

PRIORITY AREAS FOR CLIMATE CHANGE ACTION AT GLOBAL LEVEL

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Abstract

Climate change is one of the most challenging environmental problems to be faced by humankind. Its impact is predicted by various scenarios and it is considered unavoidable for some extent. Since the main cause of climate change is related to energy production, we approached this sector as a priority area with actions consisting in efficiency improvement and renewable energy use. Further we analyzed agriculture and water, areas that will also face difficulties caused by climate change. Increasing knowledge about the physical phenomena by collecting comprehensive data is very important to address the most important issues.

Keywords:

Climate change, energy, agriculture, water, priority areas

Introduction

The increasing intensity of industrial activity that accompanied social progress along the last decades also resulted in a range of environmental degradations that now threatens the livelihood of billions of people. The forms of degradation are very diverse, but also interconnected. One of the most challenging is considered to be climate change, a phenomenon that could be understood only by considering the global ecosystem (Brown et al., 2001).

The issue of climate change besides being an environmental challenge, it is also a managerial challenge since it supposes a broad collaboration among all states of the world, states that on the one hand have very different levels of development, and on the other hand are in very different situations with respect to climate change.

Since 1992 than the global framework was established through the UN convention at the Rio Summit, knowledge and experience built up providing improved guidance for policy makers who should design strategies and programs for accomplishing their corresponding contribution to the climate change action. This process is supported by defining priority areas and revealing what needs to be done for further progress.

Using these priority areas as supported we are intending to highlight how goals should be defined for each of them and what are the economic implications of accomplishing those goals. The implications are outlined by referring to investments, funding, employment, and, if it is the case, business opportunities. In the first part of the paper we synthesis the results literature review regarding climate change action priorities reported by different studies. Further, the sections of the paper are corresponding to the priority areas identified previously. Finally, some conclusions are discussed by comparing the economic implications in the analyzed areas.

1. Literature review

Climate change is a complex environmental issue in both, its causes and its impacts. The phenomenon is caused by the building up of greenhouse gases in the atmosphere. The main sources of greenhouse gases are burning of fossil fuels, agriculture, and decaying waste. Consequently, the balance between incoming and outgoing radiation is slowly shifted

resulting in the so called global warming. The process was demonstrated by comparing data for the global annual mean temperature along a long range of years. The impact of climate change is far more complicated. Although the variation of the global temperature is of only several Celsius degrees, then it is transposed in weather patterns the results indicate many potential threats such as more frequent and more intense droughts, heavy storms, harsh frosts and other extreme conditions. Further, the balance between solid and liquid water will shift toward a larger amount of liquid water, impacting in the size of the land area, on the one hand, and the size of the ice caps on the other hand.

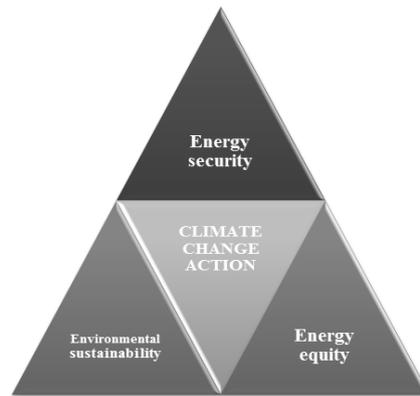
The first approach for tackling climate change envisaged the reduction of greenhouse gas emissions. This was included in the global agreement established at the Rio Summit in 1992 as emission target. Each signatory state assumed an emission reduction target against the reference year of 1990 (Brown et al., 2001).

Further research on climate change revealed that even if emission targets are met, which was not the case for many states, some of the impacts cannot be avoided, and it is necessary to improve resilience. At this time, climate change action comprised two directions: climate change mitigation and climate change adaptation. The first one preserved its goal of reducing emissions, with a special focus on capturing emissions by afforestation or other technological solutions like carbon storage plants. The second path envisaged strategies for reducing losses and improving safety of people who will be exposed to the unavoidable impact (Noges et al., 2010).

Climate cannot be perceived by the public at large and awareness rising progressed very slowly. At some moment it was realised that although policy is very advanced, the public is lacking a proper understanding of climate change and how could each person contribute. Thus, the focus shifted from explaining what is about to happen, to what needs to be done or the actions to be performed. Thus, at global level climate change related activities are now coined as climate action. The European Commission, although it already has a directorate general for environment, it also established a Climate Action DG.

Climate change action is often framed with respect to its causes and impacts. One of the most recent approaches considers that the action should balance between three needs: energy security, environmental sustainability and energy equity (World Energy Council, 2015). This approach is known as the energy trilemma (fig. 1). Energy security refers to the management of primary energy sources and the corresponding infrastructure. Environmental sustainability refers to maximizing energy efficiency and increasing the supply from renewable sources. Energy equity refers to affordability, but also accessibility of energy for population. In this framework the priority areas are differentiated by regions, as follows:

- Asia: increasing energy access, fostering energy efficiency, management of the demand, increasing resilience of the energy system and acceptance among populations
- Europe: reduction of greenhouse gases emissions, fostering energy efficiency, increasing the proportion of renewables, increasing affordability;
- Latin America and Caribbean: focus on adaptation, management of energy demand, and regional integration of optimization.
- Middle East, North Africa: increasing energy efficiency, diversification of primary resources, management of demand;
- North America: increasing energy efficiency, reducing carbon intensity of energy;
- Sub-Saharan Africa: increasing energy accessibility, affordability.



Source: World Energy Council

Fig. 1 The energy trilemma for climate action

In a later report (World Energy Council, 2016) there were defined five action paths, as follows: energy supply, energy access, energy affordability, energy efficiency and demand management, and decarbonisation of the energy sector. The key priorities are energy subsidies, renewable energies, energy efficiency, and regional interconnection.

In the vision of the World Bank (World Bank Group, 2015), the climate change action consists in the followings:

- Using more renewable energy and increasing the efficiency of energy use;
- Designing a more climate friendly transportation system;
- Increasing the resilience of cities against major natural hazards, especially floods;
- Enhancing the productivity of land and water by means like precision agriculture;
- Increasing competitiveness between green technology operating companies in order to foster innovation;
- Providing „safety nets” for the most vulnerable social categories.

Another report, focusing on Asia and the Pacific (ADB, 2009) finds as priorities for climate action the followings:

- Supplying more energy from clean primary sources;
- Sustainable transportation and urban development;
- Maximizing carbon sequestration by agricultural land management and forestry practices;
- Supporting development that enhance resilience against climate change;
- Developing institutional capacities for policy making and implementation.

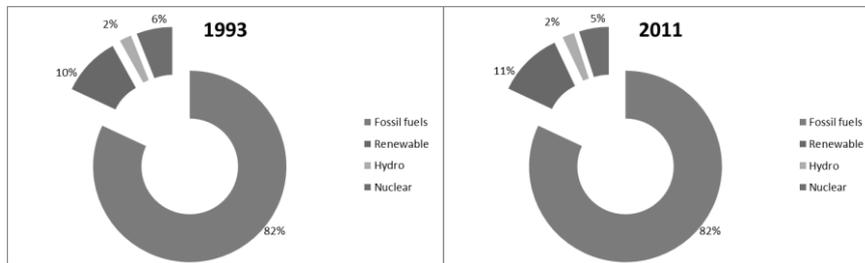
The fifth IPCC report (2014) makes the difference between long-term mitigation actions and short term actions. The second ones could be cross-sectorial and sector specific, with special focus on energy supply, end-use, agriculture, forestry, infrastructure, settlements, and spatial planning.

The World Meteorological Organization established a specialised service for addressing climate change. By this initiative there were identified the following priority areas: food security and agriculture; risk management; energy, health and water.

For the following sections, we will consider the as priority areas of climate change action energy, agriculture, and water.

2. Climate change action in the energy sector

Increasing the energy supply is one of the most important characteristic of human activity. This is occurring because humans rely extensively on products and devices that are not produced by their own body, but need energy to be manufactured or for functioning. The primary energy sources are quite diverse, but most of the energy used by humans originates from fossil fuels – coals, oil, and natural gas (fig.2).



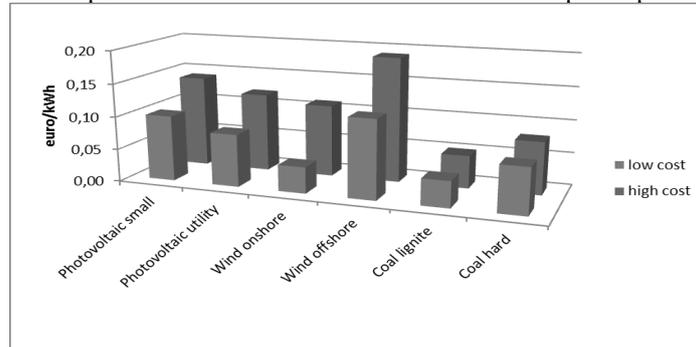
Source: World Energy Council

Fig. 2 The structure of primary energy sources in 1993 and 2011

Releasing energy from fossil fuels is occurring by burning them in various devices. The resulting heat is used as such for heating indoor spaces or preparing meal or it is transformed in electric power or fuels mobility. Along with heat, burning also releases the most important greenhouse gas – carbon dioxide.

Thus, one important climate change action in the energy sector is improving the efficiency of using the energy. This is possible by improving the devices for burning, reducing the heat loss of buildings, and reducing the consumption of electricity powered equipment. Since energy procurement is one important component of production costs, the struggle of increasing energy efficiency is also reducing costs.

Another climate change action in the energy sector is increasing the ability of using other primary energy sources, the capturing of that does not release greenhouse gases or have lower emissions per unit of energy. Such primary energy sources include wind energy, solar energy, hydro energy, nuclear energy but also various forms of biomass. Unlike fossil fuels, these energy sources are more difficult to capture, although they are more abundant. For instance, solar energy is available almost everywhere for at least several hours. Nonetheless, transforming it in heat or electricity supposes the use of high tech devices like solar panels and photovoltaic cells. Consequently, the energy produced by other sources than fossil fuels tends to be more expensive. The chart presented in fig.3 shows the evolution of solar and wind electricity prices compared with the one obtained from coal fuelled power plants.



Source: Fraunhofer Institute for Solar Energy Systems ISE

Fig. 3 Leveled cost of electricity

Climate change action also envisages the management of renewable energy supply, since these forms of energy are highly dependent on weather patterns. The solution for this challenge is brought by enhanced monitoring capacity provided by the new technologies based on remote sensing and cloud computing (Laitner and Berners-Lee, 2012).

3. Climate change action in agriculture

Agriculture remains the most important source for food. Although revolutionary technologies emerged that promise factor increase in productivity (for instance, vertical farming, animal protein from plants), most of the food production should be obtained by cropping and livestock. In the same time, crop production is relying on certain weather patterns, the change of which will impact on productivity.

The forms of climate change impact on food production include reduced yields, increased demand for irrigation water, shifting planting and harvesting seasons, reduced area of arable land, higher impact of pests, reduced or unsafe fish production (Parry et al., 2004).

Reducing this impact could be achieved by predicting adverse conditions and establish adaptation strategies accordingly, diversification of crops and livestock for enhancing resilience, design and implement appropriate financial support measures with special focus on insurance, enable regional cooperation for managing impacts and early warning, and develop food processing and storage sectors (Teng et al., 2015).

Agriculture is often treated in relation with food security. This notion is more complex, since it involves not only the physical size of production, but also how this production is distributed. According to FAO (2008), the following aspects should be considered with priority:

- Availability of food: it could be achieved by high productivity, imports, but also food aid;
- Access to food: implies the availability of income to be spent for food;
- Adequate use of food: the nutritional value of food might be lost if other conditions like sanitation, clean water, heat treatment are not available;
- Stability: means reducing the risk of losing access to food.

What is particular in climate change action for agriculture is the fact that mitigation and adaptation are interconnected. This leads to the need of adopting integrated strategies.

4. Climate change action for water

The different weather patterns under the impact of climate change will impact on the availability of water resources in many ways that include reduced rainfall, increasing volume of water withdrawals for irrigation, drying up of springs depending on ice cups and others (Adams and Peck, 2008).

Many of the challenges could be addressed by increasing the information and data regarding resources and rainfall. The indicators that should be monitored are frequency of heavy rainfall, duration of heavy rainfall, maximum precipitation, flood probability, size of water resources. The monitoring should collect weekly, monthly, seasonal and annual data at local, regional, and national scales (WMO, 2014).

Coping strategies for water scarcity should consider also water storage options, adjustment of water prices, and extending water infrastructure. From the economic point of view, it is very important to have more precise climate change models and forecasts. In this way the opportunity costs of preparing for the worst case scenario will be significantly reduced. Precision refers to extending the time frame of predictions, and sharper information about location, duration, and intensity of water shortages or excesses (Adams and Peck, 2008).

Conclusions

Climate change is a complex environmental issue because of how it is produced, but also because of its widespread and diverse impact. We selected energy, agriculture, and water as priority areas for climate change action by considering both causes and impacts.

In case of energy climate action involves improving efficiency, but also changing the structure of primary energy sources by increasing the proportion of renewables. Although this is already done, the cost of renewable electricity continues to be above fossil fuel sources. On the other hand, energy efficiency is a major cost saving strategy. In both agriculture and water management the reduction of uncertainty by more precise and expanded forecast would have the most important positive economic impact.

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