

EVALUATION OF SUSTAINABLE DEVELOPMENT APPROACHES AND PERESENTATION OF NEW SCENARIOS IN SOUTH KHORASAN PROVINCE WITH EMPHASIS CLIMATE CHANGE

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Evaluation of sustainable development approaches and presentation of new scenarios in South Khorasan province with emphasis on climate change

Global warming and its environmental consequences, such as climate change, are the biggest environmental threat on Earth. The effects of climate change have led to water and food shortages, illness, unemployment and migration, poverty, resource tensions and global instability. The purpose of this study is to analyse the effects of climate change on a landscape and its impact on sustainable development. South Khorasan province in Iran, is a region that is in crisis due to the misuse of natural resources. There are many environmental “sustainability ladders”. According to the findings, the effects of climate change have a significant and inverse relationship with sustainable development. Hence, the present article introduces four conceptual approaches. It identifies the largest and most vital environmental crises in Iran today, using a hierarchical analysis process and the opinions of 60 experts in the field of environment and urban planning. The degree of threat of each crisis (AHP) is quantified. Finally, the priority of the threat crises and the weight of each of them were obtained as follows: Drought (0.425), Destruction of forests pastures and Agricultural lands (0.222), Air pollution (0.147), Evacuation of villages (0.139) and Loss of biodiversity (0.067). By identifying these priorities, four approaches to each of the crises to deal with the devastation of “ideal sustainable development” were proposed. As an Approach to Drought Crisis Evacuation of villages and migration to “and” air pollution “to address the” strong sustainable development of forests, pastures and agricultural lands and to address biodiversity loss, one of the two approaches to weak sustainable development or “poor sustainable development” approach to cities, pollution control is recommended. The important consequences of climate change for this region are the water crisis, drought and the migration of villagers, and the increase in heat, air and fine dust in the cities. The results show that in order to achieve sustainable development in this region, as a result, with the consequences of climate change, it can be sustainable that must be chosen.

Key words: sustainable development, climate change, adaptation, South Khorasan

INTRODUCTION

According to statistics, the average world today is a good place for living. Development in the second half of the 20th century has been more than previous human periods. The population has grown fivefold, the median income since 1820 AD, has increased 8 times. The world economy in the second half of the twentieth century has grown more than any other period in history. The GDP in the world from 1950 to 1990, has had an annual growth rate of 3.9% 6 times. While the growth rate from the years 1820 to 1950 was 1.6 percent and from 1500 to 1820 AD was 0.3 percent. Life expectancy in the world the year 1800 was about 30 years, while in the year 2000 it reached 67 years and in high-income countries 75 years. In countries with adequate health systems, rates infant mortality has reached

very low levels and vaccination has almost eradicated the deadly diseases of children (Strange 2008).

Most of the consequences of climate hazards in the low-lying coastal belt of developing countries occur mostly due to the effects of climate change, recurring storms, hurricanes, etc. (Haque et al. 2021). Climate change is now beginning to affect the way our communities live and function (Bell et al. 2015). As a result, the risk of potential climate change in communities with significant social, economic, health, cultural, and environmental hazards is significantly increased (Mallick et al. 2017). The consequences of climate change and severe climate events have generated a great deal of attention, both theoretically and practically, among researchers in this field. Some recent studies have presented scenarios that show the consequences of climate change will be more severe (Gustafson et al. 2018, p. 149 and Peng et al. 2019, p. 469). Estimates show that by 2050, between 150 and 200 million migrants will be affected by global climate change (IPCC 2018). Climate change is likely to exacerbate poverty, and agricultural groups are more at risk in less developed countries (Uttam et al. 2020, p. 124). Climate change and global warming are contributing to the spread and persistence of drought. Also, this change causes the scattering of rainfall and affects water resources (Khosravi et al. 2010). Climate scenarios are widely considered a key tool for climate change impact and risk assessment (Wilby et al. 2009, p. 1193).

One of the most important consequences of climate change in Iran is the frequency and extent of heat waves, the number of days of dust and drought, and consequently the lack of water resources and the destruction of environmental and agricultural ecosystems. Climate change and global warming as well as snow, hail, storms, night dew, floods, heavy rainfall, drought, heat and cold in the planning and policies of the agricultural and water management sectors, environment, human welfare, system Social and economic factors have a great impact. Due to the importance of the issue, countries analyze it in national, regional, continental and international dimensions (Rahimzadeh and Fatahi 2005). Climate change affecting the sustainable development of the country in terms of its impact on logistics and regulatory capacity. There is currently no single consensus definition of sustainable development or indicators (UNSCD 2012b). However, many definitions of sustainability and sustainable development have been made in the resources. However, the most enduring consensus is the definition of the Brundtland Commission (WCED 1987). Sustainable development is development that meets current needs without compromising the ability of future generations to meet their needs. The concept of sustainable development deals with the quality and quantity of economic growth simultaneously. It considers three dimensions of welfare: environmental, economic and social. This concept generally addresses needs in the first place, not only economic needs but also the need for a clean environment, a secure and cohesive society and the opportunity to create employment. In the concept of sustainable development, equality between generations is important in order for the next generation to have the same opportunities as the current generation (Giovannini and Linster 2005). It seems that human development trends suffer from a lack of intergenerational justice. Distribution Unjust wealth and poverty in the world are examples of the lack of justice. It is endogenous and the number of resources consumed by the earth throughout the years after the Industrial Revolution indicate progress. The great human economy in this era, without any effects is not harmful to the environment. One of the countries that lacks justice between generations and is suffering is Iran. Despite the very high antiquity of Iran, the amount of exploita-

tion and destruction of resources in the last century is much more than it has been throughout history. The biggest challenge of South Khorasan is the water supply to the city, and in the province, the destruction of historical heritage, the reduction of green spaces and augmentation. Expanding residential lands, increasing worn-out tissues, urban poverty and related issues are examples of the lack of intergenerational justice. The realization of sustainable development in this city has become a dream has done. Therefore, the present article intends to introduce four levels: “Weak sustainable development”, “Strong sustainable development”, “Ideal” and to sustainable development, the fit of each of these “pollution controllers” and examine approaches to the current situation in South Khorasan.

The necessity of this research arises from the fact that the continuation of trends available, not only to future generations, but also to current generations threatens their lives in the near future. These effects on the economic, social and ecological dimensions of one in the country and neglect of and public awareness related to this phenomenon affects the development of the country and the future of Iran and South Khorasan, of the international community and the power of the government. The main question of this research is: Is there a significant relationship between climate change and sustainable development?

Climate change is one of the most important challenges in eastern Iran. Therefore, understanding climate behaviour has led to awareness of the crisis of severe drought, sources of heat stress and the emergence of the important consequence of climate refugees in the climate in this region. In this study, we have rightly tried to sustain from the importance of the effects of climate change on the process of sustainable development with the aim of promoting climate change. As a result of the political turmoil in the event of unintended impacts on the dry state, there was little water and water resources, homelessness, unemployment and migration, etc.

STUDY AREA

South Khorasan Province is located in the east of Iran and lies between 30° 32' and 34° 36' northern latitude and 57° 1' to 60° 50' eastern longitude with a total surface area of 102,460 km². Most of the province area is a platform or continental shield and these flat areas are limited to the Bagheran Mountains from centre and the north. The South Khorasan province has wide altitudes and scattered plains (Esmailnejad 2021).

RESEARCH METHODOLOGY

Since the extent and volume of each of the crises mentioned are not carefully recorded and the severity of the effects of each of them on the economy, society and living conditions of citizens are not agreed upon, to assess the optimal approach in the face of each of these crises, you should consult the opinions of experts and specialists. For this reason, this article presents a method of hierarchical analysis to determine the priority of each crisis AHP (Analytic Hierarchy Process). To carry out this process, the importance of each variable was determined.

The hierarchical analysis process is flexible, robust and simple to decide in situations where decision criteria contrasts make it difficult to choose between the options to be used (Zebardast 2010). To prioritize the listed environmental crises from the perspective of how threatening they are, questionnaires containing paired

comparisons were designed with 60 environmentalists, urban planning and climatology specialists completing it. The general model of analysis is as follows:

The research method of this research is quantitative and after the list of Critical areas of South Khorasan, using the analysis process and completing the questionnaire by AHP specialists in areas of environment and urban planning, the level of related risks identify each of the crises and score points earned and the type of encounter with each of them suggests the above approaches.

There is currently no single definition and consensus case of development stability or no measurement indicators (UNCSD 2012a). However, there are many definitions of sustainability and sustainable development mentioned in the sources. Perhaps the most consensual definition of development stability is the definition of the Brand Land Commission (WCED 1987).

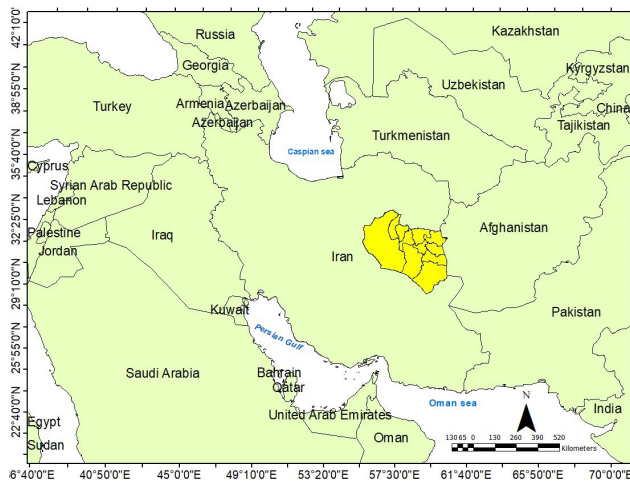


Fig. 1. The location of the study area

Sustainable development is a development that meets current needs without endangering the ability of future generations to meet their needs. To continue, the Lars-WG (a Stochastic Weather Generator for Use in Climate Impact Studies) model (Racsco et al. 1991) was evaluated by comparing statistical period data and data produced by the model using statistical tests and comparative graphs. For this purpose, the baseline scenario was prepared for the statistical period of 1981-2020 and the model was implemented for the mentioned base period. To evaluate the outputs of the Lars-WG model (Donuso 2002), monitoring and modeled data were prepared for 4 climatic elements of maximum and minimum temperature, precipitation and radiation, humidity, as well as their statistical characteristics including monthly average, etc., and the model's ability to create past climates and climate change was identified by this model in the South Khorasan province.

The first version of the LARS-WG weather generator was developed in Budapest in 1990 as part of an assessment of agricultural risk in Hungary, a project funded by the Hungarian Academy of Sciences (Racsco et al. 1991). The Lars model is capable of generating random time series of precipitation. The maximum and minimum temperature and solar radiation are on a daily scale. The amount of

precipitation for one day is more than the semi-empirical distribution of precipitation for the month in question as it is obtained independently of the wet series or the amount of precipitation in the previous day. The temperature in this model is estimated using the Fourier series and this model is used for simulating the length of dry and wet periods. Precipitation and solar radiation on a daily scale from semi-empirical distributions use the formula below (1) – Semenov (1998).

Formula 1:

$$E_{mp} = \{a_0, a_1; h_i, i = 1, \dots, 10\}.$$

RESULTS AND DISCUSSION

The concept of sustainable development in terms of quality and quantity of economic growth simultaneously pays and includes three dimensions of welfare: economic, environmental and social. This concept in the first place pays for its needs; not only economic needs but also the need for a clean environment, safe and cohesive society and opportunities such as abundant employment. The second point in the concept of sustainable development is intergenerational equality, in the sense that the future generations should have opportunities similar to the opportunities available to the current generation. The third point is that the concept based on equality is emphasized within and between countries (Giovannini and Linster 2005). To prioritize the listed environmental crises from the perspective of how threatening they are, the questionnaires were designed with couple comparisons and 60 environmentalists in urban planning completed them. The general model of analysis is shown in Fig. 2 (Elliott 2013) Sustainable Development Goals in Three Dimensions, Social, Biological and Economic.

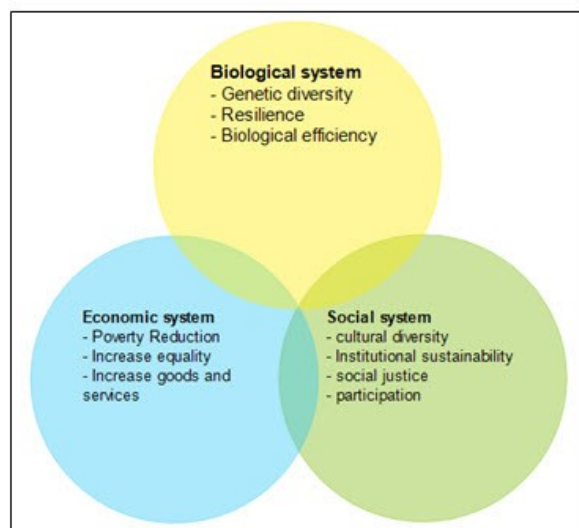


Fig. 2. Sustainable Development Goals

Source: Elliott (2013)

The South Khorasan province's 17 years of continuous drought has destroyed the natural foundations of rural areas. In order to better display the results, the dif-

ference between the mean monthly observed and predicted precipitation is presented. Both scenarios for the months of February, March, January, October, November and December predict the decrease in rainfall in the decade 2020 – 2050 (Fig. 3). The greatest decrease in rainfall will occur in February. In January, May and June, scenario A2 predicts a decrease in precipitation and scenario B1 predicts an increase in precipitation.

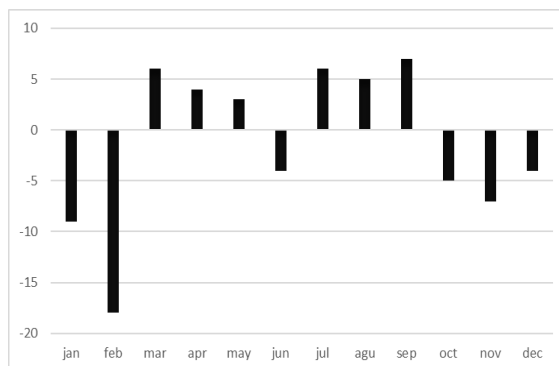


Fig. 3. Changes in average monthly rainfall of 2020 – 2050 under scenarios SRES A2 and B1 scenarios

The end result of climate change is the transformation of an intermediate space of tension and conflict into water transfer. Therefore, in cities such as Nehbandan and Sarbisheh, water transfer leads to social tensions and challenges the development of this region (Fig. 4)

According to the analysis of climate change in the South Khorasan province, unstable, highly unstable and severely unstable areas were classified. The southern and western regions of the province have created climate instability, which has been accompanied by high temperatures and reduced rainfall and continued drought.

The relationship between environment and human activities

Rapid population growth, accompanied by agricultural modernization and disproportionate distribution of land leads to farmers not having enough land or access being reduced to productive lands. This leads to environment tensions such as increased migration to cities, evacuation of villages in arid areas, illegal exploitation and more pressure on forest areas. These tensions lead to adverse environmental consequences such as human habitation in areas of danger, lack of healthy and safe water, exacerbated drought, desertification, land degradation, degradation of vegetation, soil erosion, reduced soil fertility, global warming and biodiversity loss.

Four types of approaches to sustainable development

Thinkers and experts on the concept of sustainable development, examine this issue and different approaches to it, and they have presented different patterns. Some magic patterns including economic, social and environmental pillars have been proposed Valentine and Spangenberg (2000) and Bell and Cheung (2009). There are presented the six aspects of the Charter of Stability. Burden distribution,

efficiency, accessibility, justice, democracy, are “economic requirements” and below are 4 general concepts of “care institutional requirements” and “environmental requirements”. “Social requirements” are ladder of stability.

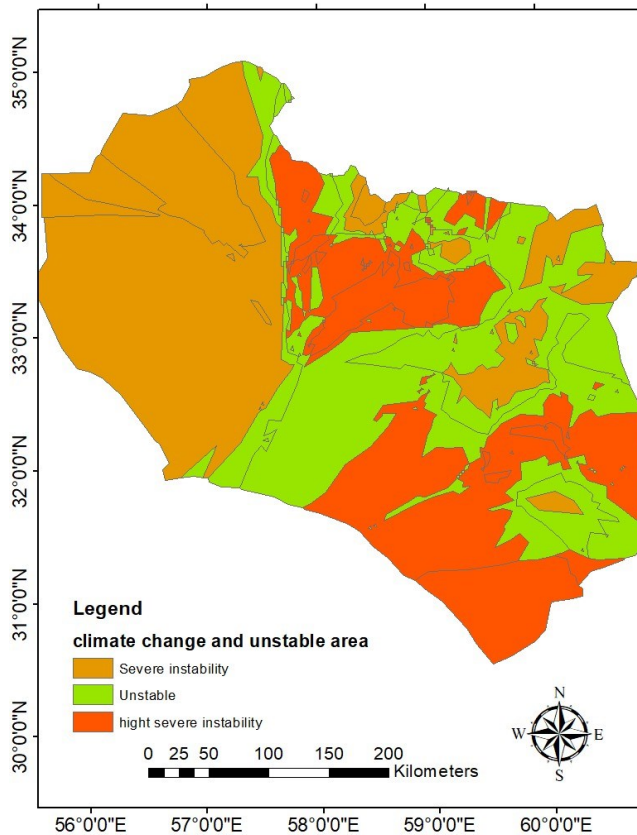


Fig. 4. Climate change and unstable area in South Khorasan

Introducing the ladder model of sustainability and its approaches

The sustainability ladder model, approaches sustainable development on the basis of the level of priority they give to the environment. There are four categories: ideal model, strong sustainable development, poor sustainable development and pollution control. Also, the principles of the normative type of development and the spatial focus of each pattern are specified as well. At the bottom of the sustainable development ladder is the pollution control approach. Proponents of this approach believe that pollution often occurs when the early stages of industrial development are underway. Then we get to the stage where pollution is no longer just a side effect of economic growth and is necessary to implement pollution control policies (Baker 2006).

Following the pollution control approach, the next step of the ladder to sustainable development is dedicated to integrating capitalist growth with environmental concerns. Proponents of this case have been working to make the actual transcript

of this statement available online. life that contained resources and “natural capital.” Important natural processes such as forests.

It’s worth it, it’s their economic value or amount allocated. This price is based on the extent of people’s desire for payment which is made to maintain that natural capital. This “cost-benefit” figure can be used to perform the analysis (Dresner 2002).

Climate change and environmental crises in South Khorasan province

Today, this southern province with environmental and social crises and with different economics are struggling. These crises are often caused by human mismanagement and have accumulated over time and today they have reached dangerous levels (Fig. 5). Since the present article emphasizes environmental issues, a set of crises of the major countries is listed below:

1. Evacuation of villages and migration to the city;
2. Destruction of forests, pastures and agricultural lands, soil erosion, increase flood probability, decrease runoff absorption capacity;
3. Drought, reduction of surface water, reduction of water underground, land subsidence;
4. Air pollution (dust, greenhouse gas emissions) and loss of biodiversity.

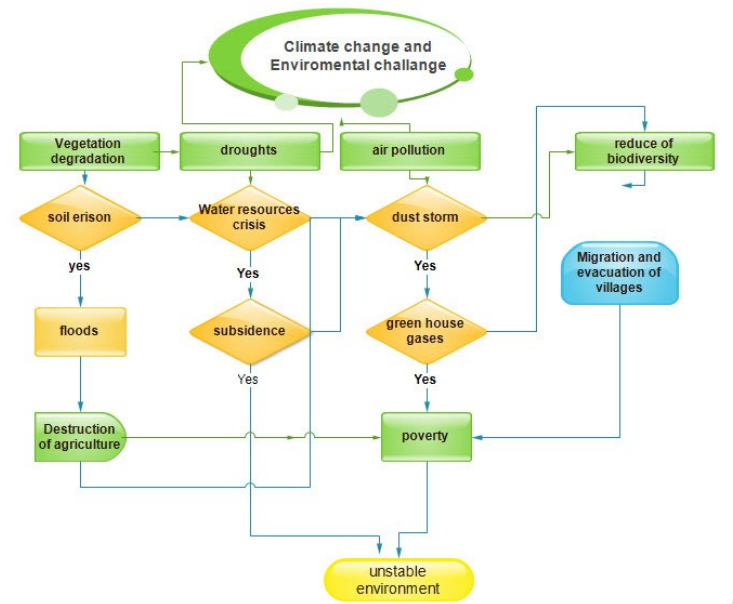


Fig. 5. Analytical model of research

After 20 questionnaires were completed by experts, Expert Choice software analyzes the weight of their priorities. The results of the analysis are presented in Table 1.

Tab. 1. Results of hierarchical analysis by sections

| Type | Crisis | General weight |
|------------------------|--|----------------|
| Main critical | Drought | 0.425 |
| | Destruction of forests, pastures and Agricultural lands | 0.222 |
| | Air pollution | 0.147 |
| | Evacuation of villages | 0.139 |
| | Losses biodiversity | 0.067 |
| | Groundwater reduction | 0.519 |
| Drought | Land subsidence | 0.242 |
| | Reduction of surface water | 0.239 |
| | Soil erosion | 0.371 |
| Vegetation degradation | Reduction of runoff adsorption power | 0.368 |
| | Increased probability of flood | 0.261 |
| Air pollution | Greenhouse gases and toxic | 0.626 |
| | Dust | 0.370 |

It is now necessary to weigh each of the crises relative to the total environmental problems in general. For this it suffices to weigh the weight of each subsection in the weight of the section and multiply it by its total weight relative to the subject to determine the environment. By doing so, the end result (Tab. 2) will be obtained. Crises and their subdivisions are listed in order of weight. One of the important steps in hierarchical analysis is the compatibility test for this hourly test of formulas and introduces various indicators for the number of criteria that so there is no reason for brevity in this section. One of the advantages of the software is where the incompatibility values for expert choice come into play. The scores of each respondent are combined and these scores are calculated. Accordingly, the incompatibility values of each respondent were less than 0.1, which was a confirmation that internal consistency is the answer. Also for general incompatibility the value 0.02 was found because it is less than 0.1.

Tab. 2. General classification of environmental crises

| Title impact climate change and critical | Total weight |
|--|--------------|
| Groundwater reduction | 0.220 |
| Evacuation of villages | 0.139 |
| Land subsidence | 0.103 |
| Reduction of surface water | 0.102 |
| Greenhouse gases | 0.092 |
| Dust storm | 0.091 |
| Soil erosion | 0.082 |
| Reduction of runoff adsorption power | 0.082 |
| Biodiversity loss | 0.082 |
| Increased flood probability | 0.058 |
| Heat waves | 0.055 |

It is now possible to have values related to the threat of each one of the consequences of climate change and environmental problems in Tables 1 and 2, the a favourable approach for them is suggested and results prioritized them accordingly. The most threatening environmental issue in the South Khorasan is drought as it accounts for the total weight of the problems. This means that drought is a serious threat in returning, it is and should be an “ideal model” to be considered. In fact, any economic, demographic, political problem should be given second priority to drought. Any use of water that leads to reduction of existing water resources, even if there are economic benefits, should also be banned altogether. According to climatic data, the drought in the South Khorasan province has lasted for 15 years (Fig. 6).

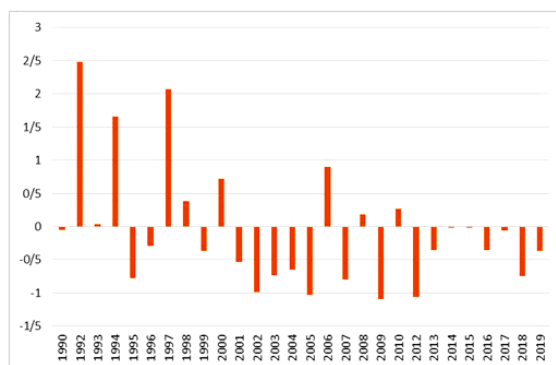


Fig. 6. Frequency of drought years with SPI index

The second threat is the destruction of forests, pastures and agricultural lands, it is about a quarter of the total critical weight and it is dedicated to the environment. This crisis, too although less severe than the drought crisis, but facing further development, also requires special measures. Understanding of local livelihoods and vulnerabilities, knowing the assets that comprise people’s livelihoods and the factors (including climate-related risks) that shape vulnerability to ensure the design of appropriate and locally-relevant project activities can help to sustainable development. Finally, it seems that loss of biodiversity and biological change in this region due to climate change is defeating sustainable development. Community development activities for immediate to needs of communities through diversification of local productions systems and revenue opportunities, and reduce the pressure on pasture resources and biodiversity is the final strategy.

CONCLUSION

Climate change can affect and exacerbate environmental and non-climatic variables such as socioeconomic factors, migration. The effects of climate change on human settlements are direct and indirect. Direct effects include increased heat stress on humans and severe droughts, and indirect effects include reduced freshwater resources, agricultural productivity, migration, and the depopulation of rural settlements. The real challenge is to show the link between the effects of climate change on sustainable development and policy decisions. The present study first introduces as follows four approaches. Then the biggest and “ladder of stability”

concept identify the most vital environmental crises in the South Khorasan province today and (AHP) and by using the hierarchical analysis process benefit from the opinions of 20 environmental and urban planning experts. There are comparisons of how threatening each of the crises and their subdivisions are (Tab. 3).

Tab. 3. The final strategy to deal with climate and environmental crises in South Khorasan Province

| Crisis | Strategies |
|---------------------------------------|--------------------------------|
| Drought | Ideal sustainable development |
| Vegetation degradation | Strong sustainable development |
| Air pollution | Weak sustainable development |
| Evacuation of villages | Poor sustainable development |
| Biodiversity loss / control pollution | Poor sustainable development |

After recognizing the environmental crises of this region four strategies have been proposed to respond and resilience to these crises:

- ideal sustainable development strategy and adaptation to drought,
- strong sustainable development to tackle air pollution and reduce dust storms impacts,
- sustainable development and reduction of migration from rural to cities and empowerment of rural stakeholders
- sustainable development and increasing biodiversity and adapting to climate change.

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Morteza Esmailnejad

HODNOTENIE PRÍSTUPOV UDRŽATEĽNÉHO ROZVOJA A PREZENTÁCIA NOVÝCH SCENÁROV V PROVINCIÍ JUŽNÝ CHORÁSÁN S DÔRAZOM NA KLIMATICKÚ ZMENU

Všetky javy na tomto svete sú prepojené a navzájom sa ovplyvňujú vrátane dosahov, ktoré zanechávajú. Skúmaným problémom tohto príspevku je vplyv zmeny klímy na proces udržateľného rozvoja a vplyv udržateľného rozvoja na proces klimatickej zmeny. Ak bude globálne otepľovanie, ktoré sa za posledné roky stáva vážnou hrozbou, pokračovať súčasným tempom, môže ovplyvniť počasie a jeho priebeh. Počasie sa postupne stane veľmi nevyspytateľné a spôsobí zmenu života, najmä v rozvojovom svete. Klimatická zmena je jednou z environmentálnych výziev na Blízkom východe a jej dôsledky, ako sú suchá, vlny horúčav a chladu a vysychanie vodných zdrojov v extrémnom rozsahu, môžu viesť až k zničeniu ľudských sídiel. Preto pochopenie správania sa klímy viedlo k uvedomeniu si krízy zdrojov extrémneho sucha, tepelného stresu a k prejavu dôležitého dôsledku klimatických zmien v regióne, ktorým sú klimatickí utečenci.

Cieľom výskumu je identifikácia dôsledkov klimatických zmien v Južnom Chorásáne a ich vplyv na udržateľný rozvoj v tejto oblasti. Provincia Južný Chorásán v Iráne je zároveň regiónom, ktorý sa nachádza v kritickej situácii aj v dôsledku nesprávneho využívania prírodných zdrojov.

Existuje mnoho environmentálnych „rebríčkov udržateľnosti“. V tejto štúdii bola využitá metóda hierarchickej analýzy, ktorá určuje priority jednotlivých kríz. Udržateľný rozvoj je taký rozvoj, ktorý umožňuje uspokojiť súčasné potreby bez toho, aby ohrozoval schopnosť budúcich generácií uspokojovať svoje potreby. Okrem toho bol vyhodnotený Lars-WG model, porovnaním štatistických údajov za dané obdobie a údajov vytvorených modelom pomocou štatistických testov a porovnávacích grafov. Na tento účel bol pripravený základný scenár pre štatistické obdobie 1981 – 2020 a model bol implementovaný na uvedené východiskové obdobie. Na vyhodnotenie výstupov modelu Lars-WG boli pripravené monitorovacie a modelované dáta pre štyri klimatické prvky (maximálna a minimálna teplota, zrážky a radiácia), ako aj ich štatistické charakteristiky vrátane mesačných priemerov a pod. Model bol využitý na identifikáciu klímy v minulosti a odhad budúcich klimatických zmien v provincii Južný Chorásán.

Keďže provincia Južný Chorásán nemá veľkú kapacitu zdrojov povrchovej vody, je veľmi dôležité venovať osobitnú pozornosť skúmaniu zmien zrážkových pomerov. Sedemnást' rokov nepretržitého sucha v provincii výrazne zmenilo prírodné predpoklady pre život obyvateľov vidieckych oblastí. Výsledky výskumov za uvedené obdobie poukazujú na 4-percentný nárast zrážok v provincii, zníženie počtu dní s teplotou pod bodom mrazu, zvýšenie priemernej ročnej teploty približne o 0,3 stupňa Celzia. Najvyšší mesačný nárast teploty (o 1 stupeň Celzia) bol zaznamenaný v zimnom období. Fenomén sucha v oblastiach prírodných zdrojov vedie k chudobnej vegetácii a erózii pôdy a jedným z dôsledkov tohto javu je aj šírenie škodcov a nákaz na pasienkoch a v lesoch. Táto koncepcia platí v prvom rade pre naplnenie potrieb. Ide nielen o potreby ekonomické, ale aj potreby čistého životné-

ho prostredia, bezpečnej a súdržnej spoločnosti a dostatok pracovných príležitostí. Druhým bodom v koncepcii udržateľného rozvoja je medzigeneračná rovnosť, ktorá je chápaná tak, že budúce generácie by mali mať podobné príležitosti, aké má k dispozícii súčasná generácia. Tretím bodom koncepcie je to, že táto je založená na rovnosti v jednotlivých krajinách, ako aj medzi nimi.

Na záver konštatujeme, že politické rozhodnutia prijaté s cieľom znížiť dosahy klimatickej zmeny v provincii Južný Chorásán sú pomerne neefektívne. Z hodnotenia plánu udržateľného rozvoja vyplýva, že príznaky klimatickej zmeny povedú v budúcnosti k zaostávaniu a environmentálnym hazardom. Preto v mestách ako napr. Nehbandan a Sarbisheh, vedie transfer vody k sociálnemu napätiu a je aktuálnou výzvou pre rozvoj regiónu, ktorá bojuje s rozličnými environmentálnymi, sociálnymi a ekonomickými krízami. Krízy sú často spôsobené nesprávnym riadením, nahromadili sa v priebehu času a v súčasnosti dosiahli nebezpečnú úroveň. Preto sa odporúča, aby manažéri a odborníci v provincii Južný Chorásán zvolili stratégie, ako je efektívna správa povodia, prispôbenie sa klimatickým zmenám, zvýšenie odolnosti a využívanie čistej energie na zníženie emisií skleníkových plynov, a tak sa adaptovali na dôsledky klimatických zmien. Výsledky ukazujú, že na zníženie klimatických rizík spôsobených klimatickou zmenou v regióne v záujme udržateľného rozvoja je potrebné určiť adaptačné stratégie a prijať nízkouhlíkové scenáre. Zmena výsadby a správne využívanie vodných zdrojov môže viesť tento región k udržateľnému rozvoju.



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