

**THE IMPACTS OF GEOTHERMAL ENERGY ON RURAL COMMUNITIES:
ENVIRONMENTAL INJUSTICE IN THE CASE OF AYDIN, TURKEY**

By

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Abstract

Although geothermal energy solution to energy demand, it is a justice issue for most of the citizens in rural areas. In the province of Aydin in Turkey, there are many ecological issues which are water, soil and air pollution due to geothermal energy power plants. The pollution caused by these power plants, which are generally built in rural areas, turns into environmental issues such as unequal distribution and participation for rural residents. The research aims to shed light on how geothermal power plants and their regulations affect rural communities in Aydin through the lens of Environmental Justice and Modernization. In order to see how the geothermal power plants are related to the local people, data was obtained from the narrative interview with a person from Kizilcakoy village of Aydin and secondary data such as documentary, newspaper news, and academic articles. The obtained data were analyzed with the narrative analysis method. After comparing the findings and existing literature, the results show that while geothermal power plants promote economic interests for the private powers, they negatively affect local people socially, economically, and environmentally. The implications show that modernization, which is based economic growth, is not sustainable in Aydin and geothermal energy policies and practices, which are based on modernization, causes environmental justice issues for citizens of the village in Aydin.

Keywords: geothermal energy, environmental justice, rural community, sustainability, modernization

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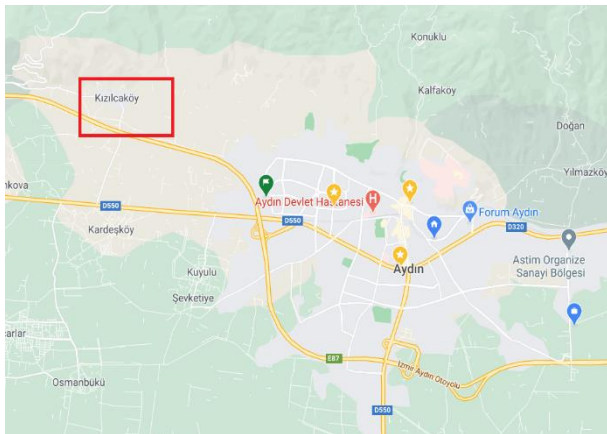
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1. Introduction

Described in 1671 by the Ottoman explorer, Evliya Çelebi, as the city where "oil flows from its mountains and honey from its plain", Aydın has historically been known for its fertile lands in the Menderes Basin and as a location that has preserved a unique culture and tradition. A city in southwestern Turkey known for this historical past, agriculture, and summer tourism, Aydın is currently "home" to thirty out of Turkey's sixty geothermal power plants. Although geothermal energy is considered by policy as a climate-friendly and renewable energy source in the world, the emission levels of geothermal power plants are even higher than coal-fired power plants (Aksoy et al., 2015). The incomes of the village residents in Aydın province are generally provided by agricultural activities conducted on fig and olive farms. In addition to soil and water pollution, geothermal power plants pollute the air, too. The purpose of my research is to shed light on how geothermal power plants and their policies affect rural residents living near geothermal power plants while encouraging private companies. Although there are limited studies in the academic field on the damage caused by geothermal power plants to the environment, there is no study on the environmental justice issues. By basing my research on narrative interviews conducted with Aydın residents and analyzing secondary data from articles, documentary and newspapers, I will focus on the Kizilcakoy district (See Figure 1) in Aydın as a case study that demonstrates how justice issues are related to the rural community. This paper argues that the region's categorization as an economic investment area rich in underground geothermal sources is (the potential of Aydın can be seen in Figure 2) one of the main factors contributing to environmental injustice and inequality for citizens living in rural areas. Using the case of Aydın, I follow the following research question: How are Turkey's geothermal energy practices related to rural communities in its approach to modernization and environmental justice?

Figure 1. The location of the Kizilcakoy village (Google maps)



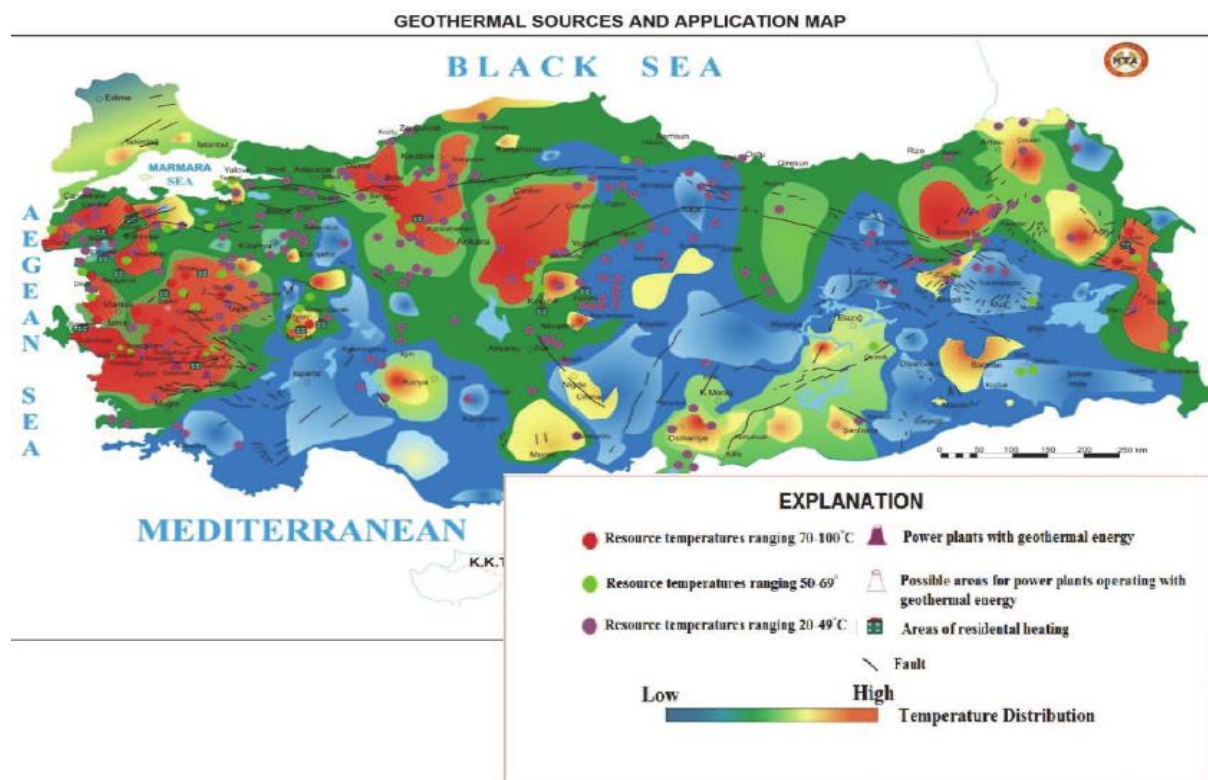
Before analyzing Kizilcakoy, it is necessary to provide an overview of Turkey's environmental policies. In article 1 of Law No. 6094, Turkish Policy YEKDEM, geothermal energy is considered a renewable resource, there is no legal regulation in Turkey that limits the carbon dioxide emission of geothermal power plants or imposes an obligation to report them. In addition to the aim of bringing renewable energy resources to the economy by this law, it is also

aimed to privatize rural areas in the geothermal law. According to the Geothermal Resources and Natural Mineral Water Law No. 5686, accepted in 2007, anyone can obtain a license and seek

geothermal resources. It means that it is not necessary to have preparation, equipment, or infrastructure related to geothermal resources. These laws related to geothermal have affected the sustainability and local people in regions with geothermal resources due to irregularity and deficiencies. Furthermore, in Turkey an Environmental Impact Assessment is not required for geothermal plants of less than 5MW (Geothermal laws 2007). Moreover, plants like the one in Kizilcakoy are not required to have an emergency action plan (Yakan 2021). As a result, there are potential environmental and social issues that are not addressed surrounding these plants. Kizilcakoy, one of the rural areas of Aydin, which is known as a natural and cultural structure, has several environmental and social impacts caused by geothermal power plants.

The ecological issues related to geothermal power and source potential in Turkey, geothermal sources are shown in Figure 1, are the water, air, and soil pollution caused by a large part of these power plants. In thermal waters supplied from geothermal sources, varying amounts of arsenic, boron, selenium, lead, cadmium, hydrogen, sulfur, mercury, ammonia, radon, carbon dioxide, and methane can be found in the region where the drilling is made (Erkul, 2012). Sunay Dag (2015) noticed in his Ph.D. thesis that the heavy metal content in the fruits of fig trees in locations near geothermal plants is higher in Aydin, Turkey than in other locations (Dag, 2015). These chemicals and heavy metals damage livelihoods and the environment which have cultural values (Aydin, 2020).

Figure 2. Geothermal sources and applications map in Turkey



2. Literature Review

2.1. The chaos of geothermal energy law

Although the geothermal law brought full equality and a liberal order among citizens, it seems to have been forgotten that natural resources are the property of the State according to the Constitution (Aydin, 2020). One of the complexities created by the liberal licensing system is the emergence of a license market (SERPEN et al., 2009). In the evaluation report of the Aydin Environmental Congress held on January 20, 2016, it is stated that 80% of the lands in Aydin province were opened to geothermal energy activities with the Law on Geothermal Resources and Natural Mineral Waters enacted in 2007, and 85% of the geothermal fields in the country are located in this province. (Efeler Municipality, Geothermal Commission Report)

According to the project research report on the detection of obstacles to the use of geothermal energy in greenhouse, as a result of geothermal investments and land licensing, producers will migrate to cities and they will have problems both in sustaining their lives economically and in adapting to the new city life. In this case, high income groups in the privatized organized industrial zones based on agriculture will make greenhouse investments, and the imbalance in the income distribution that increases day by day in Turkey will increase a little more (Ozdemir, 2012).

2.2. Sustainable development without participatory justice

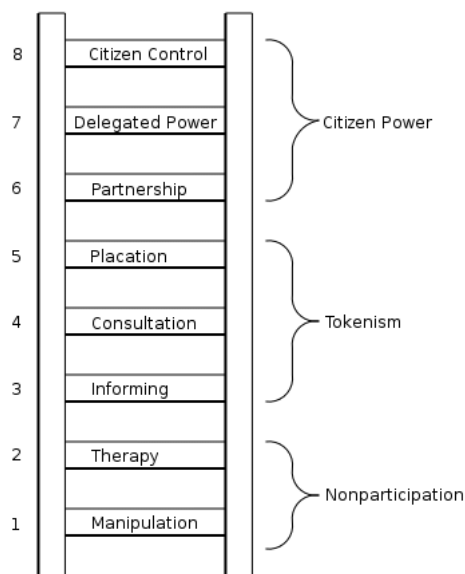
Liquid and gas emissions of geothermal power plants cause water, soil and air pollution and negatively affect the agricultural activities in their regions. For this reason, the chance of the people of the region to gain income from agricultural activities is jeopardized and an imbalance occurs in the income distribution in favor of energy investors and against farmers. While the strong factors take income from the generated electricity, the citizen, on the contrary, suffers from damage.

Sustainable development is incomplete without social justice, because sustainability can only be achieved by addressing the problems of inequality in living conditions and unequal wealth distribution, among others (Davidson, 2014). It is seen that the justice of income distribution, which is another element of social sustainability, is adversely affected by geothermal power plant projects.

Public participation, which causes the most important environmental justice issues in Aydin, is explained by the Arnstein citizen participation ladder and White's participation patterns. Based on Arnstein's ladder and Sarah's participation patterns, the thesis interprets what the types, level and function of public participation mean in the meetings held during the project phase of geothermal power plants. The classifications of citizen participation levels are the ladder created by Arnstein as Figure1 indicates (1969). He begins by discussing "participation or so-called participation in citizens' and explained their level of participation on an eight-step ladder into three groups. The first group is the

non-participation which includes 1- Manipulation and 2- Therapy steps. In the non-participation stage, the main purpose is not to enable citizens to participate in the realization of plans, but to provide power holders with the opportunity to educate and improve citizens. The second group is the symbolic level group consisting of 3- Informing, 4- Consultation and 5- Placation steps. In this group, although citizens are allowed to have a say, to be informed or to make suggestions, their opinions do not have the power to be cared for by those in power. The last group consists of the steps of 6- Partnership, 7- Delegated

Figure 1. Ladder of Citizen Participation (Kocaoglu, 2018)



Power, 8- Citizen Control, which includes the power level of the citizens. While citizens are given the opportunity to negotiate in the 6th step, in the 7th and 8th steps, the citizens gain the majority in decision making (Kocaoglu, 2018). In addition, White's patterns, along with the type of participation, are needed to examine the function of participation. Sarah White refers that nominal participation as a labeled rhetorical tool in development interventions that can take advantage of some 'participatory' excuse measures to make the entire operation appear authentically participatory (1996). The dominant interest of agencies in this form of participation is to legitimize development interventions and to satisfy donor demands for access to funds. (Zocher, 2010)

2.3. In practice, modernization is not sustainable

Modernization: in sociology, the transformation from a traditional, rural, agrarian society to a secular, urban, industrial society according to Krishan Kumar. Because of increasing modernization and urbanization, lots of forest covers and grasslands are being destroyed and the aquatic habitats are being polluted to the core. As a result, this destroys habitats of wildlife and various aquatic species. Therefore, nature is affected by economic growth based on modernization but not everyone's nature is affected because an unequal transformation emerges (Kumar, 2020).

According to the researcher Akbulut (2015), social policies in Turkey are never created by taking the local conditions into account, and growth always creates cost and inequality in Turkey (Oktay, 2015) In addition, some critics argue that ecological modernization does not compensate for the injustices it has caused, for example, that people of color and low income carry a disproportionate burden of environmental damage, such as pollution and poverty (Bullard, 1993). As a result, the fact that geothermal energy investments made for economic development are also independent of nature is

not real in practice and causes ecological problems, but the nature of everyone is not affected here. Economic development causes justice issues of unequal distribution for rural communities.

3. Methodology

Qualitative research introduced a new modality for approaching subjects with less complex guidelines, no predefined response questionnaires, greater freedom for subjects to express themselves, and significantly restricting the researcher's control over subjects (Scarneci, 2013). Narrative analysis is a type of methodological approach in which researchers interpret stories told in the context of research and shared in everyday life (Allen, 2017). Narrative analysis is a useful method for revealing the broader culture that creates basic ideologies and narratives embedded in stories (Stokes, 2003; Rodriguez, 2016). In this thesis, a narrative research approach was chosen which involves using data collection methods that are interviews and secondary data such as newspapers, academic articles, dissertations, reports, official documents. Narrative analysis is important to explain the research with the stories of the people in village of Kizilcakoy. In order to gain an in-depth and better understanding through first-hand experience stories to understand how participants perceive the issues and to make sense of their experiences, the narrative research and interview method was chosen.

Narrative interviewing is a technique that does not impose strict discourse guidelines on topics, does not encourage those who decide what and how to tell, and is often used in narrative research (Scarneci, 2013). For the interview, a middle-aged female farmer and activist, who lives close to the planned geothermal power plant of the village of Kızılcaköy in the province of Aydın, was chosen. Furthermore, her story about geothermal energy, which she has been struggling with for the last 3 years, and her reasons for maintaining the traditional lifestyle (fig and olive cultivation) in the region have made her chosen as an interviewee. Only one interviewer from the village was chosen because in order to know deeper into her life story and interpret her story more broadly. As a research study region, Aydın, which hosts 30 of the 60 geothermal power plants in Turkey, has been one of the most important factors in the selection of this region in order to investigate the environmental effects of geothermal energy. (Energy Atlas, 2021). The interview was based on the main question which is regarding her thoughts on geothermal power plants. (What do you think about geothermal power plants?)

Improving through secondary data, it would be the most efficient method to reveal the participants' ideas and sentiments in order to hear from the rural residents' experiences and justice concerns from themselves. Based on interview data and secondary data which are obtained local newspapers (Denge, Ses, Evrensel), BBC Turkish documentary, Aydın geothermal commission report, academic articles and reports, data is interpreted and criticized that the environmental impacts of

geothermal energy practices are examined in order to evaluate the sustainability of rural communities in the framework of modernization and environmental justice in the case of Aydin.

4. Findings

4.1. Loss of livelihoods and sentiments of traditional life

When we started talking about Aydin's landscapes and rich lands, the interviewee pointed that she was the daughter of a farmer family who remarked wistfully that the environment she lived in was not the same as before. By making a connection between the Ottoman explorer's discourse and Aydin's nature and culture, she complained the production of the arable lands has decreased due to geothermal pollution. Aydin, which was defined by Ottoman explorer Evliya Çelebi, in 1671, as the city where "oil flows from its mountains and honey from its plain", in reference to the abundance of figs and olives, has been known to have fertile lands of the Menderes basin and preserved its culture and tradition. Similarly, to interviewee, the Mayor expressed a similar emotional connection with the Greek writer Herodotus's beauty on Aydin at the Aydin Provincial Congress and said that instead of the smell of rotten eggs she wanted to feel the scent of chamomile in spring. In addition to the deterioration of the natural environment, in the news of the Evrensel newspaper, the bees are died due to geothermal plants' gasses pollution (Akdemir, 2019). It can be understood from these expressions that geothermal energy threatens the biodiversity in rural region of Aydin.

A farmer was equally concerned with the interviewer in Aydin, a former geothermal power plant employee said in the at the BBC Turkish documentary, which is about the geothermal energy in Menderes and Gediz Basins and its problems and solutions discussed with farmers, industry, scientists and environmentalists:

"Agricultural practices will cease, and we will look for work in factories."

Therefore, the potential of the residents of the region to gain income from agricultural activities is threatened, and an imbalance occurs in the income distribution in favor of energy investors and against farmers. Consequently, it can be concluded that the local people are concerned about not only losing their livelihood, incomes lands, but also landscapes and traditional life they have a sense of belonging to.

4.2. Concern over migration

The interviewee continued to stress that they would have to relocate due to pollution with the following statement:

If the people are unable to harvest produce from the trees they grow or cultivate their land, they will be forced to migrate. We don't want to leave our village!

Interviewee is afraid that the village residents will have to migrate due to pollution. Similar to this concern, one year ago (2019) due to the geothermal power plant established in Kavaklıdere Village of Manisa province, the citizens living in the village and living on olive cultivation had to sell their houses and migrate to other places due to the inefficient crops, according to Evrensel newspaper.

Germencik district, known as the geothermal place of Aydın province, has seen a population increase in the last 10 years. According to the Cumulative Impact Assessment of Geothermal Resources in Turkey (2020), a local official interviewed informed that those who sold their agricultural lands in the village due to geothermal investments settled in the city centers by buying a house, and this situation led to an increase in population.

In other words, citizens will have to leave the agricultural culture they have been accustomed to for years, inherited from their ancestors, and even if they do not have sufficient economic income, they will be dragged from their happy environment to new life adventures that they do not know.

4.3. Loss of trust in government

The explosion of the geothermal well in the geothermal region in Aydın's Yılmazköy village in 2020 damaged the agricultural products and the farmers were affected economically. After the accident, the company official tried to normalize this accident by mockingly saying that the accident was not important, it was a possible accident in an interview with a local news (Ekoloji Birliği, 2020). According to interviewee, neither the government, the municipality, nor the private company did anything for the damage to the farmers, and the farmers were content to just sue. After telling about this accident, she continued her words resolutely as follows:

We are aware that the planned geothermal power plant does not benefit the village of Kizilcakoy, and we do not trust the local municipality or government policies in this regard.

If private companies can make this statement clearly, it is obvious that they have more power than supposed to be, they care for neither people nor their damage. There is no policy to cover and protect the local population; while energy policies encourage private companies, they ignore the farmers who own land near power plants.

Supporting this claim, according to the BBC Turkish documentary Geothermal Energy: record growth and problems (2019), the 5-hectare grape vineyard of the farmer Senturk in Alasehir was damaged by geothermal waste as a result of the geothermal well explosion. The farmer emphasized that the authorized company would pay for the damage caused by the accident, but later did not even answer the phone calls. He is still trying to claim his rights through the court, and that he said:

It is the law that has brought us to this situation, and it is to the law that I shall make my complaint. [But] To whom do I complain?

The lack of a policy that covers the protection of rural people suffering from environmental pollution or a breakdown caused by geothermal power plants, and lack of recognition of rural people, and emphasis only on economic development of the policies in this field with neoliberal methods cause unequal distribution and injustice. This is a kind of non-participation form of shushing and consoling people, which is nominal participation.

4.4. Participation as a showpiece for citizens

A resident from the village of Germencik, at the interview news of the Environmental Platform of Aydin, said that although the public participation meeting was held in, they were not given enough information, their complaints and requests were not taken into account (Aydin, 2019). In the case of Kizilcakoy, geothermal wells were planned to be drilled among the agricultural lands, but the private company officials and the village headman agreed secretly, and the village residents were not informed. The interviewee said it this way:

“They were constructing geothermal wells near our farm, but we did not know anything”

Therefore, it is understood that environmental justice regulations are not properly implemented due to the lack of citizen participation and recognition, because the former require in order to informed citizens and should be taken their opinions and requests about the geothermal power plant project planned to be built near the village .Even if public information meetings are held in the project area as required by the law, the complaints and demands of these meetings, which are mostly met with the reaction of the local people, are not responded to by the administrative authority and institutions. In fact, their purpose is not to develop mutual understanding between the company and the people, but to shape people's thoughts and manage their consciousness in order to achieve the desired result.

5. Discussion

These results suggest that it is understood that the applications of geothermal power plants in our country are not compatible with environmental and social sustainability criteria in their current form. My research demonstrates that income distribution justice is negatively affected by geothermal power plant projects because in Aydin they are built in the pursuit of modernization. As mentioned in the literature, the fluid and gas emissions of geothermal power plants cause water, soil and air pollution, negatively affecting agricultural activities in the regions they are located. Therefore, the chance of those living in the region to earn income from agricultural activities is endangered, and an imbalance occurs in the income distribution in favor of energy investors and against farmers. Similarly, in this framework,

as Ozdemir stated in his research, in 2012, an imbalance occurs in the income distribution for farmers. Also, according to the project research report on the determination of the obstacles to the use of geothermal energy, the lives of farmers are affected socially and economically. Although village residents' products are affected, there is no compensation to protect them. As Bullard said, modernization does not compensate for the injustices it has caused. These results are based on available literature evidence, fear of losing their livelihoods and the concerns of the two farmers support each other with the results found in the literature.

My research demonstrates that public meetings for geothermal projects are not properly implemented in Aydin, hence showing a limitation of participation. According to my interviewee, citizen participation meeting was not held in her village for the planned geothermal power plant. Likewise, according to the interview of the Environment Platform, Citizen's opinions and questions were not considered by the administrative authorities at the citizen participation meeting in the village of Germencik. These results show that the lack of sufficient stakeholder engagement and grievance redress, monitoring, and evaluation mechanism in relation to project-affected people. These types of participations, which causes justice problems for residents, is explained in my research by Arnstein's first and second groups on the participation ladder, nonparticipation and tokenism, and Sarah White's nominal participation model. Dysfunctional forms of participation are often used by more powerful actors to legitimize economic development plans. These types of participation in my research get along with nominal participation. It is often used by more powerful actors to give legitimacy to economic development plans based on modernization. As a result, the participation was just display and did not result in change.

According to my results, residents in the village of Germencik, in Aydin, sold their lands because of the geothermal investments. Similarly, according to Evrensel newspaper, the citizens of Kavaklidere, in Manisa, migrated to other places because they lost their livelihoods. Also, according to my interview, residents of the village do not want to leave their homeland because of the economic growth ambition. These results show that geothermal investments for the economic growth forced the people to migrate in rural areas. In the literature, as Kumar emphasizes, nature is affected by modernization, because a sustainable modernization does not force people to leave the nature to which they belong. Bullard's view, modernization does not compensate for rural injustices, is collaborative among my findings. According to my interview in Kizilcakoy, public of village does not trust in government or municipality because geothermal policy has not any regulation like compensation for them due to damage of geothermal accident. Also, she knows that power plants do not have benefit for them rather they have cost for them. Examples such as the fact that the couple in the BBC documentary is not compensated for their harm, and that their complaints are not even answered, show us that the government's policies ignore people's rights because of modernism.

6. Conclusion and Recommendations

This research aimed to identify the relation between the rural communities and geothermal energy practices in its approach to modernization and environmental justice. Based on a qualitative analysis of my research, it can be concluded that the characterization of Aydin as an economic investment region rich in geothermal resources is the main factor contributing to environmental injustice and inequality for citizens living in rural areas. In general, my findings reveal that rural communities in Aydin experience environmental injustices that are both distributive and participatory in nature. Geothermal power plants do not advantage them, although they are the community whose nature is the most influenced by power plants.

My research demonstrates that the harmful consequences of considering economic sustainability in isolation from environmental and social considerations. Turkey's concept of sustainable development and the policies that have resulted from this process is insufficient to address these environmental and socioeconomic issues. However, in the struggle against these environmental threats, the capitalist system must include abandon the priority of economic growth and the understanding of excessive consumption in favor of ecological sustainability. As a consequence of my research, the residents of Aydin are unable to benefit from geothermal energy in Aydin under adequate and affordable conditions. Because of the illegitimate, unapproved, unmanaged, and unlawful development and operation of power plants in Aydin, the city has practically become an energy production dump reliant on geothermal power plants. In addition, my research shows that geothermal energy policies only focus on how to get more energy and more profit. It means that they focus on economic growth based on modernization but don't care about people.

In order to overcome issues of geothermal , steps should be taken urgently to take technological measures to prevent the negative effects of geothermal power plants, activate the inspections during the installation and operation of the power plants, and ensure the real participation of the public in the decision-making processes. As for recommendations, it should be considered that investments that can provide economic returns in the short term may hinder the welfare of future generations and the development process of countries with their environmental and social costs in the long term. Furthermore, the confusion and uncertainties in the geothermal law should be solved. The biggest step to be taken in this regard should be to change the geothermal energy policy with the sustainability of the geothermal energy and local people in mind. More interviewees from various fields interacting with geothermal energy and rural areas could be included for future research on this topic. In addition, more qualitative research and narratives could be useful to research deeply.

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