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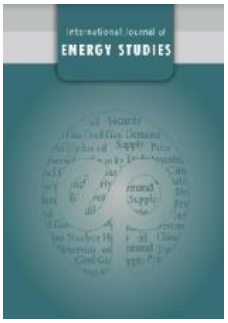

Research Article

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Attaining sustainable energy transition or facing costs of delayed action: A case of Turkey

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Highlights

- The sustainable energy policies affect future of not only environment,but also county's economy.
- Commecialisation of domestic coal could be the major obstruct of attaining sustainable energy transition.
- Turkey has a great potential to apply sustainable and envinmental energy policies.

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ABSTRACT

Apperceiving the materiality of energy transition, it is observed an enhancing effort and scoping in this field. Many countries have started stimulating studies and allotted extra budget for transition. In the last decade, some governments determined ambitious goals and applied policies to come true goals determined. Agreed two point are "energy efficiency" and "environment" along all the goals. It is irrefutable fact that policy makers will rev up because of the need of fast-react coming with developing technology. It is expected to occur new, more balanced, clean, clear and sustainable policies in the fallowing period. Paris Agreement has addressed climate change, its effects and necessity of stopping it. Some countries have taken action forthwith not to more arise matters from fossil fuel whereas others are late accordingly. In this study, sustainability of Turkey's energy policies has been interrogated in terms of energy efficiency and environment. The official data has been collected from reports of Ministry of Energy and Natural Resources (MENR), International Energy Agency, Strategic Plan (2019-2023) of MENR and so forth. also, current and declared policies for future by MENR have been examined. The comparison of current and prospected situations including attain sustainable energy transition and encountering with their possible costs of delayed actions has been illustrated. The big data collected refers to Turkey needs to; attain sustainability and preserve it with implementation of renewable and environmental energy policies, enhance investment in renewable, nuclear energy power and energy efficiency, continue stimulating and encouraging capital investors to carry its Energy sector to a competitive dimension. Until 2030 the vital challenge in front of Turkey is funding of transition nonetheless Turkey made a huge progress in last two decades. Finally, the most effective movements for achieving the sustainable transition are discussed.

Keywords: Sustainable Policy, Energy Transition, Energy Efficiency, Environment

1. INTRODUCTION

Energy policies are significant for some reasons in Turkey which has a big potential to be Energy Hub with coming from its characteristic geopolitics. Firstly, Turkey is a developing country and annual energy consumption increases every year. To further clarify this with an example, it can be stated that annual electricity consumption, is around 132.5 TWh in 2002, climbs up about 304.2 TWh [1, 2]. Secondly, although Turkey try to bring down its energy dependency, it is a dependent county upon fossil fuels. Thirdly, Turkey is the one of the most fruitful countries in terms of renewable energy potential as indicated in some (Kick C. et al., 2011 [3]; Çapık M. et al., 2012 [4]) papers. An another reason, Turkey spends average 45 billion USD annually and it is a huge blackhole for Turkey's economy especiallly when burden on total import was thought [5]. Actually, even just above reasons are enough to become aware of magnitude to shaping of energy policies. Nonetheless, there is more. Not only for Turkey, but also for the whole World there is a case to be need taking precautions soon, global warming due to greenhouse gas emissions. As a natural result, Paris Agreement has been signed and signatory countries put forth their Intended Nationally Determined Contributions (INDC). Against all the efforts, evaluations of science World, even if all the INDCs come true, it would be insufficient to reach holding global warming a level under 2°C and emphasize necessity to increase endeavours. Overall, taking the afore-mentioned remarks into consideration, it can be effortlessly concluded that in order to reach the pledges made under the Paris agreement on climate change it is clear that we need an ambitious energy transition towards low-carbon solution involving every part of economy [6].

Although Turkey made a big progress, it still does not have a clear strategy for 2030. Moreover, when literature was investigated there are some researches (Kaygusuz, 2002 [7]; Soyhan, 2009 [8]; Yorkan, 2009 [9]; Talinli et al, 2010 [10]; Yüksel. 2010 [11]; Yuksel & Kaygusuz, 2011 [12]; Kotcioğlu, 2011 [13]; Dağcı & Çaman, 2013 [14]), yet it is not possible talk about diversified resources. In this study, data from different official instructions is collected and the data compiled with organizational research method is used for detection of energy policies' stature of turkey through 2030 thereby is flashed on next studies.

The rest of article is structured as fallows. Section 2 details the method used. Section 3 provides official information and figures belong to last 2 or 3 decades. Section 4 discusses the main findings and Section 5 concludes the article.

2. METHODOLOGY

According to Duriau et al., 2007 [15] it has been studied in varied fields using with Organisational Research Methods (ORMs) by many scholars. ORMs have many advantages such as analytical flexibility, deep examination, in-depth comparative results, non-intrusive make, and so forth. That is why, we use content and policy analysis method.

This study is occurred in a few steps by using content and policy analysis method. First of all, the literature has been reviewed rigorously and the studies related to the topic have been defined. Secondly, type of data given below has been aggregated from multifarious data sources such to be including leading MENR and IEA, and so on.

Type of data [15]

- Annual reports (AR)
- Mission statements (MS)
- Proxy statements (PS)
- Other publicly available documents (PD)
- Internal company documents (ID)
- Trade magazines (TM)
- Scholarly journals (SJ)
- Business cases (BC)
- Computerized databases (CD)
- Open-ended questions in surveys (OQ)
- Transcribed videotapes (TV)
- Interviews (IN)
- Other field data (FD)
- Measurement items (MI)

Thirdly, the whole data has been subjected to an ad hoc methodological refinement. Lastly, the results have been supplied by concluding in the limits of research theme.

3. SUSTAINABLEITY OF ENERGY TRANSITION POLICIES IN TURKEY

Turkey's Gross National Product (GDP) demonstrated a growth more than three times in last two decades. It is an irrefutable fact that there is the production behind of this growth. In the other face of shape, production also means consuming electricity. Interaction of both can be obviously

derived from directly proportional growth between electricity consumption and GDP which is demonstrated at Figure 1.

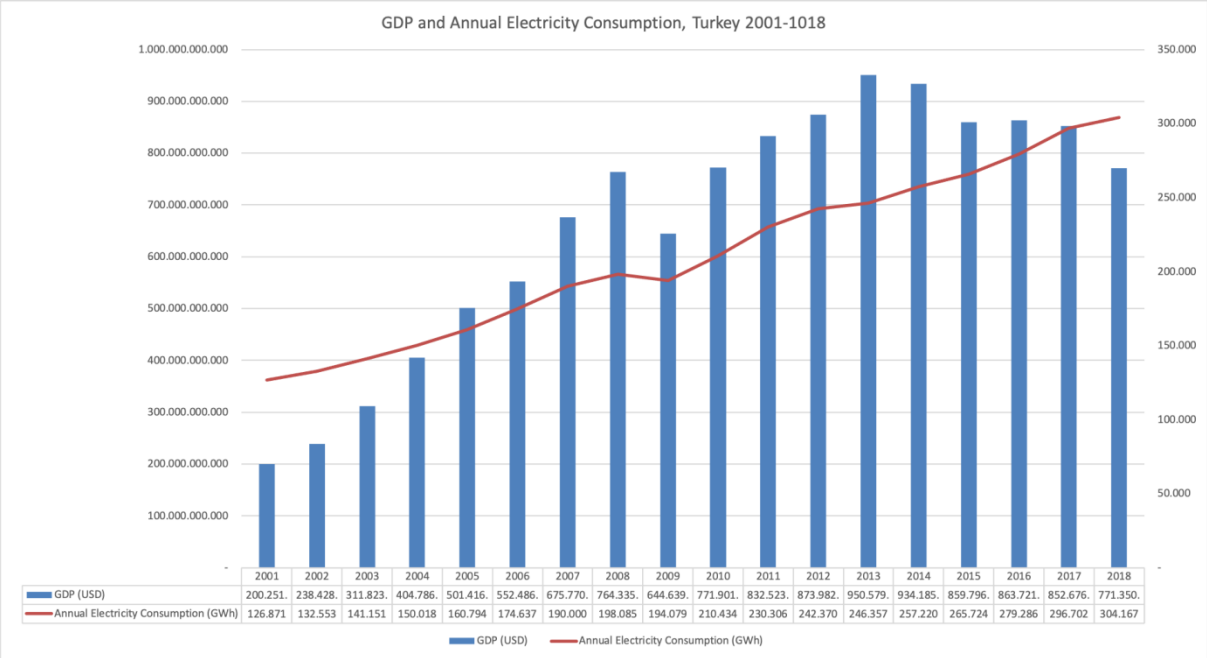

Figure 1. Gross National Product (GDP) and Annual Electricity Consumption of Turkey between 2001-2018 [16, 17]

It is not a logical perspective to evaluate movement of GDP regardless of Turkish Lira's (TL) value against USD. As a result, Turkey's GDP started decreasing after 2013 whereas energy consumption remains its climb. What is more, mentioning a continuous development in Turkey is feasible according to the World Bank's (WB) report [18].

It is not to hard project that Turkey maintains its development in the future, too. Turkey needs to more energy for its development. Even though its wish to use variable energy sources like fossil fuels is comprehensible, at the same time his development brings a negative effect on environment due to CO_2 emissions from the use of fossil fuels.

In the Figure 2. total CO_2 emission of Turkey is illustrated over a period of 28 years. In the figure is shown a remarkable climb. Inferred result is clear. Nonetheless, total CO_2 emission cannot be sufficient to say that Turkey increase detriment on environment. That is why, outcomes of Figure 3. Which depict CO_2 emission per capita is examined. The ratio of total CO^2 emission over population experience a rise to 4.6 tCO_2

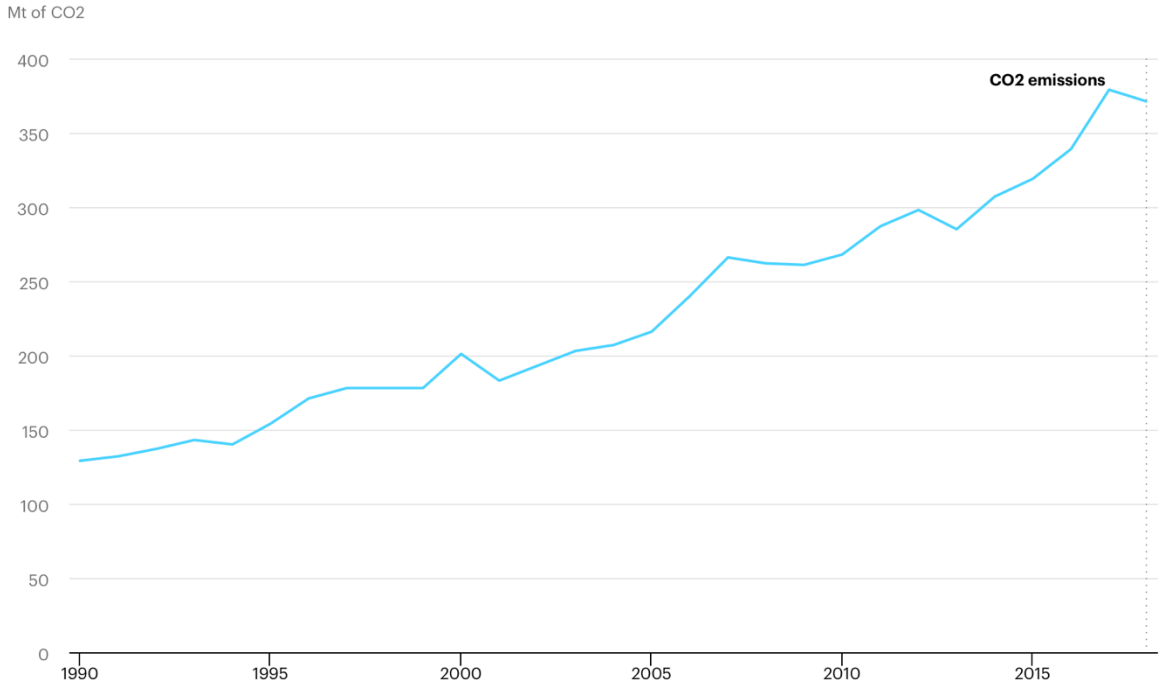

Figure 2. Total CO^2 emissions of Turkey between 1990-2018 [19]

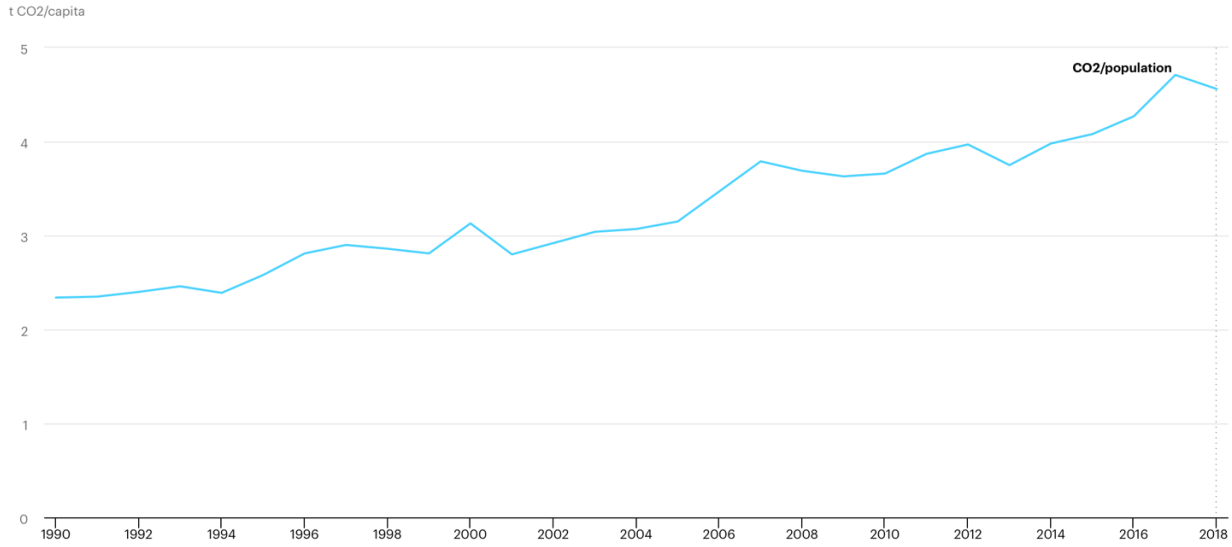

Figure 3. CO_2 emissions per capita of Turkey between 1990-2018 [19]

Figure 4. which distinguish sources of CO_2 emission is added to tackle the essence of problem. In this manner, implications in the figure give us opportunity to clarify what has the biggest incidence to release CO_2 into atmosphere. Especially with the soar to just below 120 $MtCO_2$ coal-sourced emission dominate CO_2 emission of Turkey.

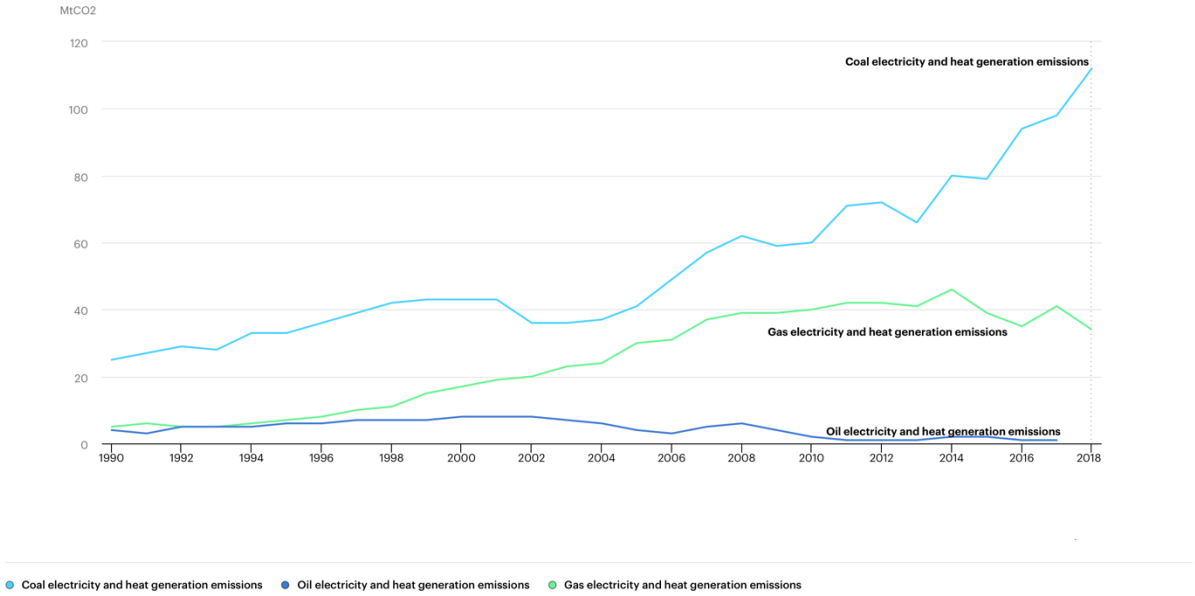

Figure 4. CO_2 emissions from electricity and heat by energy source of Turkey between 1990-2018 [19]

Magnitude of case can be grasped in Figure 5. with rocketing quantity of coal-sourced electricity generation in spite of growth in other renewable-sourced electricity production. The underlying factor of coal usage this much is the great coal reserve of Turkey. Commercialisation of domestic coal became even more important with National Energy and Mining Policy (NEMP) published on 6 April 2017.

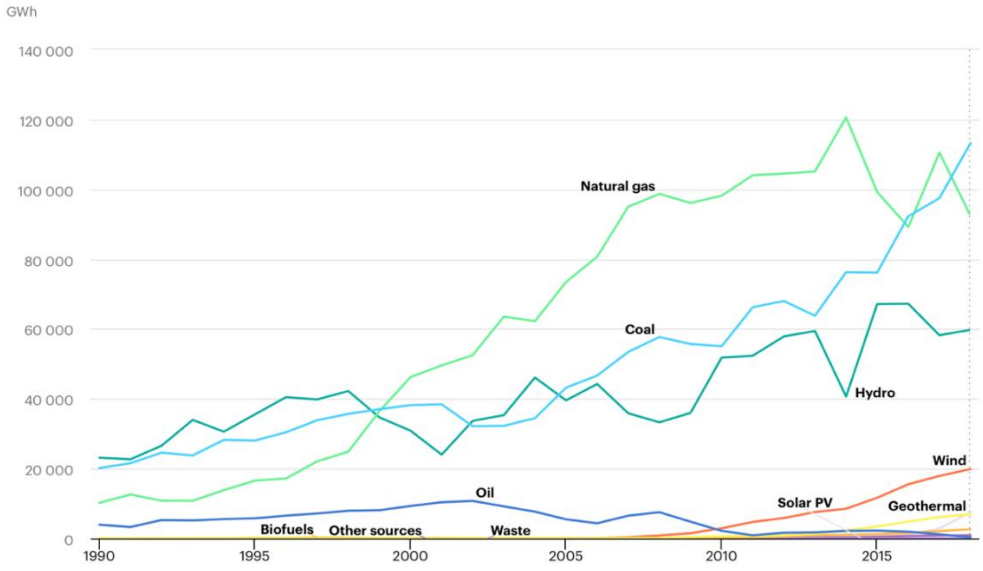

Figure 5. Electricity generation by source of Turkey between 1990-2018 [19]

The NEMP of Turkey mainly aims to meet Turkey's increasing energy demand in the most flexible, affordable and domestic way. The NEMP bases on three pillars; one of them is security of supply, other one is foreseeable market and the last one is indigenization. Accordingly, Turkey wants to utilize domestic coal more. Nevertheless, it does not seem the most efficient way because of lower calorific value of Turkish coal. In the last decade, Turkey tried to make its energy usage more efficient with direct investments and incentives such as YEKDEM, YEKA and so on…

On the other hand, there is a big problem in the industry to convert energy to added value. Manufacturing energy intensity of Turkey from 2000 to 2018 is displayed. Against to the drop through a decade, it levels off after 2013. However, Turkey's data does not seem in the wanted grade.

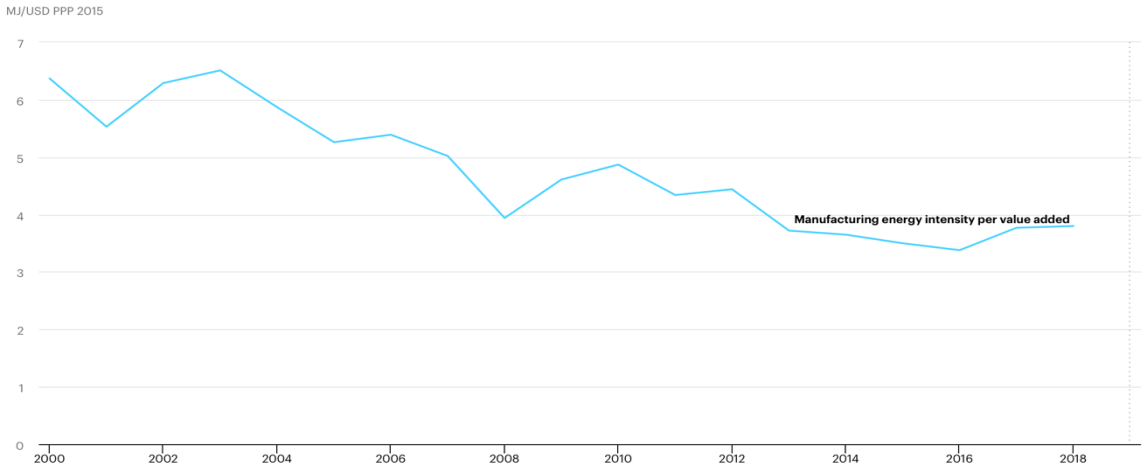

Figure 6. Manufacturing energy intensity of Turkey between 2000-2018 [19]

It is not fair to ignore Turkish Government endeavour to put forth efficient and environmental energy policies. In the Intended Nationally Determined Contribution (INDC) [20] sent to United Nations is adverted some important goals. A part of these is given below:

- Increasing capacity of production of electricity from solar power to 10 GW until 2030
- Increasing capacity of production of electricity from wind power to 16 GW until 2030
- Tapping the full hydroelectric potential
- Commissioning of a nuclear power plant until 2030
- Reducing electricity transmission and distribution losses to 15 percent at 2030

- Rehabilitation of public electricity generation power plants
- Establishment of micro-generation, co-generation systems and production on site at
- electricity production
- Reducing emission intensity with the implementation of National Strategy and Action Plan on Energy Efficiency
- Increasing energy efficiency in industrial installations and providing financial support to energy efficiency projects

Actually, made in huge progress most of them but major question is whether they are enough to make the world more unpolluted place. Winning et al., 2019 [21], attract attention to that approaching ambitious targets starting now, combined with accelerated low-carbon technological innovation, can both mitigate climate change as envisaged in the Paris Agreement, and achieve strong long-term global economic growth rates.

4. FINDINGS AND DISCUSSION

Promoting sustainability is not a single action done in a day, on the contrary, is a process including a group of movement fortified with assessments covered over a long-term period. Moreover, sustainable policies affect countries economy directly in the long view because these policies build up with forecasting future scenarios. Sustainability gains ultimate significance about energy when the major reasons of the world wars were thought.

In this study, some figures are leaned over about sustainable energy policies and some findings given below are reached. First of all, Turkey's GDP and energy utilisation are related with each other. Secondly, Turkey's development enhances its total CO^2 emission and CO^2 emission per capita. Thirdly, the main actor is coal for surging CO^2 emission in spite of Turkish Government's struggle to catch an upward trend on the energy production ratio from renewable energy resources among all over other energy resources. Other one, even though the NEMP of Turkey made a momentous contribution on country economy and energy pathways, the coal is still main rub in front of environmental energy policies. Lastly, most of goals in the INDC of Turkey was achieved significantly. Shortly, although an improvement is espied in Turkey, there is still a long way to go.

When Strategic Plan (2019-2023) of MENR [22] was analysed, the statures given below can be detected. It is forecast that Turkey will have used more renewable and domestic resources to

produce energy by 2023. It is predicted that Turkey will activate its first and only nuclear power plant's first unit (1200-MW) thereby it robust its security of energy supply and ensure more resilience its energy system. Moreover, The Turkish Government intends to build another. It is projected a growing domestic coal usage despite of its high negative impact. It is calculated that stimulation on energy efficiency will have demonstrated an increase by 2023 [23].

Overall, Turkey has an endeavour to attain energy transition and trend clean energy ecosystem. Yet, the domestic coal reserves needed commercialising constrain it with economical rationales. Turkey has a huge potential to reach %100 clean energy ecosystem if it overcomes the domestic coal reserves' pressure on its economy. Overcoming this issue can be a proper research question for fallowing scholars and papers.

5. CONCLUSION

Numerous policies exist for sustainable energy transition all over the world. In this study evaluation of Turkey case is revealed with diversified indicators. Thanks to comparisons is determined prominent bars in front of sustainable energy transition in Turkey. All the finding is examined and reach a consensus.

Findings address that Turkey need to create further opportunity for investors in energy sector to continue its economic growth. Furthermore, Turkey should diminish ambitiously CO^2 emission to catch the level mentioned in Paris Agreement. The domestic coal reserves' commercialisation in a clean way seems as the main obstruct over against %100 clean energy ecosystem. Turkey is quite close to its INDC declared in 2015, yet it has a prolonged list of things done by 2030.

In spite of the challenges, Turkey's potency is adequate to provision sustainability in energy field and construct an energy system including security of supply, affordability, steadiness and environmentalist.

As a Conclusion, Encouraging energy saving and renewable energy investments, remaining nuclear energy investments, increasing incentives for investors, fighting against CO^2 emission with mitigation of coal usage and clean conversion of coal to an economic output are vital. Otherwise, facing with unwanted environmental issues such as decreasing air quality, getting thinner of ozon layer, affecting adversely climate change, rising rate of CO_2 the water is inevitable

for Turkey. There is also possibility of impact on econmy of Turkey related with effect of fossil fuels' import in the future.

Declaration of Ethical Standards

The authors of the paper submitted declare that nothing which is necessary for achieving the paper requires ethical committee and/or legal-special permissions.

LIST OF ABBREVIATION

MENR	Ministry of Energy and Natural Resources
TWh	TeraWatt-hour
INDC	Intended Nationally Determined Contributions
GDP	Gross Domestic Product
WB	World Bank
NEMP	National Energy and Mining Policy
YEKDEM	tr. TR. (RERSM) Renewable Energy Resources Support Mechanism
YEKA	tr. TR. (RERA) Renewable Energy Resources Areas
CO_2	Carbondioxide
tCO_2	ton(nes) Carbon dioxide
$MtCO_2$	Million tonnes Carbon dioxide

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