The Not in My Backyard (NIMBY) Phenomenon on the Revival of the Bataan Nuclear Power Plant

Carlo G. Custodio, Jr.[2], Cristian Ryan Argamino[1,2*], Anna Isabel Celis[2], Gerald Catambacan[2] , Arvin Jay Carandang[2] , Ma. Luisa Adamero[2],Carmina Magnaye[2]
[1]*De La Salle University Laguna Campus; LTI Spine Road, Biñan City, Laguna 4024*
[2]*School of Environmental Science and Management, University of the Philippines Los Baños; Batong Malake, Los Baños, Laguna 4031*
**Corresponding Author: cristian.argamino@dlsu.edu.ph*

Abstract: There are instances when one recognizes the benefits of a facility but is opposed to having it located in their own neighborhood or what is known as the Not In My Backyard (NIMBY) phenomenon. This study looked at the difference in perception of Filipinos about the possible revival of the Bataan Nuclear Power Plant (BNPP) focusing on their proximity to the nuclear plant, and their perceptions of the possible environmental risks and economic benefits. The study used a purposive, non-random snowball sampling method resulting in respondents from 42 Philippine provinces plus the National Capital Region. While the results of this study can not be used to generalize the behavior of a bigger population , information beyond public approval of a project could be useful for policy formulation and implementation. It was determined that while a greater percentage of respondents recognized the economic benefits of reviving the BNPP, the majority were also not willing to live near the plant, or a nuclear waste storage facility. Further, the concern regarding emergency situations was significantly higher for respondents whose permanent residence was near the BNPP. Results from the survey also showed that communication campaigns regarding the revival of BNPP should focus on the soundness of the BNPP construction, and the capability of the Philippine government to maintain and operate the plant optimally, and safely, in addition to its capability to handle plant operation-related emergencies.

Key Words: NIMBY; Bataan Nuclear Power Plant; nuclear energy; risk perception; economic perception

1. INTRODUCTION

The Not in My Backyard (NIMBY) Phenomenon occurs when one is opposed to "the locating of something considered undesirable in one's neighborhood" (Kinder, 2016). It is also described as "individuals who recognize the benefit of a facility, but exhibit protectionist attitudes when a facility is proposed in another 'neighborhood'" (Dear, 1992 in Boyle, et. al., 2019). In energy technology, NIMBY is referred to as the public opposition of unwanted local developments, ranging from landfill waste dumps to energy projects such as wind farms (Wright, 2009).

Completed in 1987, the Bataan Nuclear Power Plant (BNPP) was built in response to the 1973 oil crisis and up to this day, it has never produced a single watt of power (Mendoza et al., 2016). It cost the country US $1.1 billion (overpriced by at least US $75 million) (Mendoza et al., 2016) while consuming Php40 to 50 million per year for its maintenance and preservation (Buenviaje, 2018).

In 2017, the Philippines Senate unanimously voted to ratify the Paris Agreement, committing the country to cut carbon emissions by 70 percent by 2030 (Climate Action, 2017). The energy sector of the Philippines makes up 54% of the country's GHG emissions (Climate Links, 2016). Without reconstructing the energy mix of the country, the Philippines would not be able to attain the target of GHG emission for the Paris agreement, making the revival of the inactive Bataan Nuclear Power Plant even more relevant now (Buenviaje, 2018).

The NIMBY phenomenon has been analyzed in many different cases of infrastructure facilities, including nuclear power plants and the conventional view on this phenomenon is that people are in favor of facilities, but are opposed to it in their area (Wolsink, 2000). Evidence of NIMBY attitude to nuclear plants has been demonstrated (Pignataro and Prarolo, 2011; Tanaka, 1994). If NIMBY indeed exists, there is evidence that strategies to gain stakeholder support could be formulated accordingly such as increasing the knowledge of stakeholders on nuclear energy (Bisconti, 2020) or economic benefits (Uji, Prakash, and Song, 2021). While the BNPP has been built, its operationalization is still being decided upon. If BNPP will be operationalized, laws such as the Environmental Impact Assessment System and the Local Government Code may be triggered and these have public consultation provisions thus showing the need for stakeholder support. Adams (2009) stated that "'Green' development is not about the way the environment is managed, but about who has the power to decide how it is managed". It is valuable for the voices of those close to the BNPP to be heard. Yearly (1992) makes the argument that industrial operations may bring pollution and not necessarily economic benefits. While nuclear energy is a complex matter, this research in NIMBY will seek to reveal stakeholder perception of environmental and economic factors.

The Philippines has one of the highest costs of electricity in Asia and continues to rely on non-renewable energy with only a small fraction of the energy mix coming from renewable sources. Recently, there have been attempts by the Department of Energy and the Philippine Nuclear Research Institute under the Department of Science and Technology to revive the discussion on another energy source, nuclear power, specifically, the Bataan Nuclear Power Plant in Morong, Bataan. The power plant was never made operational primarily due to safety concerns. This study will gather information on the perceptions of Filipinos from different social classes towards the revival of the nuclear power plant with a special focus on the correlation of a person's proximity to the site and his/her perception of its revival.

This paper seeks to determine if the NIMBY phenomenon is in effect with respect to the proposed revival of the Bataan Nuclear Power Plant (BNPP). Further, the study seeks to:

1. Identify the perceived economic benefits of BNPP's revival;
2. Identify the perceived environmental threats in BNPP's revival; and
3. Determine which among the two (2) perceptions will outweigh the other in accepting or rejecting the BNPP's revival.

2. METHODOLOGY

Snowball sampling was used which is "a recruitment technique in which research participants are asked to assist researchers in identifying other potential subjects" (Oregon State University, Retrieved November 28, 2020). It is a non-probability sampling methodology that is used to access hard-to-reach, marginalized, or even stigmatized populations (Atkinson and Flint, 2001). This methodology was used in this study to overcome the travel restrictions during the Covid 19 pandemic and obtain referrals from the Zones. Since the snowball sampling method can be used to reach stigmatized populations, the method could have the advantage of ensuring honest data from the respondents especially since there is no stigma involved in opinions about the BNPP. Since respondents were obtained through a non-random method, and statistical tests that will be used are the ANOVA, Tukey-Kramer, and Spearman's Correlation. Chronbach's Alpha was also used. The survey instrument was distributed online via Google Form. Variables that were tested are:

1. **Socio-demographic Characteristics of the Respondents**

   Place of residence will be grouped into 5 zones (at least 40 survey respondents per zone) depending on the distance from BNPP:

   a. **Zone 1** will be a **30 km radius** from BNPP following the evacuation zone during the Chernobyl incident (World Nuclear Association, 2020)
   b. **Zone 2** will be **31 km to 117 km radius** following the modified exclusion zone around Chernobyl (World Nuclear Association, 2020)
   c. **Zone 3** will be the rest of Luzon
   d. **Zone 4** will be the Visayas; and
   e. **Zone 5** will be Mindanao.

2. **Perception About Reviving the BNPP**
   This determined whether the participants have a favorable perception of reviving the BNPP. Likert scale that was used was: strongly agree; agree; neutral; disagree; strongly disagree. For

ease of data analysis, positive attributes were always be on the strongly agree side.

3. **Perception of Environmental Risks from Nuclear Energy**

   The participants' perception of environmental risks from nuclear plants and of the BNPP were tested using a Likert scale. This test allowed statistical testing of which factor affected the respondents' opinions.

4. **Perception of Possible Economic Benefits from BNPP**

   Likert scale questions were asked on topics such as their perception of the reduction of household electricity bills, possible economic boosts from nuclear energy, and other economic questions. This allowed testing of which variable affected their decision-making.

3. RESULTS AND DISCUSSION

Socio-demographic Characteristics of the Respondents

A total of 368 individuals across the Philippines participated during the survey period, 198 of which are female and 170 are male. The majority of them belong to the 21-30 age group which comprise 54.9% of the total number of respondents. This is followed by the 20 and below age group, comprising 29.9% of the respondents, and the remaining 15.2% of the respondents from the rest of the age groups.

Metro Manila has the greatest number of respondents comprising 37.1 % of the total. This is followed by Cavite (10.6% of the total) and Laguna (7.0% of the total).

Respondents were also clustered into 5 zones depending on the distance from BNPP. Out of the 368 respondents, 67.5% of the participants belong to zone 2, this covers the 31km to 117km radius following the modified exclusion zone around the Chernobyl incident. This is followed by 11.4% of zone 5, which represents the island of Mindanao. Then 8.2% of respondents are from zone 3, and the remaining 12.8% of the respondents are from zones 1 and 4.

Perceptions about the BNPP

The majority (29%) of the respondents agree to the BNPP revival. For the rest of the respondents, 19% strongly agree, 15% disagree, and 5% strongly disagree with the power plant's resurgence. There were also a considerable number of respondents who were neutral on the topic (32%).

When asked about their opinion on the statement that the BNPP structure is sound, 27% strongly agreed, 11% agreed, 16% disagreed, and 5% strongly disagreed. Thus, 38% had a positive perception, 21% had a negative perception, and 42% were neutral.

For these variables, respondents who had a positive perception were noticeably higher than those with a negative perception. Those who are undecided are sizable at roughly one-third of the total.

Environmental Risk Perception

When the respondents were asked if they believe the Philippines has the capability to operate the BNPP safely, 10% of the respondents strongly disagreed, 20% disagreed, 12% strongly agreed, and 29% agreed. Thus, for those who have a positive perception the Philippines' capability to operate the BNPP was 41% while those who have a negative perception was 30%. Only 29% of the respondents had a neutral stand.

However, when respondents were asked if they were willing to live within a 10-kilometer radius of the BNPP, 30% of them strongly disagreed with the situation and another 30% disagreed. Only a total of 4% strongly agreed and 16% agreed to the presented situation. A total of 21% held a neutral ground.

An even higher number of disagreements were recorded when the respondents were asked if they were willing to live within 10 km of nuclear waste storage. Among them, 41% strongly disagreed and 29% disagreed with living within 10 km of nuclear waste storage. Only a total of 11% were willing to live within the 10km radius of nuclear waste storage and 19% were neutral.

The majority of the respondents were neutral when asked about the transport of nuclear waste through their municipality, with 31%. Among them, 4% strongly agreed and 19% agreed while 25% of the respondents strongly disagreed and 20% disagreed.

A total of 51% of the respondents believe that the government will implement proper evacuation in case of an emergency, with 27% in strong agreement and 24% in agreement. The number of respondents that were

neutral was 17% while 15% did not agree and 17% were in strong disagreement.

However, when asked if the Philippines can manage a nuclear incident, 54% of the respondents fell on the other end of the spectrum with 32% in strong disagreement and 22% in disagreement. Among the respondents, 24% were neutral and the remaining 22% agreed, with only a sparse 8% in strong agreement and 14% in agreement.

Economic Benefit Perceptions about the BNPP

When asked if they believe that the Philippines has the capability to operate and maintain the BNPP at its best capacity to produce electricity, 5% strongly agree, 30% agree, 18% disagree, and 14% strongly disagree. In this variable, 35% had a positive perception, 32% had a negative perception, and 32% were neutral. In this variable, the distribution between positive, negative, and neutral was roughly evenly distributed.

The respondents were also asked about their perception that the BNPP will lower respondents' personal electricity bill, 19% strongly agree, 29% agree, 15% disagree, and 5% strongly disagree. Those with positive perceptions were 48% while those with negative perceptions were 20%, and 32% were neutral.

On the perception that reviving the BNPP will make the Philippines more attractive to foreign investment, 19% strongly agree, 29% agree, 15% disagree, and 5% strongly disagree. There were 48% with a positive perception, 20% had a negative perception, and 32% were neutral.

When the respondents were asked if they perceive that operating the BNPP will make the economic growth of the Philippines faster, 19% strongly agreed, 29% agreed, 15% disagree, and 5% disagree. In total, 48% had a positive perception, 20% had a negative perception, 32% were neutral.

For the three variables under economic benefit perceptions, the positive perception was more than double those who had a negative perception. Neutrality was also observed for around one-third of the respondents.

The Difference in Means and Correlations of Variables

Zone of permanent residency produced a significant difference of means when tested with the belief that in case of an emergency proper evacuation of those concerned will be implemented by the government, and the Philippines can manage a nuclear incident ($p=0.048102238$). Further testing with Tukey Kramer showed a significant difference between Zone 2 and Zone 5 in the perception that proper evacuation will be conducted. There was also a significant difference between Zone 2 and Zone 5, and Zone 3 and Zone 5 in the perception that a nuclear incident can be managed by the Philippines. It appears that the more significant concern of those who live near the BNPP is emergency scenarios as opposed to concerns during normal operations. Variables that represent environmental and personal risk during normal operations in Table 1 are indicative of only moderate favorability to the BNPP revival. :

Table 1. Variables related to risk with their corresponding coefficients (r_s)

Variable being tested	Coefficient (r_s)
Capacity to operate the plant safely	$r_s=0.65482427$; fairly strong positive relationship
Willing to live near the BNPP	0.556659465; Moderate positive relationship
Willing to live near waste storage faciliy,	0.432391815; Moderate positive relationship
Willing to have nuclear waste transported through own municipality	0.529082828; Moderate positive relationship

The mean of those who answered they are willing to live near the BNPP and are also in favor of its revival are significantly higher than those who are not in favor of the BNPP revival. However, there is no significant difference in means when the zone of permanent residence is tested against being in favor of BNPP revival ($p=0.167879988$). Further, zones of permanent residence and being in favor of reviving the BNPP have a very weak positive relationship($r_s=0.066945479$). Thus, those who Strongly Agree with reviving the BNPP also say they are willing to live near it, but may not actually live near the BNPP.

There was no significant difference in means of the Zones in terms of perceived economic benefits (operating the BNPP will reduce my monthly electricity bill,p=0.303228064; BNPP will make the Philippines more attractive to foreign investors,p=0.917314065; and BNPP will make the economic growth of the Philippines faster, p=0.872151414). There was a significant difference in means when the above three variables on economic benefit perceptions were tested against being in favor of the revival of BNPP. Thus, zones of permanent residency do not produce a difference in perceived economic benefit. Those who are in favor, perceived economic benefits as high.

4. CONCLUSIONS AND RECOMMENDATIONS

The results indicate that NIMBY is present to a certain degree. A greater percentage of respondents agree that the BNPP can be operated safely than those who do not. However, a greater percentage of respondents are not willing to live near the BNPP or a nuclear waste storage facility.

For BNPP's economic aspect, respondents from Bataan and other nearby provinces from Region 3 and 4-A generally perceive benefits, especially in electricity generation. Respondents perceive that success in power generation translates to investments and better economic activity locally and nationally. NIMBY with respect to economic benefits does not apply.

There is a significant difference in the zones regarding perceptions on emergency scenarios where Zones nearer the BNPP have more negative perceptions. The strong relationship between favorability to revive the BNPP and willingness to live near it (r_s = 0.556659465), is not reflected in the very weak relationship between favorability to revive BNPP and proximity of permanent residence to the nuclear plant (r_s = 0.066945479). There is a significant difference in means when favorability to the BNPP revival is tested against the willingness to live near the plant where Strongly Disagree and Disagree are significantly different from the Undecided, Agree, and Strongly Agree. There is no significant difference in means when the zone of residence is tested against the willingness to live near the BNPP. Thus, respondents who have a high favorability to revive the BNPP may not be the respondents who are living near the plant.

The variables with the highest relationship to favorability to BNPP revival are perceptions on the soundness of the engineering of the BNPP and that the Philippines can operate the BNPP safely. Meanwhile, there is a significant difference in perception that proper evacuation can be made in case of emergency, and that the Philippines can manage a nuclear incident with those living near the BNPP having a less favorable perception. If the Information, Education, and Communication (IEC) campaign are to be conducted, these are topics that can be addressed. A science-based campaign can focus on the engineering of the BNPP and the capability of the Philippines to operate it safely. Based on data from the study, an online communication campaign may reach a significant number of stakeholders.

Risk mitigation is considered an important part when establishing new developments as social rejection can lead to the termination of constructing facilities, infrastructure, and services necessary for the development of our country. More than half of the respondents agreed that the Philippines can operate the BNPP safely showing favor in the revival but were not willing to live within a 10-kilometer radius of the BNPP or nuclear waste storage, indicating the presence of NIMBY. Trust and confidence in government agencies resulted in conflicting responses and it is recommended that future studies further specify questions regarding their opinion in government response during nuclear emergencies.

5. ACKNOWLEDGMENTS

We would like to acknowledge Dr. Joyce DL. Grajo of the UPLB Institute of Statistics Statistical Consulting Group for consultations on the appropriate tests and proper interpretation of results. In addition, we also would like to recognize Dr. Marisa Sobremisana, the coordinator of our course on Contemporary Issues in Environment and Development where this study was conceptualized and developed.

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