

# Anthropogenic Impacts in the Himalayas and the Sustainable Development Goals (SDGs)



Durmuş Çağrı Yıldırım, Seda Yıldırım, and Seda H. Bostancı

**Abstract** The world leaders and policy makers globally agree on fighting against to the climate change for sustainability of living conditions for people. The rapid continuation of climate change is mostly a result of human activities nowadays. In other words, anthropogenic impacts on climate change have become a common issue for both academic, scientific and political platforms. Therefore, the era we live in has also left its mark as the Anthropogenic era. The Himalayan Mountains, where glaciers are located, contain forty percent of the world's fresh water. With this aspect, considering various different environmental riches, the sustainability goals of this field, which is among the main backbones of the world's ecological sustainability, is a critical research topic. In this context, it is vital to make future predictions by looking at the relationships between Sustainable Development Goals and anthropogenic effects and the Himalayas. The main aim of the study is to explore the relationships between the effects of climate change and human activities in the Himalayas under the 2030 Sustainable Development Goals. In this study, it is planned to present a conceptual perspective by interpreting economic, ecological and social indicators with the help of some global statistical data.

**Keywords** Sustainable development goals (SDGs) · Anthropogenic impacts · Ecological indicators

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D. Ç. Yıldırım

Faculty of Economics and Administrative Sciences, Department of Economy, Tekirdağ Namık Kemal University, Süleymanpaşa, Turkey

S. Yıldırım (✉)

Faculty of Economics and Administrative Sciences, Department of Business, Tekirdağ Namık Kemal University, Süleymanpaşa, Turkey

e-mail: [sedayil1@gmail.com](mailto:sedayil1@gmail.com)

S. H. Bostancı

Faculty of Economics and Administrative Sciences, Department of Political Science and Public Administration, Tekirdağ Namık Kemal University, Süleymanpaşa, Turkey

# 1 Introduction

Climate change is a natural phenomenon that has occurred in various periods of the world. However, today's climate change and accelerating global warming, which is the result of anthropogenic effects, has caused some sudden separation in the world. "Anthropogenic features such as urbanization, roads, and power lines, are increased by rapidly growing human populations" (Leu et al., 2008). The human factor, which affects the environment and climate, also creates a multiplier effect with the world demography and population growth. Along with population increases, technological development, environmental pollution and the problems of directing large volumes of capital accumulation to investments are the factors that trigger the human impact on global climate change (İslamoğlu & Akkuzu, 2023).

The concept of Anthropocene has emerged as a result of the combination of the Greek origins of "human" and "new" concepts. Also, scientific roots come from anthropology, which describes the human history (Usher, 2016). "Considered as a category and concept, the term inspires fear, revelations, skepticism, and all manner of predictions and projects" (Moore, 2015). The effects of human impacts on climate change vary from environmental pollution to excessive consumption of natural resources and energy usage. It certain that we must stop seeing anthropogenic release of CO<sub>2</sub> as something detached from future energy supply questions (Höök, & Tang, 2013). "The effects of anthropogenic emissions can now be discerned not only globally, but also at more regional and local scales for a variety of natural and human systems" (Hansen et al., 2016).

The Anthropocene, which was first conceptually defined by the Russian scientist Aleksei Pavlov in the 1920s, the environmental problems that increased exponentially after the second world war, the colonization of the world and the dramatic changes in the human–environment interface brought about by the rise of capitalism, including the age of fossil fuels, made this age more threatening to life on earth than in other periods (Foster, 2016). According to Lewis and Maslin (2015) the year of beginning of this era is 1964. "The key advantage of selecting 1964 as the base of a new Anthropocene Epoch is the sheer variety of human impacts recorded during the Great Acceleration almost all stratigraphic records today, and over recent decades, have some marker of human activity" (Lewis & Maslin, 2015). The most important feature of this age is that climate change occurs faster than expected time estimates in the world. Instead of taking urgent measures to environmental problems, human impacts take superficial measures with greenwashing approaches (Yıldırım, 2023; Yıldırım & Kantarcı, 2022), causing irreversible environmental problems. At this point, the sustainability discourse is also a phenomenon that is both supported by its solution-generating aspect and criticized by environmental activists and academics as a global dimension of greenwashing. Taking these criticisms into account, this study is based on the 2030 sustainable development goals as the broadest way of common sense for the future of the world, despite everything. The 2030 SDGs cover the sustainable development goals of the United Nations, which aim to realize the most favorable conditions for the continuation of the world's favorable condition for

human life, by considering equality and justice as much as possible. In the study, evaluations on the ecological sustainability of the Himalayas will be made through the 2030 sustainable development goals and policy recommendations will be developed. This study includes an originality in the interpretation of 2030 items regarding the Himalayas and the creation of original tables. It is aimed that this study will be a guide for those who will work in this field in the future in terms of a basic due holistic analysis.

## 2 The Position of the Himalayas

It is thought when understanding the position and importance of the Himalayas will be helpful to determine why the link between climate change and the Himalayas is important issue among the worldwide. The Himalayas are dominated by a region of about 2400 km stretching from Nanga Parbat (Pakistan) on the west coast and Namche Barwa on the east coast. The Himalayan contains ecological features within the region. For example, the climate is tropical at the foot of the mountains and the climate is formed as permanent ice at higher elevations (McGill School of Computer Science, n.d.).

The Himalayas are considered to be the region with the largest glacier mass in the world after the polar regions. There are approximately 15 thousand glaciers in this area and the glaciers contain 3000 cubic kilometers of fresh water (Himalayas Facts, n.d.).

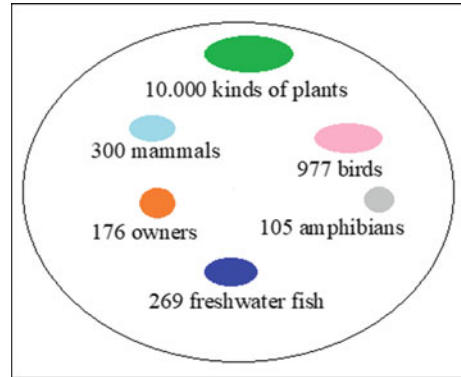
The most important feature of the Himalayas is being the most important source of fresh water around the Polar regions. 16.6% of India's geographical area belongs to the Himalayas (Kumar et al., 2021).

The Himalayas form the largest and youngest mountain range in Asia. These extend to Bhutan, China, India, Nepal and Pakistan, respectively (Ghosh, 2021). The Himalayas cover the highest part of the world. In other words, it is home to the highest mountain peaks in the world. The highest peak, Everest (8848 m), is located in the Himalayas. Afterwards, high peaks such as Godwin-Austen mountain (8611 m) and Kanchenjunga (8586 m) are also located here. The two main seasons in the Himalayas are transitional and summer–winter. The winter season is very cold in Himalayas, while the summers can be seen as 25–30 °C in the central parts of the Himalayas. On the other hand, all areas above 4880 m are under snow patterns and are constantly cold (Mount Everest, 2018).

The Eastern Himalayas stand out with the large number and variety of living species in the region. Asia's largest herbivore, the Asian elephant, one-horned rhinoceros and wild hippopotamus live here (WWF, n.d.a). The rich ecosystem of the region can be categorized as Fig. 1.

Unique creatures such as the Bengal tiger and snow leopard also live in this region. Problems such as the climate crisis and environment-human conflict experienced by the Himalayas pose a great threat to the unique ecosystem (WWF, n.d.a).

**Fig. 1** Ecosystem of the Himalayas. WWF, (n.d.a)  
Source adapted from



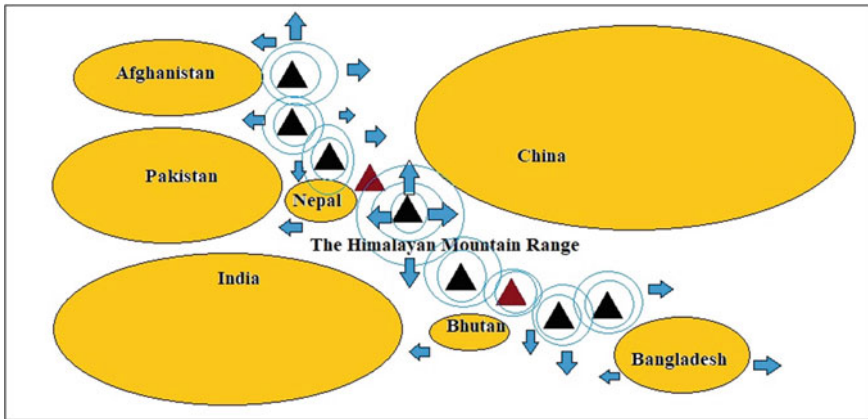
### 3 The Climate Change and the Himalayas

Today, the Himalayas are one of the most important regions where the effects of climate change are felt on a global scale. Food insecurity, water scarcity and energy security problems and biodiversity problems will gradually increase due to the continuation of climate change in the long term. It is a fact that each negative impact on food security and water security in the Himalayas will expand in the Asian region and then the world. As being a water tower of Asia, the Himalayas are a vital source of water for the world. Accordingly, more than 500 million people in South Asia and 450 million people in China depend entirely on the Himalayas, while the lives of more than a billion people depend on the same resource (WWF, n.d.b).

An increase in temperatures due to the climate change has caused the glaciers to melt faster. At this point, the rapid melting of the glaciers in the Himalayas shows that the threat of climate change is at serious levels. The melting of the glaciers in the Himalayas increases disasters such as avalanches and floods and poses a great danger to the population living in the region. In addition, melting glaciers cause sea level rise worldwide (Ntv.com.tr, 2021). The most of studies on the impact of climate change on the Himalayas is seen as “melting of glaciers” in the literature. In other words, the melting of glaciers in the Himalayas is seen as the greatest threat posed by climate change (Shrestha et al., 2012). As seen in Fig. 2, the impacts of the Himalayas can cover all over the Asia region in the future.

As scientists have pointed out, climate change has been anthropogenic in the last century. It is stated that the temperature change experienced in the Himalayas between 1951 and 2014 is human-induced. It can be said that there is a warming of 0.2° every year in the relevant area (Sabin et al., 2020).

Large chunks of ice from the glaciers in the high reaches of the Himalayas have caused many deaths and great destruction in Uttarakhand, India. The sinking of glaciers also increases threats such as floods and landslides in the same region. Between 2016 and 2018, it was observed that the glaciers in the region lost about 0.5–2.5 m of perimeter thickness. Considering that melting glaciers pose a long-term



**Fig. 2** The Himalayas among the Asia region. *Source* Created by the authors

threat to the region, taking precautions will be a vital necessity (Buchholz, 2021). As a result of global warming and anthropogenic climate change, the ecosystem in the Himalayas is also being destroyed. Factors such as the melting of glaciers, deforestation, excessive consumption of natural resources, the spread of invasive species, and poaching signal that the ecosystem in the Himalayas will not be sustainable in the long run (Ghosh, 2021). Figure 2 shows these locations.

#### **4 2030 Sustainable Development Goals (SDGs) and the Himalayas**

Sustainable development aims to achieve economic development when keeping balance between economic growth and environmental quality in the long term (Yildirim, 2023; Yıldırım & Yıldırım, 2020; Yıldırım et al., 2023; Yıldırım et al., 2018). The world leaders also noticed that achieving economic growth is not enough without social welfare. At this point, sustainable development is a new guide both for developed and developing countries. By 2015, the UN launched 2030 Sustainable Agenda and 17 main goals planned to be achieved until 2030. These goals include economic, social and environmental issues and each main goal includes some sub-goals (Yıldırım et al., 2023). There is a clear gap in knowledge of economic impacts of climate change in the Himalayas (Gautam et al., 2013) (Table 1).

The effects of climate change in the Himalayas region also affect the 2030 SDGs. In particular, accelerating global warming complicates the realization of the 2030SDGs. As a result of the literature review, the following can be said in terms of the Himalayas and 2030SDGs:

**Table 1** The 2030 SDGs. *Source* created by the authors

Goals*	Theme*	Prior issue	What is this?
Goal 1	Poverty	Related with Economic issues	Poverty is an essential problem and related with issues of health, education and economic growth in general. Poverty should be reduced in the world to provide better life condition for everybody
Goal 2	Hunger	Related with social welfare	Hunger mostly threatens least developed countries and poor or low-income countries in the world. However, twenty-first century showed that the hunger threatens every kind of economies in the long term. The Covid-19 pandemic, the Russia-Ukraine conflict and the climate change have shown that the hunger is the biggest problem
Goal 3	Health	Related with social welfare	The world leaders have seen that providing sustainable health of societies is important aim in the long term. Especially, the covid-19 pandemic proved that no country is ready for the pandemic
Goal 4	Education	Related with social welfare	Sustainable education should be provided in the world and it should be provided equally to each girl and boy in the world
Goal 5	Gender equality	Related with social welfare	Gender equality is an important issue in education, work, health and other social and economic issues in the world
Goal 6	Clean Water	Related with environmental quality	In the world, there have been many people who had no any fresh and clean water since decades. Due to the rising global warming, the future will meet more drug and water scarcity
Goal 7	Clean Energy	Related with environmental quality and economic issues	Clean and affordable energy is related with also economic sustainability when it keeps protecting environmental quality. Without energy, economies can't keep economic growth and welfare. On the other side, air pollution and environmental destruction are all related with non-green energy plants

(continued)

**Table 1** (continued)

Goals*	Theme*	Prior issue	What is this?
Goal 8	Economic growth	Related with Economic issues	Economic growth supports social welfare. Accordingly, societies should keep the optimum level of economic growth to achieve social welfare in the long term
Goal 9	Industry	Related with Economic issues and environmental quality	The industry is responsible for achieving environmental quality when considering their impacts on natural environment since decades
Goal 10	Inequalities	Related with social welfare	Inequalities should be ended in the world. Each individual should reach equal rights and life-standards
Goal 11	Sustainable cities	Related with environmental quality and social welfare	Usual city life pollutes natural environment and it isn't sustainable in the long term
Goal 12	Responsible consumption—production	Related with Economic issues	Sustainable consumption patterns should be adapted in the long term. To achieve sustainable development, sustainable production process and systems should be adapted by the industry
Goal 13	Climate change	Related with environmental quality	The climate change is a fact that changing the usual climate and ecosystem of the Earth. Although it is an natural event, the human factor is more effected on the climate change in recent years
Goal 14	Clean Sea and oceans	Related with environmental quality	Clean sea and oceans will achieve sustainable marine biodiversity and then it will bring sustainable seafood and will support seafood security
Goal 15	Clean Lands	Related with environmental quality	Clean and sustainable land areas are needed to achieve sustainable agriculture and stock in the long term

(continued)

**Table 1** (continued)

Goals*	Theme*	Prior issue	What is this?
Goal 16	Peace and Justice, strong Institutions	Related with social welfare	Peace, justice and strong institutions will save communities in the related region and this will prevent migration
Goal 17	Global Partnership	Related with social welfare	Global partnerships can supports countries to achieve some goals in the same region. For example, countries from the Mediterranean region can collaborate with each other to achieve seafood security in this region

\*based on UNPD, <https://www.undp.org/sustainable-development-goals>

- Although the Himalayas are a region rich in biodiversity, it has been exposed to anthropogenic effects. This region is an important livelihood point for the poor people with the terrestrial resources it provides. It can be said that efforts to reduce poverty and protect biodiversity in the Himalayas are not very effective (Sandhu & Sandhu, 2015). In the long term, the focus should be on the sustainability of the biodiversity in the Himalayan region to prevent a migration wave from the region.
- Negative consequences of climate change in the Mediterranean basin (Kaplan & Yıldırım, 2023; Kaplan et al., 2022; Yıldırım & Kaplan, 2022) have also started to appear in the Himalayas. However, the acceleration of climate change in the Himalayas has increased the melting of the glaciers. Melting glaciers threaten water resources globally (Xu et al., 2009).
- Despite their inaccessibility, the Himalayas are heavily subject to human-induced biodiversity loss. People have lived in the Himalayan mountains for thousands of years, but global accessibility in recent years has increased demand for this region. The ecosystem area is gradually deteriorating and biodiversity is under threat. The proliferation of the human population and the proliferation of residential areas have disturbed the balance in the ecosystem. For example; Forest lands have been destroyed and deforestation has begun to create agricultural and planting areas (CEPF, n.d.).
- Food security differs between mountainous and plain areas in the Himalayan region. Limited accessibility in mountainous areas results in a high level of vulnerability in this region. Therefore, people living in mountainous areas have to contend with food insecurity and other socio-economic challenges. In terms of food security, agricultural activities have also been tried to be supported in mountainous areas, but climate change has also negatively affected these supports (Rasul et al., 2019).
- The most basic principle for food safety can be explained as “self-sufficiency in food”. At this point, the lack of self-sufficient food in the mountainous areas of the Himalayas region creates a great food insecurity. For example, between 2012 and 2017, it was seen that the rural mountain population was very vulnerable



to food in the mountainous areas of the Himalayas. In 5 years, food insecurity has increased by 12%. Between 2012 and 2017, the mountain population in Asia increased by 8.1%, but the food-resistant population decreased by 7.5%. About 1.5 billion people live in the mountainous area of the Himalayas and depend on this area for all their basic needs (Khandekar, 2019).

- The mountainous part of the Himalayas (HKH-Hindu Kush-Himalayan), where food insecurity is high, constitutes the smallest area of poor people (Jean-Yves et al., 2015).
- Shyamsundar et al. (2018) examined the relationship between poverty and forest in the Himalayan region. According to the results of the study, per capita income in Nepal is half of the per capita income in India. However, those living in the Himalayas seem to be in a better position in terms of wealth. Having a lot of forest land can be considered as good for the population.
- An old study also shows how farmers in Nepal are affected by the climate crisis. Extreme weather conditions (winter drought 2008–2009) have reduced agricultural yields and the vast majority of the population in Nepal has been affected by the climate crisis. (Oxfam International, 2009).
- The Indian Himalayan part is home to a very rich habitat, but these natural resources have been overused due to high demand. At this point, the problem of sustainability has emerged. Therefore, it would be beneficial to develop alternative strategies and policies for the sustainability of biodiversity in the relevant region (Badola & Aitken, 2010).
- Resurrección et al. (2019) studied on gender divert among the Himalayas region through climate change effect. Women at different socioeconomic levels are also affected differently by the consequences of the climate crisis, due to inequalities based on oppressive cultural rules and norms in the distribution of rights, sprawl, resources and power. As a result, women in the Himalayas are often poorer and less educated than men. Although women gain economic life, there are inequalities between men and women in terms of income and other socio-economic rights.
- The International Center for Integrated Mountain Development (ICIMOD) published a report about climate change in the Hindu Kush Himalaya region. In the report, it was determined that a temperature rise of 2 °C became deadly for the Himalayan glaciers (Bhushal, 2019).
- Gender relations in the Himalayas region vary according to the external migration status of men. The inequality between men and women in the Himalayas region is also seen in farming. Women can farm, but they cannot go to markets or public spaces. In addition, while men show themselves in all kinds of social areas, the social role of women is very limited (Holmelin, 2019).
- The aim of Goal-5 is to achieve gender equality and improve the social rights of women and girls through active participation in social, political and economic development. Following the Sustainable Development goals, Nepal has also focused on gender discrimination. Gender inequality is very high in male-dominated regions. Women have less social roles in society. Particular attention should be paid to improvements in the rights of women and girls in rural areas (Dhungana, 2022).

## 5 Conclusion and Discussion

Among the human-induced effects that increase climate change are factors such as the use of fossil fuels, cutting of forests and animal husbandry. For a sustainable future, global warming must be stopped. Therefore, it is essential to control the influence of human-induced factors (European Commission, n.d.). The climate crisis, the effects of which became visible in the twenty-first century, threatens the ecosystem in the HKH region. Policies should be developed urgently for the protection of biodiversity and the continuity of the ecosystem in the Himalayas. In particular, strategies on resilience need to be established (Kattel, 2022). Panwar (2020) determined the importance of preventing global warming and climate change effects on the Himalayas immediately. Unsustainable human-based activities will destroy the biodiversity and ecosystem in the Himalayas in the short term.

The most important risk of the Himalayan region is the melting of glaciers as a result of temperature increases due to climate change. The primary risk is thought to be melting glaciers. Because the melting of glaciers affects fresh water resources and negatively affects life by causing floods and overflows in the region. People living in the region first have to deal with natural disasters such as floods. On the other hand, the changing climate affects agricultural activities. Sustainable agriculture does not seem possible. Deforestation for agricultural purposes will affect the population living in the region in the long term as drought and erosion. In fact, stable work for 2030SDGs is required for the salvation of the region in the face of global warming and rising temperatures. The resilience of this region is important for the future of the whole world. If the Himalayan region falls, so will the Asian region. In other words, the world is not and can never be ready for the great wave of immigration that will start from Asia. It is estimated that Asia, which hosts a large part of the world's population, will not be able to host climate refugees in other regions due to climate change-related problems. As a result, in order not to lose the Himalayas region, it is necessary to urgently reduce the activities that cause carbon emissions among the human-induced activities and to prevent temperature increases. Deforestation for agricultural land in the Himalayas region should be prevented and it is recommended to continue on existing agricultural areas. In order for the region to be self-sufficient, improvements in the 2030 SDGs should be made, but it is recommended that activities that have accelerating effects on climate change should be eliminated with alternative solutions, even if they have positive outputs. For example, farming is an important area in gender equality. However, each new agricultural area enters the ecosystem as less forest. As suggested by Goal-17, the Himalayas region should be made resilient through global cooperation and regional cooperation.

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