Analysis of Energy Consumption Policy Criteria based on Ethical Notions in the Developing Countries

Ali Asghar Pourezzat, Ali Asghar Sadabadi, Mohammad Koohi Khor, Narges Salehi, Shahrabi, Alireza Aslani, and Mohammad Mahdi Zolfagharzadeh

ABSTRACT

Energy plays an important role in the development of societies. Policy makers enact policies intended to increase the security of energy supply and consumption. However, in most cases the ethical issues of the policies are not considered during the process of policy making and their implementations. This article is one of the first which considers the energy policies and their ethical notions in developing countries. The focus is to determine and prioritize energy consumption policy criteria in order to achieve intergenerational justice in the selected case study, Iran. The interesting results show that the sustainability relative values gained the most priority among the other criteria. Indeed, despite different policy encouragement packages for other energy sources, renewable energy is the best alternative from ethical notions.

Key words: Energy policy making, Intergenerational justice, Sustainability

INTRODUCTION

Today one of the major factors of development concerns the energy sector. When considering future generations, moral issues are often neglected. Policy makers have an economic perspective regarding the

energy sector.

Iran is facing large challenges in the area of energy policy. The increase in energy usage in Iran is distinctly out of proportion with the development of economic productivity. In the past fifteen years, Iran's energy policy has focused on satisfying the growing demand for energy by using oil and by expanding natural gas production (Massarrat, 2004, 233). As a strategic policy, Iran tries to use all kinds of accessible primary energy resources including natural gas, coal, nuclear, hydro, solar, wind and geothermal energies (Manzoor, 2004, 1). Iran is rich in fossil resources (Massarrat, 2004, 234) and has progressed in nuclear energy. The country is potentially strong in renewable energy, such as solar and wind energy.

Thinking about public policy development requires an understanding of its framework. It is essential to improve environmental, ethical and social basis, and then assess various policy alternatives for congruency with public interests. Policy making for the future of the energy sector faces many challenges including reductions of fossil fuels, events in the nuclear power plants like the Fukushima, and finding capital for investment in the renewable energy. Social issues might include considering the impacts on future generations regarding energy. This paper responds to the question: In Iran, how is the energy consumption policy in accordance with ethical considerations and intergenerational justice? This study's criteria are retrieved from the book; "Climate Justice: Ethics, Energy and Public Policy" by James B. Martin-Schramm (2010), a professor of Luther college, and "An energy policy for new Brunswick" (2011). The obtained conceptual model is illustrated in Figure 1.

Sustainability—long-term supply of resources and conservation of intact natural resources—is one of the ethical notions considered when assessing energy policies. Sustainability considers assessing:

- Risk—measures must include the least vulnerability to human health and environmental systems.
- Renewability—showing energy option's capacity to restore its resources.
- Peace—energy policies must prevent resources dependency, which increases the potential armed clashes.
- Flexibility—it is implied policies potential and options for alternation and reverse. It is notable that high flexibility is preferable and systems should avoid sudden disruption.

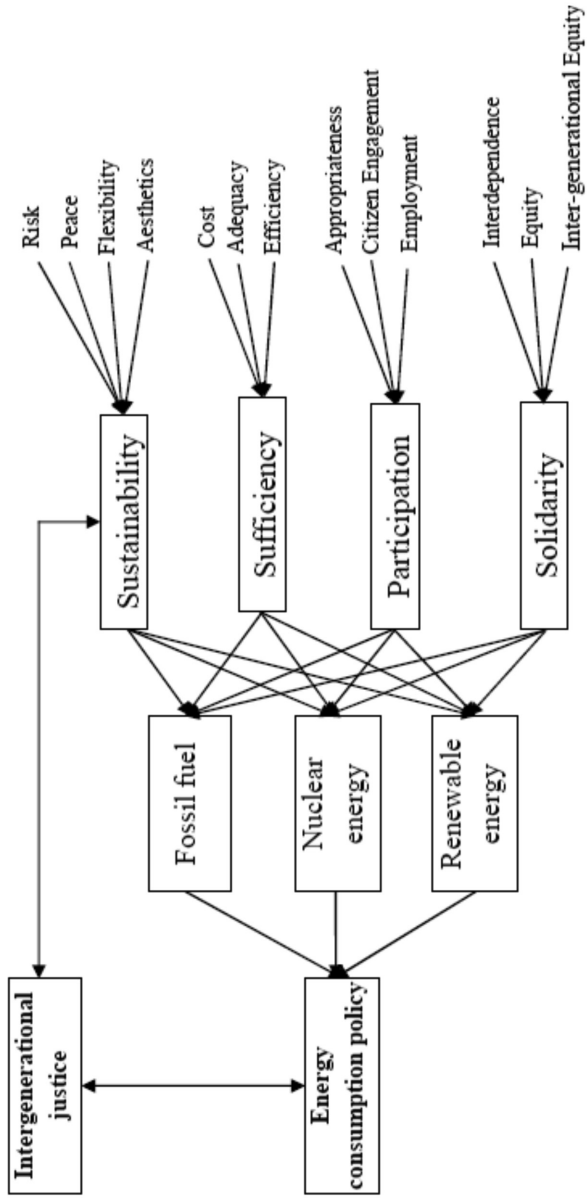

Figure 1. Research Framework

- Aesthetics, one of the major aspects of quality of life, and policies which cause gaps in vision should be avoided.

Sufficiency—policies and replaced energies should be adequate to meet the needs—is the second ethical principle which comprises:

- Cost—all of the financial, social and environmental externalities should be included in energy prices for industry and consumers, instead of imposing these burdens on people's health, quality of life and environment.
- Adequacy—policies should guarantee providing for everyone's needs.
- Efficiency—energy policies should bring power along with lower resource us, pollution and waste with improved consumption patterns.

Participation of all who are able to express their opinion on decisions is the third base which contains:

- Appropriateness—energy systems should be in accordance with contentment of basic needs, human potentials, final usages, local demand and employment levels.
- Citizen Engagement—rely on citizen's needs and engage them in developing policies.
- Employment—policies impact recruitment, skills and jobs in demand. It could be cited that systems and policies should stimulate new jobs and skills.

Solidarity—nondiscrimination, considering other species and ecosystems, paying attention to the nature of social life versus individual and not sacrificing weak creatures—is the final principle that consists of:

- Equity—the policy impact on various social parts is accompanied by special concern for poor and vulnerable classes. Interests and the burden of responsibilities should be distributed and assessed in a way that none of the pertinent groups gain disproportionate profit or loss.
- Intergenerational Equity—Do today's energy policies assure us that we are preventing the transfer to future generations of negative externalities associated with environmental impacts?
- Interdependence—Have energy policies recognized our interdependency and nature?

Energy policies are a means (often governmental) of institutionalizing decisions about issues such as production, distributions and energy consumption. Energy policies are characterized by laws, rules, international commitment, investment drivers, instructions for energy preservation, tax and other public policy techniques (An Energy Policy for New Brunswick, 2011, 1).

Environmental ethics is a sub-discipline of philosophy that deals with the ethical problems surrounding environmental protection. It aims to provide ethical justification and moral motivation for the cause of global environmental protection (Yang, 2006, 23).

The list of research efforts similar to our study are demonstrated in Table 1.

Research Methods

This study is applied-descriptive research based on a practical survey. To determine energy criteria's morality, an analytical hierarchy process has been used. Multi indexes decision making methods are developed to evaluate the indexes and to choose premier alternatives, which the Entropy method, LINMAP method, weighted least squares method and Analytical Hierarchy Process (AHP) provide examples.

The study's statistical society are all the expertise and specialists in energy policy making and planning who are involved in Iran's Power Ministry, the International Energy Studies Institute and Sharif University. In respect to the none probable targeted sampling method, thirty (30) people were considered in the sample. When there are limitations on the number of qualified people or requirements in the field of study, this method is applied (Mirzaee, 2009, 180). To deploy this method for data analyzing, initially all pairwise comparisons incompatibility rates for each responder are controlled, then after ensuring an acceptable incompatibility rate (less than 0.1), by utilizing Expert Choice software*, respondents' opinions were compounded and the paired group comparison matrix released. Due to high incompatibility rate (more than 0.1), portions of the questionnaire were omitted, and 24 were used in the statistical analysis.

Analytical hierarchy process is a multi-criteria decision-making approach which can be used to solve complex decision problems. This methodology examines complex problems based on their interactions,

*There are various supportive software for Analytical Hierarchy Process (AHP) which Expert Choice is the most popular one produced by Dr. Saati and his colleague. This software is a multi-criteria decision support based on AHP method.

Table 1. Conducted Research of Energy Policies and Intergenerational Justice

Results	Researcher(s)	No.
- Confine the proposition of fossil fuel - Providing energies compatible with environment	Massarrat (2004)	1
- Morally desirable options should follow future generation's interests - Reduction of fossil fuels reliance of countries	Taebi (2010)	2
- Concern for environmental ethics - The need for environmental justice among the present generation (especially to eliminate absolute poverty) - The need to care for future generations - The need to live harmoniously with nature	Yang (2006)	3
- The effect of present decisions on future generations	Schwarze (2003)	4
- End of nonrenewable energy resources - Decrease of countries reliance on fossil fuel - Consider later generation's interests in choosing a desirable option - Focus on nuclear energy, choose a segmentation method and return to the best desirable alternative	Taebi (2010)	5
- Abundant supply of petroleum in Iran and its environmental harms - Iran's low tendency to discourage the pursuit of alternative renewable energy sources - Lack of definite knowledge and rules in the field of renewable energy and requiring modification in private sectors	Atabi (2004)	6
- Excessive consumption of fossil fuel and environmental risks - Peaceful use of nuclear technology	Dabiri et al. (2009)	7
- Considering the importance of nuclear waste - Concern about later generations - Protect various resources for future - Fair distribution of environmental risks and responsibilities within generations - Offering suitable replacement for nonrenewable resources	Johnson (2002)	8
- Appropriate consumption of nonrenewable resources over time - Specifying cycle values of nuclear energy	Taebi & Kadak (2011)	9
- In regards to the criteria, solar energy is the best choice - Petroleum, neutral gas and nuclear energy are the last resort - Renewability, cost and availability of energy	Zahedi & Karimi (2008)	10
- Emphasis on enhancement of the proportion of renewable energy	Rahimi & Eshghi (2008)	11
- Choosing controlling criteria like interests, opportunities, costs and risks - Biomass as the best alternative for energy - Petroleum, neutral gas and nuclear energy are the last resort	Ulutas (2005)	12
- Utilizing nuclear energy as future energy resource in Sweden - Using cost- effective energies	Viklund (2002)	13

and converts them to a plain form to be solved. AHP consists of these major steps:

- Modeling—in this step decision, problem and goal are arranged in a hierarchy of pertinent elements of decision.
- Preferred judgment—Pair wise comparison of each option is implemented in terms of each criterion. This comparison is also done about decision criteria.
- Calculation of relative weight—the importance and weight of elements of decision are computed relative to each other by means of numerical calculation.
- Combination of relative weights—this step is performed to rank the options for decision making, so for each option, criteria weight matrix should be multiplied in criteria's weight vector.
- The Judgment's compatibility are examined. If the relative compatibility is less than 0.1, it is acceptable (Mehregan, 2004, 165).

Discussion

The energy sector is one of the most vital and effective sectors for economic and social development of each country. Therefore, appropriate planning and policy making is essential and requires a systematic approach to various relations of the energy sector with other sectors (e.g., social, environment and economic). It is noteworthy that future generations will have energy requirements, and it is the present generation's duty to illustrate its commitment to them by means of precise planning and policy.

Sustainability, sufficiency, participation and solidarity are our criteria in this study. Each has its own sub-criteria which are noted in Figure 1. In respect to data that were obtained from the experts' response, the criteria's relative value and sub-criteria are drawn and demonstrated in Table 2.

According to Table 2, the priority of each criterion is as follows: sustainability with 0.488 obtained the most value, and then sufficiency comes by 0.240, participation by 0.139 and solidarity by 0.132. We believe that in addition to energy consumption policy and implementation of intergenerational justice, sustainability is the most vital criterion in ethics which requires policy makers' future attention. Close relevancy between sustainability and intergenerational justice is due to opting it

Table 2. Research's Relative Values of Criteria and Sub-criteria

Relative value of main criteria	Sub- criteria		criteria
0.488	0.515	Renewability	Sustainability
	0.152	Peace	
	0.123	Flexibility	
	0.122	Risk	
	0.089	Aesthetic	
0.24	0.441	Adequacy	Sufficiency
	0.306	Cost	
	0.252	Efficiency	
0.139	0.407	Citizen Engagement	Participation
	0.315	Appropriateness	
	0.278	Employment	
0.132	0.439	Equity	Solidarity
	0.370	Inter-generational Equity	
	0.191	Interdependence	

as the main criteria. Afterwards prioritizing the criteria and synthesizing alternatives, final priority energy options resulted as follows (see Table 3).

1- Renewable energy by 0.491 relative values
2- Fossil fuel by 0.28 relative values
3- Nuclear energy by 0.229 relative values

In prioritizing, relative values are considered in distributive state due to our purpose for not achieving the best option. Instead, we focus on the relative value for each option regarding the appropriate future policy and express sub-criteria about them. When considering Table 3, it is obvious that the relative value of renewable energies is more than the two others and special attention to this kind of energy is needed by policy makers in the future. Additionally, this issue is seen in other countries with their care enhancing gradually. Similar to past use of fos-

Table 3. Final Ranking of Energy Options

Sum	Criteria	Energy
0.051	Participation	Fossil
0.041	Solidarity	
0.066	Sufficiency	
0.124	Sustainability	
0.282	**Fossil total weight**	
0.041	Participation	Nuclear
0.036	Solidarity	
0.06	Sufficiency	
0.093	Sustainability	
0.23	**Nuclear total weight**	
0.047	Participation	Renewable
0.057	Solidarity	
0.115	Sufficiency	
0.272	Sustainability	
0.491	**Renewable total weight**	
1.003	**Total**	

sil fuel resources as primary energy source, bringing renewable energy resources on-line requires better policies, development time and assessments of resource potential in Iran.

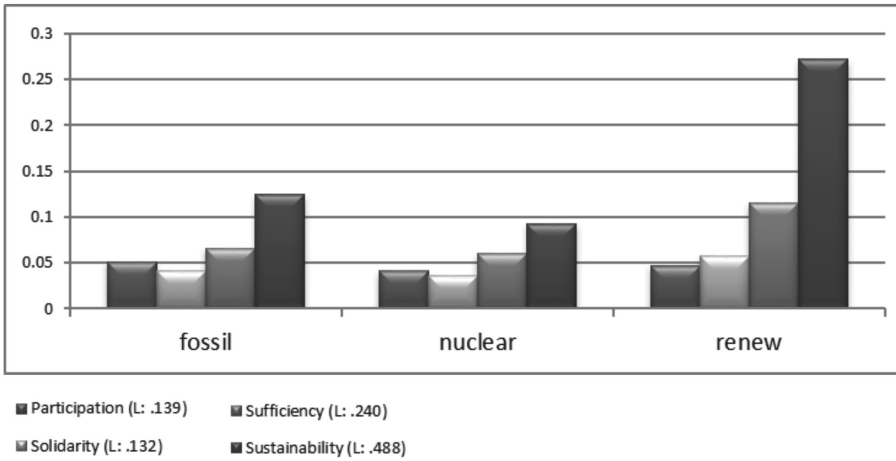

Figure 2. Combination of Alternatives and Criteria

The significance of the criterion for each option is represented in Figure 2 and Table 3. In Table 3 the criterias' relative value on options is determined by the sum of its point value to the total value of each option. To compare options based on criteria, Figure 2 could be used. For example, the relative value of participation in fossil fuel is the only criterion which is greater than the others in renewable energy.

In Iranian governmental general policies, all three kinds of energy (fossil, nuclear and renewable) are included. In spite of Iran's location in the Middle East which is one of the richest areas in fossil fuels, the country relies primarily on this type of energy, causing irrecoverable losses to its economy.

After the Fukushima incident, many countries revised their energy policy in the nuclear sector. Also, nuclear waste is one of the major difficulties in the field of nuclear energy. Besides that, sanctions are imposed against Iran for nuclear energy and this sector is influenced by political issues among different countries. It is clear that Iran endures great costs due to unsolved international problems in nuclear energy.

As expressed before, many countries are developing their renew-

able energy resources and this indicates that in spite of high initial development costs, renewables are a priority for policy making in developed countries. The outcomes of this study represent that energy experts consider renewable energy as the best choice regarding the mentioned criteria.

One of the most significant problems in developing renewable energy is acceptance of responsibility for investing in this field. In 2001, Iran's Congress set a momentous law to protect renewable energy investment in private economic sectors. These protections were not able to persuade the private sector to invest. However, in recent years this trend is improving. Another reason for the inattention of the authorities toward renewable energy is the low cost of conventional energy in Iran.

Results

Iran's environment and energy processes shows that this managerial field has not had an acceptable function due to important reasons such as: lack of a long term focus on the problem while implementing energy strategies and policies without considering social, cultural and environmental aspects. Broad measures taken by active international energy organizations (such as World Energy Council, Asia Peace Energy Committee, International Energy Agency) demonstrate that the world has awakened from the dream of unlimited energy resources. Iran's energy policies lack practicality, despite the authority's attention. The most significant results are as follow:

- Appropriate energy policy making to achieve sustainable development requires, political, economic, social and environmental considerations. Moreover, energy resources and available technologies are limited.

- "Sustainability" is one major factor in choosing renewable energy. As seen in analytical hierarchy processes, the priority of implementing renewable energies is declining.

- There is an inverse relationship between sustainability and fossil fuel energy and nuclear energy usage.

- The relative value of renewable energy declines as sufficiency, solidarity and participation increase.

- By growth in the relative value of participation, the priority of renewable energy is reducing and is being added to the priority of fossil fuel.

According to the data analysis, to guide Iran's energy policy making, the following suggestions are recommended:

1. Endeavor to protect fossil fuels as fiduciary which are transmitted to the current generation by previous generations.
2. Encourage public participation in protecting accurate consumption of fossil fuel.
3. Observe ethical principles in future energy policy making.
4. Develop intergenerational justice by accurate policy making in the field of energy.
5. Protect various sectors to invest in the renewable energy sector.
6. Persuade and protect applicable ideas in districts such as Sistan and Baluchestan, Yazd and potential rural regions.
7. Invest in nuclear energy with a long term perspective and in safe areas.
8. Note human and environmental risks regarding all three energy options.
9. Consider sustainable criterion in all energy policy making dimensions (financial, ecological and social).

Among the fundamental issues that we encounter today are regulations and environmental relationships. With the deterioration of ecological systems which rely on human and environmental crisis intensification, environmental pollution problems and ecological imbalance remain unsolved.

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ABOUT THE AUTHORS

Ali Asghar Pourezzat, Ali Asghar Sadabadi, Narges Salehi, Shahrabi, and **Mohammad Mahdi Zolfagharzadeh**—Faculty of Management, University of Tehran, Iran.

Mohammad Koohi Khor—Faculty of Management, University of Tehran, Iran.

Alireza Aslani*—Faculty of Management, University of Sistan, Iran.

Faculty of Management, University of Tehran, Iran.

Faculty of New Sciences and Technology, University of Tehran, Iran.

Faculty of Technology, University of Vaasa, Finland.

*Corresponding author: Alireza.aslani@ut.ac.ir, +358-44 255 0010.

Faculty of Management, University of Tehran, Iran.