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TURKEY'S NUCLEAR ENERGY POLICY: PERCEPTIONS, VALUES AND PUBLIC ACCEPTABILITY

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ABSTRACT

Turkey's nuclear energy policy goes back to the 1950s when the Turkish Atomic Agency was established in 1956. The country, however, has not, to date, constructed any nuclear power stations (NPP), but now plans to build three NPPs in the Akkuyu, Sinop and Igneada regions by 2030. As nuclear energy comes with both benefits and risks, Turkey's nuclear energy policy has divided the public into two, essentially opposing, groups: supporters and opponents. They both have strong and reasonable arguments, which makes nuclear energy a controversial topic. While supporters state that NPPs are cheap, environmentally friendly and reliable energy sources, opponents disagree and claim that NPPs are costly, eco-unfriendly and unsafe. This research aims to develop a broader perspective that explains how the public perceive the advantages and disadvantages of NPPs. It concludes that the acceptability of NPPs is a highly subjective judgement, which means the approach to NPPs depends mainly on the values that shape how people perceive their advantages and disadvantages.

Keywords: Nuclear Energy Policy Of Turkey, Nuclear Power Plants, Public Acceptability, Risk Perception, Values.

INTRODUCTION

Given its relatively recent development, the history of nuclear energy is not particularly extensive, with the first grid-connected nuclear power station being the Obninsk Nuclear Power Station in Russia, which was constructed between 1951 and 1954, and which produced approximately five megawatts of electrical power (Josephson. 2005). Nuclear power plants are, however, important sources of energy, and currently provide over 11% of the world's electricity. 30 countries are currently operating a total of 437 nuclear reactors for electricity generation, and there are 71 new nuclear plants currently under construction in 15 countries (Ozcan et al., 2016). However, there is a growing social and academic debate over the construction, deployment and use of nuclear fission reactors to generate electricity from nuclear fuel for civilian purposes.

It is commonly accepted that nuclear energy is one of the most controversial energy sources on the planet, because whilst it offers many advantages this is not without potentially serious risk to both the environment and to human health. Proponents of nuclear energy, such as the Environmentalists for Nuclear Energy and the Supporters of Nuclear Energy, argue that nuclear power is a cheaper, more environmentally friendly and a reliable energy source compared, in particular, with fossil fuels such as oil and coal. In contrast, opponents of nuclear energy, such as the Friends of the Earth and the Nuclear Information and Resource Service, contend that nuclear power is costly, eco-unfriendly and unsafe.

Although the risks and benefits of NPPs are both well-defined and well known publicly, the acceptability of NPPs significantly varies from person to person. This raises the question as to why people weigh the risks and benefits of NPPs in such a diverse manner. The main purpose of this paper is to discuss the acceptability of NPPs by investigating people's risk/benefit perception in order to better understand the public approach to NPPs by asking the following research questions: (1) what risks and benefits do NPPs pose to people and the environment? (2) how do individuals perceive these risks and benefits? and (3) how does risk and benefit perception affect the acceptability of NPPs?

This paper consists of two main sections. Firstly, the research will attempt to explain the fundamental risks and benefits that nuclear energy poses to both the environment and human health. Secondly, and more importantly, it attempts to argue how people weigh the advantages and disadvantages of NPPs when accepting or rejecting nuclear energy; and, what affects public perception of the pros and cons of nuclear power stations. It concludes that the acceptability of NPPs is a highly subjective judgement on the part of most individuals, which means the approach to NPPs mainly depends on the values that shape how people perceive its advantages and disadvantages. In light of related data, this paper gives some policy suggestions for a more sustainable and better nuclear energy policy which meets the demands, and acceptance, of the majority of individuals.

ACCEPTABILITY OF NUCLEAR ENERGY

Nuclear energy is one of the most controversial sources of power in the world. There has been increased public concern over the safety and environmental consequences of nuclear power plants (NPPs), and this is shared by many nuclear energy-providing countries. Recent nuclear accidents have made energy security the principal objective of nuclear energy policy in many nations. The Fukushima nuclear accident in 2011, in particular, reignited the international debate over the use of NPPs (Wittneben, 2012). Political debate on the potential for serious nuclear reactor accidents and operational safety of nuclear reactors has been brought to the forefront worldwide. Some months after the nuclear disaster in Fukushima, Germany immediately shut down several nuclear reactors. Similarly, Switzerland and Belgium initiated closure policies (Kunsch and Friesewinkel, 2014). The Fukushima accident brought about the reconsideration of decisions already made on established or planned NPPs. In other words, the public and political disccussion over the acceptability of NPPs increased at both the national and the international level post Fukushima.

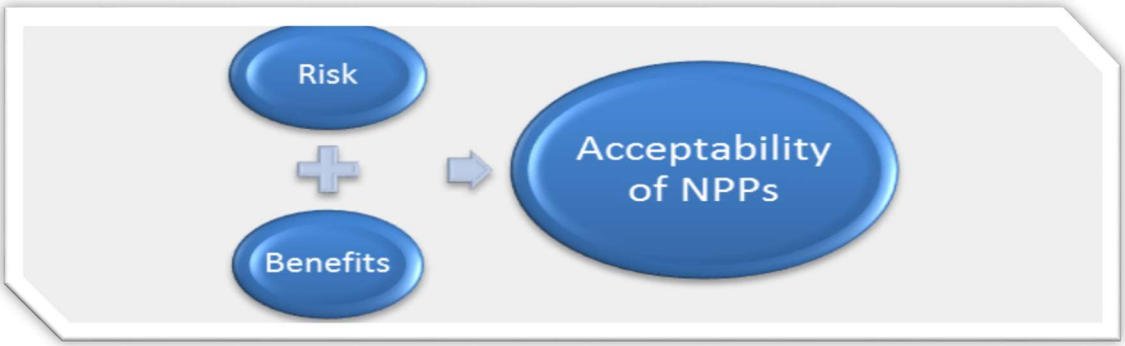
Figrue 1: Percent changes in positive opinion toward NPPs pre- andp ost- Fukushima

Countries		Pre-Fukushima	Post Fukushima
OECD Countries	U.S.	53	47
	Canada	51	43
	France	66	58
	Austria	13	9
	Italy	28	24
	Germany	34	26
	Switzerland	40	34
Non-OECD Countries	China	83	70
	Japan	62	39
	South Korea	65	64
	Russia	63	52
	India	58	59
Global Average		57	49

Reference: WIN-Gallup International

The acceptance on nuclear energy is determined by the interaction between policy makers and society. The decision to install a NPP is taken by political parties but public support is essential in order to successfully develop nuclear energy policy. Because low social acceptance of NPPs obstructs policy makers from using more nuclear energy (Jun et al., 2010). However, the problem is that recent empirical studies of public acceptability of NPPs show that there is no consensus on sociably acceptability of NPPs. Attitudes towards and trust in the regulation of nuclear power differs markedly from one country to another and from people to people in the same country (Hayashi and Hughes, 2013; Corner et al., 2012; He et al., 2013).

Figure 2: What Affects Acceptability of NPPs



There are two main ways of measuring the social acceptance of nuclear energy. They include the perception of the risks and the benefits. The answer to the question as to how acceptable NPPs are considered to be by society lies on how the public perceives the risks and benefits of nuclear energy. The risk and benefit perception of the public is directly associated with the values that shape people's understanding of nuclear energy. Before discussing the issue of how values shape people's perception, it first seems important to identify the risks and benefits of NPPs.

THE RISKS AND BENEFITS OF NUCLEAR ENERGY

Risks of Nuclear Power

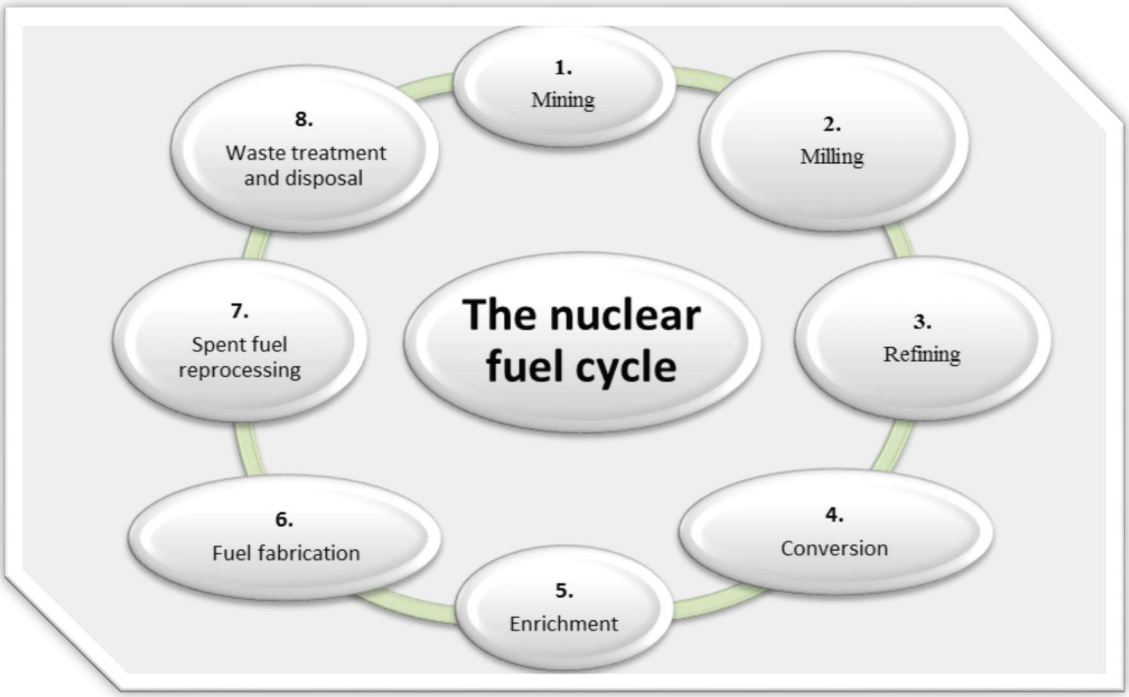
NPPs pose a number of risks to the environment and to public health. Undoubtly, there is no such thing as zero risk on earth. Thery can only be acceptable/tolerable risk or not acceptable/tolerable risk. There are many high level risky actions that we do regularly or often in our daily lives. Using planes, driving cars, smoking cigarettes and drinking alcohol are some of the actions which are much riskier than living close to a NPP. The world faces airplane and automobile crashes on a daily basis but nuclear power accidents happen rarely. Similarly, smoking is one of largest causes of preventable deaths in the world and has much riskier consequences when compared with NPPs but about 2 billion people worldwide smoke, even though they have the choice not to. Similarly, the environmental risks of using fossil fuels are much greater than the risks of NPPs. But we use all sorts of different types of fossil fuel energy sources in our daily life, such as petrol in our cars or coal in industry. Another example is certain types of food that people eat daily, which are known to lead to serious diseases such as cancer. This raises the following question: Why do people not accept the risks of NPPs even though NPPs are less risky than some of the activities they do daily?

Chauncey Starr (1969) developed an approach to answer this question. In a paper entitled Social Benefit versus Technological Risk published in 1969 Starr divided the risks into two categories: voluntary and involuntary. Voluntray risks are based on lifestyle choices or individual decisions. Smoking, bungee jumping and driving a motorbike are some examples of voluntary risks people often take. Indivudals are mostly, completely or partly aware of the risks or the potential consequences of these kinds of actions. The risks are generally controllable. People usually tend to accept much higher risks when voluntarily engaging in a risky pursuit. In contrast to voluntary risks, involuntary risks are risks over which people have no control or which they would not accept if known. These risks are external to people. Involuntary risks are not personally undertaken. They are mostly related to technology or natural disasters. Lightning, tsunamis and tornadoes or the risk from nearby chemical plant emissions are examples of unvoluntary risks. Starr claims that if individuals cannot prevent or reduce the risk, the risk is socially less acceptable. When people do not have a choice in the matter, they perceive the action as having more risk. When a risk seems involuntary they are not willing to accepts it.

Similarly, Sunstein (1997) stresses that lay people generally care a great deal whether a risk is undertaken voluntarily. The public generally seems to perceive voluntarily incurred risks as less troublesome than involuntarily incurred risks. If people are exposed to involuntary risk (such as carcinogens formed in drinking water because of chlorination), they generally make risk aversion their first goal. For example, every year 5 million people die because of air pollution but people continue to breathe air because people have no choice or control over this action. It happens without their consent. They are activities that they do not elect to undertake. From this discussion it seems reasonable to say that the acceptability of risks of NPPs is a problematic situtation because risks assocaiated with NPPs are taken involuntarily and society has no control over them. From this perpective, it can be concluded that people tend to think that NPPs carry greater risks than smoking, although smoking is much risker than living close to a NPP because of its involuntary risk factor.

The risk of NPPs generally derives from the nuclear fuel cycle and potential for catastrophic accidents. The nuclear fuel cycle is a series of stages which starts with the mining of uranium and ends with the disposal of nuclear waste. The whole fuel cycle, from mineral extraction to waste management, poses risks to people and the environment. The nuclear fuel cycle produces energy from raw materials using natural resources (including water and land) and reagents, generating solid waste and releasing effluent into the air, water, and soil. These radiological and nonradiological releases may have serious effects on the physical environment including changes in water/groundwater quality, the quality of the soil, air quality and sediment (Sun et al., 2011; Tananaev and Myasoedov, 2011).

Figure 3: The Main Activities in the Nuclear Fuel Cycle



The past 50 years of production of NPPs have left the world with extremely harmful radioactive waste (used uranium), for which there is no safe method of disposal (Ewing, 2008: p. 338). As nuclear waste contains dangerously radioactive material it is hazardous to human health and the environment. There are three categorisations of radioactive waste: low-level waste (such as wiping rags, reactor water treatment residues, protective shoe covers and clothing, mops, filters; intermediate-level waste (such as fuel debris and various sludges) and high-level waste (used reactor fuel). High-level waste is the most radioactive and can remain highly radioactive for tens of thousands to a million years (Lawless, 2014).

Figure 4: Types of Radioactive Waste

	Volume	**Radioactive content**
High-level waste	3%	95%
Intermediate-level waste	7%	4%
Low-level waste	90%	1%

Reference: World Nuclear Assocation

Radioactive waste from NPPs needs to be stored and finally disposed of in a secure way that provides sufficient protection for people and the environment for hundreds of thousands of years. This is worrisome for three reasons: first, the costs of waste management is very high (Segelod, 2006); second, there is a huge risk that the emerges and threatens future generations (Riddel and Shaw, 2013); and, third, the fear that radioactive waste can leak or be dispersed as a result of accidents or terrorist action (Carbol, 2012). If anything were to happen to the waste cylinders in which nuclear waste is stored or if the nuclear waste is improperly disposed there can be extremely dangerous consequences for the environment and humans. For one thing, drinking water can become contaminated by leaking waste. There are a number of examples of these sorts of accidents happening all over the world including the Lake Karachay incident in Russia; the Ajka Alumina plant accident in Hungary and the Valley of the Drums event in the United States (Keyne and Harris). Therefore, waste from the nuclear fuel cycle poses potential risks to the environment and people.

Secondly, even though nuclear power plants now have highly sophisticated safety systems and that many modern technologies have been put in place to ensure that disasters such as Chernobyl or, more recently Fukushima, will never happen again, the risks associated with them remain relatively high. Unquestionably, nuclear power plants are very complex systems operated by people who can, and do, make mistakes. Undeniably, they are vulnerable to potential accidents and failures due to natural disasters such as tsunamis, earthquakes, extreme weather, fires, improper maintenance, equipment failure and human error (Holt, 2009; Lipscy et al., 2016). The fact that there have been 33 serious incidents and accidents at nuclear power stations since the first recorded incident, which was in 1952 at Chalk River in Ontario, Canada, clearly shows that security risk associated with NPPs is relatively high (Raju, 2016; Hodges and Sanders, 2014).

A nuclear accident may led to significant consequences to both the environment and human beings. With the exception of damage caused by fires and explosions, accidents that cause severe damage to nuclear power plants may result in the releasing of radioactive materials, which can cause radiation sickness. Depending on the dose of radiation received, this ranges from skin rashes to leukaemia, solid cancers, thyroid cancer, breast cancer, birth defects and death, which are only some of the potential effects of a nuclear accident on human beings. Therefore, it seems reasonable to say that millions of people who live near nuclear power plants are at risk (Akyuz, 2015).

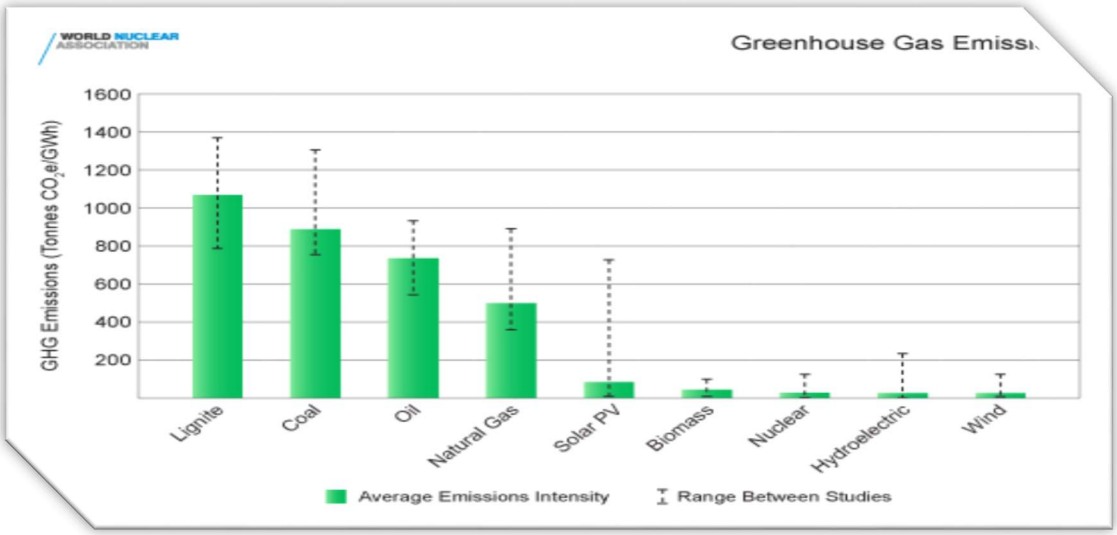
On the other hand, it can be argued that NPPs are vulneable to deliberate attackts, in particular to terrorist acitons. Until now, the world has never witnessed a terrorist attack on NPPs, but there is no guarantee that there will never be one. There is no doubt that the 21st century has been dominated by terror and terrorists, such as the Islamic State of Iraq and the Levant (formerly al-Qa'ida in Iraq) militants, al-Qa'ida (AQ), Hizballah and the Kurdistan Workers Party (PKK) (Kongra-Gel). Some terrorist actions have taken place in countries with NPPs. The September 11 attacks on the Twin Towers and the Pentagon in the United States and the November 2015 Paris attacks in France are examples of how terrorists can threaten countries with NPPs (Combs, 2015; Martin, 2015). The fact that these kind of terrorist actions can target NPPs has increased concern about the security risk of nuclear powers all over the world. From this viewpoint, NPPs can be regarded as a bomb ready to be exploded by terrorists, so to speak.

Benefits of Nuclear Power

Thre is no doubt that risk perception is an enormously significant criterion for the acceptability of NPPs, but it is not the only one. It should be clear that the social acceptance of NPPs is directly influenced by both risk perception and public awareness of the benefits. The public judges the acceptability of NPPs by weighing its risks and benefits.

Nuclear energy offers some important advantages. Firstly, one of the most important environmental issues that the world faces is greenhouse gases in the atmosphere which make the planet warmer. The main cause of increasing greenhouse gas emissions is fossil fuel use. The world is heavily reliant on fossil fuels, e.g. coal, oil and natural gas. Fossil fuels accounted for 87 percent of global primary energy consumption in 2012 (Pint, 2013; Zecca and Chiari, 2010). As can be seen from the chart below (Figure 5), unlike fossil fuel resources, NPPs do not emit greenhouse gases when they generate electricity. Increased use of NPPs may play an important role in the reduction of greenhouse gas emissions in the electric power sector as they provide an alternative to fossil fuels that pollute the environment. Nuclear power provides approximately 15% of the world's electricity, which means that NPPs are currently saving the earth from 600 million tonnes of carbon emissions per year (Paine, 2009). Therefore, decarbonisation of the global energy system can be pursued swiftly and efficiently through increased use of NPPs. If NPPs were built as an alternative to the use of fossil fuels they could be percieved as an environmentally energy source.

Figure 5: Comparison of Emissions from Different Energy Sources



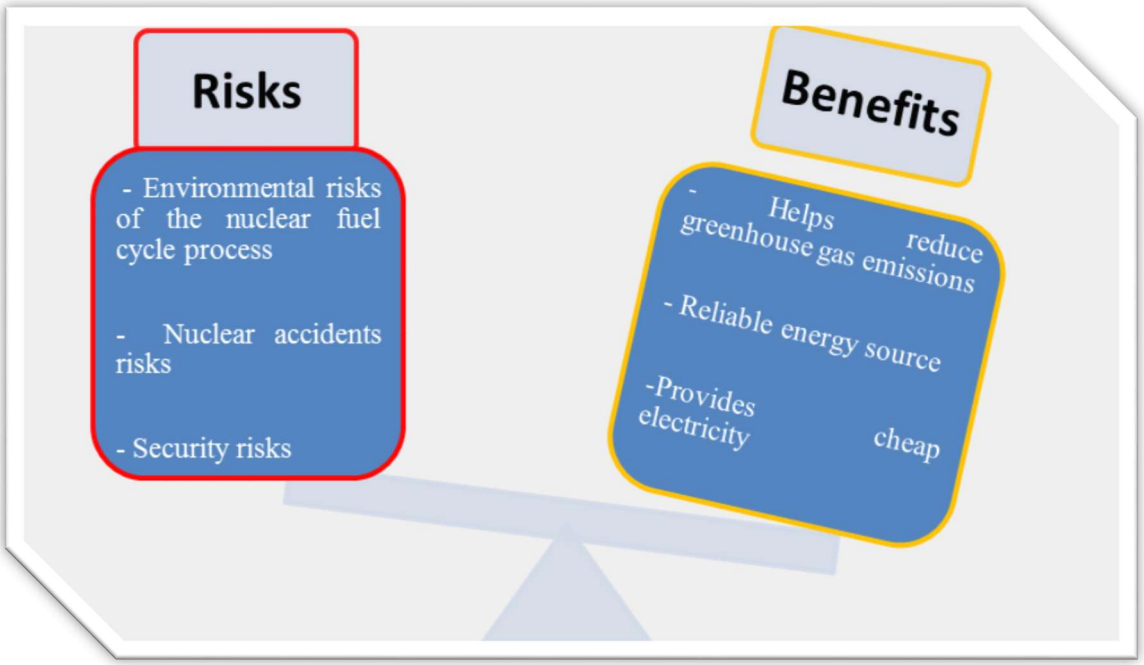
Reference: World Nuclear Assocation

Another significant benefit of NPPs is that they are a more reliable energy source than renewable energy such as solar or wind power. Where solar and wind require sun or wind to produce electricity, nuclear energy does not depend on weather conditions. Electricity can be produced from NPPs even in rough weather conditions. In addition, unlike solar or wind power, nuclear power plants do not require a great deal of space. A further significant advantage is that nuclear energy plays a major role in the creation of jobs and economic growth, providing both short and long-term employment and economic benefits.

HOW DO PEOPLE PERCEIEVE RISKS/BENEFITS OF NPPS?

NPPs pose seirous risks to the environment and humans but they also have important social and environmental benefits. The ratio of the perceived risk of NPPs to their potential benefits or the ratio of perceived benefits of NPPs to their potential risks determine to what extent NPPs are socially acceptable. Whether or not NPPs are accepted is a consequence of the evaluation of their risks and benefits. How does the public evaluate the risks/benefits of NPPs? People behave rationally when weighing the perceived risks and benefits of NPPs. However, risk and benefit perception varies significantly among people because risk/benefit perception is a subjective assessment of the probability of a specific type of accident, mainly because the risk and benefit perception of individuals is shaped by their different subjective values. In other words, NPPs are substantially a value judgement rather than a quantitative, scientific notion.

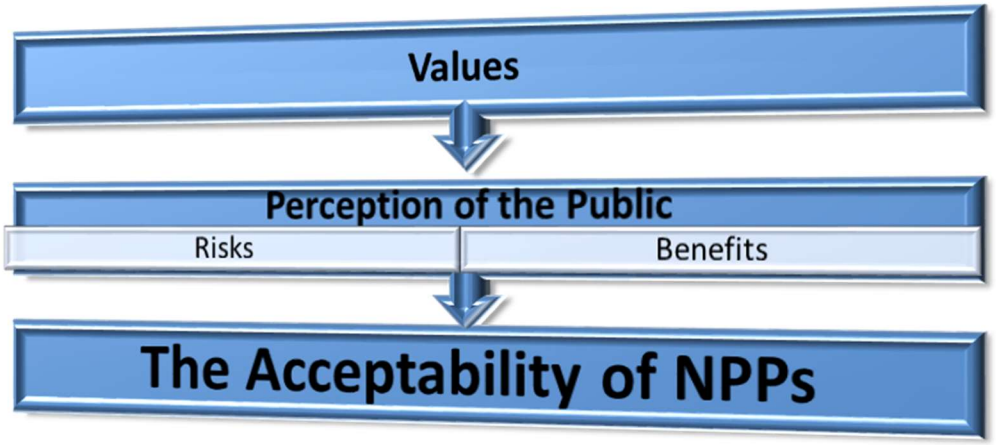
Figure 6: Weighing the Risks and Benefits of Nuclear Power



The acceptability of NPPs is a moral judgement reflecting values, beliefs and the worldviews of members of the public (Sjöberg et. al, 2004). How people perceive, tolerate and accept the risks and benefits of NPPs or how they judge environmental matters is directly associated with their individual values. Values can be described as a belief upon which one acts by preference. Values serve as a guiding principle for evaluating events. Values also may be described as a subjective assumption of what is righter and more important. An environmental matter can have many consequences but which one is deemed to be more important depends on the values that people have. For example, air pollution can be dealt with in many ways. While individuals who are keen on environmental matters may be concerned about the damage of air pollution to the natural environment such as trees, crops, other plants and lakes, those who are more interested in architecture may be more concerned about its negative impact on historical buildings, monuments and statues. How much we value something is the key to weighing risks and benefits (Van der Pligt et al., 1982; Whitfield et al., 2009; De Groot et al., 2013; Otway and Von Winterfeldt, 1982).

Not just social values but also religious values can play an important role in the judgement of environmental risks of NPPs because religion assigns a positive duty to individuals to protect the environment, as believers see nature as being God's creation. The religious approach to the environment is as old as the religions themselves but academic discussions on the topic emerged in the 1960s. *The Historical Roots of our Ecological Crisis*, written by Lynn White Jr in 1967, is an important publication publicising the theme of religious attitudes towards the environment. Lynn White Jr makes a connection between Christianity and nature. He criticises the religion and claims that it is based on an anthropocentric viewpoint which aims to dominate and exploit nature. Similarly, Islamic environmental ethics underlines that the Qur'an stresses the duty of the individual Muslim to care for the natural environment that is created by God. This duty is closely connected to the belief that one of the main responsibilities of Muslims is to respect and protect the creation of God (Rizk, 2014; Deen, 2007). However, like Christinaity, Islam's approach to nature can be critisied because of the fact that it is based on the idea that all things were made for humanity's benefit and rule.

Figure 7: Role of Values on NPPs



Values play a key role in influencing the risk and benefit perception of the public when justifying the environmental impact of NPPs and legitimising a nuclear energy policy. De Groot et al. (2013) claim that people's individual beliefs and values are the most important factor shaping the risk/benefit perception of NPPs. He states that, while biospheric values are positively related to the perceived risks of NPPs, egoistic values are positively related to the perceived benefits and acceptability of NPPs. From this percpective, it can be said that societies which have more dominant egoistic values may be more willing to accept the use of NPPs. Similarly, Liobikien and Juknys (2016) identify two different values which shape people's perception of the environmental matters: the first are the self-transcendent values that stress the interests of others, and the second are the self-enhancement values that emphasise self-interest. Individuals with a stronger self-transcendence value orientation are more perceptive of environmental problems.

Similarly, Callicott (1984) categorises values into two sets of values which bring about different environmentally responsible behaviours, practical implications and policies. The first set is the anthropocentric set of values that centre on the right thing to do for human well-being and regard all other things, including other forms of life, as instrumentally valuable things that serve humans. The second set is the non-anthropocentric set of values that recognise the values that are inherent in nature independently of human needs or desires. People who have strong non-anthropocentric values perceive the risk of NPPs as being greater than those who have anthropocentric values. This is because, while individuals with anthropocentric values judge risks of NPPs to public health highly, people with non-anthropocentric values are more concerned about the risks of NPPs to animals and plants as well as human health.

To sum up, people have different values, which in turn affects individuals' perceptions of the risks and benefits of NPPs. Perception, which is shaped by values, automatically influences how people weigh the advantages and disadvantages of NPPs in a way that results in acceptance, or rejection, of NPPs.

CONCLUCION AND POLICY SUGGESTIONS

This research has presented an analysis that aimed to explain the effects of the public's perception of the advantages and disadvantages of NPPs through critical analysis of the related literature. The risks and benefits of nuclear energy are clear and certain. What it is not clear, however, is that why lay people, scholars and politicians weigh the pros and cons of NPPs in such diverse ways. The analysis has reached two main conclusions, which include: (1) values shape public perceptions of NPPs; (2) the acceptability of NPPs depends on how people perceive their pros and cons, which are themselves shaped by different values.

The analysis shows that there is no one universal or scientific view on the social acceptability of NPPs, as this is a subjective judgement depending on how individuals perceive the risks and benefits as shaped by their values. The most rational nuclear energy policy seems the one that reflects the concerns and priorities of citizens. This can be achieved in only one way, by allowing lay people to participate in any decision-making

process regarding NPPs as the acceptability of this form of energy varies significantly from person to person. If any associated decisions are taken with due regards to public participation then the most agreed-upon decision can be taken that reflects the result of how citizens weigh the risks and benefits of NPPs. if citizens became active participants in the decision-making process, the decision that ultimately emerges will be more democratic and more effective.

On the other hand, public participation in decision-making is recognised by international, European and domestic law as a fundamental environmental human right. For example, the Aarhus Convention on Access to Information, Public Participation in Decision-making and Access to Justice in Environmental Matters is a vital document which establishes a number of rights available to the public with regards to public participation in decision-making processes about environmental matters. The Aarhus Convention empowers individuals with the right to easy access to information, effective participation in decision-making in environmental matters, and recourse to justice if human rights are violated. Similarly, Principle 10 of the Rio Declaration, as signed by 170 countries, states that: "Environmental issues are best handled with participation of all concerned citizens, at the relevant level. This principle shows that public participation in the decision-making processes on environmental matters is the democratic right of citizens recognised by 170 countries."

For all these reasons, Turkey's nuclear energy policy should, therefore, establish a mechanism that allows citizens to participate in the associated decision-making process. This would seem the only way to learn of the public's decision/judgement or risk/benefit perception associated with NPPs, and establish the latter's level of acceptability.

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REFERENCES

Akyuz, E. (2015). How Do Environmental Issues Threaten Basic Human Rights? The Case of the Chernobyl Nuclear Disaster in Ukraine. Uşak Üniversitesi Sosyal Bilimler Dergisi, 2015(22).

Callicott, J. Baird (1984). Non-Anthropocentric Value Theory and Environmental Ethics. American Philosophical Quarterly, 21 (4), pp. 299-309.

Carbol, P., Serrano-Purroy, D., Gonzalez-Robles, E., Hrnecek, E., Quinto, F., Soucek, P., ... & Glatz, J. P. (2012). The Nuclear Fuel Cycle Back-End after Fukushima. Procedia Chemistry, 7, 202-208.

Combs, C. C. (2015). Terrorism in the twenty-first century. Routledge.

Corner, A., Venables, D., Spence, A., Poortinga, W., Demski, C., & Pidgeon, N. (2011). Nuclear power, climate change and energy security: exploring British public attitudes. Energy Policy, 39(9), 4823-4833.

De Groot, J. I., Steg, L., & Poortinga, W. (2013). Values, perceived risks and benefits, and acceptability of nuclear energy. *Risk Analysis*, *33*(2), 307-317.

Deen, M. Y. I. (2007). Islamic environmental ethics, law, and society. *This Sacred Earth: Religion, Nature, Environment*, 158-67.

Ewing, R. C. (2008). Nuclear fuel cycle: environmental impact. Mrs Bulletin, 33(04), 338-340.

Hayashi, M., & Hughes, L. (2013). The Fukushima nuclear accident and its effect on global energy security. Energy policy, 59, 102-111.

He, G., Mol, A. P., Zhang, L., & Lu, Y. (2014). Nuclear power in China after Fukushima: understanding public knowledge, attitudes, and trust. Journal of Risk Research, 17(4), 435-451.

Hodges, Matthew S. and Sanders, Charlotta E. (2014). " Nuclear criticality accident safety, near misses and classification.". Progress in Nuclear Energy. Vol. 76, p. 88-99.

Holt, M. (2009). Nuclear power plant security and vulnerabilities. DIANE Publishing.

Josephson, P. R. (2005). Red atom: Russia's nuclear power program from Stalin to today. University of Pittsburgh Pre.

Jun, E., Kim, W. J., Jeong, Y. H., & Chang, S. H. (2010). Measuring the social value of nuclear energy using contingent valuation methodology. Energy Policy, 38(3), 1470-1476.

Kunsch, P. L., & Friesewinkel, J. (2014). Nuclear energy policy in Belgium after Fukushima. Energy policy, 66, 462-474.

Kyne, D., & Harris, J. T. (2015). A Longitudinal Study of Human Exposure to Potential Nuclear Power Plant Risk. International Journal of Disaster Risk Science, 6(4), 399-414.

Lawless, W. F., Akiyoshi, M., Angjellari-Dajci, F., & Whitton, J. (2014). Public consent for the geologic disposal of highly radioactive wastes and spent nuclear fuel. International Journal of Environmental Studies, 71(1), 41-62.

Liobikienė, G., & Juknys, R. (2016). The role of values, environmental risk perception, awareness of consequences, and willingness to assume responsibility for environmentally-friendly behaviour: the Lithuanian case. Journal of Cleaner Production, 112, 3413-3422.

Lipscy, P. Y., Kushida, K. E., & Incerti, T. (2013). The Fukushima disaster and Japan's nuclear plant vulnerability in comparative perspective. Environmental science & technology, 47(12), 6082-6088.

Martin, G. (2015). Understanding terrorism: Challenges, perspectives, and issues. Sage Publications.

Otway, H. J., & Von Winterfeldt, D. (1982). Beyond acceptable risk: On the social acceptability of technologies. *Policy sciences*, *14*(3), 247-256.

Ozcan, M., Yildirim, M., & Ozturk, S. (2016). Generation expansion planning scenarios to reduce natural gas dependency of Turkey. Energy Exploration & Exploitation, 34(2), 244-261.

Paine, C. E. (2009). Nuclear Fuel Cycle, Global Security, and Climate Change: Weighing the Costs and Benefits of Nuclear Power Expansion, The. U. Rich. L. Rev., 44, 1047.

Pint, B. (2013). High-Temperature Corrosion in Fossil Fuel Power Generation: Present and Future. JOM: The Journal of The Minerals, Metals & Materials Society (TMS). Vol. 65 Issue 8, p. 1024-1032.

R. Rizk, R. (2014). Islamic environmental ethics. *Journal of Islamic Accounting and Business Research*, *5*(2), 194-204.

Raju, S. (2016). Estimating the Frequency of Nuclear Accidents. Science & Global Security, 24(1), 37-62.

Riddel, Mary and Shaw, W. Douglass (2003). Option Wealth and Bequest Values: The Value of Protecting Future Generations from the Health Risks of Nuclear Waste Storage. Land Economics, 79 (4), pp. 537 - 548.

Segelod, Esbjörn (2006). The cost of the Swedish nuclear waste programProgress in Nuclear Energy, 48 (4), pp. 314–324.

Sjöberg, L., Moen, B. E., & Rundmo, T. (2004). Explaining risk perception. An evaluation of the psychometric paradigm in risk perception research. Rotunde publikasjoner Rotunde, 1.

Starr, C. (1969). Social Benefit versus Technological Risk. American Association for the Advancement of Science, 165 (3899), p. 1232 – 1238.

Sun, X., Luo, H., & Dai, S. (2011). Ionic liquids-based extraction: a promising strategy for the advanced nuclear fuel cycle. Chemical reviews, 112(4), 2100-2128.

Sunstein, C. R. (1997). Note on Voluntary Versus Involuntary Risks, A. Duke Envtl. L. & Pol'y F., 8, 173.

Tananaev, I G and Myasoedov, B F (2011). Problems of the nuclear fuel cycle. Russian Journal of General Chemistry, 81 (9), p.1925 – 1927.

Van der Pligt, J., Van der Linden, J., & Ester, P. (1982). Attitudes to nuclear energy: Beliefs, values and false consensus. *Journal of Environmental Psychology*, *2*(3), 221-231.

White, L. (1967). The historical roots of our ecologic crisis. *Readings in biology and man*.

Whitfield, S. C., Rosa, E. A., Dan, A., & Dietz, T. (2009). The future of nuclear power: Value orientations and risk perception. *Risk Analysis*, *29*(3), 425-437.

WIN-Gallup International. Impact of Japan Earthquake on views about nuclear energy. Available at WIN-Gallup International Website: /http://www.nrc.co.jp/report/pdf/110420_2.pdfS. (Accessed 05.09.2017).

Wittneben, B. B. (2012). The impact of the Fukushima nuclear accident on European energy policy. Environmental Science & Policy, 15(1), 1-3.

World Nuclear Assocation. Avaliable at: http://www.world-nuclear.org/nuclear-basics/what-are-nuclear-wastes.aspx (01.03.2016)

Zecca, Antonio and Chiari, Luca (2010). "Fossil-fuel constraints on global warming". Energy Policy. Vol. 38 Issue 1, p. 1-3.