Concept of Environment, Health and Energy Systems in Turkey

Mustafa Alparslan[1],Saniye Türk Çulha[1], Fatih Aksoy[1], Hasan Barış Özalp[2]
[1]*Izmir Katip Çelebi University, Faculty of Fisheries,*
35620, Çiğli, Izmir, Turkey,
[2]*Çanakkale Onsekiz Mart University, Faculty of Marine Sciences and Technology*
17020, Çanakkale, Turkey,
E-mails: m_alparslan@hotmail.com, saniye.turk.culha@ikc.edu.tr,
fatih.aksoy@ikc.edu.tr, jacenzo@yahoo.com,

Abstract: Since the Chernobyl disaster in the Black Sea region, it has been understood that environmental problems are not restricted to the countries of their origin. Research has shown that international attention given to the Mediterranean Sea has generated a more positive impact on environmental protection, as com-pared to that of the Black Sea. Industrialization around the Black Sea during the Cold War, a lack of international attention for long decades, and the region's position since the Second World War as a crucial hub for the transport of the energy produced by Caucasian and Black Sea littoral countries to the energy consuming countries in Europe aggravated the environmental situation in the region. Pollutants created by chemical industries and oil leaking from tankers have caused a decrease in biological diversity. Thus, increased pollution in the sea en-tered the agendas of governmental and non-governmental international/regional organizations and individual states in the last two decades. Unfortunately, after the end of the Cold War and the collapse of the Soviet Union, the main priorities of the newly independent states included neither an increase of biological diver-sity nor a decrease in pollution. As the regional states put their efforts into competing in the international liberal market, they focused on increasing industrialization, trade and economic ties with the energy demanding countries. There are ten wind farms mainly on land clustered together in the west of the country and in the Aegean region, including in Çanakkale, close to the site of ancient Troy, Çeşme, Akhisar and on the island of Bozcaada. Wind powe in Turkey is gradually expanding in capacity. In 2006, 19 MW of wind power was installed, and in 2007, installed wind capacity increased to almost 140 MW. Turkey is set to double the

amount of its electricity supplied by wind power with the construction of a wind farm in southeast Turkey which will have an installed capacity of 135 megawatts (MW) when it is completed in 2009. This very important project will use 52 of the latest generation of turbines from GE Energy, each rated at 2.5 MW.] Installed wind power is expected to reach 808.81 MW by the end of 2008.Wind energy potential for Turkey is 58GW. The European Wind Energy Association stated that installed wind power capacity in Turkey at the end of 2009 was 801 MW. A total of 343 MW of capacity was installed in 2009. According to Official Transmission Reports, installed wind power capacity in Turkey at the end of 2010 has increased to 1265 MW. The installed capacity is specified as 1645,30 MW by October, 2011 by the same reports. At the end of 2012 there will be over 80 windfarms in Turkey. At the end of 2012 Turkey will have 2 GWs of installed capacity. The Turkish government has a target of a 20 times increase in wind capacity by 2020.

Keywords: environment, renewable energy, chernobyl disaster

1. INTRODUCTION

The most horrific technological catastrophe of the 20th Century is the Chernobyl Accident. Today, many people do not know where Chernobyl is situated. This small town is located on the Pripyat River, approximately 140 km from Kyiv, the capital of Ukraine. It was founded long ago, in the year 1193. Before this disaster in 1986, the population of Chernobyl was only 12,000 inhabitants.

Now, the small town of Chernobyl is known for its nuclear power plant and this 1986 accident, which is considered to be the most terrible nuclear accident in the world's history. Since then, this accident has raised many world-wide discussions about the safety of all nuclear power plants.

The 1986 Chernobyl disaster happened on the April 26, 1986 at 1:23 AM, when a powerful explosion destroyed the 4th power block of the nuclear power plant. The Chernobyl incident was the reason for the most terrible radiation emission in the world's history. This caused serious social and economic problems for the population of the former Soviet Republics of Ukraine, Belarus and Russia. 70% of the radioactive fallout from Chernobyl disaster landed in Belarus, affecting approximately 3,500 towns and villages, and about 2.5 million people.

This Chernobyl accident influenced the lives of thousands of people. The whole town of Pripyat with a population of 49,360 people was completely evacuated

within 36 hours after the Chernobyl accident. During the subsequent weeks and months, an additional 67,000 people were evacuated from their homes in the affected areas. In total about 200,000 people were evacuated as a result of the Chernobyl incident (3)

Table: 1. Summary of average accumulated doses to affected populations from Chernobyl fallout (7)

Population category	Number	Average dose (mSv))
* including 240 000 who worked in 1986–87.		
Liquidators (1986–1989)	600 000*	~100
Evacuees from highly-contaminated zone (1986)	116 000	33
Residents of "strict-control" zones (1986-)	270 000	>50
Residents of other 'contaminated' areas (1986-)	5 000 000	10-20

Source: UN Chernobyl Forum (2006)

Especially nuts, tea etc. which has been produced in Turkey analisied in scientific laboratories and some of the products were in very dramatic points after Chernobyl accident. Children who had consumed milk from cows that had eate contaminated grass were particularly affected, and many of them went on to develop thyroid cancer. Some people, such as those living in Pripyat, very near the Chernobyl power plant, were given stable iodine tablets which substantially reduced the amount of radioactive iodine accumulated by their thyroid glands

The Great East Japan Earthquake with a magnitude of 9.0 took place at 2:46 PM on Friday, March 11, 2011. It did considerable damage in the entire region, and the large tsunami it created caused even more extensive damage. The earthquake was centered 130 km offshore from the city of Sendai in Miyagi prefecture on the eastern cost of Honshu Island (the main part of Japan). It was a rare and complex double quake with a duration of about 3 minutes. Japan moved a few meters east and the local coastline subsided half a meter. The tsunami inundated about 560 square km and resulted in a human death toll of over 19,000 and much damage to coastal ports and towns with over a million buildings destroyed or partly collapsed. Eleven reactors at four nuclear power plants in the region were operating at the time and all shut down automatically when the quake hit. Subsequent inspection showed no significant damage to any from the earthquake. The operating units which shut down were Tokyo Electric Power Company's (Tepco) Fukushima Daiichi 1, 2, 3,

and Fukushima Daini 1, 2, 3, 4, Tohoku's Onagawa 1, 2, 3, and Japco's Tokai, total 9377 MWe net. Fukushima Daiichi units 4, 5 & 6 were not operating at the time, but were affected. The main problem initially centered on Fukushima Daiichi units 1-3. Unit 4 became a problem on day five.

The reactors proved robust seismically, but vulnerable to the tsunami. Power, from grid or backup generators, was available to run the Residual Heat Removal (RHR) system cooling pumps at eight of the eleven units, and despite some problems they achieved 'cold shutdown' within about four days. The other three, at Fukushima Daiichi, lost power at 3:42 PM, almost an hour after the quake, when the entire site was flooded by the 15-meter tsunami. This disabled 12 of 13 back-up generators on site and also the heat exchangers for dumping reactor waste heat and decay heat to the sea. The three units lost the ability to maintain proper reactor cooling and water circulation functions. Electrical switchgear was also disabled. Thereafter, many weeks of focused work centered on restoring heat removal from the reactors and coping with overheated spent fuel ponds. This was undertaken by hundreds of Tepco employees as well as some contractors, supported by firefighting and military personnel. Some of the Tepco staff had lost homes, and even families, in the tsunami, and were initially living in temporary accommodation under great difficulties and privation, with some personal risk. A hardened emergency response center on site was unable to be used in grappling with the situation due to radioactive contamination. Three Tepco employees at the Daiichi and Daini plants were killed directly by the earthquake and tsunami, but there were no fatalities from the nuclear accident.

Japan also participated in the tender for the construction of a nuclear power plant in Sinop, Turkey, but Turkey excluded Japan’s bid due to the inferiority of the proposed project.

The Akkuyu nuclear power plant will be built on a Russian project which includes the construction of four power units with VVER-1200 reactors. The agreement on the construction of the station was signed in May 2010. The capacity of each unit will reach 1200 MW, while the total capacity is 4800 MW. It is assumed that the units will be commissioned in sequence at intervals of one year.

Turkey's reliance on imported natural gas for power generation has given rise to concerns over supply security and the country's growing current account deficit.

Support of domestic energy sources such as coal and renewables has gained a new urgency. More steps need to be taken to improve the investment environment for renewable energy in Turkey. Wind power boasts the second highest share of renewable energy production in Turkey, and its prospects look brighter each day. According to 2010 data from the Turkish power-generation corporation, electricity generated from renewable resources had a 19.7% share of total power, 18.5% hydroelectric energy, 0.8% wind power and 0.4% for other renewables, such as landfill gases, biogas, and biomass. By comparison, 48.6% of total energy was supplied by natural gas and 31.7% by petroleum and coal. Yet by the end of 2011, this breakdown had begun shifting in favor of renewable resources, with wind energy now amounting to 2% of total power generation in Turkey (4)

Turkey's ambitions aren't just limited to erecting wind farms on its soil, but also to eventually compete with China in the manufacture of wind turbines. To make up for its limited know-how, Turkey is more than willing to open up to the technologies of other countries. In order to promote the Turkish energy market, the sector organizes many trade fairs as well as regular networking events, all in the name of attracting foreign investment. With its advantageous geography, it seems Turkey will soon be strengthening its foothold in the energy sector.

Apart from the need to develop cost-effective energy supply strategies, the rapidly growing energy demand in Turkey results in the increasing importance of the control of air, soil and aquifer pollution. Turkey's request for admission into the European Community (EC) in 1987 makes it crucial to harmonize these present activities with their air pollution and water control strategies (6)

Meanwhile, before the nuclear power plants are constructed and operated in Turkey, the official Institutes and Government Administrations should do a number of scientific researches in terms of radiation and especially radionucleid (caesium-137) levels in marine environment (1). Additionally, national universities in Turkey may cooperate with the other highly trusted universities (especially, the USA, England, Russia, Belarus and Ukraine) more on living safe and healthy in Turkey and its neighbours.

Turkey is also focusing on environment and energy policies in its relations with its neighbors. Droughts, decreases in water resources, transit passage oil tankers through the Black Sea and the Turkish Straits and a decline in biodiversity force

Turkey to emphasize the access and use of environmentally friendly energy. However, economic and geopolitical concerns are also playing a crucial role in agreements with the energy producing countries. This paper demonstrates the dichotomy between energy and environment policies in the Black Sea region and Turkey, with references to international and regional needs.

2. MATERIAL AND METHODS

The following topics and issues are discussed in scientific areas:

- Introduction to World Energy Model (WEM)
- Input requirements: sources of energy and economic statistics; assumptions used
- Turkey's development: parameters, accuracy and sensitivity; business-as-usual vs. climate factors
- Country-wide energy demand modeling: by sector and fuel
- Power generation modeling: technologies and fuel mix needed to meet future demand
- Transport sector modeling: by mode of transport
- Oil, gas and coal production modeling
- Carbon dioxide (CO2) emissions modeling
- Nuclear energy, conservation technologies and strategies
- Education programs for energy, health and environment on every level

3. RESULTS AND DISCUSSION

Reducing poverty and achieving sustained development must be done in conjunction with a healthy planet. The Millennium Development Goals (MDGs) recognize that environmental sustainability is part of global economic and social well-being. Unfortunately, exploitation of natural resources such as forests, land, water, and fisheries - often by the powerful few - have caused alarming changes in our natural world in recent decades, often harming the most vulnerable people in the world who depend on natural resources for their livelihood.

Basically, the Baltic Sea, the Black Sea, the North Sea and Lake Zurich have been most affected in terms of sediment, seafood, and water. Radionucleid levels

(caesium-137) were determined two to three orders of magnitute higher than the pre-Chernobyl disaster's levels (2). On the other hand, radioactive contamination caused that the birds avoid testing in density radioactivity regions (8).

The exposure of the population in southern Belarus, northern Ukraine and the regions of Russia that border these two countries, to radioiodine in fallout from the Chernobyl accident in 1986, resulted in a definitely increase in those who were young children at the time of the accident [10).

As the normal frequency of thyroid cancer in children is so low, the sudden increase in thyroid cancer in the population exposed to fallout provided an opportunity to study not only the relationship between radiation exposure and the risk of thyroid cancer in the population using epidemiological methods, but also to correlate the molecular biology of thyroid cancer with exposure to radiation. The Chernobyl Tissue Bank (CTB) was established in 1998, 6 years after the first publications indicating that there was a sharp rise in childhood thyroid cancer [11,12]. The first international co-operation that seeks to establish a collection of biological samples from patients for whom the aetiology of their disease is known — exposure to radioiodine in childhood.

Among hundreds of aftershocks, an earthquake with a magnitude of 7.1, closer to Fukushima than the March 11th one, was experienced on April 7th, but without further damage to the plant. On April 11th there was a magnitude 7.1 earthquake and on April 12th a magnitude 6.3 earthquake, both with epicenters at Fukushima-Hamadori, and neither of which caused further problems.

The rockfish, caught at a port inside the devastated Fukushima Daiichi nuclear power plant last week by TEPCO, measured 240,000 Becquerel of cesium – 2540 times Japan's legal limit for seafood (9)

Turkey's vulnerable ecosystem has been placed under increasing stress by high population growth, rising incomes and energy consumption. In Turkey, as elsewhere in the world, environmental problems, such as water shortages, land degradation, and lack of clean and affordable energy resources severely hinder efforts to achieve sustainable development. In addition to these problems, climate change poses a threat to the achievement of the MDGs and related national poverty eradication and sustainable development objectives.

To help Turkey find solutions, UNDP works closely with a number of government agencies, municipalities, private sector partners and NGOs, to integrate environmental and sustainable development principles into national and regional development policies and plans. UNDP Turkey not only promotes mainstreaming environment, climate change and energy efficiency into sectorial policies, but also supports strengthening the institutional and policy capacities.

4. CONCLUSION

Despite of very hazardous results for health and environment nowadays, nuclear power plants are very effective in terms of energy production in the World. Distribution of the nuclear power plants in terms of amounts and capacity according to countries as below.

Table 1: Nuclear power plants world-wide, in operation and under construction(2)

country	in operation		under construction	
	number	net capacity MWe	number	net capacity MWe
Argentina	2	935	1	692
Armenia	1	375	-	-
Belgium	7	5,927	-	-
Brazil	2	1,884	1	1,245
Bulgaria	2	1,906	-	-
Canada	19	13,665	-	-
China				
Mainland	17	12,816	29	28,753
Taiwan	6	5,018	2	2,600
Czech Republic	6	3,766	-	-
Finland	4	2,736	1	1,600
France	58	63,130	1	1,600
Germany	9	12,068	-	-
Hungary	4	1,889	-	-
India	20	4,391	7	4,824
Iran	1	915	-	-
Japan	50	44,215	3	3,993
Korea, Republic	23	20,754	4	4,980
Mexico	2	1,300	-	-
The Netherlands	1	482	-	-
Pakistan	3	725	2	630
Romania	2	1,300	-	-
Russian Federation	33	23,643	11	9,927
Slovakian Republic	4	1,816	2	782
Slovenia	1	688	-	-
South Africa	2	1,830	-	-
Spain	8	7,560	-	-
Sweden	10	9,395	-	-
Switzerland	5	3,263	-	-
Ukraine	15	13,107	2	1,900
United Arab Emirates	-	-	1	1,345
United Kingdom	16	9,246	-	-
USA	104	101,465	1	1,165
Total	437	372,210	68	65,406

Turkey does have any nuclear power plants at present but the plant will be constructed araound Akkuyu in future. However, there are some risks at this level. First of all, the model which suggested by Russia, it has been never applied before…(5)

• Safety related risks,
• Production/operational risks,
• Commercial/financial risks,
• Strategic risks.

Another alternative that has been debated is nuclear energy. Increasing population, developing economies, and increasing energy needs push countries to find new, effective energy resources. Like other developing countries, Turkey has started to consider nuclear energy power plants again with an aim to save itself from dependency on energy producing countries. However, we have to establish effective technological safeguards against any potential nuclear disaster in Turkey.

Greater use of nuclear power is not inevitable. We should urge politicians to establish an international law to ensure that nuclear waste generated by a country is disposed of in that country. This would prevent expensive and dangerous waste being transported half way around the globe. Ships are vulnerable to piracy and terrorism. A collision, sinking, or running aground would be a major disaster.

We should also campaign for more government assistance to develop renewable energies that are greenhouse neutral and to expedite research into methods of producing clean-burning coal and the disposal of any carbon dioxide generated.

- Join local Direct Action groups promoting alternatives to nuclear energy.
- Invest in alternative technology companies.
- Buy alternative systems such as solar cells for home use.
- Encourage local councils and schools to purchase alternative energy technology.

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