

CLIMATE-FRIENDLY GREEN ECONOMY POLICIES

What Kind of City? Which Energy System? What Kind of Land Use?
2017, May



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GREENING THE CLIMATE, GREENING THE ECONOMY PROJECT

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Co-financed by the Turkish Republic and the European Union as part of the Civil Society Dialogue Program, the “Green Climate, Green Economy Project”’s goal was to develop concrete economic policy recommendations suited to Turkey’s climate change mitigation and adaptation targets and to adapt European good practices to Turkey’s local conditions.

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Climate change is one of the most serious threats facing humankind. Global warming causes growing economic, social, and ecologic losses. The challenges we face cannot be overcome by solely raising consumer awareness or by encouraging the private sector to adapt cleaner production practices alone. What we need is a system that will enable decision-makers of all levels, from individuals to international institutions, to act as a coherent whole on the path to achieve the determined targets.

Green economy offers a conceptual, theoretical, and practical framework that will enable this transformation. This is the reason why green economy began to spread with the 2008 crisis, a period during which economic, social, and ecological crises occurred simultaneously. The first rule of this transformation is to abandon the fossil fuel-based economic system. The majority of the financial resources that are needed can be obtained from the subsidies that are already being provided to sustain the fossil fuel-based structure.

Much like the threats caused by climate change, the opportunities and constraints can also differ by country. The objective of the Greening the Climate, Greening the Economy Project is to develop concrete policies based on the good practices of policies that were successful in European Union countries and to share these with the public. This report discusses the fields that need to be prioritized and the actors and mechanisms needed to develop policies in those fields in Turkey.

This report features green economy policy recommendations for the fields of urban policy, land use, and energy.

Today, 54 percent of Turkey's population lives in cities. The world's cities are responsible for 70 percent of global greenhouse gas (GHG) emissions. With their educated population and technological infrastructure, cities also play an important role in the solution.

Energy is the driving force of growth in all economic sectors. It is clear that transitioning to a system based on renewable energy and not fossil fuels—a small-scale and decentralized system, equivalent to the use of rooftop solar panels instead of large-scale and centralized

nuclear power plants—and designing economic activities so that they will use less energy will play an important role in tackling climate change.

Rapid industrialization and urbanization is continuing to cause rapid changes in land use patterns. While arable land steeply declines, the world population that needs to be fed rapidly increases. It is believed that a holistic approach to land use and the rehabilitation of deteriorated land will be able to increase climate resilience.

The mission of this report is to look at EU climate change mitigation and adaptation and its best practices in the fields of urbanization, land use, and energy in light of Turkey's current conditions. Based on this discussion, we will design green economy policies that can be implemented by decision-makers. This report is the product of a participatory effort that encompasses workshops, local meetings, a visit to Belgium, and contributions from the advisory board.

Climate Change and the City

The impacts of climate change on urban areas can be analyzed under the following headings: elevation of sea levels, urban vulnerability to extreme weather and climate events, the urban heat island effect, health problems caused by climate change, and heat waves, drought, water scarcity, and floods caused by high urban energy consumption.

The recommended solutions to tackle climate change in urban settings can be summarized as follows: compact cities, not sprawled cities and climate-friendly urban transformation; the prioritization of public transport and other means of transportation over motorized vehicles; more recycling, less urban waste; smart, energy-efficient, and passive buildings; and urban green area systems.

The energy efficiency of buildings and passive buildings especially stands out among these methods. Passive buildings require less than 1.5 cubic meter of natural gas (or 15 kWh energy) for heating. With proper designs and additional applications, the amount of energy needed for indoor heating or cooling can be reduced by 90 percent. Starting in 2019, the





European Union will impose regulations that all new buildings are to be built in accordance with passive building standards. Expanding the passive building concept in Turkey can play an important role in tackling climate change as well as reducing energy imports.

Climate Change and Energy

The world's energy system is going through a serious renewable energy and energy efficiency-based transformation. In 2015, renewable energy sources accounted for 90 percent of electricity produced by new plants globally. The cost of producing electricity using solar panels has declined by 80 percent since 2009, and solar energy is expected to become the least costly energy source by 2029. The trend to pull out from coal is accelerating all over the world.

Solar energy is advancing to the forefront of the renewable energy transformation. In Turkey, where energy import dependency and electricity self-consumption costs are high, solar energy has a wider window of opportunity than other forms of energy production because it provides need-based consumption. According to calculations, Turkey has approximately 8 million rooftops available for solar panel installations.

Citizens' Power Plants (CPP)—in Turkish, Yurttaşın Enerji Santralleri (YES)—are at the forefront of solar energy expansion. In CPPs, private citizens form energy co-ops to produce energy—either individually with their own private rooftop systems or, in an effort to combine energy consumption, collectively within buildings, building complexes, villages, and summerhouse rooftop systems—for the purpose of self-consumption or selling to the grid. All around the world, energy cooperatives and rooftop solar panels have been the driving force of renewable energy transformation. In Turkey, spreading energy co-ops and opening the way for private citizens to produce renewable energy will accelerate the renewable energy transformation.

Climate Change and Land Use

The IPCC Fifth Assessment Report estimates that land use is responsible for approximately 25 percent of global GHG emissions. The

carbon storage potential of climate-friendly land use is calculated to be around 7.2-10.6 Gt CO₂e/year by 2030. Land use practices that take climate change into consideration have important climate change mitigation potential. It has been estimated that regenerating 12 percent of the world's eroded/degraded soil by 2030 will feed 200 million people as well as increase climate change resilience and reduce GHG emissions.

The soil's organic matter can be increased in different conditions and on different scales. Methods such as starting urban gardens using urban waste composts and no-till farming in agricultural lands are some of the ways to provide the soil with permanent organic matter. Other practices consist of using planned grazing and animal impact tools with Holistic Management and Holistic Planned Grazing methods in pastures, meadows, and grasslands.

Capturing large amounts of carbon dioxide from the atmosphere and sinking them into the soil seems possible with the wide implementation of regenerative agriculture practices. Regenerative agriculture's effectiveness in reducing total GHG emissions can be predicted by adding the global reduction of GHG emissions caused by land use practices to the amount of carbon dioxide stored in the soil.

Conclusion

The common characteristic of all innovative practices featured in this report, such as passive buildings, energy co-ops, community-supported agriculture (CSA), bicycle use for inner-city transportation, urban vegetable gardens, and regenerative agriculture, is that they create easy and widely applicable environmental and climate-friendly alternatives and provide new ways for private citizens to be directly involved in the economy and even generate income. These innovations prioritize communities, families, or individuals' ventures over increasing the profits of big companies. Not only do they create new job areas, but they also have positive effects on improving deteriorating social inclusiveness and social equality.

Climate change is one of the most serious threats ever faced by mankind. The magnitude of global warming results in economic, social, and ecologic losses that increase with each passing day. Today, as expected, the mainstream economic system seems to have relegated climate change mitigation and adaptation to economic growth and the development of climate-related technology. The expectation was that as countries got wealthier the quality of the environment would be ameliorated, and technological developments would enable the “spontaneous” switch to a more climate-friendly structure. However, this market-economy perception hit a wall with the 2008 global financial crisis. The efforts to boost infrastructure investments and consumption in order to overcome the economic crisis have proved of no use but to contribute to the escalation of climate change to the point of no return. Under the current perception, the crisis deepens and spreads with each passing day.

It is very clear that the global system is in need of an urgent transformation. This brings us to the following question: “Which economic perception framework will enable us to address climate change holistically?” The challenges we face cannot be overcome by solely raising consumer awareness or by encouraging the private sector to adapt cleaner production practices. What we need is a system that will enable decision-makers of all levels, from individuals to international institutions, to act as a coherent whole on the path to achieve the determined targets. Climate change requires communication between policy fields such as agriculture, energy, and public works, and the development of these policies using a holistic approach.

Green economy offers a conceptual, theoretical, and practical framework that will enable this transformation. This is the reason why green economy began to spread with the 2008 crisis, a period during which economic, social, and ecological crises occurred simultaneously. The first rule of this transformation is to abandon the fossil fuel-based economic system. The majority of the financial resources that are needed can be obtained from the subsidies that are being provided to sustain

the fossil fuel-based structure. The policy package called the Green New Deal provides consistent answers to the economic crisis, to rising unemployment, and to the ecological destruction that results in climate change. As a matter of fact, some countries such as South Korea have turned the 2008 crisis into an opportunity to begin to transform their economic structure with green investments.

As for Turkey, despite the many advantages it possesses, it insists on the current economic structure that has proven to be unsustainable. Studies showing that it is possible to simultaneously achieve economic, social, and ecological sustainability with the climate-friendly transformation of the economic structure are on the rise. In fact, the Climate Action Network (2016) report reveals that if Turkey were to follow the trajectory that prioritizes 100 percent renewable energy and energy efficiency in line with the 1.5°C and 2°C goals, it could save 23 billion USD in energy imports, create 64,000 qualified jobs, and prevent 35,000 premature deaths from air pollution. Yeldan et al. (2015) also calculated that a carbon tax that can be used in renewable energy finance and the autonomous increase in energy efficiency could together create an effect whereby Turkey could reduce its officially announced carbon dioxide emission by an additional 40 percent by 2030. It has been noted that even if carbon taxing were to slow down economic development and job growth at the beginning, these effects would subside after 2025.

Such a transformation can only be realized through efficient cooperation. For example, the supply security-oriented energy policies favored by the Turkish Ministry of Energy and Natural Resources—which is pressured by the existing economic structure—can clash with the Ministry of Forestry and Waterworks or the Ministry of Agriculture, Food and Husbandry’s land use policies and can neutralize the Ministry of Environment and Urbanization’s efforts to combat climate change. It should not be forgotten that there is a cost to creating energy capacity solely to meet the energy demands of short periods of heat or cold waves as these facilities and utilities remain stranded for the greater part of the year. Therefore, the construction of buildings or land use can-





not be considered independent from energy policies or urban policies.

The fight against climate change should be simultaneously conducted on several different fronts and continued in a consistent manner that takes into account social, environmental, and economic policies, not as separate policies but as a whole.

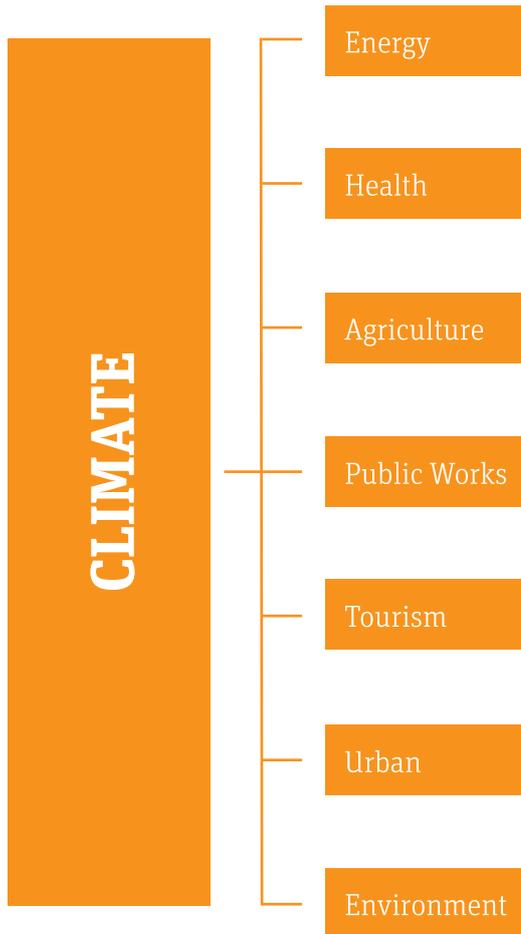


Figure 1.1 Climate change mitigation policy field connections

However, it is difficult to say that such a perception exists in Turkey today. The economic targets are not compatible with the ecological sustainability targets or with the climate change targets. Long-term development objectives such as Vision 2023 (Vizyon 2023) need to be revised in light of social, environmental, and economic constraints. Achieving the goal of becoming the world's fourth iron and steel producer by 2023, for example, might perhaps enable reaching the goal of 25,000 USD per capita income by 2023; however, it is clear

that supporting these energy-intensive and pollution-intensive industries will aggravate the country's social and environmental issues and conflict with the statements Turkey made when it signed the work safety and climate policy agreements.

THE MEANS AND TOOLS OF A CLIMATE-FRIENDLY TRANSFORMATION

An economic structure is not a static structure. It is affected by processes, and it goes through constant transformation. In outward-oriented market economies such as Turkey, the main factor that determines the nature and direction of this transformation is the price mechanism. The founder of the field of economics Adam Smith's "invisible hand" metaphor describes that the product, its quantity, and its production are all determined by the market price. However, it is unrealistic to expect that market prices will always pave the way for a transformation that is consistent with societies' vision of the future. This is exactly why the state exists. The state possesses the capacity to transform the economic structure by interfering in the results of the market system using tools such as subsidies and regulations to change the relative prices. However, this has its limits; global economic conditions (economic crisis in a neighboring country, increases in oil prices, etc.) can restrict outward-oriented economies' room to maneuver.

A successful transformation requires the systematic harmonization of not just one price (like carbon tax as a pollution fee) but of all related prices (raw material, intermediate goods, labor, transportation, etc.). This is the difficult part: Turkey's failure to achieve this is the reason why the country has not been able to proceed to the high value-added production structure defined in the Vision 2023 objectives. A sub-discipline in the field of economics studies how to design mechanisms that will enable actors to make their own decisions in a certain direction. If the aim is to direct the private sector to a specific structure (for example, a high value-added, climate-friendly production structure) then the related price set should be adapted to the



structure. In other words, it is about creating a setting in which, if the private sector were to steer towards this structure, it would make more profit than it would in other areas (dirty, low value-added production), and the private sector would voluntarily carry out this transformation without any pressure or generous subsidy. This is a task that can be compared to civil engineers making use of a slope to transport a dam's water supply to far away arid soil in an irrigation project. The water can also be transported with tankers or pump pipelines, but it will have a cost. A green transformation necessitates the related prices to be harmonious within a successive sequence, the same way a canal elevation needs to gradually decline for the water to flow by itself. Unfortunately, in present day Turkey the price set that determines the economic structure seems to make the rent-oriented construction-oriented and low value-added production structure more profitable. The government supported infrastructure investments that all countries occasionally resort to for economic recovery serve no other purpose than to aggravate the current situation in Turkey. When investments such as highways and bridges become continuous as is the case in Turkey, the pricing system deteriorates even more, construction and related sectors become more profitable for the private sector, and this paves the way for the economic structure to evolve into an unsustainable structure (AŞICI, 2015). When the price set has deteriorated overall, changing only one price from the last stage (providing subsidies for wind energy or granting value-added tax exemption to farmers' fuel, etc.) usually does not amount to much in the same way that the correct construction of a slope is useless if water has not reached that point.

The conclusion cannot be that the state should give up big public infrastructure investments. Infrastructure investments are needed to the extent that they lower the costs of the transformative actor—that is, the private sector. However, we cannot say that the Yavuz Sultan Selim Bridge and the Osmangazi Bridge¹, which were built by public-private sector partnership with the Build-Operate-Transfer

1 Yavuz Sultan Selim and Osmangazi bridges are among extremely costly mega transport projects built on the Bosphorus and Izmit Bay

and other similar models, have decreased the transportation costs of the private sector. The same is true for energy investment subsidies provided to meet the increasing demand of steel and iron. Favoring a construction-oriented growth resulted in steering the economy towards an energy-intensive structure, and this brought to light the sensitivity surrounding energy supply security. Since the fossil fuel power plants that are subsidized in the name of ensuring energy supply security operate well below their capacity, they have high per-unit production costs that are borne by the consumers and producers.

Big infrastructure projects are needed for climate change mitigation and adaptation. These projects need to be planned in such a way that will encourage the private sector and decrease its transformation costs. The state's part in this is to "make the necessary regulations and infrastructure investments that will enable the water to reach the soil by itself." Looking at the renewable energy production demand, we can see that the very dynamic Turkish private sector proved that it could become a successful transformative actor. What needs to be done is to leave aside the exclusively growth-oriented approach and look at the issue of climate change as an opportunity to transform Turkey's buildings, energy system, and agriculture.

THE SCOPE OF THE REPORT

Climate change mitigation and adaptation is a policy field including an ever-increasing number of aspects. However, much like the threats caused by climate change, the opportunities and constraints can also differ according to countries. The objective of the Green Climate, Green Economy Project is to develop concrete policies based on the best practices of policies that were successful in European Union countries and to share these with the public. This report discusses the fields that need to be prioritized and the actors and mechanisms needed to develop policies in those fields in Turkey.

Which policy fields?

There is no doubt that GHG emissions that cause climate change are the direct consequences of our economic activities. Climate

change affects societies in many different ways. To the people of the island country of Vanuatu, this signifies losing their homeland; to a ski station in Switzerland, it is a decrease in the number of customers; and to a doctor, it means diseases spread across wider physical areas and populations.

In this report, we chose to address three economic sub-systems that we consider urgent fields for Turkey: urban policies, land use, and energy. The GHG emissions caused by these three fields amount to 55% of total GHG emissions as illustrated in the chart below.

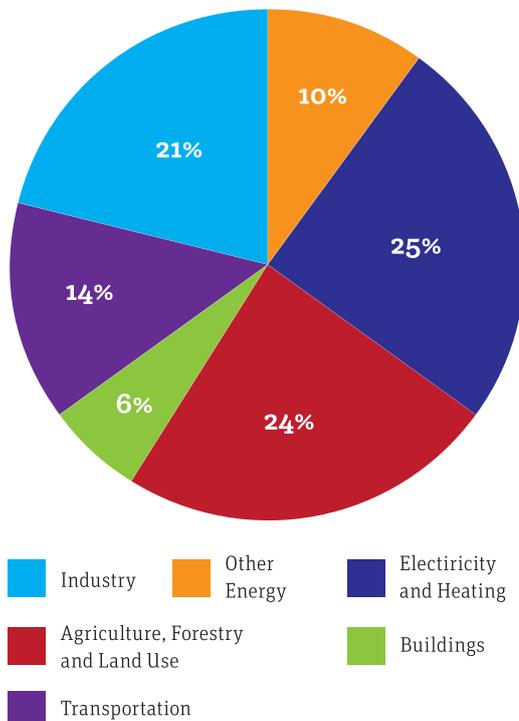


Figure I.2: Sources of global greenhouse gas (Source: IPCC, 2014)

Today, 54 percent of the world's population live in cities and, with rapid urbanization, this number is expected to reach 66 percent by 2050. Cities are responsible for 80 percent of global production and 70 percent of global GHG emissions (New Climate Economy, 2014) and, thus, are of utmost importance for climate mitigation and adaptation. While cities are one of the most important sources of the problem, their educated population and technological infrastructure makes them important actors in the solution for climate change.

Rapid industrialization and urbanization are continuing to cause the rapid change of land use patterns. While arable land steeply declines, the world population that needs to be fed rapidly increases. It is believed that a holistic approach to land use and the rehabilitation of deteriorated land will be able to increase climate resilience.

Energy is the driving force of growth in all economic sectors. However, it is a fact that energy policies that are determined solely based on "supply security" aggravate the problem of climate change. It is clear that transitioning to a system based on renewable energy and not fossil fuels—a small-scale and decentralized system, much like using rooftop solar panels instead of large-scale and centralized nuclear power plants—and designing economic activities so that they will use less energy will play an important role in tackling climate change.

Certainly, urban policies, land use, and energy are wide fields by their own right, and policies that have been implemented in a certain country might not find the opportunity to be implemented in Turkey. We will be discussing applications in these fields from around the world and identify the ones that are compatible with Turkey's priorities, means, and constraints in the following chapters.

Which actors?

We can analyze the actors who will play a role in the development of green economy policies used to tackle climate change under six headings:

1. International Organizations

Global climate policies are carried out under the United Nations Framework Convention on Climate Change (UNFCCC) in which a new era has begun with the adoption of the Paris Agreement in December 2015. The provisions of the Convention and Paris Agreement and the international institutions and mechanisms establish a framework for climate policies. However, the fact that trade agreements between international institutions and regional nations—such as the World Trade Organization (WTO) or Trans-Pacific Partnership (TPP) and Transatlantic Trade and Investment



Partnership (TTIP)—ignore climate change decreases the chances of success in the fight against climate change. Therefore, it is important for international organizations, and most notably the WTO, to engage in policies that provide solutions to climate change.

2. Central Administration (Government)

The government bears important climate change mitigation and adaptation responsibilities. Policies that will be implemented in various fields such as economy, agriculture, urbanization, and energy should be determined in light of climate change. In a country with an extremely centralized administration like Turkey, the government's power to make laws/regulations and define the economic orientation and its determinant role in investment decisions is important.

3. Local Administrations

The impacts of climate change differ across regions and locations: floods, drought, heat waves, etc. Hence, it is impossible to find a single magical remedy that can be applied everywhere. Local administrations have an important role in determining the intervention tools and methods as well as making infrastructure investments. Organizations such as the International Council for Local Environmental Issues (ICLEI)², C40³, and

2 As a local governments' network for sustainability, the ICLEI's aim is to represent more than 1,000 local authorities at the United Nations and international policy forums and draw attention to local sustainability through its global programs and campaigns. The ICLEI also provides knowledge and tools, creates cooperation opportunities and consultancy to local authorities. (See <http://www.iclei-europe.org/home/>.) As of November 2016, Bursa, Gaziantep, and Konya Metropolitan Municipalities and Kartal and Seferihisar Municipalities were listed as members of the network.

3 Founded in 2005, C40 is a network of 86 metropolitan cities, representing over 600 million people and one-quarter of the global economy. C40 supports cities to collaborate effectively, share knowledge, and drive meaningful, measurable, and sustainable action on climate change. (See <http://www.c40.org/>.) As of November 2016, only the Istanbul Metropolitan Municipality is listed among the cities that have taken the first steps in preceding past the stages of taking inventory and setting targets and implementation.

the Covenant of Mayors⁴ bring together local authorities from different regions and development levels and provide them with the opportunity to cooperate and share their experiences. However, defining methods applicable to local conditions is not sufficient; local administrations should also have the financial capacity and the power to make political decisions.

4. Private Sector

In free market economies, the private sector is the main actor who produces and invests. Hence, it is the main actor who will decide whether to instigate the climate-friendly transformation or to conserve the current structure. The direction that the private sector will choose is not autonomous from central or local government policies. Climate change creates a variety of risks, and the solution to these risks or the minimization of their impacts provides the private sector with important opportunities. The private sector can only achieve technological innovation through public support. Hence, the private sector is one of the most important actors of climate change mitigation and adaptation.

5. Civil Society

In democratic societies, civil society plays important roles such as raising climate change awareness and developing policy suggestions. Furthermore, civil society should partake in the dialogue and negotiation platforms for the development of green economy policies alongside other actors and stakeholders. As representatives of communities who will be affected directly by climate change impacts and climate policies, civil society organizations, labor unions, and professional organizations should be an integral part of the policy process.

4 Under the Covenant of Mayors, local authorities endorse certain commitments regarding climate and energy by becoming signatories. As of November 2016, 11 municipalities from Turkey were listed as signatories. These were Antalya, Bursa, and İzmir Metropolitan Municipalities and Bornova, Cankaya, Eskişehir Tepebaşı, Kadıköy, Karşıyaka, Maltepe, Nilüfer, and Seferihisar Municipalities. (See http://www.covenantofmayors.eu/index_en.html.)



6. Individuals

It will be impossible to obtain a satisfactory result unless the fight against climate change takes place on the individual/consumer level. Almost 70 percent of products and services produced are for private consumer consumption; therefore, consumer choice is quite relevant in determining what will be produced, how it will be produced, and in which quantity. However, individuals' impact on policies is only possible if consumers with similar interests act collectively. Consumer power can be set in motion or curbed through civil society and central and local administrations.

Therefore, a realistic approach to tackling climate change should be pursued in a bottom-up (from individuals to international organizations) and multi-level framework.

In this report focusing on Turkey, the government, the private sector, civil society, and most notably, local governments are considered as important actors in the development and implementation of policies.

Which change mechanisms?

So, which mechanisms or change factors can the actors we determined use in order to overcome the constraints they might encounter in the aforementioned fields?

The main constraints are market-based, policy-based, or institution-based, and it is important to design mechanisms that are relevant to the characteristics of each constraint. We can list them as follows:

1. Establishing new subsidy/penalization mechanisms that will increase resource efficiency

Market and policy failures impair efficient resource allocation and, at the same time, increase GHG emissions. Today, while subsidies for clean energy amount to around 100 billion USD, subsidies for fossil fuels are now estimated to be around 600 billion USD per year globally (New Climate Economy, 2014).

Instead of providing subsidies to fossil fuels, fossil fuel consumption taxes can be used to finance clean energy investments. However,

we should not forget that subsidizing or penalizing alone cannot suffice to transform the economic structure. Input prices should be harmonized for such a transformation to take place, and this task falls mostly on governments.

2. Procurement of resources and tools for infrastructure investments that will enable the transformation

Infrastructure investments such as transforming the existing building stock into energy-efficient buildings, constructing new passive buildings, and transforming the energy systems into smart energy systems require major financial resources. It is stated that on a global level the main problem regarding funding lies mostly in the access to existing funds and not in the lack of funding (New Climate Economy, 2014). The issue here is that markets find these green investments risky, and financial institutions abstain from creating risk-sharing tools (financial assets). It is a fact that this increases costs and therefore decreases investments. In Turkey, this problem is trying to be resolved through non-market methods such as providing treasury guarantees or guaranteed revenue to big infrastructure investments; however, it should be noted that there are problems regarding the sustainability, efficiency, and transparency of this method.

3. Supporting eco-innovation through policies and technology

Eco-innovation is the name given to technological breakthroughs and new business and social organization models that will enable the green economic transformation. Technological breakthroughs play a major part in the fight against climate change; however, business and production/consumption processes need to be restructured in light of climate change. Eco-innovation is an overarching concept that embodies the reorganization of the social sphere and business world alongside Research and Development (R&D), and given the uncertain nature of innovation activities, it is in need of public support. This support should be both financial and institutional through adequate regulations/laws.

4. Democratization of decision-making processes and transparency

The power play between the interest groups who want this clearly unsustainable structure to remain unchanged because it is profitable for them and the individuals who are trying to form a new social organization is also an important point that should be taken into consideration. Determining policies in platforms where independent non-governmental organizations (NGO) balance out private sector lobbying groups is one of the minimum conditions of democracy. Another point that needs to be highlighted is that authorities should share with stakeholders, in a transparent manner, all the issues that fall in their areas of responsibility. For example, currently in Turkey the most challenging question for a person who wants to install a rooftop solar panel in order to sell electricity to the grid is whether the substation that they are connected to has enough capacity. This information is still not being shared transparently.

METHODOLOGY

The purpose of this report is to discuss the EU climate change mitigation and adaptation applications in the three key fields of the economic system, namely urbanization, land use, and energy, in light of Turkey's conditions and, based on this discussion, to design green economy policies that can be implemented by decision-makers.

First, in order to determine the fields that need to be prioritized in Turkey's climate change mitigation and adaptation efforts, the project advisory board composed of experts and academicians held a roundtable meeting to analyze the current state of affairs. Then, the project team visited Belgium in June 2016 to observe EU best practices on site. During this visit, the project team had the opportunity to meet with NGO and local administration representatives who operate in the aforementioned fields. The team was able to observe the implementations on site, the pre-implementation constraints, and the methods these actors developed to overcome the constraints.

The meetings held during this visit provided valuable insight on how adaptable the EU best practices will be to Turkey and played a critical role in developing the scope of this report.

The next stage involved holding open house workshops in Istanbul for each field during which three questions—“What can be done?”; “What are the constraints?”; and “How can these constraints be overcome?”—were discussed together with participants and documented in order to be used in the report. The workshops were predominantly attended by NGO representatives, experts, and concerned citizens. The observations regarding each heading can be found in the relevant chapters of the report.

Furthermore, the project team planned and went on local field trips to Çanakkale, to observe the intersection of climate change and urbanization; to Bursa, to observe the intersection of climate change and land use; and to İzmir, to observe the intersection of climate change and energy. The project team was able to observe best practices on site and held discussion meetings with local stake-

holders similar to the meetings held during the Istanbul workshop.

The outcomes of the project will be shared with the decision-makers, and communicated to the wider public through radio programs and newspaper articles in order to mold public opinion.

This report is the product of a participatory effort that encompasses literature review and analysis of best practices and policy recommendation articles, as well as the outcomes of the visit to Belgium, workshops held in Istanbul, and local visits.

CHAPTER 1

CLIMATE CHANGE AND THE CITY

Today, 54 percent of the world's population lives in cities, and with rapid industrialization, this figure is estimated to increase to 66 percent by 2050. Not only are cities responsible for 80 percent of the global production and 70 percent of total GHG emissions, but they are also very important for climate change mitigation and adaptation because they are the most vulnerable living environments in regards to heat waves, floods, water shortages, and sea level rise (The Global Commission on the Economy and Climate, 2014). On the one hand, cities are considered to be the number one source of the problem at the crosshairs of climate change. On the other, they are considered to be the most important actor in finding a solution to the problem (Balaban, 2012). Thanks to their structural characteristics, cities possess advantages such as developing existing infrastructure facilities and creating economies of scale. Cities are also the center of innovation and creativity. Furthermore, the multi-actor structure of cities enables local administrations to work together with the private sector and civil society organizations.

This chapter will discuss the role that cities can play in climate change mitigation and adaptation and provide examples of policies, actions, and regulations from EU cities and other cities throughout the world. We will address the best practices we observed during our June 2016 visit to Belgium as well as some examples from Turkey. The policy recommendations noted during the Istanbul workshop held on June 27, 2016 and from the local meeting in Çanakkale on June 12, 2016 can be found at the end of the chapter.

1.1. THE IMPACT OF CLIMATE CHANGE ON CITIES

It is a known fact that climate change seriously impacts urban areas, and these impacts are expected to become more serious (Balaban, 2012). However, the precise identification of these impacts before they happen is not easy. It must be noted that scientific research, observations, and findings show geographical variations, and therefore, cities around the world will be impacted by climate change in different forms and on different levels (Bulkeley, 2013).

The escalating GHG emissions and the increase of atmospheric CO₂ levels and mean temperatures in relation to escalating GHG emissions are expected to cause: a) a general and constant warming trend in most parts of the world including urban areas, b) sea-level rises due to thermal expansion and melting ice caps, c) important changes in rainfall, and d) an increase in the number of extreme weather and climate events.

The direct impacts of climate change on urban areas are outlined below and are summarized in Table 1.1.

a) Heat waves and drought: Urban areas are approximately 5 to 6°C warmer than rural areas because of the concrete structures and building density. This is called the Urban Heat Island (UHI) effect, and it has a negative impact on the urban comfort level in warm climate regions during the summer months. The UHI effect is expected to further increase with declining winds and air circulation in relation to increased sunshine duration caused by climate change. Many cities are expected to suffer from more severe UHI effects, heat waves, and droughts (UN-HABITAT, 2011). The negative impacts of heat waves have seriously increased across the globe since 2000. For example, the most recent severe heat wave was experienced in India in 2015 with approximately 2,500 casualties, mostly the elderly and the poor.

b) Air pollution: Warming temperatures and heat waves are presumed to decrease urban air quality (Satterthwaite et al, 2007). This is because the atmospheric concentration of polluting particulate and organic matters increases in direct proportion to heat and sunshine duration. Therefore, the problem in polluted cities is expected to become more severe with increasing temperatures.

c) Water scarcity and declining water quality: Another danger that awaits cities as a consequence of climate change is water supply depletion and water scarcity (Balaban, 2010). The major causes of water scarcity are irregular rainfall and decreases in expected seasonal rain. Irregular and insufficient rain will result in underfed ground water and underground water sources. Moreover, the rise

Table 1.1 The risks and impacts of climate change on urban areas (Source: Bulkeley, 2013)

Climate risks	Examples of direct impacts in cities	Examples of indirect impacts for cities
Sea-level rise	Inundation and displacement of population Coastal flooding and storm surges Coastal erosion and loss of land Rising water tables and drainage problems Increased salinity of coastal environments Economic and leisure activities	Changing dynamics of ecosystems Changes to use of coastal zone Risks to marine economies
Extreme events	Damage to infrastructure systems, property, livelihoods and life from wind-storms, flood events, heatwaves and droughts	Risks to economic production chains Risks to urban food supplies
Health	Physiological effects of heatwaves and cold Changes in incidence of vector-borne diseases Physical- and mental-health impacts of extreme events	Risks to wider systems of health care and support
Energy use	Changes in water and summer energy demand Increased use of air conditioning leading to brownouts	Risks to hydro-power energy systems Increased loss of transmissions as temperature increases reduce energy supply
Water availability	Reduced precipitation and groundwater recharging limits water availability Retreat of glaciers reduces urban water supplies Increased demand for water as temperatures increase Reduction in water quality as river flow decreases	Risks to economic production chains Risks to urban food supplies

in temperatures will decrease water supply in water basins and springs by increasing evaporation (Hunt and Watkiss, 2011).

d) Overflows and floods: We can already clearly observe that climate change increases the frequency and severity of weather and climate events. If we add sea water level rises to this equation, we can clearly conclude that urban areas will increasingly suffer from different kinds of overflow events and floods. It is evident that we will be facing increasingly more frequent and severe, sudden floods caused by sudden and stronger than expected precipitation; coastal floods caused by sea level rises; storm surges, hurricanes, and similar events; and river overflows caused by over-melting of icecaps and extreme precipitation (Balaban, 2012). The increase in flood risks is one of the most common impacts of climate change in urban areas. Almost all cities, whether they are coastal or hinterland cities and regardless of their country's development, are expected to be impacted by flood risks associated with climate change. For

example, the 2011 flood in Copenhagen, a city considered to have an adequate infrastructure system, caused major financial damage as well as other negative consequences. Similarly, the unforgettable flood of the Ayamama Creek in Istanbul in 2009 resulted in 31 casualties as well as serious economic losses.



Urban Heat Island (UHI) Effect

Urban areas are warmer than surrounding areas by an average of 5°C to 6°C. The reason is the Urban Heat Island (UHI) effect, which emerges from building density and concrete structures in urban settings. The UHI effect is expected to further increase with declining winds and air circulation in relation to increased sunshine duration caused by climate change. Heat waves and the escalating UHI effect will cause an increase in air conditioning use and energy consumption, as well as water consumption and demand. Furthermore, there will be a rise in heat-related health illnesses, some tourism regions will suffer economic losses, and conserving urban green areas will become more difficult (Balaban, 2012).

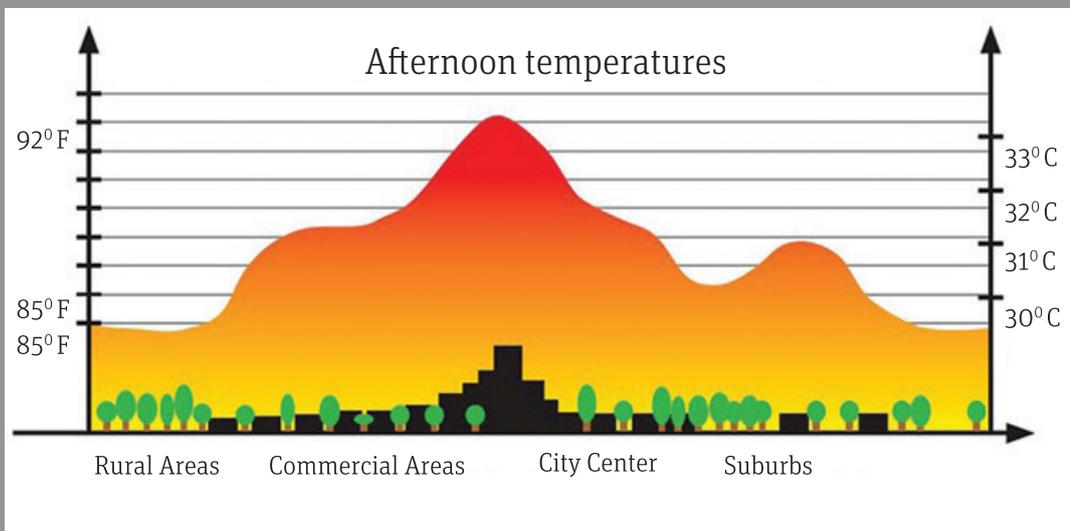


Figure 1.1 Urban Heat Island (Source: www.yesilcati.com.tr)

The energy demand for cooling that accompanies urban temperature increases poses an important threat to countries' energy systems. A study of South Australian cities showed that energy demand increases by 70 percent when average temperatures rise from 24°C to 38°C. The same study revealed that one-third of the existing energy production capacity is built to meet the energy demand that increases in just three percent of the year (11 days of extreme heat) (Berry and Davidson, 2015). This stranded capacity is caused by urban development, which increases the impacts of extreme heat and cannot cope with them, and is a serious waste of resources.

1.2. THE SCOPE OF URBAN CLIMATE POLICIES

Taking into account the aforementioned impacts, we can clearly see that we are in need of active policies, actions, and strategies in various fields such as transportation, housing, infrastructure, waste management, and land use in order to begin urban climate change mitigation and adaptation.

Urban climate policies consist of a two-pronged approach: mitigation of climate change and adaptation to the negative impacts of climate change.

Setting the frame of climate change mitigation and adaptation in cities requires addressing

the issues of compact cities, climate-friendly urban transformation, prioritization of non-motorized vehicles for urban transpor-

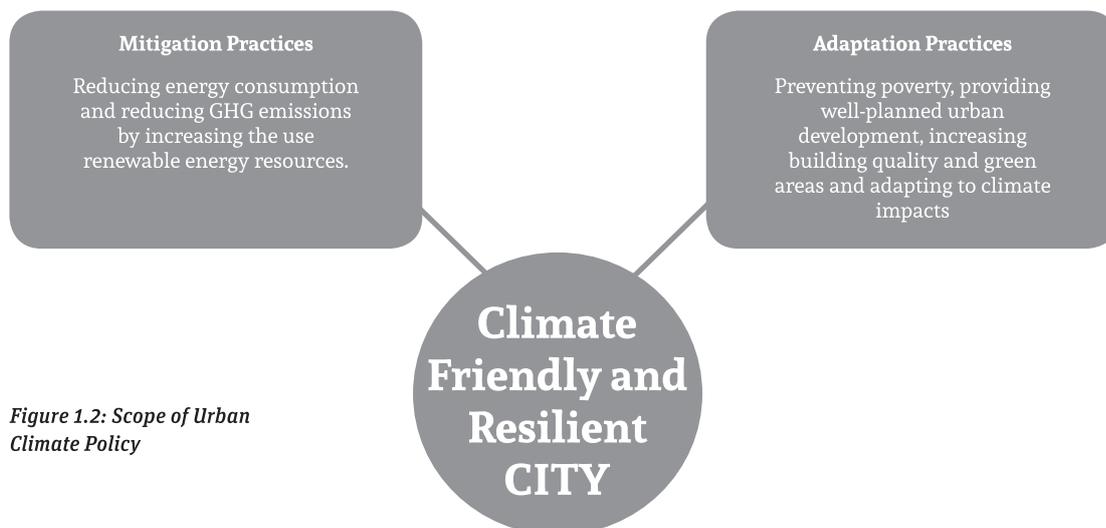


Figure 1.2: Scope of Urban Climate Policy

tation, reduction of urban waste, energy-efficient buildings, passive buildings, and the expansion of urban green areas.

Compact Cities vs. Sprawling Cities and Climate-Friendly Urban Transformation

Recent climate change mitigation and adaptation studies and efforts are putting more and more emphasis on compact cities (Balaban and Puppim de Oliveira, 2014). In this context, compact cities and urban development have become important components of urban climate policy. A compact city, in contrast to a sprawling city, is a city that provides easy access to meeting daily needs, and it is made of high density and mixed-use subdivisions (Balaban, 2012). Designing compact cities and preventing sprawling shortens travel distances and can reduce money and energy spent on transportation. For example, 70 percent of the cost of the water supply is attributed to pipes, and 30 percent of the energy used in the urban infrastructure goes to pumping clean water and collecting waste water (Suzuki et al, 2010). Compact cities also enable the effective protection of natural sites such as agricultural and forest areas that are situated near the cities and that act as biological carbon sinks and reduce the urban heat island effect (Balaban 2012).

This is where the question of how to achieve compact urban development becomes impor-

tant. Looking at examples from around the world, we can see that there is an increasing tendency to efficiently benefit from urban transformation projects (Balaban and Puppim de Oliveira, 2014). We can assert that Turkey, which is undergoing widespread and rapid urban transformation, has great potential. A more efficient urban transformation policies and practices can make the transformation of unused urban spaces into mix-use, highly energy- and resource-efficient living areas that are integrated with mass transit and non-motorized transportation possible and enable the inward expansion of the city without causing urban sprawling.



An example of urban transformation: Hammarby Sjöstad in Sweden

Hammarby Sjöstad is a former industrial area close to Stockholm city center that has been transformed into a sustainable neighborhood. The construction, which began in 1996 and ended in 2012, consisted of 9,000 houses for 20,000 people in a 200-hectare area.

Hammarby also encompasses a 200,000-m² commercial area that employs 10,000 people and facilities that host various educational and cultural programs (Gaffney et al, 2007).

The Hammarby model strives for a balanced and close-circuit city metabolism with integrated energy, water, and waste infrastructure. Moreover, the progressive construction and residential policies that provide easy access to various forms of transportation in order to decrease vehicular traffic and urban congestion, as well as those that protect and restore existing natural systems, made Hammarby Sjöstad an efficient example of the harmonization of ecology and urbanization targets.

The Hammarby model aims are lowering heating requirements to 50 percent less than the national average and minimizing electricity consumption. Garbage is being collected by a special vacuum system that reduces garbage truck traffic, and waste is being used for heating and electricity generation. Rainwater is collected, purified, and recirculated. In Hammarby Sjöstad, four- or five-story buildings are constructed around gardens where greenhouse cultivation and small-scale gardening. These buildings cut the wind and allow maximum sunshine exposure. The gardens are also used for rainwater collection and green roof practices.

The Hammarby model has inspired other urban transformation projects such as the Cao-fedian Ecocity in China and the Symbiocity in Brazil.



Figure 1.3: Hammarby before and after the transformation (Source: Gaffney et al, 2007)

Prioritizing Mass Transit and Non-Motorized Means of Transportation for Urban Transportation

With its high-energy consumption, the transportation sector is among the top sectors contributing to climate change. Inner-city transportation is an especially important part of the

transportation sector. For example, more than 60 percent of the distances travelled worldwide are in cities (Van Audenhove et al, 2014). Therefore, urban transportation policies play a considerably important role in reducing transportation-related energy consumption and carbon emissions. In this context, decreasing the demand for motorized transportation and

increasing the share of mass transit systems in motorized transportation appear to be the best policy options (Balaban, 2012).

The majority of urban travels are short distances. These distances can be travelled without using motorized transportation; however, in most cities they are travelled using motorized vehicles. This increases transportation-related energy consumption and pollutant emissions. By encouraging other transportation means such as walking and bicycling, the energy consumption generated from certain urban travels can be reduced to zero. Copenhagen is known to be a leading city in this matter. The bicycle policy of the city enabled the prioritization of bicycle use during the urban planning processes and increased the share of cycling for inner-city travels. Since 2010, 36 percent of business and educational inner-city travels are done by bicycle. The goal of the Copenhagen city administration is to increase this figure to 50 percent by 2020 (City of Copenhagen, 2011).

More Recycling, Less Urban Waste

Methane (CH₄) is the second most important GHG after carbon dioxide. Methane emissions' main sources are waste storage areas. In 2010, GHG emissions generated by solid waste and wastewater accounted for 1.5 Gt CO₂e (IPCC, 2014). The most efficient urban policies to reduce waste-generated emissions are to reduce the amount of waste and to capture the methane that is produced in waste storage and treatment facilities and to use it in energy production. This requires the installation of modern waste management systems. This practice enables the reduction of waste as well as sorting and recycling waste at its source.

Yokohama, Japan's second largest city, has been operating a very efficient solid waste management system since 2003. With this system in place, the city reduced the amount of solid waste from 465 kg per capita in 2001 to 260 kg per capita in 2008, despite a population increase of 170,000 people over this period (Balaban and Puppim de Oliveria, 2014). During the same period, emissions declined by 840,000 tons CO₂e (Suzuki et al, 2010).

Smart, Energy-Efficient and Passive Buildings

The construction sector, with its large share in global energy consumption, is another important urban sector for climate policies. Twelve percent of global GHG emissions are generated in commercial and residential buildings (IPCC, 2014). While some of the energy consumed is for heating and cooling purposes, the rest is for lighting and use of internal equipment.

We can categorize measures that reduce energy consumption and carbon footprints in buildings into two groups: active and passive design strategies and practices (Rode et al, 2011). Active design strategies aim at achieving energy and resource efficiency through the use of suitable technological products and equipment during the design, construction, and occupancy stages of buildings. These technological products and equipment include photovoltaic solar batteries or arrays, lighting sensors, LED lighting products, coated glass that provide heat control, and computer-controlled energy management systems (Balaban and Puppim de Oliveira, 2016). Passive strategies are solutions that reduce a building's energy and resource consumption needs through a more efficient and correct use of natural factors such as air circulation and sunlight without compromising indoor comfort. Many building design factors such as building orientation, façade, skylights, and many other construction factors can be the subject of passive design (Balaban and Puppim de Oliveira, 2016).

Urban buildings play an important role in climate change adaptation efforts. There are many measures that need to be taken in the building sector to decrease urban vulnerability in the face of climate change. One-third of the world's population lives without well-functioning sewage systems, clean potable water, shelter and housing security, durable housing, and sufficient living space in slums and squatter settlements. These settlements increase the vulnerability of the city and of its occupants in the face of extreme weather and climate events that are expected to escalate with climate change—extreme rainfall, wind, and storms—and decrease the city's





adaptation capacity (Balaban, 2012). Climate policy actions and strategies involving urban buildings should aim not only to ensure energy and resource efficiency but also to restore

and reinforce buildings to transform them into structures that can provide the minimum level of comfort and be resistant to extreme climate events.

Are we rich enough to live in uninsulated houses? ⁵

We mentioned that the most important weakness of the Turkish economic system is its structure, which gives rise to current account deficits during growth periods. Energy-intensive sectors have been increasingly leading economic development since the mid-2000s, and this has triggered an increasing current account deficit alongside economic growth. The current low energy prices (which have not yet been reflected onto the industrialist and final consumer) have made a positive contribution to the current account balance; however, this might be temporary. Approximately one-fourth of imported energy is being used for residential heating and cooling. Therefore, it is clear that making buildings efficient and raising the energy standards of new buildings will provide important contributions to both individual and national budgets.

In a general application:

- ▶ The monthly average heating-cooling bill of a 100 m² apartment: 220 TL
- ▶ The average insulation investment of a 100 m² apartment: 4,000 TL
- ▶ The monthly payment of a 4,000 TL, four-year Eco loan: 110TL
- ▶ 50 percent savings on the heating-cooling bill after insulation: 110TL

As illustrated by the calculations above, a monthly bill of 220 TL (heating and cooling for an uninsulated house) can be reduced to 110 TL by insulating the house. If a bank loan is used to finance the initial investment, the amount that will have to be paid (cost), and the amount that will be saved (income) at the end of four years is 5,280 TL. The bank loan lifts off all the burden of the initial investment, and at the end of the fourth year, individuals are able reduce their energy bills by 50 percent.

Today, despite some awareness efforts, a building's energy qualifications still are not sufficient during the rental or sale processes. And this proves that energy efficiency campaigns need to address the demand side of the real estate markets as much as the supply side. A regulation that would make it mandatory to include a buildings' energy identity information in real estate search engines, in addition to the usually listed criteria (m², number of rooms, etc.), can create strong pressure on the supply side.

⁵ We extend our thanks to Ahmet Acar for the calculations.

Urban Green Area Systems

Urban green areas, especially urban forests and large-scale parks, which conserve their flora and natural soil structure, are considered to be important multifunctional urban areas for climate change mitigation. Open green spaces help to mitigate the

impacts of climate change. Green spaces and natural flora, most notably forests and wetlands, are known to capture atmospheric carbon dioxide and function as natural carbon sinks. For example, the Japanese cedar tree, which requires a 10 m² planting area, stores approximately 14 kg of CO₂ per

year (Suzuki et al, 2010). Another ecosystem service provided by open green areas is the reduction of the negative impacts and outcomes of extreme climate events (Balaban, 2012). More clearly, green areas and forests reduce the risk of flood by enabling the absorption of rain water through the soil, prevent air pollution, and are effective in decreasing the impacts of heat waves and UHI (Wilby, 2007; Hunt and Watkiss, 2011). One study (Gill et al, 2007) indicated that increasing green spaces located in the city center and high-density residential areas by a mere 10 percent would prevent the rise of surface temperature.

Therefore, preserving and developing green areas is one of the most important urban policy options in addressing climate mitigation and adaptation in urban policy. Protecting and increasing the city and suburban forest assets and establishing sustainable open green spaces should be among the priorities of urban management (Balaban, 2012). Green areas should be designed and managed with sustainable and innovative drainage and infrastructure systems. The recent, widespread use of green roof and green frontage applications, especially in high-density urban fabric where open space is limited, and their positive results should also be noted by city administrations.

1.3. PASSIVE BUILDINGS

The notion of developing passive buildings was the product of a mail correspondence between Lund University (Switzerland) faculty member Bo Adamson and Wolfgang Feist from the Institute for Housing and the Environment (Germany) in May 1988. The notion was developed through a series of research projects funded by the state of Hessen in Germany. The first passive house was built in 1991 in Darmstadt, Germany.

Efficient energy use is the basis of the concept of passive houses. Passive houses require less than 1.5 cubic meters (or 15 kWh) of natural gas per square meter (Subaşı, 2015). It is noted that the amount of energy required by conventional buildings, depending on their location and quality, is

six to ten times higher.⁶

Even though passive house constructions have been observed to be more costly on average than conventional buildings—in Germany 5-8 percent⁷, in the UK 8-10 percent⁸, and in the United States 5-10 percent⁹—there are some cases in Germany where technological innovations enabled passive houses to be built at the same cost as conventional houses.

It has been noted that with some measures such as insulation, door and windows standards, air tightness and avoiding heat bridges, and using a mechanical ventilation system, the amount of energy required for indoor heating or cooling can be reduced by 90 percent. With 80 percent of a building's energy consumption being used for air conditioning (heating and cooling) and 26 percent of 100 Mtep energy (imported at 54.9 billion USD in 2014) being used for residential consumption, it is clear that passive house standards in Turkey would not only provide climate, environmental, and health benefits but substantial economic benefits as well.

European Union countries have imposed regulations requiring that all new structures be built according to passive house standards from 2019 onwards. As for Turkey, the passive house concept has not evolved beyond the construction of the following housing projects:

- ▶ The Gaziantep Metropolitan Municipality

⁶ For examples, see Harvey, 2009.

⁷ See International Passive House Association, "The Passive House – sustainable, affordable, comfortable, versatile," https://passivehouse-international.org/index.php?page_id=79

⁸ See Lucy Siegle, "How can I live in a passive house?" The Guardian, December 8, 2013, <https://www.theguardian.com/environment/2013/dec/08/live-in-passive-house-passivhaus>

⁹ See Inhabitat, "Cellar Ridge's 50/10 Homes Boast 50% Greater Efficiency for 10% More Money than Similar Homes," <http://inhabitat.com/cedar-ridges-5010-homes-boast-50-greater-efficiency-for-10-more-money-than-similar-homes>



Human Resources Headquarters Project,¹⁰

► The Vendeka Office Building projects at Hacettepe Teknokent,

► The Abant İzzet Baysal University, Energy Efficiency Training Building Project,

► The GAP Energy Efficiency Consultancy and Incubation Center Project,

► Five Public Buildings as part of a UN-DP-Turkey project.

10 <http://www.gastroantep.com.tr/files/ekolojik-bina-projesi.pdf>

Climate-friendly urbanization: The Brussels experience

During our field trip to Belgium, we met with former Brussels Regional Minister of Environment Evelyn Huytebrock and her team and toured with our rented bicycles to observe the various applications in the city. We can summarize our observations as follows:

We observed that although Brussels boasts a population close to 1.2-1.5 million permanent residents and 300,000 commuters, it is on its way of rapidly becoming a sustainable city. It was indicated to us that this transformation began in 2004 when a green party by the name of ECOLO, which was active in the Valon region, was elected to city government. During 1990-2014, the city's energy consumption increased by 16 percent, and GHG emissions had increased by 8 percent. Even though the population increased by 14 percent during 2004-2012, various projects and policy changes resulted in a 14 percent decrease in energy consumption and 17.5 percent decrease in GHG emissions (Figure 1.4).

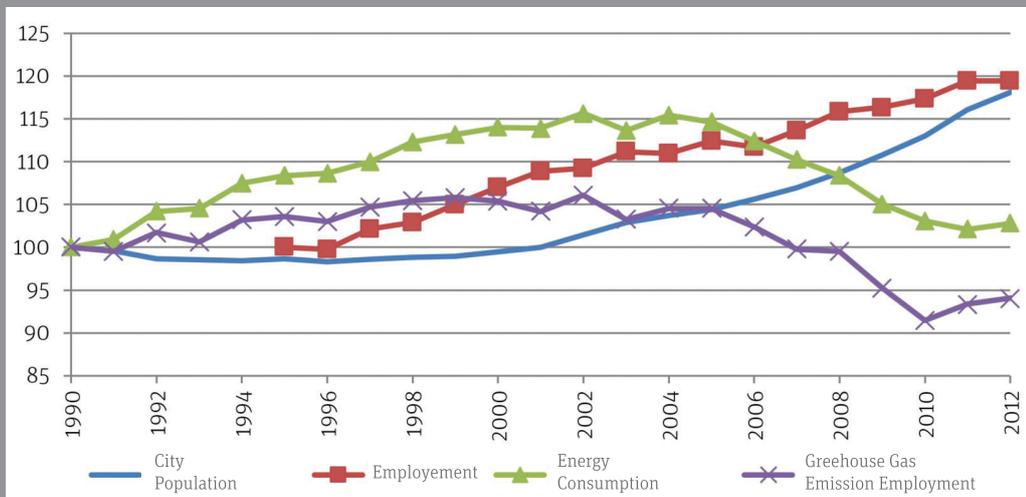


Figure 1.4. Changes in energy consumption, GHG emissions and employment in Brussels, 1990-2012. (Proportional change in relation to 1990 levels marked as 100. Source: Brussels Municipality Ministry of Environment)

The implementation of passive buildings in Brussels is the reason behind this remarkable success. Brussels' city government shows true leadership in climate change mitigation. Implemented in 2008, the Brussels building energy performance regulation was a first for the EU and made it mandatory for all new buildings to conform to passive building standards.

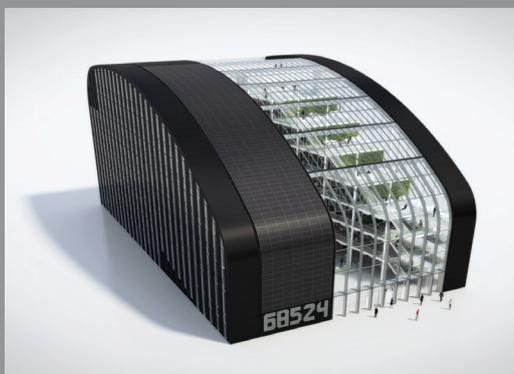
Huytebrock says that the city's transformation began with a small innovative group. They subsidized 30 different applications including double-glazed windows and rooftop solar

panels and provided low-interest loans. They were able to find the necessary funding for gas and electricity distribution because the distribution companies were controlled by the city administration. The subsidy budget increased from 600,000 EUR in 2004 to 25 million EUR in 2016. Also, a program to raise energy consumption awareness by the name of Plage brought about a two percent decrease in energy consumption. Beginning in 2007, invitations to construct sample buildings were made. This period overlaps with a sudden increase in oil prices that was caused by Hurricane Katrina in 2005, and this was indeed not a coincidence. Similar invitations were repeated six times between 2007 and 2013¹¹. The projects were evaluated according to four main criteria: energy, environment, profitability and repeatability, and harmonization with the architecture and the city. Funding was provided for 243 buildings covering 621,000 m² of residential area, translating to 100 EUR per 1 m²¹². Construction permits were given to almost 1 million m² of passive designs—half of them new, the other half already existing buildings—as part of the project.

Other challenges consisted of the misconception that passive buildings were expensive and the lack of qualified workers. Public and private sector representatives came together to discuss how to revive the passive buildings sector. Ecobuild.Brussels, an organization that brings together contractor companies, architects, engineers, and local government representatives, emerged during these meetings.

This 16,000 m² structure is Europe's largest passive building and is host to the Brussels Ministry of Environment (Figure 1.5).

Figure 1.5. The new passive building of the Brussels Ministry of Environment. Left: interior view Right: exterior view



Source: LaCapitale.be¹³

Source: Canal.Brussels¹⁴

11 For more detail on these invitations and their results, please see <http://www.environment.brussels/node/17349>

12 For more information on Brussels' sample passive buildings, please refer to <http://www.guidebatimentdurable.brussels/fr/carte-interactive.html?IDC=8027>

13 <http://www.lacapitale.be/506307/article/regions/bruxelles/2012-08-29/le-nouveau-siege-de-bruxelles-environnement-ouvre-la-refonte-de-tour-et-taxis>

14 <http://canal.brussels/fr/content/tour-et-taxis-accueille-le-nouveau-b%C3%A2timent-de-bruxelles-environnement>

1.3.1 Are Passive Buildings Cost-Effective?

One of the major constraints of widespread adoption is the false assumption that passive building construction costs are high and hence not cost-efficient.

Table 1.2 features the cost calculation of a 149-m² family home constructed by the Passivhaus Institut in Shresback, Germany.

Yearly payments to the bank	319 Euro
Yearly heating savings of 11000 kW	-822 Euro
Ventilation electricity cost	71 Euro
Yearly savings	432 Euro

Table 1.2. Total cost of a 149-m² passive house in Germany
(Source: Passivhaus Institut¹⁵)

According to calculations, transforming a 149-m² home into a passive house costs approximately 14,000 EUR (Table 1.3). The cost calculation assumes that the house owner will receive a 15,000 EUR bank loan with favorable terms from the German Federal State Bank for building a passive house. (The mortgage rate under the KfW ESH40/Passivhaus subsidy program is 2.1 percent instead of the regular rate of 4.7 percent).

Activity	Cost
Increasing the thickness of the exterior insulation to 300 mm	4.800 Euro
Increasing the roof insulation from 100 mm to 225 mm	
Using 250 mm insulation foundation panels instead of the 150 mm	
Passive residential windows	5.400 Euro
Heat-resistant ventilation	5.200 Euro
Savings made from smaller fuel tank, boiler and cancelled radiators.	-1.400 Euro
Total Cost	14.000 Euro

Table 1.3. The total cost of a 149-m² passive house in Germany
(Source: Passivhaus Institut¹⁶)

The calculation foresees an electricity consump-

¹⁵ Source: https://passiv.de/former_conferences/Passive_House_E/economy_passivehouse.htm#abb2

¹⁶ Ibid.

tion of 2,290 Kwh for heating and 350 kWh for ventilation, replacing the consumption of 13,300 KWh fuel oil or natural gas. The cost benefit calculations for a 30-year period were calculated in Table 1.3.

1.4. AMENDMENTS MADE TO THE TURKISH BUILDING ENERGY EFFICIENCY LEGISLATION

Since 2000, new buildings in Turkey have been required to conform to thermal standards similar to those of the EU. Accordingly, the Building Energy Performance (BEP) Regulation was published in the Official Gazette in 2008 and entered into force in 2009. The 2011 amendment to the regulation brought the requirement for new and existing buildings to hold an “Energy Identification Document.”

With the support of some ministries, the construction of five model buildings in Ankara, as part of the United Nations Development Program (UNDP) Turkey Office’s “Promoting Energy Efficiency in Buildings” project (2011-2015), has begun¹⁷.

The UNDP booklet lists the possible challenges to BEP implementation and constraints that might stand in the way of the improvements (UNDP, 2015):

- ▶ Turkey is identified as a four-season region. However, this classification does not adequately represent the vast climatic and seasonal variations among its 81 provinces.
- ▶ The scope and/or applications of the current energy efficiency regulations are insufficient.
- ▶ The level of adaptation to the current regulations is low.
- ▶ The awareness and level of information regarding energy performance improvement, including the Integrated Approach to Building Design, is still insufficient.
- ▶ Repeatable investment and subsidy models for energy-efficient buildings are not sufficient.
- ▶ There are shortcomings in the making and application of an “Energy Management System.”

¹⁷ For more detailed information on the project: http://www.tr.undp.org/content/turkey/tr/home/presscenter/articles/2016/08/demo_binalar

An organization model: Ecobuild. Brussels

Ecobuild.Brussels was founded in 2006 by the Ministry of Economics and Ministry of Urbanization of the Brussels regional government to support the sustainable construction and renovations sector.

The major part of the existing building stock in Brussels consists of relatively old, high energy-consuming buildings. The most important motivations behind Ecobuild.Brussels are the local government's targets of a 20 percent reduction of GHG emissions by 2020 and the mandatory construction of passive buildings, which entered into force in January 2015.

Construction and renovation companies are working together with other innovative green technology and informatics companies that are grouped under the umbrella of Impulse.Brussels.

Ecobuild.Brussels boasts a total of 200 members who are mostly entrepreneurs, architects, engineers, and equipment suppliers and 25 different partners such as research centers, universities, and professional organizations. Ecobuild.Brussels' board is composed of one chair, five entrepreneurs, four partners, and three local supporters. It is currently conducting three international projects and one local cyclical economics project. Ninety-six percent of the companies that partake in the projects are small- and medium-sized enterprises (SME) with more than 32,000 employees.

Ecobuild.Brussels indicates that their next goal is to construct buildings from zero material, in other words from recycled material.

Brussels' climate-friendly urbanization owes its success to the policies as well as to the institutions that were formed to implement these policies. Ecobuild.Brussels brings together all the urbanization stakeholders, and its authority and participatory structure makes it a good example of climate-friendly urbanization.

An example of climate-friendly urbanization: Ghent

Located in the Flemish region of Belgium, Ghent has been an industrial and commercial center since the Middle Ages. Even though Ghent is a wealthy and rather conservative city, it boasts striking and innovative examples of city planning and transportation.

The first thing we noticed during our field trip to Belgium was how well developed the bicycle infrastructure was and the high number of bicycles. The large bicycle parking space in Ghent's train station, which connects the city to big centers such as Brussels, was proof of the important role that cycling plays in intra-city transportation. People going in the same direction can leave their cars at the parking lots on the edges of the city and carpool. These are efforts to reduce inter-city traffic, energy consumption, and GHG emission levels.

The Green Belt Project surrounding the city of Ghent is about to be completed. Upon completion of the project, it will be possible to cycle and do sports around the city without any interruptions. Immediately behind the Green Belt, municipality-owned areas are opening up to community farming. Individuals can rent land and grow their own crops within the city limits.

Ghent's historical center consists of narrow streets. A plan to reduce city traffic by closing down roads to bicycles and motor vehicles is in force. The plan consists of blocking roads that lead to the city center at a specific point and directing traffic to the periphery. Even though business owners were worried that closing down the roads would have a negative effect on their business, now they are convinced that pedestrian-friendly streets will become even more crowded and will reflect positively on their business.

1.5. CLIMATE-FRIENDLY CITIES AND GREEN ECONOMY: CHALLENGES AND RECOMMENDATIONS

On June 27, 2016, experts and civil society activists met at Istanbul Policy Center to attend Osman Balaban's (Middle East Technical University (METU)) lecture on climate-friendly urbanization and Evelyn Huytebroeck's (European Green Party Committee Member and former Brussels Region Minister of Environment) lecture on energy efficiency in cities focusing on the example of Brussels. Following the presentations, workshop participants were divided into three groups according to their areas of expertise and interest in order to discuss and prepare reports on opportunities, constraints, and innovative policies to overcome these challenges in Turkey. The opinions and recommendations that came out of this workshop can be summarized under three headings: energy efficiency in buildings and passive buildings, urban agriculture, and transportation by bicycle.

1.5.1. Energy Efficiency in Buildings and Passive Buildings

1. Opportunities

- ▶ The most important opportunity Turkey has is its fairly widespread, ongoing urban transformation. Energy efficiency can be increased in newly constructed buildings as part of urban transformation.
- ▶ International green certified systems such as LEED and BREAM, which are provided by organizations such as Turkish Green Building Council (ÇEDBİK), constitute an important opportunity. However, an alternative local green certification system can also be established.
- ▶ Historic architectural traditions such as the 400-year-old passive Mardin Houses¹⁸ present opportunities that can be used to raise public awareness.

2. Constraints

- ▶ Sectoral lobbying groups' negative influence

¹⁸ For a study of heating in Mardin houses, see Bekleyen et al 2014.

is observed. The TSE825 standard seems to have been determined through the influence of sectoral lobbying. Set with profitability in mind, standards do not take into account the climate differences between, for example, Istanbul and Diyarbakır, so that the same product can be sold across Turkey.

- ▶ False information, manipulation, and lack of inspections are some of the constraints. The 2005 Environment Act and the Energy Efficiency Regulation are not entirely respected in the construction sector. The new building constructions do not fully conform to the legislation, and inspections are not sufficient. There are still cases where the Environment Impact Assessments are not taken into account, and efforts to legalize bad practices continue.
- ▶ Being able to obtain green building certificates with simple applications that are for show, such as the use of efficient light bulbs, also constitutes an important problem.

3. Policy Recommendations

- ▶ An intelligently designed subsidy system that not only obliges the sector to construct passive housing but also rewards applications should be implemented.
- ▶ New definitions and amendments to the legislation are needed. For new building constructions, the use of methods that fully ensure energy-efficient results should be made mandatory. For old buildings that will not be demolished, jacketing should be compulsory, and precautions should be taken in case of asbestos, etc., during building demolitions. The Green Roof requirement for new constructions in some countries such as France can also be implemented in Turkey.
- ▶ Public institutions and large companies should construct model buildings to set examples for the public and industry. Although some examples do exist, they are too few in number.
- ▶ Public service announcements broadcasted from various channels can be used to mold public opinion, particularly the opinion of people who will financially profit from these enterprises (such as the construction sector and homeowners). Furthermore, trainings can

be provided in schools in order to reach the parents and raise awareness. Trainings similar to those provided to building managers and homeowners in Duisburg, Germany, by the Energy School can be implemented in Turkey.

- ▶ Building management is as important as the foundation of a building. Problems such as inefficient systems that do not turn off the heating on pleasant winter days and the lack of central heating maintenance in most public buildings can be corrected with a smart management system.
- ▶ The economic contribution of properly planned and constructed passive buildings should be documented and communicated and the Housing Development Administration of Turkey (TOKİ); co-ops and the private sector should be kept informed on the comparative costs of passive and regular buildings.

1.5.2. Urban Agriculture

1. Opportunities

- ▶ Large cities such as Istanbul have a large population of well-educated and conscious middle-class residents with high purchasing power. These residents' positive approach to "urban agriculture" can present an opportunity for the expansion of this idea.
- ▶ Some positive examples can be used as an opportunity to spread urban agriculture (such as the Fenerbahçe community gardening, compost workshops at Beşiktaş and Ataşehir, and the preservation of the Kuzguncuk vegetable garden in Istanbul, etc.).
- ▶ Istanbul's ecologic marketplaces enable the protection of agricultural areas located in the outskirts of the city and facilitates establishing consumer-producer associations such as food communities.
- ▶ Large military areas present an opportunity for urban agriculture. Agriculture in military compound gardens can be made possible through establishing communication between the armed forces and local governments. These gardens can even provide for some of the armed forces' food supply.
- ▶ There are opportunities for the activation of

idle urban spaces such as the Yeldeğirmeni neighborhood in Kadıköy and for the transformation of common spaces or courtyards into vegetable gardens.

2. Constraints

- ▶ The fact that local policies are designed within a centralized structure constitutes an important constraint. For example, Kurbağlıdere creek, which constitutes a pollution problem that can be overcome with local innovative projects, is located within the limits of Kadıköy Municipality, yet the authority lies in the hands of the Istanbul Metropolitan Municipality.
- ▶ The current rent-seeking struggles and derelictions are serious constraints. In Turkey, the green spaces that should be open to the public are under the pressure of rent-seeking. These areas are easily zoned for construction because of property relations and rent-seeking policies.
- ▶ The current landscape constitutes a serious problem.

3. Policy Recommendations

- ▶ Authority issues among institutions need to be resolved (such as between the metropolitan municipalities and local municipalities), and local administration capacity needs to be increased.
- ▶ Experts and civil society organizations should be brought together with municipalities for the planning and implementation of micro-activities.
- ▶ Efforts towards increasing green jobs and developing new jobs are needed.
- ▶ There is a need to encourage recycling (including composting, etc.) and to provide practical solutions to recyclers.
- ▶ Policies that encourage the spread of green roofs and balcony gardening need to be developed.
- ▶ Ensuring the continuation of post-Gezi neighborhood forums and local initiatives is recommended.



- ▶ Opening new marketplaces that will facilitate buying products directly from the supplier and the expansion of food communities should be supported.
- ▶ Cooperating with similar co-ops from other parts of the world should be initiated.
- ▶ There is a need to provide urban agriculture and gardening training and awareness activities designed for the public.
- ▶ Another recommendation is to build, in cooperation with the municipalities, agricultural tourism centers in Gümüşdere and Beykoz to set a precedent. Municipalities can open eco-restaurants in these centers where agricultural training and cooking lessons will be provided.
- ▶ The use of foreign plants and tree species should be avoided, and the protection of the natural structure and soil fabric in landscape applications needs to be ensured.
- ▶ Using natural flora to provide shade and green to mass transit stops is recommended.

1.5.3. Transportation by Bicycle¹⁹

1. Opportunities

- ▶ The dependency on motorized vehicles and highways for inner-city transportation, integration problems of the Istanbul transportation network, and insufficient sub-province mass transit methods make bicycles an alternative method of transportation.
- ▶ Blue-collar workers constitute a potential group who can use cycling for transportation. For example, in the metropolitan area of Istanbul, the workplaces located in the informal residential areas that have developed in the last 50 years are mostly labor-intensive structures (such as textile workshops). In these areas, the transportation need of the workforce is mostly on a sub-metropolitan level. In other words, the transportation required for the mobility of this specific workforce is confined to within sub-province limits or between two or three neighboring sub-provinces at most. On a

local scale, mass transit systems generally run on main streets, and cycling can be a good transportation alternative.

- ▶ The mobility of the white-collar workforce, who is more inclined to use bicycles for cultural reasons (affinity to ecology or interest in physical activities) and has already developed a certain demand, is spread throughout the metropolitan area and covers fairly long distances. To be able to offer bicycle transportation services to this second group, the transformation system needs serious transformation and investments. Due to the scale of this workforce/transportation profile, the required infrastructure transformations—including the transportability of bicycles in mass transit vehicles during intercity or interregional travels and the design of the physical capacity and characteristics of transit or long distance roads to suit bicycles—can be considered as another opportunity.

2. Constraints

- ▶ Cycling knowhow and culture has dissolved and disappeared with rapid urbanization, population increase, urban expansion, and the rapid transition to motorized vehicles. Information and skill regarding bicycle use and repair have diminished.
- ▶ The habits and culture of motorized vehicle drivers represent serious safety issues including life-threatening risks for bicycle riders who attempt to use the same infrastructure.
- ▶ During the course of rapid urbanization, the physical infrastructure of cities develops based on small lots and the increasing use of motorized vehicles. This infrastructure is not suited to pedestrians, let alone cycling. Finding a place for bicycles in narrow streets enclosed by busy sidewalks where pedestrians and motorized vehicles struggle for existence is a big question.
- ▶ The priority target of the current urban transformation policies is to equip cities with infrastructures that are suited to motorized vehicles. The bicycle is not even mentioned as an alternative to motor vehicles in the post-transformation period.

- ▶ The predominant recommended concepts

¹⁹ We extend our thanks to Orhan Esen for preparing an extensive report on this subject during the working group.

for urban transformation suited to motorized vehicles are policies involving “highway-ization” and the expansion of expressway networks suited to highway standards. These policies disconnect settlements, shrink the infrastructures that are suitable for cycling (and pedestrians), and most importantly make interregional bicycle transportation impossible.

- ▶ Public buildings, which increase in size, are very often decentralized and moved away from the city center. They are constructed as campus buildings and on expressways and can only be reached by motorized vehicles. Public (centralized state and metropolitan municipality) investments themselves pose (irreversible or complicated and/or costly) constraints to a potential concept of a bicycle city.

- ▶ Public and local administration’s awareness regarding “bicycle as a means of transportation” is very low, and bicycle lobbies are either very weak or they fail to address their demands to the proper level of authority. As a result, we cannot talk about the existence of a general platform that is conducive to meaningful and constructive dialogue.

- ▶ One of the constraints generated from not thinking on a local level is that while transportation networks in the direction of the city center are expanding, transportation networks that will allow local mobility are overlooked.

- ▶ The fact that the local bicycle road initiatives are not sufficiently safe, the start and finish points are not integrated, and cycling is reduced to a hobby that can be practiced in small spaces are some of the other constraints.

- ▶ Health risks caused by air pollution due to traffic congestion and other factors represent constraints for big cities like Istanbul.

- ▶ The fact that the public cannot get in touch with the decision-making technocrats of local and city transportation issues, and hence the supply-demand equilibrium cannot be attained, is an impediment for the localization of transportation.

- ▶ Increasingly larger highways and the transformation of byroads into highways are

important physical constraints to intra-district and inter-district transportation alternatives such as bicycle sharing and pedestrian transportation.

- ▶ The fact that the transportation network connecting the city and the suburbs is not an integrated system is a constraint for the design of a transportation system suited to bicycles.

3. Policy Recommendations

- ▶ Cooperating with local administrations that work on these issues and focusing on the development and integration of ongoing infrastructure.

- ▶ Encouraging local administrations who are sensitive to the issue to partner and “cross-integrate” with neighboring municipalities; developing cooperation networks and common physical infrastructures and policies in sub-metropolitan areas.

- ▶ Creating infrastructure for bicycle paths in more suitable, topographically “flat,” and accessible areas.

- ▶ Developing intra-area/middle range “joint transportation patterns” around areas where university students, healthcare personnel, and young white-collar workers with possible demand for bicycle transportation in the intra-metropolitan area live.

- ▶ Intervening from the onset in areas where urban transformation or new settlements are planned; preventing urban transformation from becoming a form of urban intervention that only encourages the use of motorized vehicles; developing tangible urban transformation planning recommendations so that the transformation is suited to pedestrian, bicycle, and mass transit alternatives and to an “alternative backbone” composed of their integration.

- ▶ Encouraging cycling by reducing the demand for motorized vehicle transportation via congestion charges and banning vehicles from certain city areas.

- ▶ Increasing and expanding bicycle awareness programs.



- ▶ Encouraging cycling as a means of transformation for local commuting by developing safe cycling and following up by developing a demand for safer bicycle roads.
- ▶ Making intra-district cycling possible by correctly planning bicycle roads and establishing an integrated system; connecting the intra-city systems, which consist of bicycle intersections and bicycle highways, to the city center, thus enabling access to the city center via green transportation.
- ▶ Providing incentives to the bicycle sector to increase the demand for bicycles and a bicycle road system.

An example of climate change and urban policies: Çanakkale

On June 12, 2016, we organized a workshop in Çanakkale that was attended by eight local participants composed of an architect, city-planner, academician, and activists. We discussed the current state, opportunities, and constraints of urban policies for climate change mitigation in Çanakkale as well as energy-efficient and passive buildings, inner-city pedestrianization and bicycle roads, and urban gardening. The issues that were highlighted during the workshop can be summarized as follows:

- ▶ Thanks to its geographic, sociologic, economic, and demographic structure, Çanakkale is a city of manageable scale and characteristics. It is also a suitable place for the implementation of innovative climate and city policies. Çanakkale's open structure, its civil society, and the city council's efforts are considered to be opportunities for improvement.
- ▶ A green building study was done for the new building and cultural center project of the Çanakkale Municipality, and the building is currently under construction. The long-term study of the American Leeds criteria done by architects and municipality representatives during the competition phase increased awareness. The local administration's approach to green building initiatives, developing insulation standards, and pedestrianization shows that it is open to climate-friendly policies.
- ▶ Procuring building materials locally to minimize energy consumption, solar panels, insulation, circulation, and recycling waste were important issues during the design stage of the municipality's green building. The material criterion was especially difficult to respect.
- ▶ In Çanakkale, constructions are now more insulated as a result of customer demand and solar panels—even if few and random—being installed on new building rooftops. Environmentally conscious people who came from Istanbul to build houses have also contributed to this development in Çanakkale, and this is considered a positive sign. However, participants provided us with some examples that made things difficult, such as the Turkish Electricity Distribution Company (TEDAŞ) stating that different electrical wiring is required to produce electricity from residential solar panels. These examples seem to originate mostly from a lack of information on the subject. It has been pointed out to us that there have been instances where architects, engineers, and state representatives' lack of knowledge has made it impossible to implement solar panels, and this has constituted an important obstacle.
- ▶ The energy identity document, required since 2015 in accordance with the Building Energy Performance Regulation to ensure the efficient use of energy in buildings, makes it possible for architects and engineers to be better informed and more sensitive to these issues.



- ▶ A suitable city plan is needed to receive further benefits from rooftop solar panels (due to the importance of south-facing facades). However, this issue is not being prioritized by the decision-making Municipal Council and city planners and is pushed aside because the real determinant factor here is property relationships. It seems that it is not easy to make a plan based on the simple logic that “buildings should face South to get more sunlight.”
- ▶ Çanakkale is expanding along the coastline, contrary to the compact city planning that is proposed in order to reduce urban transportation and energy demand. Also, this expansion does not apply to green areas. Furthermore, public buildings such as the courthouse and hospital are being constructed outside city limits because land prices are more reasonable and there is more parking space available, and this creates a center of attraction.
- ▶ Information and notices were sent out to public institutions following the Building Energy Performance Regulation of 2008, but no practical adjustments regarding energy efficiency were implemented in public buildings.
- ▶ It has been pointed out to us that there is still interest in energy co-ops and that there could be interest in passive buildings in Çanakkale. The first approach to these kinds of issues consists of looking at the additional costs they will bring; however, passive buildings do not bear any important additional costs. This is why studies that would provide information to architects and engineers and create demand are important. The central government as well as the local administration can develop various subsidy systems.
- ▶ Public transportation in Çanakkale is insufficient and is mostly done by private mini-buses. There is no public transportation from certain neighborhoods, such as Kepez, to the university campus, and this is why private car use is widespread and sometimes obligatory except in a certain limited areas of the city center. The city’s expansion along the coastline and public buildings that are being constructed outside the city center increase the necessity to use private cars.
- ▶ Even though the city is built mostly on flat land, transportation by bicycle is almost nonexistent, and bicycles are only considered for recreational purposes. It has been pointed out to us that cycling in traffic is dangerous. The participants’ opinion is that bicycle roads that have been constructed by the municipality are located in the city center, even on sidewalks, only for show and that they are not continuous and cannot be used for transportation purposes, only for strolling.
- ▶ There has been successful pedestrianization over the last 20 years in Çanakkale. The pedestrianization that began with the Market Street in the city center and later expanded to the city’s back streets is receiving public support. Access to the city center by private car is limited by the implementation of one-way traffic. This presents an opportunity for the bicycle roads that will allow widespread use of bicycles for transportation purposes; however, this approach has not developed yet.
- ▶ Urban gardening activities have begun in the areas developed by the municipality; however, city residents still have ties with rural areas and villages, and this presents a constraint for the development of a serious demand for urban agriculture. Neighborhood markets are open four days a week in the city center, and produce from local gardens can be found at these markets and even at small neighborhood grocery stores. This is why there is no interest in food communities. There are many organic farms in Çanakkale; however, the products are mostly consumed in Istanbul and not in Çanakkale, and there is no organic market in Çanakkale.



CHAPTER 2

CLIMATE CHANGE AND ENERGY

CHAPTER 2: CLIMATE CHANGE AND ENERGY

Energy is the driving force behind all economic sectors. Therefore, the problem is not whether or not to produce energy but the economic vision behind energy production and the reasons why energy is produced and consumed. It is clear that in Turkey today, the energy policies, which are determined in line with “energy supply-security,” aggravate climate change and inefficient resource usage, whereas the demand-side management approach to energy policies is rapidly spreading all around the world.

This chapter will begin by covering the role and responsibilities of the energy system in climate change mitigation and adaptation. We will discuss the good practices of renewable energy transformation we observed during our June 2016 field trip to Belgium as well as some examples from Turkey. The policy recommendations noted at the Istanbul workshop (September 9, 2016) and the local meeting in İzmir (October 13, 2016) can be found at the end of the chapter.

Fifteens signals of renewable energy transformation:

1. “Renewables accounted for 90 per cent of new electricity generation globally in 2015, while contributing to half of it the year before.”
2. “Solar PV technologies electricity generation costs have decreased by more than 80 per cent since 2009. It is forecast to continue falling by up to 59 per cent in 2025, making solar PV the cheapest form of power.”
3. “Global investments in renewable generation hit a new world record, with US\$286 billion invested—not including hydropower projects >50MW in 2015, more than double dollar allocations to new coal and gas generation. Since 2013 more renewable power capacity has been installed annually around the world than fossil and nuclear together.”
4. “On the 8th of May 2016, renewables supplied Germany almost all (87.6 percent) of its power demand, marking a milestone in its energiewende.”
5. “Renewable energy employment hit a record in 2015, with 8.1 million jobs recorded.”
6. “Chinese investments in renewables increased by 17 per cent to US\$103 billion—making it again the world’s leading champion in renewables.”
7. “Sub-Saharan Africa was the largest market for off-grid solar products in the world with 1.37 million units.”
8. “The green bonds market grew at an impressive compound growth rate, from close to zero in 2007 to an outstanding US\$118 billion by mid-2016.”
9. More than 170 large companies, including energy intensive ones, signed on to set their emissions targets in line with keeping climate change well below 2°C.
10. “China may have already reached a coal consumption peak.”
11. “The coal industry faces declining prices and higher costs, leading some to bankruptcy.”
12. “Global energy-related carbon dioxide emissions stalled for the second year in a row in 2015, despite a 3 per cent economic growth.”
13. “The decline in annual global energy intensity accelerated to more than 1.7 percent



in 2010 to 2012. However, this needs to be faster to meet the 2030 sustainable development goals.”

14. “Seven hundred cities committed to reduce their CO₂ emissions by 3.7 GT per year by 2030. “

15. “Comparing projections done by international energy outlooks for global expansion of renewables versus reality, this shows that international agencies have underestimated the potential of these technologies.”

Source: WWF, 2016

2.1. THE STATE OF RENEWABLE ENERGY TRANSFORMATION AND ITS CONSTRAINTS

2.1.1. Hidden and Open Fossil Fuel Subsidies

Governments can subsidize certain sectors and penalize others with taxes. The main criteria here is the magnitude of externalities created by the production/consumption. A certain activity that has positive impacts on other sectors will be subsidized in order to increase economic gains. Conversely, if an economic activity causes economic, social, and ecologic problems, the expectation is the reduction of these problems by imposing taxes. Thinking in terms of the energy sector, we can address economic externality in terms of current account balance, social externality in terms of job security, and ecologic externality in terms of air quality.

We see that the essence of Turkey’s subsidy system for all sectors, including energy, is to reduce import dependency and achieve a development pathway that does not cause current account deficit.²⁰ When energy supply security concerns are added to this equation, the solution becomes to subsidize domestic coal mining and coal-fired power plant constructions and handing over existing coal basins to the private sector for the development of coal-fired power plants through privatization.

Yet, the global trend to abandon coal is gain-

ing momentum. Some European countries took the decision to stop coal investments or coal-fired electricity production. Germany, a country with a deep-rooted coal mining tradition and one of the biggest coal supporters who handed out 3 billion EUR to coal production in 2012, has announced that it will completely stop extracting mineral coal in 2018. Germany, who plans to achieve this target by phasing out coal subsidies, has decreased its coal consumption by one-third since 1990 and succeeded in reducing the share of coal in electricity production from 57 percent in 1990 to 46 percent in 2013.

As for England, where the age of coal began with the Industrial Revolution, the coal industry that had been shrinking since the Thatcher period came to an end with the closing of the Kellingley coal mine in December 2015. Belgium and Denmark have already given up coal; Austria, Portugal, Finland, and Canada are working on the plans to abandon coal-fired power plants in the next five to ten years. A short time ago, the Netherlands announced that it would close all coal-fired power plants, including those planning to retire in 2020 as well as new plants, by court order. Recently, the United States and China have begun an ambitious joint initiative to reduce emissions by limiting coal consumption. The G7 countries (United Kingdom, United States, Canada, France, Germany, Italy, and Japan) have also supported this trajectory, and their leaders pledged to eliminate all non-efficient fossil fuel subsidies by 2025.

Looking at the statements of the countries abandoning coal, we see two reasons. The

²⁰ This can be observed in the 2011 Input Supply Strategy (GITES) and the 2012 New Subsidy Act.

first one is about profitability, in other words about the economic risks of the investments made in coal mines and coal-fired power plants. The second one is climate change. Investment funds that look for profitable areas to invest the savings of ordinary people (university funds, retirement funds, or corporate funds) have begun to remove coal investments from their investment portfolios because of economic risks.²¹

Coal is not only high cost from an economic viewpoint but also from an environmental and social perspective. However, calculating these kinds of external costs is difficult. A report dated March 2015 states that the coal subsidies in Turkey range between 0.01-0.02 USD/kWh (Acar et al., 2015). The total value of quantifiable subsidies provided to the coal industry in 2013 were estimated around 730 million USD. This figure includes direct fund transfers to the mineral coal industry, coal exploration subsidies, power plant improvement subsidies, and coal assistance to families in need. There are other subsidies that can be

identified but are not quantifiable. If it were possible to include unquantifiable investment assurances, guaranteed high price purchase policy, customs charge and value-added tax (VAT) exemptions, social security premium assistance, research and development (R&D) subsidies, land allocation, and below market interest rates in the calculation, this estimated value would greatly increase.²²

Coal is not only the source of environmental and air pollution, but it also brings about very important external costs by affecting public health (heart and coronary, respiratory and neurologic illnesses) and by triggering climate change with its greenhouse gas emissions. In addition to these, air pollution from coal consumption has negative impacts on tourism and real estate prices. These costs are not only borne by the market but by all of society, which makes them a burden in the real sense of the word. It should be noted that the reasons behind nations moving away from coal is not solely economic; ecological and social problems also contribute to this decision.

21 Fossil fuel divestment is an increasing and spreading global trend. See <https://europeangreens.eu/sites/europeangreens.eu/files/Carbon%20Bubble%20brochure.pdf>

22 For a list of open and hidden fossil fuel subsidies in the United States, see <https://www.cbd.int/financial/fiscalenviron/g-subsidyreform-oecd.pdf> page 110.

Why is coal not cheap? Why is coal not a solution to energy security but rather a threat?

There is a misconception that electricity produced from coal is cheaper than renewable energy; this is the result of subsidizing coal mines and coal-fired power plants and disregarding external costs. Acar et al. (2015) has shown that when all externalities are taken into account, in Turkey the kWh cost of the electricity produced by coal-fired plants is higher than the kWh cost of the electricity produced by solar and wind power plants. From a financial angle, coal subsidies not only put extra weight on the national budget, but they are also an obstacle to the development of renewable energy and to the installation of infrastructures that are needed.

There is a belief that domestic coal is important for energy security; however, its health, environmental, and work-safety costs continue to increase. Turkey is considered to be one of the most vulnerable countries in face of climate change, and pollutants pose a major threat to the country's environmental integrity. It is clear that in the long term Turkey will not be able to meet its energy demand and security needs with domestic coal. However, current policies will lock Turkey in a coal-centered institutional and technical structure and open the gates of an import-dependent future. In conclusion, the emphasis put on coal reinforces an economic structure that is dependent on coal and obstructs the development of renewable energy. Furthermore, it results in a decrease in the amount of financial support that is needed to support various technologies and the activities that would reduce environmental damage.



2.1.2. Solar Energy: Where Are We at?

There is an important correlation between the development level of a country and its installed solar energy capacity. As illustrated in figure 2.1, China is the world leader with 63 GW installed solar energy capacity.

In Turkey, although the private sector's solar energy license demand is close to 8 GW, the capacity limitations only allow for the allocation of merely 600 MW capacity. In the last three years, unlicensed solar energy plant investments have also increased to approximately

850 MW. Turkey's installed solar capacity can reach 1.5-2 GW by the end of 2017. The main reason is that subsidies will begin to decline considerably by the beginning of 2018. Therefore, 2017 can be an active year followed by a calm 2018.

While the cost of solar power plants (SPP) was 15 million USD in 1996, this figure decreased to 5 million USD in 2006 and to 1 million USD in 2016. By 2026, solar energy is estimated to become not only the cleanest energy source but the cheapest one as well (Lazard, 2016).

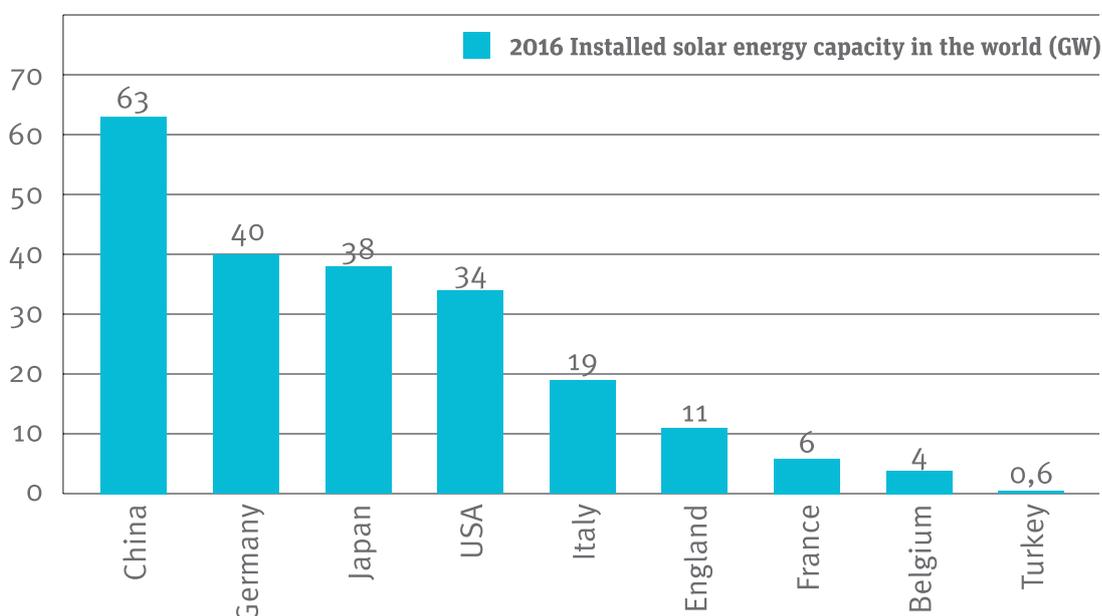


Figure 2.1. 2016 Installed solar energy capacity in the world (GW). (Source: Lazard, 2016)

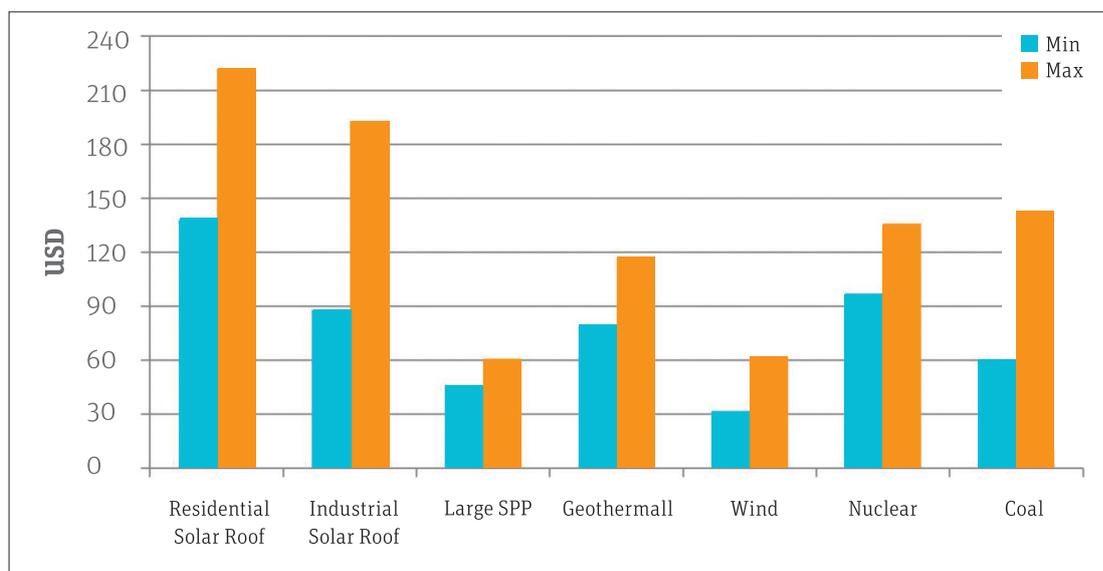


Figure 2.2. 2016 Energy production cost per MWh (\$/MWh) (Source: Lazard, 2016)



Successful European examples of renewable energy transformation

The first country that comes to mind at the mention of renewable energy is Germany. In Germany, the power struggle between lobbyists, interest groups, and political parties defined the path of transformation. The transformation accelerated when parties with environmental sensibilities came to power and the right to sell electricity back to the grid became legal in 1990. In addition, in 1999 the grid access ranking was reviewed and energy produced from solar and wind were given grid access priority. Coal-fired and nuclear power plants' access to the grid was restricted in case of increased demand.

The German Renewable Energy Sources Act provides a 20-year feed-in tariff.

In 2000, two programs were implemented to create scale:

1. 0.5 EUR/KWh purchase price guarantee for 100,000 roofs. This price was reduced to 0.16 EUR in 2016.
2. Citizens' Power Plant (CPP)

The reason behind the success of these programs is that they were accepted by the society. Energy transformation has been programmed to provide additional income to ordinary citizens, small producers, and farmers instead of creating rent-seeking opportunities—so much so that conservative Bavarian farmers, who were not the natural constituents of the Social Democratic Party/Green Party coalition that was in power during that period, began to support the program upon seeing that their income was increasing. It is a known fact that today in Germany there are farmers who produce up to 5 MW of energy and sell back to the grid.

The transformation in Germany is deliberately based on small producers. Small-scale producers account for 50 percent of total renewable energy production.

2.1.3. Turkey and Solar Energy ²³

Why?

- ▶ Solar energy offers a wider window of opportunity than other energy production sources because of the high import dependency of energy, high electricity self-consumption rates, and because it enables consumption on-demand.
- ▶ The costs per system in EUR or USD currencies are dropping rapidly with the increasing interest in solar energy and technological advances. The Turkish lira's recent extreme decrease in value against the euro and the U.S. dollar has mostly eliminated this advantage; however, the medium-term return on investment can be

expected to be shorter as will be the case in the rest of the world.

- ▶ The number of rooftops suitable for solar panels in Turkey is estimated to be around 8 million. Also, the widespread urban transformation projects offer important opportunities for rooftop solar panel installations. The number of non-residential rooftops is also large enough to attract investors.
- ▶ For every 1 MW of investment, five jobs are created at natural gas power plants; this number is seven for coal-fired power plants, thirteen for wind power plants, and twenty for solar power plants. Calculations show that setting a 23 GW target for 2023 would create 400,000 new jobs.

How?

- ▶ Turkey's total electricity consumption in 2015 was 260 GWh. Assuming that this amount of

23 Solarbaba and GÜNDER publications were used for this section. See, <http://www.solarbaba.com> and <http://gunder.org.tr/wp-content/uploads/100-B%4%BON-%C3%87ATI-PROJES%4%B0-DURUM-RAPORU.pdf>

electricity can be produced solely by solar energy, calculations show that a 155 GW installed solar energy capacity is needed and the cost would be 155 billion USD. For comparison purposes, let us remember that Turkey's energy import figure is 53 billion USD. Solar energy appears to be the most attractive alternative to energy import dependency, climate change mitigation, and health as well as the most economically attractive alternative.

► So, how much land is needed for a 155 GW solar power plant? One MW installed solar energy capacity requires 18,000 m² of land; therefore, the acreage needed for 155 GW is 2,790 km². This is only 4 percent of Turkey's surface area.

► Solar Power Plants (SPPs) can be constructed in much shorter time than traditional power plants (hydroelectric, coal-fired, and nuclear). After a minimum period of one year of bureaucratic processes, a 1 MW SPP construction can be completed in just one month.

Ateş Uğürel, who founded the solar energy advocacy platform Solarbaba in 1996, summarizes

the ten steps needed to reach these targets:

1. Creating a national solar energy strategy,
2. Defining domestic production and setting targets,
3. Addressing the issue of electricity storage,
4. Simplifying regulations and making sure they are permanent,
5. Organizing campaigns to spread information and raise awareness,
6. Implementing self-consumption incentive programs,
7. Establishing a compromise platform with reluctant distribution companies,
8. Putting in place smart financial methods,
9. Achieving integration with the construction industry,
10. Putting political will behind solar energy.

An initiative example from Turkey: The İzmir Bornova Municipality Solar Power Plant ²⁴

The İzmir Bornova Municipality is host to many environmental energy projects. The Photovoltaic Power System, which became operational in the beginning of 2015 with 2,500 solar panels on 7,000 m² of land in Erzene, has covered its initial cost with the electricity it sold back to the grid and has begun to make a profit. It is indicated that, with its 438,000 KWh electricity production, the Bornova Municipality's Solar Energy Plant can meet all the daily energy requirements (residential, industrial, transportation by metro, government office, public lighting) of 132 individuals. As for residential electric consumption, the plant produces enough electricity to meet the needs of 139 residences.

Calculations show that it is possible to save approximately 17,820 TL in electricity bills every year with an unlicensed solar power plant electricity production facility of this capacity. It should be noted that if this amount of electricity were to be produced from imported coal, its wholesale price would amount to approximately 73,545 TL. The Bornova Municipality solar power plant has prevented the emission of about 300 tons of CO₂ emissions.



Figure 2.3. Bornova Municipality Solar Energy Power Plant Source: Bornova Municipality ²⁵

²⁴ Source: <http://www.enerjiatlasi.com/gunes/bornova-belediyesi-gunes-enerjisi-santrali.html>

²⁵ <https://bornova.bel.tr/bornovanin-havasi-iyi-nitelikte/>



2.2. CITIZENS' POWER PLANT (CPP)

Citizens' Power Plants (CPP) are the small-scale solar panels installed on rooftops by citizens.

CPPs can take many different forms: citizens can start co-ops and install solar power systems on the rooftops of residential buildings, compounds, village and summer houses to combine consumption or through individual installations on their own rooftops.

The aim of the three-year Community Energy Project—a CPP initiative in sixteen European countries with twelve partners headed by Friends of the Earth (FoE)—is to expand community-owned renewable energy plants by implementing more favorable regulations. The partners' efforts cover a vast array, from solar power plants in Scotland to a community energy coalition in Hungary.

The project's requirements for an initiative to be defined as a Citizens' Power Plant are:

1. The initiative's sole purpose should not be profitability; it must include public and social benefits.
2. The initiative should have a democratic organizational structure in place where all members have a vote and equal rights.
3. The initiative should function with an open-membership system.
4. Some conditions, such as using the generated income to fund low-income household isolation projects, should be established.

The project's coordinator, Molly Walsh, whom we met in Brussels, informed us that this example in Europe followed a two-step process. First, people got together by installing low-cost and small-scale solar panels and, in the second phase, used their increased incomes to invest in bigger systems.

The most important challenge the Community Energy Project encountered was selling the renewable energy they had produced back to the grid, because electricity distribution monopolies such as EDF also own nuclear power plants. The French Enercoop is leading an active campaign in this issue.

Rescoop, a European umbrella organization, features many national co-op members from EU countries. The Flanders-based Ecopower, the French Enercoop, and the London-based Brixton-Solar are some examples of umbrella organizations.

Energy co-ops have different experiences in different countries. Some successfully expanded, while some were absorbed. As mentioned by Walsh, Germany can be cited as an example of a best practice as the country is choosing small-scale producers, smart-incentive mechanisms, and regulations. In Germany, where it is required that an individual obtain 35 percent of total energy consumption from renewable sources, farmers and small co-ops account for 50 percent of renewable energy production.

In Spain, energy co-ops seem to have increasingly strayed from their path to become structures exploited by big capitals for profit. Changing the subsidy system and taxing renewable energy to prevent this from happening resulted in financial difficulties for numerous small-scale producers. It seems that varying approaches play a big part in similar ideas resulting in different outcomes. In Germany, the primary motive drawing increased interest to energy co-ops is abandoning nuclear energy and fighting climate change; in Spain, the primary motive is profiting from energy co-ops. Accordingly, CPPs are viewed as a failed enterprise in the country.

2.3. INDIVIDUAL ROOFTOP SOLAR PANEL APPLICATIONS

2.3.1. Regulations Needed for Individual Solar Power Panels

Regulations on rooftop solar energy production in Turkey should be prepared by observing the experiences of many successful countries and adapting them to the country's realities. Here is a summary of the points that the regulation needs to take into account:

- ▶ Regulations should be integrated with urban transformation, and rooftop solar panel installation should be mandatory for every building that will apply for a license.

- ▶ Crowd funding should be incorporated into the regulation, and opportunities for multiple people and institutions to come together to install solar power plants should be provided.
- ▶ Solar power plants that are entirely built on the self-consumption model within the scope of energy efficiency laws and regulations should be reviewed.
- ▶ Centralized public institutions such as the Turkish Electricity Distribution Company (TEDAŞ) should not be involved in rooftop solar power plant installations.
- ▶ The relevant distribution company should only interfere in the post-installation phase for final quality control.
- ▶ The installations should be done by the Engineering, Procurement and Construction (EPC) companies and the issue of licensing should be handled by the private sector and not the public sector.
- ▶ Legal responsibility for legal issues such as fire or panels falling down should only belong to the client and the EPC company who did the installation.
- ▶ The 10 KW limitation featured in the current regulation should be revoked, and increasing installed capacity should be allowed for suitable rooftops.
- ▶ The installation bureaucracy for rooftop solar power plants should be decreased, and the process should be as simple as becoming a utility subscriber.
- ▶ Requirements such as permit and static reports, which were not mandatory for the 25 million-m2 rooftop solar water heating systems, should be minimized.
- ▶ Production on rented rooftops should be allowed.
- ▶ A company or individual who installs a rooftop solar power system should be allowed to sell solar electricity to other tenants with the condition that he/she resides in the building.
- ▶ The requirement to create a company to sell surplus solar electricity back to the grid should be lifted, and selling back to the grid should be simplified by using the net metering system.

The history of energy co-ops ²⁶

Private citizens are forming local energy co-ops with their own means to meet their own energy needs for reasons such as lack of infrastructure and failure of the market system, energy crisis, high energy dependency, and cost. These non-profit small-scale co-ops that are established to mitigate climate change are called Renewable Energy Co-ops.

Energy co-ops date back to the Great Depression of 1929. In the mid-1930s, nine out of ten farmers living in rural areas in the United States did not have access to electricity. The industry favored areas with electricity, and this condemned rural areas to continue to invest in agriculture. The energy companies that were in the hands of the private sector did not want to take electricity to these regions for profitability reasons.

The ill fate of rural America suddenly changed with Roosevelt's announcement of the New Deal program when he came to power in 1933. When the Rural Electrification Administration that was founded in 1935 saw that private citizen groups and not private companies were applying for funds, the federal government decided to support private citizens' non-profit co-ops through the Electricity Cooperative Corporation Act of 1937. As a result, 417 "rural electricity co-ops" were established during 1933-1939. Following the Second

²⁶ Source: America's Electric Cooperatives (<http://www.electric.coop/our-organization/history/>) ve <http://www.gazetegee.com.tr/>



World War, in 1953, more than 90 percent of farms in the United States had gained access to electricity through this model.

Today, more than 900 electricity co-ops deliver five percent of the total electricity demand and provide electricity to more than 42 million people. Renewable Energy Co-ops are quite abundant in Germany, Canada, and Denmark.

In Turkey, efforts regarding energy co-ops began in 2012 with the publication of the “Cooperatives Strategy Action Plan.” Institutions began to work on adapting successful foreign examples to the Turkish legislation and to organize meetings to raise awareness.

The Green Thought Foundation did some policy development work for the sustainable expansion of renewable energy co-ops through their 2016-2017 “Turn Your Business to the Sun” project. Three workshops covering international examples and requirements and policy recommendations for Turkey were organized for the purpose of encouraging the local, democratic, and sustainable production of renewable energy by private citizens and implementing the co-op structure. These workshops brought together representatives from finance and credit institutions, the private sector, local administrations, public institutions, and NGOs. During the workshops, which aimed at overcoming the funding problems of renewable energy co-ops and implementing the necessary regulations, co-ops and representatives from banking and credit institutions were brought together. Public institution representatives were provided with recommendations to overcome related legislation problems through regulations, and meetings were held to enable the participation of local administrations and NGOs.²⁷

²⁷ The Renewable Energy Cooperative Policy Development Workshops held in Çanakkale in May 2017 were attended by representatives from the General Directorate of Cooperatives, GÜNDER, Boden Law, DRGV (Germany), EuroslarDK (Denmark), Folkcenter for Renewable Energy (Denmark), REScoop (Belgium), WECF (Germany), EM Normandie (France), and local co-ops. The workshops addressed the issues of co-ops and renewable energy production in the context of various local experiences, local administrations, and innovative policies. For the Renewable Energy Co-op Policy Development Workshops, Sectoral Assessment of Renewable Energy and Youth Employment Report, Renewable Energy Co-op Guide, and the Conference Publication, please see the project’s website <http://isinigunesedon.org/>

2.3.2. Alternative Finance Models for Individual Solar Panels

Investment finance models are an important topic for the proliferation of individual rooftop solar panels. Looking at examples from around the world, we see two main approaches:

1. Personal financing,
2. Company financing.

In the first case, the consumer initially invests in the solar panels and keeps all of the generated income. In the second case, the

contracted distribution company installs the solar panels free of charge and reflects this cost gradually in the electricity bill.

As for Turkey, the most realistic finance model under the current conditions can be in the form of bank loans and company installment sale models (a minimum of 3-5 years).

Why isn't it enough to just subsidize wind and solar power plants?

Even a country like a China, which has become the center of fossil fuel-based energy production, announced at the Paris Climate Agreement that it will obtain 20 percent of its energy from renewable resources by 2030 and has accordingly increased its wind power capacity to 150 GW in 2016. However, the wind power produced in the northern regions cannot be transmitted to the industrial centers in the South because electricity transmission and distribution networks are old and there are no means to store energy. The 33.9 GW capacity added in 2015 and estimated to be able to meet the needs of 3 million Americans was not utilized (Killeen, 2016). This proves that investing in wind and solar power plants is not enough to accomplish a transformation of the energy system. Smart grids, smart buildings, and Internet of Things are issues that need to be addressed at the same time as renewable energy capacity.

2.4. SMART GRIDS AND SMART ENERGY DEMAND MANAGEMENT

Electric energy systems are expected to provide real-time, reliable, economic, and high-quality demand responses. Smart grid applications stand out as effective energy management tools in the production, transmission, and distribution systems.

A smart grid can be defined as an energy management system that constantly monitors and controls the balance between consumer demand and production supply using a two-way communication. A smart grid system is composed of three main control units: electric energy production, transmission-distribution, and consumers (Akcanca and Taşkın, 2013). The smart meter introduced in Turkey is one element between producer and consumer. However, in addition to smart meters, the buildings and transmission-distribution also need to be well managed in order to achieve these expectations.

The electric transmission and distribution grid in Turkey is old, and this plays a considerable role in renewable energy not reaching its expected level. This problem continues due to technological as well as managerial reasons. For example, the fact that some big companies who produce fossil fuel-based energy are also transmission and distribution companies creates a conflict of interest. The government or the Energy Market Regulatory Authority

(EPDK) should play the role of arbitrator and develop public interest regulations. As a matter of fact, in Germany, the authorities' prioritization of renewable energy sales to the grid was a determinant factor in renewable energy's surge to attain its current level. This way, when electricity is produced from solar or wind energy, fossil fuel power plants become obsolete. With these kinds of regulations, price incentives, and smart grid transformations, Germany is able to decrease fossil fuel and nuclear energy power plant capacities and demonstrates more determination and progress in reaching its climate targets.

2.4.1. The Base Load Power Myth and Its Cost to Turkey

One of the main arguments used by the advocates of electricity production through fossil fuel and nuclear power plants in Turkey is based on wind and solar power plants not being "reliable" (available) sources. Therefore, according to this argument, base load power plants with high availability are necessary if we do not want power outages when electricity demand increases. With some questionable demand projections added to this argument, the capacity deficiency argument can be perceived as a pretext for constructing coal-fired and nuclear power plants.

There are two objections to be made here:

The first one is that the EPDK's demand pro-





jections are quite overstated. As a matter of fact, the EPDK itself confirms this. For example, in 2000 the 2014, electricity demand was estimated as 397.7 GWh but only reached 257.2 GWh (EPDK, 2016). In other words, the EPDK's projection was 47.6 percent higher than the actual 2014 electricity demand figure.

The second objection is regarding where to find the financial resources needed to create this capacity. It is almost impossible to find billions of dollars for energy investment in the current situation where global financial markets are shrinking.

This forces us to think about alternative ways to achieve energy security. Is there any other way to achieve energy security without constructing coal-fired and nuclear power plants? In many countries, the wind and solar energy shares in electricity production are increasing without causing a risk to energy supply. For example, in 2014, 15.9 percent of the total electricity produced in Germany was from wind and solar energy. For Denmark, in 2014, wind and solar power's share in total energy production was 44.7 percent. Again, in the same year in Germany, the total production share of thermal and nuclear power plants that function as base load power plants was 64.3 percent, whereas in Denmark, which ranks sixth in energy security, this figure was 38.6 percent.²⁸ So, how did Germany and Denmark succeed in achieving energy security through wind and solar power plants with low-availability? The answer is simple: Smart Grids and Smart Energy Management.

Switching to smart grids comes at a cost, no doubt. There are no studies for the case of Turkey; however, some examples from around the world can give us an idea. Thirty projects from twelve countries in four continents showed that the benefits of switching to a smart grid is almost twice as much as the cost figure (King, 2012). Another study that covers the Middle East and North Africa showed that countries who invest in smart grids to realize their solar energy potential can save up to 300

million USD to 1 billion USD annually (North-east Group, 2012).

In conclusion, we have two alternatives to achieve energy security. The first one is to continue with the current coal-fired and nuclear plants that require billions of dollars of investment every year. The second one is to transform transmission and distribution systems into Smart Grids and to increase the share of wind and solar energy in total electricity production.

Even if we were to leave out climate change, health, and energy independency issues and consider the question from a solely economic standpoint, we see that the second alternative clearly outweighs the first one, as many countries have shown.

We need to address the economic costs of insisting on coal-fired and nuclear energy. We can explain the private sector's interest in fossil energy investments with the high guaranteed purchase prices and extra subsidies that are determined by the government. Private companies, which invest by relying on these subsidies, in a way hold the reins of the EPDK, who sets energy prices. This may be behind the fact that although energy prices are falling worldwide,²⁹ this does not reflect on industrialists and ordinary consumers in Turkey. We know that energy prices that need to be kept high play an important role in the inability to lower high inflation and interest rates. When high-energy costs meet high interest rates, the Turkish industry's competitiveness in international markets is affected negatively, consumers' purchasing power declines, and the economy is led towards stagnation. The only winners in such an energy policy are private companies that produce this energy. The worst part is that these energy policies also affect the private sector's capital investment decisions and cause scarce financial resources to flow into the energy sector in order to create stranded capacity. In other words, the investor will invest into a sector where the government keeps the profit margin high and

28 For more detailed information, please see Germany's and Denmark's country reports: https://en.wikipedia.org/wiki/List_of_renewable_energy_topics_by_country

29 Currently crude oil prices have dropped from 140 per barrel to 50 USD per barrel, and natural gas prices have dropped from 11 USD per cubic meter to 4 USD per cubic meter.

offers purchasing guarantee instead of opting for high value-added and environmentally friendly investments. The smartest and most profitable policy today is to encourage the private sector to invest in a transformation that will enable the rapid integration of wind and solar energy into the energy system instead of encouraging it to increase the coal-fired and nuclear base load capacity.

The fact that subsidizing practices such as passive buildings and CPPs will decrease the base load capacity that is needed to be kept in reserve should not be disregarded. Therefore, urban planning (specifically building construction criteria) and energy policies should be addressed as a whole.

2.5. THE FIELD OF CLIMATE-FRIENDLY ENERGY AND GREEN ECONOMY: CHALLENGES AND RECOMMENDED SOLUTIONS

Experts and civil society activists gathered at a project workshop at Istanbul Policy Center on September 8, 2016. Following presentations by Dr. Alper Öktem, who identifies as a solar volunteer, and Ateş Uğurel, the founder of the Solarbaba Platform on renewable energy, participants formed two groups according to their fields of interest and specialization to discuss and report on the opportunities, challenges, and the innovative solutions to overcome these problems. The outcome of this workshop can be summarized under two headings:

2.5.1. The State of Renewable Energy in Turkey: Policies and Regulations.

1. Opportunities

- ▶ Renewable energy technologies that are small-scale and those that do not require large investments can generally be turned into opportunities for the transformation of the energy system.
- ▶ Individuals' propensity to save is an opportunity to encourage the use of solar rooftop panels.
- ▶ Renewable energy presents an important opportunity from an economic sustainability

standpoint because energy sources represent 50 percent of total imports, and energy-intensive production increases the current deficit.

- ▶ Investing in the renewal of the energy infrastructure could, in the long term, contribute more to economic recovery than construction ever will.

2. Constraints

- ▶ We need to pave the way for companies to get ready for the transformation, because waiting for the privatized distribution companies' depreciation period to come to an end will present an important constraint to the transformation.
- ▶ Frequent regulation changes, heavy and slow bureaucracy are slowing down renewable energy investments.
- ▶ In areas with high transformation potential, the transformation is being conducted by large energy companies who collected most of the licenses as a consequence of the EPDK's centralized administration. This decreases the small producers and individuals' role in the energy transformation.
- ▶ The international long-term guaranteed purchase power agreements signed by Turkey are increasing fossil fuel dependency.
- ▶ The current subsidy law and economic development pathway is supporting fossil energy.
- ▶ Turkish or foreign solar panel systems are sold in U.S. dollars or the euro; however, the electricity bill is paid in Turkish liras (TL). The recent, extreme decrease in the value of the TL vis-à-vis both the euro and the U.S. dollar seems to have made 100 percent self-consumption financially unfavorable for now.

3. Policy Recommendations

- ▶ Public funds, subsidies, and guaranteed purchase agreements should be used for smart energy infrastructure and renewable energy transformation and not for large construction or fossil fuel investments.
- ▶ We need to ensure that public institutions lead the way for energy transformation.





► Using idle resources such as residential and agricultural waste to produce biogas could decrease fossil fuel dependency.

► Publicity and advertisement should be used to overcome the constraints. Featuring celebrities in publicity campaigns, as the Solarbaba Platform did for their 100 Celebrities 100 Solar Rooftops Campaign, could help to overcome certain constraints.

2.5.2. Local and Individual Production, Energy Co-ops and Local Administrations

1. Opportunities

► Advanced solar technology, rapidly dropping prices, and Turkey's significant solar potential and increased public awareness are important advantages.

► The fact that individuals are inclined to use solar panels for personal electricity production because of the already wide use of solar energy for water heating should be treated as an opportunity.

► Turkey's dynamic construction sector and new buildings generally being constructed as part of building complexes can open up opportunities to install solar panels for residential electricity consumption.

► Owning personal off-grid electricity production systems is an advantage in the presence of frequent power outages.

► The implementation of carbon pricing (tax, etc.) will also present an opportunity.

► For hospitals and other public institutions that are obliged to provide services during earthquakes, generating their own electricity is an advantage and presents an opportunity.

Irrigation unions that can invest in solar energy for water pumps can be considered as an opportunity.

► Even though in Turkey residential co-ops gave co-ops a negative image, the positive examples provided by agriculture co-ops can pave the way for energy co-ops.

► Municipalities' co-op experiences can be

extended into the field of energy co-ops. Also, the fact that district municipalities can financially contribute to co-ops and citizens can be partners of municipality-owned enterprises present an opportunity, and municipality-citizen partnerships could develop practices such as Citizens Power Plants.

► Municipalities acting as the guarantor in energy co-op initiatives will create confidence in private citizens.

► The fact that municipalities own land and that no capital is needed to establish a co-op for public land allocation initially is an advantage. Furthermore, many district municipalities own a great number of clear lands in rural areas.

► The General Directorate of Cooperatives of the Ministry of Customs and Trade (MoCT) is an institution that takes a positive approach to energy co-ops, and this should be considered as an important opportunity.

2. Constraints

► The capacity of the substations that will provide renewable energy's access to the grid is insufficient, and information regarding the existing capacity is not transparent. This creates uncertainty and is an obstacle for investments.

► The conflict of interest of big energy players who are beginning to operate in the field of solar energy and who are forming organizations can pose obstacles to personal electricity producers and co-ops.

► The lack of knowledge and vision of political decision-makers is negatively affecting the potential of the transformation.

► The rapid and uncoordinated regulation changes and the financial, real estate, etc., regulations contradicting each other constitute an important obstacle.

► The inability of residential subscribers and producers to come together to form an energy co-op, and the obligation of members to reside in the same distribution area can be considered as an obstacle.

► Agricultural land first needs to be trans-

formed into a marginal field for an energy investment to take place. This obligation constitutes as an obstacle to farmers.

- ▶ Individuals who want to make an energy investment generally do not own suitable land, and it is difficult for a new co-op to receive a bank loan, which creates funding problems. Their knowledge of funding is insufficient.
- ▶ Individual small-scale electricity sale is prevented because the grid is technically not fitted for it, and this creates a major obstacle.
- ▶ Distribution companies who do not operate in the solar energy sector constitute an obstacle to individual producers who want to sell energy back to the grid.
- ▶ The government targets that prioritize electricity production by coal-fired and nuclear power plants create excess supply, which is an obstacle to renewable energy.

3. Policy Recommendations

- ▶ Like in many other countries, the consumer should be able to choose to buy electricity produced from renewable sources. Even though at the moment consumers with utility bills of 150 TL or more are allowed to choose their distribution company, there is no institution to control the application of this regulation.
- ▶ The opportunities offered by urban transformation should not be missed. Meetings should be held with architects and construction companies to determine a percentage of new buildings in which installation of solar energy systems will be mandatory.
- ▶ Municipalities should set an example, and

the constraints that keep them from producing electricity in their own buildings should be lifted (first and foremost requiring permission from the Ministry of Environment and Urbanization).

- ▶ Crowd funding can be considered as an alternative to co-ops. The relevant draft law can be further developed with stakeholders and should be enacted as soon as possible.
- ▶ Renewable energy study centers that would provide information to individuals who want to produce their own electricity could be established. They could be modeled after the municipality study centers that were founded after the 1999 Marmara earthquake—and closed later on—to provide free-of-charge building analysis.
- ▶ A certain percentage of renewable energy investments could be allowed on agricultural lands to enable farmers to partake in these investments.
- ▶ Municipalities could come together on the regional level and join forces to produce electricity.

Civil society organizations should work on raising public awareness and lobbying. The relevant NGOs should go through intensive clean energy—and especially solar energy—trainings and obtain competence in issues such as cost, technology, and finance.

- ▶ There is information pollution that perpetuates negative public opinion in regard to wind and solar energy. This should be prevented by providing scientific and real information and including the local population in investment decisions.

Climate change and energy policies: The case of Izmir

A workshop held on October 13, 2016 in İzmir Bornova brought together 16 local participants. Engineers, doctors, municipality representatives, academicians, and activists discussed energy policies that could be implemented for climate change mitigation; the status of renewable energy, rooftop solar panels, and energy co-ops in İzmir; and opportunities, constraints, and experiences. Some of the points that were underlined in the case of İzmir can be summarized as follows:



- ▶ The return on renewable energy power plant investments is long term, and therefore, it is not easy for private citizens to invest. Furthermore, power distribution units in the Aegean region are not adequate.
- ▶ Developing renewable energy depends on municipalities, and it would be more useful if solar power plant locations were marked on city development plans. It was also pointed out to us that subsidies are obligatory and participants gave the example of the initiatives developed with the subsidies provided by Izmir Development Agency two years ago.
- ▶ Participants pointed out that municipalities should take the initiative to produce energy from solid waste.
- ▶ There are many summer house compounds that are vacant in the winter in the Aegean region, and participants proposed that initiatives should be taken to install solar panels on these rooftops or on suitable locations in these compounds to produce electricity all year round.
- ▶ Incorrect industrial policies increase energy demand. We should first discuss the reason why we are producing energy.
- ▶ The Izmir Metropolitan Municipality was criticized for not opposing the coal-fired power plant in Aliğa.
- ▶ Participants underlined that Izmir Metropolitan Municipality has a sustainable energy plan; however, there is no adaptation work because there is no climate action plan in place. The recommendation was for the municipality to install rooftop solar panels on the many rooftops it owns, such as those of parking lots. It was also pointed out to us that Izmir possesses geothermal resources and that biomass should be used in rural areas. Another comment was that municipalities, like private citizens, were unable to act because of bureaucracy and lack of regulations.
- ▶ Designing urban transformation in a way that increases energy efficiency is an important opportunity. Municipalities could take initiative in these issues through council decisions, and agreements with construction co-ops and contractors should ensure installation of rooftop solar panels on new buildings. However, there is no successful example of this to date.
- ▶ There is unrest regarding the location of wind and solar power plants, such as installation on first-degree agricultural lands or constructing multiple wind power plants on the same location, and villagers are complaining about the pollution caused by geothermal energy. Participants underlined that renewable energy should not be managed as other natural resources are in Izmir, that is in an uncontrolled manner.
- ▶ It was pointed out that municipalities are suffering from a lack of qualified staff who have sectoral experience and can pursue these issues on an international level. The fact that there are no technical staff who can keep track of national and international funds and prepare projects in line with the municipality's strategic plan and institutions working under capacity were cited as determining constraints.
- ▶ The fact that activists mobilize other activists and together they persuade municipalities, thus creating a cooperation between private citizens and the municipality, is very important. Energy co-ops should be established one after the other, and the relevant state

institutions should be receiving stacks of application letters. This should put pressure on resolving the lack of regulation. Participants underlined that co-ops should be established in a way that allows private citizens to earn income.

- ▶ One of the recommendations was to install and gift small solar panels to deprived neighborhoods through co-ops and hence enable free access to energy where demand is the lowest.
- ▶ According to the participants, the real problem here is the regulation. GEDAŞ and the Turkish Electricity Distribution Company (TEDAŞ) are obstacles for people who want to install solar panels. The fact that TEDAŞ is asking for invoices from people who want to sell back electricity to the grid means that they need to pay taxes, and this holds them back.
- ▶ The static load analysis report constitutes an important bureaucratic obstacle. The report is not required for water heating solar systems, but it is required for solar panels. The same standards are applied to a city such as Kars—where rooftops need to be able to carry the weight of snow—and Izmir, where this problem does not exist.
- ▶ It is important for municipalities to set a good example. The Municipality of Gaziemir sets a good example by producing 75 percent of its electricity from its own solar panels. Being a commercial entity, it can also stay connected to the grid. However, it is wrong that the demonstration panels set by the municipalities are just touristic examples. The fact that municipalities need to also provide consultancy services was underlined. One of the comments was that it is wrong to expect everything from municipalities because they were experiencing serious financial and technical capacity troubles.

CHAPTER 3

CLIMATE CHANGE AND LAND USE

As the world's population increases, the arable land that is needed to feed this population is decreasing because of industrialization, urbanization, industrial enterprises, and new road constructions. This situation increases the pressure on forests and grasslands, and the pattern change in land use also causes the rapid loss of these carbon sinks.

This chapter will first cover the importance of land use in climate change mitigation and adaptation. We will discuss the good practices we observed during our June 2016 project field trip to Belgium as well as some examples from Turkey. The policy recommendations noted at the October 2016 Istanbul workshop and the December 2016 local meeting in Bursa can be found at the end of this chapter.

3.1. THE RELATIONSHIP BETWEEN LAND USE AND CLIMATE CHANGE IN THE WORLD

The United Nations Convention to Combat Desertification (UNCCD) defines the land use pattern changes of the last century as follows:

- "The total area of ice-free land on earth is estimated at 13 billion hectares. Of this, about 46% is currently being used for agriculture and forestry; almost 7% is considered urban, peri-urban or modified by human infrastructure."

- "The estimates indicate that up to 25% of all land is currently highly degraded, 36% is slightly

or moderately degraded but in stable condition, while only 10% is improving. In the last two centuries, humans have converted or modified 70% of the world's grasslands, 50% of the savannah, 45% of the temperate deciduous forest, and 27% of the tropical forest biome primarily for farming and grazing activities." (UNCCD, 2015).

This transformation has beyond any doubt a climate change cost. The Fifth Assessment Report of the IPCC estimates the share of land use in GHG emissions to be about 25 percent (IPCC, 2014). Of this, agricultural

emissions account for 5.0-5.8 GtCO₂e (50% of which is attributed to livestock production), and land use change (deforestation, conversion for other purposes, etc.) accounts for 4.3-5.5 GtCO₂e. This shows that using land by taking climate change into consideration has important climate change mitigation potential. The IPCC calculates the total carbon sink potential of climate-friendly land use to be between 7.2 and 10.6 GtCO₂e per year by 2030 (UNCCD, 2015).

Land degradation is both a cause and a consequence of climate change. Intensive production increases emissions at the same time as soil and vegetation loss considerably reduces carbon sinks. This results in the increase of atmospheric carbon dioxide, which in turn sets off the cycle of land degradation, biodiversity loss, and climate change.

Soil is an important and safe carbon sink. Two and half trillion tons of carbon reside in the soil: this figure is larger than the amount of carbon in the atmosphere (0.8 trillion tons) and the carbon in all plant life (0.56 trillion tons). However, 25 to 75 percent of the carbon in the soil has been lost because of extensive agriculture and bad management.

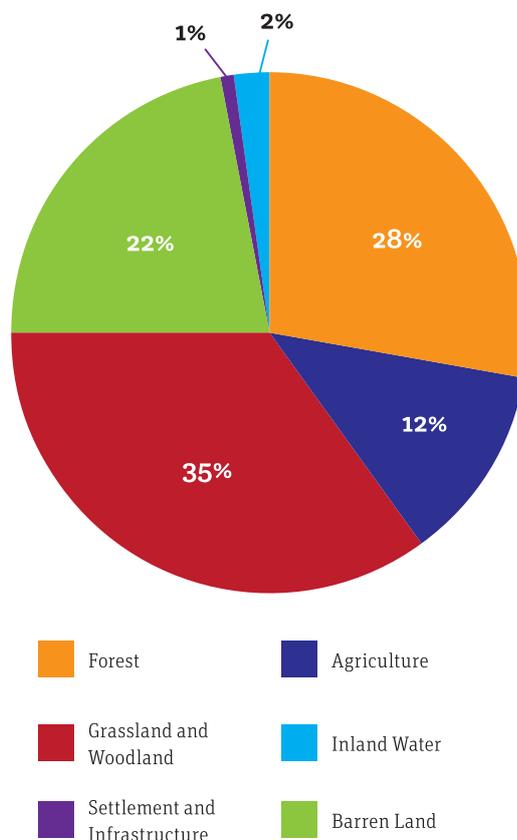
Climate change's relation with land use has many different dimensions. The first one is a decrease in agricultural productivity caused by changes in average temperature and precipitation and production losses triggered by drought or extreme weather events. Another dimension is the increase of atmospheric GHG concentration by the destruction of carbon-absorbing forests and grasslands. While the first one is a threat caused by climate change, the second one is a process that accelerates climate change. Therefore, land use is one of the most important economic systems for climate change mitigation and adaptation.

We need proper land use and increased productivity to meet this end. It is estimated that 2 billion hectares of productive land worldwide has been lost to land degradation. Furthermore, every year about 12 million hectares of productive land (about half of Turkey's agricultural land) is being



lost to land degradation (UNCCD, 2015). It has been indicated that restoring 12 percent of the world’s eroded/deformed soil by 2030 will feed 200 million people and increase climate change resiliency and decrease GHG emissions (The Global Commission on the Economy and Climate, 2014).

Turkey is situated in an important land degradation risk area. Looking at the desertification risk map (Figure 3.2), which is one of the most important reflections of land degradation, we can see that an important amount of land in Central, East, and South-east Anatolia is facing intensive erosion and desertification risks.



- Forest
- Agriculture
- Grassland and Woodland
- Inland Water
- Settlement and Infrastructure
- Barren Land

FIGURE 3.1. Land use distribution around the World (source: UNCCD, 2015)

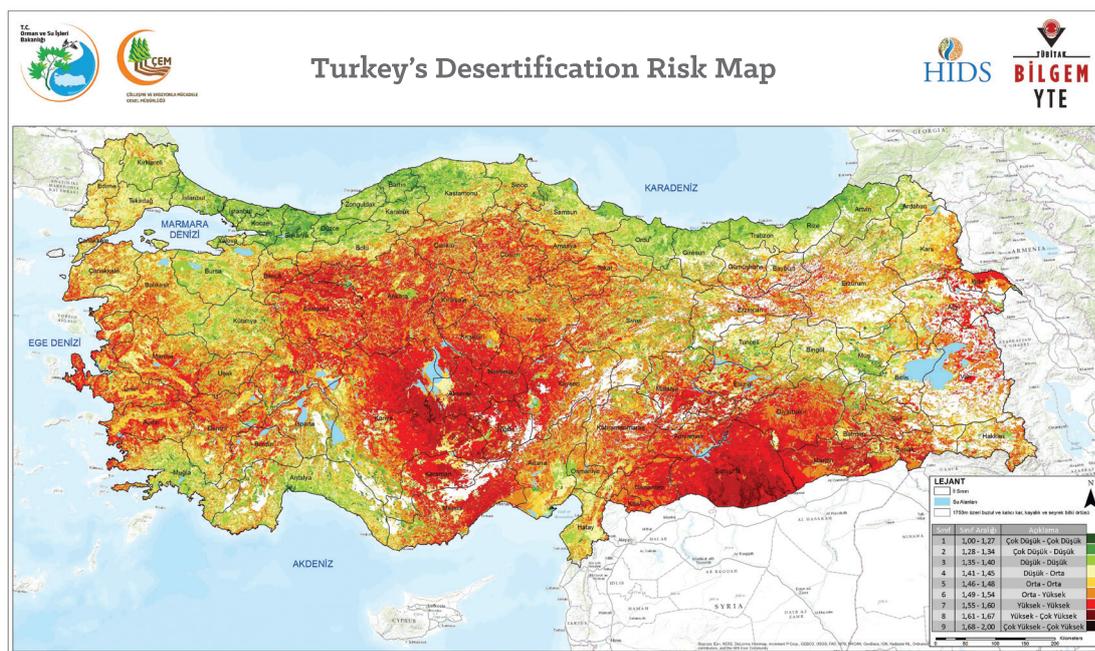


FIGURE 3.2. Turkey's Desertification Risk Map, 2015 (Source: Ministry of Forestry and Waterworks, General Directorate of Combatting Desertification and Erosion)



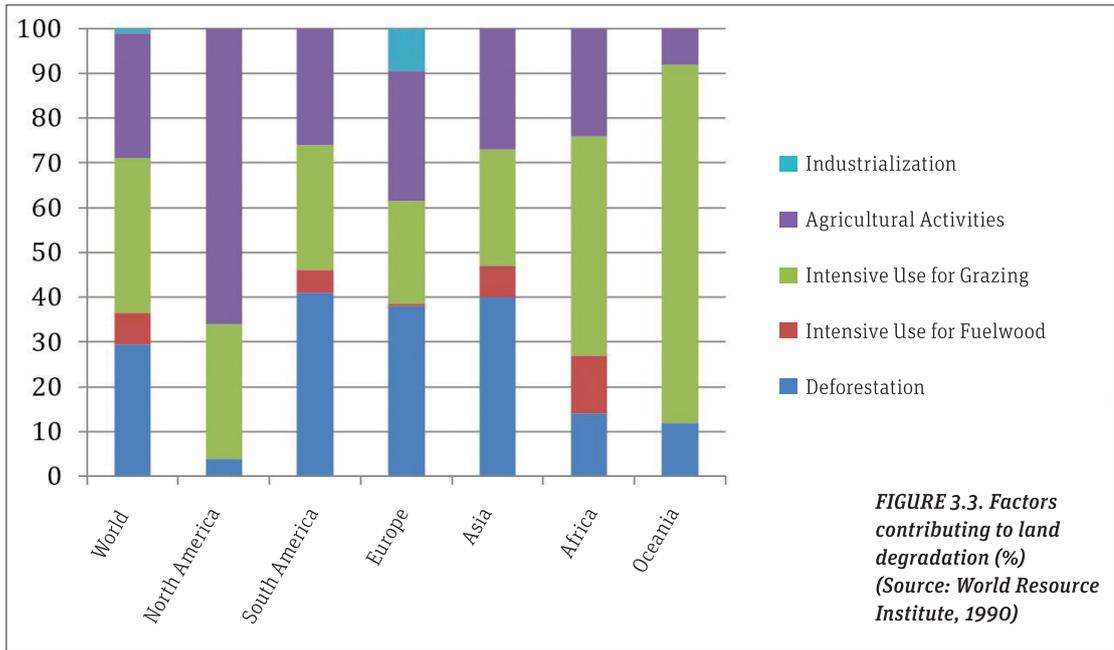


FIGURE 3.3. Factors contributing to land degradation (%)
(Source: World Resource Institute, 1990)

The main reasons for land degradation are deforestation, expansion of agricultural areas, overgrazing in grasslands, and industrialization (Figure 3.3). Climate change is also another factor.

GHG emissions. The most important factor in this 24 percent is Land Use, Land Use Change and Forestry (LULUCF). GHG emissions from agricultural production and LULUCF can be seen in figure 3.5.

The IPCC agricultural production model studies show that climate change will cause increasing productivity losses. As shown in figure 3.4, agriculture, forestry, and other forms of land use account for 24 percent of

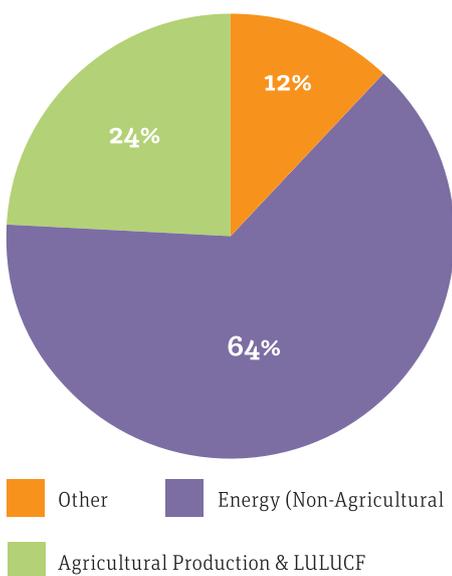


Figure 3.4. Sources of Global GHG Emissions (%)
(Source: The Global Commission on the Economy and Climate, 2014)

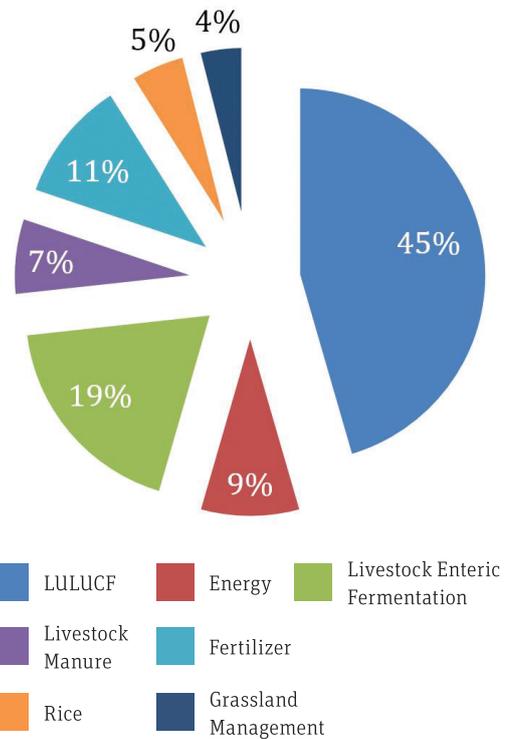


Figure 3.5. GHG Emissions from Agricultural Production and LULUCF
(Source: The Global Commission on the Economy and Climate, 2014)



3.2. THE IMPACTS OF FOOD AND RURAL LIFE POLICIES ON CLIMATE CHANGE

While population pressure and macro policies brought about the industrialization of the agricultural system, the changing production-consumption balance negatively impacts social, economic, and ecological sustainability.

Aydemir (2014) summarizes the problems encountered in Turkey's food and urban policies as follows:

1. Disintegration of small-scale farming and monopolization of the production-consumption chains,
2. Disappearance of traditional knowledge,
3. Rise of energy and chemistry-intensive agricultural techniques,
4. Promoting agricultural production based on one type of hybrid seeds instead of heirloom seeds,
5. Transforming perennial production systems that "feed the soil" into yearly monocultures,
6. Local dynamics not being able to impact the production-consumption balance.

Therefore, the attributes of agricultural and rural policies play a quite determinative role in climate change mitigation and adaptation. Aydemir (2014) lists the steps that need to be taken as follows:

1. Encouraging "Rural Progress"
2. Rural revitalization and transformation of villages
3. Urban transformation through connections between cities and new rural areas
4. Making production-consumption networks independent from the market.

As for the tools needed to accomplish this transformation, Aydemir lists them as follows:

- ▶ Heirloom seed improvement and seed exchange systems
- ▶ Organic markets
- ▶ Community-supported agriculture and food

communities

- ▶ Urban agriculture and balcony gardens
- ▶ Ecovillages
- ▶ Transition cities to quiet cities.

3.3. COMMUNITY-SUPPORTED AGRICULTURE

According to the International Federation of Organic Agriculture Movements (IFOAM), Community-Supported Agriculture (CSA) is "a partnership of mutual commitment between a farm and a community of supporters that provide a direct link between the production and consumption of food". Its goal is to eliminate the risks encountered by farmers and facilitate consumers' access to healthy and affordable food. For example, the CSA's purchase guarantee eliminates the risks of poor harvest or poor sales, price uncertainties are offset by price guarantee, capital access difficulties are overcome by real or financial contributions.³⁰ Table 3.1. lists examples of CSA initiatives in Turkey.

Table 3.1. Example of CSA initiatives in Turkey (Source: Website of Gıda Toplulukları³¹)

ANKARA

100. Yıl Food Community³²
Doğal Besin, Bilinçli Beslenme Grubu (DBB)³³
Güneşköy³⁴

ANTALYA

Doğal Ürünler ve Sağlıklı Yaşam Platform³⁵

BALIKESİR

Yaşam Dostu Ürün Dayanışma Üretim ve Paylaşım Grubu³⁶

30 For more detailed information on Community Supported Agriculture, see <http://www.ifoam.bio/en/community-supported-agriculture-csa>

31 The list from http://gidatopluluklari.org/?page_id=103 has been updated.

32 <http://www.facebook.com/yzuyilgida>

33 <http://ankaradbb.wordpress.com>

34 <http://www.guneskoy.org.tr>

35 <http://www.facebook.com/groups/dogalurunplatformu>

36 <http://www.yasamdostu.org>

ÇANAKKALE

Çanakkale Ekolojik Yaşam İnisiyatifi (ÇAYEK)³⁷

GAZİANTEP

Yeşil Ev Consumer Co-op Initiative³⁸

İSTANBUL

Boğaziçi University Consumer Co-op³⁹

Direnen Üretici Tüketici Kooperatifi (Dürtük)⁴⁰

Kadıköy Co-op⁴¹

Koşuyolu Co-op Initiative⁴²

37 <http://www.cayek.org>

38 <http://www.facebook.com/groups/573407206045155/>

39 <http://www.bukoop.org>

40 <http://www.facebook.com/durtuk>

41 <http://www.facebook.com/KadikoyKoop>

42 <http://www.facebook.com/kosuyolukoop>

Yeryüzü Derneği Consumer Association⁴³

İZMİR

CSA Group of Ege University Faculty of Agriculture Department of Agricultural Economics Foça Earth Markets⁴⁴

İmece Evi Abone Aile Sistemi⁴⁵

MUĞLA

Bizim Bostan CSA Group⁴⁶

Bodrum Tohum Foundation⁴⁷

43 <http://www.yeryuzudernegi.org/projeler.php?pid=71>

44 <http://www.focazeytindali.org/earth-markets>

45 <http://www.imeceevi.org>

46 <http://www.facebook.com/bodrumtohumdernegi>

47 For more information, please see <http://www.haricots.org/presentation>

Harricots

One of the initiatives we met during our Brussels visit was Le Début des Harricots, a community founded in 2005 and connected to the Brussels-based GASAP (Groupe d'Achat Solidaires de l'Agriculture Paysanne) network. GASAP is one of the communities that began to develop in France in the 1960s, with the goals of directly bringing together small producers and consumers without any middlemen, increasing producers' income, and mending the severed relationship between urban and rural life. Today, the 36 producers of GASAP provide 30 to 60 varieties of organic produce to approximately 90 consumer groups of 20 members each. Members pay 20 Euros for a weekly vegetable and fruit basket that meets the needs of a family of five. The products are not expected to have an organic certificate; the system is based on trust. Producers directly distribute 80 percent of the basket's contents. The community leaders state that reducing carbon emission is their key motivation. Therefore, the community generally gives preference to producers from around Brussels.

One of the most important features of GASAP is the one-year purchase guarantee. In case the producer decides to invest in greenhouses and such, he/she has the option to receive early payment up to six months in advance.

3.4. RECOMMENDATIONS FOR CLIMATE CHANGE MITIGATION THROUGH CORRECT LAND USE

It is clear that the current system is unable to feed the world, increases climate change, and exploits land and small-scale farmers. Focusing on just one target (like encouraging industrial agriculture or genetically modified organisms to feed the growing population) will

obstruct climate change mitigation and adaptation efforts. This is why agriculture needs to be reinstated into the economic, social, and ecological context to which it belongs.

The industrialization of agriculture and the monopolization of distribution result in the decline of food varieties, increase in the difference between production and consumption (to the disadvantage of both parties and to

the advantage of the intermediary companies) and decrease in food quality due to intensive use of chemicals. Breaking this vicious circle is only possible if rural life and agricultural policies go through a serious revision.

There are various policy and application recommendations on eliminating the impacts of climate change with the complete transformation of land use and agricultural systems. The idea is that a holistic approach to land use and recovering eroded soil will increase

climate resilience. Therefore, in addition to good consumption practices such as community-supported agriculture and food communities, it is necessary to analyze regenerative agriculture, a new approach to the traditional.

The following section features an article that defines regenerative agriculture and how to increase the carbon sequestration capacity of soil.

“Regenerative Agriculture” for Climate Change Mitigation

Durukan Dudu

This article will examine if it is possible to fight climate change and adapt to its impacts and, at the same time, ensure food safety and security through regenerative agriculture that will establish a new relationship between climate change and soil and agriculture.

We will first examine the principal dynamics of the world’s carbon cycle and the soil’s carbon sequestration characteristics and potentials. Then using numerical data, we will calculate how much increasing the soil’s organic matter impacts climate change mitigation. We will also examine the impacts of regenerative agriculture on climate adaptation by acting as a buffer against the extreme weather events that are related to climate change, and we will provide some examples. Lastly, we will discuss how regenerative agriculture transcends being a technical methodology and provides a paradigm shift in the relationship between food, agriculture, economy, and nature.

1. A very big and hungry carbon sink: the soil

In this section, we will frequently use the word “soil” and discuss one of the most complex ecosystems within a triple bottom line (TBL)⁴⁸ framework, which is a concrete step in repairing our relationship with soil. Let us begin by explaining what we mean when we say “soil.” Soil is as a very thin terrestrial layer (30 cm to a few meters) that is home to amazing biodiversity; it is an ecosystem where, in subsoil and topsoil, living matter (grass, flowers, trees, bushes, agricultural crops, etc.) have established an extraordinary symbiotic interaction network. The difference between soil and “dirt” by definition is that soil is a “living” environment that is measured according to the amount of organic matter it contains.

Soil organic matter is a substance that is 55 to 60 percent carbon atoms and is created through photosynthesis—the basic process of all energy and matter transformation and interactions we call nature. Atmospheric carbon dioxide is taken in by plants through photosynthesis and reaches the soil in the form of complex molecules with the help of the soil microbiota.

According to the law of thermodynamics, the total number of carbon atoms in the world is constant. All of this carbon travels from one sink to the other by going through certain

⁴⁸ TBL is a concept that achieves a “win-win-win” situation for ecological, economic, and social aspects at the same time.





short- and long-term cycles. We call this macro cycle the “carbon cycle.” For example, each year 120 gigatons of atmospheric carbon is transferred to plants through photosynthesis, and during the same year, the same amount of carbon is converted into atmospheric carbon through the decomposition and respiration of plants and animals. In other words, carbon is in a constant state of motion between sinks. We also know that climate change is a “carbon cycle” problem. Climate change is the result of the human-caused imbalance in carbon sink cycles: while certain sinks become continuously carbon-deficient, other sinks exhibit carbon-surplus at an increasing rate. The best known example is when humans burn subterranean and undersea fossil fuels for energy resulting in carbon emission from this sink into the atmosphere.

When some of this carbon “surplus” in the atmosphere is absorbed by oceans—another sink—the carbon increase in oceans causes acidification. Another example of human-caused damage to the carbon cycle is deforestation. In this case, the surface carbon, which is in the form of trees/woody plants, moves up to the atmosphere as a result of fires and/or reduction of forest areas.

Among the anthropogenic disruptions of the carbon cycle, the least known but oldest “deficiency”—and according to some the one with the most cumulative impacts—takes place in the soil. According to data provided by the National Aeronautics and Space Administration (NASA), the soil contains about 2,500 gigatons of carbon—that is, three times the amount contained by the atmosphere and four times the amount contained by all green biomass (forests, agricultural crops, grass, etc.). A considerable amount of soil carbon is in the form of organic matter, and organic matter, as mentioned above, is the real trigger of plant growth that is the foundation of all soil and terrestrial ecosystems. We know that in the last 10,000 years, we have lost soil organic matter as a result of human impact, most notably agriculture. The rate and spread of the loss of soil organic matter increased in the last 60 years with the “Green Revolution,” which can basically be explained as a technical and socio-economic process by which agriculture became dependent on chemistry instead of biology. Even though there are various estimates regarding how much soil carbon was emitted into the atmosphere since the advent of agriculture, according to the most reputable claims, we have lost close to 50 percent of soil organic matter⁴⁹.

In other words, according to some estimates, the amount of soil carbon we have emitted into the atmosphere since the advent of agriculture is 150 times more than the current total yearly amount of anthropogenic carbon emissions.

At this point, we need to ask the following question: What would happen if we were to stop and reverse this process that causes soil depletion and loss of water retention capacity, loss of biodiversity and desertification, hunger, and the fall of human civilization? In other words, what would happen if we were to restore the soil’s organic matter?

This question has been voiced for the last ten years, and the results obtained by the “regenerative farmers” who are currently restoring the soil’s organic matter are being shared. Last year, climate change activists such as Naomi Klein and Bill McKibben joined this discussion, which was started by independent platforms, rural organizations calling themselves “carbon farmers,” some NGOs, and leaders who developed and practiced regenerative agriculture methods. This issue also caught the attention of private companies and entrepreneurs, and last year it became part of a governmental agenda when the French government launched

49 Lal, R., Follett, R. F., Stewart, B. A. & Kimble, J. M. (2007) Soil carbon sequestration to mitigate climate change and advance food security. *Soil Sci.* 172, 943–956

the “4pou1000” initiative, which calls for “an 0.4 percent increase of soil organic matter.”

There are many ways to increase soil organic matter of different conditions and scales. Making compost from urban food waste and using them in urban gardens and no till-agriculture⁵⁰ in agricultural lands are some of the ways to permanently restore the soil’s organic matter. Another practice is to use planned grazing and animal impact tools in accordance with Holistic Management and Holistic Planned Grazing in grasslands, meadows, and pastures spread across almost all the Earth.

The annual rainfall distribution in grasslands, which are the largest terrestrial ecosystems in the world, show great variations. The terrestrial area they cover can reach up to 4.5 billion hectares, depending on how this category is classified.

2- Two scenarios that analyze the amount of carbon that can be stored in the soil

We can analyze the soil’s carbon storage and the amount of atmospheric carbon dioxide that can be cleaned through Holistic Management practices by looking at two scenarios. The question we will address in the scenarios is as follows: How much carbon (C) would be captured and stored in the soil (sequestration) if in an x unit area of soil, in a y depth/layer, and z percent organic matter were to be increased?

This is the formula⁵¹:

Affected soil mass (=unit area x depth x soil density) x increase in organic matter per unit volume = Soil Organic Matter Increased (SOMI)

SOMI x 0.55 (the carbon content of organic matter) = Sequestered Carbon (SC)

SC x 3.66 (the fraction of C in CO₂) = Amount of carbon dioxide removed from the atmosphere

Scenario 1: Slight increase

Let’s assume that we increase organic matter (OM) by an average of 0.1 percent (OM) within an area of 500 million hectares (5 million km², approximately six times Turkey’s surface area) of soil and a depth of 50 cm.

Considering that the average density of the soil is 1.3 ton/m³, an increase of 50 cm in the depth of the soil would mean that the amount of organic matter is increased by 0.5 m³/m², or an increase of 650 kg/m².

In a 650 kg mass, a 0.1 percent OM increase corresponds to 650 grams. In other words, in a 1 m² area of soil, a 0.1 percent OM increase in soil with a depth of 50 cm means achieving 0.1 percent increase in OM and creating 650 gr of OM.

Fifty-five to 60 percent of organic matter is composed of carbon (C). In other words, to “create” 650 gr of organic matter, we need approximately 360 gr of C atoms. This C needs to be obtained through photosynthesis, the process by which the soil is in contact with the

50 Tilling is one of the first agricultural inventions, and it is one of the most important causes of the loss of organic matter.

51 For a calculation using this formula, see: Jack Kittredge, “Conversions, Quantities, Calculations and Indulgences: A Primer”, The Natural Farmer, Summer 2014 <http://www.nofa.org/tnf/Summer2014B.pdf>



atmosphere through plants. So, creating 650 gr of organic matter signifies capturing 360 gr of C atoms from the atmosphere.

The atomic mass of C is 1/3.66 the molecular weight of CO₂. So, since we need a 3.66 unit weight of CO₂ molecules to obtain 1 unit weight of C atom, we need 1,300 gr of CO₂ to obtain 360 gr of C.

According to this calculation, increasing OM by 0.1 percent in soil with a depth of 50 cm and an area of 1 m² signifies capturing 1,300 gr of CO₂ from the atmosphere and storing it in the soil. (Thirteen tons of CO₂ in one hectare or 10,000 m² and 6.5 billion tons [Gt] of CO₂ in 500 million hectares.)

In conclusion, the calculation shows us that such an application over 500 million hectares of soil will sequester about 17 percent of the 2015 global CO₂ emissions.

Scenario 2: Strong increase

In this scenario, let us assume that we increase organic matter by 0.5 percent across 1 billion hectares of soil with a depth of 50 cm ⁵².

According to the formula above, this means capturing 65 gigatons of atmospheric carbon dioxide and storing it in the soil in the form of organic matter. This equals approximately 1.6 times the amount of annual global carbon dioxide emissions.

An alternative approach to these calculation methods is used by GRAIN and the Rodale Institute and suggests the following pathway: It is possible to capture a total of 300 gigatons of atmospheric carbon dioxide and store it in the soil if we restore 200 gigatons of organic matter (which is the most modest estimate regarding the amount of organic matter lost through human intervention) by using regenerative agriculture practices in agricultural lands (all cultivated and uncultivated terrestrial systems—fields, grasslands, pastures) ⁵³. And this will correspond to a decrease of about 40 parts per million (ppm).

An article that compiles up-to-date academic articles on the sequestration potential of the soil states that it is possible to sequester six tons of carbon, more than 20 tons of carbon dioxide per 1,000 m² in semi-arid terrains. Calculations estimate that storing a total of 210 gigatons of carbon in a 40 million km² area of global grassland would correspond to about a 100 ppm decrease in the concentration of atmospheric carbon dioxide ⁵⁴.

A question that comes to mind at this point is how long it will take to achieve the soil organic matter increase rates mentioned in the scenarios above. The results obtained by the “carbon farmers,” who practice regenerative agriculture on a global scale and conduct soil analysis, showed that an annual increase of 0.1 to 0.4 percent of organic matter in a 1 m-deep layer of soil is not merely theoretical and can be considered as empirical data. Some scientific studies showed that it is possible to achieve two percent organic matter increase

52 Founded by the developer of Holistic Management (the fundamental regenerative agriculture practice and method that focuses on grasslands) Allan Savory and his friends, the International Savory Institute sets 1 billion hectares as a target area to be managed with Holistic Management and regenerative agriculture on a global scale by 2025. Anatolian Grasslands is the Savory Institute hub in Turkey.

53 See: <https://www.globalpolicy.org/home/217-hunger/48282-tackling-the-climate-crisis-from-the-ground-up.html>

54 Upside (Drawdown) – The Potential of Restorative Grazing to Mitigate Global Warming by Increasing Carbon Capture on Grasslands <http://www.planet-tech.com/upsidedrawdown>

in soil with a depth of 90 cm over a period of 10-25 years.

In a case study, random soil samples were collected in the Anatolian Grasslands implementation field near Biga, Çanakkale, from six locations with soil depths ranging from 0-30 cm, 30-60 cm, and 60-90 cm in December 2014 and December 2015. The samples were analyzed by the Directorate of Food, Agriculture and Husbandry in the Province of Çanakkale. The results showed a change in the soil's organic matter. According to the results, between December 2014 and December 2015 the soil organic matter:

- Increased from 1.75 percent to 2.37 percent at a depth of 0-30 cm,
- Increased from 1.15 percent to 1.54 percent at a depth of 30-60 cm,
- Increased from 0.31 percent to 0.34 percent at a depth of 60-90 cm.

There was also an increase in the soil's nitrogen, phosphorus, and potassium content during this process. The implementation field is a field that is neither irrigated nor seeded and where no other form of regenerative agriculture except grazing is practiced. Thus, it constitutes an important example to illustrate the results of solely practicing Holistic Planned Grazing.

Data from various regenerative agriculture practices from around the world support the results of the Anatolian Grasslands. The United States-based grassroots organizations Soil Carbon Coalition and Carbon Farmers collect data from farmers for mapping and sampling studies. One of these studies shows that through regenerative agriculture practices, which he began in 1993 and gradually varied throughout the years, the American farmer Gabe Brown was able to increase the soil organic matter from below two percent to above five to six percent and achieved an average increase of four percent.

In conclusion, it seems possible to sequester a much larger amount of atmospheric carbon dioxide through the wide adaptation of regenerative agriculture practices than the amount promised by the very costly methods that have been suggested up until now and whose adverse effects are unknown. A further increase in efficiency can be anticipated if we were to add the decreasing impact of the reduced global land use emissions on total greenhouse gas emissions to this equation.

3- The win-win-win cycles created by regenerative agriculture in other areas:

Adaptation along with mitigation

The most widespread and perceivable acute crisis linked to climate change is the decrease in rainfall frequency and the increase in the force of rainfall, which are caused by the increase of the heating atmosphere's moisture-holding capacity. In other words, in many areas in the world, rainfall gradually becomes rarer, and serious drought episodes and sudden downpours occur simultaneously. And these simultaneously occurring drought and floods further increase soil erosion and degradation in lands that are already worn-out, arid, and turning into deserts.

Soil that has been regenerated, in other words soil that is covered by vegetation and whose physical structure has been regenerated by organic matter, acquires a "sponge-like" characteristic. We can say that each mass unit of organic matter provides the soil with the storing/holding capacity of approximately four units of water. According to this calculation, increasing organic matter by 0.43 percent in a 90-cm-deep layer of soil in the Anatolian Grasslands'



field would signify ensuring that the soil holds, approximately, an additional 25 liters of water or 25 millimeters/m². This corresponds to 25 tons/1,000 m² and 250 tons/hectare.

Degraded and increasingly frail soil is like a ceramic-tiled surface, the rain just slides off the surface. However, even severe rainfall can be absorbed by regenerated soil and can increase its vitality and feed streams and aquifers. The same rainfall on a frail soil will cause both soil erosion and floods, and the soil will become vulnerable to drought because it will dry rapidly.

We can also provide some data from Gabe Brown's field, the American farmer we mentioned above. According to Brown's measurements in 1993 when he was practicing conventional agriculture, his soil's "water absorption rate" was 13mm/hour. In other words, when rainfall exceeded 13 mm/hour, the soil could not entirely absorb the water, and the water would flow and run off (causing erosion). The same soil was able to absorb 200 mm/hour strong precipitation by 2011⁵⁵. This means that there is no more water erosion and that the soil enters the drought periods with a strong water reserve.

For regions, basins, or countries, the large-scale application of holistic management and regenerative agriculture practices can signify being equipped with a serious "buffer" against droughts and floods, not being affected/or being minimally affected by them, and the end of the struggle against them. In other words, regenerating the soil with regenerative agriculture practices is one of the symbiotic climate change adaptation tools that can be used.

Regenerative agriculture and humans

Another aspect of regenerative agriculture is the socio-economic impact it has, notably on food production and agriculture. Regenerative agriculture is not only a body of technical methods and procedures but also an important paradigm shift. Almost all of the implementers of regenerative agriculture on the global scale act in a local context and participate in a wide range of activities: raising a generation of new and "regenerative" farmers, taking brave and innovative steps to establish food communities and co-ops, developing "out of the box" recommendations and practices for the finance system (such as the new generation dividend systems that enable food communities to become shareholders of regenerative farms), and trying to merge consumers and producers in the medium-term by bringing them together under the concept of being a "prosumer." Operating in different forms, each of these individuals, organizations, and networks constitute a fundamental momentum for important systemic changes such as seed freedom, biodiversity, food security, converting the current chemical-based agriculture economy into biology-based agriculture, the expansion of small-scale family farms, the restructuring of rural areas (and cities), and developing resilience in local economic cycles.

In this context, regenerative agriculture also possesses the quality of being a social movement that paves the way of decentralizing society, politics, and economy.

In addition, crops and animal products that originate from soil that has been enriched with regenerative agriculture practices do not contain any chemicals that are hazardous to human health. Moreover, a more resilient microbiological life makes it possible to obtain agricultural crops that are more resistant to "agricultural pests." And the foods that are produced in this soil have higher nutritional values. Today, food production with regenerative agriculture holds an important place in the rapidly spreading approaches to nutrition and

⁵⁵ Brown's Ranch: Farming in Nature's Image to Regenerate Land, Productivity, and Quality of Life (PennState Extension), <http://extension.psu.edu/plants/sustainable/news/2014/spring/browns-ranch>

healthy living and is defined as one of the most important human health trends in the near future ⁵⁶.

Conclusion

As a body of agricultural methodologies and approaches, regenerative agriculture presents important solution opportunities for climate change mitigation and adaptation. The fact that regenerative agriculture practices are less costly than conventional agriculture practices in the medium term, or in other words that they have negative costs (after the initial low equipment, training, and technical support expenses) provides an important counterargument against those who argue that economic constraints constitute an obstacle to climate mitigation.

Regenerative agriculture is a grassroots movement that originated from the rural setting and is just beginning to draw the attention of scientists. In order to close the gap between “real life” and academia, it is important that scientists in Turkey and all over the world focus on specific and comprehensive studies, such as the effects of carbon sequestration on water cycles and on the changes in land use practices. In this sense, the widespread regenerative agriculture practices in Turkey provide extensive research opportunities for disciplinary and inter-disciplinary researchers.

56 The Next Hot Trends in Food, Wall Street Journal, October 16 2016, <http://www.wsj.com/articles/the-next-hot-trends-in-food-1476670682>

3.5. CLIMATE-FRIENDLY LAND USE AND GREEN ECONOMY: PROBLEMS AND RECOMMENDED SOLUTIONS

A project workshop gathering experts and civil society activists was held on October 27, 2016 at the Istanbul Policy Center. Following the presentations of Project Advisor and Associate Professor Barış Karapınar and Durukan Dudu from the Anatolian Grasslands, a Savory Institute hub, on land use and regenerative agriculture, workshop participants formed two groups to discuss and report on the opportunities, constraints, and innovative policies to overcome these constraints. The outcome of this workshop can be summarized under these two headings:

3.5.1. Regenerative Agriculture

1. Opportunities

► Turkey is a country that is rich in agricultural land and grasslands and is situated in a temperate climate zone—although this is changing.

► Regenerative agriculture practices are low cost and thus easy to implement.

► Development agencies that provide support present an opportunity.

► Dry conditions, which are aggravated by climate change, lead farmers to search for alternative practices, and this can put regenerative agriculture on their agenda.

► City dwellers’ deep interest in new agricultural practices because of the problems caused by rapid urbanization is an opportunity.

► The government began to encourage young people to go back to rural areas. Even though the incentives are insufficient, these and the fact that the young generation is educated and open to change can present an opportunity for spreading regenerative agriculture.

► Enabling farmers to come together to establish networks for processes such as organic certification and information exchange can pave the way of such new applications.

► Industrial agriculture practices and methods used in the South Anatolian region have caused soil deterioration and salinization. The search for alternative methods to enrich the soil also presents an opportunity for regenerative agriculture.

► The price of animal products is very high, and animal feed accounts for 80 percent of the costs. Therefore, the increase of grassland productivity is economically attractive.

2. Constraints

► Rapid economic growth and, as its consequence, the legal amendments that have paved the way for endless investment opportunities in forests, grasslands, and agricultural lands (such as the amendment to Article 80) are important constraints in the development of agriculture as well as to the application of alternative practices.

► Restrictive regulations and incorrect agricultural planning obstruct the way of these practices.

► Structural problems, such as the slowness of the decision-making mechanism and centralization, as well as the lack of institutional cooperation present a permanent constraint.

► The lobbying activities of multinational companies are pro-industrial agriculture and detrimental to these kinds of alternative practices.

► The shortcomings in forming co-ops and organizations cause difficulties and delays in the spreading of these innovations through grassroots movements.

► The agriculture education provided at universities emphasizes management and cost minimization, and this is a constraint.

► The structure of Turkey's agricultural land is composed of small and fragmented parts, and this a constraint that increases costs.

► Problems regarding grassland control and access, such as the behavior of villagers at odds with each other and the administrators' indifference to grasslands, allows the legitimization of other uses.

► NGOs fall short of providing information and motivating decision-makers to act, and as a result social awareness is not developing. Similarly, cultural codes that determine consumer behavior and the lack of awareness of the unsustainability of the industrialized lifestyle create obstacles.

3. Policy recommendations

► Creating opportunities for landless farmers' accession to lands.

► Creating joint capital structures: for example, food communities can be brought together to buy lands where they will practice Holistic Management and regenerative agriculture.

► Writing regulations that will encourage regenerative agriculture: for example, like in Australia, carbon farming and carbon offset practices could be subsidized. Regional pilot applications can be prioritized.

► Exchanging information between researchers and farmers; efforts to transform this into a systematic exchange are needed. Gathering data through citizen science can contribute to regenerative agriculture.

► Making efforts towards raising social awareness on the results of bad practices and promulgating best practices.

► Adapting regenerative agriculture in a way that would make it applicable to both grasslands and private gardens.

► Ensuring the formation of structures such as co-ops that will develop the practice of bringing herds together.

3.5.2. Protecting Agricultural Land and Mitigating Emissions

1. Opportunities

► The recent Environmental Plans written in the scope of the Zoning Act No. 3194 offer a legal platform where new recommendations on land use can be presented.

► Non-cultivated areas are increasing. A proactive approach will make it possible to recover these areas for cultivation.



- ▶ The urban population's increasing interest in ecologic villages, eco-consumption, and eco-tourism and the increasing number of people moving back to rural areas present opportunities.
- ▶ With the development of carbon markets, carbon sequestration technologies can provide farmers with an additional source of income.
- ▶ The low yield of existing agriculture practices and the continuing decline in product quality can lead to an increased interest in traditional agricultural practices.
- ▶ The Ministry of European Union Affairs and the Ministry of Development's increasing financial contributions in these areas can be interpreted as opportunities.

2. Constraints

- ▶ The continuous amendments to the legislation and application mistakes such as changes in individual parcel ownerships are slowing down the spread of new practices.
- ▶ Many rural agricultural areas will become urban plots with the Metropolitan Municipalities Act No. 6360. This increases the expectation of rent-oriented income and creates an obstacle to the correct use of agricultural lands.
- ▶ The lack of information and the perception that the cost of reducing emissions is high

prevents the issue from getting onto the public agenda.

- ▶ The fact that retail chain stores are monopolizing agricultural production causes a gap between producers' gain and consumers' spending and this makes it increasingly more difficult to earn a living from agriculture.
- ▶ Society's insufficient environmental awareness and the limitations of ecology movements make it difficult for new practices to spread.

3. Policy recommendations

- ▶ Ecology movements and NGOs that operate in this field need to be supported.
- ▶ Sustainable agriculture awareness should be increased through education programs, and new platforms and channels need to be established in order to spread information. Establishing special departments at universities can also be recommended.
- ▶ Producer and consumer associations need to be supported.
- ▶ Organic agriculture and practices that increase the amount of carbon in the soil should be provided subsidies.
- ▶ The insurance and liability regulations need to be revised.

Climate-friendly land use: Bursa Nilüfer Urban Vegetable Garden

The Nilüfer Urban Vegetable Garden is located in the Ürünlü neighborhood of Bursa, on 5,500 m² of land provided by the Nilüfer Municipality, and consists of 67 gardens, each 64 m². Here, gardeners practice ecological agriculture and mostly focus their efforts on producing organic seeds. The distribution of land consists of one parcel per neighborhood committee. Neighborhood committee representatives work on their own parcels and take the produce back to their neighborhoods. Agriculture faculty students work at the gardens of Uludağ University and Karacabey Vocational College. The urban vegetable garden features work areas for the production of various organic seeds such as heirloom wheat seeds. Eskişehir Research Institute conducts product yield analysis for some rarely produced wheat species. Siyez wheat from Kastamonu and local wheat varieties from Hatay are among the different varieties of wheat that are being produced. The Nilüfer Urban Vegetable Garden boasts 96 local seeds belonging to 16 different varieties of produce. Producers do not use any pesticides or chemical fertilizers.





Climate change and land use policies: Bursa

The workshop held in December 2016 in Nilüfer, Bursa, brought together a group composed of agricultural engineers, food engineers, medical doctors, farmers, organic producers and market-owners, members of the city council, municipality representatives, academicians, and activists. The 17 participants discussed land use policies for climate change mitigation, the situation in Bursa in regard to organic food production and food communities, opportunities, constraints, and experiences. Some of the issues that were identified by the participants as particular to Bursa can be summarized as follows:

- ▶ Bursa is well suited to organic agriculture, but production for local markets is low. As an example of insufficient organic produce supply in the city, we were told about the Nilüfer organic market. Founded in 2006, it did well the first three to four years, but today it has only three producers. The reasons provided by the participants were the inability to create a demand for organic produce and that there was less demand for organic animal products. Even though there are about 500 to 600 organic farmers in Bursa (mainly, cherry, strawberry, raspberry, blackberry, etc.), they only produce to export. Bursa boasts three village markets, one organic market (in Nilüfer), 64 neighborhood markets, and hundreds of shopping centers/malls.
- ▶ The other reasons for low demand for organic produce in Bursa were that there are only a few varieties of organic products and they are too expensive and of poor quality. The products first go to Istanbul and then come to Bursa, and they are often not fresh. The products are not attractive enough, and there is a trust issue; the buyer does not trust the seller.. The purchasing power of consumers in Istanbul and Bursa are considered to be the same, however in reality the purchasing power in Bursa is lower and there is no transportation cost for local products and yet the prices are the same in the two cities.
- ▶ Society needs to be educated about what organic is and what it is not. For example, a villager might be selling produce labeled organic at a villagers' market at a much lower price than organic products. And this might lead us to think that the demand for villagers' markets is in reality a demand for organic products. Moreover, there is organic production at the faculty, and these products are very rapidly sold within the faculty. This can also signify that there is indeed a demand for organic products but that it is not managed properly.
- ▶ There was also a comment about the fact that since Bursa's ties with traditional life and the land are not severed, this made it possible to buy from villages and this might be the reason behind the low demand for organic markets.
- ▶ Participants recommended that organic production should be subsidized, and local administrations should also take responsibility. Municipalities should facilitate access to organic products, and the state should provide subsidies to reduce the price difference in the name of protecting human health.
- ▶ Villagers should establish production and consumption co-ops instead of producing individually.
- ▶ Bureaucrats working at the Provincial Directorate of Agriculture dissuade producers from going organic. These bureaucrats are not well informed, and they create obstacles (that do not exist in the legislation) for the producers.

- ▶ One comment addressed the pollution in Bursa, which is caused by industrial and coal-fired power plants. There is concern that the products might be unhealthy even if pesticides and chemical fertilizers are not used.
- ▶ According to participants, the only urban vegetable garden is the one established by the Nilüfer Municipality at the Ürünlü village. This organic agriculture center, which mainly focuses on organic seed production, plays an important role in educating and raising awareness. However, there are no urban vegetable gardens and hobby gardens for the public. On the other hand, there is a demand for urban vegetable gardens, and people are demanding areas where they can be engaged with agriculture and have a good time on the weekends. People transforming empty lots near their apartment buildings in the city into urban vegetable gardens illustrates this demand.
- ▶ Municipalities should allocate space for NGOs to establish urban vegetable gardens that would be open to the public.
- ▶ According to other comments, with the Metropolitan Municipality Act, common areas and grasslands that belonged to the village administration will now belong to the municipalities; if husbandry is banned when villages become neighborhoods with this Act, it will not be possible to raise livestock anywhere in Bursa. Water and energy prices and taxes will increase and be the same as in the city center. The villagers are not aware of this because of the current transition period, but this will create a huge problem for the villagers and will impact organic production.

CONCLUSION

The world is facing an economic, social, and ecological crisis. The green economy approach, which claims to develop a holistic solution to overcome this triple crisis, also provides an important frame for finding a solution to climate change. In contrast to the traditional economic approach—which reduces economic development to growth and ignores environmental and social concerns and even considers them as hindrances—a green economy prioritizes human development by encouraging social justice and environmental quality and proposes policies that reduce GHG emissions, minimize pollution, and protect the environment.

While the sustainable development approach does not question the economic process and claims that protecting nature does not hinder growth and therefore prioritizes the conservation of the traditional development approach, the green economy approach prioritizes protecting the climate and nature and emphasizes job creation, social rights, and fair labor conditions and can provide the realistic framework we need to fight climate change.

The experiences of the European Union countries, which for years led the development of climate protection policies, provide brilliant examples for countries like Turkey that insist on prioritizing economic growth. The success of European countries lies in innovative technologies and creative social organizations—examples that bear economically satisfying results.

The common point of innovative practices featured in this report—such as passive buildings, energy co-ops, community-supported agriculture, inner-city transportation by bicycle, urban vegetable gardens, and regenerative agriculture—is that they create environmental and climate-friendly alternatives with easy and widespread applications and also enable new jobs whereby citizens directly contribute to the economy and even earn income. The priority is set on family or individual initiatives instead of increasing the profitability of big companies. This not only creates new jobs but also provides

benefits for increasingly corroding social inclusiveness and equality.

The misperception that these innovative practices result in unrecoverable, additional costs was recently overcome through the success of widespread practices. The time for a new era has come: the price of solar panels continues to drop, and solar energy will be the most economical form of energy production in ten-years time; passive buildings will cost as much as conventional constructions; and organic production will be more successful than industrial agriculture in matters of food quality and environment protection, as well as from an economic viewpoint.

The participatory method used in this report to discuss the importance of European best practices and their adaptation to Turkey to develop climate-friendly green policies also provides a model for spreading green economy across the country. Also, the probability of implementing the policy recommendations that were designed during discussions by experts, academicians, civil society members, activists, and private citizens is higher. In an economic system where each private citizen is a green entrepreneur, sectors such as energy, transportation, agriculture, and construction stop being the sources of GHG and pollution and become parts of the solution to climate change. If we rethink the processes of science and policy using a participatory and innovative approach, it becomes clear to us how easy and applicable the transformation—which was once considered an illusion but today is necessary for our survival—to a green economy can be.

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