



## Public awareness and stakeholder involvement for Bangladesh's nuclear power plant

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### ABSTRACT

Nuclear energy renders itself as one of the sustainable energy sources for power production available now. But the major nuclear accident that occurred in the nuclear industry has shown that the generation of nuclear energy has an inherent risk for the environment and the eco-system. Therefore, members of the public - the principal stakeholders - shall be provided with significant opportunities for their engagement in every phase of construction of the Nuclear Power Plant (NPP). National and regional level public support is very important for the implementation of the first-ever NPP of Bangladesh, the Rooppur NPP (24°4'0"N 89°2'50"E) as well as for the future power plant of the country. This paper analyses public awareness and stakeholder involvement systems in the nuclear energy establishment process in Bangladesh. According to the best international practices settled by the IAEA and national authorities like the Rosatom, this paper recommends certain solutions to the improvement of the public outreach mechanism for the construction of NPP in Bangladesh.

### 1. Introduction

Considering the limited amount of indigenous resources and the very high cost of energy generation using imported fuel, the Bangladesh government has been carrying out a major nuclear power program. Accordingly, Bangladesh is implementing the first NPP project (the construction of Rooppur NPP on the eastern bank of the Padma, in the Rooppur settlement of the Pabna District, 160 km off Dhaka) in cooperation with the government of the Russian Federation [1]. The introduction of the first NPP is targeted to meet about 10% of electricity demand by 2023–2024 [2]. The government of Bangladesh is also planning to build a second nuclear power plant soon. For the successful implementation of the nuclear program in Bangladesh, it is crucial to dispel all doubts of the population regarding nuclear power. To achieve this, it is necessary to continue implementing the campaign aimed at informing the public about the safety and environmental sustainability of the future NPP and promoting the transparency of the project at all stages of implementation. It is essential to raise public awareness of the benefits of nuclear power and the safety of nuclear technologies, to convince the masses that a nuclear power plant is indispensable for

successful as well as sustainable social and economic development of Bangladesh.

IAEA Nuclear Energy Series No. NG-T-1.4, "Stakeholder Involvement throughout the Life Cycle of Nuclear Facilities" explains the effective stakeholder involvement in all the principal stages of the life cycle of nuclear facilities (i.e. construction, operation, radioactive waste management, decommissioning, etc) and then make use of updated methods to put into practice stakeholder involvement programs [3]. A report by the international nuclear safety group INSAG-20, also gives a guideline for stakeholder involvement in nuclear-related issues [4]. In particular there is no previous study on this topic for Bangladesh's NPP. In this paper the public perception and stakeholder involvement for Bangladesh's NPP is analyzed based on the general guideline given by the IAEA. To disseminate the information among all the stakeholders this paper also suggests a digital information center. (see Fig. 1)

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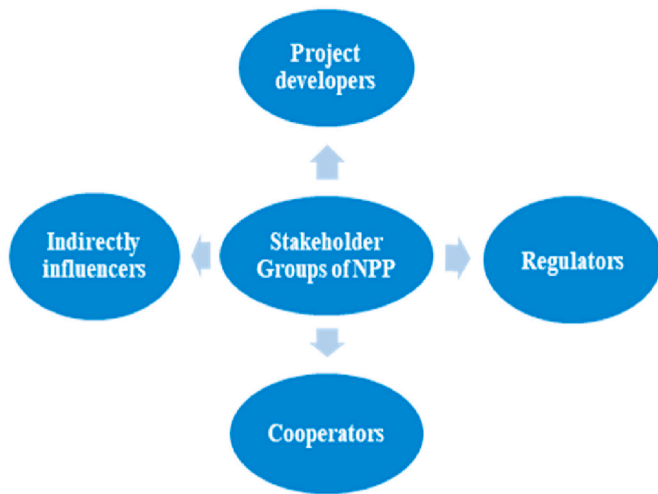


Fig. 1. Stakeholder groups.

2. Materials and methods

2.1. Stakeholders

The term “stakeholder” refers to a person, group of people, or an organization with interest, involvement or investment in the activities concerned. They may also be called interested/concerned parties. The needs and expectations of a member of the same parties might be different in economic effect, environmental efficiency, technologies, political aspects, etc. [3] Some stakeholders may have a variety of interests or areas of concern in the nuclear power plant there must be some definite stakeholders group:

- > Project developers: Owner of site/facilities and equipment, investors, operational staff, management.
- > Regulators: Supervisory authorities, industry bodies, local governments.
- > Co-operators: Trade unions, responsible waste management, local entrepreneurs, local contractors, nuclear and non-nuclear industry, Non-Government Organizations (NGOs), different ministries.
- > Indirectly influencers: The members of the stakeholders who are not directly involved in the construction and operation of the concerned activities will fall into this category. The general public, neighboring countries, indigenous peoples, landowners, scientists, educators & students, universities, tourists, archaeologists, historians, museums, archives, media, health workers, lobby, religious and non-religious groups, political leaders, experts’ communities, intellectual bodies, social media celebrities, millennial are the indirect influencers.

To involve the stakeholders, it is most important to find out the main concern parties in nuclear power project-related activities. Some of the stakeholders have little interest but a huge influence. To see the principal stakeholder involvement a survey was carried out both online using software named survey monkey and manually. In online we got

only 30 responses whereas 70 responses were collected manually. The responders are the scientists and engineers of Bangladesh Atomic Energy Commission, teachers, and students of different universities of Bangladesh. The interest and influences of different stakeholders are given in Tables 1–4.

The stakeholder matrix given in Fig. 2 was drawn from Fig. 3 the analysis given in Tables 1–4. From the matrix, it can be concluded that the Indirectly Influencers are the principal stakeholders (see Fig. 3).

2.1.1. Why stakeholder involvement is important for Bangladesh’s nuclear power plant?

Bangladesh is going to be mature in everywhere. It has undertaken some mega-projects such as Metro rail, Padma Bridge, Rooppur NPP, Matarbari Coal Power Plant, Rampal Power Project, Payra Deep Sea Port [2]. The government is facing many challenges for the smooth implementations of all the above-mentioned projects. At present people are very serious about all of the projects. They are very much serious to know the project progress, project cost, role in long-term socio-economic development, and effect on the environment.

Bangladesh is going to build its first nuclear project in Rooppur, Pabna [5,6]. It is a fast track project of the Bangladesh Government. Bangladesh is introducing nuclear energy as a safe, environmentally friendly, and economically viable source of electricity generation. The country has started the construction of the Rooppur Nuclear Power Plant (Rooppur NPP). The country will build two units of Rooppur by 2023–2024. The first unit of Rooppur NPP with capacity 1200 MW will start commercial operation by 2023 and the second unit of Rooppur NPP with capacity 1200 MW by 2024 [7]. General people are confused about whether it is safe or not. What will be the future of residents of the neighboring region? Would they free from radiation? Environmentalists, intelligent, media personnel, residents, millennials, teacher-students, experts, political leaders, religious speakers, government officials are always showing concern about the long-term effect of the project on the environment, eco-system, safety-security, radiation, transparency, the progress of the project, competent manpower. To satisfy all the stakeholders, trusted media, or reliable sources of information are mandatory. Due to the lack of a trusted and verified source of information, miscreants try to spread rumors. Taking advantage of the presence of different types of rumors the opportunists try to create an unpleasant situation.

Construction of Rooppur Nuclear Power Plant is our long-cherished dream that was started in 1961 [8]. Bangladesh entered into the nuclear world with the first Concrete Pouring of the First unit of Rooppur NPP on 30 November 2017 [9]. It is a pride and joy for us as a nation. To meet the huge demand for electricity nuclear power plants will play a vital role. IAEA has a clear direction for Stakeholder Involvement. For the successful implementation of the nuclear program in Bangladesh, it is crucial to dispel all doubts about nuclear power. To achieve success in stakeholder involvement, it is necessary to continue implementing the campaign aimed at informing the public about the safety and environmental sustainability of the future NPP and promoting the transparency of the project at all stages of implementation. Following objectives should be accountable for the stakeholder involvement:

Table 1 Interest/Influences of Project developers in Nuclear Power Plant?

Interest				Influence			
Answer Choices	Online	Manual	Total	Answer Choices	Online	Manual	Total
Low	1	9	10	Low	7	12	19
Not at all	1	8	9	Not at all	3	5	8
High	22	36	58	High	12	12	24
Medium	6	17	23	Medium	8	41	49
Total	30	70	100	Total	30	70	100

**Table 2**  
Interest/Influence of Regulators: Supervisory authorities, industry bodies, local governments in Nuclear Power Plant?

Interest				Influence			
Answer Choices	Online	Manual	Total	Answer Choices	Online	Manual	Total
Low	5	40	45	Low	5	40	45
Not at all	1	2	3	Not at all	1	2	3
High	12	13	25	High	12	13	25
Medium	12	15	27	Medium	12	15	27
Total	30	70	100	Total	30	70	100

**Table 3**  
Interest/Influence of Cooperators: Local communities, trade unions, responsible waste management, landowners, local entrepreneurs, contractors, nuclear and non-nuclear industry, NGOs, different ministries in Nuclear Power Plant?

Interest				Influence			
Answer Choices	Online	Manual	Total	Answer Choices	Online	Manual	Total
Low	11	9	20	Low	8	42	50
Not at all	3	10	13	Not at all	6	7	13
High	8	36	44	High	5	4	9
Medium	8	15	23	Medium	11	17	28
Total	30	70	100	Total	30	70	100

**Table 4**  
Interest/Influence of Indirectly influencer General public, neighboring countries, indigenous peoples, scientists, educators & students, universities, tourists, archaeologists, historians, museums, archives, media, health workers, lobby, religious and non-religious groups, political leaders, experts communities, intellectual bodies, social media celebrities, millennial in Nuclear Power Plant?

Interest				Influence			
Answer Choices	Online	Manual	Total	Answer Choices	Online	Manual	Total
Low	5	10	15	Low	7	8	15
Not at all	3	7	10	Not at all	3	2	5
High	15	39	54	High	10	37	47
Medium	7	14	21	Medium	10	23	33
Total	30	70	100	Total	30	70	100

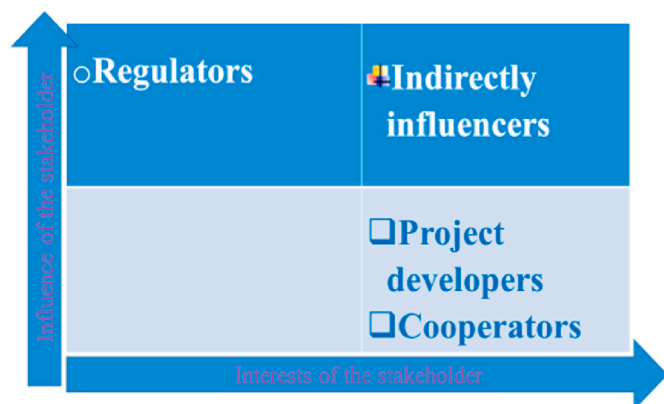


Fig. 2. Interests and influence of stakeholders in Bangladesh.

- Raise public awareness and stakeholder involvement for nuclear power and the safety of nuclear technologies;
- Convince the masses that a nuclear power plant is indispensable for socio-economic development of Bangladesh
- Building public confidence in nuclear energy and the whole nuclear power development program thereby increasing public acceptance and support;
- Increasing awareness among general people in favor of nuclear power;
- Strengthening the understanding of the need to use nuclear technologies and the benefits of Rooppur NPP, a project of national importance;



Fig. 3. Current process map.

- Enhancing brand awareness and cementing Rosatom’s reputation as a reliable partner for the implementation of a major nuclear program in Bangladesh;
- Improving the image of Rooppur NPP as a reliable project investor employing social investments, which will secure the trust of residents in the project;

- Feeling exposed to people’s impact to know they can control that impact on their well-being and the environment;
- The democratization of the general public and the local population to participate in decisions that may affect their lives;
- All stakeholders know the decision-making process and can help to identify several aspects that would otherwise not be taken into account or used;
- The public can block many projects, so the strategy of involving stakeholders should take into account their needs and desires;
- Everyone involved in the project should work towards common goals.

2.1.2. Methods of stakeholder involvement [10]

Method	Objectives	Instruments
Information and education	An increasing level of knowledge and understanding of the situation, understanding the possibilities of participation, information on decisions	Leaflets and booklets, websites, public relations, information centers, mass media, social media public hearings
Collection of information	Searching facts for decision-making, notification on decisions	Face-to-face surveys, online questionnaires, interviews, public opinion studies, referendums
Consultation	Consideration and getting a response to applications, evaluation of various opinions and views, discussing and clarifying opinions	Focus groups, forums of interested parties, expert committees, review of applications
Building Trust	Better mutual understanding, the achievement of common agreement, understanding the reasons for disagreement	Small working groups, negotiating conferences, friendly appearances
Partnership	Common participation in decision-making	Representative committees for decision-making, promotion of the development of social responsibility

2.1.3. Principle of stakeholder involvement [3,10]

- Information for all stakeholders should be identical and come to them at the same time
- Stakeholders should be invited to a dialogue, and this dialogue should not be seen as a hindrance or delay of the project, but as a way to promote and improve the project
- It is necessary to demonstrate that stakeholders’ opinions are taken into account if they are not accepted, it is necessary to explain – why
- All requests for information should be dealt with promptly
- It is better to give risk-related information in a broader context, e.g. as the situation before a project’s activity and the desired situation after the activity
- You should not discuss the situation in general, it is better to talk about specific cases and activities
- If information is provided by several independent entities, their activities need to be coordinated.

2.1.4. The current process of stakeholder involvement for nuclear power in Bangladesh

- Developed and approved a communication plan according to communication strategy 2015–2021;
- Distribution of information material at different fairs all over the country.
- Exhibition of a video documentary about the nuclear power plant;
- Organize a various meeting, seminar in the local region;
- Disseminate the article about the project in national dailies
- Developing TVC about the project and broadcast in TV

2.1.5. Obstacles of the current process, reason of obstacles and their effects

Obstacles	Reason of obstacles	Effects
<ul style="list-style-type: none"> <li>•Not knowing the correct information;</li> <li>•Lack of accurate information sources.</li> </ul>	<ul style="list-style-type: none"> <li>•The horrific past of a nuclear accident;</li> <li>•Insufficient information</li> <li>•Illegal activities of self-seeker;</li> <li>•Scarcity of trust.</li> </ul>	<ul style="list-style-type: none"> <li>•Increase fears and distrust;</li> <li>•Birth of negative perceptions in the public;</li> <li>•Administrative complications;</li> <li>•Reduction of project speed.</li> </ul>

2.2. Digital information center

Nuclear power was introduced through destruction and erosion. As a result, people have scary ideas about nuclear power. Eliminating all nuclear fears from local and national levels by providing accurate information we propose to develop a digital information center, which could be operated in online and offline media. The proposed digital information center is given in Fig. 4.

2.2.1. Description

- Provide information on the positive use of nuclear energy;
- Provide an accurate explanation of nuclear accidents;
- Make information available;
- Provide free information;
- Get the identity of the information recipients;
- Serve more recipients;
- Assist in research.

2.2.2. Proposed idea for digital information center of stakeholder involvement for nuclear power in Bangladesh

- Provide accurate information for all
- Provide more information at a low cost
- Provide accurate information to anyone according to one’s demand
- Accurate information near at hand
- Provide information through online and offline media.

2.2.3. The innovation in the digital information center of stakeholder involvement for NPP (which is not in the existing system)

- Provide more information at a lower cost;
- Make a source of accurate information near at hand;
- Make information available;
- Provide information online and offline;
- Get an idea of the service recipient;
- Preventing Illegal activities of self-seeker.

2.2.4. The primary requirement to implement a digital information center

- Software, database
- Verified Facebook Page and Boost Up
- Link up with Main Web site.

2.2.5. Expected outcome

Description	Information Wants	Information Received	Attitude
Before implementing the digital information center	01-30 Persons	01–10 Persons	Negative
After the implementation of the digital information center	01–1000 Persons	<1000 Persons	Positive
Expected benefits of serving as a result of digital information center implementation	1000 Persons	Information almost for all	Conscious

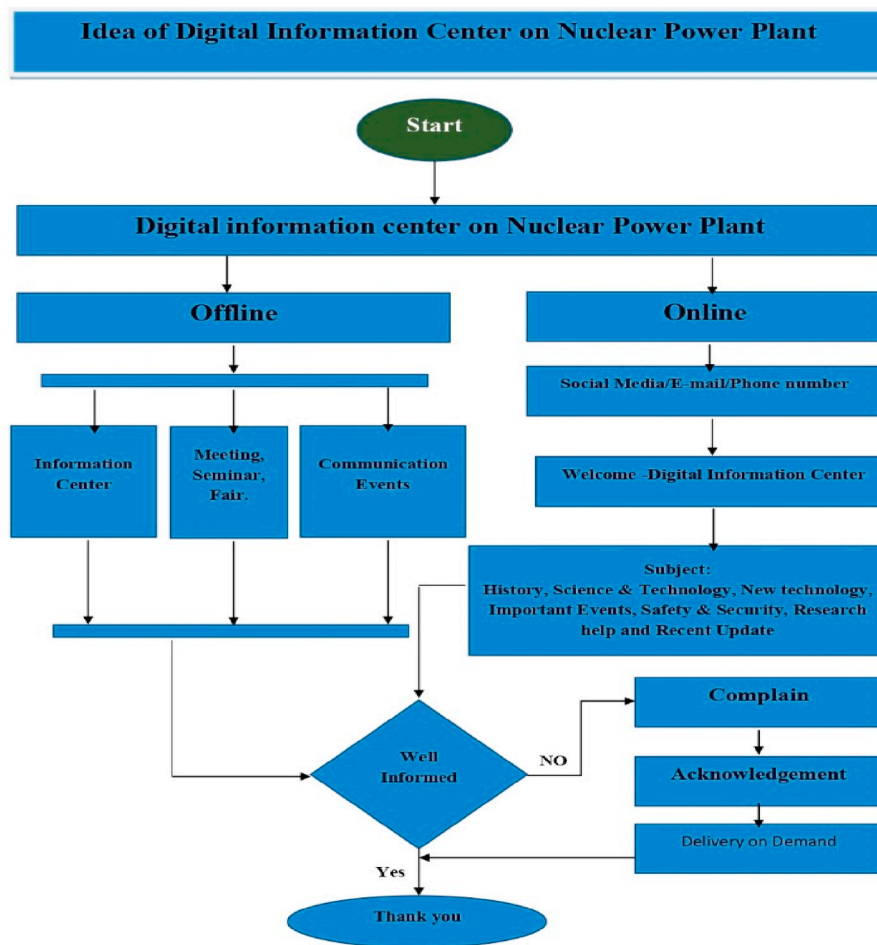


Fig. 4. Digital Information center on NPP.

### 2.2.6. Other benefits

- Public awareness will increase at a tremendous rate
- Receiving information will be easy
- The need for manpower will be less.
- Implementation of the nuclear power plant will be facilitated
- The negative perception of the government will be reduced

### 3. Result and discussion

In recent times, there has been a growing trend worldwide of adopting alternative sources of energy in policy framework in the context of diminishing reserve of fossil fuel as well as the detrimental impact of its burning on environment and human health. Renewable and environment-friendly energy sources come into consideration to tackle the future energy crisis. Renewable energy sources like solar energy, wind energy, etc., cannot cope with the huge consumption demands of industrialization and urbanization. In this perspective, nuclear energy is considered as a suitable alternative, provided necessary safety measures are in place. Nuclear power plants are especially suitable for countries like Bangladesh having a huge population and limited land area and resources. The prospect of nuclear energy had been recognized in policy plans of Bangladesh and necessary steps are being taken for early implementation of the Rooppur Nuclear Power Project at Rooppur, Pabna.

For the smooth implementation of a nuclear power plant, a country

needs not only technical competence but also public acceptance. A construction entity needs a comprehensive stakeholder involvement program. Before making decisions for stakeholder involvement the construction entity needs to identify the stakeholder and their interest, who are the principal stakeholder? In this paper, we discussed the stakeholder and their classifications, with the help of survey we found out that “Indirectly Influencers” are a principal stakeholder. This article also illustrated the different methods of stakeholder involvement and the various instruments of the respective method, principle of stakeholder involvement. From this paper, the researcher will get an idea about the Digital Information center on Nuclear Power Plant.

### 4. Conclusion

Decisions regarding any type of nuclear facility have typically received considerable attention from the public and other stakeholders. Regardless of the stage in the life cycle of the nuclear program — initial consideration, operation, expansion, or decommissioning — properly addressing stakeholder needs and concerns improves the probability of program success. Engaging stakeholders as early as possible and with ongoing attention is essential; including helping stakeholders to understand the extent of their involvement and responsibility in decision making processes regarding these nuclear facilities/programs. In this paper, it was focused to develop a common understanding of stakeholder involvement and developed a portable information center on nuclear named “Digital Information Center”. The public should know about nuclear power programs. The Digital Information Center helps to raise the awareness of the interactional NPP safety and security

standards for nuclear infrastructure. The Digital Information Center will reduce the time, cost, and visit of the information provider and also all stakeholders. Thus, the Digital Information Center will play a significant role to improve the comprehensive stakeholder involvement programs. An appropriate stakeholder involvement activity will ensure the sustainable and safe development of nuclear energy and industry.

#### Future works

This work is left open for the future. Recently, we are going to the world of mobile technology. Further improvement of this Digital Information center would be transformed into a mobile app. We hope with this kind of transformation of the Digital Information center Stakeholder Involvement will be more convenient and effective.

#### Credit author statement

Saikat Ahmed, Writing - original draft. Md. Iqbal Hosan, Writing - review & editing, Supervision. Asma Begum, Methodology. A F M Mizanur Rahman, Conceptualization. Md. Abdur Razzaque, Validation. Quazi Mohammad Iqbal Hasani, Resources.

#### Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

#### Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.esr.2020.100564>.

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