

RESEARCH REPORTS

Social Acceptance and Social, Economic, and Environmental Impact of Renewable Energy - A Case Study from Hanimaadhoo Island, Maldives

NOBORU ZAMA¹, MASACHIKA SUZUKI¹ & AMINATH SHAZLY²

Sophia University, Japan¹, The Maldives National University²

ABSTRACT *Social acceptance particularly public opposition on renewable energy have been key obstacles for renewable energy deployment in many developed nations particularly in Europe. The level of awareness of the situation in the global south, particularly in Small Island Developing States (SIDS), was rather limited. This research utilizes Cultural Theory as a framework, incorporating data obtained from household questionnaire surveys, focus group discussion and individual interviews conducted on Hanimaadhoo island in the Maldives. The objective is to gain a more comprehensive understanding of how individuals' worldviews influence their opinions and behaviors regarding renewable energy. This study also aims to comprehend the anticipated social, economic, and environmental impacts of renewable energy. The authors highlight key findings from a local perspective that they deem crucial to consider for the future deployment and diffusion of renewable energy in the Maldives.*

Keywords: Social Acceptance, Renewable Energy, Social, Economic and Environmental Impacts, Cultural Theory, Maldives

Introduction

The Maldives is considered very susceptible to the impacts of climate change due to its distinctive geographical situation as a Small Island Developing State (SIDS) characterized by an average height of 1.5 meters above sea level, making it the lowest-lying country globally. According to a report by the Intergovernmental Panel on Climate Change (IPCC), it has been projected with medium confidence that the global mean sea level will see a rise ranging from 0.43 m (with a probable range of 0.29–0.59 m, under the RCP2.6 scenario) to 0.84 m (with a likely range of 0.61–1.10 m, under the RCP8.5 scenario) by the year 2100, in comparison to the reference period of 1986–2005 (Oppenheimer et al., 2019).

The aforementioned projection presents a significant peril to island nations such as the Maldives, as seen by the observed occurrences of coastline erosion. The Maldives has demonstrated a proactive approach in addressing climate change by setting ambitious goals and actively implementing measures both alone and in cooperation with diverse funders and development partners. Despite its minimal contribution to global greenhouse gas emissions (0.003% of the total share), it has also demonstrated proactive efforts in addressing climate change mitigation

(Ministry of Environment, 2020).

Technology is widely recognized as a potent tool for addressing and responding to climate change. Among the various measures employed globally, renewable energy stands out as a robust strategy for mitigating climate change. Recently, scholars have conducted studies on both the technological and social aspects of renewable energy technologies and associated infrastructures (RET) in the literature. Batel (2020) emphasize that social science has been very prolific in the last decades in publishing research that attempts to better understand the social acceptance of RET.

In the present scenario, the presence of public resistance towards the establishment of renewable energy facilities and the hesitancy of the public to invest in renewable energy continue to serve as significant barriers to the growth and development of the renewable energy sector in the United Kingdom and several other European nations (West, 2010). Nevertheless, a disparity in research exists between rich nations and developing nations, and prior studies have recognized the necessity of conducting social research on renewable energy in developing nations. The primary objective of this study is to fill the existing research gap and make a scholarly contribution to the body of literature on the social acceptance of RET. This will be achieved by offering valuable insights derived from the context of the Maldives. The research question can be formulated as follows: Is renewable energy welcomed by the locals? If not, what is the primary element that opposes its acceptance? Are there any factors specific to SIDS?

Moreover, the impacts of renewable energy extends beyond climate change mitigation and has garnered significant recognition on a broader spectrum. To date, several studies have been conducted on the subject of renewable energy and its potential contributions and impacts on the economic, social, and environmental dimensions of specific countries (Jaramillo-Nieves and Del Rio, 2010; Bertheau, 2020; Sheikh et al., 2016; Akella et al., 2009; Kumar, 2020). However, it should be noted that, akin to the social acceptance of RET, there remains a significant dearth of research conducted in developing nations, including the Maldives. The objective of this research is to gain insight into the situation in the Maldives and contribute to the examination of the social, economic and environmental impacts of renewable energy. The present investigation will be directed by the subsequent research inquiry: What are the seen and anticipated social, economic, and environmental impacts of renewable energy?

Methodology

This study has employed a multimethodological approach. A questionnaire survey was conducted in households, as depicted in Figure 1, as a means of quantitative analysis. The purpose of this survey was to categorize respondents into four cultural biases proposed in the Cultural Theory. Additionally, the survey aimed to assess the respondents' level of social acceptance, their anticipated impact from renewable energy, and gather sociodemographic information. The selection of questions regarding cultural biases was conducted with meticulous care, drawing upon the work of Marris et al. (1998) and afterwards presented in Table 1. The second and third steps of the qualitative analysis involved conducting a focus group discussion and individual interviews, respectively, based on the quantitative data

obtained from the questionnaire survey. The co-authors performed a questionnaire survey with the support of a research grant from The Institute for the Studies of the Global Environment, Sophia University, over the period of 2021-2022.

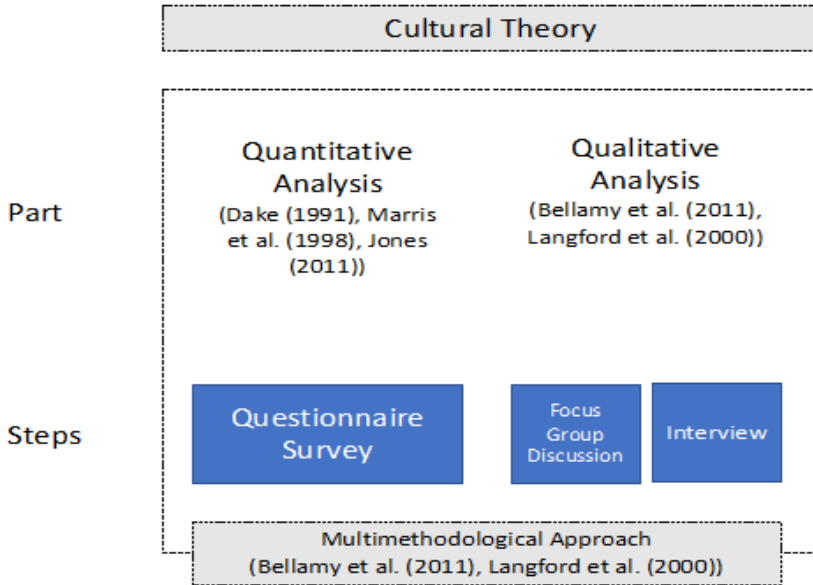


Figure 1: Multimethodological Approach

Table 1
Questions on Cultural Biases

<p><u>Fatalist:</u></p> <ul style="list-style-type: none"> • Cooperating with others rarely works. • The future is too uncertain for a person to make serious plans. • I feel that life is like a lottery. • No matter how hard we try, the course of our lives is largely determined by forces outside our control. 	<p><u>Hierarchist:</u></p> <ul style="list-style-type: none"> • I'm for my country, right or wrong. • There is little discipline in today's youth. • Centralization is one of the things that makes this country great. • Society would be much better off if we imposed strict and swift punishment on those who break the rules.
<p><u>Individualist:</u></p> <ul style="list-style-type: none"> • The welfare state tends to destroy individual initiative. • In a fair system people with more ability should earn more. • Even if some people are at a disadvantage, it is best for society to let people succeed or fail on their own. • We are all better off when we compete as individuals. 	<p><u>Egalitarian:</u></p> <ul style="list-style-type: none"> • I support a tax shift so that burden falls more heavily on corporations and persons with large incomes. • Misuse of scientific and expert knowledge is a very serious problem in society today. • If people in this country were treated more equally, we would have fewer problems. • The world could be a more peaceful place if its wealth were divided more equally among nations.

The questionnaire survey was administered during a three-month period, spanning from December 2021 to February 2022. KoboToolbox was used for data collection and covered 427 households, which accounted for approximately 81% of the total households in the target area. The study employed a complete enumeration approach; nevertheless, it is important to note that the coverage rate was affected by the COVID-19 epidemic and the subsequent public health emergency issued by the Government of Maldives. This resulted in a number of abandoned residences, hence reducing the overall coverage rate.

The study utilized the Cultural Theory framework, drawing on the works of Marris et al. (1998) and Dake (1991), to classify respondents into four distinct groups: Individualist, Egalitarian, Hierarchist, and Fatalist. A focus group discussion was conducted, wherein 2-3 household representatives from each cultural group were selected based on their effective fulfillment of the established criteria. The purpose of this discussion was to explore various aspects related to social acceptance, as well as the social, economic, and environmental impacts of renewable energy.

A total of 13 individuals, comprising 6 females and 7 males, ranging in age from 25 to 59 years, took part in the study. In relation to education, the majority of the participants received schooling up until the secondary level (O' Level), while one participant attained a higher level of education at the tertiary level. The monthly household income of the participants exhibited variability, with a majority of participants earning less than MVR 40,000. Each and every person in the study spent in excess of 300 kilowatt hours (kWh) of electricity on a monthly basis. It is worth noting, however, that none of the participants were utilizing renewable energy sources for their electricity consumption.

The purpose of the focus group discussion was to serve as a direct supplement to the questions posed in the questionnaire survey. The utilization of a focus group setting allowed participants to provide more comprehensive insights into their opinions.

The focus group discussion encompassed an exploration of the following subjects.

- Theme 1: Concern on climate change
- Theme 2: Willingness to accept renewable energy
- Theme 3: Impact of renewable energy deployment on local sustainability

The analysis of the data obtained from the focus group discussion has been conducted utilizing a qualitative cultural theory framework proposed by Bellamy and Hulme (2011). The individual questions and the sessions as a whole underwent a rigorous analysis to identify recurring themes, which were subsequently organized and classified using a coding process.

A subsequent interview was conducted to specifically engage potential participants of the focus group discussion, with the aim of comprehensively examining and analyzing their opinions regarding renewable energy.

Background

Maldives and Hanimaadhoo Island

The Maldives is a sovereign archipelagic nation comprising some 1,200 islands situated in the southwestern region of the Indian Ocean, in close proximity to India and Sri Lanka. According to Knoll (2018), the islands depicted in Figure 2 are dispersed in a north-south direction and the Maldivian midsection of this marine barrier spans approximately 900 kilometers, extending from a latitude of 7° 6' north to a location just below the equator. With a combined geographical size of only 298 square kilometers, this archipelago stands as the most diminutive nation in the continent of Asia. According to The World Bank, the estimated population of the region is at approximately 521,457 individuals in 2021. The predominant language spoken in this area is Dhivehi, while the state religion is Islam. Malé Island, colloquially referred to as Malé, stands as the most populous urban center inside the nation, boasting a remarkable level of population density that positions it among the highest in the global context. The etymology of the term “Maldives” suggests that it originates from the Sanskrit word “Malodheep,” which translates to “garland of islands.”

Haa Dhaalu Atoll, also known as Thiladhunmathi Dhekunuburi, is an administrative subdivision of the Maldives. The geographical region in question pertains to the southern portion of Thiladhunmathi Atoll, which is an inherent atoll formation located inside the Maldives. The atoll in question is the second one located to the north, following the Haa Alifu Atoll. The administrative division in question encompasses the island of Makunudhoo, also known as Maamakunudhoo (referred to as Malcolm Atoll in the Admiralty Charts), which features a substantial reef. Additionally, it comprises the southern portion of the larger Thiladhunmathi or Tiladummati Atoll. On May 21 1958, the region of Thiladhunmathi underwent a division, resulting in the establishment of its northern and southern divisions.

According to the information presented in Figure 3, Kulhudhufushi, the capital island, is situated in the central region of Haa Dhaalu Atoll. This island acts as the primary economic hub for the northern region of the Maldives. Kulhudhufushi encompasses various educational institutions, a bustling marketplace, a prominent healthcare facility, and a multitude of commercial establishments.

The island of Hanimaadhoo, which serves as the target area of this study, is inhabited by an estimated population of 2,664 individuals as of the year 2022 (Maldives Bureau of Statistics, 2022). The destination is situated at a distance of 290 kilometers to the north of Malé and boasts an airport that facilitates several daily airline operations. The facility encompasses an agricultural center, a meteorological office, and accommodations in the form of a hotel and guesthouses.

Locals have reported the occurrence of erosion on a certain side of the island, which they assert commenced in the early 2000s. According to reports, a certain section has seen coastal erosion, leading to the loss of over 200 feet of land and the demise of over 400 trees and coconut palms.



Figure 2: Map of Maldives.
Source: Google Earth

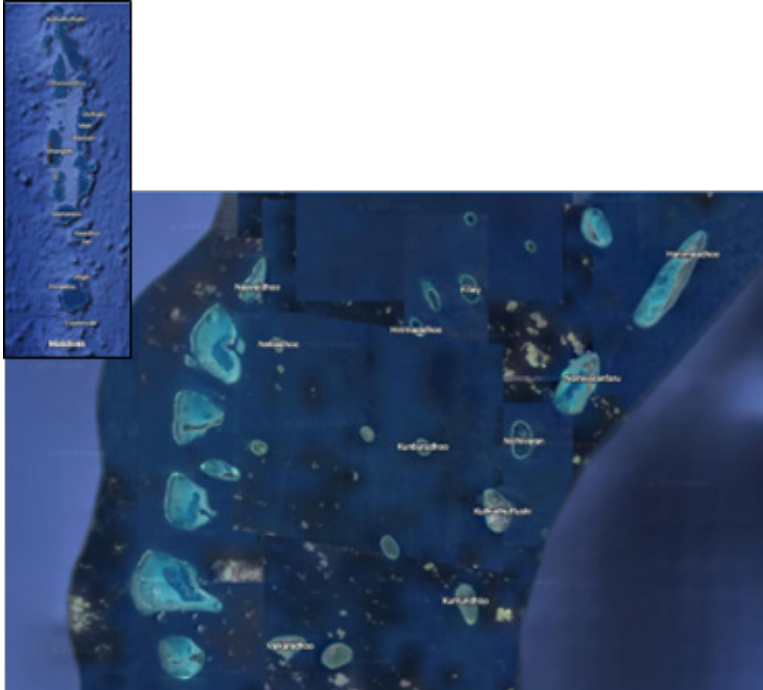


Figure 3: Map of Haa Dhaalu Atoll.
Source: Google Earth

Cultural Theory

The primary objective of Cultural Theory is to elucidate the mechanisms via which individuals interpret and engage with their surrounding environment. The idea posits that this phenomenon is primarily influenced by social factors and adherence to cultural norms. The foundation of Cultural Theory is in Douglas' grid-group typology, as discussed in the works of Douglas (1978) and Thompson et al. (1990). Douglas argues that the interactions between the dimensions of group and grid are sufficient to explain the variety observed in social involvement. Bellamy and Hulme (2011) explain group and grid as "Grid denotes the extent to which an individual's life is prescribed by social regulation, while group denotes the extent to which an individual's life comprises social contact". The grid-group analysis is a theoretical framework that delineates many modalities of social control.

When the dimensions are plotted on a two-axis system, four distinct outcomes are seen, as shown in Table 2. These entities symbolize many forms of social contexts. The affiliation of an individual with a particular dimension will influence their interactions with the surrounding environment. Each individual, in addition to specific social connections, is thus characterized as one of four worldviews or lifestyles. The aforementioned worldviews, namely individualist, egalitarian, hierarchist, and fatalist, exhibit a distinct pattern of risk assessments

that is oriented towards self-preservation. This implies that individuals interpret phenomena that pose a threat to their own lifestyle as being associated with risk. The individualist perspective is distinguished by a tendency towards lower levels of group orientation and social hierarchy. Egalitarians are individuals who belong to cultures characterized by both high group and low grid orientations. On the other hand, the hierarchist way of life is associated with cultures that exhibit high grid and high group orientations. Furthermore, the fatalist worldview is typically observed in cultures that possess high grid and low group orientations.

Table 2
Cultural Theory Grid-Group Framework

Grid	Fatalist	Hierarchist
	Individualist	Egalitarian
	Group	

One crucial and foundational aspect pertaining to individuals' risk perceptions is their overall attitudes towards nature (Thompson et al., 1990). Cultural Theory posits that one's views regarding the nature of existence and perceptions of others are intricately intertwined with their overall worldview and manner of living. Thompson et al. (1990) employed individuals' views towards ecological systems as the foundation for their analysis. There exists a divergence of perspectives about the application of pesticides in forested areas and on plants, with proponents advocating for their usage as a means to mitigate diseases, while others contend that natural processes may adequately address these issues without human interference. Diverse perspectives on nature exhibited by individuals are not arbitrary; rather, they align with one of the five designated "myths of nature" as posited by Thompson et al. (1990). The following discourse presents overarching perspectives on the functioning of nature and its potential reactions to human interventions. The grid/group dimensions have practical implications for individuals' risk perception and understanding.

Individualists experience apprehension towards factors that have the potential to impede their personal autonomy. The ultimate impediment pertains to armed conflict, wherein specific individuals are subjected to physical subjugation by others. The emergence of a socialist government may also be perceived as a

potential danger by proponents of individualism, despite its less sensational nature. Individualists advocate for market liberalism, asserting that individuals should be afforded the right to retain their economic profits for personal benefit. From a political standpoint, individuals who adhere to individualist ideologies tend to align themselves with right-wing positions. The individualist perceives nature as possessing inherent self-preservation capabilities, enabling it to restore its own state of equilibrium. Therefore, individuals should not place much emphasis on the manner in which nature is regarded. In a broad sense, proponents of individualism perceive danger as a potential avenue for growth and advancement, provided that it does not impede upon personal liberty.

Egalitarians express concern on the potential consequences of development that could exacerbate disparities among individuals. Individuals often exhibit skepticism towards expert knowledge due to their concerns regarding the potential misuse of authority by experts and powerful institutions. Egalitarians are typically positioned on the political left and advocate for legislative measures aimed at enhancing social equality, such as implementing progressive taxation policies that disproportionately affect the wealthiest individuals in society. The perspective on nature held by the collective differs from that of individualists. Egalitarians perceive nature as inherently delicate and susceptible to human interventions. Egalitarians exhibit heightened concern for pollution and emerging technologies that have the potential to alter the natural environment. They tend to resist risks that could impose irreparable harm upon several individuals or future generations.

Hierarchists place significant emphasis on the concept of a “natural order” within society and the steadfast maintenance of this established order. Individuals experience apprehension about phenomena such as societal unrest, public demonstrations, and criminal activities. Hierarchists place a significant amount of trust in the expertise of knowledgeable individuals. The proponents of hierarchical perspectives perceive nature as predominantly inclined towards self-preservation, albeit within stringent and inflexible boundaries. If individuals exceed these boundaries, the natural environment will become incapable of self-regeneration, perhaps resulting in significant repercussions. Therefore, proponents of hierarchy are willing to embrace risk, provided that the decision-making process about such risks is substantiated by governmental authorities or subject matter specialists.

Fatalists tend to have limited involvement in social activities, despite experiencing a sense of being bound and governed by social collectives to which they do not belong. This phenomenon renders fatalists largely apathetic towards risk, as the determination of their fears and concerns is primarily influenced by external factors. Individuals who adhere to a fatalistic worldview tend to prefer being uninformed about potential hazards, as they perceive such dangers to be inevitable and beyond their control. The fatalist does not receive any dependable feedback from nature regarding the correctness or incorrectness of human actions. The operational dynamics of this system bear resemblance to that of a lottery, wherein individuals are compelled to confront and address any predicament that arises, irrespective of its nature or complexity. Typically, those subscribing to fatalistic beliefs exhibit a tendency to avoid acquiring knowledge or concern regarding matters they perceive as beyond their sphere of influence.

Results

This section presents a summary of the information obtained from the questionnaire survey, focus group discussion and individual interviews. The results are presented according to thematic categories: (1) Concern on climate change; (2) Willingness to accept renewable energy; and (3) Impact of renewable energy deployment on local sustainability.

Concerns on Climate Change

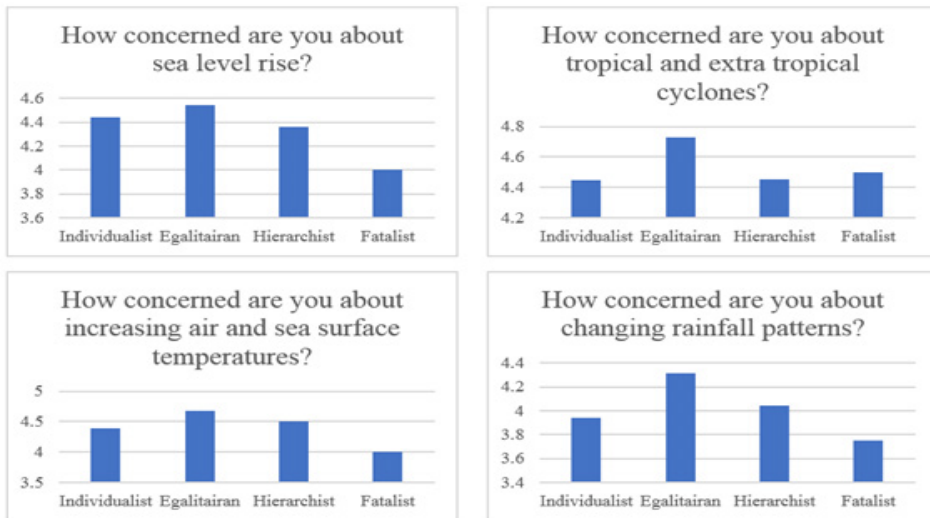


Figure 4: Concerns on Climate Impacts.

The study encompassed four distinct categories of inquiries that were posed to the participants. The respondents have answered in a five-point Likert scale ranging from 1, “unconcerned strongly” to 5, “concerned strongly”. The individuals who were identified as egalitarians demonstrated the greatest scores across all categories of concerns, with hierarchists and individualists subsequently exhibiting lower scores. Fatalists exhibited a relatively elevated level of concern over tropical and extra-tropical cyclones.

Based on the findings of the focus group discussion, it was observed that individuals with egalitarian beliefs expressed a notable level of concern regarding the natural and geographical circumstances of the island, specifically in relation to the country’s existence. Concerns have also been expressed over the importation of agricultural products and its potential impact on public health.

During the individual interviews, participants conveyed their apprehension regarding the formation of the country. They expressed concern about potential destructive events, particularly in light of the experiences of larger nations affected by cyclones. The respondents emphasized that even minor instances of destruction in the Maldives can have significant consequences, posing considerable challenges. Additionally, they highlighted the issue of rainfall, specifically its potential to cause

flooding and adversely impact households, thereby affecting the overall quality of life for all residents.

Hierarchists have demonstrated a specific focus on the phenomenon of rainfall. They have identified that erosion may be attributed not just to fluctuations in sea level but also to the influence of natural wave currents. Although individualists were not particularly proactive, they did express their concerns over land issues. Fatalists hold the belief that the elevation of Hanimaadhoo is relatively high, resulting in reduced susceptibility. They have conveyed their apprehension regarding the forthcoming rainy season, although they have not mentioned any concerns regarding temperature.

Table 3

Qualitative Cultural Theory Framework

<p><u>Fatalist:</u></p> <ul style="list-style-type: none"> • The EIA surveys are not so realistic. • Hulhangu (rainy) season brings kolhigandu, and we notice weak trees die during hot weather, even corals die. • Hanimaadhoo faces wave surges but the island is naturally a high island so there is less damage within the island compared to the outer area. • The sea temperature is relatively the same even during hulhangu (rainy) and iruvai (hot) season. 	<p><u>Hierarchist:</u></p> <ul style="list-style-type: none"> • Erosion can also be caused due to how the wave current occurs but do not believe there will be any changes in sea level due to construction of harbor. • There is no coral reef which has not died in this area. • During bad weather (rainy season) we are worried when we see dark clouds forming.
<p><u>Individualist:</u></p> <ul style="list-style-type: none"> • This requires huge land space. 	<p><u>Egalitarian:</u></p> <ul style="list-style-type: none"> • Most of the islands are naturally low except for few, and majority of the islands does not have jetty, so low sea level is a concern, islands with no harbor face erosion during wave surges, but islands which has a harbor face less damage. • Maldives is naturally low-level islands, there is fear of sea level rising above the country's sea level as well as fear of the country no longer existing, having gone under the sea. • Since we import majority of the goods we need, this effects the imports as well, it's difficult to import agriculture related items. • People face severe health issues in foreign countries such as dying due to extreme heat, here also we face health issues due to this.

Willingness to Accept Renewable Energy

During the administration of the questionnaire survey, participants expressed their level of acceptance towards five distinct renewable energy technologies. This was measured using a five-point Likert scale, where respondents indicated their willingness on a scale ranging from 1 (indicating low willingness) to 5 (indicating high willingness). The findings are succinctly presented in Figure 5.

Egalitarians exhibited a pronounced inclination towards embracing all five forms of renewable energy technologies in comparison to other cultural groups. The individuals who were identified as individualists and hierarchists followed and those who were identified as fatalists, had the least amount of inclination towards all forms of renewable energy sources.

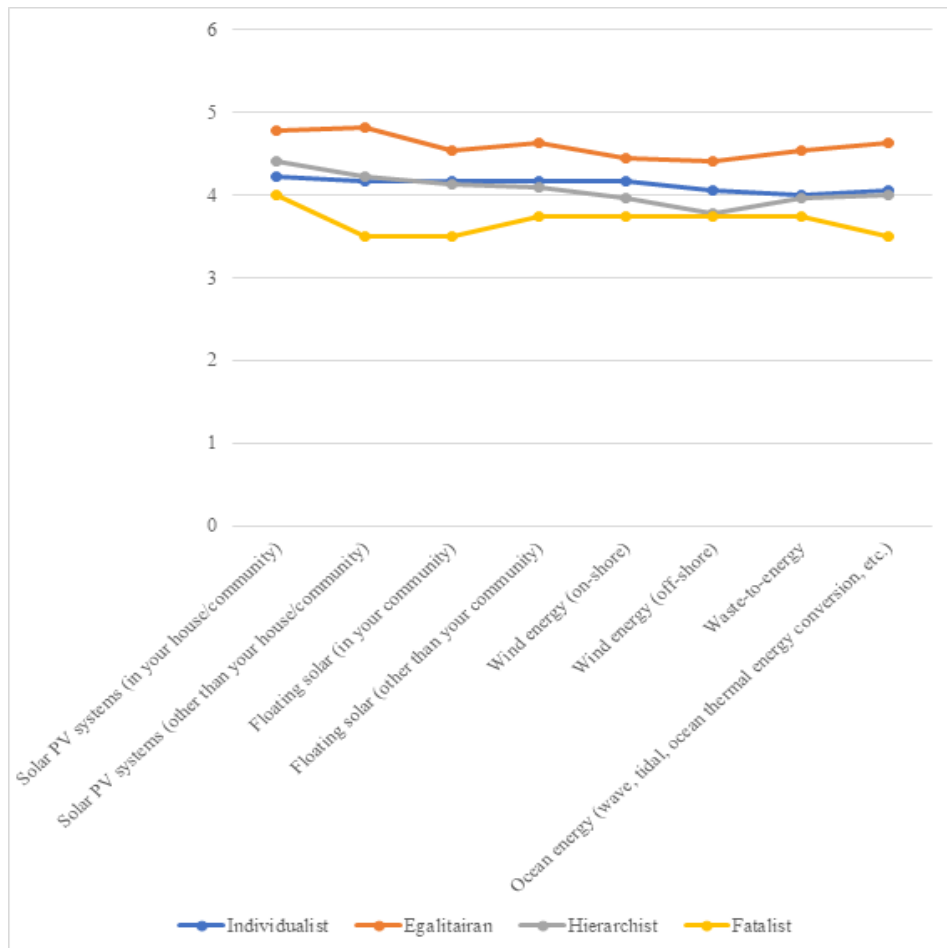


Figure 5: Willingness to Accept Renewable Energy Technologies.

During the focus group discussion, egalitarians shown a favorable disposition towards the adoption and acceptance of renewable energy sources. The group emphasized the significance of utilizing renewable energy sources, despite the

considerable upfront expenses associated with their installation. Nonetheless, apprehensions over the financial implications were noted. Hierarchists believed that the acquisition of solar photovoltaic (PV) systems by individuals is hindered by their high costs, so suggesting that individuals would be more inclined to adopt such systems if they were provided by the government. Individualists expressed their anticipation on the rise in wages. Fatalists have articulated their reluctance to embrace certain renewable energy technologies on account of concerns related to mobility, sound, and land.

During the individual interviews, egalitarians expressed a preference for solar PV systems in their households or communities. This preference was based on the anticipated reduction in electricity bills and the potential decrease in the use of engines that contribute to global warming. Egalitarians exhibit a preference for the implementation of solar PV systems within the community, as the installation of such systems outside the community would incur substantial expenses. This is mostly due to the necessity of establishing grids and transmission lines to facilitate the transportation of power to the community. Additionally, it has been highlighted that in order to ensure long-term sustainability, it is imperative to establish appropriate mechanisms for the disposal or repair of the panels. When considering the implementation of floating solar systems, egalitarians tend to advocate for their placement outside of the community. In the event that the equipment is situated within the community, there exists the possibility of individuals causing harm to the equipment, which in turn may result in disconnection. Potential disruptions may also arise for individuals utilizing the maritime region for recreational swimming activities. Regarding wind energy, egalitarians may oppose its implementation, both on-shore and off-shore, because to concerns about potential disruptions to quality of life and adverse effects on animal populations, notably birds. Egalitarians demonstrate a strong inclination towards embracing ocean energy. Given the expansive nature of the sea, it is plausible to harness the potential of the ocean as a source of energy. However, there were also concerns expressed over the potential environmental and coral reef impacts.

Hierarchists are willing to embrace solar PV panels, wind energy or ocean energy in and beyond their community if the government decide to implement renewable energy. Hierarchists are inclined to demonstrate deference towards governmental choices.

Individualists consider the concept of savings to be of great importance. Consequently, they have a positive attitude towards solar energy due to its potential to enhance their savings. Additionally, it is believed that the implementation of an appropriate maintenance system is crucial for the acceptance and effectiveness of solar PV systems. Floating solar installations are typically favored for placement outside of populated areas. Individualists may exhibit a reluctance to embrace on-shore wind energy due to concerns regarding its noise emissions. However, they are more likely to be receptive to the utilization of ocean energy, as the vast expanse of the sea offers a plentiful resource for harnessing renewable energy.

Fatalists have addressed an issue of the area used for solar PV systems. There is opposition to the utilization of sites typically frequented by island residents for swimming purposes. In the context of floating solar installations, it is commonly preferred to utilize areas that are not typically utilized by the local island inhabitants. Fatalists are unwilling to embrace on-shore wind energy due to concerns related

to sound. Fatalists only endorse the utilization of floating solar and wind energy in locations beyond their immediate neighborhood.

Table 4

Qualitative Cultural Theory Framework

<p>Fatalist:</p> <ul style="list-style-type: none"> • If you put this [floating solar] outside of the community it's more than ok. If it's within the community it will be difficult for travelling. • Have heard it's [wind energy (on-shore)] very loud when you have it on shore. • This [ocean energy] is ok to be done in the ocean/deep sea if this doesn't require such a huge area. 	<p>Hierarchist:</p> <ul style="list-style-type: none"> • This can be used if the Government buy the panels and supplies the household as a project, this is very expensive for the average person to purchase. • It will be expensive to buy [solar PV systems]. There are PV panels installed on the rooftop of the school and it is used by Fenaka.
<p>Individualist:</p> <ul style="list-style-type: none"> • Minimum wage can be increased, and the budget amount spend on fuel can be spent on something else. 	<p>Egalitarian:</p> <ul style="list-style-type: none"> • Whatever benefit we can get from using solar energy, others will also get the same. • This [solar PV systems] will be more environment friendly as well as reduce the electricity bill. • This [solar PV systems (other than your house/community)] is a good method, if this can help coral reef growth. • Not everyone can afford this, so the government can provide this on installment like how they are giving flats. • Not many are aware of this, people know its solar panels when they see, but they don't know the use for it. So I don't believe there is much awareness on this. This is expensive so if the government subsidize this it will be good. • We have to think about global warming as well, not just the cost. If we can use solar energy together with the electricity provided by the Engine-ge (fenaka), then the usage of the engine will be low. • [wind energy (on-shore)] People might cause damage as well considering the lack of awareness on these, and birds can hit the blade and die.

Social, Economic and Environmental Impact of Renewable Energy

In the conducted questionnaire survey, participants were asked to indicate their anticipated implications of renewable energy on various social, economic, and environmental domains. The respondents expressed their expectations using a five-point Likert scale, where 1 represented “low expectation” and 5 denoted “high expectation”.

In line with the findings pertaining to levels of concern and willingness, egalitarians had the highest levels of expectancy. The findings derived from the survey conducted through the use of questionnaires are presented in Figure 6.

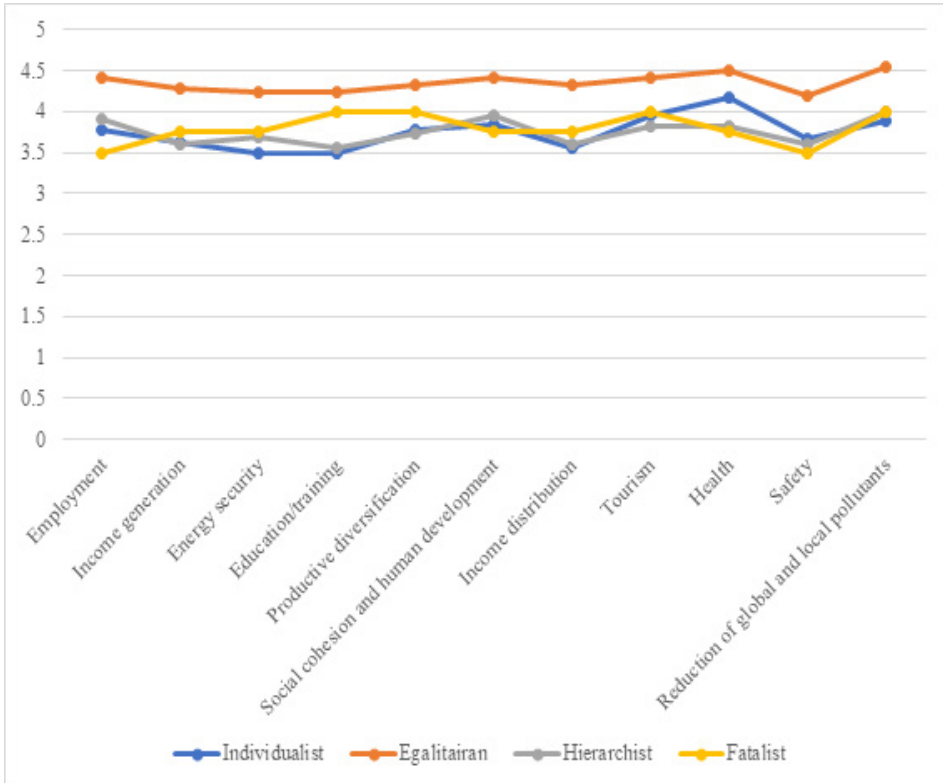


Figure 6: Expected Social, Economic and Environmental Impact of Renewable Energy.

During the focus group discussion, egalitarians expressed potential impacts on income generation resulting from the lowering of electricity bills, improvements in education and training, advancements in healthcare, and the reduction of global and local pollutants in the air. Hierarchists anticipate that there will be significant effects on employment, income generation, and education/training. The possible impact on income generation was emphasized by individualists and fatalists.

During the individual interview, a participant with an egalitarian bias highlighted the possible effects on employment and productive diversification. It has been noted that a decrease in the electricity bill allows for potential savings in comparison to previous expenditures on electricity, hence enabling the allocation of funds towards alternative expenditures. In the realm of agriculture, this development will facilitate the expansion of production capabilities, perhaps leading to the creation of novel agricultural commodities. Similarly, within the fisheries sector, fishermen will endeavor to curtail fuel use by adopting renewable energy sources for the purpose of fish drying.

The significance of energy security, particularly the necessity of maintenance and resolution of potential concerns, has been emphasized by hierarchists.

Individualists have highlighted potential impacts on employment, education, and training, such as the reduction of electricity expenses in educational institutions. This reduction could allow for the allocation of funds to other areas and facilitate productive diversification. For instance, individuals who were previously unable

to engage in certain activities due to high electricity costs may now have the opportunity to do so, as they are able to reduce their expenditure on electricity bills.

Table 5
Qualitative Cultural Theory Framework

<p>Fatalist:</p> <ul style="list-style-type: none"> • If the electricity bill decreases this is a good impact. 	<p>Hierarchist:</p> <ul style="list-style-type: none"> • Vacant jobs will increase when more people are needed for maintenance as well as for technical areas, even for administrative posts. • A huge amount is spent on electricity bill now, even if the bill reduced to half, we can save a lot. • Students will be more interested and awareness will increase.
<p>Individualist:</p> <ul style="list-style-type: none"> • The amount school spend on electricity can be saved by renewable energy and this amount can be used for something else. • I don't think this is a good idea to have these kind of machinery in the island. 	<p>Egalitarian:</p> <ul style="list-style-type: none"> • If electricity bill decreases than every household income will be better, when you consider the community also this will be a benefit. • When you do this continuously, it will help with income generation. Expense will be high at the initial stage when you start. • Students studying in technical areas will increase. • This will have a better impact on the health system, as the damages caused by smoke inhalation will decrease. • If we use renewable energy instead of fuel, the amount we spend will increase. • Will get clean air. • This will decrease pollution.

Conclusions and Implications

The objective of this study was to gain insight into the concerns expressed by residents regarding climate change, as well as their attitudes towards the adoption of renewable energy technology. Additionally, the study aimed to examine the social, economic, and environmental impacts associated with the implementation of renewable energy sources, with a specific focus on the context of the Maldives.

An important finding underscores the significance of implementing a system that enables and sustains the installation of solar PV systems in residential communities. This would be of crucial importance, especially for individuals who have a vested interest in the implementation of renewable energy sources, such as those who align with the major egalitarian, as well as a smaller subset of hierarchists and individualists.

Once a substantial quantity of renewable energy is included into the energy portfolio, it becomes imperative to establish a system that can provide benefits not only to utility companies but also to local communities. This study has unveiled both direct and indirect impacts of renewable energy, including but not

limited to the different effects stemming from reduced electricity expenditures. In order to comprehensively address the matter at hand, it would be imperative to duly contemplate and implement a system of this nature at the earliest feasible opportunity.

Land difficulties are a prevalent concern in the Maldives, which cannot be disregarded. The necessity for meticulous consultation and deliberation arises in the context of both social acceptance and the social, economic, and environmental impacts of renewable energy.

The decision to embrace or reject renewable energy lies with the local population, who possess the agency to optimize the social, economic, and environmental benefits associated with its implementation. The inclusion of all individuals in the entirety of the renewable energy deployment process would be of utmost importance.

In order to enhance the scope of this research, it is imperative to emphasize the significance of augmenting the number of case studies. The authors also assert that a more comprehensive examination, encompassing both quantitative and qualitative analysis, is needed in order to validate the research technique and theoretical framework employed. These factors will be thoroughly examined and given due consideration in the subsequent phase.

Acknowledgements

The authors are grateful to the funding provided by The Institute for the Studies of the Global Environment, Sophia University to carry out the questionnaire survey which served as a base for this research and to Ms. Aishath Nahuma and Ms. Zulfeena Ali for her dedicated work on information collection.

References

- Akella, A. K., Saini, R. P., & Sharma, M. P. (2009). Social, economical and environmental impacts of renewable energy systems. *Renewable Energy*, 34(2), 390-396. <https://doi.org/10.1016/j.renene.2008.05.002>.
- Batel, S. (2020). Research on the social acceptance of renewable energy technologies: Past, present and future. *Energy Research & Social Science*, 68. <https://doi.org/10.1016/j.erss.2020.101544>.
- Bellamy, R., & Hulme, M. (2011). Beyond the Tipping Point: Understanding Perceptions of Abrupt Climate Change and Their Implications. *Weather, Climate, and Society*, 3(1), 48-60. <https://doi.org/10.1175/2011wcas1081.1>.
- Bertheau, P. (2020). Assessing the impact of renewable energy on local development and the Sustainable Development Goals: Insights from a small Philippine island. *Technological Forecasting and Social Change*, 153. <https://doi.org/10.1016/j.techfore.2020.119919>.
- Claire Marris, I. H. L. a. T. O. R. (1998). A Quantitative Test of the Cultural Theory of Risk Perceptions: Comparison with the Psychometric Paradigm.
- Dake, K. (1991). Orienting Dispositions in the Perception of Risk An Analysis of

Contemporary Worldviews and Cultural Biases.

- Delrio, P., & Burguillo, M. (2008). Assessing the impact of renewable energy deployment on local sustainability: Towards a theoretical framework. *Renewable and Sustainable Energy Reviews*, 12(5), 1325-1344. <https://doi.org/10.1016/j.rser.2007.03.004>.
- Douglas, M. (1978). *Cultural Bias*: Humanities Press.
- Ian H. Langford, S. G., Ian J. Bateman, Rosemary J. Day, and R. Kerry Turner. (2000). *Public Perceptions of Health Risks from Polluted Coastal Bathing Waters: A Mixed Methodological Analysis Using Cultural Theory*.
- Jaramillo-Nieves, L., Del Río, P. (2010). Contribution of Renewable Energy Sources to the Sustainable Development of Islands: An Overview of the Literature and a Research Agenda. *Sustainability*, 2(3), 783-811. <https://doi.org/10.3390/su2030783>.
- Knoll, E.-M. (2018). The Maldives as an Indian Ocean Crossroads. In *Oxford Research Encyclopedia of Asian History*. <https://doi.org/10.1093/acrefore/9780190277727.013.327>.
- Kumar, M. (2020). *Social, Economic, and Environmental Impacts of Renewable Energy Resources*.
- Marco Verweij, M. D., Richard Ellis, Christoph Engel, Frank Hendriks, Susanne Lohmann, Steven Ney, Steve Rayner and Michael Thompson. (2006). *Clumsy Solutions for a Complex World: The Case of Climate Change*.
- Marris, C., Langford, I.H. and Riordan, T.O. (1996). Integrating sociological and psychological approaches to public perceptions of environmental risks: detailed results from a questionnaire survey.
- Ministry of Environment. (2020). *Maldives Nationally Determined Contribution*.
- Oppenheimer, M., B.C. Glavovic, J. Hinkel, R. van de Wal, A.K. Magnan, A. Abdelgawad, R. Cai, M. Cifuentes-Jara, R.M. DeConto, T. Ghosh, J. Hay, F. Isla, B. Marzeion, B. Meyssignac, and Z. Sebesvari. (2019). *Sea Level Rise and Implications for Low-Lying Islands, Coasts and Communities*.
- Rayner, M. T. a. S. (1998). *Risk and Governance Part I: The Discourses of Climate Change*.
- Sheikh, N. J., Kocaoglu, D. F., & Lutzenhiser, L. (2016). Social and political impacts of renewable energy: Literature review. *Technological Forecasting and Social Change*, 108, 102-110. <https://doi.org/10.1016/j.techfore.2016.04.022>.
- Thompson, M., & Wildavsky, E.R. (1990). *Cultural Theory*. Boulder, CO: Westview Press.
- West, J., Bailey, I., & Winter, M. (2010). Renewable energy policy and public perceptions of renewable energy: A cultural theory approach. *Energy Policy*, 38(10), 5739-5748. <https://doi.org/10.1016/j.enpol.2010.05.024>.