutrients thus the requirement of synthetic fertilisers will increase[12]. Ground and underground waters are also polluted by pesticide contamination causing soil salinisation, particularly in dry areas and causing a degradation of soil fertility and the occurrence of methane and nitrous oxide gas [17].
Additionally volatile pesticides or solvents of pesticides are spread into weather causing harmful effect on employees, crops, air, earth, water. These pesticides are persistent chemicals and they leave a toxic residue on cotton lint, leaves, stems, roots, seeds, even in the soil. The amount of pesticide in the earth is increasing as time passes by and entails toxic effect. Pesticides in cotton fibres are also persistent[18] . Pesticides are not generally soluble in water, they are persistent chemicals to degradations. Then they may be left on textile products to create harmful effect on textile consumers. That's why, organic chlorinated pesticide are tested on ecological textiles for Oekotex 100 and GOTS standards. Toxic pesticides

used in the production of conventional cotton are methamidophos, malathion, aldicarb, parathion, acephat etc. [7] . The total dose of pesticide chemicals vary between 1.85 kg/ha and 10.5 kg/ha in the selected region [15]. There are some researches to remove organophosphate pesticides (OP) pesticides from waste waters [19]. Organic fibre production prohibites the use of pesticide and some natural precautions are suggested and these will decrease the pollution of natural sources in the world.

Natural pesticides: If preventive measures are not sufficiently efficient and pest populations exceed the economic threshold, a number of natural pesticides can be used in organic cotton cultivation. Some of these are: neem spray, prepared from neem kernels (Azadirachta indica) extract, effective against sucking pests, jassids, bollworms and thrips; pyrethrum, prepared from powdered flower heads or liquid extracts of chrysanthemum, effective against red cotton bug, cutworms, grasshoppers; botanical mixtures, combinations of extracts from different plants such as castor, thorn apple, lantana, custard apple, sweet potato leaves, tomato leaves, ginger, chilly, gliricidia, marigold, etc. Their cost values consist 10% of market price.

Trap crops: Some cotton pests prefer crops like maize, sunflower, okra (lady finger), sorghum, pigeon pea or hibiscus to cotton. By growing these crops along with cotton as a trap crop, the cotton crop is spared.

Promotion of natural enemies: Not using pesticides and diversifying crops benefit natural enemies from cotton pests such as birds, ladybirds, beetles, spiders, parasitic wasps, bugs and ants. They help the farmer keep pest attacks at tolerable levels by providing suitable habitats for these natural enemies of pests. **Crop rotation**: This helps prevent leaching from soils, a build-up of critical pest populations and also diseases and weeds [4].

2.3. Contribution to Prevention of Global Warming

Global warming is an environmental problem caused by carbon dioxide (CO_2), methane, nitrous oxide etc. gas layer occurred in the atmosphere and this layer acts as a preventive and a trapping heat from the earth and warming the planet. Fossil fuels and all industrial production entail global warming [20]. Global carbon dioxide (CO_2) concentrations in the atmosphere are expected to rise from 350 ppm to over 400 ppm which entail between 0.5 and 1 ^{O}C of a global warming by 2030. Carbon dioxide has also positive effect o plantes, it causes plante stomata to narrow, so water losses are reduced and the efficiency of water usage improves. Increasing atmospheric concentrations of carbon dioxide will also stimulate photo-synthesis of plantes and have a fertilizing effect on many crops [16]. Fibre plants absorb carbondioxide (CO_2) under sun light, then giving back oxygen (O_2) by photosynthesis. Photosynthesis cleans the weather, helps reduce global warming.It is suggested that, on average, organic cotton cultivation causes 0.98 kg CO_2 equivalent/1 kg of cotton fiber produced, this compares to 1.81 kg CO_2 equivalent/ 1 kg of fiber for conventional cotton [10].

But natural bestial fibres entail the increase effect onto global warming in reverse because animals breath oxygen (O_2) then give back as carbondioxide (CO_2). Global warming is also the result of the Industrial Revolution, the gases released to atmosphere due to industrial production in a large amount. Some international precautions were thought to decrease carbon dioxide (CO_2) level to lower %5 of 1990's level at Kyoto Protocol.

Some synthetic fertilizers used in the conventional vegetable fibres have contribution to global warming. They spend 1.5% of the world's annual energy consumption and release large amounts of carbon dioxide during their production. Additionally the excessive application of nitrate fertilizers transformed into nitrous oxide ("laughing gas"), that is 300 times more destructive than carbon dioxide (CO_2) in terms of global warming [4]. Pesticides have also increased effect on global warming by spreading green gases. Organic fibres have contribution to the decrease of global warming by ceasing fertilizers and pesticides.

2.4. Consumption of the Natural Sources: Soil, Water, Weather

It is suggested that while cultivable land is 0.218 hectar / 1 person in 2010, it will be 0,181 hectar / 1 person in 2050, that means that crop consumption will decrease per head in future [21]. Cotton production includes 2,5% of agricultural areas in the world corresponding to 30- 34 million hectars in the recent years. If conventional cotton is reversed to organic cotton, this will create a great benefit for the environment and ecology [9]. Conversion of conventional cotton field to organic field needs 3 years, organic cotton yield is approching to that of conventional cotton in the third year approximately 1100 kg lint/ ha of yield. It is important that adjacent agricultural fields must cultivate similarly since pesticides and herbicides applied in a field could easily transport to a adjacent field, thus it looses organic cotton prooperty [15]. Sustainability of soil depends on strongly the organic cultivation.

Water is the main material for living organisms, and there is no life without it. Every year, many treatments are performed to treat, clean and purify water. Therefore, availability of clean water at an affordable price remains a crucial goal for humanity. Cotton is a very water-intensive crop; it is estimated that cotton growing results in 1–6% of the world's total freshwater withdrawal. In order to produce1 kg of cotton lint, 10,000–17,000 L water is required. Innovative irrigation techniques like drip irrigation, can lower the water demand for cotton production down to 7000 L/kg-lint [15]. When conventional cotton is compared to organic cotton at the point of the consumption of conventional cotton, there may not be difference if the cotton yields are both the same; if organic cotton yield is lower than that of conventional cotton, water consumption may be higher than that of conventional cotton.

Water consumption of the cultivation of organic cotton in India, USA, Israel are given in Table 2 [22] .

Tablo 2: Water Consumption of Organic Cotton

Water Consumption of Organic Cotton			
Country	Water consumption m^3/ha	Yield seed cotton kg/ha	Water Conservation Measure
Maikaal- India	2950-4100	1200-1400	Crop rotation
USA	1500-4500	2200-4200	Drip irrigation
Israel	1300-2800	2900-4700	Mulching, hoeing of soil crust to break evaporations capillar

Oxygen in weather is always consumed by all chemical oxidation reactions, energy reactions in a large amonunts. Oxygen is reversing carbondioxide by combustion. Plantes transform into carbondioxide to oxygen by photosynthesis. Oxygen is always consumed by chemical reactions, if plantes are available enough amount, always transform into carbondioxide.

2.5. Decrease of Energy Requirement

Vegetable fibre production depends on energy in a high ratio which includes cultivation, fertilizer and pestiside applications, irrigation, machine harvesting, ginning, transportation of natural fibres, yarn production, knitting or weaving, finishing treatments, sewing clothes, transportation clothes. All these stages include carbon foot print in different ratios, some of them can be applied by hand such as harvesting, cultivation, weaving etc. which arise carbondioxide (CO_2) in a small ratio. It must be also added washing, ironing, dry cleaning etc. treatments which are applied by textile consumers and which require energy to these stages. It is suggested that consumer use needs 80% of the life cycle energy of a conventional cotton textile products [15]. Conventional and organic fibres spend the same energy except chemical synthesis of fertilizers, pesticides; for mechanical applications of chemical fertilizers and pesticides; excessive wet treatments to remove pesticides on textile products. Whereas the production of 1 kg of conventional cotton requires 15 MJ energy, 1 kg of organic cotton requires only , as a global average, 5.8 MJ of energy [10]. Energy sources today are mainly fossil fuels such as charcoal petrol, coal, and natural gas; nuclear energy; renewable energy such as sunlight, wind, rain, waves, geothermal heat, biomass, hydro electricity. Energy production is the prevalent factor of environmental pollution, and arising carbondioxide (CO_2), methane etc. from fossil fuels in a large ratio causes global warming. Thus renewable energy sources are recommendable for the ecological production.Replacing diesel fuel with biodiesel in the machinery, preferably produced from agricultural wastes and residues, would theoretically improve further sustainability of the final product [15].

2.6. Standards for Protection of Human Health and Biological Diversity

Organic fibre production only assures that the fibres are produced the lack of fertilizers, pesticides, GMO seeds, thus there will be no pesticide residue on textile products; and organic fibres requires organic fibre certification system.

But textiles are treated in the textile mills such as scouring, bleaching, dyeing, finishing etc., these may also create some toxic effects on environment and the textile consumers. Even though these textiles are produced by organic fibres, it can not be assured that the textile product is safe for human health of consumers. That's why a standard like Global Organic Textile Standard (GOTS) is also added to the organic standard.

Organic Fibre Standard: EU regulation 834/2007; USA National Organic Program (NOP); United Stated Department of Agriculture (USDA) ; OTA: Organic Trade Association (USA) (Agriculture and foods into organic textiles and body care products); Indian National Program for Organic Production (NPOP) ; the Japanese Agricultural Standard (JAS); Soil Association Organic Standard (UK); Organic Guarentee (New Zealand); IFOAM: International Federation of Organic Agriculture Movements [4] [23].

Organic Exchange: OE 100, OE Blended Standards and the new Organic Content Standard is also suggested by Textile Exchange [10]

Organic Fibre+ Ecological Processed Product : *GOTS : Global Organic Textile Standard stipulates that organic fibres or yarns, fabrics, textile products from these organic fibres* were treated and manufactured ecologically and have no toxic effects on consumers. But it does not include any preventions or precautions to protect environment from toxic by-products contained in the wastewater from manufacturing plants of these textiles pollute wastewaters, giving harmful effects on ecosystem [13].

MTS: Market Transformation to Sustainability (Sustainable Textile Standard examines garment sustainability in five areas of sustainability) standards also include ecological textile products.

Some labels of ecological cotton are given in Figure 1 [24].

Figure 1: Organic Cotton 100 Label; GOTS Label; Fair Trade Label; Better Cotton Label successively.

Ecotextile Standard: There are some ecotextile standards such as EU Flower, eco-label and Oeko-Tex 100 that they do not require organic fibres, but they stipulate that the end textile product were ecologically treated and manufactured and have no toxic effects such as allergy, skin irritations, chemical sensitivity and other health problems.
Better cotton: Environmentally friendly and sustainable cotton cultivation by controlling all stages without decrease in crop yield, in contrary by increasing the crop yield and keeping the cost the same. Harmful effect decreases 30-50 % that of conventional cotton. (BCI) [7]. Fairtrade: It is primarily a social label and focuses on improving the working and living conditions of smallholder farmers in the South. However, Fairtrade standards also include environmental criteria.

Fairtrade and Organic complement: Combining the two is a way of strengthening the position of farming families socially and environmentally as well as supporting their development efforts [4].

Cotton quality order: It is given successively Organic cotton ; Better cotton without GMO ; Better cotton with GMO ; Conventional cotton [7] .

2.7. Biodegradable Property of Organic Fibres

Biodegradable means that a material will break down or decompose through microbial action into basic elements found in nature. Many materials over time will degrade from sunlight, heat, moisture and mechanical stress, but this alone is not biodegradation. Compostable means that a material will break down quickly in a typical composting operation into nutrient-rich, soil-conditioning mixture. Heat, humidity and regular mixing, quickly break down the waste. Natural fibres are biodegradable, but synthetic fibres are recalcitrant to biodegradation and need long period of time giving pollutant products Certain studies have found the synthetic material to be an endocrine disruptor that can potentially effect the fertility. Organic fibres will biodegrade environmentally friendly while conventional fibres will give residual pesticide to the environment.

2.8. Recycling Organic Natural Fibres

Natural fibres and synthetic fibres can be recycled by tearing machines in a shorter length. Most of the time fresh and recycled fibres are mixed to produce new textiles. Conventional and organic textiles have no difference at the point of recycling, if there is pesticide residue on textile, this may only create toxic effect. For every kg of virgin cotton displaced by second-hand clothing approximately 65 kWh is saved, and for every kilogram of polyester approximately 90 kWh is saved [15]. Synthetic fibres are convenient for recycling process through melting polymer followed by fibre production from extruder. But natural fibres are not convenient to melt treatment since they have no melting properties. Especially recycled plastic bottles or even recycled polyester fabric are used in recyle process by melting process [11].

2.9. Economical Impacts: Cost Value of Organic Fibre Production and Selling

Organic fibres need more care, labor, procedure than conventional fibres, that's why organic fibres cost approximately higher than 5-50 % than conventional fibres in the world. But the total price of a textile product from organic cotton is higher 5-10 % than that of conventional cotton, since the other treatments such as yarn, weaving, finishing etc. are the same for both types. Fibre amount in the textile product will increase the price so as heavy sweatshirt will be more expensive than that of light one even though they were made of organic cotton[6] [11]. Organic and conventional cotton prices in 2013/14 period in the first 5 countries as India, China, Turkey, Tanzania, USA in the World are given in Table 3 [10] [26].

Tablo 3 : Cotton lint price in the first 5 countries in 2013/14 (correspond to 96 % of organic cotton world production)

	India	China	Turkey	Tanzania	USA	World Conventional Cotton
Organic Cotton Lint Price ($ / kg)	1,52	2,08-3,20	1,60-2,15	-	2,60-3,40	
Organic Cotton Seed Price ($ / kg)	-	1,04	-	0,43-0,46	-	
World Conv. Cotton Lint Price ($ / kg)						1,48

Transition period of conventional cotton to organic cotton requires 3 years, but the decrease of yield in three years creates a serious economical problem. Even though increasing awareness on environmental issues besides organic fibres was tried to be created, the result is not at the promising level recently. Some textile companies have begun to produce organic textiles, some of them have begun to produce only an organic line among their products. Demand and offer will determine the future of organic textiles.

2.10. Social Impacts: Promotion of Organic Fibres, Management of Organic Fibres

The more demand to organic fibres increases, the more production of organic fibres increases. Basic factors which affect the demand of organic textile products: 1-Sufficient knowledge about organic fibres and their harmful impacts on the environment, ecology: There is no enough visual or written knowledge to explain, to make the consumers conscious about the production process of organic textiles. 2-Having economical capacity to pay organic textiles being about 10% of higher price than that of conventional one: There are about 8 billion people in the world, most of them are living under insufficient conditions. That's why only people having higher salaries can pay the increase in price of organic textiles. 3-Accessibility to organic textiles: Consumers have different ability during shopping, price, model, colour, season, fibre type, accessibility etc. are the basic reasons. Organic fibres are being produced only in a small amount and it is also difficult to find, to access organic textiles all over the world, this is also a drawback of organic textiles. It is suggested that consumers have three knowledge which affects buying organic textiles: objective knowledge, subjective knowledge that is the perception of what and how people know, and knowledge usage which is gained from prior experience. This result stimulates new marketing methods, presentation, making people conscious studies to increase organic fibres demand. Renewable sources and sustainable production must be explained to consumers strictly.

Organic cotton did not show gradually increase in production and consumption for 40 years. Organic markets are only available in the developed countries such as UK, Europe, the US, Canada, Japan and Australia etc. , and in their elite shops. The global market share has gone around 4.3 Billion USD in 2009 [4]. Even though the benefits of using organic cottons instead of conventional cottons in apparel products are well acknowledged among consumers, they tend to choose conventional cotton clothing over organic cotton clothing due to relatively higher price. Organic cotton producers and retailers need to improve organic cotton production and trading processes to provide organic cotton clothing at more affordable prices [27]

The decrease in production was a problem of not having enough resources to produce organic cotton including the lack of seeds; the lack of pre-financing options; difficulty in finding capital and health care centers; accessing to training and advisory services.

The farmers may perceive the crop prices as too low, and therefore not making the investment required for organic production. This risk is especially high for farmers depending on rain, not using irrigation. In this case, it is necessary incentive precautions for farmers.

3. CONCLUSIONS

It ıs obviously seen that world is getting dirtier day by day. All sustainable precautions to prevent the pollution is worth to stimulate, like organic cotton, to leave habitable world for future generations.

There are mainly environmental- ecological, economical, social diameters from the transition conventional fibres to organic fibres; cotton is the leading of organic cultivated fibres.

Organic fibres will have environmental- ecological benefits to cease pesticides, fertilizers, GMO which entail declining yields and, therefore environmental sources such as weather, water, soil besides human health and ecosystem will be protected. Organic cultivation will supply sustainable production being environmentally friendly.

Transition to organic fibres requires about three years and the organic crop yield decreases during these years by entailing the decrease of cost value which is important for livelihood of farmers. The main problem is how can it be compensated this lost? The premium of organic cotton may surpass the conventional cotton if the first three years are compensated by some ways. This may be supplied by governmental support, incitement all over the world, transition to organic cultivation may be performed gradually. It is suggested that finding capital, seeds, health care centers, accessing to training and advisory services are even more important.

The cost value of organic textiles is higher than that of conventional. If consumers demand and pay this premium of organic production, offer of farmers will increase, therefore social awareness of consumers must be increased to buy organic products. Despite of harmful effects of conventional fibres to environment and human health; for example the production ratio of organic cotton in conventional cotton is still 0,7 % , this revealed that social interest must certainly be created. Demand, it was said, will overcome these issues.

Transition to organic fibres requires the collaborations among International Farmers Associations, Non Governmental Organisations, Governments, Trademarks, Consumers Associations and Fashion Designers. Organic textile demand from consumers could not be promising levels by now having 0,5%-0,7% of conventional cotton, due to about 10% higher price. Considering of this issue in new and creative ways may be a potential solution.

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