



The Importance and Evaluation of Environment-Friendly Megaprojects - As Perceived By Users

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Abstract

The environmental degradation of our time, the environmental devastation of previous years and global warming have presented the world with new and novel challenges that were not experienced in previous decades. Rising sea levels, increasing energy demand and the explosion in energy prices have created new focal points in the thinking of all spheres of economic life. The environmental degradation of fossil fuels has led to an increasing focus on renewable energy sources and innovative solutions. The aim of this paper is to examine the main issues outlined above through the examples of two flagship megaprojects. The study will examine the Maldivian floating city and the European Energy Island project from a user perspective, specifically in terms of their environmental and visionary messages. In this study, we will examine the two flagship projects through the results of a primary research, formulating the main messages for the design of the future projects. The aim of the study is to demonstrate the importance of environmental considerations in the definition of project scope, in order to give a starting point for projects with similar objectives, and to give ideas for their design and implementation. The acceptance of any project by its users is a key success factor, as the two projects under review are intended to demonstrate.

Keywords: Change; Environment; Project; User evaluation

1 Introduction

It is a well-known fact that the impacts of environmental and climate change are extremely wide-ranging. Not only our quality of life, but also our health and future are determined by global processes that can be linked to changes in the natural environment (WHO, 2015; Costello et al., 2009). We can hardly be independent of environmental change. There are very few economic actors that are not directly or indirectly affected by some external environmental change. The environment in which economic actors operate has undergone significant changes in recent decades. Whereas in the past the pace of change was slower and the economic systems were not so extensive, these actors could operate in a much simpler, so-called static environment. In such an environment, the pace and speed of change was not so rapid that it would have placed a significant strain on the day-to-day functioning of economic agents. However, recent decades have changed this situation. After the Second World War, the world economy started to grow intensively, if we only look at GDP or world trade. Population growth has also been unprecedented in our history. It is practically impossible to list all the factors that have made the economic system of our time so complex and changeable. Yet the

effects of globalisation, the development of telecommunications and the spread of the internet (digitalisation), the emergence of new consumer awareness, the easier availability of resources, the proximity of distant markets, etc., are very often highlighted, as are new trends such as sustainability. The reasons for the slow shift from a static environment to a turbulent global environment are almost endless. Of course, this does not mean that all areas of life have the same environmental conditions. But we can say that most economic actors are experiencing an acceleration of events and that these changes require us to respond in some way. We can relate climate variability in the natural environment to sudden and irreversible changes in ecosystems (Malhi et al., 2019). This paper also focuses on changes in the natural environment as a primary focus of environmental change and presents examples of good responses to such challenges.

It was mentioned in the introduction that for most economic actors the world has accelerated and events are becoming more intense and varied, impacting on our daily lives (Russell-Jones, 2005). The complexity of economic globalisation and the increased dynamism of business have also led to a surge in unexpected events and changes. These come from our immediate environment and have an impact on our daily lives. Among the most significant environmental changes of our time are digitalisation, sustainability and the green transition, technological advances, the COVID-19 crisis, the Russian-Ukrainian conflict, the energy crisis and, last but not least, the environmental degradation that has been observed for decades, or the impact of global warming. There are common points and differences. The common point is that they all affect a large number of economic actors, while there is also a fundamental difference.

Part of the environmental change is taking place in the natural environment, which we can only influence indirectly, while the other part is taking place in the social environment. Global environmental change is a topic that is increasingly discussed in the literature (Pyhälä et al., 2016). Changes in the natural environment include global warming, the green transition or resource scarcity. Changes in these areas could be caused or triggered by human activity, but it is essentially the natural environment itself that is driving the change process. In the social environment, on the other hand, it is humanity, the economic actors, who cause the change and who carry out the change. Digitalisation or the conflict between Russia and Ukraine are clearly changes caused by humanity and are also being carried out by people themselves. Human activity, which is mostly a feature of the social environment, is changing many of the world's natural systems, including the climate system (McMichael et al., 2008).

Global environmental change is challenging both natural and social scientists to better understand. Global environmental change offers a strategy for combining the efforts of natural and social scientists to better understand how our actions affect global changes and how these changes affect us (NRC, 1992). Whatever the environment in which the change takes place, it will affect a narrow or broad range of actors. Each of the processes identified above has affected economic actors and people more broadly, so that none of the events has not been an epoch-shaping factor in recent years (Shi, 2018). Of the environmental changes, changes in the natural environment are the main focus. Among the changes in the natural environment, climate change is one of the most significant challenges (Lenton et al., 2019). It is a proven fact that climate change has negative impacts on people's lives (Stern, 2006).

In terms of concrete economic impacts, this is reflected in the deterioration of access to adequate drinking water, the negative impact on food production, and the deterioration of people's health and the quality and condition of the environment. Environmental change can only be considered in a

complex, even global, way (Norgaard-Bode, 1998). This is because ecological change cannot be limited to a narrow geographical context. Global warming or resource scarcity does not stop at national borders and does not discriminate between people and people. What is more, the effects of changes in the natural environment spill over into the social environment, where they have their real impact. Changes in the natural environment can all affect the lives of societies more widely, but this is not always the case in the social environment, where, for example, the closure of an economic organisation that did not have a large market share anyway may not affect the lives of many people. In the natural environment, there are fewer changes that are concentrated in a narrow segment of society, if only because, for example, natural disasters do not happen every day, but in the economy, new products may be released on a daily basis, causing changes in some consumers. The social environment is more likely to generate a number of changes, but not all of them are comprehensive. In the natural environment, we see fewer changes, but most of them have a knock-on effect on several people or economic actors.

The drive for sustainability, which has also become a dominant trend today and is linked to the natural environment, can also be seen as a response to changes in the natural environment. The concept of sustainability dates back to the 1960s, although its roots go back even further (McKenzie, 2004; Engelman, 2013). The underlying causes of sustainability can be highlighted as societal environmental changes, such as globalisation, market liberalisation, international factor mobility or the emergence of economic integration. These have been created by the social environment and have had an impact on the natural environment.

This has led to adverse processes in the natural environment, and nature has reacted in its own way. Climate change is now an alteration of the natural environment, the effects of which feed back into the environment that actually caused it, which was none other than our social environment. The consequences can be unforeseeable. Rising sea levels, rising average annual temperatures, water scarcity, drought, energy shortages, while our continuing population growth will only place greater demands on the planet's resources, which are in turn becoming increasingly scarce and scarce. Fossil fuels are extremely polluting, and we must take significant steps to keep our air and water clean. Climate change is a threat to vulnerable societies.

It can cause heat waves, floods, tornadoes, hurricanes, droughts, fires and the disappearance of glaciers (Cianconi et al., 2020; Church et al., 2013). We need new thinking and new awareness to protect the values of the natural environment. We need to implement projects and investments that are sufficiently innovative and green to mitigate or possibly prevent negative impacts on the natural environment and adverse changes in the natural environment. Understand the ecological dynamics of climate impacts, identify vulnerabilities and points of resilience. Identify intervention steps that can help build resilience of the biosphere to climate change. At the same time, ecosystems can also help mitigate and adapt to climate change. The mechanisms, opportunities and constraints of climate change solutions need to be explored and quantified as clearly as possible. Environmental problems are more common in developing countries and less developed countries need more money and investment to become more sustainable.

Developing countries need to invest more in promoting environmentally friendly activities and responding to the risks of climate change (Ahmed et al., 2018). However, there is no question that responding to environmental challenges requires funding and targeted investments, projects and development (Varga – Csiszárík-Kocsir, 2019; Dobos et al., 2022). Some people need to spend more

and others less, but we are talking about something that is a common concern for all. We have talked about global environmental change, which includes the word global.

2 Material and Method

The megaprojects presented in this study are included in the list of the top 50 projects published by the Project Management Institute (PMI, 2021). The questionnaire on which this study is based was completed in April 2022 by the survey respondents. The questionnaire included 14 megaprojects that were on the priority project list published by PMI. The projects included in the survey were selected on the basis of their relevance to the challenges of the 21st century, and thus projects with an environmental, innovation or digital aspect were selected for the survey. The survey was conducted using an online questionnaire with the survey facilitator present throughout. The projects were presented first and then the questionnaire on which the evaluation was based was completed. For each of the characteristics of the project scope, an effort was made to provide clear and general characteristics. Where the meaning of a characteristic was not clear to respondents, they were given the opportunity to clarify its meaning. The research was conducted as a pilot programme and is not intended to be repeated for the present projects. However, we intend to measure the priority projects on the 2022 project list on a larger sample of projects with similar criteria. The results obtained are intended to provide a basis for the design of future projects, in order to define similar project ideas and provide an external reference point for defining them.

The study presents two projects that address contemporary environmental problems, meet the requirements of environmental protection and conservation, and are considered to be important and interesting from a user perspective. The two selected projects (Energy Island, Maldives Floating City) were evaluated from the perspective of ordinary people as users, i.e. there was no educational background or previous project management experience as a prerequisite for inclusion in the sample, so the questionnaire on which the evaluation was based could be completed by anyone. Respondents were asked to rate the selected projects according to some factors of project scope. Respondents rated the factors on a scale of 1 to 4, with a value of 1 indicating a very weak factor and a value of 4 indicating a very strong factor. We then examined how respondents rated the project overall on a scale of 1 to 5, where 1 was the weakest and 5 the best, and then used significance analysis to see if there was a correlation between the specific scope characteristic and the overall rating of the project. There were 172 evaluable responses to the questions. Of the sample respondents, 39.5% had a tertiary education and 60.5% had a secondary education. 12.2% of the respondents are Generation Y, 23.3% are Generation X and 64.5% are Generation Z. The survey was conducted in April and May 2022.

3 Results

3.1 User Evaluation of the Maldives Floating City project

The 24th ranked Maldivian floating city project looks like a utopia at first glance. But the problem it seeks to solve is very real. The island nation will be one of the biggest victims of global warming in the near future. It is estimated that sea levels could rise by as much as half a metre by 2100, which means that 77% of the island group will be covered by water. That is why decision-makers have tried to run ahead and find a solution to the looming problem. The project itself would be built in a warm-water lagoon not far from the Maldivian capital. The project would provide homes for thousands of families, in addition to hospital and school facilities and commercial property. The floating city would rely entirely on renewable energy to protect the environment. The floating city would be both flexible and stable, following the geometric pattern of the local coral. If successful, the project could be a

model for all countries involved, as it would be the world’s first and largest floating structure, with 5,000 floating houses. Construction was scheduled to start in 2022, which is estimated to take 5 years (PMI, 2021).

Respondents gave the project the highest average rating of interest and a very high rating of novelty, above 3.5. The uniqueness of the project and its future focus also received a high rating, with an average of over 3.4. In addition, the project design presented was considered by many to be useful, usable, of public interest and feasible. However, the respondents felt that the environmental, profit orientation, and cost saving aspects of the project were less dominant. Thus, many fear that the project will be implemented with a very high budget, which will be a problem in terms of usability and utilisation, i.e. poorer people, who are more in need, will not be able to benefit from this solution.

Table 1: Scope assessment of the Maldives floating city based on means and standard deviations

	Mean	St. dev.
Novelty	3,512	0,662
Usefulness	3,198	0,821
Interesting	3,558	0,594
Future Focus	3,465	0,737
Sustainability	2,971	0,812
Relevance	2,930	0,835
Feasibility	3,000	0,692
Usability	3,174	0,752
Public Interest	3,140	0,887
Profit Orientation	2,721	1,067
Uniqueness	3,494	0,662
Cost-Effectiveness	2,320	0,903
Environmental Awareness	2,860	0,881

When looking at the overall rating of the project, it was rated very highly by the respondents. Overall, they rated the project 3.98 on a five-point scale. The overwhelming majority of the ratings were in the positive direction, with only three respondents rating it as unsatisfactory, which clearly indicates acceptance and positive reception of the project idea.

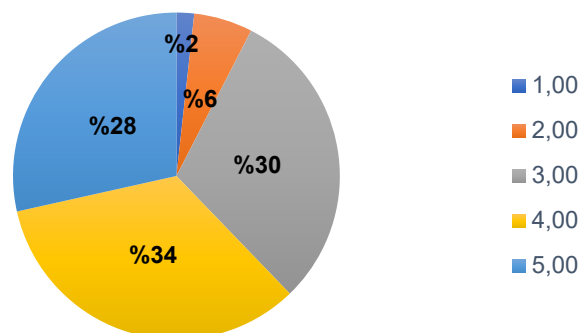


Fig. 1: Average rating of the Maldives Floating City project

We also wanted to find out whether the overall perception of the project is related to certain characteristics of the project scope. As shown in the Anova table below, a correlation was found for almost all characteristics, as the significance value was below 5% for all characteristics tested. This suggests that respondents who rated positively all the characteristics of the scope also rated the project itself highly. This shows that the project design presented a positive picture from the users' point of view, i.e. its innovativeness and novelty is certainly exemplary and should be followed if the project is successful.

Table 2: Correlation of the Maldivian Floating City scope elements with the project evaluation

	F	Sig.
Novelty	9,239	0,000
Usefulness	17,390	0,000
Interesting	12,740	0,000
Future Focus	25,109	0,000
Sustainability	10,214	0,000
Relevance	13,206	0,000
Feasibility	5,616	0,000
Usability	9,293	0,000
Public Interest	10,714	0,000
Profit Orientation	5,385	0,000
Uniqueness	4,206	0,003
Cost-Effectiveness	3,340	0,012
Environmental Awareness	9,985	0,000

3.2 Evaluation of the Energy Island Project from the User Perspective

The project ranked 9th in the PMI Top 50. Thirty years after Denmark built its first offshore wind farm, it is now embarking on another gigantic project to secure the country's entire energy supply from renewable sources. To do this, they want to create an artificial offshore island capable of collecting, storing and delivering the energy generated by the surrounding wind farms to where it is needed. The surplus energy that they plan to produce will be sold to other parts of Europe, providing part of their electricity supply from renewable energy sources. The project is scheduled to come on stream in 2023, and will be defined as one of the largest construction projects in the country's history in terms of budget. The gigantic scale of the project could once again serve as a model for other coastal countries, offering an alternative to renewable energy projects that take up land (PMI, 2021).

For some characteristics of the project coverage, it can be seen that, in contrast to the Maldives Floating City, there was a much higher proportion of characteristics above 3.5. The future focus of the project was ranked first, practically the highest on the scale, but utility, environmental awareness, public interest, sustainability and usability of the project were also highly rated (in descending order). The lowest score for each of the scope characteristics was for the profit orientation of the project, which was the only characteristic below 3 for the factors studied. At the very end of the list, in addition to profitability, were feasibility and cost-effectiveness. Overall, it can be said that the purpose of the project was clearly appreciated by the respondents.

Table 3: Assessment of the scope of the energy island based on means and variances

	Mean	St. dev.
Novelty	3,465	0,687
Usefulness	3,767	0,566
Interesting	3,465	0,737
Future Focus	3,831	0,460
Sustainability	3,593	0,628
Relevance	3,331	0,710
Feasibility	3,180	0,715
Usability	3,523	0,653
Public Interest	3,651	0,636
Profit Orientation	2,645	0,983
Uniqueness	3,285	0,806
Cost-Effectiveness	3,093	0,818
Environmental Awareness	3,698	0,603

If we look at the average project rating, it is much higher than for the previous project. Respondents rated the project above 4.4 on a five-point scale, which is a very high level of acceptance. Almost 60% of respondents gave the project a rating of 5, the highest on the scale. Among the ratings, there is no score of one, and only 3 out of 2. This shows that respondents were positive about the project plan to tackle the energy crisis, and that the success of the project could be an example for other countries to follow in responding to the increasingly serious energy issue of today.

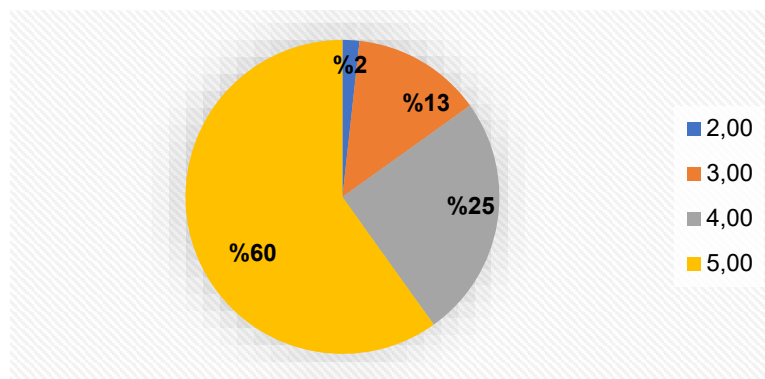


Fig. 2: Average evaluation of the Energy Island project

As with the previous project, we were interested to see if there was a significant relationship between the rating of each feature of the project scope and the overall rating of the project. In this case, too, this relationship was found for the vast majority of the individual characteristics. Only project orientation and uniqueness did not show a significant correlation with the users' perception of the project, i.e. it can be stated that there is a clearly detectable relationship between those who positively evaluated the project and the overall acceptance of the scope.

Table 4: Correlation of energy island scope elements with project evaluation

	F	Sig.
Novelty	7,732	0,000
Usefulness	22,470	0,000
Interesting	7,665	0,000
Future Focus	21,391	0,000
Sustainability	10,402	0,000
Relevance	9,196	0,000
Feasibility	2,692	0,048
Usability	16,390	0,000
Public Interest	19,501	0,000
Profit Orientation	0,456	0,714
Uniqueness	1,262	0,289
Cost-Effectiveness	5,479	0,001
Environmental Awareness	3,725	0,013

4 Conclusion

Today's increasingly serious environmental problems call for new and innovative solutions. The challenges that have arisen from the environmental degradation of previous years cannot be tackled by traditional means because our existing knowledge is finite. That is why only innovation can provide solutions. The two projects presented in this study are highly regarded for their innovation. Both projects aim to address acute problems that could become serious in the decades ahead. Rising sea levels, the increasing depletion of conventional energy sources and the environmental damage they are causing are problems that must be addressed. The project plans presented in this study can only be described as pilot programmes for the time being, but their success will provide solutions to the problems described above. The positive nature of the projects has been demonstrated by the present non-representative research and can be used as a model for future similar projects in order to provide more workable solutions to the challenges of environmental degradation. We intend to continue this research in the future, especially during the implementation phase of the projects, in order to provide a starting point for future projects with similar objectives.

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