INTERNATIONAL
JWM&D

International Journal of Water Management and Diplomacy

ISSN 2717- 8277

Volume: 1
Issue : 4
January 2022

Published by HPA Hydropolitics Association

International Journal of Water Management and Diplomacy
e-ISSN:2717-8277

Submission

The journal is an online journal and all manuscripts should be submitted electronically through Dergipark Online Submission and Peer-Review System : https://dergipark.org.tr/en/pub/ijwmd

Authors should prepare their papers in accordance with the current Guideline for Authours available at the same website.

JWMD Issue: 4 2021
International Journal of Water Management and Diplomacy
e-ISSN:2717-8277

International Journal of

Water Management and Diplomacy

Official Journal of the Hydropolitics Association

HYDROPOLITICS ASSOCIATION

Editor-in-Chief

Dursun Yıldız

International Journal of Water Management and Diplomacy Vol.1, No. 5 (June 2022),

International Journal of

International Journal of Water Management and Diplomacy
e-ISSN:2717-8277

Water Management and Diplomacy

Official Journal of the Hydropolitics Association

Volume :1 Issue:4 January 2022

Contents

International Journal of Water Management and Diplomacy
e-ISSN:2717-8277

Research Article

WATER CONFLICTS AND THE SPATIOTEMPORAL CHANGES IN LAND USE, IRRIGATION, AND DROUGHT IN NORTHEAST SYRIA WITH FUTURE ESTIMATIONS

Fulya Aydin-Kandemir[1], Dursun Yıldız[2]

[1] Ege University Solar Energy Institute 35100 Bornova/İzmir, Turkey

[1]Hydropolitics Association, 06680 Kavaklidere/Ankara, Turkey

ORCID NO: 0000-0001-5101-6406

E-mail: fulya.aydin.kandemir@hpacenter.org

[2] Izmir Institute of Technology, 35430, Izmir, Turkey

[2]Hydropolitics Association, 06680 Kavaklidere/Ankara, Turkey

E-mail: dursunyildiz@hpacenter.org

ORCID NO: 0000-0001-5110-9960

Corresponding author: fulya.aydin.kandemir@hpacenter.org

Abstract

Climate change cause instability for conflict zones in the coming years with potential socio-economic consequences in addition to environmental impacts. Decreasing water resources and rural land usage force people to migrate from rural to urban areas due to low productivity in agriculture and animal husbandry, rising food prices, and decreasing wealth levels. This study evaluates climate change impacts on northeast Syria, relatively a wetter climate zone of Syria. Within the scope of the study, it was determined to what extent land use changes and agricultural patterns throughout the region affect water use (mainly groundwater) in addition to addressing the effects of climate change on the scale of drought. Just like in this study, revealing the possible relations between the previous regional conflicts and the changes in land use, drought, and water use will be beneficial in terms of evaluating the possible threats in the future. Obviously, the changes in land use, the increase in irrigated agricultural areas, and the intensive groundwater use make the experienced situation worse. Additionally, it will be undeniable that the effects of climate change are one of the most pressing political and economic challenges in the region since the drought has also exacerbated these problems. Therefore, it is worthwhile to evaluate the potential future threat of the spread of conflicts experienced before. In entire Syria and the northeast region, it is required more attention to adapt climate change effects on water resources to peace and security.

Keywords: Syria, Northeast Syria, drought, irrigation, climate change, water security, hydropolitics, Geographic Information Systems

JWMD Issue: 4 2021
International Journal of Water Management and Diplomacy
e-ISSN:2717-8277

1. Introduction

Water is vital for all living creatures. In some cultures, certain waters are believed to be holy or to possess healing qualities. However, since water is very imperatival, water scarcity can influence many relations between different communities in the world, especially in the Middle East. According to Amery (2020), no region has witnessed more water-based conflicts than the Middle East since more than 5000 years ago (earliest civilization in Mesopotamia).

The countries of the Middle East are considered with significant spatio-temporal variations in precipitation and with local surface and groundwater resources. As a Middle East country, Syria turns into increasingly scarce water as the future requirement approaches or exceeds current resources (Varela-Ortega and Sagardoy 2002; Salman and Mualla 2004).

Syria (Fig 1) includes very arid, arid, semi-arid, humid, and semi-humid climatic zones (Fig 2 and Fig 3). Different climate types arise from geographical differences in the country because of the coastal areas in the Mediterranean, deserts in the middle, and forests in the north and the northwestern regions (Albrecht, Schmidt, Mißler-Behr and Spyra, 2014). Therefore, Syria is vulnerable to climate change because of current and future climatic conditions for the Mediterranean, the Middle East, and African countries. According to Mathbout et al. (2018), the 2007–2010 drought was the driest period in the instrumental record, happening just before the onset of the recent conflict in Syria.

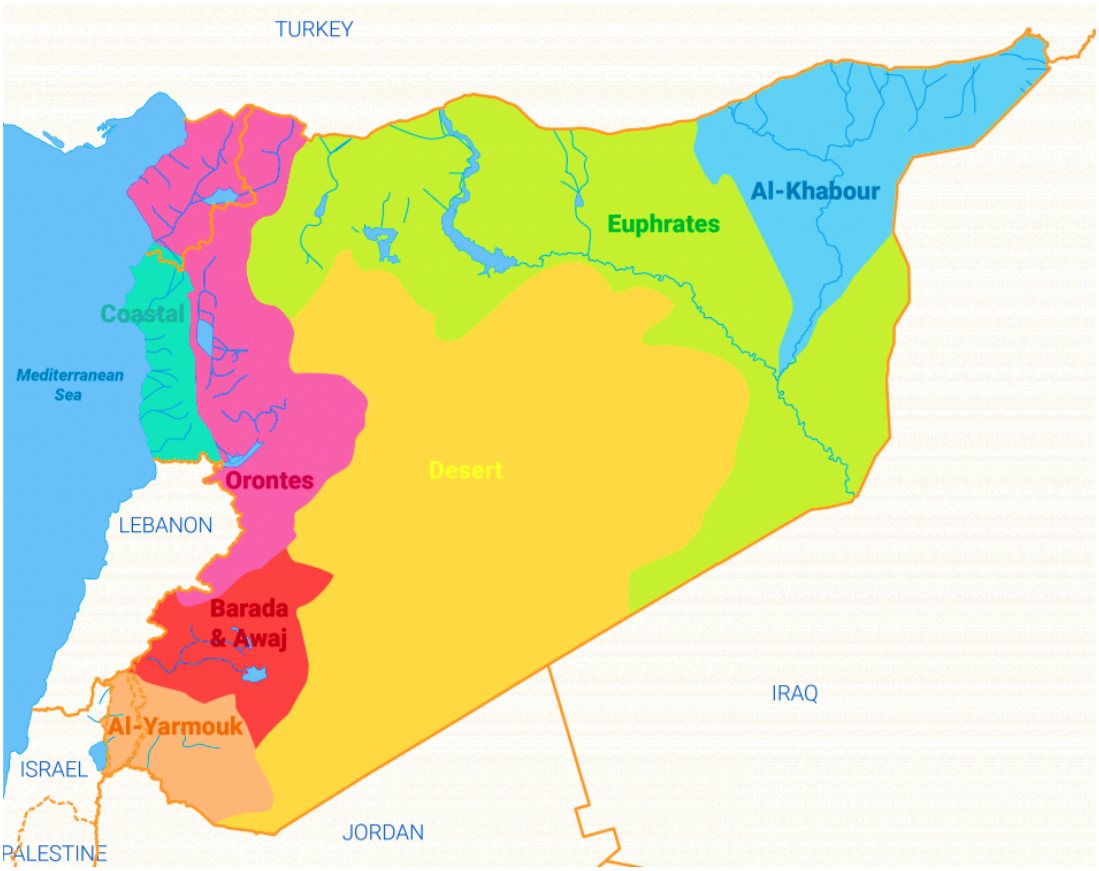

Fig 1. Water basins of Syria (Fanack.com, 2019).

International Journal of Water Management and Diplomacy
e-ISSN:2717-8277

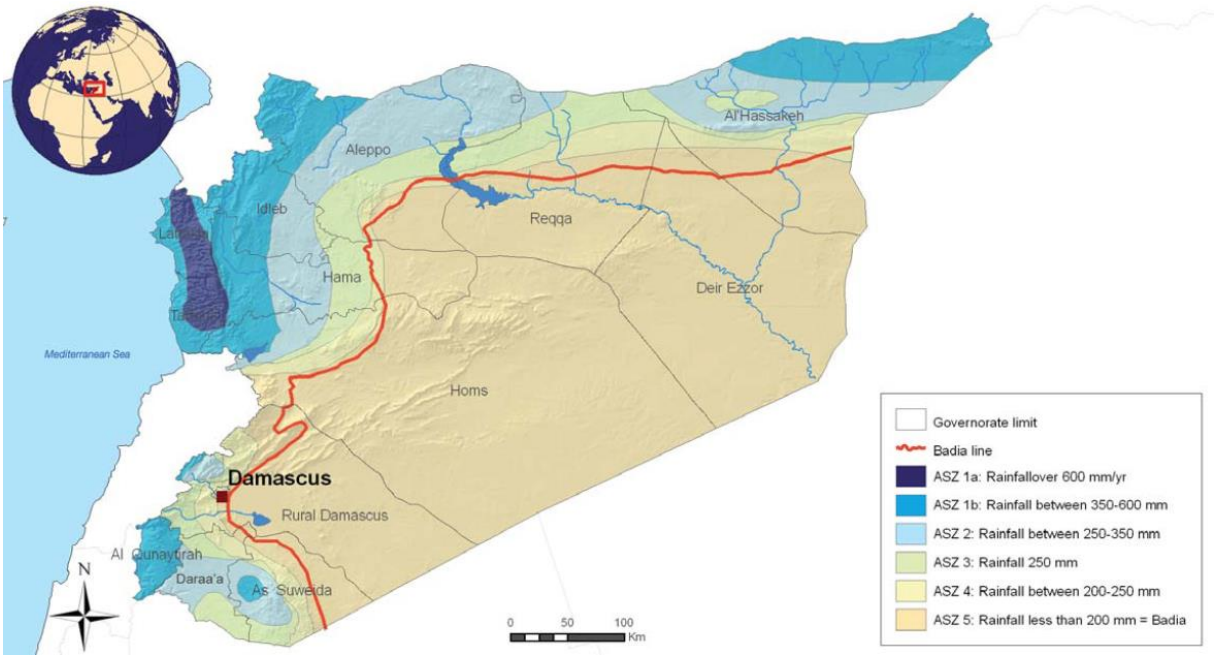

Fig. 2. Based on IFAD, climatic zones in Syria (IFAD, 2010).

In Fig 2, the ASZ regions are defined as Syrian Agricultural Settlement Zones (ASZs, which are classified based on several agro-ecological variables (annual rainfall depth and probability and geomorphological features) for policy and planning purposes since the early 1970s (IFAD 2010). The categories of the ASZs are given in the study (Ülker, Erguven, Gazioglu, 2018) as follows.

- ASZ 1: The most humid zone of Syria is divided into two areas: ASZ 1a: This area receives more than 600 mm of precipitation, and rainfed crops are productively planted. ASZ 1b: This area receives 350-600 mm precipitation and not less than 300 mm in two years out of three. Thus, it has the potential to get two seasons every three years. Wheat, legumes, and summer crops are the primary crops here.
- ASZ 2: A zone with annual precipitation of 250-350 mm and not less than 250 mm in two years out of three. The area is suitable for barley but also wheat, legumes, and summer crops. The usual rotation in this zone changes based on the depth of the soil. On deep soil, wheat pulses and forage legumes – a summer crop is planted if winter rain is adequate; otherwise, the summer crops will fall fallow. On shallow soil, primarily barley, but part of the land is planted with cumin. Thus, fallow is rarely carried out.
- ASZ 3: Precipitation of 250-300 mm and more than 250 mm in one year out of two. This zone is suitable for barley, the primary crop, and some legumes in the rotation could be planted. It is probable to get one to two seasons every three years. Fallow is practiced in the case of investment shortage.
- ASZ 4: These are marginal lands with 200-250 mm precipitation and not less than 200 mm during half the related years. Lands in this zone were used for growing barley or grazing, but cultivation is precarious and thus forbidden by law. Recent agricultural policy changes have affected this area: (1) Official credit does not exist for crop production because cropping is uncertain. (2) Fertilizer is not dedicated to rainfed

Issue: 4 2021
International Journal of Water Management and Diplomacy
e-ISSN:2717-8277

crops because it is unnecessary in this marginal zone. (3) Since it is a marginal production zone, not all farmers participate in the government production plan and hence do not have crop production licenses that authorize them to subsidize inputs. (4) Groundwater pumping to irrigate the summer crops is inhibited.

- ASZ 5: This is the desert and steppe area used only for grazing, with less than 200 mm precipitation. It is generally defined as steppe after excluding irrigated lands and marked as a Badia agro-ecological zone. It is a natural grazing area for sheep and camels (IFAD, 2010).

According to Global Trade Analysis Project (GTAP) (2005), the agro-ecological zones in Syria consist in 4 classes as (1) temperate arid, (2) temperate dry semi-arid, (3) temperate moist semi-arid, and (4) temperate sub-humid. The zones were mapped and given in Fig 3. In FAO (2018) special report for Syria, the country can be divided into the five Agro-Ecological Zones (AEZs) based on the level of annual precipitation received, as shown in Fig 4.

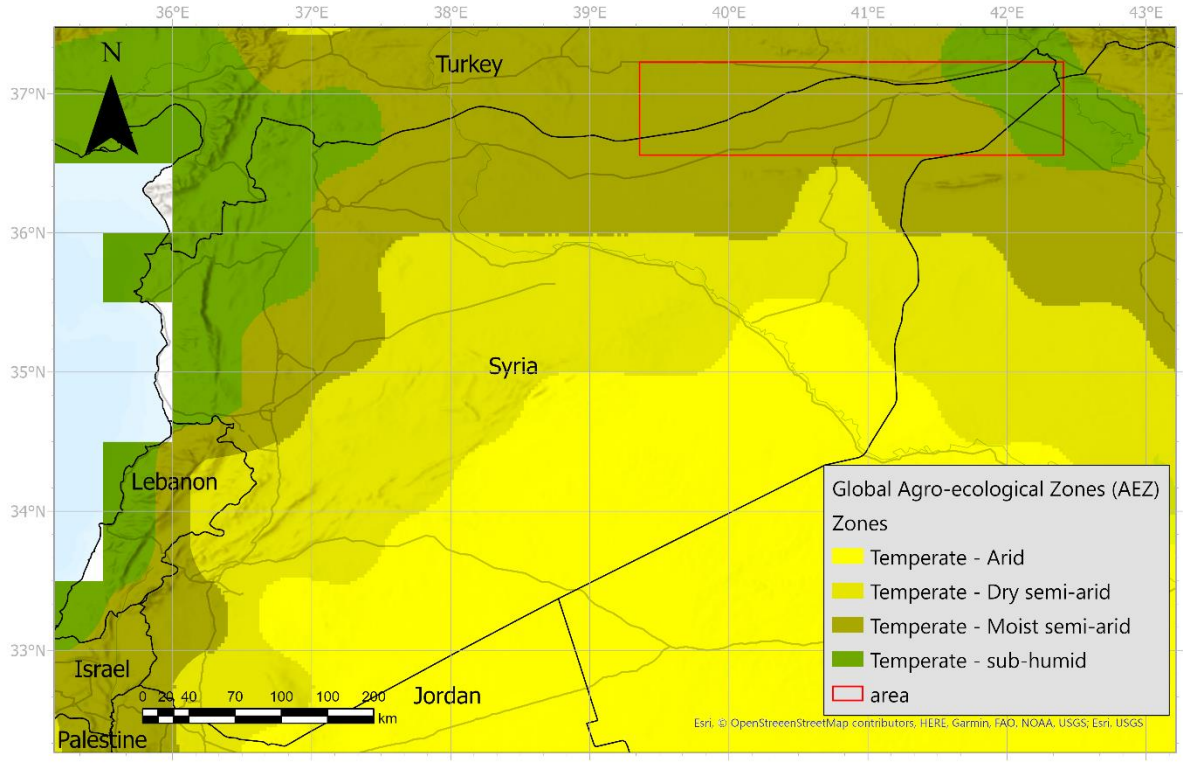

Fig 3. Agro-ecological zones in Syria (data source: GTAP, 2005; mapping by ArcGIS pro 2.8). Area indicates the study area (in legend).

JWMD Issue: 4 2021
International Journal of Water Management and Diplomacy
e-ISSN:2717-8277

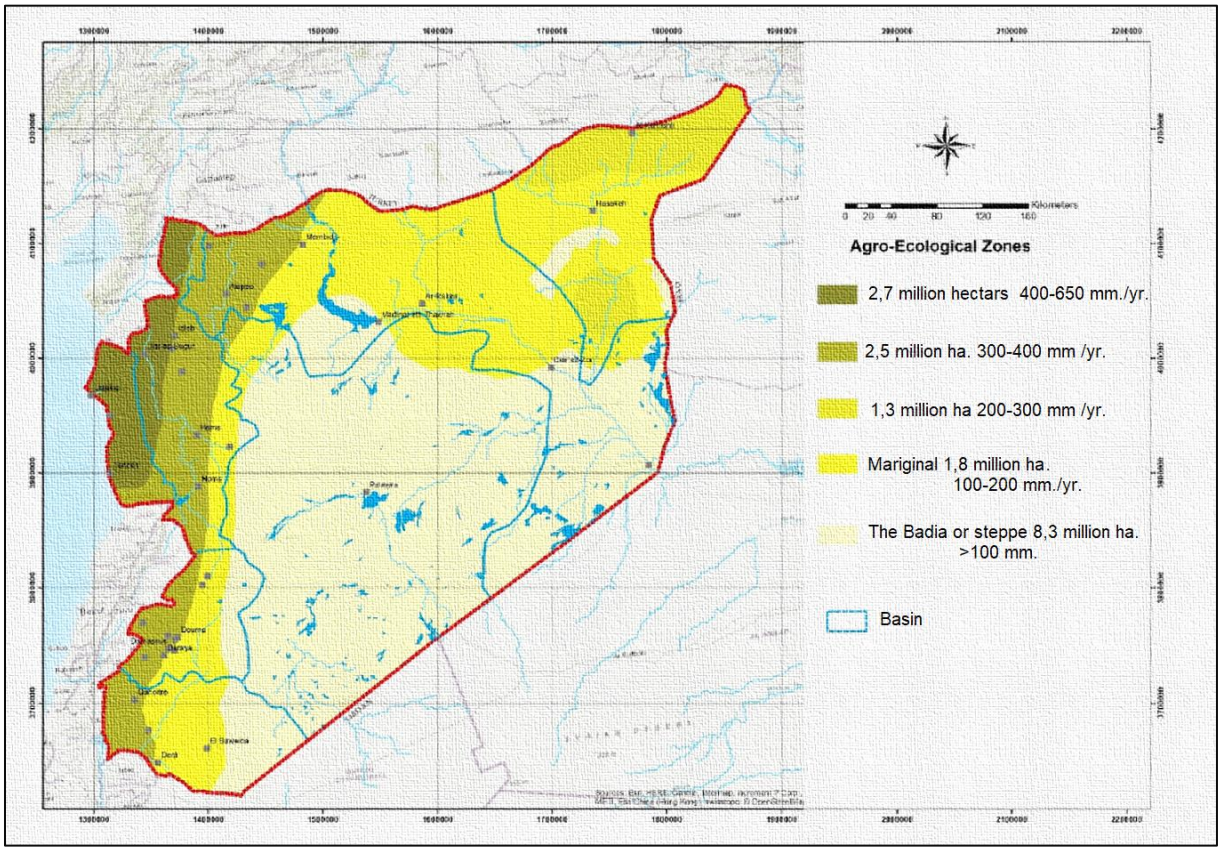

Fig 4. Agro-Ecological Zones (AEZs) are based on the level of annual precipitation (FAO, 2018).

1.1. Groundwater Use

Groundwater use in Syria has increased considerably and is overexploited in an unsustainable manner. Almost 60% of all irrigated sites in Syria depend on groundwater (Salman and Mualla 2004). Areas irrigated by groundwater increased by 140% from 1985 to 2002 (Somi, Zein, Dawood, Sayyed-Hassan, 2002).

About 87% of all water is used for irrigation, with almost 60% taken from groundwater resources, which leads to immense and unsustainable exploitation of these resources (Wada, Beek, Bierkens, 2012). The rest is used for household and industrial purposes, which account for 9% and 4%, respectively (Salman and Mualla 2004). Therefore, the highest water consumption can be detected in areas where irrigation is common. About 44% of water is consumed in the Euphrates & Aleppo basin, followed by Dejlah & Khabour. 33% of total groundwater wells were drilled in Al Hassake Region for irrigation, followed by Aleppo and Al Raqqa. These regions are responsible for almost 70% of groundwater pumping in total (Table 1). When dividing amounts of withdrawals by the area of each region, the Al Hassake region also accounts for the highest withdrawal per km^2 (Baba, Kareem, Yazdani, 2021).

Table 1. Data for drilled wells in Syria's region from FAO (2012).

Region	Private Well	Government Project
Daar'a	13075	20992
Damascus	44543	-

Table 1. Data for drilled wells in Syria's region from FAO (2012).

Region	Private Well	Government Project
Homs	22655	27518
Hama	55798	7979
Idleb	44515	11164
Aleppo	101213	89358
Al Raqqa	51407	93128
Deir Ezzor	25420	38173
Al Hassake	313248	-

Al Hassake region also accounts for the highest number of drilled wells (313248), all private wells. (Table 1). About 300000 ha area is equipped for irrigation in the Al Hassake region, and 75% of this area is used groundwater. Almost 60% of all irrigated sites in Syria depend on groundwater. Areas that are irrigated by groundwater have increased each year. However, groundwater resources have been affected by natural and anthropogenic factors. Salinization is one of the critical problems for sustainable agricultural activity. This problem, which is of particular concern because it can limit socio-economic development in many areas, continues to attract scientists' attention to preserve and protect groundwater quality (Baba, Kareem, Yazdani, 2021).

In the Al Hassake region, mainly groundwater has been unsustainably exploited, which will worsen the situation quantitatively and qualitatively without recharge of resources. Due to over-pumping and the increase in unsustainable wells observed in recent decades, groundwater is quantitatively declining. Generally, groundwater contamination sources fall into two main categories: natural and anthropogenic sources. Significant sources of natural groundwater pollution include climate effects. For example, about 43% of groundwater has a high concentration of SO_4 and/or NaCl. This is particularly dominant in the eastern region of Syria due to the severe environment where rainfall is relatively low, and evaporation is high (Baba, Kareem, Yazdani, 2021). As seen in Fig 5, water in Syria has primarily used for irrigation, and nearly half of irrigation systems use groundwater as their main water resource (Salman and Mualla 2004).

Issue: 4 2021
International Journal of Water Management and Diplomacy
e-ISSN:2717-8277

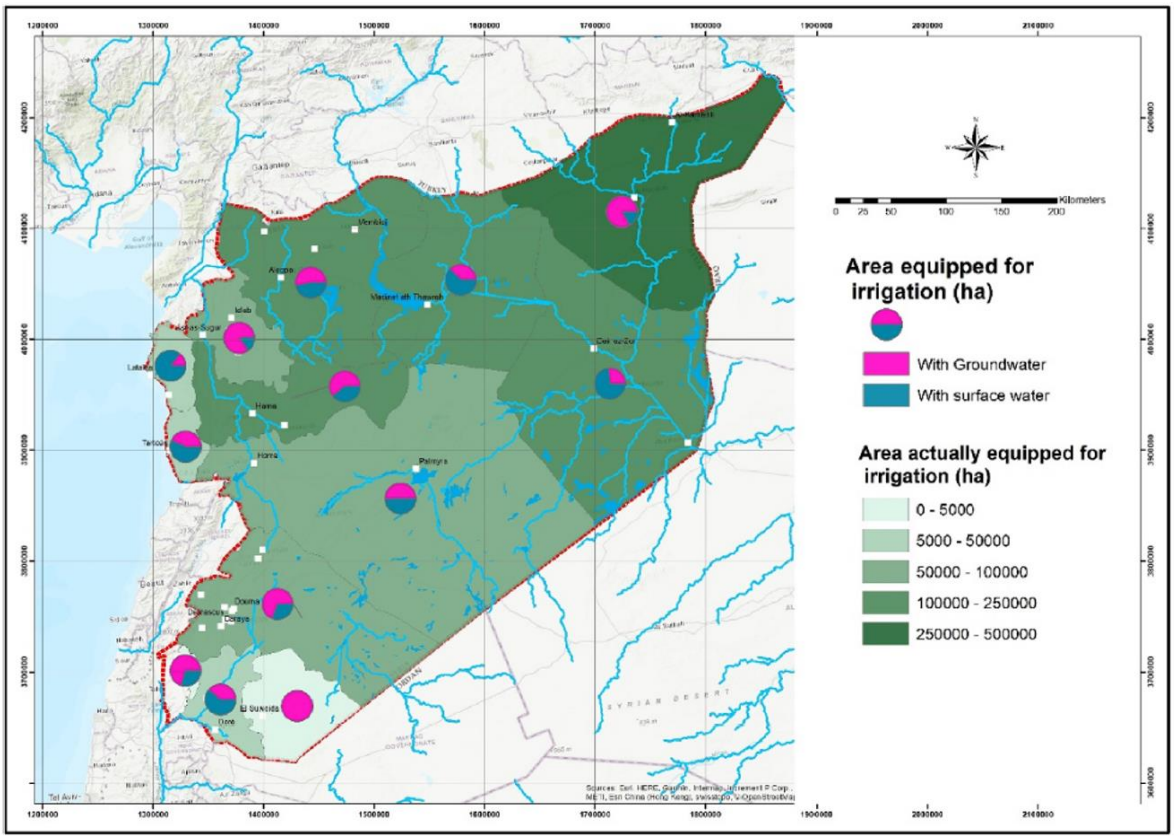

Fig 5. Area equipped for irrigation and irrigation resources (Mourad and Berndtsson 2012).

2. STUDY AREA

The study area lies in Northeast Syria (Fig 6 and Fig 7). North-east Syria is described as the land located on the right bank of the Euphrates River. It also consists of a small part of the catchment area of the neighbouring Tigris River. Generally, the terrain is low-lying, becoming hillier and less flat in the north. Elevation ranges from 200 to 500 **m**eters **a**bove **s**ea **l**evel (MASL). There is only one geological characteristic with higher elevation—the Abdel Aziz mountains, located parallel to the Sinjar in Iraq— specifying how this plate moved north and folded in the geological past, affecting the oil resources in the area (Graham, Muawia, Al-Maleh, Sawaf, 2001).

Demographic and community data vary according to the source and date. There are over three million people presently residing in northeast Syria (UNOCHA, 2019), including many Internally Displaced Persons (IDP) and imprisoned members of the Islamic State in large camps (ACAPS, 2020). The population is spread over major cities and many smaller towns and villages, as well as larger IDP camps.

International Journal of Water Management and Diplomacy
e-ISSN:2717-8277

Fig 6. Locator map of the study area.

Fig 7. Study area in detail (Zwijnenburg, Nahas, Vasquez, 2021).

3. DATA AND METHOD

The selected study area includes (1) the Euphrates and Tigris basins of Southeast Turkey, (2) the Euphrates and Al-Khabour basins of North-east Syria, and (3) the Tigris basin of North-west Iraq. The study area is discussed in light of some parameters. These parameters are:

(1) Area equipped for irrigation (AEI-AI) with groundwater (AEI-Groundwater) or surface water (AEI-Surface water)
(2) Land use changes (LUCs)
(3) Spatio-temporal changes in shallow groundwater wetness percentile (GWS)
(4) Trends in precipitation
(5) Temporal changes in Standardized Precipitation-Evapotranspiration Index (SPEI)
(6) Timeline of conflicts

In this study, which presents the situation of Syria and neighbouring countries in the study area in detail, how much ground and surface water is used in the area equipped for irrigation has been revealed.

After determining which resource in the study area was mainly used, spatio-temporal land use changes in the region were examined. The change over the years was identified for each land-use class.

The temporal variation of the GWS values, which can be evaluated together with the examination of the LUCs in the region, has also been evaluated within the scope of this study.

The temporal variation of the precipitation parameter, which may affect the temporal variation of groundwater and other water resources in the region, has been determined in the study, and the long-term trend of SPEI values has also been revealed.

At the end of all these temporal change analyses, the relationship between LUC, GWS, and SPEI (potential measure of drought) changes with the trend of conflict events in the region are discussed.

3.2. Database Development for the Study

In this study, the Area Equipped for Irrigation data (AEI-Actually Irrigated (AI), AEI-Groundwater, and AEI-Surface water) was obtained from Intergovernmental Hydrological Program (Siebert, Henrich, Frenken, Burke, 2013; IHP-UNESCO, 2017; AQUASTAT-FAO, 2017) with 8.32 km spatial resolution and mapped in the ArcGIS Pro 2.8 environment. Area irrigated (AEI-AI) is a percentage of the area equipped for irrigation. The statistics with a reference year closest to the year 2005 were chosen for this version of the Global Map of Irrigation Areas.

The spatio-temporal land use/cover data were attained from Copernicus Climate Change Service's Land cover maps (2000 to 2020) with 300 m spatial resolution (Copernicus Climate Change Service, 2021). The database mentioned that the entire Medium Resolution Imaging Spectrometer (MERIS) Full and Reduced Resolution archive from 2003 to 2012 was first classified into a unique 10-year baseline land cover map. This is then back- and up-dated using change detected from (i) Advanced Very-High-Resolution Radiometer (AVHRR) time series from 1992 to 1999, (ii) SPOT-Vegetation (SPOT-VGT) time series from 1998 to 2012, and (iii) PROBA-Vegetation (PROBA-V) and Sentinel-3 OLCI (S3 OLCI) time series from 2013. Copernicus Climate Change Service provides these maps' long-term consistency, yearly

updates, and high thematic detail on a global scale (Copernicus Climate Change Service, 2021). In these maps, the typology was defined using the Land Cover Classification System (LCCS) developed by the United Nations (UN) Food and Agriculture Organization (FAO), with the view to be as much as possible consistent with the GLC2000, GlobCover 2005, and 2009 products. In addition, the UN-LCCS was found quite compatible with the Plant Functional Types (PFTs) used in climate models (ESA, 2017).

As a groundwater drought indicator, Shallow Groundwater Drought Indicator data (GWS) were obtained from the Nasa Grace database between 2003 and 2021 with 27.75 km spatial resolution (NASA Grace, 2021). NASA Grace documentation indicates that the groundwater indicator is based on terrestrial water storage observations derived from GRACE-FO satellite data and integrated observations. In Fig 8, the indicators describe current wet or dry conditions, showing the probability of occurrence with lower values (warm colors) meaning dryer than usual and higher values (blues) meaning wetter than usual.

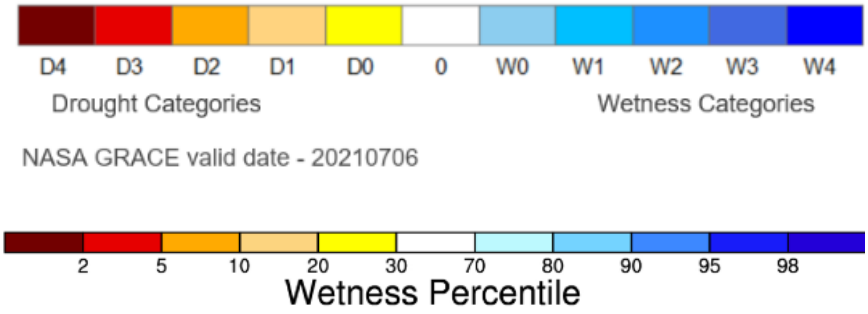

Fig 8. Wetness percentile classification (above) and percentile values (below) (NASA Grace 2021).

In this study, the Standardised Precipitation-Evapotranspiration Index (SPEI) was used to evaluate the drought conditions of the study area. SPEI data were attained from SPEI (2021) (https://soton.eead.csic.es/spei/index.html). The dataset is updated during the first days of the following month based on the most consistent and updated sources of climatic data. Mean temperature data are attained from the NOAA NCEP CPC GHCN_CAMS (for download; ftp://ftp.cpc.ncep.noaa.gov/wd51yf/GHCN_CAMS/) gridded dataset. Monthly precipitation totals data are obtained from the Global Precipitation Climatology Centre (GPCC) (for download; ftp://ftp-anon.dwd.de/pub/data/gpcc/first_guess/). The Climate Prediction Center (CPC) data with an original resolution of 55.5 km is interpolated to the resolution of 111 km (SPEI, 2021).

The SPEI Global Drought Monitor is currently based on the Thornthwaite equation for estimating **p**otential **e**vapo**t**ranspiration (PET). This is due to the lack of real-time data sources for computing more robust PET estimations with more extensive data requirements. The SPEI Global Drought Monitor is thus its near real-time character, a characteristic best suited for drought monitoring and early warning purposes (Begueria, Latorre, Reig, Vicente-Serrano, 2021).

4. RESULTS AND DISCUSSIONS

4.1. Relations of groundwater (GW) and surface water (SW) with the areas equipped for irrigation

Area equipped for irrigation and actually irrigated (AEI-AI), AEI-Groundwater, and AEI-Surface water were mapped by ArcGIS pro 2.8 software and shown in Fig 9, Fig 10, Fig 11.

In this study, the area equipped for irrigation (AEI) is considered separately for both groundwater (AEI-Groundwater) and surface water (AEI-Surface water). Therefore, it was calculated how much groundwater (GW) or surface water (SW) was used according to the irrigation percentages in the total irrigated area by the spatial analyses employed via ArcGIS pro 2.8. As a result, the graph shows the groundwater and surface water usage rates in irrigated areas in Fig 12.

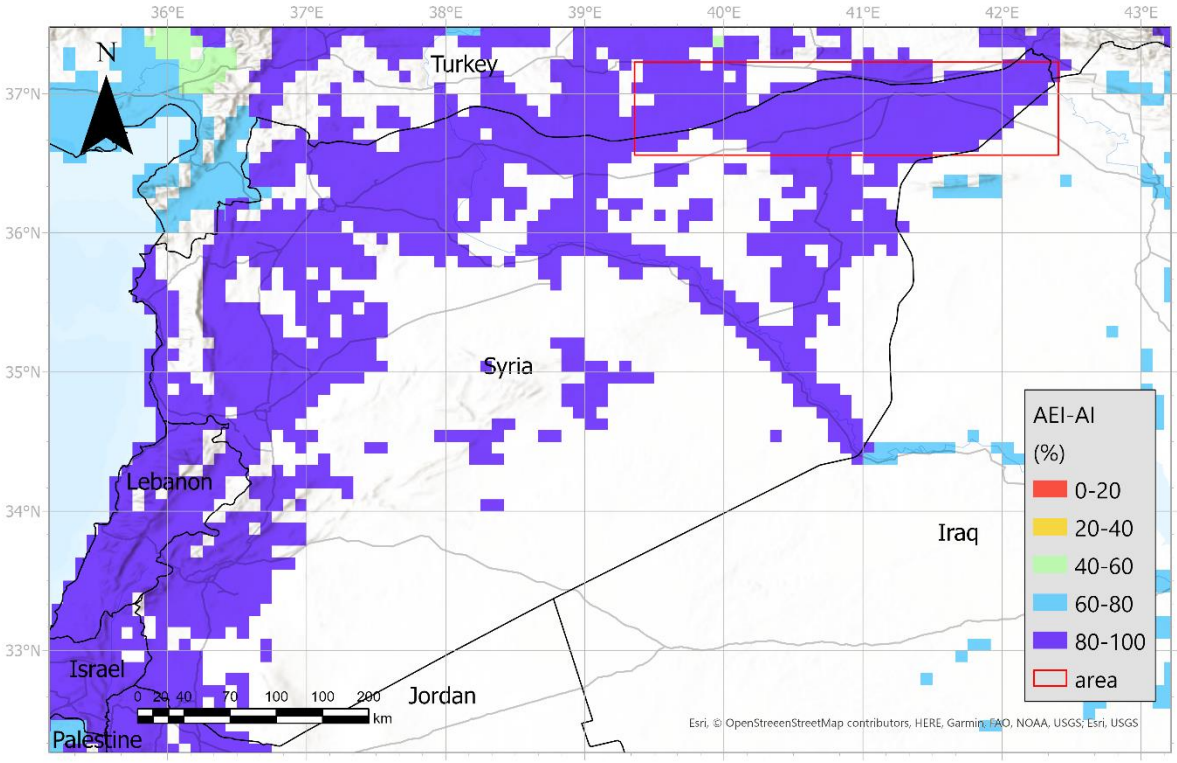

Fig 9. Area equipped for irrigation and actually irrigated (AEI-AI).

International Journal of Water Management and Diplomacy
e-ISSN:2717-8277

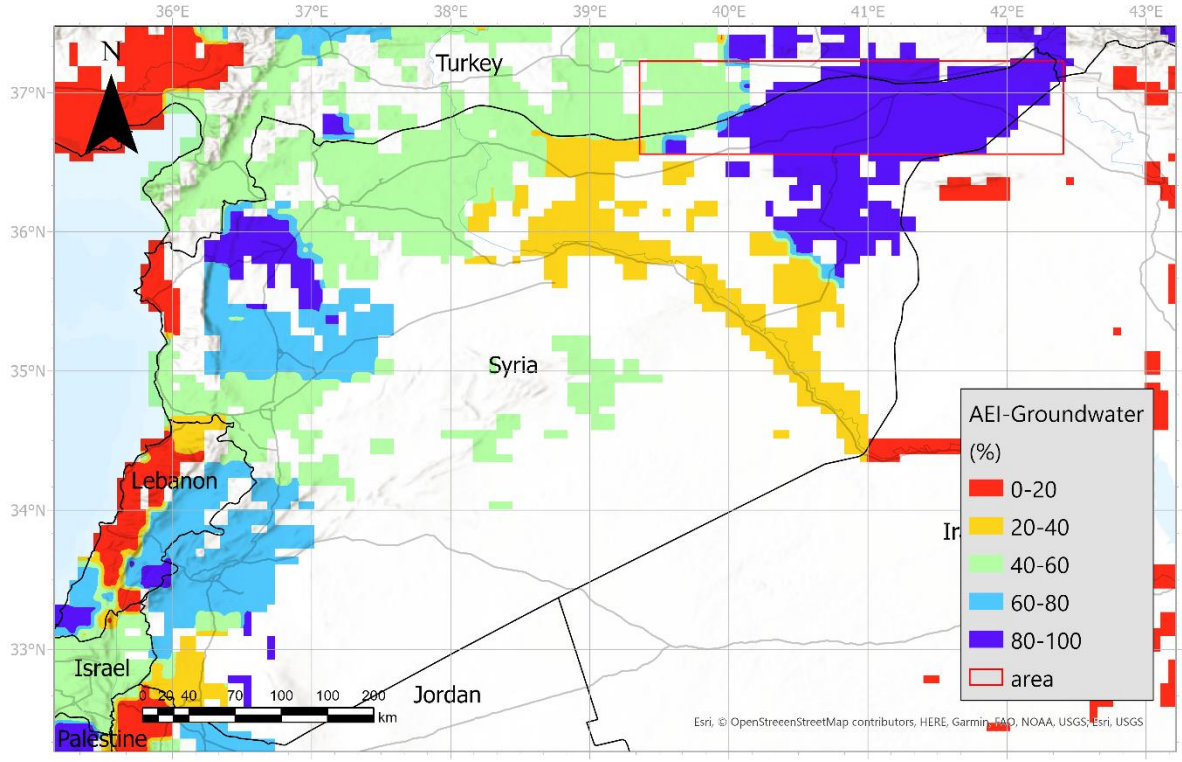

Fig 10. Area equipped for irrigation with groundwater (AEI-GW).

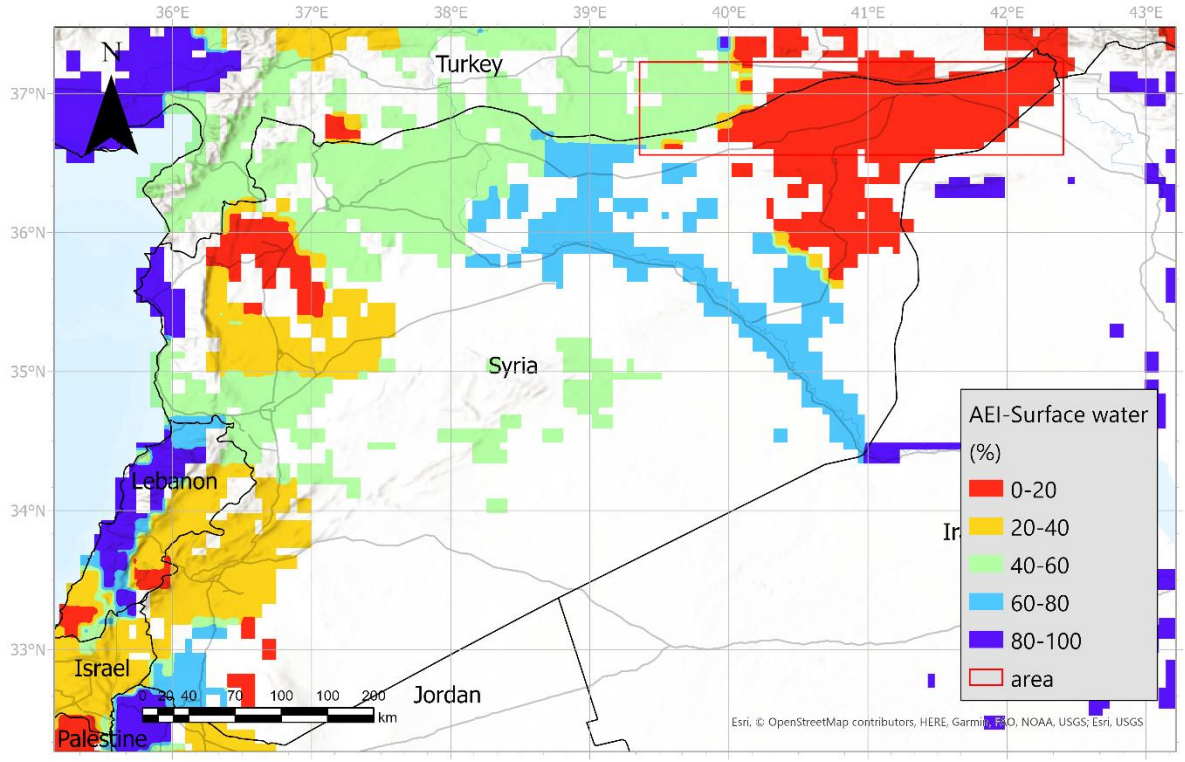

Fig 11. Area equipped for irrigation with surface water (AEI-SW).

As calculated from the data of Intergovernmental Hydrological Program, an area of approximately 76377 km² is irrigated in Syria (Fig 9). The actual irrigation rate of the irrigated areas in Syria is between 77.26% and 100%. The total of the irrigated areas between 80% and 100% is 76131 km². The area irrigated between 77.26% and 80% was determined as 246 km². GW and SW are used among the sources used for irrigation in these areas.

Areas with intensive groundwater irrigation are generally in the Al-Khabour water basin (Fig 1) in the north-east of Syria (Fig 10). When viewed transboundary in this region, groundwater use in Turkey is quite intense in regions equipped for irrigation and actually irrigated between 40% and 100%. However, Turkey also benefits from surface water in these regions (Fig 11). Apart from Al-Khabour, another region where groundwater is used intensively is the north of the Orontes water basin (Fig 1).

The study area, which is the focus of this study, is located within the Euphrates and Al-Khabour basins. While groundwater is used intensively in the Syrian part of the study area, both underground and surface water resources are utilized in the Turkish part of this area (Fig 10 and Fig 11).

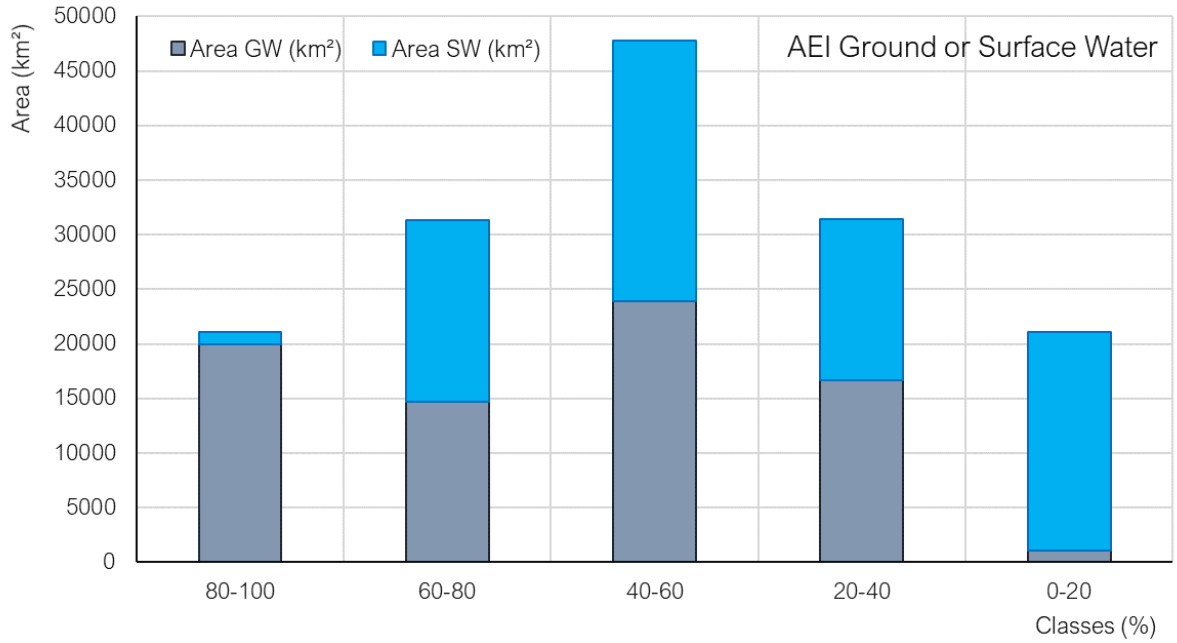

Fig 12. Groundwater and surface water usage rates in the areas equipped for irrigation.

As shown in Fig 12, groundwater is predominantly used where 80% to 100% of the area equipped for irrigation is actually irrigated. In areas where irrigation is actually between 20% and 80%, groundwater and surface water are used almost equally. A large amount of surface water is used in areas where irrigation is really low (0-20%) of the area equipped for irrigation.

4.2. Spatio-temporal changes in land use

The study examined the change of land use classes in the region between 2000 and 2020. The change in agricultural areas is particularly remarkable. Here, agricultural areas are divided into two classes as irrigated and rainfed areas. The land use maps of 20 years between 2000

and 2020 are given in Fig 13 and Fig 14, respectively. Additionally, the detailed information about the legend used in the maps is given in Table 2.

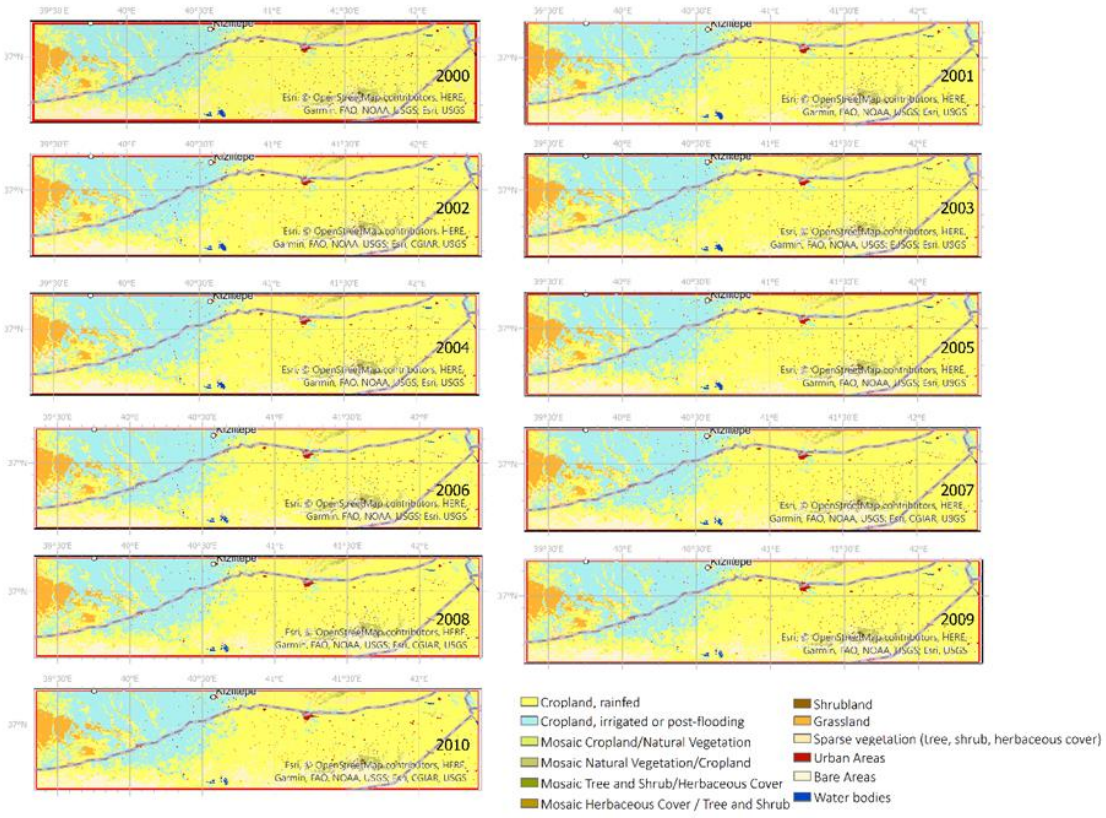

Fig 13. Land use classification maps from 2000 to 2010.

Issue: 4 2021
International Journal of Water Management and Diplomacy
e-ISSN:2717-8277

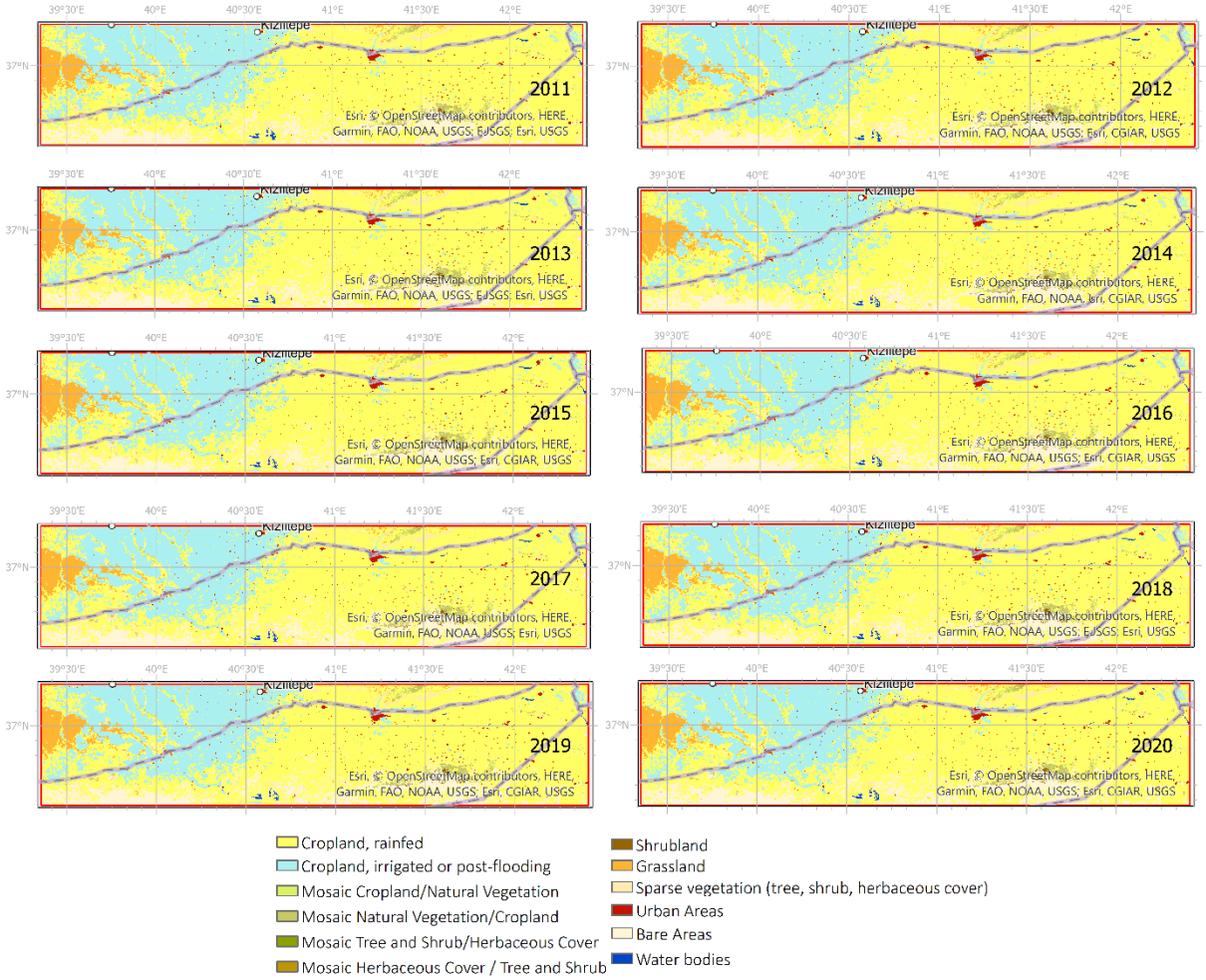

Fig 14. Land use classification maps from 2011 to 2020.

Table 2. Correspondence between the IPCC land categories used for the change detection and the LCCS legend used in the land cover classification maps (Fig 13 and Fig 14) (Copernicus Climate Change Service, 2021).

IPCC Classes considered for the change detection	**LCCS legend used in land cover classification maps**
Agriculture	Rainfed cropland
	Irrigated cropland
	Mosaic cropland (>50%) / natural vegetation (tree, shrub, herbaceous cover) (<50%)
	Mosaic natural vegetation (tree, shrub, herbaceous cover) (>50%) / cropland (< 50%)
Forest	Mosaic tree and shrub (>50%) / herbaceous cover (< 50%)
Grassland	Mosaic herbaceous cover (>50%) / tree and shrub (<50%)
	Grassland
Shrubland	Shrubland
Sparse vegetation	Sparse vegetation
Settlement	Urban
Bare area	Bare areas
Water	Water

The land use maps in Fig 13 and Fig 14 were also subjected to spatial change analysis in ArcGIS Pro 2.8. Particularly the temporal variations in the areas of (1) cropland (irrigated or post-flooding), (2) cropland (rainfed), (3) mosaic cropland/natural vegetation, and (4) mosaic natural vegetation/cropland were given between Fig 15 and Fig 16. The changes of all land use classes in the study area were also shown in Table 3.

It is also critical to determine the trend of land use change in Turkey and Syria. The extent of the change in especially irrigated and rainfed agricultural areas should be assessed by considering the two countries separately. Also, the change of urban areas over time should be evaluated individually for both countries. The study examined the spatio-temporal change of agricultural and urban areas by country, and the results were given in Table 4 and Fig 17.

International Journal of Water Management and Diplomacy
e-ISSN:2717-8277

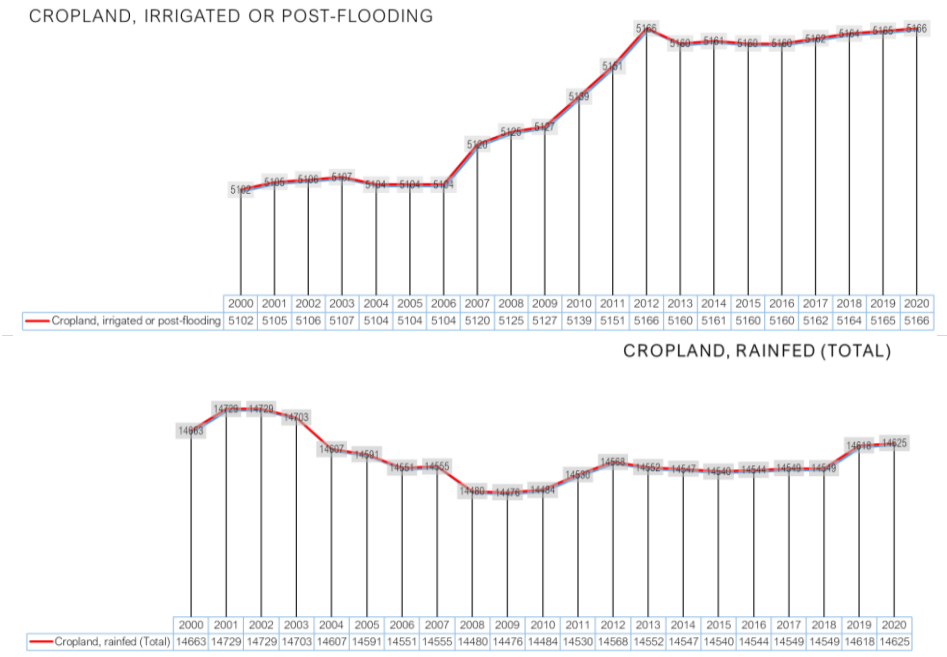

Fig 15. Spatio-temporal change (km²) of irrigated cropland and rainfed croplands between 2000 and 2020.

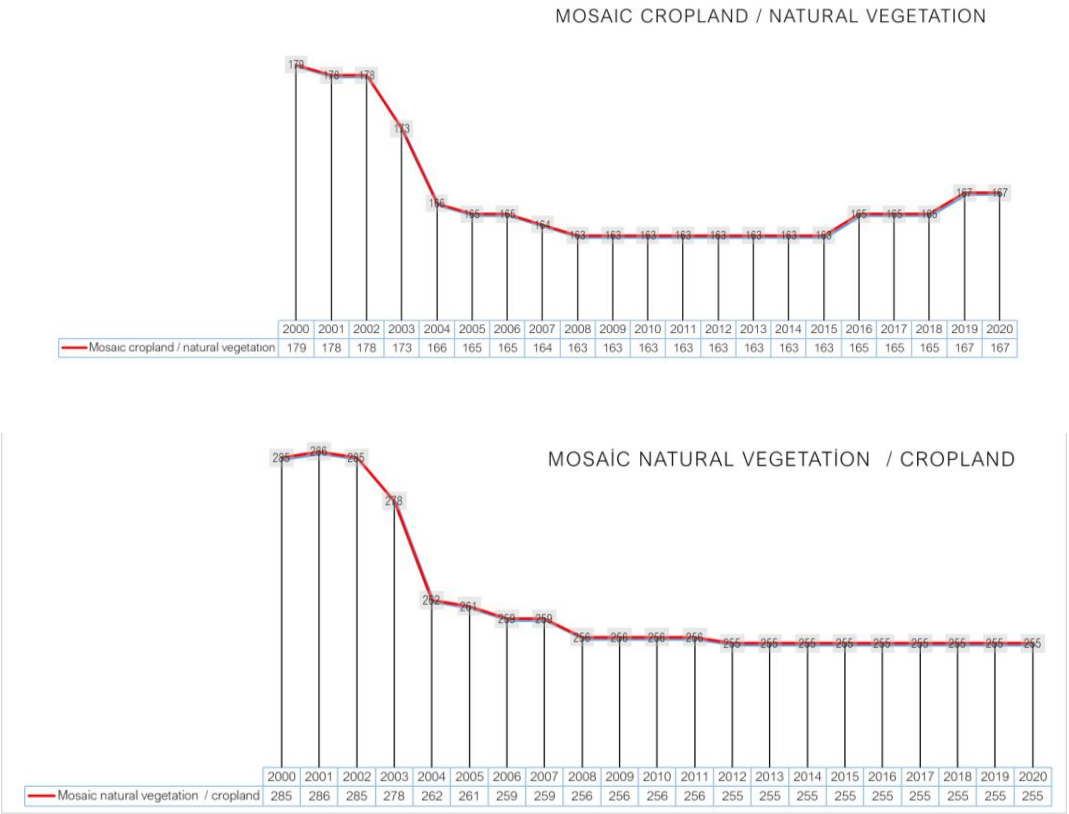

Fig 16. Spatio-temporal change (km²) of mosaic cropland/natural vegetation and mosaic natural vegetation/cropland between 2000 and 2020.

Issue: 4 2021
International Journal of Water Management and Diplomacy
e-ISSN:2717-8277

Table 3. The area (km²) of LULC classes except agricultural areas (classes are based on IPCC classification).

LULC Classes	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Mosaic tree and shrub/herbaceous cover	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Mosaic herbaceous cover/tree and shrub	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Shrubland	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26
Grassland	777	777	778	796	827	827	828	823	822	815	801	738	715	715	713	713	708	699	691	689	686
Sparse vegetation (Total)	453	397	391	396	416	420	424	401	397	390	364	362	336	341	341	341	341	343	343	335	335
Urban areas	166	167	167	167	167	167	168	168	170	171	172	174	176	180	187	195	195	196	201	201	201
Bare areas	2090	2075	2080	2095	2168	2182	2220	2230	2309	2323	2343	2348	2342	2356	2355	2355	2355	2355	2355	2293	2289
Water bodies	51	51	51	50	50	49	47	46	45	45	45	44	42	42	42	42	42	42	42	42	42

Issue: 4 2021
International Journal of Water Management and Diplomacy
e-ISSN:2717-8277

Table 4. Spatio-temporal change (km²) for the agricultural areas (as Cropland, rainfed and Irrigated cropland) and urban areas in Turkish and Syrian parts of the study area.

LULC Classes	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**
Turkey - Cropland, rainfed	2727	2731	2736	2726	2708	2708	2707	2736	2757	2780	2816	2870	2906	2906	2903	2901	2904	2911	2914	2914	2916
Syria - Cropland, rainfed	10181	10211	10205	10189	10128	10114	10075	10051	9985	9959	9931	9922	9922	9906	9905	9901	9901	9900	9898	9936	9939
Turkey - Cropland, irrigated or post-flooding	3577	3579	3580	3580	3577	3577	3577	3593	3598	3601	3616	3629	3644	3647	3647	3647	3647	3649	3651	3652	3653
Syria - Cropland, irrigated or post-flooding	1486	1486	1486	1488	1488	1488	1488	1488	1488	1487	1484	1483	1483	1474	1474	1474	1474	1474	1474	1475	1474
Urban Areas	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**
Turkey	36	36	36	36	36	37	37	37	37	37	38	39	39	40	44	47	47	47	50	50	50
Syria	119	119	119	119	119	120	120	121	121	122	123	124	125	127	129	133	133	134	136	136	136

International Journal of Water Management and Diplomacy
Issue: 4 2021
e-ISSN:2717-8277

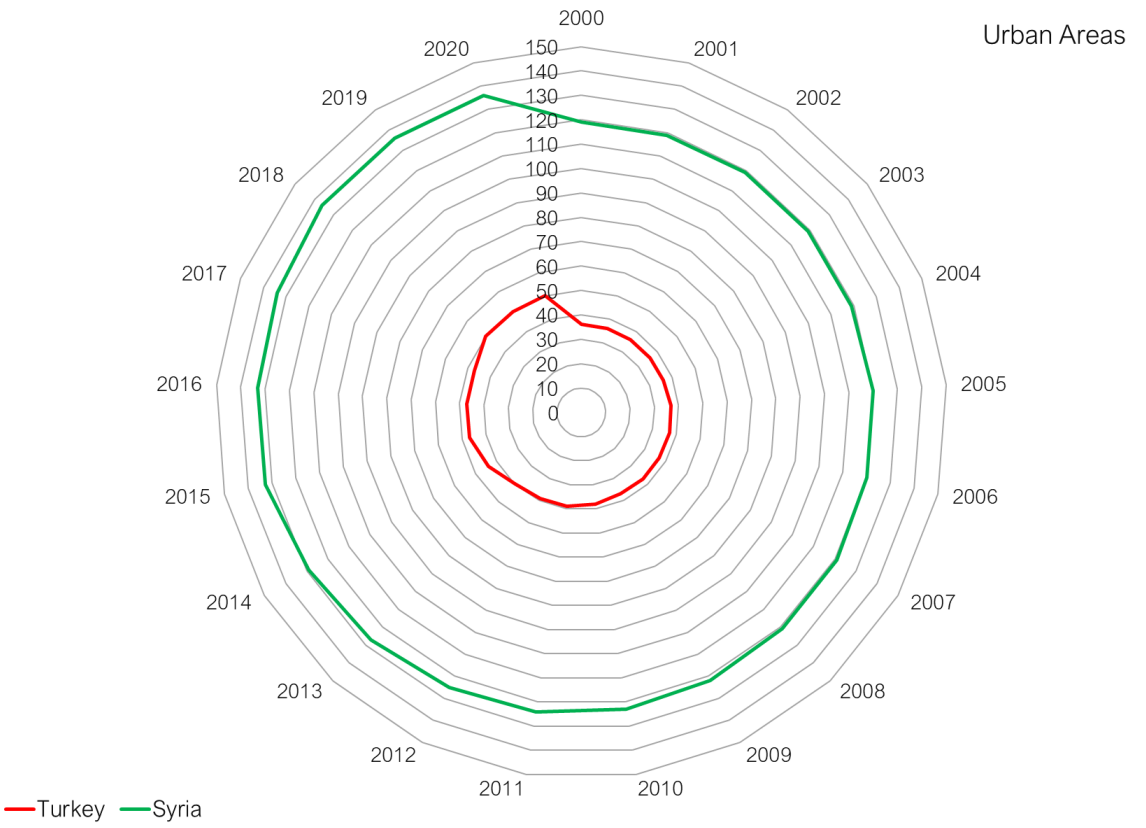

Fig 17. The spatio-temporal change (km²) of urban areas between 2000 and 2020 in Turkish and Syrian parts of the study area.

In Fig 15, irrigated agricultural areas experienced a significant increase, especially in 2006. These areas reached their maximum in 2012 (5166 km²), and there was no dramatic decrease until 2020. While rainfed agriculture had the largest area in the region between 2000-2004, it decreased after 2004. This spatio-temporal change shows the transition of the local communities' agricultural activities from rainfed agriculture to irrigated agriculture in the region. According to the 2005 "area equipped for irrigation data" in Fig 9, Fig 10 (GW), and Fig 11 (SW), the study area has the highest percentage of the irrigated area according to all Syrian lands. It was determined that this region, which had an irrigation capacity of 80% to 100% in 2005, switched to a high amount of irrigated agriculture in 2006. According to these assessments, local communities used more water in agricultural activities. The spatio-temporal change of mosaic cropland/natural vegetation and mosaic natural vegetation/cropland classes in Fig 16 shows the decrease in these areas as shifting to irrigated agriculture.

When countries are considered separately in Table 4, it has been determined that the area of rainfed agriculture in the region has increased over time in Turkey. However, this increase was reversed in some years (2003-2006 and 2014-2016). In the Syrian part, there was a decrease in the rainfed agricultural areas.

Issue: 4 2021
International Journal of Water Management and Diplomacy
e-ISSN:2717-8277

Although there was an increase between 2000 and 2002, a decline was determined in rainfed agriculture from 2002 to 2018. In 2019 and 2020, a relative rise was observed.

In irrigated agriculture, an expansion has been determined in Turkey (Table 4). Although there was a decline in the irrigated agricultural areas between 2004-2006, the general trend is to increase the irrigated agriculture every year, albeit a little. In Syria, irrigated agricultural areas expanded between 2000-2008; however, after 2008, there has been a slight decrease in irrigated agricultural areas every year. The urban area expansion shows an increasing trend for both countries (Table 4 and Fig 17).

4.3. Historical GWS Change

In Fig 18, spatio-temporal GWS values were assessed in the study area. Although it was observed that the groundwater was high between 2003 and 2007; however, a significant decrease occurred in 2008 and 2009. This is consistent with the data in Fig 9 and Fig 10. The percentage of irrigated areas in the region in 2005 was relatively high compared to other parts of Syria (Fig 9). Additionally, irrigation is employed by groundwater intensively in this region (Fig 10). According to these data obtained in 2005 (Fig 10), it is inevitable that there will be a significant groundwater withdrawal after 2005.

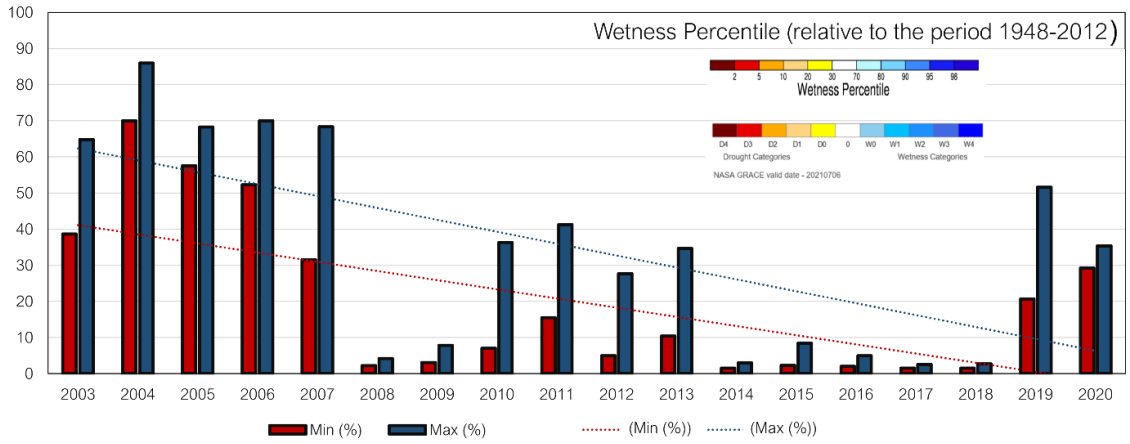

Fig 18. GRACE-Based Shallow Groundwater's wetness percentile (GWS) changes between 2003 and 2020.

The results in Fig 18 supports Fig 10. After 2007, groundwater has never regained its pre-2007 values. Compared to Table 4, the decrease in irrigated agriculture in Turkey between 2004-2006 and Syria's increase in irrigated agricultural areas in this period (2000-2008) explains the dramatic return of the high groundwater value between 2003-2007 in 2008-2009. Even though Syria decreased the irrigated agricultural areas, especially after 2009, Turkey's expanded irrigated agricultural areas caused the short-term increase in 2010-2013 not to continue, and a much more impressive decrease occurred between 2014-2018. Between 2019 and 2020, there was an increase in intensity in the groundwater level, even if the groundwater rates were not in 2007 and before.

Issue: 4 2021
International Journal of Water Management and Diplomacy
e-ISSN:2717-8277

4.4. Precipitation in the region and SPEI Results

Monthly precipitation and long-term average precipitation (1981-2010) near the Al-Hassake region, where lies our study area, is given in Fig 19. This figure shows that no precipitation has occurred in 5 months (July to November) between (1981-2010).

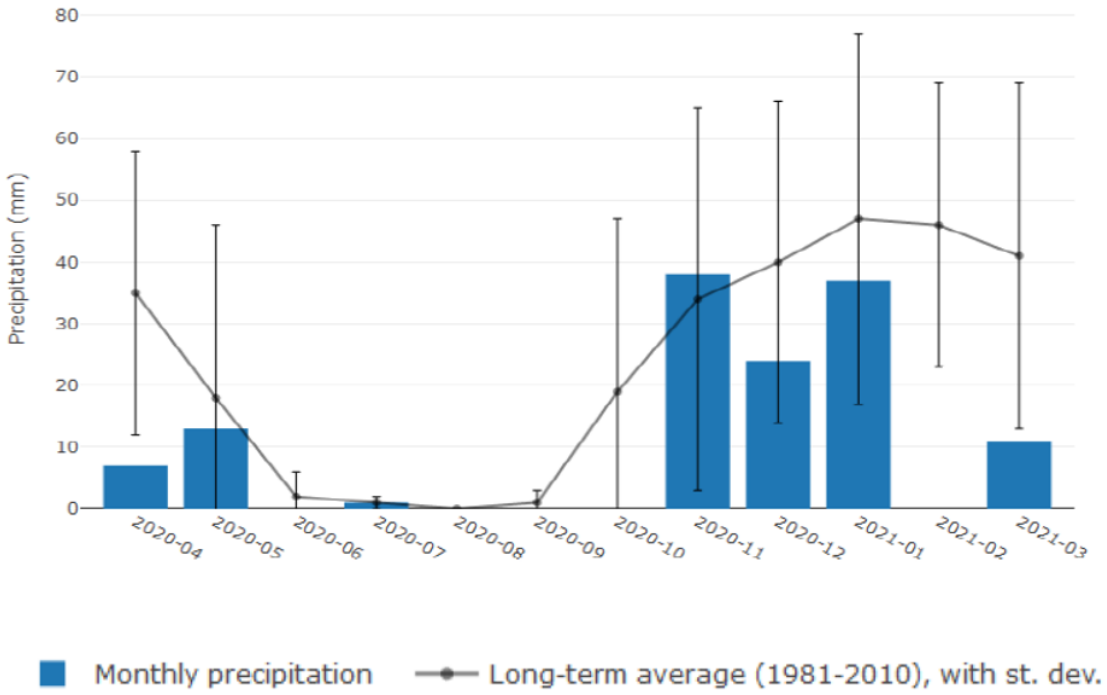

Fig 19. Monthly total precipitation near Al-Hassake, Syria (coordinates: 36.4°N, 40.7°E), with the long-term monthly average and standard deviation (1981-2010) (GDO, 2021).

The map of Fig 20 shows Standardized Precipitation Index (SPI) at the 6-month accumulation period, encompassing all the typically rainiest months of the year, hence emphasizing the areas that accumulated the highest precipitation deficit since autumn 2020, compared to the long-term average. As a result, most of Syria, the north of Iraq, and neighbouring Iranian and Turkish areas display meteorological drought. The index is significant, especially considering the role of precipitation anomalies at such a critical stage for the annual water balance (GDO, 2021).

Issue: 4 2021
International Journal of Water Management and Diplomacy
e-ISSN:2717-8277

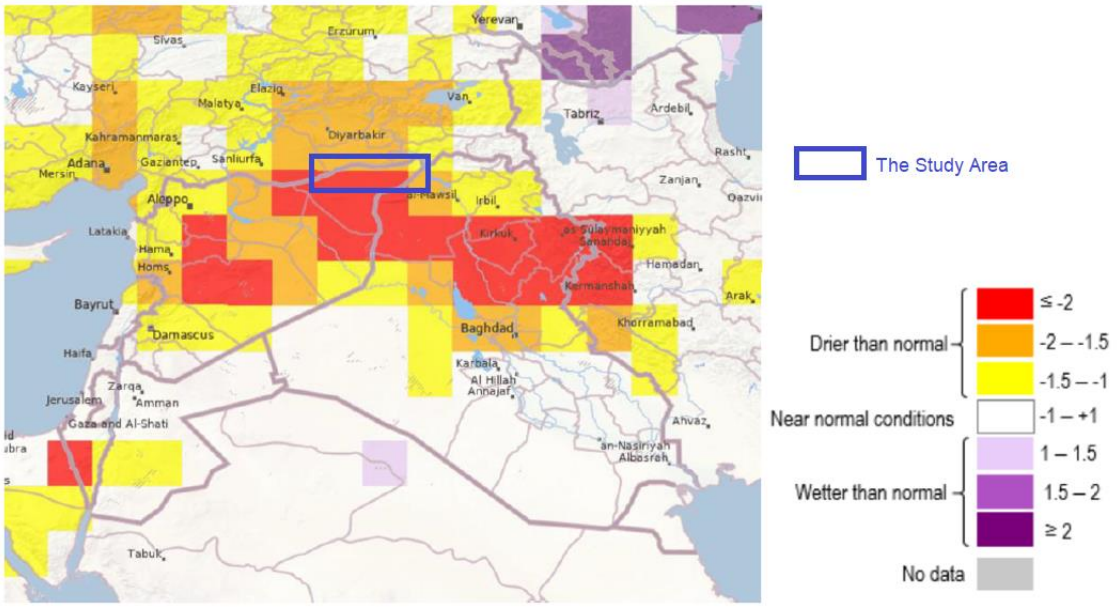

Fig 20. The anomaly of precipitation for October 2020 to March 2021 (SPI-6) over Syria and Iraq (GDO. 2021).

The charts in Fig 21 describe the downwards trend of precipitation anomalies in the past few months employing SPI-6 and SPI-12. The former demonstrates the overall decrease as precipitation totals stood well below a typical month after month since October 2020. The latter indicates that the consistent rainfall surplus was progressively depleted, and the annual balance was strongly negative. Thus, despite the high frequency of meteorological droughts in the past 25 years, the recent drought stands out as one of the worst over the same period (GDO, 2021).

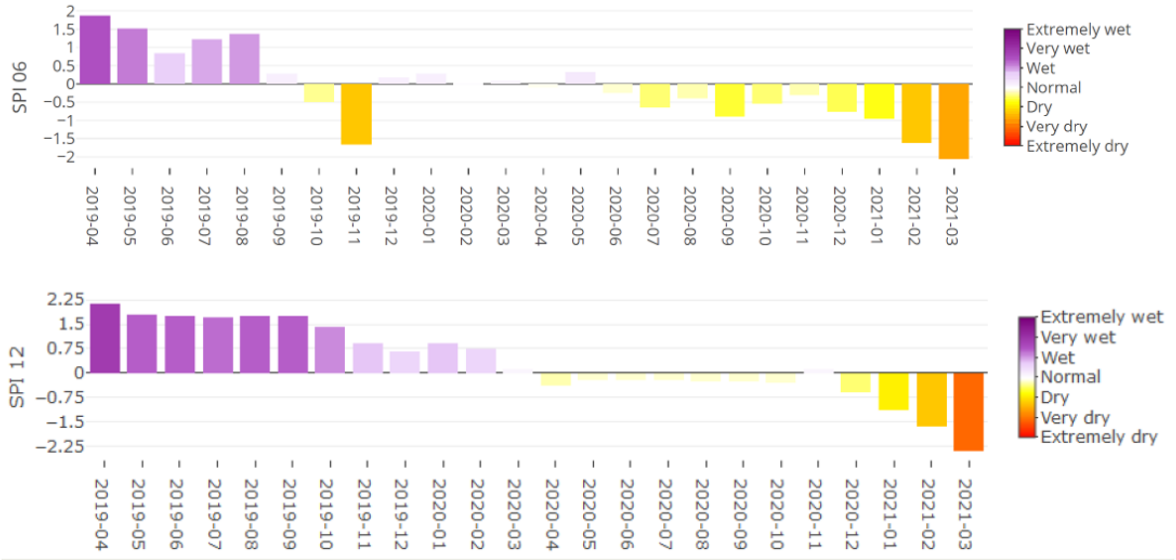

Fig 21. SPI for a cumulative period of 6 and 12 months near Al-Hassake (top and middle respectively, Al-Hassake, Syria (coordinates: 36.49°N, 40.74°E)) (GDO, 2021).

4.4.1. SPEI Results

The SPEI realizes the needs of a drought index since its multi-scalar nature enables it to be used by various scientific disciplines to detect, monitor, and analyse droughts. Like the Self-Calibrated Palmer Drought Severity Index (sc-PDSI) and the SPI, the SPEI can measure drought severity according to its intensity and duration and identify the onset and end of drought episodes. In addition, the SPEI allows the comparison of drought severity through time and space since it can be calculated over a wide range of climates, as can the SPI. Furthermore, Keyantash and Dracup (2002) indicated that drought indices must be statistically robust and easily calculated and have a clear and logical calculation procedure. The SPEI meets all these requirements. However, a crucial benefit of the SPEI over other broadly used drought indices that consider the effect of PET on drought severity is that its multi-scalar characteristics allow the recognition of different drought types and impacts in the context of global warming.

According to Lopez-Moreno and others (2013), three main sub-basin groups were distinguished based on the correlation of their streamflow responses to different time scales of the SPEI: (1) sub-basins correlated with short SPEI time scales (2–4 months), which generally corresponded to unregulated headwater areas; (2) sub-basins correlated with long SPEI time scales (10–20 months), where groundwater reserves play a significant hydrological role; and (3) sub-basins correlated with medium SPEI time scales (6–10 months).

In this study, the SPEI results were given for 12 and 48 months in Fig 22 and Fig 23. The coordinates of the pixels in the study area are considered when dealing with the SPEI values.

(d)

International Journal of Water Management and Diplomacy
Issue: 4 2021
e-ISSN:2717-8277

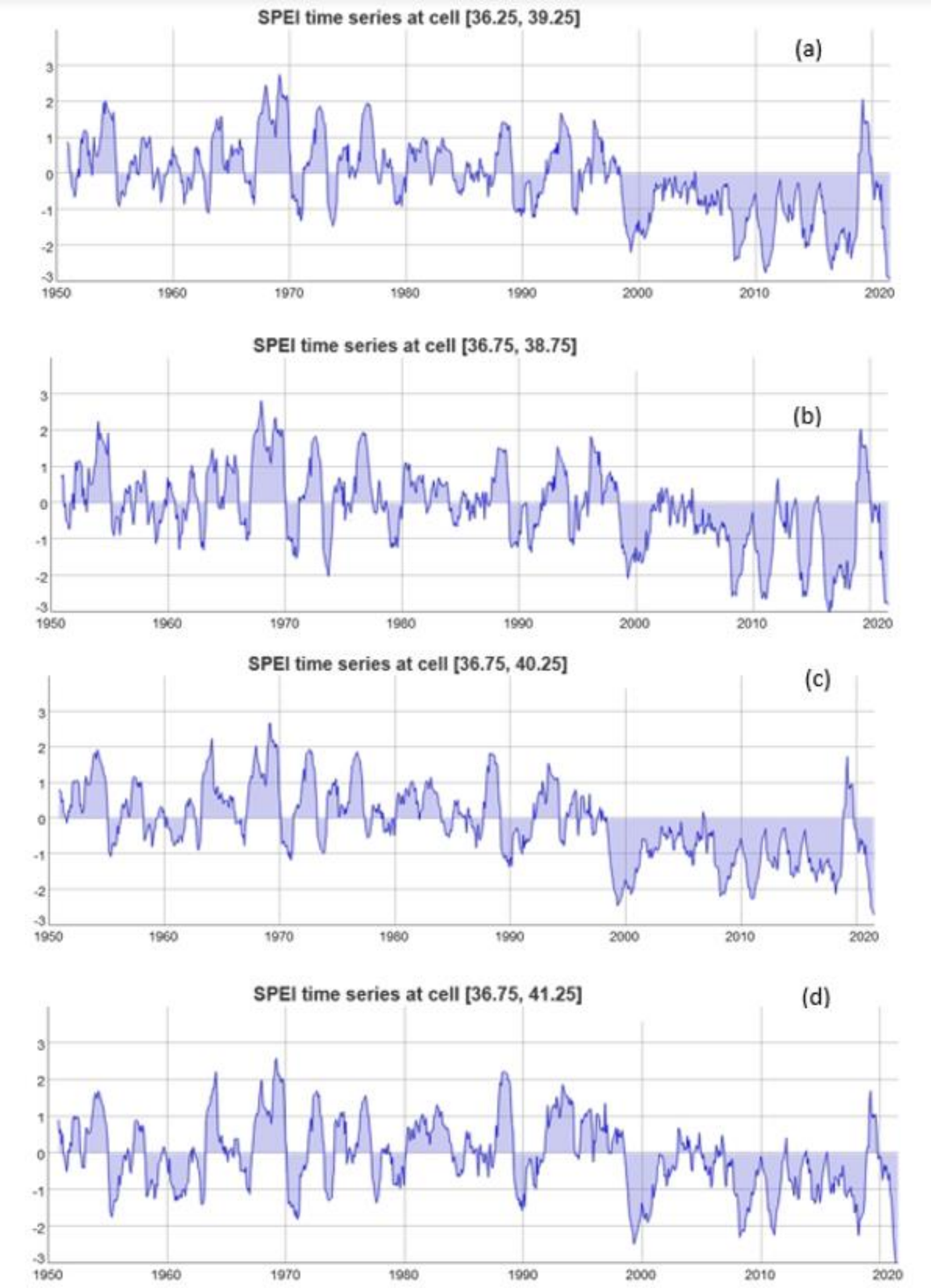

Fig 22. SPEI (Timescale: 12 months) changes of pixels in the study area between 1955 and 2021. The coordinates were given in the title of the graphs (Data source: SPEI, 2021).

International Journal of Water Management and Diplomacy
Issue: 4 2021
e-ISSN:2717-8277

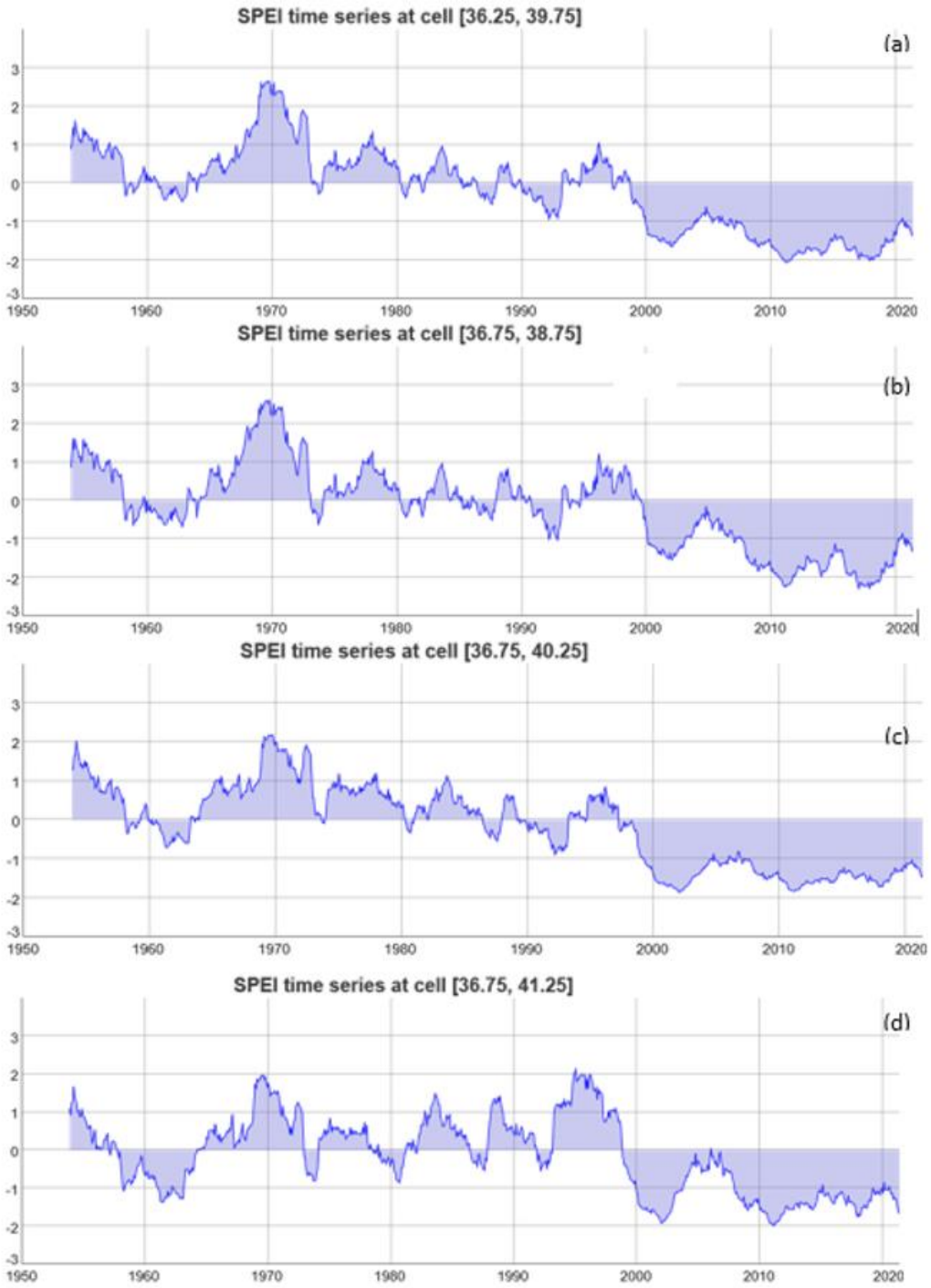

Fig 23. SPEI (Timescale: 48 months) changes of covered pixels between 1955 and 2021. The coordinates were given in the title of the graphs (Data source: SPEI, 2021).

e-ISSN:2717-8277

Fig 22 (a) represents the west of the study area. These values remain within the borders of Syria. Although there are irregularities in precipitation between 1990-2000 in this region, there are positive SPEI values in this period. However, after 2000, a long dry period was experienced in the region until 2019. The long-term drought between 2000-2018 did not affect the groundwater values in the study area between 2003-2007 (Fig 18). Because, between 1990-2000, drought is not very severe, and precipitation is seen. Thus, groundwater was protected between 2003 and 2007. However, the decrease in precipitation and the increase in the transition to irrigated agriculture after 2000 (Fig 15) adversely affected groundwater, broadly preferred over time.

Figure 22 (b) represents the western part of the study area within the borders of Turkey. The dry period in this region again covers the period of 2000-2018. However, there was diminutive positivity in SPEI between 2002-2004. The drought between 2008-2010 is still severe. This condition also explains the low level of GWS in those years. The low precipitation in all pixels for the 2008-2010 period and the increase in groundwater use exacerbated the withdrawal. 2016 was the period when the most negative SPEI value between 2000-2020 was seen. In this region, it was determined that there was an increase in precipitation in 2019.

Fig 22 (c) represents the middle part of the study area. In this region, as in other pixels, it is seen that there is a long-term drought, except for 2019. For this reason, there is dense use of groundwater rather than surface water throughout the region. The high rate of drought and irrigated agriculture in this region has led to an irreversible decrease in groundwater (Fig 18).

Figure 22 (d) shows that the SPEI being positive in the northeastern part of the study area between 1991 and 1999 means that drought events did not intensify in the region. Sufficient precipitation did not affect the groundwater in this period and the following period between 2000-2007 (Fig 18). In fact, except for the dry period between 2000-2003, there was a relative increase in precipitation until 2006. After 2007, a long dry period was seen in this region until 2018. It is seen that SPEI was positive only in December of 2012. The year 2019 is the highest SPEI since 2000. The increase in the amount of precipitation also positively affected the groundwater.

According to the 48-month SPEI values analysed in Fig. 23, it is seen that a severe long-term drought has been experienced since 2000 (even if the intensity decreases in some years) throughout the study area, including all pixels.

4.5. Recent Drought, Agriculture, Water Management Stresses, and Links to Conflict

Over the past century (from 1900 to 2005), there were six major droughts in Syria. The average monthly level of winter precipitation—the primary rainfall season—dropped to around one-third of normal. Five of these droughts continued only one season: the sixth lasted two (Mohtadi, 2013).

Issue: 4 2021
International Journal of Water Management and Diplomacy
e-ISSN:2717-8277

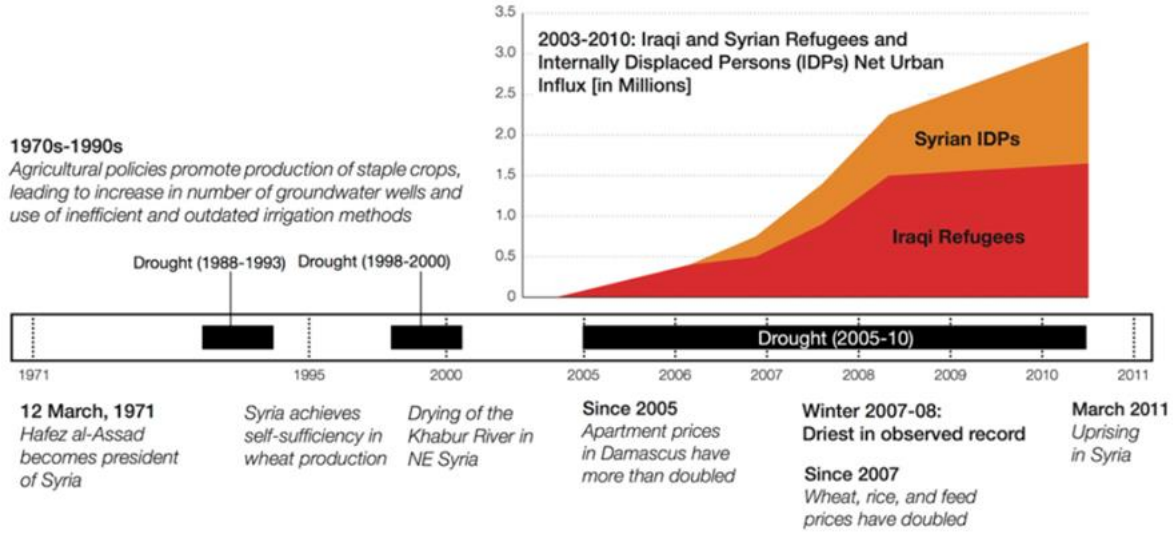

Fig 24. Timeline of events (Kelley and others, 2013).

Fig 24 shows how events in the region have evolved. (1) Drying of the Khabour river around 2000, (2) severe meteorological drought between 2005 and 2010, and (3) increase in the prices of crop plants that require water in this region are relatively compatible with land-use changes and temporal variations of the irrigation in agricultural lands (Fig 15).

According to data from 2005 (Fig 9, Fig 10, and Fig 11), northeastern Syria is a region where the irrigation of agricultural lands varies between 80% and 100%. In the study area, irrigation is generally employed with groundwater. As seen in the study, the use of groundwater, which has high availability (2003-2007), especially started to increase in the region in 2006 in the irrigated agricultural areas. Thus, the existence of the sufficient groundwater led to an increase in irrigated agricultural areas in this region until 2011 (Fig 15). This result is supported by Yılmaz and Peker (2013). However, the region experienced an intense drought from 2002 until 2018. As a result, Syria experienced a multiseason, multiyear period of extreme drought that contributed to agricultural failures, economic disruptions, and population displacement (Worth, 2010). This dry period has continued and is explained as the "worst long-term drought, and most severe set of crop failures since agricultural civilizations began in the Fertile Crescent many millennia ago" [Gary Nabhan, as cited by Femia and Werrell (2013)].

Drought also caused the groundwater to lose its ability to be fed by precipitation while being withdrawn by communities. Especially 2008 and 2009 (Fig 18) were the years when the groundwater decreased remarkably. As stated in Fig 24, this has led to an increase in the prices of water-demanding crops such as rice and feed. The sufficient precipitation in the region between 1970 and 1990 caused the decision-makers to irrigate agricultural lands with inefficient irrigation systems and drill too many wells in the region. However, the long-term drought in the region, especially after 2000, pushed the local people in the region to use groundwater more intensively, as can be seen in the 2005 data (Fig 9, Fig 10, and Fig 11). The inability to feed groundwater due to drought almost ended the expansion of the irrigated

e-ISSN:2717-8277

agricultural area in 2011, which had increased until 2011. 2011 was also the year that the uprising in Syria started.

In the current civil war, some specialists have argued that factors related to drought, including agricultural failure, water shortages, and water mismanagement, have played an essential role in contributing to the deterioration of social structures and spurring violence (FAO, 2012; Femia and Werrell 2013; Mhanna, 2013). In particular, the combination of severe drought, persistent multiyear crop failures, and related economic deterioration led to substantial dislocation and migration of rural communities to the cities. These factors further influenced the urban unemployment and economic dislocations, and social unrest.

5. CONCLUSIONS: CLIMATE CHANGE - AS A DRIVER OF FUTURE CONFLICTS IN THE REGION

Gleick (2014) argues that there is some evidence that the recent drought is an early indicator of the climatic changes that are expected for the region, including higher temperature, decreased basin rainfall and runoff, and increased water scarcity. Absent any efforts to address population growth rates, these water-related factors will likely produce even more significant local and regional political instability risks unless other mechanisms for reducing water insecurity can be identified and implemented.

In the region as a whole, decreasing water quality, growing water withdrawals, and limited political cooperation on water issues may become even more critical and lead to the securitization of water resources in coming years.

The pressure of climate change in Syria has contributed to mass migration, armed conflict, and ethnic division. Climate change model projections show that the current trend will continue and may lead to conflict between riparian states. Moreover, it can significantly change the basin-scale water equation and rise hydropolitics tension.

In the mid and long-term, drought and lower precipitation based on the climate models and projections represent a severe threat to the region's stability, as the competition for the limited resource will increase.

The future of water in the study area is threatening when the future projections were evaluated. While the current water stress in the study area is “low-medium” in the northeast, “extremely high” in the centre, and “high” in the west based on Aqueduct (2015), it will be “medium-high” in the northeast, “extremely high” in the centre and “high” in the west for all the scenarios, which are optimistic (SSP2 RCP4.5), business as usual (SSP2 RCP8.5) and pessimistic (SSP3 RCP8.5), in 2030 and 2040. Water supply (total blue water (renewable surface water))[1] will be 10-30 cm in the entire study area for all scenarios.

The region is now, regrettably, more sensitive to the climate. In the past, the precipitation and sufficient groundwater caused the local people to shift their agricultural patterns to irrigated agriculture. However, human-induced excessive water withdrawal, increased drought, contaminated water, and climate

1 Projected change in total blue water is equal to the 21-year mean around the target year divided by the baseline period of 1950–2010 (Aqueduct, 2015).

change have caused this agricultural shift to be replaced by conflicts and uncertainties. Studies show that trends will continue, and the region requires a more collaborative, visioner, and mutually beneficial approach to take measures for these growing threats.

References

ACAPS (2020). Syria Conflict Overview. Accessed at https://www.acaps.org/country/syria/crisis/conflict.

Albrecht, E., Schmidt, M., Mißler-Behr, M., & Spyra, S. P. (2014). Implementing Adaptation Strategies by Legal, Economic and Planning Instruments on Climate Change vol 4. Springer.

Amery, H. A. (2020). Malthus in the Middle East: Scarcity induced water conflicts. (Nile and Euphrates; Water and food as weapons). In book: Water and Conflict in the Middle East. Hurst & Company, London.

Aqueduct (2015). Aqueduct Water Stress Projections: Decadal Projections of Water Supply and Demand Using CMIP5 GCMs. In M. Luck, M. Landis, & F. Gassert (Eds). World Resources Institute.

AQUASTAT-FAO (2017). AQUASTAT - FAO's Global Information System on Water and Agriculture. http://www.fao.org/aquastat/en/geospatial-information/global-maps-irrigated-areas/map-quality. Accessed 24 September 2021.

Baba, A., Kareem R. A., & Yazdani, H. (2021). Groundwater resources and quality in Syria. Groundwater for Sustainable Development 14, 100617.

Begueria, S., Latorre, B., Reig, F., & Vicente-Serrano, S. M. (2021). Global SPEI database. https://spei.csic.es/database.html.

Copernicus Climate Change Service (2021). [Dataset]. Copernicus Climate Change Service's Land cover maps (2000 to 2020). https://cds.climate.copernicus.eu/cdsapp#!/dataset/satellite-land-cover?tab=doc.

ESA (2017). Climate Change Initiative - Land Cover led by UCLouvain.

Fanack.com (2019). Water Resources in Syria. https://water.fanack.com/syria/water-resources/.

FAO (2012). The Syrian Arab Republic Joint Rapid Food Security Needs Assessment (JRFSNA). FAO Rep., 26 pp. [Available online at http://www.fao.org/giews/english/otherpub/JRFSNA_Syrian2012.pdf.]

FAO (2018). Special Report. In: FAO/WFP Crop and Food Security Assessment Mission to the Syrian Arab Republic, vol. 51p. Food and Agriculture Organization of The United Nations World Food Programme, Rome.

Femia, F., & Werrell, C. (2013). Syria: Climate change, drought, and social unrest. The Center for Climate and Security. [Available online at http://climateandsecurity.org/2012/02/29/syria-climate-change-drought-and-social-unrest/].

IFAD (2010). Syrian Arab Republic: Thematic study on land reclamation through defrocking. International Fund for Agricultural Development. Rome, Italy.

IHP-UNESCO (2017). [Dataset]. http://ihp-wins.unesco.org/maps/new.

GDO (2021). Analytical Report Global Drought Observatory: http://edo.jrc.ec.europa.eu/gdo 4 Drought in Syria and Iraq – April 2021 JRC Global Drought Observatory (GDO) of the Copernicus Emergency Management Service (CEMS).

Gleick, P.H. (2014). Water, drought, climate change, and conflict in Syria Weather. Climate, and Society, 6, 331-340.

Global Trade Analysis Project (GTAP) (2005). Global Agricultural Land Use Data for Integrated Assessment Modeling, in Human-Induced Climate Change: An Interdisciplinary Assessment. In: N. T. Ramankutty, H. Hertel, L. Lee, & S. K. Rose.

Graham, B., Muawia, B., Al-Maleh, A. K., & Sawaf, T. (2001). Tectonic and Geologic Evolution of Syria. GeoArabia, 6(4).

Kelley, C. P., Mohtadi, S., Cane, M. A., Seager, R., & Kushnir, Y. (2013). Climate Change and Political Instability in Syria. American Geophysical Union, Fall Meeting 2013, abstract id. GC13A-1047.

Lopez-Moreno, J. I., Vicente-Serrano, S. M., Zabalza, J., Begueria, S., Lorenzo-Lacruz, J., Azorin-Molina, C., & Moran-Tejeda, E. (2013). Hydrological response to climate variability at different time scales A study in the Ebro basin. Journal of Hydrology, 477, 175-188.

Mathbout, S., Lopez-Bustins, J. A., Martin-Vide, J., Bech, J., & Rodrigo, F. S. (2018). Spatial and temporal analysis of drought variability at several time scales in Syria during 1961– 2012. Atmospheric Research, 200, 153-168.

Mhanna, W. (2013). Syria's climate crisis. [Available online at http://www.al-monitor.com/pulse/politics/2013/12/syrian-drought-and-politics.html#].

Mohtadi, S. (2013). Climate change and the Syrian uprising. [Available online at http://thebulletin.org/web-edition/features/climate-change-and-the-syrian-uprising].

Mourad, K. A., & Berndtsson, R. (2012). Water status in the Syrian water basins. Open journal of modern hydrology, 2, 15, 01.

NASA Grace (2021). [Dataset]. Groundwater and Soil Moisture Conditions from GRACE-FO Data Assimilation for the Contiguous U.S. and Global Land. https://nasagrace.unl.edu/Default.aspx.

Salman, M., & Mualla, W. (2004). The utilization of water resources for agriculture in Syria: analysis of the current situation and future challenges. In: International Seminar on Nuclear War and Planetary Emergencies, pp. 263–274.

Siebert, S., Henrich, V., Frenken, K., & Burke, J. (2013). Global Map of Irrigation Areas version 5. Rheinische Friedrich-Wilhelms-University, Bonn, Germany / Food and Agriculture Organization of the United Nations. Rome, Italy: FAO.

Somi, G., Zein, A., Dawood, M., & Sayyed-Hassan, A., (2002). Progress Report on the Transformation to Modern Irrigation Methods until the End of 2001. Internal Report, MAAR (Ministry of Agriculture and Agrarian Reforms). Syria (in Arabic).

SPEI (2021). [Dataset]. SPEI Global Drought Monitor. https://spei.csic.es/map/maps.html.

UNOCHA (2019). Northeast Syria – As half a million people gradually regain access to safe water – the number of displaced people nears 180,000. Press release, 22 October 2019. Accessed at https://reliefweb.int/report/syrian-arab-republic/northeast-syria-half-millionpeople- gradually-regain-access-safe-water.

e-ISSN:2717-8277

Ülker, D., Erguven, O., & Gazioglu, C. (2018). Socio-economic impacts in a Changing Climate: Case Study Syria. International Journal of Environment and Geoinformatics, 5(1), 84-93.

Varela-Ortega, C., & Sagardoy, J. A. (2002). Analysis of irrigation water policies in Syria: Current developments and future options. Proceedings of Irrigation Water Policies: Micro and Macro Considerations Conference, Agadir, Morocco, June.

Wada, Y., Beek, L., & Bierkens, M.F. (2012). Nonsustainable groundwater sustaining irrigation: a global assessment. Water Resources Research, 48 (6).

Worth, R. F. (2010). Earth is parched where Syrian farms thrived. New York Times, 13 October, New York ed., A1.

Zwijnenburg, W., Nahas, N., & Vasquez, R. J. (2021). War, Waste, and Polluted Pastures an Explorative Environmental Study of the Impact of the Conflict in north-east Syria. Development and Peace CARITAS CANADA.

Yılmaz, M. L., & Peker, H. S. (2013). A Possible Jeopardy of Water Resources in Terms of Turkey's Economic and Political Context: Water Conflicts [In Turkish]. Çankırı Karatekin Üniversitesi İktisadi ve İdari Bilimler Fakültesi Dergisi, 3(1), 57-74.

Other Datasets:

SPEI - https://soton.eead.csic.es/spei/index.html

NOAA NCEP CPC GHCN_CAMS - ftp://ftp.cpc.ncep.noaa.gov/wd51yf/GHCN_CAMS/

Global Precipitation Climatology Centre (GPCC) - ftp://ftp-anon.dwd.de/pub/data/gpcc/first_guess/

Article received: October 15 2021

Article accepted : November 17 2021

International Journal of Water Management and Diplomacy
e-ISSN:2717-8277

Research Article

MULTI CRITERIA ANALYSIS OF POWER ASYMMETRY IN ARAS TRANSBOUNDARY RIVER BASIN: DERIVING POTENTIAL HYDRO-HEGEMON COUNTRY

Mahmood Rashidi[1]*, Mahdi Zarghami [2], Esmaeil Pishbahar[3], Firouz Fallahi[4]

[1] PhD candidate of water resources management, Faculty of Civil Eng, University of Tabriz, Tabriz, Iran. Email: mhmd.rashidi@gmail.com

[2] Professor at the Center for Excellency in Hydroinformatics Faculty of Civil Eng and the Institute of Environment, University of Tabriz, Tabriz, 51666 Iran. Email: mzarghami@tabrizu.ac.ir, Adjunct Professor, Energy, Water and Environment Institute. Sharif University of Technology, Tehran Iran

[3] Associate Professor, Faculty of Agriculture, Department of Agricultural Economics, University of Tabriz, Iran. Email: Pishbahar@yahoo.com

[4]Associate Professor in Economics, University of Tabriz, Tabriz, Iran. Email: ffallahi@tabrizu.ac.ir

**Corresponding author, Email: mhmd.rashidi@gmail.com*

ORCID : https://orcid.org/0000-0002-7071-1575

Abstract

Transboundary rivers are becoming a controversial issue due to the interactions among several players over water. Deriving the relative power of stakeholders in the tranboundary river basin is one of the critical factors that could affect the water negotiations. This research uses the TOPSIS method to derive power asymmetry in the Aras River basin shared among Turkey, Armenia, Iran and Azerbaijan. Power is subdivided into four main pillars, including geographical, material, bargaining and ideational. For each pillar of power, several numerical or linguistic criteria are defined and evaluated between countries. Overall ranking results show that Iran, with the relative power value of 0.79, has the highest potential hegemonic power, followed by Turkey, Armenia, and Azerbaijan with relative power values of 0.72, 0.40 and 0.30, respectively. In the last part, sensitivity analysis of the overall power ranking is also performed based on different weighting the four pillars of power. Results indicate that weight change in bargaining power has the most significant impact on the states' power ranking.

Keywords: Hydro-Hegemon, Transboundary River Basin, Power Asymmetry, TOPSIS.

e-ISSN:2717-8277

1. INTRODUCTION

Water is a shared asset whether at an international level like shared lake (i.e., the Caspian Sea) (Madani et al. 2004) a shared river between riparian countries such as the Nile basin (Dinar and Alemu, 2000), Euphrates and Tigris (Kucukmehmetoglu 2009), Aras River basin (Klaphake and Kramer 2011) or domestic level between different water withdrawal sectors (Kerachian and Karamouz 2007). Due to the urge in nations to reach sovereignty and self-sufficiency, interactions over shared resources between adjacent countries have become rivalry (Earle et al. 2013), leading to either cooperation or conflict (Wolf 1998). Therefore, water management researchers have recently focused on the conflict and cooperation nature of international interactions (De Stefano et al. 2010; Wolf et al. 2003). Whenever a conflict or cooperation arises, the chosen policies of riparian countries toward shared water resources (SWR) become more vital. Scholars refer to Hydro-policy as a framework to define the strategies of riparian countries in water-related issues. However, the concept of "hydro-politics" is poorly formulated and needed to be clarified (Turton and Henwood 2002). Cascao and Zeitoun (2013) have investigated the practical approaches to analyze SWR problems. First, they introduced the two main aspects of water that form an individual's policies: 1) the quantity and quality of water and 2) the fluid nature of water that flows over political boundaries. Then, by mentioning that the principle of inter-relations policies varies from one basin to another, they concluded that there is no constant template to model any transboundary basin. They also depicted that the control over shared waters in transboundary basins varied from cooperative form (shared control) to competitive form (contested form) and named the in-between area as competitive-but-stifled (consolidated form) that favors the hegemon of the basin.

Recently numerous conflict resolution approaches have been adapted to explore SWR problems (Madani 2010). Some have focused on allocation conflict resolution (Herrero and Villar 2001; Mianabadi et al. 2014). Others have explored cooperative approaches to benefit all stakeholders (Madani et al. 2011). In addition to the conflict resolution modeling of SWR, some researchers have paid attention to hydro-political issues that are more sophisticated and need more exploration. Several studies investigate hydro-policy in various geographical areas such as Jordan River (Wolf 1995), Nile valley (Waterbury 1979) and southern Africa (Turton 2003). Bazrkar et al. (2013) and Shahbazbegian et al. (2016) have discussed hydro-policy issues in Hirmand River using System Dynamics method and Dinar et al. (2011) concluded that water scarcity at the moderate level would lead to negotiation and trigger hydro-political interactions. To sum up, due to the complexity of water conflicts, there would be a strong need to understand the hydro-policy issues of the basin, which are manifested and settled through negotiations (Yu et al. 2015).

Furthermore, the power of all involved individuals in SWR problems seems crucial and may play a significant role in the water withdrawal system. It is clear that power is a relative and asymmetric term; in other words, individuals with higher relative power would not tolerate any deviation from normal water cycle conditions. Individuals with less relative power are willing to accept the condition imposed by powers (Yu et al. 2015). In this regard, Allan and Mirumachi (2013) discussed the two states in their work that make the research about transboundary rivers challenging. These conditions are 1) asymmetric nature of relative powers of riparian countries and 2) unavailability of international water issues because they have been politicized and securitized.

e-ISSN:2717-8277

Recognition and assessment of the main elements of power are other essential factors in this regard. Cascão and Zeitoun (2013) defined four main aspects of power as follows: geographical power, material power, bargaining power and ideational power. They examined Jordan, Nile, and Tigris and Euphrates River basins and showed that the hegemon of the basin utilizes different combinations of power and the power stance of countries is asymmetrical and dynamic. Following their work, Rein (2017) has focused on the Mekong River basin's hydro-hegemony to determine the hegemon and non-hegemon of the river by assessing four pillars of power. This author also mentioned that due to less visibility of bargaining and ideational power, content analysis of speeches, media articles and meetings are scrutinized from 2004 to 2017. Zeitoun and Warner (2006) discussed who gets how much water, how and why. They conceptualized the term "hydro-hegemony" and defined two primary power forms: 1) potential power, which lies in capabilities of an individual such as military and economic power and 2) actualized power, which refers to controlling rules of the game. They also discussed the compliance and non-compliance of the weaker side to the instruction of stronger states.

The most abstract form of power to discuss is ideational power. The study of ideas in political science started simply by emphasizing "ideas matter". Although many scholars have argued that the term "ideas matter" is a general claim in political power (Campbell 1998; Hay and Rosamond 2002), some have tried to theorize ideational power (Béland 2010). Therefore, the ambiguity remained with the exact meaning of the ideational power and its relation to other forms of power (Carstensen and Schmidt 2016). There might be three approaches to define power: the *compulsory* power which is the notion concerning the direct control of interactions by one agent over another (Dahl 1957; Weber 1964), the *structural* power, which discusses the constitution of agents' capacity in structural relation to one another (Barnett and Duvall 2005), and the *institutional* power, which deals with the act of controlling others through formal and informal institutions between them (Bachrach and Baratz 1962; Mills and Wolfe 2000). In any form of power relations, the ideas' central role is inevitable (Lukes 2004). Carstensen and Schmidt (2016) defined the Ideational power as the capacity of actors to influence other actors using ideational elements in the forms of persuasion (power through ideas), imposition (power over ideas), or indirectly influencing the ideational context (power in ideas). They also depicted that ideational power connects to the necessary, structural and institutional forms of power, yet is distinctive enough to form power on its own.

The present work identifies the potential hydro-hegemon in the Aras River basin between four riparian countries through analyzing the power asymmetry in the region by comparing four pillars of power, including geographical power, material power, bargaining power, and ideational power introduced by Cascão and Zeitoun (2013). For each pillar, some criteria are defined, and then, using the TOPSIS (for numerical criteria) and Fuzzy TOPSIS (for linguistic form of criteria) method, the power stance of each country against others is derived. In the last section of the study, we discuss the Sensitivity of the power asymmetry to the weights in each pillar of power. Since the power has dynamic nature, all data are considered to be analyzed from the year 2015 to 2019.

e-ISSN:2717-8277

2. MATERIALS AND METHODS

2.1. Geographical Power

Being upstream of a transboundary river may seem advantageous; however, it is not the only component in the power asymmetry analysis of the agents (Zeitoun and Cascao 2010). This type of power deals with the geographical specifications of a riparian relative to a shared resource. Geographical specifications include the quantity and quality of the resource under control and the potential quantitative and qualitative vulnerability of a resource affected by others. This research introduces four criteria that well represent the mentioned specifications above; Percentage of the basin confined in each territory, Length and Stream-order of the river available in each territory, Annual Potential Surface Runoff and finally, Qualitative and Manipulative Vulnerability of a country.

2.2. Material Power

This power refers to the Economic, Military, Technology and monetary and/or political support of any state (Cascão and Zeitoun 2013). Measuring the economic strength depends on scrutinizing various parameters forming the overall economic performance of a country. Here, the quality of an individual's life and living standards is an essential factor for comparing economic situations; however, this term is rather difficult to measure. Levels of income, consumption, employment rate, inflation and recession rate, a long and healthy life, development, and quality of education are among several parameters that all matter. Stiglitz et al. (2009) broadly discussed the external factors that affect a human's well-being in a society. They also brought the critical issue that measuring the GNP or GDP as an economic criterion would be very misleading, simply because it does not consider other important factors discussed above. Therefore, several other criteria are developed: Human Development Index (HDI) introduced by the United Nations Development Programme (UNDP), which is a composite index of life expectancy, education, and per capita income; Human Capital Index (HCI), prepared by the World Bank which is a criterion of the amount of capital each country loses through lack of education and health and includes survival rate of children passed the age 5, quality and quantity of education and health parameters; and GDP Per Capita, PPP which is gross domestic product converted to international dollars using the purchasing power parity rates. In this section, we discuss Gross National Product (GNP), Gross Domestic Product (GDP), Purchasing Power Parity (PPP) and Human Development Index (HDI) for analyzing economic capabilities and Armed Force Personnel as well as Military Expenditure as a percentage of GDP for analyzing military power of a country.

2.3. Bargaining Power

The criteria used in this section are expressed in two categories: first, the number of signed agreements between countries and second, potential assets that are essential in an issue-linkage dialogue between states. These assets would be the Labor Force, Arable Land Area and Installed and Planned Hydropower Stations.

JWMD Issue: 4 2021
International Journal of Water Management and Diplomacy
e-ISSN:2717-8277

2.4. Ideational Power

As mentioned before, ideational power is the most abstract and less tangible form of power. Common tools of ideational power are summarized in knowledge structure, sanctioned discourse, securitization and the imposition of narratives (Hajer 1995; Lukes 2004; Zeitoun and Cascao 2010). For knowledge structure, we introduce criteria that represent the knowledge status of an individual. These criteria are Percent of the GDP spent on research and development (available data are for the year 2017), Number of published articles (available data is for the year 2016), the average ranking of each riparian's universities among the top 1000 universities in the world (QS Quacquarelli Symonds 2015), and the world press freedom index (over two-year period 2018 and 2019). For analyzing other ideational tools, based on Rein (2017), the media contents such as reports, articles, and reviews over water-related issues are scrutinized in the recent five years. These media references mainly include policy makers' speech towards the basin's issues and/or discourses in the joint meetings. In this regard, ten online references from official online press and media websites from 2015 to 2020 are chosen for each riparian. Regarding these references, three primary behavior are inferred: conservative manner and/or playing with time and ambiguity that can be categorized as a sanctioned discourse tool, expressing concern for others' activities in the basin that can be categorized as a securitization tool and articulating the policy of total withdrawal of domestic waters that can be considered as an imposition of narratives tool.

2.5. TOPSIS Method:

TOPSIS, the Technique for Order of Preference by Similarity to Ideal Solution, was developed by Yoon and Hwang (1995) and is a branch of the multi-criteria Decision–making method. This technique follows the concepts of compromise solution and chooses the best alternative from measuring the shortest Euclidean distance to the ideal solution and farthest Euclidean distance from the negative ideal solution. Mathematically, TOPSIS is expressed as follows:

Given a set of alternatives (here Countries), $A = \{A_k | k = 1,2, \dots, n\}$, and a set of known criteria, $C = \{C_j | j = 1,2, \dots, m\}$, the numerical values of alternatives in each criterion denoted by x_{kj} and the set of weights $W = \{w_j | j = 1,2, \dots, m\}$, the TOPSIS matrix is formed with rows being Alternatives and Columns being weights. The first step is to convert x_{kj} to normalized form r_{kj} as follows:

$$r_{kj}(x) = \frac{x_{kj}}{\sqrt{\sum_{k=1}^{n} x_{kj}^2}} \quad (1)$$

The next step is to determine the beneficial and non-beneficial criteria. For the beneficial criteria, larger values (x_{kj}) are better. Therefore, $r_{kj}(x)$ is written as follows: $r_{kj}(x) = (x_{kj} - x_j^-)/(x_j^* - x_j^-)$, where x_j^* is the ideal point and $x_j^-$is the worst point. Additionally, for non-beneficial criteria, $r_{kj}(x) = (x_j^- - x_{kj})/(x_j^- - x_j^*)$. The normalized matrix is then converted to weighted normalized (v_{kj}) by multiplying the weight vector ($v_{kj} = w_j r_{kj}$) by the matrix $r_{kj}(x)$. The next step is to calculate the Positive Ideal Solution vector (PIS) and the Negative Ideal Solution vector (NIS) as follows:

Issue: 4 2021
International Journal of Water Management and Diplomacy
e-ISSN:2717-8277

$$PIS = S^+ = \{v_1^+(x), v_2^+(x), \dots, v_m^+(x)\} = \left\{\left(\max_k v_{kj}(x) \middle| j \in J^+\right), \left(\min_k v_{kj}(x) \middle| j \in J^+\right) | k = 1, \dots, n\right\} \quad (2)$$

$$NIS = S^- = \{v_1^-(x), v_2^-(x), \dots, v_m^-(x)\} = \left\{\left(\min_k v_{kj}(x) \middle| j \in J^-\right), \left(\max_k v_{kj}(x) \middle| j \in J^-\right) | k = 1, \dots, n\right\} \quad (3)$$

where J^+ and J^- are related to the beneficial and non-beneficial attributes of a criterion, respectively. Euclidean distance from an ideal point is then calculated as follows:

$$D_k^+ = \sqrt{\sum_{j=1}^{m} \left[v_{kj} - v_j^+\right]^2}, k = 1,2, \dots, n \quad (4)$$

$$D_k^- = \sqrt{\sum_{j=1}^{m} \left[v_{kj} - v_j^-\right]^2}, k = 1,2, \dots, n \quad (5)$$

The next step is to calculate the distance to the worst condition:

$$C_k^* = \frac{D_k^-}{(D_k^+ + D_k^-)}, k = 1,2, \dots, n \quad (6)$$

Where $C_k^* \in [0,1]$. Finally, all alternatives are ranked by rearranging C_k^* in a descending order.

2.6. FUZZY TOPSIS Method:

In this research, the triangular fuzzy number is used for data fuzzification. A triangular fuzzy number is represented as $\tilde{a} = (a, b, c)$ and the related membership function $\mu_{\tilde{a}}(x)$ is given as:

$$\mu_{\tilde{a}}(x) = \begin{cases} \dfrac{x-a}{b-a} & if\ a \le x \le b \\ \dfrac{c-x}{c-b} & if\ b \le x \le c \\ 0 & Otherwise \end{cases} \quad (7)$$

where $a, b, and\ c$ are real numbers and $a < b < c$. We call b the most probable value and a and c are the least probable values, which are also the lower and upper bounds of the available area for the evaluation data. In the Fuzzy TOPSIS method, we need the distance between two fuzzy values ($\tilde{a}$ and $\tilde{b}$) that is calculated as:

$$d(\tilde{a}, \tilde{b}) = \sqrt{\frac{1}{3}[(a-a')^2 + (b-b')^2 + (c-c')^2]} \quad (8)$$

In Multi-Criteria Decision Making (MCDM) problems, every criterion is expressed as linguistic terms like low, high, etc. To analyze this, equivalent fuzzy sets can be assigned. For example, a triangular fuzzy set of (1,1,3) is assigned to linguistic rank of "very low", (1,3,5) is assigned to "low, and so on. These intervals are chosen to have uniform representation from 1 to 9 and also cover the five linguistic weights (very low, low, medium, high, very high) and distances between all alternatives.

Let us consider k decision-maker in one specific problem. Therefore $\tilde{x}_{ij}^k = (a_{ij}^k, b_{ij}^k, c_{ij}^k)$ denotes for the weight of the kth decision-maker about the ith alternative on the jth criterion where $i = 1,2, \dots, m$ and

$j = 1,2,\dots,n$. The next step is to calculate $\tilde{x}_{ij} = (a_{ij}, b_{ij}, c_{ij})$, which is called aggregated fuzzy number for alternative (i) and criterion (j) such that:

$$a_{ij} = \min_k\{a_{ij}^k\}, b_{ij} = \frac{1}{k}\sum_{k=1}^{K} b_{ij}^k, c_{ij} = \max_k\{c_{ij}^k\} \quad (9)$$

After constructing a fuzzy MCDM Matrix, the normalized fuzzy decision matrix is equal to $\tilde{R} = [\tilde{r}_{ij}]_{m\times n}$ where:

$$\begin{aligned} \tilde{r}_{ij} &= \left(\frac{a_{ij}}{c_j^*}, \frac{b_{ij}}{c_j^*}, \frac{c_{ij}}{c_j^*}\right) = (a'_{ij}, b'_{ij}, c'_{ij}) \; and \; c_j^* = \max_i c_{ij} \;\; (for \; beneficial \; criteria) \\ \tilde{r}_{ij} &= \left(\frac{a_j^-}{a_{ij}}, \frac{a_j^-}{b_{ij}}, \frac{a_j^-}{c_{ij}}\right) \; and \; a_j^- = \min_i a_{ij} \;\; (for \; non \; beneficial \; criteria) \end{aligned} \quad (10)$$

The normalized components of the above matrix $[\tilde{r}_{ij} = (a'_{ij}, b'_{ij}, c'_{ij})]$ belong to [0,1]. The Fuzzy Positive Ideal Solution (FPIS) and Fuzzy Negative Ideal Solution (FNIS) of the alternatives are defined respectively by A^* and A^- as follows:

$$\begin{aligned} A^* &= (\tilde{v}_1^*, \tilde{v}_2^*, \dots, \tilde{v}_n^*) \; where \; \tilde{v}_j^* = \max_i\{c'_{ij}\} \\ A^- &= (\tilde{v}_1^-, \tilde{v}_2^-, \dots, \tilde{v}_n^-) \; where \; \tilde{v}_j^- = \min_i\{a'_{ij}\} \end{aligned} \quad (11)$$

The distance of each alternative from FPIS and FNIS is calculated as follows:

$$\begin{aligned} d_i^* &= \sum_{j=1}^{n} d_v\left(\tilde{r}_{ij}, \tilde{v}_j^*\right), \qquad i = 1,2,\dots,m \\ d_i^- &= \sum_{j=1}^{n} d_v\left(\tilde{r}_{ij}, \tilde{v}_j^-\right), \qquad i = 1,2,\dots,m \end{aligned} \quad (12)$$

where $d_v(\tilde{a}, \tilde{b})$ denotes the distance between two fuzzy numbers $\tilde{a}$ and $\tilde{b}$. The last step is computing the closeness coefficient CC_i as follows:

$$CC_i = \frac{d_i^-}{d_i^- + d_i^*}, \qquad i = 1,2,\dots,m \quad (13)$$

Here, the alternative with the highest closeness coefficient is the best.

3. CASE STUDY

Aras River basin is shared between Turkey, Armenia, Iran and Azerbaijan. This basin is located in the southern Caucasus Region with a surface area of about 95739 square kilometers. The altitude of this basin changes from 20 meters (reaching a point in the Caspian Sea) to 5000 meters (Mount Ararat in Turkey). This basin's river is called the Aras River, which has two main tributaries, originating from Turkey. One is the Aras tributary, which originates from the highlands of 3100 meters height above the Bingol Mountains of Turkey near Erzurum County. The other is the Akhurian tributary, which also originates from Turkey near the Kars district. The two main tributaries join together and form the borderline of Turkey, Armenia, Iran and Azerbaijan. Then, it flows to Azerbaijan's territory and finally discharges to the Caspian Sea. This river's border length is initially 215 kilometers between Turkey and Armenia, 198

e-ISSN:2717-8277

kilometers between Iran and Nakhchivan (secluded part of Azerbaijan), 43 kilometers between Iran and Armenia, and 175 kilometers between Iran and Azerbaijan (Figure1). During the Soviet Union era, some essential water-related constructions were made, such as the Akhurian dam (shared project between Armenia and Turkey), the Aras, and the Mil-Moghan Dam (shared project between Iran and Azerbaijan). After the collapse of the Soviet Union, many other projects in all riparian countries were completed, which are mainly hydropower plants and reservoirs for agricultural purposes.

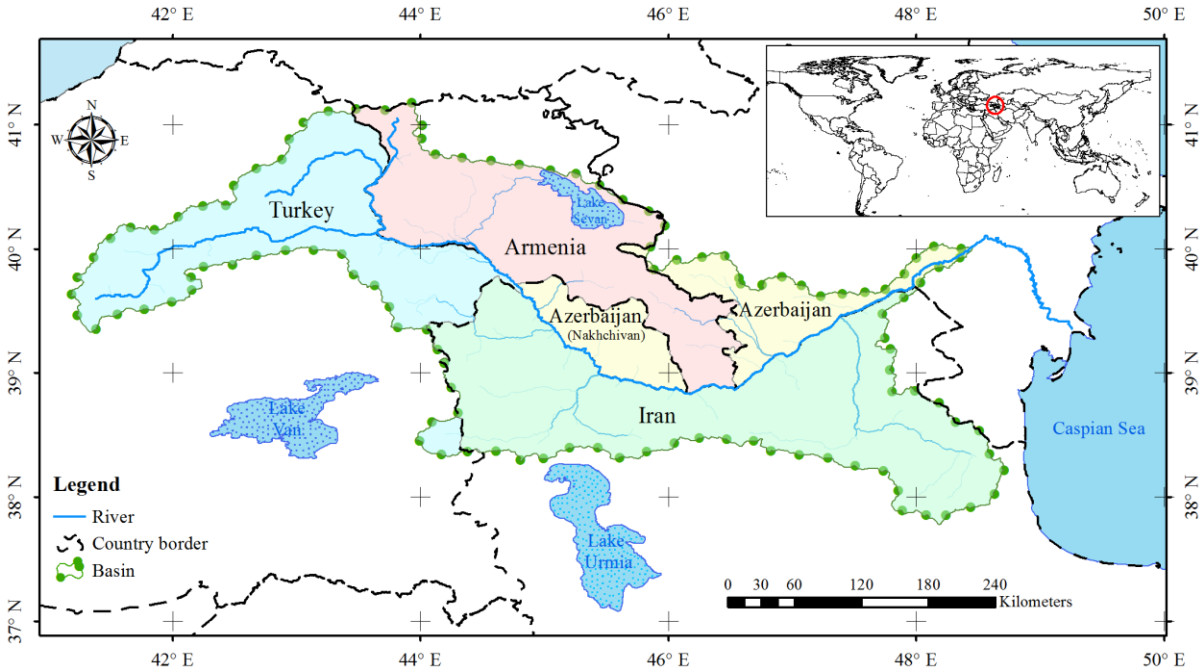

Fig. 1 Map of the location of Aras basin and the riparian countries.

4. RESULTS AND DISCUSSION

The obtained results are represented and discussed in two parts: first, the overall relative power of countries is derived in all forms of the power using TOPSIS and Fuzzy TOPSIS method. Second, the sensitivity of the overall relative power is analyzed based on the weighting of the four pillars of power.

4.1. Measuring power of countries

4.1.1. Geographical Power

This power stems from the position and geographical aspects of each riparian in the basin. One determining factor is the percentage of the basin confined in a country's territory. In this regard, 37.8% of the Aras basin belongs to Iran's territory, 25% belongs to Turkey and 23.6% and 13.6% belong to Armenia and Azerbaijan, respectively. In addition to the basin's area, the river stream length seems to have paramount importance. It provides a broad geographical range for a country to plan and exploit the river's energy alongside the stream. Therefore, the river's length with its geomorphological importance, i.e., stream order, is defined as the second criterion and is calculated by multiplying the river's length by its stream order in each country's territory. It is worth mentioning that the borderline

length of the river is shared equally for adjacent countries. The calculated numbers are 3533 km for Turkey, 2928 km for Armenia, 6133 km for Iran and 3344 km for Azerbaijan (Table S1).

More importantly, downstream countries are negatively affected by upstream water withdrawal and water contamination. This worsens downstream vulnerability status. For each country, the vulnerability assessment is defined by Qualitative and Manipulative Vulnerability criterion. This criterion represents the length of the river prone to water contamination and manipulation before entering the corresponding territory. Table S2 summarizes the river length in two forms for each riparian: the border length of the river and the interior length of the river in upstream territories.

The last criterion of the geographical power is the mean annual renewable surface runoff, which is calculated through hydrological rainfall-runoff modeling of the basin (Rashidi et al. 2020). Table 1 lists the four criteria introduced above and their relative power distance.

Table 1 Criteria for geographical power assessment and the relative power distance

	Turkey	Armenia	Iran	Azerbaijan
Percentage of a Basin confined in each territory	25	23.60	37.80	13.60
Length and Stream-order of the river available in each territory (km)	3533	2928	6133	3344
Mean Annual Renewable Surface Runoff (BCM)	3.40	3.80	2.40	1.20
Qualitative and Manipulative Vulnerability (km)	1030	3556	4208	5761
Relative Power Distance	**0.65**	**0.50**	**0.59**	**0.05**

Relative power distance in geographical form shows that Turkey benefits its upstream condition, followed by Iran and Armenia with relatively equal rank. By contrast, Azerbaijan suffers from being downstream because of having less control over the river and is more vulnerable to quality and quantity of stream flow.

4.1.2. Material power

In this form of power, GDP per capita as PPP (constant 2011 in international dollars) and HDI are chosen for economic comparison purposes. In addition, Armed Force Personnel and Military Expenditure as a percentage of GDP are criteria of military assessment. The related data are shown in Table 2.

Table 2 Criteria of economic and military power assessment criteria and the relative power distance

	Turkey	Armenia	Iran	Azerbaijan
GDP per capita, PPP index	24341	8563	19813	16225
HDI index	0.74	0.76	0.85	0.85
Armed Force Personnel, Total (thousands)	512	49	563	82
Military Expenditure (Billion dollars)	17.60	0.50	12.50	1.90
Relative Power Distance	**0.92**	**0.01**	**0.78**	**0.19**

In this pillar of power, Armenia and Azerbaijan have significantly low relative power than Iran and Turkey. Besides, Turkey has the strongest economic and military performance amongst others.

4.1.3. Bargaining Power

e-ISSN:2717-8277

As discussed earlier in this paper, to compare the bargaining power of countries, we need to assess each country's water-related assets. These assets can be utilized as a bargaining advantage and an issue linkage. Table 3 lists these assets and their corresponding values.

Table 3 Criteria of bargaining power assessment and the relative power distance (("Human Development Reports", n.d.; "World Development Indicators | DataBank" n.d.))

	Turkey	Armenia	Iran	Azerbaijan
Arable Land Area (km^2)	5522	5121	4430	9281
Hydropower Energy Capacity (MW)	441.2	1527	341	312
Labor Force in the basin (Million people)	0.3	1.24	0.69	2.12
Signed Bilateral and/or multilateral agreements	3	4	8	7
Relative Power Distance	**0.10**	**0.59**	**0.31**	**0.54**

Arable land area is obtained through remote sensing techniques in which dry-land farming is excluded. The labor force in the basin is also another potential aspect to consider and is one of the critical components of enhancing manufacturing and agricultural activities. Another useful criterion is the Hydropower Energy Capacity. The data relating to this is collected from the official statistical data resources websites of each country ("Armenian Energy Agency" n.d.; "AzərEnerji ASC" n.d.; "Hidroelektrik Santralleri (HES)" n.d.; "Iran Water Resources Management Company" n.d.).

Signing agreements show the high inclination of a country acting cooperatively, highlighting its bargaining power. The Aras River basin has undergone water policy changes during the past several decades. During the Soviet Union period, several important agreements were signed concerning the water withdrawal of the Aras River and water facility construction issues, which all still stand legitimate. Two agreements were signed between USSR and Turkey in 1964 and 1990, which are now legitimate between Turkey and Armenia. The former was about constructing the Arpachay reservoir with a joint commission on operating the infrastructure and allocating the water. The latter concerns technical cooperation, riverbed changes, and joint hydropower facilities (Kibaroglu et al. 2005). USSR and Iran also signed an agreement in 1957 (equal allocation of the Aras River and assessment of constructing the Aras reservoir), 1963 (constructing the Aras and Mil-Moghan dam), 1977 (constructing the Khoda-Afarin and Giz-Galasi reservoirs), and 1988 (equal share of the Khoda-Afarin and Giz-Galasi reservoirs) (Kibaroglu et al. 2005).

Meanwhile, in 1955, Iran and Turkey signed an agreement related to the utilization of inter-boundary Rivers, namely Sarisu and Garasu, which originate in Turkey and flow into Iran (Kibaroglu et al. 2005). Another less noticeable agreement was signed in 1974 between Azerbaijan and Armenia as two Soviet Socialist Republics on the joint utilization of the Vorotan River. This river originates in Armenia territory, flows to Azerbaijan, and finally discharges to the Aras River (Yu et al. 2014). Almost all the agreements are based on equal withdrawal of the river between the parties.

In 1991, Soviet Union collapsed, and therefore, Azerbaijan and Armenia declared independence. In the recent period, three crucial mutual agreements were signed. One is signed in 2018 between Iran and Armenia, which is about installing a hydropower plant with 130 MW capacity in the Meghri district. The

e-ISSN:2717-8277

two other treaties are between Iran and Azerbaijan and were signed in 2016. One treaty is related to the construction of hydropower plants in Urdubad and Mazarad and the other is about the continuation of construction and technical operation of Khoda-Afarin and Giz-Galasi reservoirs (''Islamic Parliament Research Center Of The Islamic Republic Of IRAN'' n.d.). It is clear that Armenia and Azerbaijan possess rich assets and are more inclined to reach mutual agreements than Iran and Turkey.

4.1.4. Ideational Power

One primary approach in assessing this form of power is deducing commonly used ideational tools from scrutinizing the media content that reflects the policy-makers' attitudes over the basin's water issues. The reduction of available fresh water and more importantly degradation of the Aras river's quality have become a growing concern. Untreated municipal wastewaters, agricultural fertilizers as well as heavy metal pollutants are considered the main polluting sources (Klaphake and Kramer 2011).

The first tool is securitization, in which policy-makers express concern towards other party's activities relating to upstream water projects and the degradation of water quality. This issue has been exacerbated by the poor tailings treatment, especially from Armenia's mining site near the Aras River (Bidhendi et al. 2007). In this regard, Azerbaijan and Iran have delivered their concern towards stream flow reduction and river contamination especially addressing Armenia. In contrast, Armenia has successfully prolonged preventive measures in a conservative manner and playing with ambiguity. We consider this behavior as another tool named sanctioned discourse. Turkey, on the other hand, has demonstrated its power by declaring the policy of total withdrawal of domestic waters and propelling its development plans. We refer to this behavior as the imposition of narratives. Following, is the summary of some media content containing the aforementioned tools used by authorities.

Azerbaijan has accused Armenia of polluting and cutting down the water on several occasions. For example, Azerbaijan foreign ministry's spokesperson stated on 19 July 2017 that Armenia's policy in transboundary rivers and the Sarsang reservoir in the occupied Azerbaijani lands is to prevent water from entering the Azerbaijan territory, and this proves that Armenia uses water as a means of environmental terror and threat not only to Azerbaijan but to all other neighbors. The head of Azerbaijan's department of economic and political geography also stated that dumping the mining waste into the Aras River by Armenia contradicts the international documents, and the rivers flowing from Armenia through Azerbaijan bring vast amounts of waste.

Iran, however, has occasionally declared a hazardous future for downstream people who rely on the Aras River for domestic and agricultural purposes. For example, Irans' President (Hassan Rouhani) emphasized the importance of the Aras River quality for the downstream population during the meeting with Armenia's deputy prime minister. In his speech to reporters at the end of his tour to Azerbaijan-e-sharghi province (an important industrial county of Iran in Aras River Bain) in 2019, he stated that Iran monitors the pollution and informs the neighboring country to take the required measurements. Mohsen Khadem Arabbaghi, Director of Public Relations and International Affairs of the Aras Free Trading Zone Organization, said on the first international meeting on cross-border environmental protection of Iran and neighboring countries: "Despite numerous efforts by Iran to prevent the entry of Chemical waste from one of the neighboring countries to the Aras River, the international community has remained silent

e-ISSN:2717-8277

in the face of the danger of water pollution of the Aras River. The region has various ecosystems, Arasbaran forests, historical monuments and numerous sites and therefore the environmental issues are followed with special sensitivity". Yousef Ghafarzadeh, the head of Regional Water Company of Azerbaijan-e-sharghi province, once pointed out that the construction of dams in Turkey can affect runoff quantity of the Aras River. However, we continuously monitor stream flow of the river and will inform authorities in any anomaly conditions, which will damage our water supply.

In contrast, Armenia has chosen ambiguity and successfully prolonged the procedure of taking practical measurements regarding waste management. For example, during the meeting with the Iranian Ambassador in 2016, the Nature Protection minister of Armenia stated that the Aras River is a cross-border river and it is necessary to carry out the pollution studies in the territories of all five countries to find out the exact sources of the pollution. Additionally, regarding concern over upstream activities, Tigran Avinyan, Armenian Deputy Prime Minister, during his meeting with Fekitamoeloa Katoa, the UN High Representative for the Least Developed Countries, in 2019 expressed concern over Turkey's broad reservoir construction projects. He pointed out that these projects not only affect the lands that are cultivated in Aras River Basin negatively but also substantially upset the hydrological and biosphere balance of the region

Another primary ideational tool reflected in the media relates to the development policy in each territory. Despite some mutual water-related agreements discussed earlier in this study, there is no integrated water resources plan and inclination towards reaching a multi-lateral comprehensive plan. In this regard, the policy is to declare total domestic water withdrawal and future developing program. For example, Recep Akdag, Deputy Prime Minister of Turkey in 2017 declared that besides several dam construction projects, 34728 hectares of agricultural land in the region would flourish after completion of the Soylemez reservoir. The body height will be 113 meters and 1.3 billion cubic meters of water will be regulated. Soylemez Dam will also produce 202.69 gigawatt-hours of electricity. Goksel Gulbey, the head of ASIMDER (International Association for Struggle against Baseless Armenian Claims) in Turkey in 2019, said that there has been important improvement in our country's water policy in recent years. Just as the current wars in the world are over oil and gas, the future wars will be on the water. Therefore, our policy must be towards taking control of the rivers that flow in vain from our region".

In this regard, The Deputy Minister of Jihad for Agriculture in Water and Soil Affairs of Iran in 2019 said that: with the maximum operation of the Khoda-Afarin Dam Irrigation Network Project, at least one million tons will be added to the production of agricultural products and more than 70% of the dry-land farming area in the Moghan region will be irrigated (equal to 37,000 hectares). In 2020, the head of the Management and Planning Organization of Azerbaijan-e-Gharbi province in Iran also referred to the significant capacity of border waters for manufacturing and development in the province. He said: "So far, 58 thousand and 840 billion rials have been spent to control border waters in the province". The head of the Regional Water Company of Azerbaijan-e-sharghi province also mentioned in 2020 that the Aras Exploitation and Development Plan is to make maximum use of the Aras River, supply agricultural water and create irrigation and drainage network of 16170 hectares with a water volume of 102 million cubic meters per year.

e-ISSN:2717-8277

A general overview of the media shows that Turkey has remained passive and focused chiefly on domestic development rather than joint cooperative commissions with adjacent countries in the basin. This behavior of the Turkey might be due to its position as a geographically upstream country. On the other hand, Iran seems to be active and uses ideational tools to keep the basin's condition in its favor. In contrast, Azerbaijan and Armenia moderately articulate their policy through the press and media.
The results of media content analysis are summarized in Table 4. In this table, the frequency of occurrence of each Ideational tool in media is presented in linguistic form, and the relative numerical equivalent is derived using the Fuzzy-TOPSIS method. The entire media content is then considered as one criterion of ideational power.

Table 4.Ideational tools extracted from media content analysis

Criterion	Turkey	Armenia	Iran	Azerbaijan
Expressing Concern for other 'states' activities (securitization)	Low	Average	Very High	Average
Conservative Manner/Avoiding transparent Political Stance (sanctioned discourse)	Low	Average	Low	Low
Declaring the Policy of total Domestic Water Withdrawal (imposition of narratives)	Average	Low	Average	Low
Relative numerical equivalent	**0.24**	**0.41**	**0.75**	**0.17**

The criteria that are introduced to assess the knowledge structure of a country are representative of the country's ability to disseminate ideas in order to influence other actors in mutual or multilateral political discourses. For example, research and development (R&D) is the first stage of developing any new service or production and therefore, the Expenditure on R&D reflects the eagerness of a country to support ideas. Another criterion developed here is the number of published articles in each country, which shows scholars' ability to explore the new science topics prevailing worldwide. The next criterion is the number of top-ranked (among the top 1000) universities in each state. Turkey and Iran have ten and seven top-ranked universities, respectively, while Azerbaijan has only one and Armenia does not currently have a good university. Freedom of speech is another factor that might be useful in assessing the influence of media activists in disseminating social and political ideas. Moreover, the lower the value of press freedom, the better the circulation of ideas. Table 5 summarizes the relative ideational power distance through all criteria related to knowledge structure along with media content analysis.

Table 5. Ideational power criteria

	Turkey	Armenia	Iran	Azerbaijan
GDP percentage spent on Research and Development	0.93	0.22	0.62	0.2
Number of Published articles (2016)	33902	521	40975	480
Best Ranking Universities (2019)	10	0	7	1
Freedom of Speech Index (2018 and 2019)	52.8	28.9	64.4	59.1
Media Content Analysis	0.24	0.41	0.75	0.17
Relative Ideational Power Distance	**0.66**	**0.24**	**0.71**	**0.06**

e-ISSN:2717-8277

4.2. Overall Relative Power

Finally, to take a broad view of the power asymmetry in the Aras River basin, all four elements of power are aggregated to derive the overall relative power. The result is shown in Figure 2. It is concluded from Figure 2 that Turkey and Iran, having almost equal overall power, could be the potential hegemon of the basin. Although both countries lack some bargaining power, they excel in the other three forms of power. On the other hand, Azerbaijan suffers from being located geographically downstream. This may cause severe qualitative and quantitative water problems when the rivalry water withdrawal sores up in the future. Although Azerbaijan and Armenia both have good assets such as cultivated lands, labor, and installed hydropower plants, it seems that those assets are not sufficient to play a vital role in political discourses between adjacent countries.

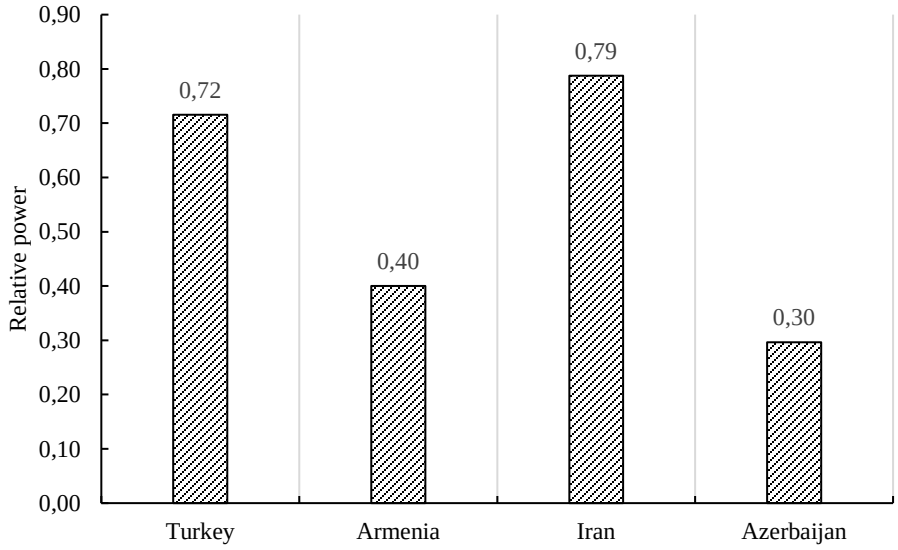

Fig. 2. Power asymmetry in the Aras River basin.

4.3. Sensitivity Analysis

In the last section of this study, a sensitivity analysis is performed to evaluate the changes in countries' relative power based on the weight factors' variation in all four pillars of the power. To reduce the number of all possible weighting cases, all the weight factors are assumed to take discrete numbers from zero to one with the step of 0.1 so that the sum of all the four weights assigned to power pillars is equal to one. Owing to these presumptions, only 82 cases of weighting allocations are possible. The results are shown in Figure 3. In any studying pillar, the relative power in each riparian country is equal to the average of all possible cases with the same weight factor.

Issue: 4 2021
International Journal of Water Management and Diplomacy
e-ISSN:2717-8277

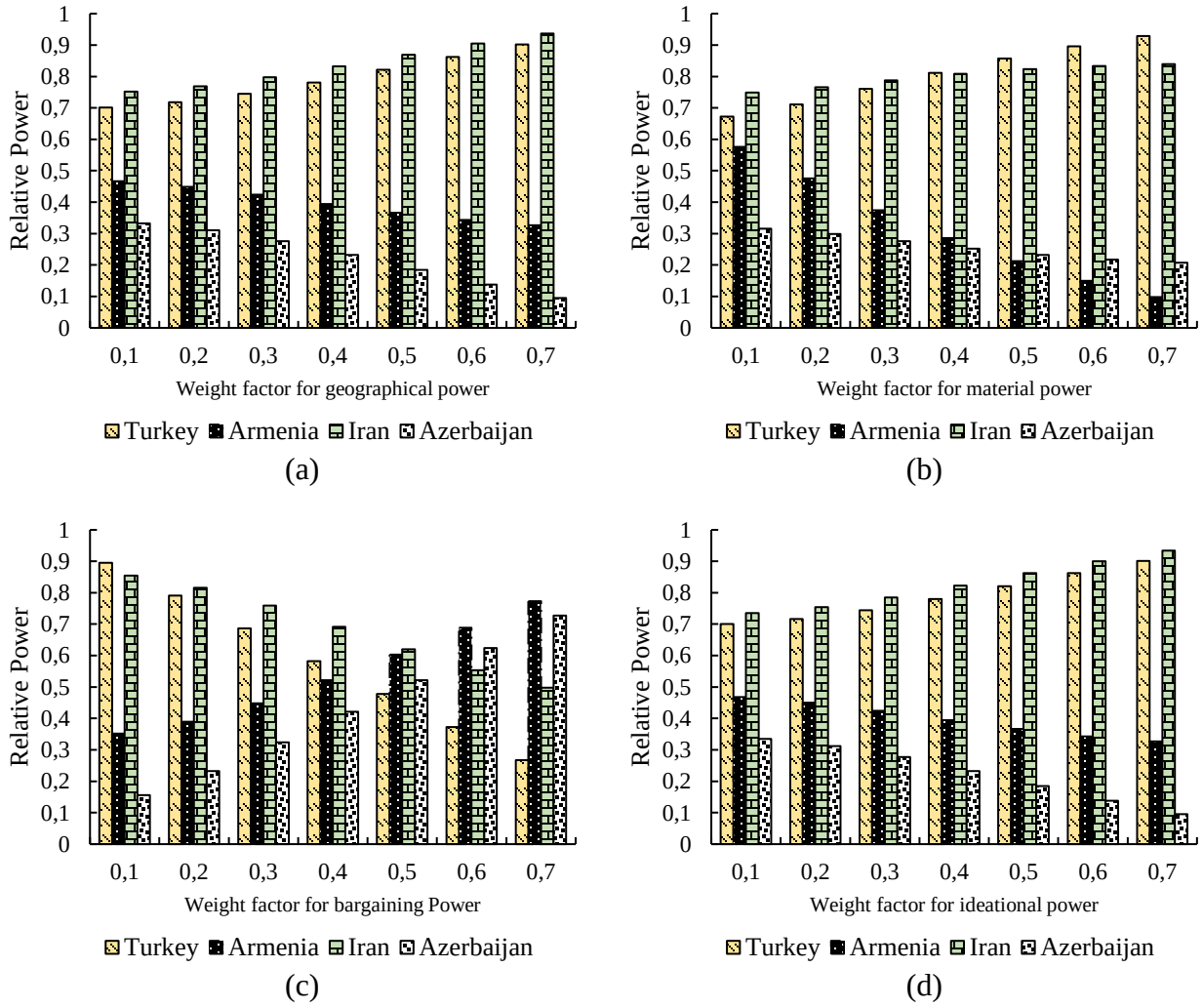

Fig. 3 The bar chart of the countries' relative power distance based on the variation of the weight factors in (a) Geographical, (b) Material, (c) Bargaining and (d) Ideational Power.

As can be seen from Figure 3. In the case of the geographical, material and ideational power, by increasing the weight factor, the relative power of Turkey and Iran increases while that of Armenia and Azerbaijan decreases. Bar chart (b) shows that Armenia is the most sensitive country to the variation of the weight factor in material power (its relative power changes from near 0.6 to 0.1). As shown in bar chart (c), the variation of the relative power through increasing the weight factor of the bargaining power is significantly different. Giving more weight to the bargaining power, gives Armenia and Azerbaijan the privilege of being potential hegemon of the basin.

5. CONCLUSION

Power asymmetry assessment over an SWR needs a broad range of data and, most importantly, decision-makers' viewpoints in weighting the criteria. This research, offers an MCDM approach to analyze the

power asymmetry through defining equal-weighted criteria. Based on the findings of this paper, it is expected that in the water shortage period, the potential hegemon of the basin (Iran or Turkey) will play an essential role in reaching stable cooperation or escalating conflict. In contrast, Armenia and Azerbaijan would possibly act as anti-hegemon individuals.

Since not all forms of power have the same importance in reality, sensitivity analysis is done to compare different weighting scenarios. It is concluded that the relative power between countries is more sensitive to the variation of material and bargaining powers' weight. For example, if Armenia and Azerbaijan focus on bargaining terms, they may reach equality in power despite their relatively low rank in other forms of power. Moreover, the coalition of parties, on the other hand, is an essential factor to consider, and this may totally affect the power asymmetry in the basin.

Declarations

Funding Not applicable

Conflicts of interest/Competing interests Not applicable

Availability of data and material all data are available within the article

Code availability Not applicable

References

Allan JAT, Mirumachi N (2013) Why negotiate? Asymmetric endowments, asymmetric power and the invisible nexus of water, trade and power that brings apparent water security. Transboundary Water Management, Routledge, 26–39

Armenian Energy Agency. (n.d.). Retrieved April 2, 2020, from https://energyagency.am/en/page_pdf/hidroenergetika

AzərEnerji ASC. (n.d.). Retrieved April 2, 2020, from http://www.azerenerji.gov.az/index/page/13#mingechevirses

Bachrach P, Baratz MS (1962) Two faces of power. Am. Polit. Sci. Rev 56(4): 947–952

Barnett M, Duvall R (2005) Power in international politics. Int. Organ 59(1): 39–75

Bazrkar MH, Tavakoli-Nabavi E, Zamani N, Eslamian S (2013) System dynamic approach to hydro-politics in Hirmand transboundary river basin from sustainability perspective. Int J Hydrol Sci Technol 3(4): 378–398

Béland D (2010) The idea of power and the role of ideas. Polit. Stud. Rev 8(2): 145–154

Bidhendi GRN, Karbassi AR, Nasrabadi T, Hoveidi H (2007) Influence of copper mine on surface water quality. Int. J. Environ. Sci. Technol 4(1): 85–91

Campbell JL (1998) Institutional analysis and the role of ideas in political economy. Theory Soc 27(3): 377–409

Carstensen MB, Schmidt VA (2016) Power through, over and in ideas: conceptualizing ideational power in discursive institutionalism. J. Eur. public policy 23(3): 318–337

Cascão AE, Zeitoun M (2013) Power, hegemony and critical hydropolitics. Transboundary Water Management, Routledge, pp 40–55

Dahl RA (1957) The concept of power. Behav. Sci 2(3): 201–215

De Stefano L, Edwards P, De Silva L, Wolf AT (2010) Tracking cooperation and conflict in international basins: historic and recent trends. Water Policy 12(6): 871–884

Dinar A, Alemu S (2000) The process of negotiation over international water disputes: the case of the Nile Basin. Int Negot. 5(2): 331–356

Dinar S, Dinar A, Kurukulasuriya P (2011) Scarcity and cooperation along international rivers: an empirical assessment of bilateral treaties. Int Stud 55(3): 809–833

Earle A, Jägerskog A, Öjendal J (2013) Introduction: setting the scene for transboundary water management approaches. Transboundary water management, Routledge, pp 15–24

Hajer M A, (1995) The politics of environmental discourse: Ecological modernization and the policy process. Oxford University Press, Oxford.

Hay C, Rosamond B (2002) Globalization, European integration and the discursive construction of economic imperatives. J. Eur. Public Policy 9(2): 147–167

Herrero C, Villar A (2001) The three musketeers: four classical solutions to bankruptcy problems. Math Soc Sci. 42(3): 307–328

Hidroelektrik Santralleri (HES) (n.d.). Retrieved April 2, 2020, from https://www.enerjiatlasi.com/hidroelektrik/

Human Development Reports. (n.d.). Retrieved March 29, 2020, from http://hdr.undp.org/en/indicators/137506#

Iran Water Resources Management Company. (n.d.). Retrieved April 2, 2020, from http://barghabi.wrm.ir

Islamic Parliament Research Center of the Islamic Republic of Iran. (n.d.). Retrieved May 25, 2020, from https://rc.majlis.ir/fa/law/show/1005215

Kerachian R, Karamouz M (2007) A stochastic conflict resolution model for water quality management in reservoir–river systems. Adv Water Resour. 30(4): 866–882

Kibaroglu A, Klaphake A, Kramer A, Scheumann W, Carius A (2005) Cooperation on Turkey's Turkey's transboundary waters, The German Federal Ministry for Environment, Nature Conservation and Nuclear Safety, Berlin

Klaphake A, Kramer A (2011) Kura-Aras river basin: burgeoning transboundary water issues. In Turkey's Water Policy, Springer, Berlin, Heidelberg 263–275

Kucukmehmetoglu M (2009) A game theoretic approach to assess the impacts of major investments on transboundary water resources: the case of the Euphrates and Tigris. Water Resour Manag 23(15): 3069.

Lukes S (2004) Power: A radical view. Macmillan International Higher Education

Madani K (2010) Game theory and water resources. J Hydrol 381(3–4): 225–238

Madani K, Rheinheimer D, Elimam L, Connell-Buck C (2011) A game theory approach to understanding the Nile River Basin conflict. A Water Resour Festschrift Honor Profr Lars Bengtsson, Div Water Resour Eng 97

Madani K, Sheikhmohammady M, Mokhtari S, Moradi M, Xanthopoulos P (2014) Social Planner's Planner's Solution for the Caspian Sea Conflict. Gr Decis Negot 23(3): 579–596. https://doi.org/10.1007/s10726-013-9345-7

Mianabadi H, Mostert E, Zarghami M, van de Giesen N (2014) A new bankruptcy method for conflict resolution in water resources allocation. J Environ Manage 144: 152–159

Mills CW, Wolfe A (2000) The power elite (Vol. 20). Oxford University Press

QS World University Rankings 2019: Top Global Universities | Top Universities. (n.d.). Retrieved May 25, 2020, from https://www.topuniversities.com/university-rankings/world-university-rankings/2019

Rashidi M, Zarghaami M, Pishbahar E (2020) Evaluation of Panel Regression Models in Estimating the Relationship between Water and Countries' Agricultural Added Value in the Aras River Basin. Iran-Water Resour. Res 16(1) 17–28.

Rein M (2018) Power Asymmetry in the Mekong River Basin: The Impact of Hydro-Hegemony on Sharing Transboundary Water. Vienna J East Asian Stud 8(1): 127–162. https://doi.org/10.2478/vjeas-2016-0005

Shahbazbegian MR, Turton A, Shafaee SMM (2016) Hydropolitical Self-Organization theory; system dynamics to analyze hydropolitics of Helmand transboundary river. Water Policy 18(5): 1088-1119.

Stiglitz JE, Sen A, Fitoussi JP (2009) Report by the commission on the measurement of economic performance and social progress. Citeseer

Turton A, Henwood R (2002) Hydropolitics in the developing world: A Southern African perspective. Retrieved from https://library.wur.nl/WebQuery/wurpubs/123299

Turton AR (2003) The hydropolitical dynamics of cooperation in Southern Africa: A strategic perspective on institutional development in international river basins. Transboundary Rivers, sovereignty Dev Hydropolitical drivers Okavango River Basin 83–103

Waterbury J (1979) Hydropolitics of the Nile valley. Syracuse University Press, Syracuse, NY

Weber M (1964) The Theory of Social and Economic Organization: Transl. by AM Henderson and Talcott Parsons. Free Press

Wolf AT (1995) Hydropolitics along the Jordan River: Scarce water and its impact on the Arab-Israeli conflict (Vol. 99). United Nations University Press

Wolf AT (1998) Conflict and cooperation along international waterways. Water Policy 1(2): 251–265. https://doi.org/10.1016/S1366-7017(98)00019-1

Wolf AT, Stahl K, Macomber MF (2003) Conflict and cooperation within international river basins: The importance of institutional capacity. Water Resour Updat. 125(2): 31–40

World Development Indicators, Data Bank. (n.d.). Retrieved March 29, 2020, from https://databank.worldbank.org/source/world-development-indicators

World press freedom index, RSF. (n.d.). Retrieved May 25, 2020, from https://rsf.org/en/ranking/2018

Yoon KP, Hwang CL (1995) Multiple attribute decision making: an introduction (Vol. 104). Sage publications

Yu J, Kilgour DM, Hipel KW, Zhao M (2015) Power asymmetry in conflict resolution with application to a water pollution dispute in China. Water Resour Res 51(10): 8627–8645

Yu W, Cestti RE, Lee JY (2014) Toward Integrated Water Resources Management in Armenia. The World Bank Publications

Zeitoun M, Cascao AE (2010) Power, Hegemony and Critical Hydropolitics. Transboundary Water Management: Principles and Practices, pp 27–42

Zeitoun M, Warner J (2006) Hydro-hegemony–a framework for analysis of trans-boundary water conflicts. Water Policy 8(5): 435–460

JWMD Issue: 4 2021
International Journal of Water Management and Diplomacy
e-ISSN:2717-8277

Supplementary Information

Tables

Table S6. Length and stream order of Aras River available in each riparian territory (km)

Turkey			Armenia			Iran			Azerbaijan		
Stream Order	Length (km)	Index (km)	Stream Order	Length (km)	Index (km)	Stream Order	Length (km)	Index (km)	Stream Order	Length (km)	Index (km)
1	875	875	1	690	690	1	1361	1361	1	489	489
2	276	552	2	318	636	2	588	1176	2	187	374
3	422	1266	3	184	552	3	275	825	3	136	408
4	210	840	4	210	840	4	259	1036	4	137	548
5	-	-	5	42	210	5	347	1735	5	305	1525
Total		3533			2928			6133			3344

Table S7 Qualitative and manipulative vulnerability for each riparian's territory (km)

	Turkey	Armenia	Iran	Azerbaijan
Border River Length (km)	215	456	631	631
Interior River Length in Upstream Countries (km)	815	3100	3577	5130
Total (km)	1030	3556	4208	5761

Article received: September 2 2021

Article accepted :October 16 2021

International Journal of Water Management and Diplomacy
Issue: 4 2021
e-ISSN:2717-8277

Research Article

CLIMATE CHANGE AND HUMAN SECURITIZATION SPECIFIC TO THE 2014 SOUTHEASTERN EUROPEAN FLOODS; CIVIL SOLIDARITY AS AN ETHNIC CONFLICT RESISTANCE

Faruk Hadžić

Independent researcher/scholar
Bosnia and Herzegovina
ORCID iD *https://orcid.org/0000-0003-1158-7858*

Research Gate *https://www.researchgate.net/profile/Faruk-Hadzic-3*

Google Scholar *https://scholar.google.com/citations?user=BT055jYAAAAJ&hl=hr*

Email: faruk.hadzic01@gmail.com

Abstract

The paper presents insight into the consequences of emergency-based climate and crisis applications in the Balkans related to solidarity behavior, i.e., human securitization within civic pluralism, offering ethnic conflict opposition. Prior research in post-conflict countries focused on rebuilding destroyed and fragmented societies, liberal peacebuilding, state-building, transitional justice, income generation, or restoring people's sense of opportunity. However, the solidarity paradigm lacks administering climate change related to emergencies in the ethnoreligious divided nations (i.e., former Yugoslavia; Bosnia and Herzegovina). The paper examines human securitization cooperation in climate change, emphasizing the 2014 Balkans floods associating the post-Yugoslav citizenship paradigm within solidarity as an ethnic conflict resistance, arguing that the institutions had an abortion, and civic solidarity became requisite transforming an ethnic conflict. Through joint action and a systemic approach, it is possible to limit climate change consequences and work on capacity building and create a more resilient community capable of protecting its individuals. The resolutions to existing ethnic policies come from above through reactive civic solidarity, an ambivalence where citizen activists filled the gap in the crisis sensitively. Solidarity must also have a "polarity" to be symmetrical, not equalized with charity. An essential factor is the motive of proactivity, which neoliberalism and emerging ethnopolitics often confront. Political value and a certain level of nostalgia within socialist memory might have occurred through the solemnity of narratives. There must be effective counter-narratives to effectively change the subjectivity of citizenship and improve the ethnopolitical solidarity calculations. The comprehensive transformation of conflict means that even those organizations that are pillars of collective identity, which often exclude, alienate other communities in the process, must find a way to become active participants in civil society.

e-ISSN:2717-8277

Keywords: Climate change, Southeast Europe floods, Bosnia and Herzegovina, former Yugoslavia, Civic solidarity, Human security, Conflict resistance, Ethnicity, Water management, Crisis

1.INTRODUCTION

Research in post-conflict countries focused on rebuilding destroyed and fragmented societies, liberal peacebuilding, state-building, transitional justice, employment, and income generation, or the more profound challenge of restoring people's sense of opportunity, dignity, and hope. However, the solidarity paradigm lacks administering climate change related to emergencies in the ethnoreligious divided nations (i.e., the solidarity paradigm lacks administering climate change related to emergencies in the ethnoreligious divided nations (i.e., former-Yugoslavia; Bosnia and Herzegovina inter-state international relations paradigm). The paper examines human securitization cooperation in climate change, emphasizing the 2014 Balkans floods associating the post-Yugoslav citizenship paradigm within solidarity as an ethnic conflict resistance, arguing that the institutions (Bosnia and Herzegovina) had an abortion, and civic solidarity became requisite transforming an ethnic conflict. Thus, no state institutional solidarity was examplar, particularly in Bosnia and Herzegovina (B&H). Moreover, by raising awareness of the problem and the active participation of all social structures, an inevitable shift can be expected in the struggle for the environment's survival, peacebuilding, and human security. In the following lines, the focus will be on how these climate changes are reflected in the territory of B&H, emphasizing the significant floods in Southeast Europe in 2014 and how they opened the discourse of conflict transformation within the framework of solidarity.

Climate change over the years has been one of the most controversial topics globally. Although there is strong evidence of the genesis, manifestation, and consequences, some scientists and authors deny the view that they violate and negatively affect human security. Thus, Stephen Walt believes that spreading the concept of security, which would include threats such as poverty, AIDS, natural disasters, would lead to excessive stretching of the concept of security, and thus everything would become a threat and make it difficult to make decisions significant problems. (Baysal, 2017) Other primary opponents, representatives of the Copenhagen School of Security, believe that climate change is being securitized, which, following the logic of security, would have problematic consequences such as the militarization of the problem and the legitimization undemocratic decisions. (Trabletta, 2009) Despite skeptical views that climate change should not be perceived as a security problem, Brown points out that we need to understand that the speed and scale of climate change and the way it affects our habitats, food, and water resources can very quickly undermine economic and political stability in many regions of the world in the coming years. By doing so, climate change will act as a threat booster and make existing problems such as water and food shortages more complex and challenging to solve. (Brown et al., 2009) Climate change can affect some or all of the factors at once.

States of acute threats such as famine, conflict, and socio-political instability are caused by the interaction of several factors. For many populations and communities that are socially marginalized and with

e-ISSN:2717-8277

insufficient natural resources, human security will continue to be progressively threatened as these climate changes take hold. In mid-May 2014, in the northern, eastern, and central parts of B&H, on the border with Croatia and Serbia, were the most damaging floods in 120 years. The natural disaster affected a quarter of the country's territory and about a million people, approximately 30% of B&H's total 3.5-3.8 million inhabitants. The floods brought enormous devastation to the country, which is still recovering from the effects of the 1992-1995 war, where many people suffer from a perpetual deficit, unemployment, and constant political instability. The total estimated economic damage amounts to more than four billion convertible marks (KM) or 15% of B&H's total gross domestic product. Heavy rains have caused numerous rivers to overflow their banks, devastating more than 100,000 individual homes and buildings, more than 230 schools, and health facilities and causing enormous damage to farms. (UNDP, 2015) Thus, numerous industrial facilities, traffic infrastructure were destroyed. It is a well-established practice in most developed democracies that each state assumes responsibility for the care of victims and timely assistance in emergencies on its territory. Consequently, civil emergency planning is primarily the responsibility of state institutions, and it is common practice for funds earmarked for this purpose to also be under the control of those institutions.

However, considering that B&H has one of the most complex constitutional structures, planning and financing in civil emergencies are characterized by a slightly different form of organization and management of this sector. The complexity of the constitutional structure of B&H results in the existence of several similar laws that define the same area but relate to different levels of government. At the very beginning of the analysis of the legislative framework, we must indicate the following: B&H is a state consisting of two entities - the Federation of Bosnia and Herzegovina (Federation of B&H) and the Republika Srpska (RS), and the Brčko District (DB B&H). The federal state of B&H, the complex structure of two entities and one district, the ethnoreligious division, EU and NATO integration, is complicated. At the same time, in B&H, the entities have increased the possibilities of monopoly and power over the territory. The ideological ethnonationalism has metastasized into a social organization's daily political discourse that produces uncritical subjects in all three constitutive ethnic governments. (Hadžić, 2021) Like many other issues in B&H, water management issues are primarily political issues. (Vucijak et al., 2011) The existing administrative-institutional structure of the water sector in B&H fully reflects the existing administrative-political structure of B&H. Coordinating activities and activities of international cooperation are within the competence of the state, and those crucial for the safety and living standards of B&H citizens, operational activities related to water management in B&H are the responsibility of the entities and the Brcko District (BD B&H).

The notion of solidarity has experienced inevitable progression in the Balkans 2014, although all the processes in which it occurs reopen many questions that accompanied the phenomenon of solidarity in some earlier times. Thus, for example, when it comes to counter-narratives within anti-war movements, the question is who are we in solidarity with and why? What is the community of our joint affiliation, and what rights do we enjoy in it? Are we left with self-exclusion as solidarity with the excluded? Moreover, where does the motive for solidarity come from? Due to the political and the growing

e-ISSN:2717-8277

economic crisis, people are developing a network of solidarity that is often understood as a set of behavior practices. Also, there is a need for solidarity in this context due to the lack of state institutional assistance, which offers less and less support in neoliberal conditions. State disaster prevention should have included action to prevent human security violations and to avoid the historical accumulation of violations of economic, social, and cultural rights, including the right to food. Humanitarian aid is based on legal and operational frameworks at international, regional, national, and local levels. Experience and lessons learned should be considered for emergency response planning and implementation. A multilevel approach facilitates the decentralization of emergency response. However, in the months after the scale floods, the public focused on self-organization, unity, and solidarity (Grbesic, 2014) in ethnoreligious divided societies. Thus, a framework of civic pluralism to effectively improve the damage from the floods. In the context of today's policies of the post-Yugoslav space, solidarity is something that goes beyond certain borders and passes through the overall model of citizenship. The rhetorical power of solidarity depends on the constitution of citizens.

For the actual demonstration of the multiethnic nation's construction and, most importantly, its memory, the Yugoslav case is one of the better examples, not only because the whole construction of Yugoslavia was built and dismantled in more than a century. Hence, it is available for research and that in this framework, the Yugoslav state was quite successful for a certain period. (Wachtel, 1998) The most significant issue after Tito died in 1980 was that civil democracies did not replace communism but ethnonational ones, not supporting pacific self-transformation but extensive violence. Suddenly, in the mid-1980s, a new wave came that he no longer called it a counter-revolution, meaning in the socialist-style: revolution and counter-revolution - but called it an ethnic-religious threat. The thematization of the Yugoslav case is inspiring because it can simultaneously point out the advantages and limitations of the functions of shared social memory of solidarity in multiethnic and multireligious societies and the deep dependence of the state's survival on the skill of working on national memory. However, the short spring of civil society concepts and the formation of social capital in the 1980s quickly turned into the ethnicization of Yugoslav society. (Hadžić, 2020) The consequences were, in principle, ethnoreligiously homogeneous communities whose internal social capital was produced to the detriment of restrictions and the struggle against other ethnic communities. Historically, and presently, Bosnia and Herzegovina (B&H) is the most critical area of former Yugoslavia multiethnic discourse (some call it a "small" Yugoslavia). The "complex" nation of so-called constituent peoples- Bosniaks (Bosnian Muslims, the most numerous ethnic group), Bosnian Croats (Catholics), and Bosnian Serbs (Orthodox).

Subjects of solidarity, legally and politically, are additionally found through discursive reactions within the narratives of today's citizens. The "political" that constitutes the community changes over time, as does the idea of who we are and how we will function. The "brotherhood and unity" community has best defined the concept of solidarity, but in today's societies, the citizen must be responsible as a citizen entrepreneur in the neoliberal citizenship agendas. The diversity of normative articulations of citizenship is interpreted differently in societies worldwide, and changes occur when radical regime changes occur. The period of socialist Yugoslavia until the disintegration, the repetition of the mantra "brotherhood and

e-ISSN:2717-8277

unity," socialism, a civil status inclination, led to the fact that this mantra was, in fact, a recognition that different peoples live together in the same community and carry the idea that woven into legal, political, everyday practices that were like, e.g., labor actions or military service practices. The counter-narratives were nationalistic, and the constitutional solutions removed all those who did not have an adequate origin, and that is the case when the existing community destroyed the imagined one. Destructive solidarity called "we against them" was very much present in Serbia in the 1990s, and anti-war narratives were constructed in feminist movements. (Vasiljevic, 2019) Counter-narratives and advocating for different citizenship agendas (different reasoning of solidarity) were used in various ways to accumulate capital in the post-Yugoslav period, striving for economic equalization. However, this move of solidarity through partial concealment and change of subjectivity affected power that no longer comes only from specific points. It is already becoming a way of thinking and overlaps with all the accompanying processes. The idea of who is a citizen in an ethical sense, who is a minority, and how he behaves changes the original idea of citizenship, and people must earn the status of a citizen who has their rights. The socialist past is used as a legitimizing narrative that justifies the position of people relying on the state instead of taking matters into their own hands. (Vasiljevic, 2019)

Due to new national-state theoretical inadequacy (i.e., nationalism as an ideology), religion is used as an instrument of socialization and legitimization of new national-political state subjects. When nation and religion become "controversial" identification and mark others as potentially dangerous, through a policy that allegedly aims to "affirm" and "protect" its people and their faith, then in local historical and current circumstances, it essentially implies antagonism in the most dramatic conflicts. Historical revisionism and the "evil" memory developed into a behavioral practice. (Hadžić, 2020) In deeply divided societies such as the Balkans, where groups fear each other, the option of leaving the current group is often limited, either because the costs of social solidarity are too high or simply because no groups are willing to accept a new member. For example, it was practically impossible for the Orthodox community to accept a Catholic as its member or a Muslim, and vice versa. For the reasons stated above, it is apparent that we need to begin to appreciate the potential that identity change brings with it.

From a sociological point of view, conflict is genuinely an inevitable fact of social life. Nonviolent methods, in contrast, strive for a more communicative approach and provide opportunities for trust and relationship development. Moreover, violence polarizes groups, while less violent forms of conflict open up the possibility of developing solidarity among rivals. Because violence and intimidation cause trauma and undermine trust, which only prolongs violent conflict, one of the main challenges of all peace initiatives is the "end of violence," as John Brewer (2003) points out in the title of his book. (Smithey, 2011) Furthermore, the liberal peace debates have produced a body of critical research that has analyzed the theory and practice of contemporary peace interventions from different positions. These debates have questioned the paradigm of liberal peace, inquiring about how liberal and prosperous these interventions are. For Vivianne Jabri (2016), peacebuilding signals a much more profound transformation of the nature of war and the maintenance of international order where war and peace have an intimate and co-constitutive relationship. (Jabri, 2016) Within the conflict transformation paradigm, concerning the

e-ISSN:2717-8277

international organizations, independently of the principle, good intentions, support for the development of the civil society gave inferior results in the last 30 years in the Western Balkans. One of the main reasons is the focus on NGOs, neglecting other important "sectors" civil society, trade unions, religious communities, and academia. It appears that they are left with party influences and manipulations. (Papic and Buric, 2013)

Although human individuality must be respected as the foundation of human dignity, it can only be defended based on collective solidarity from the infliction of unnecessary pain and suffering by the state or some other institution or organization. Tischner states elegantly and confidently to people of all times looking for solidarity that they must come together in collectively grounded actions: "People willing to do something good become members of a spontaneously based community of people of goodwill. Those in their hearts have a love for those they act. Those on the lips feel the taste of courage. (Tischner, 1984) Furthermore, social problems that need to be addressed systematically, such as intolerance, hate speech, discrimination and violence, and hate-motivated violence, are responded to superficially and reactively, often only after they escalate, failing to protect the most vulnerable in society. In addition, children and young people are not learning sufficient about human rights, equality, and solidarity, while at the same time, distrust in institutions is growing (Turcilo et al., 2019) and opportunities for civic participation are weak.

Prior research in post-conflict countries focused on rebuilding destroyed and fragmented societies, liberal peacebuilding, state-building, transitional justice, income generation, or restoring people's sense of opportunity. However, the solidarity paradigm lacks administering climate change related to emergencies in the ethnoreligious divided nations (i.e., former Yugoslavia; Bosnia and Herzegovina). The paper examines human securitization cooperation in climate change, emphasizing the 2014 Balkans floods associating the post-Yugoslav citizenship paradigm within solidarity as an ethnic conflict resistance, arguing that the institutions had an abortion, and civic solidarity became requisite transforming an ethnic conflict. The paper presents insight into the consequences of emergency-based climate and crisis applications in the Balkans related to solidarity behavior, i.e., human securitization within civic pluralism, offering ethnic conflict opposition.

2.METHOD AND MATERIALS

Besides general scientific (analysis and synthesis) and specific scientific methods (comparative-legal, formal legal), the study applies descriptive, discursive, content analysis, and in-depth literature review within the theoretical and conceptual discussion to initiate the research gap. Therefore, research considerations of distinct appearances interrelation are lacking. In the sociopolitical and security context, the paper aims to simplify administering climate change related to emergencies in the post-conflict ethnoreligious divided nations (former Yugoslavia) within the solidarity paradigm. The paper is based on secondary data analysis, current literature review, and theoretical and Regional and International legislative discussion focusing on the massive SouthEast Europe floods and 2014 Western Balkan crises. It included various literature such as Environmental Assessment of the Water Management Plans, Strategic and Legislative Frameworks in Forestry and Related Sectors, research on the adverse effects of

e-ISSN:2717-8277

climate change in the European Union and Region, Framework law on protection and rescue of people and material goods from natural or other disasters, numerous media extracts including grey literature, civic nationalism, ethnicity, and philosophy of s*olidarity literature, n*atural disasters and institutional reports, global environmental change, and human security research, evaluation of development, and others.

3. RESULTS AND CONCLUSION

3.1. Western Balkans, B&H and 2014. severe floods

Climate change threatens human security because it disrupts housing, livelihoods, threatens culture and individuality, increases migration that people would rather avoid, and can undermine the ability of the state apparatus to provide the conditions necessary for human security. Climate change can cause current insecurity, such as hunger, conflict, and socio-political instability, and almost always occur with multiple factors. The circumstances that served to open the perceptions of both state institutions and the entire public and show what problems we will face soon were the catastrophic floods in the Western Balkans and B&H in 2014. Floods in the Western Balkans and B&H can occur throughout the year and peak in the spring when high precipitation and melting snow from the mountains. The 2014 floods damaged flood protection infrastructure (mostly embankments). It failed to prevent floods due to underground erosion beneath their foundations. The consequences of the floods, except in the most affected municipalities and cities, were felt throughout the country. From the harmful impact on the environment, health, and human lives, through the enormous economic consequences, all citizens have experienced adverse effects. Besides, the state has shown unwillingness and lack of resources to deal with the emergency. (Centri civilnih inicijativa, 2014) Without the help of the international community, civic solidarity, and humanity, it is questionable whether the state would guarantee the security of its citizens.

Nevertheless, what do human security and climate change have in common? Human security is achieved when individuals and communities have the solutions necessary to end, diminish or adapt to threats to their human, social, and healthy environmental rights; or when they have the capacity and freedom to practice potential responses to threats and to participate in acquiring the necessary knowledge to do so actively. (GECHS, 2013) Globally, the Intergovernmental Panel on Climate Change addressed security for the first time in a 2015 report, including them in the human security subsection. The report states that climate change will increase the forced migration of people due to a lack of natural resources and extreme weather conditions, both in rural and urban regions and especially in developing countries.

Climate change can indirectly increase the risk of armed conflict, civil wars, and intergroup violence by exacerbating poverty and causing economic shocks. (McKim, 2015) It is evident that B&H citizens, having in mind the experiences from the past, do not have sufficient capacity to face the consequences successfully. The National Council prepared vulnerability assessments for the hydrology and water resources, forestry, agriculture, and health sectors and confirmed that these sectors were affected by the changed climatic conditions. However, nowhere is it explicitly stated that climate change harms human security, nor is there a strategy to address these adverse effects. In addition to drowning, the indirect

e-ISSN:2717-8277

danger during floods is the potential contamination of surface and groundwater and surrounding lands with hazardous substances and wastewater. Human health is generally very dependent on weather conditions, but the diseases that are expected to have the most pronounced impact on climate change are:

1) asthma, respiratory allergies, and diseases of the respiratory system;
2) malignant diseases;
3) vascular diseases;
4) diet and foodborne illness, heat stress-dependent illness and mortality;
5) mental health disorders and stress-induced disorders, neurological disorders, vector-borne diseases, and zoonoses;
6) water-borne diseases. (Aberle et al., 2012)

The event marked 2014 is undoubtedly the floods that hit Southeast Europe and B&H. The May floods were catastrophic, with human casualties and significant material damage. Large amounts of rain caused numerous rivers to overflow their banks. One million residents were displaced from their homes, more than 100,000 individual residential buildings and buildings, more than 230 schools and health institutions were devastated, and huge damages were inflicted on agricultural properties. Numerous industrial facilities, transport infrastructure were also destroyed. During floods, vast precipitation caused large floods in the northern, eastern, and central parts, and Croatia and Serbia. These were the worst floods in 120 years, bringing enormous devastation to a country still recovering from the 1992-1995 war, where a significant number of residents suffer from chronic poverty and unemployment. A report created by the United States Development Agency (USAID) from 2017, which refers to climate risks, predicts that reducing temperature and precipitation will affect the cereal crops that dominate B&H agriculture. Maize production could fall by as much as 58 percent due to reduced rainfall and higher temperatures during the summer. The increase in temperature has already led to increased fungal diseases and pests that reduce crop production. (USAID, 2017) Food security also builds on agricultural production and is evident in how they are linked: from shortening the production season, lack of irrigation water, loss of fertile soil due to desertification or floods, to problems in supply chains. (Advisory Committee on the Microbiological Safety of Food Annual Report. 2018.) In addition to the impact on the economy, changes in biodiversity are expected. B&H has various relief, forest, and water resources and numerous species that inhabit them. It is estimated that there will be significant changes in grasslands, coastal habitats, and forest ecosystems in response to changes in the amount and seasonal distribution of precipitation. As climate zones change, some species will adjust their geographical range, while others will not keep up with climate change and will decline. (Institut za građevinarsvo, 2021). Elevated temperatures combined with more frequent and intense droughts can increase the risk of forest fires. It directly affects a safe and healthy environment, thus jeopardizing another dimension of human security. (Rankovic et al., 2016) All these effects of climate change on health security, economic, food security, and a healthy environment compromise the security of the individual. If more than one individual is affected, we cannot talk about community security. Finally, if the state cannot ensure that its individuals live in a healthy environment, have access to resources, a secure supply of food, their

e-ISSN:2717-8277

economic needs are met, and adequate health care is provided, then indeed the human security of these individuals is threatened.

Nature showed in May 2014 that it does not recognize any administrative boundaries, and rivers have mercilessly overflowed in both the Republika Srpska (RS) and the Federation of B&H (FB&H). The B&H citizens did not regard which side of the entity border to flee to save lives and material goods. Citizens turned to each other when it was most needed, and in those moments, all administrative boundaries, national tensions, was erased. For example, only in B&H was it easier to declare three states of emergency, in the Republika Srpska (RS), in the Federation of B&H (FB&H), and the Brcko District (BD B&H), instead of the so-called coordination team at the Ministry of Security submitted a request for a state of emergency at the state level. We cannot escape the impression that specific centers of power also saw a danger of the potential possibility of strengthening the power of the state and state institutions and weakening the entity ones. According to the Framework Law on Protection and Rescue of People and Material Goods from Natural and Other Disasters in BH, the BH Council of Ministers was formed by the Coordination Body of Bosnia and Herzegovina, consisting of representatives of

1. B&H Council of Ministers - (nine members),
2. Republika Srpska Government - (five members),
3. Government of the Federation of Bosnia and Herzegovina - (five members), and

the Government of the Brčko District - (two members).[2]

At the regular session of the Association of Independent Intellectuals Krug 99 in 2019. the theme was "The constitution of the people against the citizens and the democratic state of B&H." Senadin Lavic states that today's state of "peace in B&H" is based on satisfying the needs of Serbia and Croatia to dominate B&H rather than on the internal process of democratization of B&H society and the development of civil liberties. (Lavic, 2017) Since Dayton Peace Accords divided B&H into two entities, one District, along ethnoreligious lines, genuine civic initiatives remain essentially blocked. "All parties address one particular ethnic group. Therefore, there is no civic awareness. For example, there are educational textbooks for the Croatian and Serbian curricula. It is the same as living in Croatia or Serbia. Sadly, the Bosnian civic identity has never developed. B&H urgently needs citizens' awareness." (Stieger, 2017). However, the catastrophe showed that instead of today's entities segmentation by the authorities in B&H, civic pluralism and solidarity problematized the development of a "single state behavioral model" that was operational in the event of natural disasters.

[2] Okvirni zakon o zaštiti i spašavanju ljudi i materijalnih Dobara od prirodnih ili drugih nesreća u Bosni i Hercegovini [Legislative law on protection and rescue of humans and material goods from natural or other disasters in Bosnia and Herzegovina] http://msb.gov.ba/Zakoni/zakoni/default.aspx?id=1721&langTag=bs-BA

e-ISSN:2717-8277

The Council of Ministers B&H had not declared a state of natural or other disasters in complete B&H. Therefore, the protection and rescue activities with the institutions and bodies of the entities and the Brcko District (BD) were not within the Coordination bodies' competence. This arrangement of competencies did not accommodate the entity centers of power. The representatives of the Republika Srpska (RS) were not particularly interested in participating in the work of this body during the first days of the disaster. However, one of the competencies of the Coordinating Body forced them to change their position. Namely, the Coordination Body of B&H for Protection and Rescue is in charge of coordinating the reception and provision of international assistance and donations in protection and rescue after declaring a state of natural or other disasters.

Given that international assistance in the form of helicopters, boats, and other forms of assistance from other countries were needed for the RS entity, representatives of this entity also became involved in joint coordination at the state level. The European Commission has approved a 65 million euros emergency financial assistance package to Serbia and B&H. In addition, over 30 countries provided assistance to B&H during the floods, and 850 members of international specialized protection and rescue teams were received and deployed. In addition to inter-entity, inter-ministerial divisions, considerable fragmentation in planning, uneven funding, and organization of protection measures, the system is not fully developed due to a lack of continuity in planning and delays in government institutions in adopting key documents relevant to water management and protection. For example, the adoption of the first FB&H Water Management Strategy was delayed by three years; in RS, the strategy has not yet been adopted, while at the state level, it does not even exist in a framework form. Given the efficiency shown in the actions of the B&H authorities over the past years, the complex state structure of government in the country, the still high degree of manipulative policy, the high level of corruption, and other problems that characterize the country. This natural disaster had been used for political purposes in the political scene, suspecting the abuse in collecting and distributing aid. In the RS, it is suspected that political reasons were the basis for the lack of greater coordination and integrated approach to crisis management. The level of the catastrophe could undoubtedly have been avoided by monitoring and timely radical decisions. However, as a rule, political staffing was never ready for that by professional systems. The space, and even its catchments, must be managed based on cognition and scientific logic. (Sterc, 2014) As a result, the study "Floods in &iH - Natural disasters and institutional inefficiency concludes," we express-open fears that B&H could face the aforementioned worse scenario and a much slower economic recovery. (Centri civilnih inicijativa, 2014)

The apparent fact is that the floods and landslides in B&H in 2014 took many human lives. In addition, the financial damage is estimated at almost 4 billion KM. Therefore, the data reflect the final assessment of the damage suffered by domestic institutions and experts of the international community. However, the political elites of entities could not agree on a "national grief day." Therefore, the state of B&H as a whole did not signify during the crisis. For example, the Council of Ministers, the government of B&H, held an extraordinary session only six days after the floods began. However, the council did not declare

e-ISSN:2717-8277

a state of emergency at the state level. Request for an emergency state had not been received. (Centri Civilnih Incijativa, 2014)

In the outcome, the European Union's relationship came down to the fact that Croatia, since it is a member of the EU, has no difficulties accessing European solidarity funds, that Serbia, as a candidate country, can use EU assistance according to the same model, and B&H, which is not a member, neither the candidate has that right. Due to the political agitation, B&H was only given potential candidate status in 2003 and is covered by the current EU enlargement policy. The application for membership in the EU was officially submitted on 15 February 2016. However, the damage in B&H is three times greater than in Croatia and Serbia combined. One million people were displaced, a third of the economy of B&H was destroyed.

In order to conclude what is the attitude of regional political parties towards the issues of water management, catastrophes, natural disasters, and human security, a much more studious examination of party programs and legal practices should be approached, especially in the period when parties participate in government. Such an examination should focus on the (programmatic) attitudes and solutions that individual parties advocate concerning various critical issues within observed phenomena. It includes exercising social rights and access to services, in particular issues of protection and cares; but also other issues related to the economic development strategy, exit measures from the crisis, and especially austerity measures, and questions about the position of these parties in response to the catastrophic floods or social unrest and civil self-organization from the beginning of 2014.

3.2. Civic solidarity as a Transformation of the Conflict

In the post-Dayton Peace Accords B&H, the NGO sector, dependent on international donors, followed the logic of "enlightening the people" with continuous training and round tables on peacebuilding, democracy, human rights, the so-called "change of awareness." Each subsequent election round demonstrated the failure of this concept. The fact is that "old-new ethnonational parties are constantly winning at elections." At the same time, the NGO sector has become part of the "industry of projects," losing its civic character and not sticking to its practice for the values of civil society. The fundamental mistake was that, conceptually, civil society itself was the opposite of ethnonational identity, which did not develop civil society concepts in specific B&H conditions, multiethnic and multireligious communities. (Papic and Buric, 2013) Besides, through the concept of the constitutiveness of the people, Serbia and Croatia directly implement "their policies on the soil of the B&H state and affect the internal sovereignty, turning into an obstacle to civic pluralism prosperity.

One of the preconditions for the creation and functioning of democratic public opinion relies on the category of personal autonomy, which makes every citizen a political subject, able to resonate critically and participate in the community's political life. Thus, the definition of one's identity includes his view of moral and spiritual issues and his relationship to a defined community. The constant fabrication of

e-ISSN:2717-8277

dangers (stimulant) that threaten the alleged survival of an ethnic group creates a psychosis of fear and uncertainty, defensive internal cohesiveness, making it impossible to discern the dangers to the existence of peoples coming from that group. It is rapidly transferred from one religious group (nation) to another in which the same processes occur, creating a chain of imaginary interethnic threats. According to Integrated threat theory, ingroup members who are relatively unfamiliar with outgroup tend to be prone to experience threats than those who know each other. Because of all of the above, national identity is an essential component of integrated threat theory. (Hadžić, 2021) Starting from the hypothesis that changing the ideas and opinions of an individual and a group (elite) can create new interests/identities of a religiously divided community (nation), it certainly opens opportunities for establishing radically different interethnic relations, thus opening a new area of political communication in the Balkans.

Due to the complexity of legislation, institutional organization, interdepartmental and even regional connections of the "water sector" and protection against natural disasters, in just one analysis, it is impossible to cover the general issue of water management in B&H, and the author focuses on the part that talks about floods as a concept of solidarity of the specific population, but also flood risk management. It was more "natural" to declare three states of emergency in the Republika Srpska (RS), in the Federation of B&H (FBIH), and the Brcko District (BD B&H), instead of the so-called coordination team at the Ministry of Security[3], submitted a request for a state of emergency at the state level. However, we cannot avoid the impression that specific centers of power also saw a danger of the potential possibility of strengthening the power of the state and state institutions and weakening the entity ones. Indomitable ethnopolitical conflicts, which some scientists call "identity conflicts," are primarily resilient because they are driven by deep psychological and emotional forces that overlap with wide-ranging structural forces. (Smithey, 2011) Before negotiations and cooperation of any kind, communities within themselves must reconsider their mutual relations, adjust their relations with members of other communities, and adjust their views to a more communicative framework, which is more open to cooperation. Despite knowing what is needed to transform the conflict and move it to a calmer, political framework, within which the option of negotiation and peace is most feasible, several individuals cannot just change and forget all acts of violence of the Balkans past. For these reasons, members of certain groups are so defensive and "closed" to any possibility of peaceful coexistence - because they have experienced nothing but violent methods of trying to impose their views and their identity, after all. In extreme conflict situations, the opponents' identities become defined so that they are proportionally opposed to each other, indivisible, and inaccessible to negotiation. They become inseparable from the conflict that is beginning to be understood in terms of zero-sum, "us," and "them." Neither Bosniaks,

[3] According to the Framework Law on Protection and Rescue of People and Material Goods from Natural and Other Disasters in B&H, the B&H Council of Ministers was formed by the Coordination Body of Bosnia and Herzegovina, consisting of representatives of a) B&H Council of Ministers - (nine members), b) Republika Srpska Government - (five members), c) the Government of the Federation of Bosnia and Herzegovina - (five members), and d) the Government of the Brčko District - (two members).

e-ISSN:2717-8277

Orthodox, nor Catholics saw the possibility of mutual "victory" in their conflict or the possibility that their worldviews were considered equally valuable.

For this reason, the very transformation of identity complicates the solidarity process, which requires a lot of attention and effort because it requires a change that comes from within, from the very foundations. Primordialists or fundamentalists attribute the permanence and resilience of ethnic solidarity to the generational transmission of emotionally charged kinship ties. A person is, one might say, born in an ethnic identity, which is based on a profoundly emotional perception of "emotional kinship" developed from race, language, religion, and customs. The individual has explained his origin, where he comes from, and certain attitudes are built-in, especially those concerning relations with other communities, especially those with which his community conflicts. Whether he likes it or not, an individual develops consciousness by everything he is taught - he cannot know otherwise than what is transmitted to him through related connections, nor can he develop his own opinion. He is forced to "continue" the conflict with another community because his teaching requires it. Constructivists, on the other hand, inspired by the work of Fredrik Barth (1969), hold that ethnic identity emerges from categories constantly reconstructed through processes of connection that produce a sense of social cohesion and integrity. Identities are considered reflections of connections maintained and shaped through narratives and discourses. Categories of identification or connections transcend groups; that is, groups are the effect of processes in which people identify with particular categories. (Smithey, 2011) Jenkins' (2008) "basic anthropological model" of ethnicity concisely shows a constructivist approach. Ethnicity is a matter of "cultural" differentiation (bearing in mind that identity is always a negotiation between similarities and differences). Ethnicity is a matter of "culture" of shared meanings - but it is also constructed and reconstructed during the interaction. Ethnicity is determined to the extent of the way of life. It is a part of the situation in which it is produced. Ethnicity is collective and individual, externalized in social interaction and categorization and internalized in personal self-identification. (Jenkins, 2008)

To what extent has the enormous solidarity shown during the floods in B&H managed to suppress national intolerance? Nature showed in May 2014 that it does not recognize any administrative boundaries, and rivers have mercilessly overflowed in both the Republika Srpska and the Federation of B&H. It is worth all the political, sociological, and anthropological attention. Many issues have turned out slightly different from those in the previous 30 years in the Balkans, but it is such a controversial topic that it should be discussed very carefully. Examples of help and solidarity of people from different municipalities, entities, and cantons have broadened the narrow horizons of people secured in ethnic spaces After the catastrophic flood that devastated Doboj[4] in mid-May, citizens from the neighboring

[4] It is a city located in Republika Srpska (RS), an entity of Bosnia and Herzegovina. It is situated on the banks of the Bosna river, in the northern region of the Republika Srpska.

e-ISSN:2717-8277

municipalities of Tešanj[5] and Usora[6] were among the first to aid the endangered residents. Inter-neighborly solidarity thus came to the fore in the area intersected by war lines of separation during the B&H war. The first quantities of bread and drinking water after the floods in Doboj, inhabited mainly by Serbs, arrived from Tesanj, where most of the population are Bosniaks (Bosnian Muslims). For Muha Berberović, the bakery owner in Tešanj, that was logical because they were the first neighbors hit by a natural disaster. The bread was also prepared in his bakery for the endangered population in Doboj. "We are the first neighbors of Doboj. We walked over the hill. We could not get across the bridge. We will always send and help our neighbors. Tesanj is like that. They used to go to Doboj for 300 loaves a day until their bakeries started working", Berberović remembers. The other residents of Tešanj maintain the same way.

The Doboj citizens assessed the aid from Tešanj and other parts of the Federation of B&H as the most humane progress of the year in this region. Patients from Doboj were admitted to the Tešanj hospital for hemodialysis. After the catastrophic flood, the neighboring Usora, where most Croatian (Catholic) nationality residents live, also joined. They formed a point for the distribution of humanitarian aid in the yard of the Catholic Church in Doboj. "At least I distributed over 40,000 packages to the people," says Doboj parish priest Pero Iljkić. In those days, it turned out that ordinary people managed much better and came to each other's aid than all levels of government in B&H, which could not even agree on declaring a joint Day of Mourning for flood victims in this country." The government had no share. It resembled helping a man because nothing is worth a human life, but it was done without authority. The government did not order anything. If the government had ordered or asked, such situations might not have occurred at all. The people themselves organized that ", believes the professor of sociology and philosophy from Doboj, Simeuna Jevtić. The parish priest of Doboj, Pero Iljkić, believes that a lot depends on the characteristics of each individual. "Good is good, and evil shows what a man he is. If we could be good in evil, why could we not be suitable in good? That is the question of all people, to each of us. It can only be done if I want to. The only question is whether I will or not ", concludes Iljkić. (Grbesic, 2014) Furthermore, Croatian emigrants have launched an action to help flood-prone B&H and Croatian Slavonia. They collected clothes, shoes, and food on their initiative, under the motto, "It does not matter who is who, in this story, a man helps man." In addition, some Croatian cultural and sports societies joined collecting aid for the most endangered areas. (Fenix, 2014)

Consequently, the region within the geographical, transnational, transethnic, trans religious paradigm in post-conflict antagonism infected region, and particularly B&H's social capital was emancipated from

[5] It is a town and municipality located in the Zenica-Doboj Canton of the Federation of Bosnia and Herzegovina, an entity of Bosnia and Herzegovina.

[6] It is a village and municipality located in Zenica-Doboj Canton of the Federation of Bosnia and Herzegovina (FB&H), Bosnia and Herzegovina. It borders Doboj and Tešanj municipality, and it is named after the Usora River.

ethnocentric restraints and divisions along ethnic lines. Therefore, their objectively common position overcame the appeal of ethnonationalism, and the strength of that position produced a sense of empathy among citizens—policies of convergence, the will to unite in the class struggle, and a transnational culture of solidarity.

Former Yugoslavia is an example of a country that disappeared when it gave up on constructing a standard memory. However, it disappeared when it could no longer control the public imagination of different "communities of memory." Considering that social memory is usually constructed in one of three ways that often coincide and mix, it evaporates down to establishing and symbolically representing social cohesion, legitimizing institutions, and the status of authority. Ultimately, strengthening socialization, shared beliefs, and values, then it is clear that the post-war Yugoslav society applied all these procedures and that, in that period, given the previous non-consolidation, it did so with great success. (Wachtel, 1998) The formation of youth is described in the Program of the League of Communists of Yugoslavia, which was accepted at the Seventh Congress of the League of Communists of Yugoslavia (April 22-26, 1958 in Ljubljana): "The primary goals of education and upbringing in our conditions are: developing the creative attitude of the young generation towards the future vocation and towards work in general; developing socialist social awareness and training of youth for participation in the social life of the country, in the bodies of social self-government and management; getting to know and adopting the achievements of our peoples and all of humanity in various fields of social, scientific, technical, artistic and other cultural creativity; developing the spirit of brotherhood and unity of the Yugoslav peoples; developing internationalism, the spirit of international solidarity of working people and the idea of equality and rapprochement of all peoples in the interests of peace and progress in the world; adoption of the basics of a scientific, materialistic worldview; developing a versatile activist personality with the intellectual and moral characteristics of the citizens of the socialist community; improving physical health, especially by developing physical culture and physical education as a condition for an everyday creative life. "(Duda, 2017)

Affection and respect for the symbols of socialist Yugoslavia (Josip Broz Tito, National liberation movement (NOB) and Yugoslav peoples Army (JNA), Non-Aligned Movement, self-government, and "brotherhood and unity") were recognized and promoted among all ethnicities-nations. The construction projects and hundreds of work actions aligned with socialist ideology and involved youth work brigades from different parts of the country, promoting brotherhood and unity, and collectivity in work. However, newcomers' ethnocultural identities in the former Yugoslavia were found in the inevitable phase of subsequent consolidation of national identities and state creations, creating antagonistic new generations.

3.3. Conclusion

Civic solidarity and emerging self-organized behavior and performance are crucial aspects of the post-conflict joint promotion of human securitization and social protection systems. Through joint action and

e-ISSN:2717-8277

a systemic approach, it is possible to limit the consequences and work on capacity building and create a more resilient community capable of protecting its individuals. Therefore, activities for repairing existing damages and vigorous action toward preventing new floods, for which there are no guarantees that they will not be repeated soon, must be realized in parallel. Unfortunately, this is not the case in B&H. It is a priority, but the authorities should also work parallelly to revise existing and develop new strategies, programs, and action plans to build more advanced protection systems to prevent further floods in the western Balkans. However, it is questionable given the efficiency shown in the actions of the B&H ethnopolitical authorities, the complex state structure of government, the still high degree of manipulative policy, and other issues that are characteristic of the Western Balkans.

The resolutions to existing ethnic policies come from above through reactive civic solidarity. In some situations, people are forced to show solidarity. For example, in the 2014 Balkan floods, the state had an abortion, and civic solidarity became a requisite as no institutional solidarity was examplar. Thus, the resolutions to existing ethnic policies come from above through reactive civic solidarity, an ambivalence where citizen activists filled the gap in the crisis sensitively. However, solidarity must have a "polarity" and be symmetrical, not equalized with charity. Also, an essential factor is the motive of proactivity, which neoliberalism and emerging ethnopolitics often confront. Moreover, political value and a specific level of nostalgia within socialist memory might have occurred through the solemnity of narratives.

The history of citizenship can be interpreted as a history of change of citizenship, and reasons and changes in citizenship play an imperative role. The attitude towards solidarity should not be overemphasized institutionalized because of the solidarity itself or even the false solidarity gaining dominant ethnopolitical prevalence. Very often, solidarity changes the way we think. There must be effective counter-narratives to effectively change the subjectivity of citizenship and improve the ethnopolitical solidarity calculations. The comprehensive transformation of conflict means that even those organizations that are pillars of collective identity, which often exclude, alienate other communities in the process, must find a way to become active participants in civil society. Only when such organizations, particularly ethnopolitical structures and religious officials, act in the way mentioned above will other groups find meaning and act in the same way. A complete transformation of the conflict is undoubtedly possible through a series of such related actions.

References

Aberle, N., Kljajic, B., Blekic, M., Bardak, D., Gudelj, A., Cancarevic, G., Karvazi, M. and Vuckovic, M. (2012). ISAAC II: Prevalencije alergijskih bolesti i predisponirajući čimbenici za astmu dječje dobi na području Brodsko-posavske županije. [ISAAC II: Prevalence of allergic diseases and predisposing factors for childhood asthma in Brod- Posavina County]. Zagreb, Hrvatsko društvo za alergolgiju i kliničku imunologiju. https://www.bib.irb.hr/459784

Advisory Committee on the Microbiological Safety of Food Annual Report, (2018). https://acmsf.food.gov.uk/sites/default/files/acmsf_annrep_2018.pdf

Assessment of the Water Management Plan for the Sava River Basin in the Federation of Bosnia and Herzegovina 2022-2027]. Banja Luka, Institut za građevinarsvo.
Baysal, B. (2017). Climate Change and Security: Different Perceptions, Different Approaches,Uluslararası İlişkiler Dergisi, 14 (54): 21-44

Trobletta, M. (2009). Environmental security and climate change: analyzing the discourse, Cambridge Review of International Affairs, 21 ($): 585-602

Brown, W., Pfeiffer, K., Mclver, K., Dowda, M., and Addy, P., (2009). Social and Environmental Factors Associated With Preschoolers Nonsedentary Physical Activity, Child Development, 80 (1) https://doi.org/10.1111/j.1467-8624.2008.01245.x

Centri Civilnih inicijativa, (2014). Poplave u BiH – Elementarne nepogode i/ili institucionalna neefikasnost [Floods in BiH - Natural disasters and / or institutionalinefficiency]. Tuzla: Centri civilnih inicijativa. http://www.cci.ba/dokumenti/Analiza_B5.pdf

Duda, I. (2017). Uvod: od nazadnosti do svemira, od projekta do zbornika. U Stvaranje socijalističkoga čovjeka: hrvatsko društvo i ideologija jugoslavenskoga socijalizma [Introduction: from backwardness to space, from project to collection. In Creation of thesocialist man: Croatian society and the ideology of Yugoslav socialism. Zagreb, SrednjaEuropa.

Fenix Magazin, (2014). "Iseljeništvo pomaže stradalima u poplavama u BiH i Hrvatskoj" [Emigrants are helping flood victims in BiH and Croatia]. https://fenix- magazin.de/iseljenistvo-pomaze-stradalima-u-poplavama-u-bih-i-hrvatskoj/

GEHCHS, (2013). Global Environmental Change and Human Security, GECHS project, Annual Review of Environment and Resources. https://doi.org/10.1146/annurev-environ- 032112-100655

Grbesic, A. (2014). Slobodna Europa, „Solidarnost nakon poplava." [Solidarity after floods]. https://www.slobodnaevropa.org/a/plp-doboj-solidarnost-nakon-poplava/26763571.html

Hadžić, F. (2021). Ethnoreligious political dispute, conflict management, leadership, and civic inclusion: the Balkans and globally. Istanbul Aydin university Journal of social sciences[Istanbul aydın üniversitesi sosyal bilimler dergisi]. 13 (3): 619 – 637 10.17932/IAU.IAUSBD.2021.021/iausbd_v13i3003

Hadžić, F. (2021). Agnosticism and Atheism as Amoralism and Anti-Ideological Sociopolitical Paradigm in the Balkans, Specifically in Bosnia and Herzegovina, OccasionalPapers on Religion in Eastern Europe, (OPREE), 41 (2): 68-84 https://digitalcommons.georgefox.edu/ree/vol41/iss2/6

Hadžić, F. (2020). The Politicization of Religion and the Sacralized Balkan Nations Regarding Bosnia and Herzegovina, Occasional Papers on Religion in Eastern Europe, 40 (7):105-136 https://digitalcommons.georgefox.edu/ree/vol40/iss7/8

Institut za gradevinarstvo, (2021). Strateška procjena uticaja na okoliš Plana upravljanjavodama za vodno područje rijeke Save u Federaciji Bosne i Hercegovine 2022.-2027. [Strategic Environmental

Jabri, V. (2016). Post-Colonialism: A Post-Colonial Perspective on Peacebuilding. In: Richmond O.P., Pogodda S., Ramović J. (eds) The Palgrave Handbook of Disciplinary and Regional Approaches to Peace. London: Palgrave Macmillan. https://doi.org/10.1007/978-1-137-40761-0_12

Jenkins, R. (2008). Rethinking Ethnicity. Thousand Oaks: Sage.

Lavic, S. (2017). Krug 99, "The constitution of the people against the citizens and the democratic state of B&H." https://www.krug99.ba/o-zloupotrebama-koncepta- konstutivnosti-naroda-pise-senadin-lavic/

McKim, C. (2015). Wyoming Public Media, „Governor Mead Responds To Paris ClimateAgreement." https://www.wyomingpublicmedia

Okvirni zakon o zaštiti i spašavanju ljudi i materijalnih dobara od prirodnih ili drugih nesreća u Bosni i Hercegovini [Legislative law on protection and rescue of humans and material goods from natural or other disasters in Bosnia and Herzegovina] http://msb.gov.ba/Zakoni/zakoni/default.aspx?id=1721&langTag=bs-BA

Papic, Z. And Buric, A. (2013). Civic and national in BiH, Initiative for better and morehuman inclusion.

Ranković, N., Stanisic, M., Nedeljkovic J. and Nonic, D. (2016). Analiza strateških izakonodavnih okvira u šumarstvu i povezanim sektorima - ublažavanje negativnih efekata klimatskih promena u Evropskojuniji i Srbiji [Analysis of Strategic and Legislative Frameworks in Forestry and Related Sectors - Mitigating the Negative Effects of Climate Change in the European Union and Serbia"] Glasnik Šumarskog fakulteta, 113: 99-132

Smithey, L. (2011). Unionists, Loyalists and Conflict Transformation in Northern Ireland.Oxford: Oxford University Press.

Stieger, C. (2017). We no longer know whom we are: The Forgotten Minorities of the Balkans, Germany: Zsolnay.

support activity (measure-BH) expanding USAID's network of development, Final Report. http://measurebih.com/uimages/THE202010201320USAID20BiH20DGP20EVALUATION

e-ISSN:2717-8277

20FINAL20REPORT2C20edited2C2012072017.pdf

Tischner, J. (1984). The Spirit of Solidarity. New York: Harper Collins.

Turcilo, L., Osmic A., Kapidzic D., Sadic S., Ziga J. and Dudic A., (2019). Studija o mladima Bosna i Hercegovina 2018/2019 [Study on youth in Bosnia and Herzegovina 2018-2019]. Sarajevo: Friedrich-Ebert-Stiftung https://library.fes.de/pdf- files/bueros/sarajevo/15288.pdf

UNDP, (2015). Podrška oporavku od poplava i smanjenju rizika u Bosni i Hercegovini,[Support to Flood Recovery and Risk Reduction in Bosnia and Herzegovina] https://www.ba.undp.org/content/bosnia_and_herzegovina/bs/home/operations/projects/response_to_floods/eu_floods_recovery_programme.html

USAID, (2017). Monitoring, and evaluation
support activity (measure-BH) expanding USAID's network of development, Final Report. http://measurebih.com/uimages/THE202010201320USAID20BiH20DGP20EVALUATION 20FINAL20REPORT2C20edited2C2012072017.pdf

Vasiljevic, J. (2019). Historiografija.hr, Portal hrvatske historiografije,
Predavanje jelene vasiljević "Solidarnost i politička zajednica od socijalističke Jugoslavije dodanas" u Beogradu [Lecture by Jelena Vasiljevic "Solidarity and the political community from socialist Yugoslavia to the present day" in Belgrade] http://historiografija.hr/?p=16161

Vucijak, B., Ceric, A., Silajdzic I and Kurtagic, M. (2011). Voda za život: osnove integralnog upravljanja vodnim resursima [Water for life: fundamentals of integrated water resources management], Sarajevo: UNDP Amos Graf

Wachtel, A. (1998). Making a Nation, Breaking a Nation: Literature and Cultural Politics in Yugoslavia (Cultural Memory in the Present). Palo Alto: Stanford University Press.

Šterc, S. (2014). Slobodna Bosna, "Kako nam se desio užas" [How the horror happened to us] [Number 915, 22.5.2014]

Received: 10 July 2021

Accepted 13 November 2021

International Journal of Water Management and Diplomacy
Issue: 4 2021
e-ISSN:2717-8277

Review Article

THE GUIDING LEGAL REGIME AND INSTITUTIONAL ARRANGEMENT OF TRANSBOUNDARY WATERCOURSE: A REVIEW

Yusuf Ali MOAHMMED

Public Law, Social Science Institute, Anadolu University, Ankara, Turkey

Corresponding author *Email: yusufkud@gmail.com*

Abstract

Among contentious international law issues, the transboundary watercourse management, which is exhibited with a conflicting states interest, is at the center of international law discussion. In order to vividly grasp the very essence behind such conflicting states interest, it is quite important to understand how – the international water law works, and – its institutional platform arrangements are established. Hence, a comprehensive review concerning the guiding legal regime and institutional arrangement of transboundary watercourse is very crucial.

In the above vein, at the backdrop of the major theoretical doctrine of transboundary watercourse, this paper reviewed and addressed, customary international watercourse laws and the 1997 UN transboundary watercourses convention coupled with its incorporated principles. Alongside the aforementioned analysis, the paper reviewed major contentious issues relating to the aforesaid customary laws and principles. Moreover, the paper also reviewed and addressed the modelled categorization of institutional arrangement of transboundary watercourse.

Keywords: customary law; institution; legal theory; principle; transboundary watercourse; watercourses convention

1. INTRODUCTION

A world is endowed with so many resources both under and outer surfaces of the earth. Let alone a complicated and sophisticated matter of under surfaced natural resources, the now alarming which need utmost critical attention is the outer surface natural resource in general and cross-boundary watercourse resources in particular. These transboundary watercourse resources are – "the aquifers and lake and river basin shared by two or more countries" (UN Water, n.d.) – which "...cover 45.3 % of the earth's land surface, affect about 40% of the world's population, and account for approximately 80% of global river flows." (UN FAO, n.d.)

Though varies studies and publication addressed how to manage these transboundary watercourses, a comprehensive scrutiny of its guiding legal regime coupled with institutional arrangement have not been reviewed and addressed in an organised and easily referable manner. Hence, this paper critically and

thoroughly reviewed the guiding legal regime and institutional arrangement of transboundary watercourse in a well organised collocation.

Within the above vein, the paper is divided into six sections. Assuming this introductory part as the first section, the second section deals with the major theoretical doctrine of transboundary watercourse, while the third section gives not only a clear view of the two Customary International Law of Transboundary watercourse, but also expose the most controversial issues of the latter. The fourth section discusses the 1997 UN Transboundary watercourses conventions in general, and the latter's adopted Principles and contentious issues in particular. The fifth section gives a short brief of Institutional arrangement for transboundary watercourse, followed by the last concluding section of the paper.

2. MAJOR THEORETICAL DOCTRINES OF TRANSBOUNDARY WATERCOURSE

Though the nature and scope differs, the evolution of international transboundary watercourse is at the centre of human evolution as water is one among the very basic human needs that is crucial for survival. Moreover, the creation of States increases the utmost importance of water for various domestic usages. On the one hand, the increasing demand of water due to the widening demographic nature, agricultural development, industrial revolution, energy production, and on the other hand, the deterioration of quality and quantity of transboundary water resource, created a conflicting interest among basin States, as States follow different approaches to retain & attain their respective vital resource interests. These complications lead to the emergence of various theoretical doctrines of transboundary watercourses.

Accordingly, three major theoretical doctrinal principles have developed so far. And these theories are 'absolute territorial sovereignty', 'absolute territorial integrity', and 'limited territorial sovereignty'. Though two additional legal doctrines, i.e., 'prior appropriation' and the 'community interest', would alternatively be considered, however, for the purpose of this review, the former three major legal theories are to be discussed in detail in the following sections.

2.1. Absolute territorial sovereignty

The 'absolute territorial sovereignty' theory is one of the extreme picks of transboundary watercourse, which mainly gives an exclusive right for a particular upstream basin State. In this theory, a particular "co-basin state may freely utilize waters within its territory without having any regard to the rights of downstream or contiguous states… [in a sense that] a state may extract or alter the quality of these waters to an unlimited extent but has no right to demand continued flow from an upper co-basin state or to assert its rights against a contiguous state." (McIntyre, 2010, 61) This theoretical thought is also known as 'Harmon Doctrine' as the theory emanates from the then US Attorney General, named 'Harmon', for the first time in 1895 in which the latter argued for absolute right of USA over Rio Grande irrigation usage. (McIntyre, 2010, 61)

However, though the 'Harmon doctrine' contribution is undeniable, this theory doesn't last long. The United State itself doesn't show its conformity toward the former. This was clearly reflected in the 1906

e-ISSN:2717-8277

US-Mexico Rio Grande river treaty and 1909 US-Canada boundary water treaty. The very reason for this fact is that, having this doctrine at hand, though the US might have won the 'Rio Grande river' case as the basin's upper riparian States, but the US might lose the boundary waters case against Canada as the latter is geographically located on the lower riparian State.

The effort of other states to adopt this theory fell shortly as the theory didn't go along with their respective practical basin scenarios. This can be inferred from the case of the Indus River as India claimed for 'full freedom' over the resource but later on accepted the right of Pakistan. Similar cases have been observed in the 'Mauri River' 'Lauca River' as well.

One thing interesting is "…those authors who might be argued to have endorsed the principle mostly voiced their respective positions before non-navigational uses of international watercourses had taken on much significance, which 'may have led them not to appreciate fully the serious ecological, economic and other harm … that could result from large-scale diversions or pollution'." (McIntyre, 2010, 62) What makes it more interesting is again, "… [almost] all the commentators referred to came from only four countries, Austria, Germany, Canada and the United States, each of which are upstream states, at least in relation to some of their watercourses." (McIntyre, 2010, 61) Despite these facts, however, "…it is possible to conclude that no recent authoritative work supports this approach while very many, including even relatively early ones, completely eschew it." (McIntyre, 2010, 61)

Therefore, scholars concluded the Attorney Generals driven Harmon doctrinal thought as an, *inter alia*, "unfortunate anomaly, intolerable, radically unsound." (McIntyre, 2010, 61-62) As a result, "[I]t is at best an anachronism that has no place in today's interdependent, water-scarce world." (McCaffrey, 2001, 114)

2.2. Absolute territorial integrity

The other theory that is characterized as the other pick is 'absolute territorial integrity', which predominantly favours the respective downstream basin States. This theory confers the latter basin states not only – a privilege to use the total flow of the river without any interruption and due consideration to upstream riparians interest, but also – accord veto power to rule out any potential activity that undermine the actualization of the aforesaid scenarios. (McIntyre, 2010)

Though some downstream States like Argentina, Spain, Bangladesh, and a number of Middle East countries have invoked the principle of absolute territorial integrity ...its [practical] application was unequivocally rejected in the *Lac Lanoux case*. (McIntyre, 2010; Lake Lanoux Arbitration, 1957) Moreover, scholars like McCaffrey argue that "reliance on these contrasting extreme positions demonstrates above all else that they were invoked as 'tools of advocacy' rather than as legal principles." (McCaffrey, 2001, 129-130; McIntyre, 2010, 62)

It is also clearly perceived that, like absolute territorial sovereignty, "most of the authors cited in support of absolute territorial integrity wrote before non-navigational uses had assumed much significance and thus before state practice concerning non-navigational uses had substantially developed," so that has got little support in the contemporary world. (McIntyre, 2010, 62)

e-ISSN:2717-8277

Therefore, now a day, most scholars "has so far rejected [this Absolute Territorial Integrity theory] ...like the Harmon doctrine, it has limited support in states practice, jurisprudence or the writings of commentators." (Parhi & Sankhua, 2014, 258; Rahaman, 2009, 210)

2.3. Limited Territorial Sovereignty

The 'limited territorial sovereignty' is a middle striking theory that lies in the mid somewhere between absolute – 'territorial sovereignty' and 'territorial integrity', – with its compromising approach by entitling all basin riparians to use their co-shared water resources in an equitable and reasonable manner within their defined sovereign territory. (McIntyre, 2010, 64) This theory is alternatively named as 'equitable apportionment theory' and/or 'sovereign equality and territorial integrity.' (Parhi & Sankhua, 2014, 258; Rahaman, 2009, 201)

The guiding principle of this theory is from the very thought of transboundary watercourses in which the co-shared water resources remain in "...a community of interest among all co-basin states [in a sense that]… a community of interest requires a 'reasonable and equitable' balancing of state interests which accommodates the needs and uses of each state." (McIntyre, 2010, 64) Moreover, the theory has its theoretical genesis "...in the sovereign equality of states, whereby all states sharing an international watercourse have equivalent rights to the use of its waters." (McIntyre, 2010, 64)

From its application point of view, this theory "appears to have its origins in widespread state practice, [bilateral and multilateral] treaty law, in judicial decisions" and major international scholars commentators. (McIntyre, 2010, 65)

In relation to States practice, though the theory considered to have "received some limited support among the state practice of the several Middle Eastern States," the vast majority of states' practices seem to be in line with this theory. (McIntyre, 2010, 64; McCaffrey, 2001, 142) To mention some prominent cases, *inter alia*, the 1856 agreement between Dutch-Belgian over River Meuse in which the aforenamed state parties are accredited "...to make the natural use of the stream;" the 1971 Act of Asunción between Argentina and Brazil over Paraná River in which all parties to the aforesaid act "...may use the waters in accordance with its needs provided;" the 1909 Boundary Water treaty between US-Canada in which they had agreed "...to an 'equitable' share of water for irrigation;" and in the US-Mexico case over the Rio Grande river as well, the US made concession and agreed to share the latter river "...on a just and reasonable basis." (McIntyre, 2010, 64; McCaffrey, 2001, 139-144; Declaration of Asunción, 1971)

Unlike those previous theories, this Limited Territorial Sovereignty theory "has received consistent support in the case law of international tribunals, with…'no known international decision supports a contrary rule." (McIntyre, 2010, 65; McCaffrey, 2001, 145) For instances, the '*Lac Lanoux'* Arbitration and '*Gabcíkovo-Nagymaros'* case "...left little doubt that equitable utilization comprises the governing principle in the field of international watercourses." (McIntyre, 2010, 66)

This theory is considered a guiding principle for a number of international legislation like, *inter alia*, Salzburg Resolution adopted by Institute of International Law in 1961 (hereinafter the 'Salzburg

e-ISSN:2717-8277

Resolution'); Helsinki Rules on the Uses of Waters of International Rivers adopted by the International Law Association in 1966 (hereinafter the 'Helsinki Rules'); Environment Programme's Principles on Shared Natural Resources adopted by the UN in 1978 (hereinafter the 'Environment Principles'); Convention on the Law of the Non-navigational Uses of International Watercourse adopted by the UN in 1997 (hereinafter the '1997 Convention'); Berlin Rules on Water Resources Law adopted by the International Law Association in 2004 (hereinafter the 'Berlin Rules'). (McIntyre, 2010)

For the above very reason, nowadays, the limited territorial sovereignty thought is "...supported by the overwhelming majority of commentators [and]… widely [considered] …as the primary rule of 'customary international law' governing the use and allocation of the waters of international watercourses." (Kaya, 2005, 69-71; Birnie & Redgwell, 2009, 202)

3. CUSTOMARY INTERNATIONAL LAW OF TRANSBOUNDARY WATERCOURSE

A quick skim of international law development basically related with States conformity through its domestic law assimilation and international relation, in a sense of abiding by a particular way of order. Such an attitude creates a strong foundation between/among States to be guided by a particular Principle, up on reciprocal practice.

The degree of acceptability depends on how many States, and sometimes which potential States, adhere to that particular Principles and/or vice versa. As more States act in accordance with a provided Principle with the intention of abiding by it, *opinion juris*, its acceptability and application under international law gets higher and wider under lots of circumstances. In such a way, as more international and non-international actors, like States, international courts, international organization, authoritative scholars *et al*, adhere to a particular Principle, the latter be lifted up to 'Customary International Law'. Once a particular Principle has got a status of Customary International Law, all States, except persistent objector/s, have to be abided by it. Accepting such customary international law in general, States or international organizations entered into bilateral or multilateral treaties to formalize, detail, and/or fill its possible lacunas.

Coming to International transboundary watercourse, the 'limited territorial sovereignty' theory gave birth to two basic principles that have got status of Customary International Law, i.e. 'Equitable & Reasonable' use and 'No-Harm rule' Principle.

3.1. Equitable and Reasonable Utilization Principle

It is clear that the 'equitable and reasonable' use principle is a very crucial principle originating from 'limited territorial sovereignty' theory, which empowers both upstream and downstream riparian states to utilize their shared transboundary water resources in an equitable and reasonable manner within their respective sovereign territory.

e-ISSN:2717-8277

This principle follows a very standardized tolerable approach by conferring a "...balance of interests that accommodates the needs and uses of each riparian state." (Rahaman, 2009, 210) Moreover, though this principle "rests on a foundation of shared sovereignty, equality of rights," however, it shall not be equated with equal shares, as the respective basin States water share be determined by taking lots of relevant factors like, *inter alia*, "the geography of the basin, hydrology of the basin, population dependent on the waters, economic and social needs, existing utilisation of waters, potential needs in future, climatic and ecological factors to a natural character and availability of other resources should be taken into account." (Rahaman, 2009, 210-211; Helsinki Rules, 1966, Article V; UN Watercourses convention, 1997, Article 6; Berlin Rules, 2004, Article 13)

The 'equitable and reasonable utilization' principle has got tremendous "...support in state practice, judicial decisions and international..." legislations. (Rahaman, 2009, 211) Among the international court's decision which have endorsed 'equitable & reasonable use' principle, the case of 'River Oder' and *'Gabcikovo-Nagymaros*' are the most common ones. In the former case, the PCIJ affirmed that *"an important basis of the entitlement to an equitable share is the notion of equality of right."* (River Oder Case, 1929) The ICJ also firmly confirmed this latter fact in the *'Gabcikovo-Nagymaros*' case by indicating in its decision that *"International Rivers are shared resources and all riparian states have equal rights to enjoy both the commodity and non-commodity ecological benefits of the river."* (Gabcikovo-Nagymaros Case, 1997)

Most bilateral and multilateral watercourse treaties and conventions incorporate the 'equitable and reasonable use' principle as a base scenario for their respective water share. Let alone regional basin watercourse treaties, all of those United Nation (hereinafter the 'UN'), International Law Association (hereinafter the 'ILA') and International Law Commission (hereinafter the 'ILC') lead legal regimes dealing with international transboundary watercourses have included this principle in the first row. This can be clearly inferred from the Helsinki Rules, the 1997 Convention, the Berlin Rules *et al*. (Helsinki Rules**,** 1996; UN Watercourses convention**,** 1997; Berlin Rules, 2004) On the base of these facts, the ILC commentary underlines the irrefutable fact of considering 'equitable and reasonable' use principle as a guiding legal regime of international transboundary watercourse law. (Stebek, 2007) Similarly, the ILA commentary on the 'Berlin Rule' confirms the universality and principality of the aforesaid principle in managing transboundary watercourse. (McIntyre, 2010; ILA, 2004) Moreover, scholars like Joseph W. Dellapenna dare to conclude the unanimity among international water law experts over the primacy of 'equitable and reasonable' use principle in transboundary watercourse. (Dellapenna, 2001, 279)

Having the above concrete facts and basing on the broad acceptance, therefore, the 'equitable and reasonable utilization' Principle is considered "as the primary rule of customary international law governing the use and allocation of the waters of international watercourses." (McIntyre, 2010, 66)

3.2. Principle of No-Harm rule

Like the 'equitable and reasonable use' principle, the 'no-harm rule' principle also originates in the parcel of 'limited territorial sovereignty', in a sense that, though the former principle dictates the right of particular state to use the shared watercourse resource in ones defined sovereign territory, the latter

principle underscore the need to be precautious in respecting the equal right of other riparians states interest. (UN Fact Sheet Series, Number 5)

According to the 'no-harm rule' principle, riparian states shall refrain from using transboundary watercourse in their sovereign land in a way that could possibly cause significant harm against a shared watercourse's ecosystem and/or other riparians states equal right. (Rahaman, 2009) Hence, as this principle has a double edge responsibility in protecting environment and guarantees equal right of other riparian states, it is endorsed both in international environmental law and transboundary watercourse legal regime. (UN Fact Sheet Series, Number 5)

Though this principle is mistakenly often associated with downstream States' right for obvious facts, upstream States could possibly be benefited from the principle against downstream States harmful handling of their shared river resource, so that both upper–lower and lower-upper riparian discourses can be entertained.

Looking at different international instruments, the language terminology employed to refer to 'no-harm' rule differs from one to the other. While 'significant harm' terminology is predominantly used in the 1997 Convention, Convention on the Protection and Use of Transboundary Watercourses and International Lakes (hereinafter the '1992 Convention') uses 'transboundary impact' and the World Bank Project Policy refers it as 'appreciable harm'. (UN Watercourses convention, 1997; UNECE Watercourses convention, 1992; Tignino & Brethaut, 2020)

For this review, the 1997 Convention's 'significant harm' terminology is considered. Accordingly, under the 'no significant harm rule,' States are obliged to take all precautionary risk minimizing measures not to cause significant harm to a down neighbouring basin States. A very crucial parameter in this case is 'significant' harm, which refers to "...the real impairment of a use, established by objective evidence, [and in this parameter] …[f]or harm to be qualified as significant, it must not be trivial in nature but it need not rise to the level of being substantial [which ultimately] …be determined on a case by case basis." (UN Fact Sheet Series, Number 5, 1; Tignino & Brethaut, 2020, 635) It is, however, quite important to bear in mind that this 'significant' parameter standard rules-out a "...mere inconveniences or minor disturbances that [riparian] states are expected to tolerate, in conformity with the legal rule of 'good neighbourliness'". (UN Fact Sheet Series, Number 5, 1) Hence, 'significant harm' doesn't mean an absolute prohibition of harms, as appreciable harm is tolerable under a scheme of 'equitable and reasonable' use principle.

A number of International Tribunals and ICJ endorsed the 'No-significant-harm' rule principle, namely the '*Trail Smelter case*', *'Lake Lanoux case' et al.* In the '*Trail Smelter case*' of, the tribunal underlined the significance of the aforenamed principle by stating "*...no State has the right to use or permit the use of its territory in such a manner as to cause injury...*" (Tignino & Brethaut, 2020, 635) Moreover, in the famous *'Lake Lanoux case'*, the tribunal underscore the existence of *"...a rule prohibiting the upper riparian State from altering the waters of a river in circumstances to do serious injury to the lower riparian State."* (Tignino & Brethaut, 2020, 637)

The 'no-harm rule' is widely incorporated in as number of bilateral and multilateral treaties. Letting alone bilateral and regional treaties, the latter principle is dictated in the Helsinki Rules, the 1997

Convention, the Berlin Rules and the 1992 Convention. (Helsinki Rules, 1966; UN Watercourses convention, 1997; Berlin Rules, 2004; UNECE Watercourses convention, 1992) Moreover, the Principle is also incorporated in a number of international environmental declarations and conventions like, *inter alia*, Declaration on the Human Environment adopted by UN in 1972 (hereinafter the '1972 Stockholm Declaration'), Declaration on Environment and Development adopted by UN in 1992 (hereinafter the '1992 Rio Declaration') and Convention on Biological Diversity adopted by UN in 1992 (hereinafter the '1992 Biological Diversity').

Taking into account the above concrete facts, now days, the 'no-harm rule' principle is deemed to be considered as – part and parcel of customary international watercourse law, and – a guiding legal regime of transboundary watercourse management. (Rahaman, 2009)

3.3. Equitable & Reasonable Utilization Principle vis-à-vis Principle of No-Harm rule

As a clear set up, it has to be vivid that the 'no-harm rule' has economic as well as environmental aspects. Though most scholars endorsed and supported the strong alliance of the aforenamed principle with that of environmental protection, they "...underline the precaution that is needed in the interpretation of the rule with regard to the economic aspect, i.e. utilization of watercourses." (Mohammed, 2014, 34; Stebek, 2007, 49)

The 'equitable and reasonable' use and 'no-harm' rule are the two guiding principles of transboundary watercourses. While the former gives a right for basin states to use their shared water resources in their respective sovereign land, on the other hand, the latter principle burdens the basin States with a responsibility to use their shared water resource in a way that shall not cause significant harm to a neighbouring basin riparian state.

However, as there is no way of upholding absolute prohibition of harms, the extent tolerable harm is usually at dispute. In the vein of this disputed issue, the much higher contesting issue is 'whether Equitable & Reasonable Utilization or No-Harm rule shall take priority'. Even during the 1997 Convention development, long debate and discussion was uncovered on this particular issue. While the upper riparians are so reluctant to support the supremacy of 'no-harm' rule fearing "...it might potentially lead to a curtailment of future upstream developments," down riparians strongly abstain from supporting the prioritisation of 'equitable and reasonable' use principle it would probably "...allow scope for harm to occur from such developments with impacts downstream." (UN Fact Sheet Series, Number 5, 1) Despite such unsettled contentious issues, the UN General Assembly adopted related provisional text dealing with the aforementioned ones of the 1997 convention "...by 38 votes in favour, 4 (China, France, Tanzania and Turkey) against and 22 abstaining." (Rieu-Clarke & Loures, 2009, 14)

Although the final text was assumed to follow a mid balancing approach, arguably, the 1997 convention still seems to be prioritising 'equitable and reasonable' use principle, as a governing principal of transboundary watercourses. The phrasing of Article 7 (2) – "where significant harm nevertheless is caused to another watercourse State ...due regard for the [equitable & reasonable utilization] provisions of articles 5 and 6", and Article 10 (2) – "in the event of a conflict between uses of an international watercourse, it shall be resolved with reference to [the equitable & reasonable utilization provision of]

articles 5 to 7" exemplify this fact, as the harm is to be evaluated within the scope of 'equitable and reasonable' use principle.

Moreover, a convincing logic stretched from this fact is that a riparian state must always confer with 'equitable and reasonable' use principle if 'significant harm' happens to be materialized in any case, but not vice versa of the latter in determining the former; consequently, many scholars in the field concluded "...the duty not to cause significant harm is ...a secondary obligation to the primary principle of equitable and reasonable utilisation." (UN Fact Sheet Series, Number 5, 2) Among the Authoritative scholar, a well respected scholar named McCaffrey described the aforementioned scenarios and facts as follow:

> "*If equitable utilization is the controlling legal principle, upstream State A may develop its water resources in an equitable and reasonable manner vis-à-vis downstream States B and C, even though that development would cause significant harm to their established uses. If, on the other hand, the obligation not to cause significant harm is dominant, State A could engage in no development, no matter how equitable and reasonable, that could cause States B and C significant harm.*" (Stebek, 2007, 49-50)

McCaffrey further indicates the non-absoluteness of the 'no-harm' rule as it can be alleviated by taking necessary precaution measures (Stebek, 2007; McCaffrey, 2001) It is not only believed such a method would balance with least harm among basin States, but also creates a mechanism of compensation for greater materialized damage. In order to determine the extent of damage, while differentiating '*factual harm*' and '*legal injury*', it has to be born in mind "it is only injury to '*a legally protected interest*' that is prohibited." (Stebek, 2007, 53; McCaffrey, 2001, 329)

Caflisch, another prominent scholar, underscore the less importance of 'no-harm' rule in transboundary water resource apportionment, believing the latter is already fully or overexploited, so that to actualise equitable and reasonable allocation of the former resource among the rightful riparian states, "...the negative no-harm rule had to be superseded by a positive rule which would make it possible to effect such an apportionment." (Stebek, 2007, 49)

4. THE GENESIS OF TRANSBOUNDARY WATERCOURSE CODIFICATION

With the aim of developing a codified International Non-navigational Transboundary watercourses legal regime, a number of studies and codification attempts have been made by Prof. H. A. Smith of London as well as the ILA and ILC since the 1900's. The prominent revolutionary codification was the work of ILA and ILC, in which the former developed a draft text on the 'Dubrovnik Rules', Helsinki Rules and Berlin Rules, while the latter is responsible for a draft of the 1997 famous Convention *et al*.

Prof. H. A. Smith was assumed to be the first scholar who had undertaken massive studies on the legal courses of transboundary watercourses by "...review[ing] more than 100 treaties and studied several conflicts on the use of transboundary rivers," in the early period of 20th century (Biswas, 2008, 13) In his study, he "...noted that some of the treaties considered the concept of equitable utilization," which let him to reiterate the basin states rights for a fair share of the aforesaid river. (Biswas, 2008, 13)

e-ISSN:2717-8277

ILA had introduced the Helsinki Rules for transboundary watercourses, which was an updated version of Dubrovnik Rules, through Finland's proposed resolution to the UN General Assembly in 1970. However, member states pulled back from endorsing these rules on three grounds, claiming: a pure professional work which lack states say; its non-consideration of practical nexus issues; and its incorporation of troubling drainage concept, which was unwelcomed and fiercely disputed by states. (Biswas, 2008, 13) Despite the aforementioned facts, the ILA continued updating the Helsinki Rules, and as a result, came up with the Berlin Rules. Although the works of ILA have not been endorsed by international organizations like the UN, all three works of the forgoing association, undeniably, show a huge transformation of transboundary watercourse codification, thus "...can probably be best regarded as guidelines for a legal regime for managing transboundary waters." (Biswas, 2008, 13)

Up on the failure of the Helsinki Rules, the UN passed a major shifting resolution 2669 (XXV) in December 1970 and directed the ILC to commence its work in codifying the legal regime of international transboundary watercourse law. (Biswas, 2008) After two decades of study, the Commission came up with a draft text in early 1990's and conducted a number of consultations with various concerned stakeholders. Despite a major difference among basin States, the UN General Assembly approved with more than 100 States vote in favour of the ILC's Draft on the 1997 Convention in July 1997. In accordance with Article 36 (1) of the latter, the 1997 Convention came into force on the 17th of August, 2014.

4.1. The Principles adopted in the 1997 Convention

The 1997 Convention has incorporated a number of major principles for transboundary waters. Letting alone the two major principles, named 'equitable and reasonable' use principle and 'no-significant-harm' rule principle, which have been dealt with under the previous section, in this section it is worth noting those left over principles of the 1997 Convention.

Among those Principles that deserve to be discussed here are: Principles Cooperation, Regular exchange of Data and Information, Notification of Planned Measure and Peaceful Settlement of Dispute.

With respect to a shared transboundary watercourse, the very baseline of riparian States is that water shall not be a source of Conflict, but Cooperation. With this understanding, the 'Principle of Cooperation' dictates riparians have to come together and negotiate over their shared water, with the ultimate aim of – attaining "...optimal utilization and adequate protection of an international watercourse" and – managing the aforesaid one via joint institutional arrangement mechanisms. (UN Watercourses convention, 1997, Article 8)

Through basin-wide cooperation scheme, riparians shall regularly exchange all obtainable, *inter alia*, hydrological, meteorological, hydro-geological and ecological information and/or data of the international river course. (UN Watercourses convention, 1997, Article 9 (1))

Within the scope of 'regular exchange of data and information', riparian state shall timely notify each other of their respective planned measures, and if such planned measures can possibly cause significant harm on the other riparian, immediate notification alongside all disposable technical date and information shall be provided. (UN Watercourses convention, 1997, Article 12)

e-ISSN:2717-8277

Despite the above scenarios, for any case of possible dispute over the shared watercourse, the 1997 convention incorporates a 'peaceful dispute settlement' mechanism in which riparian states shall settle their differences in a mutually amicable manner. (UN Watercourses convention, 1997, Article 33)

4.2. Contentious issues of the 1997 Convention

It is not only the drafting and consultation of the 1997 Convention which takes a very long time, so does the phase of entering the latter into force through States ratification. This was due to the contentious issues revolving around the aforesaid Convention and States hesitation to endorse this controversial Convention, as it was adopted without narrowing their differences. Let alone the very contentious issues of 'equitable and reasonable' use vs. 'no-harm' rule for obvious reasons, the other two major contentious issues, namely the 'existing and future agreement' and 'compulsory dispute settlement', are worthy to be discussed under this section.

Starting with the 'existing and future agreement' issue, the two diverse for-against views rotate around Article 3 of the 1997 Convention. Up on ratification, the latter Article dictates the unnecessity of harmonizing rights and/or duties arising from pre existing transboundary water treaties with that of the present Convention, unless the riparian parties intend to do so. (UN Watercourses convention, 1997, Article 3) The very purpose of this particular provision is to provide flexibility and to avoid the unduly burdensome of reviewing more than 3,600 of existing transboundary watercolours treaties. (Rieu-Clarke & Loures, 2009) However, there were states that have rejected this approach and argued for the inclusion of a clear provision of text stating otherwise. Rieu-Clarke & Loures, 2009) With these heated diverse opinions, "35 countries voted in favour [to Article 3] of the text, while 3 countries voted against (Ethiopia, France and Turkey), and 22 abstained." (Rieu-Clarke & Loures, 2009, 14)

Coming to the 'compulsory dispute settlement' issue, Article 33 of the 1997 Convention, though provides for amicable or mutual adjudication dispute settlement mechanism, however, provides if no agreement is reached within six months, with the fear of turning a dispute in to a real conflict, the convention follows a compulsory approach and dictates that "the dispute shall be submitted [even unilaterally], at the request of any of the parties to the dispute, to impartial fact-finding [Commission]." (UN Watercourses convention, 1997, Article 33 (3)) Such approach of period fixation and Compulsory fact-finding Commission arrangement, with unilateral initiation, was a source of contentious issues. Accordingly, the provision of "Article 33 was adopted by 33 votes to 5 (China, Colombia, France, India and Turkey), with 25 abstentions." (Biswas, 2008, 15)

5. INSTITUTIONAL ARRANGEMENT OF TRANSBOUNDARY WATERCOURSE

One among a very crucial step for the basin-wide watercourse cooperation is the establishment of institutional arrangement, as it is vitally so viable and monumentally "...resilient over time, even between otherwise hostile riparian nations, and even when conflict is waged over other issues'." (Vollmer, Ardakanian, Hare *et al*, 2009, 11)

e-ISSN:2717-8277

The significance of such Institutional arrangement is underlined in most of the major legal regime of international watercourses like, *inter alia*, the 1997 Convention, and the Berlin Rules. (UN Watercourses convention, 1997, Article 33 (2); Berlin Rules, 2004, Article 31 (e), 34 (f), 35 (d))

Basin States follow different approaches of institutional set-up, which can be categorised into three basic groups: a River Basin Commission, a River Basin Authority, and a River Basin Coordinating Committee or Council.

5.1. River Basin Commission

A River Basin Commission arrangement is a much formal structural set-up and considered when comprehensive developmental alternates with conflicting users and uses are experienced on the watercourse. Moreover, this structural model is considered up on the need of information exchange, policy formulation, and detail management plan in order to achieve the ultimate goal of equitable and reasonable share of the transboundary water, without, of course, exposing significant harm on the latter resource. (Millington, Olson & McMillan, 2006)

Aside from the above, the commission is in need in order to "...set the bulk water shares that each state/province is entitled to divert and would monitor water use at the higher state/provincial level." (Millington, Olson & McMillan, 2006, 8) Moreover, the commission is set "...to arbitrate trans-jurisdictional or transboundary disputes [and to ensure] equal partnership among all stakeholders, and involvement of the basin community as and when relevant in planning and decision making." (Millington, Olson & McMillan, 2006, 9)

The major possible structural design of a particular basin commission would be composed of 'Ministerial Council', 'Board of Management', and 'technical officers and experts'. The 'Ministerial Council' is a body which empowered with the overall ultimate authority of the commission, while the 'Board of Management' is a structural layer which is responsible to set policies, strategies *et al*. Besides, the 'technical officers and experts' gives technical supports to the aforementioned ones. (Millington, Olson & McMillan, 2006)

5.2. River Basin Authority

A River Basin Authority is the other category of institutional arrangement for transboundary watercourses. This institutional model either takes in a form of organization – "...with specific development tasks to undertake, such as hydropower development or navigation, [or] – ... that absorbs virtually all the water resources functions of other agencies in the basin, rendering it very large and powerful." (Millington, Olson & McMillan, 2006, 8)

This River Basin Authority structure is "...adequate, for example, in some African basins because of their relatively low degree of water resources development, such as the Niger." (Vollmer, Ardakanian, Hare *et al*, 2009, 9) Despite the aforementioned facts, this model "...is not suitable for 'historically,

geographically, and politically very complex' basins" like Nile River Basin." (Vollmer, Ardakanian, Hare *et al*, 2009, 9). Thus, some basin states authority like 'Tennessee' Valley Authority (TVA) of the U.S, 'Mahaweli' (River Basin) Authority of the Sri Lank, the 'Snowy Mountains Authority' of the Australia *et al* are being transitioned to 'commissions' or 'coordinating committees/councils. (Vollmer, Ardakanian, Hare *et al*, 2009)

5.3. River Basin Coordinating Committee or Council

A River Basin Coordinating Committee or Council structure is formed assuming the existence of favourable conditions in a particular transboundary river basin with the spirit of high cooperation and less competition and/or confrontation among riparians. (Millington, Olson & McMillan, 2006)

Under this so called committee or council structural arrangement, though it might encompass senior public officials of a particular basin states, however, the latter is with no actual executive power, so that its strength and/or weakness depend on its riparian states commitment and chairperson leadership capability to do so. (Millington, Olson & McMillan, 2006) Thus, this institutional set-up can be used at the initial stage of basin-wide cooperation, and once a better institutional platform is in place, its existence would come to an end. (Millington, Olson & McMillan, 2006)

All in all, in order to establish such Joint Institutional set-up of transboundary watercourses, basin States need to agree in a form of bilateral or multilateral treaties to do so. In this vein, basin States need to not only determine the appropriate type of Institutional model, but also set measurable clear tasks and responsibilities. Moreover, "the [institutional mandate] does not only have to be clear-cut and coherent, [but] also need to be enforceable." (Vollmer, Ardakanian, Hare *et al*, 2009, 12) For the effective realization of the latter, it is crucial to align basin States national legislation in general and the legal provisions dealing with River Basin Organization in particular.

6. CONCLUSION

The evolution of international transboundary watercourse is at the center of human evolution as water is one among the very basic human needs that is crucial for survival. Throughout this revolution, among the three major theoretical doctrinal principles, the two opposing extreme theories, i.e., *'absolute territorial sovereignty'*, *'absolute territorial integrity'*, "are, in essence, factually myopic and legally 'anarchic': [as] they ignore other states' need for and reliance on the waters of an international watercourse, and they deny that sovereignty entails duties as well as rights." (McCaffrey, 2001, 135) These lead to the emergency of a middle ground, which is more universal and tolerable theoretical thought, called *'limited territorial sovereignty'*. The overwhelming support of different international legal instruments, authoritative scholars, judiciaries lifts the latter doctrine up to the Customary International Law. The aforementioned facts gave birth to a very crucial Principles of Customary International Law, i.e., 'Equitable & Reasonable Utilization' and 'No-Harm rule' Principle. Arguably, not only the latter is a primary governing principle of transboundary watercourse, but the latter is also qualified within a scope of the former.

e-ISSN:2717-8277

Since 1900's a number of studies and codification attempts have been made by Prof. H. A. Smith of London, ILA and ILC. In this vein, a number of international transboundary watercourse legal instruments have developed, *inter alia*, the Dubrovnik Rules, Helsinki Rules, Berlin Rules, and the 1997 Convention. Except the latter one, the remaining aforenamed legal texts can be considered as a guideline for transboundary watercourse, as they show the evolution of the latter codification. Though States opposing diverse standing was yet to be compromised, the 1997 Convention came into force on 17 August 2014 and it is now the only universal guiding legal regime of transboundary watercourse. The latter Convention incorporates, on the one hand, the six major principles, namely 'Equitable and Reasonable' use, 'No-Significant-harm' rule, 'Cooperation', 'Regular exchange of Data and Information', 'Notification of Planned Measure' and 'Peaceful Settlement of Dispute'; while, on the other hand, the Convention contain unresolved contentious issues like 'Equitable and Reasonable Utilization' vs. 'No-Harm Rule', 'Existing vs. Future Agreement', and 'Compulsory Dispute Settlement'.

Bearing in mind the very significance of Institutional arrangement of International Transboundary watercourse through bilateral or multilateral treaties, there are three joint structural set-ups known as 'River Basin Commission', 'River Basin Authority', and 'River Basin Coordinating Committee or Council'. Though these joint institutional arrangement applications vary depending on the nature of watercourse basins, the most common and preferable one is 'River Basin Commission'. To manage transboundary watercourses through such Joint Institutional arrangement mechanisms, basin States have to, *inter alia*, – agree on a basin wide 'Legal Framework', determine appropriate 'Institutional model', set its clear tasks and responsibilities, align it with its domestic legislation, and take necessary steps to enforce it.

Acknowledgement:

"The author is very grateful to Prof. Dr. Yücel ACER for his critical reading and invaluable feedback throughout its initial and final preparation of this Article"

References

Alistair Rieu-Clarke & Flavia Rocha Loures. (2009). Still not in force: Should States support the 1997 UN Watercourses Convention? Review of European Community & International Environmental Law. Vol. 18. No.2, p. 185-197. https://doi.org/10.1111/j.1467-9388.2009.00640.x

Asit K. Biswas. (2008). Management of Transboundary Waters: An Overview. In Olli Varis, Cecilia Tortajada, Asit K. Biswas (eds). Management of Transboundary Rivers and Lakes. Berlin. Heidelberg. Springer, p. 1-20.

Berlin Rules on Water resources (Adopted by International Law Association in August 2004). Available at <http://www.cawater-info.net/library/eng/l/berlin_rules.pdf> Accessed 14/07/2021.

Convention on the Law of the Non-navigational Uses of International Watercourses (Adopted on 21 May 1997 by the UN General Assembly Resolution 51/229, entered into force on 17 August 2014), Article 6. Available at <https://legal.un.org/ilc/texts/instruments/english/conventions/8_3_1997.pdf> Accessed 15/07/2021.

Declaration of Asunción on the Use of International Rivers (Argentina and Brazil) (Signed in June 1971).

Elias N. Stebek. (2007). Eastern Nile at Crossroads: Preservation and Utilization Concerns in Focus. Mizan Law Review, Vol. 1. No. 1, p. 33-59. https://doi.org/10.4314/mlr.v1i1.55613

Food and Agricultural Organization of the United Nations. Transboundary Waters. Available at <http://www.fao.org/land-water/water/water-management/transboundary-water-management/en/> Accessed 21/07/2021.

Gabcikovo-Nagymaros Project (Hungary v. Slovakia).International Court of Justice (ICJ). Case ICJ GL No 92. 25 September 1997.Available at <https://www.icj-cij.org/public/files/case-related/92/092-19970925-JUD-01-00-EN.pdf> Accessed 14/07/2021.

Helsinki Rules on the Uses of Waters of International Rivers (adopted by International Law Association (ILA) in August 1966), Article V. Available at <https://www.internationalwaterlaw.org/documents/intldocs/ILA/ILA-HelsinkiRules1966-as_amended.pdf> Accessed 15/07/2021.

İbrahim Kaya. (2005). The Question of Sources of Law Concerning International Watercourses. Dokuz Eylul University, Hukuk Fakultesi Dergisi, Vol. 7. No. 1, p. 65-82. Available at <https://dergipark.org.tr/tr/download/article-file/754283> Accessed 15/07/2021.

ILA. (1873). Available at <https://www.ila-hq.org/index.php/about-us/aboutus2> Accessed 15/07/2021.

ILA. (2004). Commentary on Berlin Rules. Article 12 **-** Equitable Utilization ,p.20. Available at **<**https://www.internationalwaterlaw.org/documents/intldocs/ILA/ILA_Berlin_Rules-2004.pdf**>**Accessed 15/07/2021.

ILC. (1947). Availableat <https://legal.un.org/ilc/> Accessed 15/07/2021.

Joseph W. Dellapenna. (2001). The customary international law of transboundary fresh waters, International Journal of Global Environmental law. Vol. 1.No. ¾, p. 264–305. http://dx.doi.org/10.1504/IJGENVI.2001.000981

Lake Lanoux Arbitration (France v. Spain). Arbitral Tribunal. Reference No. R.I.A.A. 281.November 16, 1957.Available at <http://www.cawater-info.net/bk/water_law/pdf/france_v_spain.pdf> Accessed 14/07/2021.

M.M. Rahaman. (2009). Principles of international water law: creating effective transboundary water resources management. Int. J. Sustainable Society.Vol. 1.No. 3, p. 207-223. http://dx.doi.org/10.1504/IJSSOC.2009.027620

M. Tignino & C. Bréthaut. (2020). The role of international case law in implementing the obligation not to cause significant harm. Int Environ Agreements, Vol. 20, p. 631–648. https://doi.org/10.1007/s10784-020-09503-6

Owen McIntyre. (2010). International Water Law: Concepts, Evolution and Development. In Anton Earle, Anders Jägerskog and Joakim Öjendal (eds). Transboundary Water Management Principles and Practice.1st Edition. London. New York. Earthscan.

Permanent Court of International Justice (PCIJ). Case PCIJ Series A no 23. 20 August 1929. Available at <http://www.worldcourts.com/pcij/eng/decisions/1929.09.10_river_oder.htm> Accessed 15/07/2021.

Peter Millington, Douglas Olson & Shelley McMillan. (2006). An introduction to integrated river basin management, from Concepts to Good Practice. Briefing note no. 1 – An Introduction to Integrated River Basin Management. Washington, D.C. World Bank Group. Available at <https://documents1.worldbank.org/curated/en/965371468340137430/pdf/411500Intro0to1mgmt0NOTE1101PUBLIC1.pdf> Accessed 20/05/2021.

P. K. Parhi & R. N. Sankhua. (2014). Beyond the Transboundary River: Issues of Riparian Responsibilities. J. Inst. Eng. India Ser. A. Vol. 94. No. 4, p. 257–261. https://doi.org/10.1007/s40030-014-0067-x

P. W. Birnie, A. E. Boyle & C. Redgwell. (2009). International Law and the Environment. 3rd edition. Oxford. Clarendon Press.

R. Vollmer, R. Ardakanian, M. Hare, J. Leentvaar, C. Van der Schaaf & L. Wirkus. (2009). Institutional Capacity Development in Transboundary Water Management. United Nations World Water Assessment Programme Insights. Paris: UNESCO. Available at <https://www.ais.unwater.org/ais/pluginfile.php/90/course/section/126/181792e.pdf> Accessed 15/07/2021.

Stephen McCaffrey. (2001). The Law of International Watercourses – Non-Navigational Uses. Oxford University Press. Oxford. https://doi.org/10.1093/yiel/12.1.822

Territorial Jurisdiction of the International Commission of the River Oder Case. (United Kingdom, Czechoslovakia, Denmark, France, Germany, Sweden V. Poland).

The convention uses this terminology to evaluate transboundary watercourses vis-a-vis environmental harms. Available at <https://treaties.un.org/doc/Treaties/1992/03/19920317%2005-46%20AM/Ch_XXVII_05p.pdf> Accessed 15/07/2021.

The 1992 United Nation Convention on Biological Diversity (Adopted on 5 June 1992 by UN General Assembly and entered into force on 29 December 1993**)**, Article 3.Available at**<**https://www.cbd.int/doc/legal/cbd-en.pdf**>** Accessed 15/07/2021.

The 1992 United Nation Rio Declaration on Environment and Development (Adopted on12 August 1992 by UN General), Principles 2, 4, 13, 24. Available at **<**https://www.un.org/en/development/desa/population/migration/generalassembly/docs/globalcompact/A_CONF.151_26_Vol.I_Declaration.pdf**>** Accessed 15/07/2021.

UN Convention on the Protection and Use of Transboundary Watercourses and International Lakes (Adopted on 17 March 1992 and entered into force on 6 October 1996). Available at https://unece.org/DAM/env/water/pdf/watercon.pdf Accessed 15/07/2021.

UN Watercourses Convention. User's Guide Fact Sheet Series, Number 5. No Significant Harm Rule. Available at <https://www.unwatercoursesconvention.org/documents/UNWC-Fact-Sheet-5-No-Significant-Harm-Rule.pdf> Accessed 15/07/2021.

United Nation Waters. Transboundary Waters. Available at <https://www.unwater.org/water-facts/transboundary-waters/> Accessed 21/07/2021.

Yusuf Ali Mohammed. (2014). The 'Water Security' Principle Under Nile Basin Cooperative Framework Agreement vis- à-vis International Water Law. (LL.B Dissertation).Dire Dawa University. School of Law.

Article received: November 18 2021

Article accepted : December 24 2021

International Journal of Water Management and Diplomacy
Issue: 4 2021
e-ISSN:2717-8277

Review Article

ANALYSIS OF THE EFFECTS OF DEFORESTATION ON THE ENVIRONMENT AND AGRICULTURE IN KENYA

[1*]**Benson Njora , Hasan Yilmaz**

Isparta University of Applied Sciences, Faculty of Agriculture,

Department of Agricultural Economics, Isparta, Turkey, 32260, Isparta, Turkey.

*Correspondence Author, e-mail: wanduben12@gmail.com

Abstract

Forests are known to have beneficial effects on the environment, influence the climate, water sources, and temperature. Forests help in conserving biodiversity, reducing harmful effects caused by chemicals from the soil, acting as a carbon sink, and protecting watersheds, all of these have great benefits to both humans and the environment. The ecosystem of the forests and the environmental sustainability is at risk as a result of deforestation. Deforestation also hampers the socio-economic development in many parts of the world. Through secondary research and a descriptive research design, this paper analyzes the impacts of deforestation on the Environment and Agriculture in Kenya. According to research, agricultural activities are the major cause of deforestation globally, it accounts for about 80% of total deforestation in developing countries. Other causes of deforestation are human population growth, poor governance and corruption, illegal logging, and wildfires. Deforestation affects the environment through climate change, water loss, decreased biodiversity, habitat loss, and conflicts. Several conservation measures have been tried in various places to slow down the rate of deforestation. These include; imposing bans, legislations, devolution, public participation, barriers, and modernizing forest management. It is therefore recommended that; people need be educated about the benefits of forests and their adverse impacts that may result from deforestation, population control to avoid invasion in forested areas, adoption of sustainable and environmental-friendly agricultural practices, strengthening institutions such as legislature and judiciary to curb corruption, reduction of the continued widespread dependence of household biomass sources of energy ad adoption of Geographic Information System (GIS) techniques to monitor activities in and around forests.

Keywords: Forest; deforestation; agriculture; climate change; environmental policies

1.0 INTRODUCTION

Deforestation is the practice of permanently removing or uprooting trees from the ground to give rise to something else other than forests (Derouin, 2019). The reasons for deforestation are mainly to ensure that there is sufficient land for cultivation, infrastructure purposes, residential purposes, and manufacturing or industrial purposes. Deforestation is not only caused by human intervention but it can also be caused by other natural causes (Cesareo et al., 2021). For example, when natural fires occur, large swathes of land covered by forests can be decimated within a short period. Forests are crucial for conservation and

human survival. Without forests, people will; lack the natural herbs they can use as medicine, without forests, the habitat for animals of all species will become destroyed. Forest cover also ensures that the air that the people breathe is filtered and the earth's surface is not affected by the harmful rays from the sun (Cesareo et al., 2021).

Despite the increasing importance of forest cover, many people contend that forests occupy lands that would otherwise be used for human settlement, development, and civilization. Forest cover utilizes land that can otherwise be used to provide settlement for millions of people now that in the world the population is fast rising (Cesareo et al., 2021). Forests cover occupies land that would otherwise be converted into farming areas to be used crop and livestock farming so that the population of the world remains fed.

The rise in urbanization steadily over the past few years has seen a decline in the forest cover in the world. Large towns and cities now stand in place of areas that were once booming forests. The Food and Agricultural Organization estimates that by 2050 at least 68% of the world's population will be living in urban centers (Youmatter, 2020). The current urban centers cannot sustain all these people leading to the expansion of towns and cities. The expansion of towns cannot happen without the decimation of the natural environment around them such as forests and other critical natural resources like Rivers.

1.1 Deforestation Situation in the World

Forests cover the Earth's land, an area of over 4 billion hectares. 93% of the world's forests are natural, 7% and are planted forests. Every year, the world loses 10 million hectares of the world's forests. Some 80% of the tropical rainforests are destroyed due to agriculture. Deforestation is the leading cause of 15% of carbon emissions. (*The Global Forest Goals Report 2021*). Deforestation is considered to be a significant problem in various parts of the planet when it comes to preventing changes in the climate and also conserving biodiversity. Some nations are cutting trees at alarming rates. As a result of deforestation, the global distribution of forests throughout the rest of the world is concentrated in a few countries as shown in the table below;

Table 1: Percentage of World Forests (%In Different Countries)

Country	**Percentage of World Forests (%)**
Russian Federation	20
Brazil	12
Canada	9
United States of America	8
China	5
Australia	3
Democratic Republic of Congo	3
Indonesia	2
Peru	2
India	2
The Rest of the World	34

Issue: 4 2021
International Journal of Water Management and Diplomacy
e-ISSN:2717-8277

Source: FAO and UNEP, 2020

Deforestation increase affects the populations of world animals. With declining forest covers, the population of animals such as elephants and the orangutans will decline. Research by the World Wildlife Fund shows that if the current deforestation trend is not halted with strategic and sustainable solutions, over 420 million acres of forest cover will be lost between 2010 and 2030 (McGrath, 2019). Other areas that are deemed to be at risk in the increase in the forest losses are the Atlantic Forest, the Gran Chaco, the Borneo, the Cerrado, the Congo Basin, Eastern Democratic Republic of Congo, Eastern Australia, and also Eastern Africa (McGrath, 2019). Other areas that are at high risk of losing large areas of land that were previously forested include Sumatra, the Greater Mekong area, and the Papua Guinea areas. The above countries contain some of the most vital ecological and climate-sensitive forest lands in the world as they are home to some of the most endangered species in the world such as the rhino, the duck-billed platypus, the saola, and the Gharial (Onekindplanet.org, 2016).

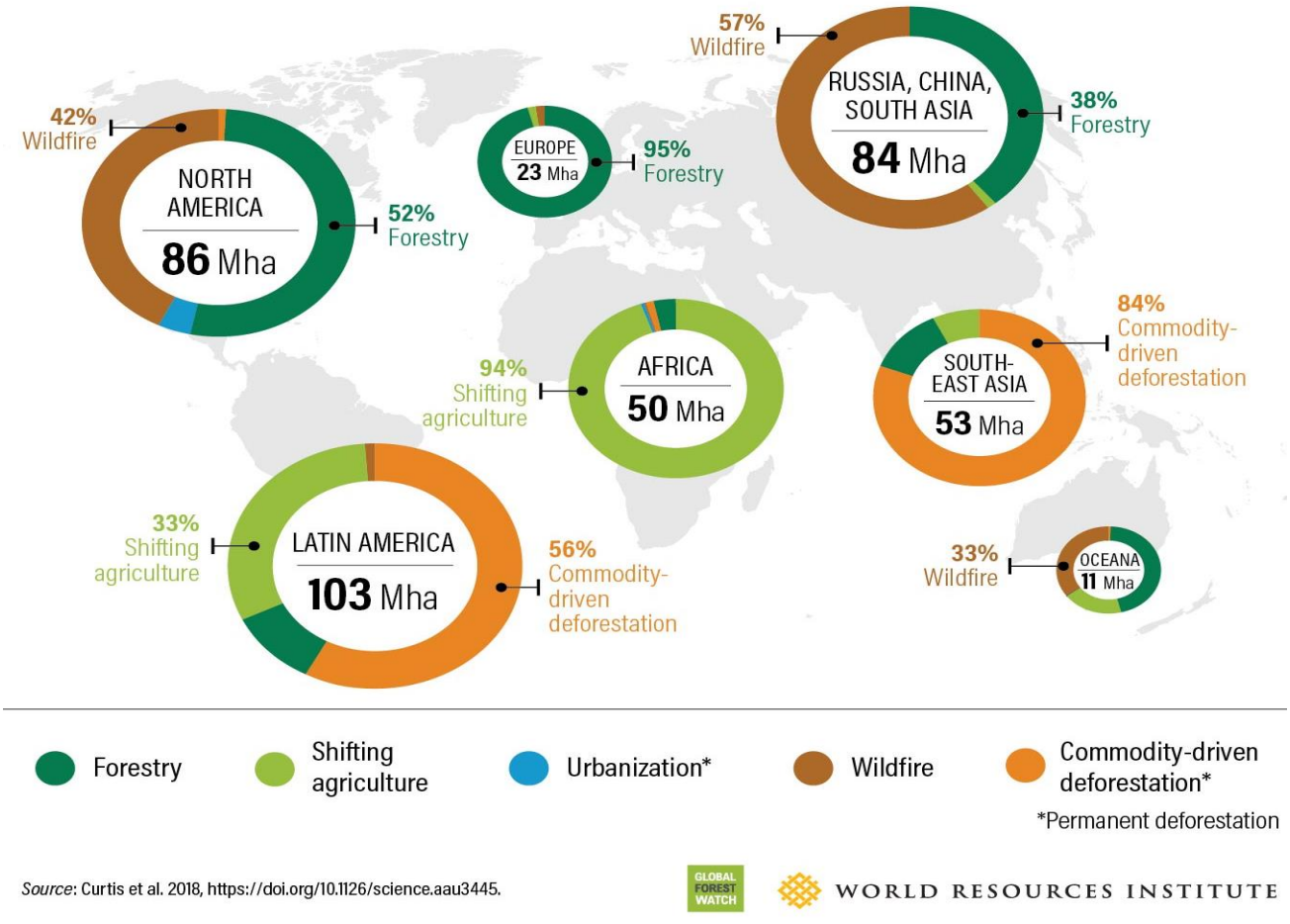

Figure 1: Drivers of tree cover loss by region (2001-2010)

e-ISSN:2717-8277

According to the World Resources Institute, in 2020, Brazil was the nation in the world with the highest decline in forestation where about 1,400,000 hectares of forest land was decimated through deforestation. Other areas include DR Congo, Bolivia, Malaysia, Peru, Madagascar, Cameron, Colombia, and Indonesia. In the list above, there are three African countries among the nations that are at the highest risk of losing a major chunk of their forest cover. This shows that African countries are among the nations in the world that are at risk of losing large forested areas and if the situation is not reversed, the continent will be covered by large areas of land that have turned into deserts.

The Amazon is a widely known natural rainforest in the world. It has been in existence for the past 10 million years. New species continue to be discovered daily. It is home to over 390 billion trees. The Amazon is every biologist's dream of the vast area of biodiversity. Since the 1970s, the government led a massive advertisement for cheap land, and immigrants from Italy plus some members of the local community descended on the forest in droves to establish settlements. As a result, huge tracts of forest cover were cleared to make way for human settlement. Infrastructural development also contributed to the growth of deforestation in the region (Wolosin, M., & Harris, N. 2018).

Large tracts of land were cleared to pave way for electricity and telephone lines. The government's policy of allowing the people to settle in the Amazon also created an influx of wealthy individuals to come into the country and establish large tracts of land to be used as ranches. Politicians also contributed to the growth and development of deforestation in the area. The Ministry of Environment in Brazil had put in strong policies that compelled the people to be serious about deforestation through the introduction of fines that people were supposed to pay as a result of deforestation. However, the change in the regime prompted the relaxation of these policies (Silva Junior et al., 2021). The current President Bolosonaro is development-oriented and this has contributed to the increase in deforestation in the region.

As a result of these reasons between 1985 and 1999, at least 191, 664 square kilometers of forest land in Brazil was lacking forest cover (Silva Junior et al., 2021). Research has shown that 80% of the previously forested land in Brazil has been converted into cattle farming. The returns of cattle farming, sale of meat and hides are huge in the country and this has contributed to deforestation as forest lands are now being converted to ranches to be used for cattle farming (Silva Junior et al., 2021). Despite the above problems, there have been efforts to reduce deforestation in the country. There was a reduction of 84% of deforestation rate in 2012 compared to the year 2004 when the rate of deforestation rate was so high. This reduction can be attributed to some of the efforts that the government put in place particularly through working together with some International lobby organizations such as the Action Plan International for the Prevention and Control of Deforestation in the Legal Amazon Area (FAO & UNEP, 2020).

1.2 Deforestation Situation in Africa

According to the FAO 2020, 10% of the forest cover in Africa was destroyed through the problems of deforestation. The problem of deforestation in Africa has been huge and it has contributed to the encroachment of the Sub Saharan Desert in the region. In Africa, deforestation is both an environmental problem and a human rights and social problem. The act of deforestation deprives the rural African communities of their important source of livelihood. Poor rural communities depend on the forests for

e-ISSN:2717-8277

their medicinal value, shelter, and food. The 10% of the economies of Ghana and Cameroon are reliant on forests. Logging operations in the African continent particularly in the Central African Republic have been mentioned as the largest contributor to deforestation. Trees are indiscriminately cut so that they provide raw materials for furniture and other uses. The companies that carry out logging activities in the continent and the country do so through efficient machines and labor-intensive operations that not only remove the trees but they also eradicate any vegetation that was existing on the ground surface. Mining activities especially in the Central African region and the Congo Basin have contributed to the problem of Deforestation (FAO, 2020).

Areas that are covered with rare minerals like the Democratic Republic of Congo have seen a large area of forest cover decline to give way for the miners to carry out their activities. In Congo, Copper, Gold, Diamond, uranium, and coltan are found deep in the soils in the areas with green lush forests (Harneis, 2018). The mining companies have to first cut down the trees, remove the vegetation, and then start their mining activities. Mining also has led to the destruction of the existing rainforests in the region. As seen in the image below, deforestation for mining purposes leads to a wide-scale decimation of the land. Trees are not only removed but the land is also left bare to the vagaries of the weather such as soil erosion.

Population increase, agricultural activities, urbanization, and economics are the possible drivers of deforestation within the East African countries of Kenya, Uganda and Tanzania, and Ethiopia. Apart from that, there has been a wide demand for forest trees to be used as fuelwood in the region (M, J. 2018). In the 1980s and the 1990s, the demand for forest wood for fuels grew not as a result of the need for forest food for subsistence use but because of the increased demand for forest wood in the urban areas. In these two countries, the urban centers led in the demand for wood charcoal. As a result, a large tract of land was felled so that they can provide charcoal. Within the region, there have been cases of land division where the administrators are involved in the sub-division of the land of the forests into smallholder farms to be distributed to the farmers. The impact of this land division is that after some time, no land can be used for the regeneration of forests.

Lack of training of the forest staff also seriously impacts the conservation efforts. Monies by most East African governments are only directed towards agricultural activities as a matter of political expediency but the departments that are tasked with the protection of forests have little to no funds that can be used to fund research (Wu, 2011). The major landmarks, which also serve as the large water catchment areas in East Africa are also areas that have huge forest covers. These areas include the Ngorongoro crater, the Shompole Conservancy, Mount Kilimanjaro, Mount Kenya, and the Mau Forest.

2.0 MATERIALS AND METHOD

The data gained for this research was done through secondary research. The data was sourced from the Kenya Forest Research Institute, the Kenya Wildlife Services, Food and Agricultural Organization (FAO), the Kenya Forest Service, the Kenya National Bureau of Statistics (KNBS), the National Environment and Management Authority of Kenya (NEMA-Kenya). To examine the policies that have been put in

e-ISSN:2717-8277

place to protect the forests, the Constitution of Kenya will be one of the key sources of data. Besides government institutions, data was also obtained from Non-Governmental Organizations Reports and related research articles and journals. In the analysis and synthesis phase, the data obtained were evaluated, discussed, interpreted, and analyzed from different angles to determine the effects of deforestation on the environment and agriculture.

3.0 RESULTS AND DISCUSSIONS

3.1 Deforestation Situation in Kenya

Kenya's forest cover stood at 10% of the total landmass of the Republic of Kenya in 1964. However, this has dropped to 6%. Also between the 1990 year and 2010, Kenya on average lost an estimated 12,050 hectares of forest land which accounts for about a 0.32 % reduction in the forest cover size every year (Buttler, 2010). This reduction is alarming and it is projected that it may reach a time when the forest cover in Kenya is only 3% and below. In Kenya deforestation has affected the five major water towers which are the Aberdares, the Mau Forest Complex, Mount Kenya, and Mount Elgon. These water towers, which have around it many forested areas often supply the water that is filtered to the country's largest lakes and rivers. However, it is estimated that between the years 2000 and 2010, the rate of deforestation in these areas led to reduced forest cover by 50,000 hectares. This has also reduced the availability of water by 62 million cubic meters in that decade (Kogo et al., 2019).

The rapid population growth in the country, coupled with the issues of urbanization has made Kenya's forest resources to be depleted at an alarming rate. In the Coast region, for example, the growth of infrastructural development particularly the building of the tourist resorts, the dams, and the hotels that are used for the tourist attracts have made large hectares of the mangrove forests to be uprooted(M, J. 2018).

In 2010, Kenya had 3.18Mha of natural forest, extending over 5.7% of its land area. In 2020, it lost 17.2kha of natural forest, equivalent to 7.68Mt of CO_2 of emissions. From 2002 to 2020, Kenya lost 49.4kha of humid primary forest, making up 14% of its total tree cover loss in the same period. The total area of humid primary forest in Kenya decreased by 7.6% in this period. From 2001 to 2020, Kenya lost 361kha of tree cover, equivalent to an 11% decrease in tree cover since 2000, and 176Mt of CO_2 emissions. In Kenya from 2001 to 2019, 2.6% of tree cover loss occurred in areas where the dominant drivers of loss resulted in deforestation. From 2013 to 2020, 80% of tree cover loss in Kenya occurred within a natural forest. The total loss within the natural forest was equivalent to 45.8Mt of CO_2 emissions. In Kenya, the top 6 regions were responsible for 52% of all tree cover loss between 2001 and 2020. Narok had the most tree cover loss at 72.4kha compared to an average of 7.84kha (Global Forest Watch, 2021)

e-ISSN:2717-8277

Table 2: Kenya top regions with highest tree cover loss (2001-2020)

Region	Forest cover Loss
Narok	72.4kha
Nakuru	31.5kha
Kilifi	24.9kha
Lamu	21.0kha
Kwale	18.6kha

Source: Global Forest Watch, 2021.

Table 3 represents the annual loss of primary forest cover and tree cover for Kenya by year. All area figures are in hectares (ha). Over time, Kenya has been losing a huge amount of forest and trees cover. Between the years 2001-2018, Kenya has lost 13.8 of its primary forest and tree cover as indicated below.

Table 3:Primary forest loss and tree cover loss: Kenya

Year	**Primary forest**	**Tree cover (30%)**
2001		19,107
2002	2,974	20,399
2003	1,568	13,621
2004	2,974	17,053
2005	1,703	17,053
2006	3,340	20,743
2007	3,440	26,213
2008	1,887	19,296
2009	1,596	17,750
2010	6,749	22,770
2011	1,410	17,364
2012	1,664	17,977
2013	1,623	13,622
2014	1,210	15,404
2015	3,055	15,654
2016	2,052	19,114
2017	3,134	22,235
2018	2,649	15,965
Primary loss 2002-2018	43,029	
Tree cover loss 2001-2018		312,233
Primary loss/ Total tree cover loss	13.8%	

Source: Mongabay, 2019.

e-ISSN:2717-8277

Among the Kenyan plains, the rise in deforestation hugely affected the plains and the wooden grasslands. The rising cases of drought in many parts of Kenya have also prompted increased cases of deforestation. In the country, long periods affect the livelihood of the people (Reliefweb.net, 2021). As a result, it reaches a point when the people do not have sufficient amounts of food or economic activity and they turn to deforestation such as lumbering so that they can sell these trees to the people who use them as charcoal or they are further sold to the urban centers to be used as building materials (Reliefweb.net, 2021). In the Central region of Kenya, specifically in the towns of Nairobi, Kiambu, Thika, and Kajiado, there has been witnessed a widespread rise in real estate. The migration of people to these towns in a rural-urban migration scenario has prompted the need to build their houses for them to live in. This has led to the huge demand for timber in those towns and this has also precipitated the growing deforestation in the region.

Deforestation in the country has also negatively affected the nation in terms of the capital injections and the returns from the economic activities affected by deforestation. In 2012, the then Kenya's Minister of Forests and Natural Resources, Prof. Noah Wekesa, said that deforestation in that year deprived the Kenyan economy of 5.8 billion while only 1.3 billion shillings (Kenyan Currency) were injected into the economy from the logging activities (U.N Office for Coordination of Humanitarian Affairs, 2021).

3.2 Deforestation Causes in Kenya

Generally, the causes of deforestation in Kenya are as follows: there are unregulated charcoal products, there is logging and livestock grazing, human settlement, landholding problem in the country, commercial farming, and cutting trees from lands to be used for mining activities.

3.2.1 Unregulated charcoal production in Kenya

Statistics from the Kenya Bureau of Statistics have listed charcoal as the top two sources of fuel for Kenya, after firewood. The energy use in Kenya defies the energy ladder theory where it is estimated that with the growth of the disposable income in the country, among the households in Kenya, people should transition from the cheap sources of energy like charcoal and firewood to more sustainable sources of energy like the Liquefied Petroleum gas (LPG) and electricity (Ndegwa et al., 2020). From the data represented in the figure below, between 2005 to 2009, charcoal use in Kenya among the percentage of the population rose by over 12% from 13% to 25%. This data only reduced slightly between 2009 and 2015 (Ndegwa et al., 2020). There are many charcoal kilns in the country, particularly in the forests. With unregulated charcoal business which is a booming business, many people pass the roadblocks mounted on the roads and sometimes they bribe the police officers so that they can be allowed to pass through with the charcoal (Ndegwa et al., 2020).

Issue: 4 2021
International Journal of Water Management and Diplomacy
e-ISSN:2717-8277

Table 4: Primary sources of domestic energy in Kenya (2005-2015)

Fuel type	2005 (% population)			2009 (% population)			2015 (% population)		
	Overall	Urban	Rural	Urban	P-Urban	Rural	Overall	Urban	Rural
Firewood	68.3	10	87.7	7.9	71.3	92.9	54.6	16.1	84.3
Charcoal	13.3	30.2	7.7	68.8	25.5	4.8	14.6	21.9	8.9
Kerosene	13.2	44.6	2.7	14		1.4	14	29	2.3
LPG	3.5	11.9	0.7				13.4	27.6	2.5
Electricity	0.6	1.8	0.2				1	2	0.3
Other fuels	1.1	1.5	1	5		0.9	2.4	3.4	1.7

Source: Ndegwa et al., 2020.

3.2.2 Logging

The Logging problem in the country has been fueled by the increasing rise in demand for wood products by large construction companies and the trees that are cut in the country do not even meet the demand for the raw materials for furniture making and building (Collins, 2020). The need for wood is often met through importation from other countries and also through the local forests. A report by the African business report also states that the logging problems persist because the existing sawmill machinery and the factories are ill-equipped to deal with the need to process large amounts of trees efficiently. The problem with this logging is that the timber that is often harvested when it is irregular in size sometimes is ill-treated making timber in the country to be poorly priced (Collins, 2020). Because of this poor pricing mechanism, the dealers have to cut a lot of timber so that they obtain the needed returns on their investment (Collins, 2020).

Figure 2: Logging Kisumu, Kenya.
Source: Tom Otieno /NMG, 2019.

Issue: 4 2021
International Journal of Water Management and Diplomacy
e-ISSN:2717-8277

3.2.3 Cultivation in the indigenous forests

When the cultivation in the indigenous forests occurs, deforestation occurs because large parcels of land are cleared to pave way for the occurrence of crop farming (FAO, 2020). With the increase in the population, the land available for farming is becoming thinner and thinner and as a result, a vast majority of the population is pushed into the forests so that they can carry out their farming and/or cultivation activities. The reduction in the Arable land per capita in the country has also been blamed for the increase in the cultivation in the forested areas. Statistics below show how arable land per capita has been decreasing over the years (FAO, 2020). As indicated in figure 2, arable land in Kenya has been in a declining trend since the 1960s, this has led people to cultivate more in the indigenous forests leading to loss of forest cover.

Year(Period)	Arable land per hectare
The 1960s	2.2
The 1980s	1.24
The 1990s	0.89
2000	0.66
2020	0.48

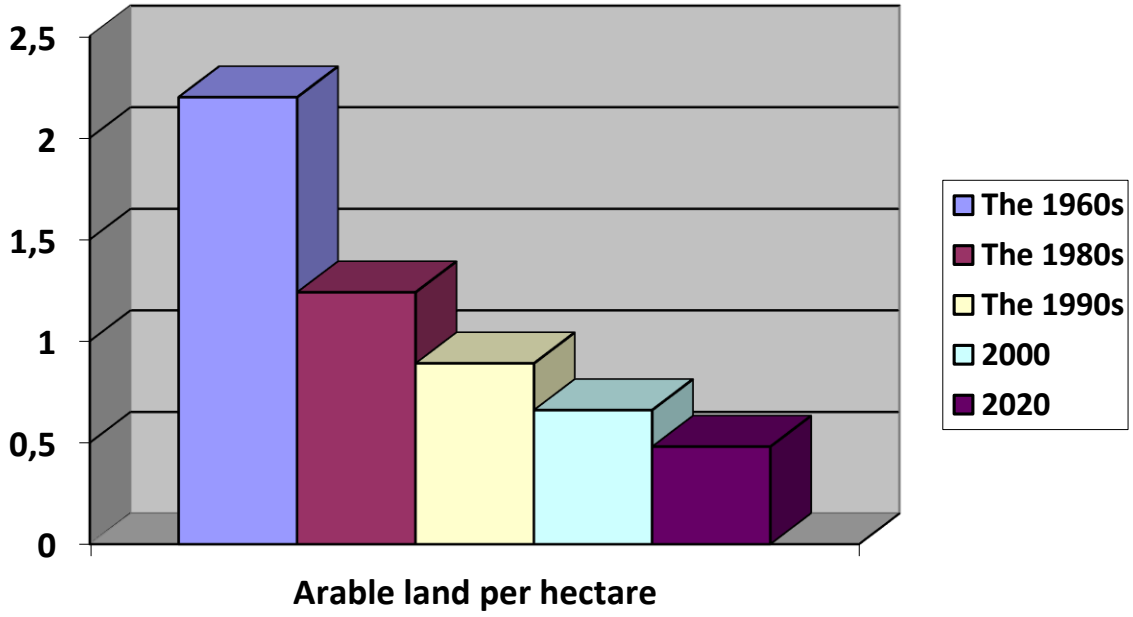

Figure 3: Arable land per hectare in Kenya

Source: FAO, 2020.

Aside from the cultivation in the indigenous forests, the problem of commercial farming has also led to deforestation. For example, there are many acres of land that have been cleared in the country to pave

e-ISSN:2717-8277

way for tea estates, the growth of the sisal, etc. In the Sugar producing belt of Kisumu, Kakamega, Muhoroni, and Bungoma towns in Kenya, in the Western Region, the massive clearing of the forests and the bushes to give rise to the sugar cane plantations has led to deforestation in the region. In the counties of Kericho in areas such as Limuru, there are tee bushes that are standing currently in a place where there were large forests. Although there are policies that have been enacted to boost the production of sugar in the country so that the country can be food secure, these specific policies harm the growth of forests because even sugar cane farming uses a lot of fertilizers (Obidzinski et al., 2015).

3.2.4 Landholding problem

The rise in human population in the country both in the rural areas and the urban areas continues to put a strain on the forested areas and the large expansive lands. In the past, the land was bequeathed as a whole from generation to generation but with a high increase in population, land continues to be subdivided, and even then it is not enough. The subdivided land into plots makes it necessary to cut down trees so that other economic activities that can be supported by the small farms can be put in place. This has given rise to the high-cost plots of land in the urban and semi-urban areas that are exclusively used for residential purposes (Reliefweb.net. 2021).

3.2.5 Mining activities and livestock grazing

Intensive grazing of livestock on the shrubs and even the trees that would otherwise have formed forests in the country also contributes to deforestation. In Kenya, in the Laikipia plateau, in the Maasai Mara area, in the Lake Baringo Basin, and also in the Amboseli region, the Pokot region the number of pastoralist activities in the area have been blamed as the cause of deforestation. Most of these pastoralist communities own large numbers of animals especially cattle. With time, the growth in the numbers of livestock is not commensurate with the growth of the available land for grazing (Boles et al., 2019). Instead of grazing for a while and then leaving the grazing field with some time so that the trees and the grasses can be regenerated, the members of these communities carry out overgrazing leaving no vegetation on the ground.

Kakamega County in the western part of the country has been known as the gold rush area where conglomerates and even the local people often rush to take advantage of the gold in the area. However, gold causes siltation, covering the surface of the land with dust and the uprooting of the tree roots, the coloration of the stream water as a result of the finished wastes of the mining activities leads to insufficiency of water to be used in tree growth (Mulinya, 2020). The gaping holes that are found in the ground sometimes grow and this makes the ground not able to support any agricultural activities and hence there is no chance that the trees could be grown in the areas (Mulinya, 2020).

3.3 The Effects of Deforestation on the Environment and Agriculture

3.3.1 Desertification

The Northern Eastern and the Eastern Counties of Carissa, Turkana, Mandera, Marsabit, and Pokot have experienced desertification for a long time in Kenya. Because of desertification, the land is not suitable

e-ISSN:2717-8277

for crop farming activities (NEMA, 2020). According to Also, D. 2017, the persistence in the drought conditions has also made the land in these areas lack the resources to support any livestock keeping. Due to the increase in the levels of desertification in the region, many of the pastoralist communities have to travel long distances in the search of the elusive water and pasture to be used as a source of nourishment for their animals. As a result of this also, the animals sometimes become so malnourished to an extent that when they are sold they no longer fetch the high prices. Desertification hinders the development of these arid and semi-arid areas and when the current carrying capacity cannot exceed the amount of livestock in the area, livestock farming becomes a non-profitable activity (NEMA, 2020).

3.3.2 Soil erosion

Soil erosion leads to land degradation (Mulinge et al., 2015). Soil erosion is a serious problem in the country because at least 12 million people in the country live in lands that have undergone degradation. In The Manifestation of soil erosion in the country often occurs near the slopes of the mountains, close to the hilly areas, close to the riparian areas, and also banks of rivers and streams (Mulinge et al., 2015). When the trees are cut the soil is eroded to an extent that there is no loam soil available that can support the growth and the development of trees. Soil erosion in the country also comes at a cost. The rangeland degradation of land as a result of soil erosion is a factor that has reduced livestock farming because there is no grass on the surface of the earth. This leads to the reduced milk and meat production. Soil erosion in the country has also been noted as one of the threats to food security because the soil nutrients that would have otherwise supported wheat, rice, and maize farming are depleted (Mulinge et al., 2015).

3.3.3 Floods

Flood is the number 2 cause of the hazards in Kenya that affects or kills people as shown in figure 4 below, floods contributed 38% of total hazards in 2020.

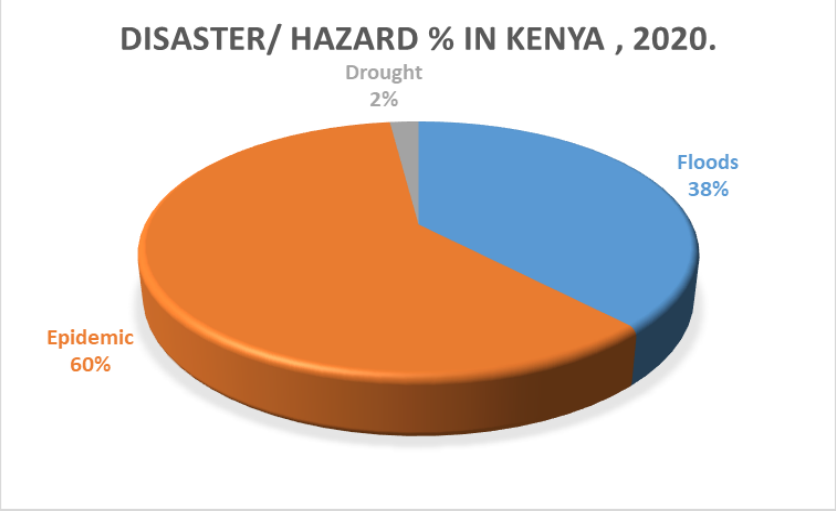

Figure 4: Disaster/Hazard % in Kenya, 2020

Source: Opere, 2020.

e-ISSN:2717-8277

Deforestation in the Mount Elgon area for instance has caused the removal of trees that would have otherwise held and prevented the movement of the sediments of the soil (Opere, 2013). The accumulation of these sediments that often occurs over a long time leads to the expansion of the river bed and sometimes they change the course of River Nzoia which leads to the river bank sometimes breaking and the huge inflows of water seep into the neighboring lands. Flooding affects the environment because the flood water can be breeding grounds for pathogens that cause diseases such as the bilharzia and also it leads to the breeding of the female anopheles mosquito that wreaks havoc on the residents causing high incidences of malaria (Opere, 2013). If deforestation was not done especially in the Mountain slopes of Elgon, Suswa, and the Keiyo slopes, the tree roots would have held back the raging floodwater and reduced its speeds. The deposited silt as a result of the flooding causes the deposition of the black cotton soils which do not support agricultural production (Opere, 2013). Flooding also affects agricultural activities due to its destructive nature. The water destroys crops by breaking down. When the shoots and the seeds imbibe a lot of water due to floods, the quality of the yield is reduced.

3.3.4 Drought

Prolonged drought in 2016 in Kenya caused severe food shortages in the country. A report by UNICEF stated that in 2016, more than 4 million people were left without access to food as a result of the drought (Oloo, 2017). It was a real humanitarian crisis in the country as hunger, thirst, and disease almost left these people on the verge of death. The expansive large forests store moisture, it is this moisture that evaporates into the atmosphere leading to the formation of clouds that cause rainfall (Oloo, 2017). The forests also protect the soil moisture which is often retained in the root systems of the trees. When these trees are cut, the rate of the diminishing of the soil moisture occurs at a similar rate to the rate of the diminishing of the clouds (Macdonald, 2018). Lack of formation of clouds leads to prolonged drought as the rain does not fall for long periods. With no rain, the planted maize, wheat, potatoes, and other crops, shoots shrivel and die up leading to low harvests. In maize production, for instance, the long periods of drought cause stress that makes it difficult for the seeds to germinate and flourish. Long periods of drought in the country are responsible for the occurrence of fluctuated crop yields in the country over a long time.

4.0 RECOMMENDATIONS

A diplomacy approach policy needs to be instituted especially among the communities that reside in the forest areas. This approach will be collaborative and the local people will be hugely involved in the resolution of some of the problems they may in sharing natural resources. The local community has been residing in the forested areas for a long time and as a result, they have gained useful experience in identifying plants and living in harmony with the wildlife. The government needs to tap into the natural experience of these local people and use them in the forest conservation process. They can do this by

e-ISSN:2717-8277

giving them incentives to plant even more trees and coordinating with the existing forest rangers to protect the existing trees.

The government has achieved is the creation of awareness through partnerships with international organizations like the United Nations (National Environment Management Authority (NEMA) -, n.d.). For example, the United Nations Convention on Combating Desertification works with the local government to train the local communities, the women, and the children for instance to better interact with the natural resources so that they can fully participate in activities that help in the restoration of the forest cover. Some of the key initiatives that have been taking place include the Desertification Day where the wide-ranging awareness programs are laid out and the members of the community are reminded of the need to be cooperative, collaborate, and actively engage in the environmental conversation activities (National Environment Management Authority (NEMA, 2020).

The Forest Conservation Act of 1980 has been the single-unifying policy of India that was adopted to protein the forest regions in the country and this act has yielded fruits and the same can be replicated in Kenya (Verma, 2020). The importance of the policy is that is a unifying piece of legislation and over the years it has achieved the following: it has promoted the protection of the territory, the individuality, and the economic value of the forests. It came with the penalties that prevented the forests from being converted into residential areas and plots. The centrality of the top authority in making some key decisions about the forests also made sure that the State and the local governments from coming up with their restrictions concerning forested areas (Verma, 2020).

In the country, the Forest Conservation and Management Act that appeared in the Kenyan laws as gazette notice number 34 was the single most still in force legal ban on the logging of trees. This act has helped in taming the indiscriminate logging of trees from the forested areas but more needs to be done especially on the implementation of the ban so that it is more effective. Eradication of corruption and unfair business practices would help in the implementation of the ban(*Kenya Law | Kenya Gazette*, 2016).

Over time, other policies that have been implemented by the government of Kenya include the Kenya environmental policy that is designed by the National Environmental Management Agency, the acts that established the Kenya Forest Service which is a government-based institution that could help in the reduction of deforestation in the country. The government has also put together the Rangelands Management Policy which is tasked with the provision of guidelines to promote forestation in the Arid and Semi-Arid Areas, but not all these policies have been implemented by the government. The government had an ambitious plan of restoring the forest cover in the country to be about 10% or more through the Introduction of the Sessional Paper Number 1 on Forestry of 2007. This sessional paper focused on the threats that currently bedevil the forests in the region. However, the problem of urbanization and other threats that are emerging periodically reveals that there is a need for this policy to be updated so that it reflects the current threats (Ph.D. Candidate) et al., 2016).

The Supreme legislative piece in the Republic of Kenya is the Kenyan Constitution, Chapter 5 and section 69(1), sub-article (b), states that it's the mandate of the state to ensure that 10% of land forest cover is maintained throughout the country. Genetic resources and diversity protection is etched in Part e of the

e-ISSN:2717-8277

constitution of Kenya. Areas used in catching the water are identified in section 62(1) (g) of the constitution of Kenya and this also identified the presence of the national and game reserves which are placed under the public utilities. Besides them being public utilities, they can be managed and acquired by certain Kenyan communities. These communities may also use these forested areas as shrines. An Act of Parliament is the one that often specifies how forested and public land should be used. It is furthermore, the responsibility of the State government to ensure that the environment and the forests are properly managed, conserved, and exploited. Under this protection are also the natural resources (Verma, A. 2020).

The new constitution of Kenya 2010 states that both the national government and the country governments must join hands to ensure that the forests are protected. The 2015 Transitional implementation plan mandated all the county governments to come up with their strategies to be used in national goals of forest conservation. This work was supposed to be done in consultation with the Kenya Forest Service. Also, the same constitutional dispensation Chapter 5, section 69 (1) d, gives processes where people who live close to the forests to be allowed to take part in the forest conservation measures. Lack of clear forest boundaries is an issue in the nation. However, erected fences, to some extent have reduced human-animal conflicts. This policy helped to save forests from the increased encroachment of the people and exploitation. Some protected Kenyan forests include Shimba Hills National Park, Aberdares National Park, Mwea National Park, and Lake Nakuru National Park, etc. The provision of roads at the forest edges has also been said to be an activity that acts as a buffer zone. The establishment of the Nyayo tea zones has also led to the protection of the unique species of trees and effectively made sure there is no encroachment of forests in the Aberdare forest. The 2007 KWS report on banning non-legal entry into Mount Kenya revealed some sure improvement where the 6013.5 forest land that had suffered the long periods of degradation is on the path of recovery after extreme deforestation was reported in 2003. In the Mount Kenya reserve, the stopping of the illegal cutting of trees in the 2003 to 2007 period was an efficient way of stopping the destruction of the forest ecosystem. Key programs of Forest conservation implemented by the National government over the years are as follows: (i) Forest Conservation and Management, (ii) Forest Plantations and Enterprise, and (iii) Farm and Dryland Forestry Development (Kenya Forest Service, 2015).

Forest conservation measures are also etched in the vision 2030, visionary development-based legislation of the government of Kenya. Vision 2030 Fourth Pillar is about the environment and it is stated as, "A nation living in a clean, secure and sustainable environment." This vision continues to identify some of the natural forest management practices that are unsustainable and which need to stop. Some of these unsustainable forest management practices include poaching, conflicts between human beings and wildlife, wrong policies, and a poor regulatory framework. The Vision 2030 proposes the following measures to protect the forests: conservation, pollution and waste management control and the land management in the Arid and Semi-Arid Areas, planning and good governance incorporation (Thugge, Ndung'u & Otieno, 2008).

The 2010 Kenyan constitution established the Transitional Authority which explains how the counties in the Kenyan Republic should manage the existing forest resources. County governments according to the

e-ISSN:2717-8277

constitution are supposed to ensure that housing estates are established where there is at least 5% of the landmass dedicated to forests. The establishment and the management of a recreational center is also a legally established mandate of the county governments. The 2012 Forest Charcoal Act of the County governments also gives them the power to regulate charcoal production in the counties. Each county may set up its bylaws and policies to implement the forest growth and development activities (Kenya Forest Service, 2015).

It is not only the forest policies in Kenya that can contribute to the reduction of deforestation in the country. Other vital policies include the Intensive Agricultural policies which propose intensive farming on a small piece of land rather than farming in a huge area. Also to be developed is a policy framework that reduces the incentives that are offered to the companies and the individuals who cut timber. In Kenya, without the support of the banking institutions that offer credit activities, not many people will be able to harvest timber. This policy should further be extended to a situation where the government is extremely strict on the people who carry out the illegal harvesting of timber. Bottlenecks should be instituted to make it extremely hard to obtain licenses to carry out deforestation. This will create a deterrence effect and discourage people from the indiscriminate cutting and harvesting of trees.

5.0 CONCLUSION

The importance of the forests to humanity cannot be overrated. Their responsibility in the maintenance of the ecosystem and promotion of continual economic growth has been well enumerated in the paper. Despite all this, a spike in deforestation closely linked to agriculture, rise in human population, logging, inadequate governance structure, fraud, fires in the wild, and poor living conditions have placed the people and the whole ecosystem at risk. Changes in the climate are attributable to deforestation.

As climate changes, like the floods, drought, and even the occurrence of cyclones rise. Deforestation also leads to soil erosion and a rise in the destruction of the soil biodiversity. Government institutions like the Kenya World Life Service and the Kenya Forest Service play a unique role, together with other international and NGO partners in coming up with measures that will successfully hinder people from encroaching on the forests. Some of these measures include banning tree logging, gazetting forests as protected areas, forest boundary marking, collaborative approach where the members of the public are involved in forest conservation, awareness of the public members so that they can know the existing rules, and regulations that govern forest conservation measures. The impediment is also a strategy of the authorities where physical boundaries are placed around the forests to prevent the people from encroachment on the forests and patrolling. Technology may also be involved in forest conservation specifically social media education approach and carrying out aerial surveillance to detect the encroachers on forests.

e-ISSN:2717-8277

Creating awareness on how deforestation affects agriculture and the environment will be important to encourage them to comply with forest conservation programs and make informed daily choices. The government of Kenya has been planting trees over time but also it has imposed restrictions on logging and charcoal burning. The combination of environmental policies and agricultural policies will ensure there is sustainable agriculture and at the same time protect natural resources. Kenya National government has implemented different forest conservation programs such as Forest Conservation and Management, Forest Plantations and enterprises, and Farm and Dryland Forestry Development. These programs are not only working to reduce deforestation but also in reforestation and land reclamation. The programs align with Kenya Vision 2030 Fourth Pillar, achieving a country with a clean, secure, and sustainable environment.

Acknowledgment

There was no funding involved.

Author Contributions

Both authors contributed substantially to the research design, data collection, data analysis, write-up, and editing of the manuscript. The submitted version is checked and approved by both authors.

Conflict of Interest

The authors confirm that there are no conflicts of interest.

References

Also, D. (2017). *In Kenya, severe drought threatens to leave 4 million food insecure*. Unicef.org. https://www.unicef.org/stories/kenya-severe-drought-threatens-leave-4-million-food-insecure

Boles, O. J. et al (2019). Historical Ecologies of Pastoralist Overgrazing in Kenya: Long-Term Perspectives on Cause and Effect. *Human Ecology*, *47*(3), 419–434. https://doi.org/10.1007/s10745-019-0072-9

Buttler, R. (2010). *Kenya Forest Information and Data*. Rainforests.mongabay.com. https://rainforests.mongabay.com/deforestation/2000/Kenya.htm

Cesareo, K., Walker, L., Varela, J., & Smith, A. (2021). *Deforestation and Forest Degradation | Threats | WWF*. World Wildlife Fund. https://www.worldwildlife.org/threats/deforestation-and-forest-degradation#causes

Collins, T. (2020). *Kenya faces a timber shortage as demand for wood grows*. African Business. https://african.business/2020/11/energy-resources/kenya-faces-timber-shortage-as-demand-for-wood-grows/

Derouin, S. (2019). *Deforestation: Facts, Causes & Effects*. Live Science; Live Science. https://www.livescience.com/27692-deforestation.html

FAO and UNEP. 2020. *The State of the World's Forests 2020. Forests, biodiversity, and people.* Rome. https://doi.org/10.4060/ca8642en

Food and Agriculture Organization. (2020). *FOSA Country Report - Kenya*. Www.fao.org. http://www.fao.org/3/AB569E/AB569E03.htm

Harneis, J. (2018). *Mining in the DRC*. Cool Earth. https://www.coolearth.org/2018/09/mining-drc/

Kenya Law | Kenya Gazette. (2016). Kenyalaw.org. http://kenyalaw.org/kenya_gazette/gazette/volume/MTY2OA--/Vol.CXX-No.28/

Kenya Maize yield, 1960-2020 - knoema.com. (n.d.). Knoema. Retrieved June 10, 2021, from https://knoema.com/atlas/Kenya/topics/Agriculture/Crops-Production-Yield/Maize-yield

Kideghesho, J. R. (2015). Realities on Deforestation in Tanzania — Trends, Drivers, Implications and the Way Forward. *Precious Forests - Precious Earth*. https://doi.org/10.5772/61002

Kogo, B. K., Kumar, L., & Koech, R. (2019). Forest cover dynamics and underlying driving forces affecting ecosystem services in western Kenya. *Remote Sensing Applications: Society and Environment*, *14*, 75-83. https://doi.org/10.1016/j.rsase.2019.02.007

M, J. (2018). Deforestation in Uganda: Population increase, forests loss, and climate change. *Environmental Risk Assessment and Remediation*, *02*(02). https://doi.org/10.4066/2529-8046.100040

Macdonald, J. (2018). *Does Deforestation Lead to Drought? | JSTOR Daily*. JSTOR Daily. https://daily.jstor.org/deforestation-lead-drought/

Martins, F. S., Cunha, J. A. C. da, & Serra, F. A. R. (2018). Secondary Data in Research – Uses and Opportunities. *Revista Ibero-Americana de Estratégia*, *17*(04), 01–04. https://doi.org/10.5585/ijsm.v17i4.2723

McGrath, M. (2019). Deforestation: Tropical tree losses persist at high levels. *BBC News*. https://www.bbc.com/news/science-environment-48037913

Mongabay (2019). *Deforestation statistics for Kenya*. https://rainforests.mongabay.com/deforestation/archive/Kenya.htm

Mulinge, W., Gicheru, P., Murithi, F., Maingi, P., Kihiu, E., Kirui, O. K., & Mirzabaev, A. (2015). Economics of Land Degradation and Improvement in Kenya. *Economics of Land Degradation and Improvement – a Global Assessment for Sustainable Development*, 471–498. https://doi.org/10.1007/978-3-319-19168-3_16

Mulinya, C. (2020). *Gold Mining Industry and Its Implications on the Environment Kakamega South Sub-County, Kakamega County, Kenya*. ResearchGate. https://www.researchgate.net/publication/344908287_Gold_Mining_Industry_and_Its_Implications_on_the_Environmentin_Kakamega_South_Sub-County_Kakamega_County_Kenya

National Environment Management Authority (NEMA) - Desertification and Drought Day 2020. (n.d.). Www.nema.go.ke. Retrieved June 10, 2021, from https://www.nema.go.ke/index.php?option=com_content&view=category&id=2&Itemid=469

National Environment Management Authority (NEMA) -. (n.d.). *Desertification and Drought Day 2020*. Www.nema.go.ke. https://www.nema.go.ke/index.php?option=com_content&view=category&id=2&Itemid=469

Ndegwa, G., Sola, P., Iiyama, M., Okeyo, I., Njenga, M., Siko, I., & Muriuki, J. (2020). *Charcoal value chains in Kenya: a 20-year synthesis*. https://doi.org/10.5716/wp20026.pdf

Obidzinski, K., Kusters, K., & Gnych, S. (2015). Taking the Bitter with the Sweet: Sugarcane's Return as a Driver of Tropical Deforestation. *Conservation Letters*, *8*(6), 449–455. https://doi.org/10.1111/conl.12172

Onekindplanet.org. (2016). *Top 10 - The World's Most Endangered Animals - OneKind*. OneKindPlanet. https://onekindplanet.org/top-10/top-10-worlds-most-endangered-animals/

Opere, A. (2020). Floods in Kenya. *Developments in Earth Surface Processes*, 315–330. https://doi.org/10.1016/b978-0-444-59559-1.00021-9

Dr. E. W. (2016). Processes Of Track Three Diplomacy In The Management Of Cross-Border Security Relations Between Kenya And Somalia. *The International Journal of Social Sciences and Humanities Invention*. https://doi.org/10.18535/ijsshi/v3i7.03

Reliefweb.net. (2021). *Kenya: IRIN Focus on dangers of deforestation - Kenya*. ReliefWeb. https://reliefweb.int/report/kenya/kenya-irin-focus-dangers-deforestation

Reliefweb.org. (2014). *Kenya: Drought - 2014-2019*. ReliefWeb. https://reliefweb.int/disaster/dr-2014-000131-ken

Silva Junior, C. H. L., Pessôa, A. C. M., Carvalho, N. S., Reis, J. B. C., Anderson, L. O., & Aragão, L. E. O. C. (2021). The Brazilian Amazon deforestation rate in 2020 is the greatest of the decade. *Nature Ecology & Evolution*, *5*(2), 144–145. https://doi.org/10.1038/s41559-020-01368-x

U.N Office for Coordination of Humanitarian Affairs. (2021). *Kenya: IRIN Focus on dangers of deforestation - Kenya*. ReliefWeb. https://reliefweb.int/report/kenya/kenya-irin-focus-dangers-deforestation

e-ISSN:2717-8277

Venkateswarlu, B., & Singh, A. K. (2015). Climate Change Adaptation and Mitigation Strategies in Rainfed Agriculture. Climate Change Modelling, Planning and Policy for Agriculture, 1-11. doi:10.1007/978-81-322-2157-9_1

Verma, A. (2020). *All you need to know about the Forest Conservation Act, 1980*. IP leaders. https://blog.ipleaders.in/need-know-forest-conservation-act-1980/

Vizzuality. (n.d.). *Kenya deforestation rates & statistics | GFW*. Forest Monitoring, Land Use & Deforestation Trends | Global Forest Watch.

Voumatter. (2020). *Deforestation - What Is It? What Are Its Causes, Effects, And Solutions?* Youmatter. https://youmatter.world/en/definition/definitions-what-is-definition-deforestation-causes-effects/

Wolosin, M., & Harris, N. (2018). Tropical Forests and Climate Change: The Latest Science. Ending Tropical Deforestation: A Stock-Take of Progress and Challenges, 1. Retrieved from https://wriorg.s3.amazonaws.com/s3fs-public/ending-tropical-deforestation-tropical-forests-climate-change.pdf

Wu, Y. (2011). *Investigation of Deforestation in East Africa on Regional Scales* [Undergraduate Dissertation]. https://www.diva-portal.org/smash/get/diva2:450729/FULLTEXT01.pdf9%20(Accessed

Yohannes, H. (2015). A Review on Relationship between Climate Change and Agriculture. Journal of Earth Science & Climatic Change, 07(02). doi:10.4172/2157-7617.1000335.

,

HPA