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To cite this article: M Leus *et al* 2018 *IOP Conf. Ser.: Earth Environ. Sci.* **143** 012059

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Architectural design led approach to sustainable tourism for the waterfront development of Kunduchi in Tanzania

M Leus¹, P Winkels and E Hannes

Faculty of Architecture and Arts, University of Hasselt, Agoralaan Gebouw E, 3590 Diepenbeek, Belgium

¹ Corresponding author. E-mail address: maria.leus@uhasselt.be

Abstract. In Kunduchi, located in the Kinondoni district of the Dar es Salaam Region, it is of vital importance for the lives and livelihoods of the indigenous people to preserve the typical ecosystems and ensure the identity and economic resilience of these areas. The problem statement is as follows: In what way can sustainable tourism in Kunduchi serve as an engine for economic and social empowerment? How can Kunduchi be an inspiring example for the development of the coast of Dar Es Salaam in Tanzania that is threatened by large-scale tourist infrastructure? How to design sustainable solutions with respect for the local community and the local traditions? Firstly, a theoretical framework that connects sustainable tourism with the sustainable development of coastal areas is defined. Assumptions made on the basis of the literature review provide parameters that play an important role in the architectural concepts. Secondly, a research by design is presented in order to analyze and evaluate different scenarios to outline the opportunities of sustainable tourism on site of Kunduchi. Sustainable waterfront development is an obvious subtitle since the subtle spatial integration of these projects in the urban and water related context of Dares Salaam is of major importance.

1. Introduction

The World Ocean covers seven-tenths of the planet's surface and many societies depend on its health. The decline of fish populations and sea biodiversity occurs all around the world. In Tanzania approximately eight million people are living in coastal communities dependent on ecosystems typical for these coastal regions. Currently several coastal areas including Kunduchi, located in the Kinondoni district of the rapidly growing city Dar es Salaam Region, are under severe pressure because of frequent unsustainable use of natural resources. The inhabitants of Kunduchi depend on *fisheries* and coastal ecosystems. Various activities including overfishing, coral mining, mangrove-mining and waste water discharges permanently damage the ecosystems [1]. Kunduchi is an area with its own identity and with important natural resources. But the coastal zone of Kunduchi can also be considered as a deprived area. Deprivation is caused by a lack of social and economic development linked to three factors. First, there is a lack of economic activity; fishing is almost the only economic source. However, due to overfishing this is a vulnerable source. Secondly, in the future this area will be subject to an aggressive urban sprawl, so the identity of the site will be lost. Thirdly, there is a need for an additional economic development. Kunduchi has a unique mix of social engagement and aquatic knowledge to tackle these problems.

To develop this vulnerable coastal heritage site into valuable, livable spaces where experience and safeguarding of the local identity is essential, a more sustainable perspective to the waterfront development and tourism is inevitable. Sustainable tourism can be one of the possible strategies to



overcome this deprivation, mainly economically and socially. Sustainable tourism in developing countries is even more crucial because of the lack of proactive legislations and policies [2]. Sustainability is based on the credo “people planet profit”. Together these three dimensions represent the wealth and development potential of the society. They are interconnected with each other in such a way that any change in dimension will have an effect on the other ones.

Only by a strategic tourism action plan with an overall vision that adopts a holistic approach with a balance between the benefits for human, planet and economy, tourism can be sustainable.

2. Aim, a search for synergies

The problem statements are as follows: In what way can new developments associated with sustainable tourism in Kunduchi serve as an engine for economic and social empowerment? How to develop the coast of Kunduchi that is threatened by large-scale tourist infrastructure, in a sustainable way with respect for the local population and the local traditions? How can we empower the local communities that are part of the DNA of the Tanzanian coastline to counter the pressure of the fast growing city of Dar es Salaam?

In the design studio, the focus was not on tourism but undifferentiated phenomenon, but on types of tourism that are triggered by positive architectural interventions with respect for the cultural and natural identity and the host community in order to create a liveable site. The goal of the design studio was to create architectural interventions for a liveable community, building on its unique ecological and human capital and respecting the uniqueness, the identity of coastal areas. The design proposals must add value to the daily life of the local community. This objective can only be guaranteed when the local inhabitants will enclose the projects in their heart. Therefore people have to understand the aim, by understanding they will appreciate and value it so they will take care of it, long after architects and contractors are out of sight.

The functions that should be developed concerning sustainable development must be based on the current and potential qualities of nature and the identity of the region. The objective is to protect the natural biodiversity along with the underlying ecological structure and the supporting processes in the environment as well as promoting education, innovative economic and sustainable concepts and recreation.

Sustainable development projects must unite the social community and the economic fabric of the area. Using the cultural biography as an instrument for revitalisation means “preservation through development”. To do this, one needs to invest in the development and the enhancement of the identity of the site, in available knowledge, in the potential for economic activity in the region, and in its potentiality to attract tourism [3].

3. Methodology: Research by design as a tool for sustainable development

The material for this investigation is provided by a design course at the Faculty of Architecture & Arts of the University of Hasselt in Belgium and is part of a collaborative two-year research project funded by VLIR/UOS with the School of Architecture of Ardhi University of Dar Es Salaam, Tanzania. In the design studio, research by design is the guiding principle.

The theme of the design studio and the studio’s official assignment is ecotourism in urban waterfront developments. According to the International Ecotourism Society ecotourism is defined as: “Responsible travel to natural areas that conserves the environment, sustains the well-being of the local people, and involves interpretation and education”[4]. Considering the urban context of Dar es Salaam the studio’s assignment was redefined to sustainable tourism as explained by UNWTO “Sustainable tourism is tourism development with a balance between environmental, economic and socio-cultural aspects” [5].

Based on sustainable design and capacity building principles, this project addresses issues around sustainable tourism, sustainable economy, waterfront development and social responsibility. In 2014 Tanzania became a member of the World Green Building Council [6]. A green building is defined as a building that is energy efficient, resource efficient and environmentally responsible, incorporating design, construction and operational practices that significantly reduce or eliminate its

negative impact on the environment and its occupants. Because the built environment plays such an important role in social welfare, climate responsive buildings can make a valuable contribution to the social aspect of a community.

4. Sustainable tourism, an opportunity for implementing sustainable development goals

Tourism can be considered as an important stimulator for the whole economic system. Tourism is one of the most important industries for the economy of a country and results in an increase of the gross national product and gross domestic product. It ensures an increase in added value creates jobs and plays an important role in improving the competition between local and international companies, which leads to investments of public services [7]. In many cases tourism is a source of income for the local community which can be an important lever for the general social situation. But tourist activities can also affect a community's social and natural sources. In order to avoid that the tourist capacity is exceeded, there is a need for an adapted and sustainable development of tourism in Kunduchi. The charter for sustainable tourism of Lanzarote states that "*Tourism must consider its effects on the cultural heritage and traditional elements, activities and dynamics of each local community*" [8]. The recognition of the identity and interests of the local communities must always play a central role in the design of tourism strategies. This charter also underlines that "To participate in sustainable development, tourism must be based on the diversity of opportunities offered by the local economy. It should be fully integrated into and contribute positively to local economic development". Tourism can support the specific character of this area, hence increasing the attraction of the site.

Notwithstanding all these benefits, tourism should not be taken for granted as 'a key to a golden future for the destination' [9]. Sustainable tourism should be 'culture and nature-friendly'. The protection of the natural-cultural heritage areas, biodiversity and eco-systems must be guaranteed. Secondly, sustainable-tourism must have a positive impact for the local community on both the socio-cultural and economic level. Sustainable tourism should respect the identity of the living environment, the socio-cultural authenticity of the host community, their heritage and traditional values and it should contribute to intercultural understanding and tolerance. Thirdly, the ecologically-sound way of opening up of the site by tourism must offer a high quality experience to the visitors.

Sustainable tourism is more than offering a banal market product. It is finding a delicate balance between daily life of an area and welcoming outsiders to visit and experience the uniqueness of the site. The identity of the coastal region is an important tourism product that should be safeguarded. The commitment to sustainability must be strengthened. A crucial element is the overall consciousness of the issue to ensure the coherence of the initiatives. Therefore education is desirable. Knowledge is a key in the whole process. Education for policy makers, the local community and tourist operators will encourage the understanding, appreciation and the care for this vulnerable site and the planet.

5. Case study: Kunduchi

Kunduchi is approximately 15 miles, to the northwest of the Dar es Salaam metropole and borders to the North on the river Tegeta and in the South on the Manyema Creek which is very dependent on tides [10]. Like every town, Kunduchi has to deal with general problems like urban sprawl of the city by pressures on greenfield development.

The research area in Kunduchi is located at the coastal line and includes different zones that are clearly separated: the Kunduchi Beach Hotel and resort, a fishing village, an abandoned university site and a green zone.

The Kunduchi Beach Hotel and Resort in Afro-Arabic style was built in 1971 and is recognized as one of the 100 best hotels in the world. During the 1980's erosion threatened the Kunduchi coastline as well as the foundations of the hotel. With the assistance of a number of international renowned engineers and a major financial investment, the land could be reclaimed and the hotel was restored to its original beauty and charm. Yet the hotel is fully walled and its beachline is privatized. Tanzania's largest waterpark, the Wet 'n Wild, is located in between the hotel's entrance pavilion and its lobby. A major parking lot separates the hotel from the surrounding and thus forms a psychological threshold for local inhabitants of Kunduchi.

The fishing village with houses constructed with waste materials is also not freely accessible. The fisherman communities along the Tanzanian coastline descend of the ancient Naga tribes [11]. With a rich past of trade, exchange of cultures and goods, an impressive knowledge of the sea and its fragile life, it is essential to transfer their (hi) story to future generations. When the fishermen obtain more economic stability they can preserve and strengthen the autarky system or self-sufficiency.



Figure 1. Different zones in Kunduchi.

The former university site north of the Hotel Resort is free to enter and is an opportunity for future development. At this moment the old abandoned and dilapidated university buildings create a desolate and hopeless atmosphere. Only a Muslim school is in use.

The green zone, west of the fishing village, the Hotel Resort and the university campus, is completely separated from the ocean. This zone, an open area without a defined function, is used for herding cattle and sports. In addition the area also acts as a meeting place for fishermen and villagers. The site is characterized by beautiful and diverse nature, densely forested areas with giant Baobab trees, open and dry grasslands and a vast mangrove forest that is flooded at times of high water. In the shadow of an impressive Baobab tree lie the historic ruins of an ancient muslim graveyard, as the witnesses of the former intercontinental trading routes [12]. The ruins are decorated with graphic patterns and fine china objects to visualize the status of its 'owner'. Situated at the highest point of this area, elevated above the water and somewhat hidden by the surrounding greenery, this site breathes respect and timelessness.



Figure 2. Beach hotel and resort



Figure 3. Fishermen village



Figure 4. University buildings



Figure 5. Green zone



Figure 6. Ruins

6. Research by design proposals.

The research by design starts from the future's perspective and is a provocation of the prevailing reality principles [13]. It provides opportunities that are currently hidden behind the reality with a view to a new reality. The three key drivers, a focus on the future, developing alternatives and stimulation of

imagination, have a direct influence on the architectural thinking and ensure that problems can be redefined so that new insights are developed towards a foresighted alternative [14]

With an uncompromising naivety and open-minded view of the world, the studio projects of the faculty of architecture of the University of Hasselt aim to be a design inspiration for the Ardhi colleagues, and together with them, all the stakeholders and planners in Dar es Salaam.

Three case studies in three different areas are presented as inspirations for the sustainable development in relationship with eco-tourism of the coastal site of Kunduchi. The design proposals aim to find appropriate solutions for these areas that entail a balance between development and sustainability in terms of preservation of local culture, economy (sustainable tourism) and ecology. The first design proposal analyses local food production in order to dissolve social, spatial, and economic resilience. The second design proposal focusses on upgrading local life and nature through aquaculture. The third design examines the revival of the old aquatic sciences faculty site by creating a sea lab as an educational hub for scientists as well as for the host community.

6.1. Case 1. Food over Boundaries

The Food over Boundaries, in its focus on local food production, searches for a sustainable synergy between the hotel and the fishermen's community, between the tourists and the residents of Kunduchi. In this design, project local food production becomes the catalyst to dissolve social, spatial, and economic boundaries that are predominantly present at Kunduchi [15,16]

Developing countries face major challenges which are subject to several problems that continue to increase, for which urgent solutions have to be sought before they escalate. 'Urban farming' can offer a suitable solution for some of these problems such as food shortages, limited economies, vulnerability to crises, the disappearance of green areas. In addition to healthy and fresh food, urban farming gives the local community additional economic stability, making them more independent of the global food market. A very important development target in many African cities, including Dar es Salaam, is to provide a reliable source of food for everyone who lives in and around the city. If this is not the case, the society will be unstable and civil unrest will increase [17].

The goal of the project is twofold: firstly empowering local inhabitants by giving them more economic resilience by adding sustainable local food production to the site and secondly characterising the Kunduchi Beach hotel as a 'healthy living' hotel that offers its guests a high quality local food and natural swimming experience.

The design implements urban farming in the green area of Kunduchi with farmhouses at the centre, in between crops, the fishermen's village and the hotel. The project focusses on three actions: working, learning and enjoying so that the urban farm becomes a meeting place, a place to work, a place to eat and relax, and a place to learn about sustainable farming techniques.

The aim of the project is that Kunduchi will be known as a respectful city quarter that functions as an example for the small plot farms spread over the entire city of Dar es Salaam. Thus food will be the engine to transcend the existing social, economic and spatial boundaries and it will create a synergy between the fishermen's community and the hotel, between local residents and tourists.

The project proposal is carried out in three phases. The first phase consists of the development of an agricultural project. The open green zone is reserved as an agricultural area that produces food for the hotel. The fishermen village will be a place for subsistence production by means of square-meter-gardens. In the second phase, the creation of a 'learning center' or a consultation forum will bring fishermen and tourists together on basis of exchange of knowledge. This community project can be financed with the output of the agricultural projects. The third phase focuses on tourists who want to stay in eco-lodging units. The pavilions are characterised by constructive simplicity so that the buildings can be constructed by the local labour and local available materials. Also principles of climate response buildings are integrated to create low tech solutions. The future vision is that the Kunduchi beach hotel can become a 'foody hotel', some kind of health- and eco resort. When the existing Wet 'n Wild waterpark will be replaced by an ecological swimming zone in harmony with the environment, this will

mark the natural qualities of this area. By creating a synergy with the hotel, the urban farming concept is brought to an innovative level.

The integration of urban farming in architecture on a small scale provides the best chances of success. Vanderstadt concluded that urban farming on a small scale by inhabitants and users of the city is at least as important as urban farming on a large scale professional level [18].

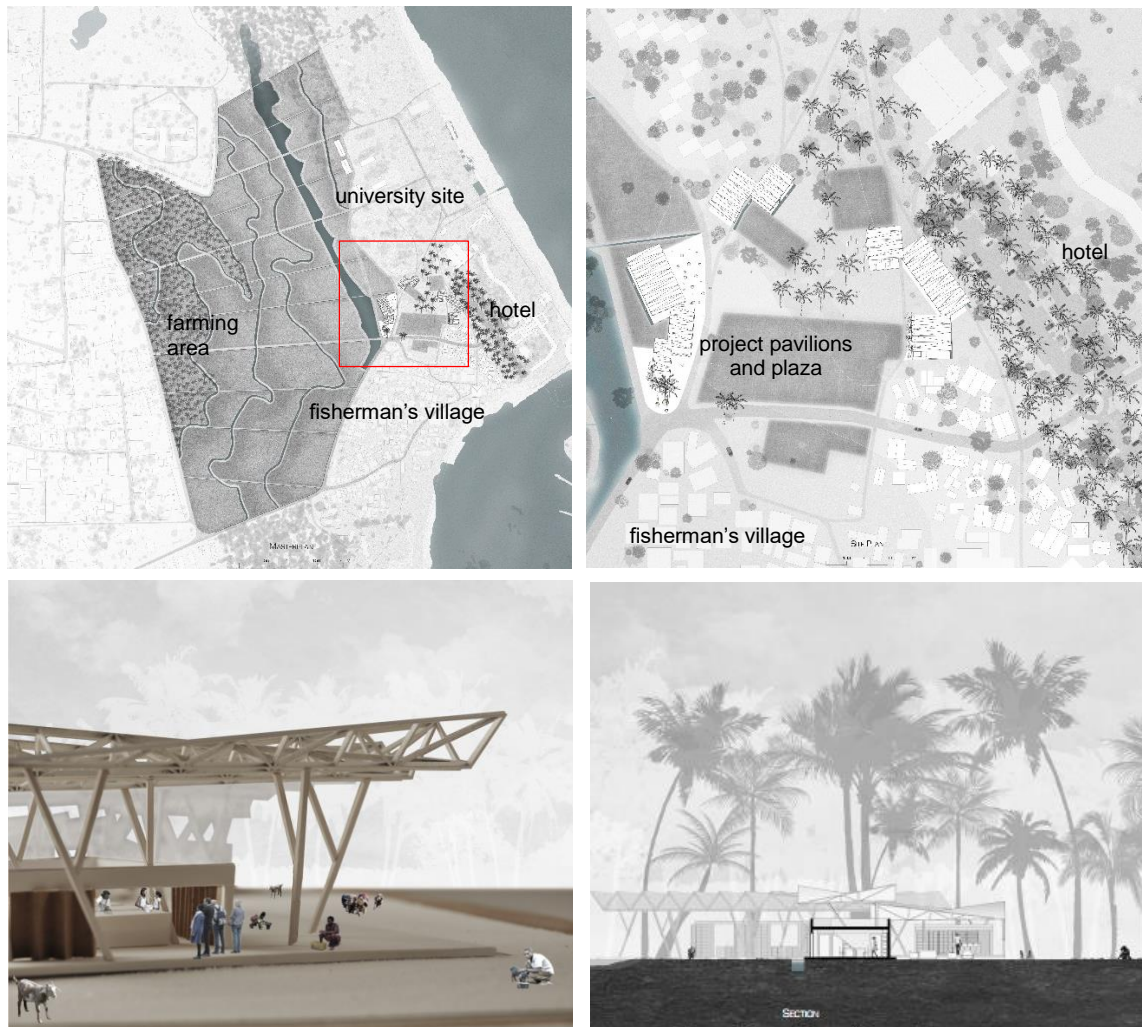


Figure 7. Food over Boundaries [15, 16]

By investing in sustainable agricultural methods cities of developing countries are given the opportunity for the development of a sustainable living environment with a positive impact on climate change [19].

6.2. Case 2. Fisherman and Sons

The second design project is based on research of the fishermen's economic situation and tries to upgrade local life and nature through aquaculture [20]. The title 'Fisherman and sons' refers to the English companies that often had the name of their founders or of their sons, that joined in the next generation. 'Fisherman and Sons' is about recreating a nature reserve in synergy with aquaculture activities, at the reef island, bordering the fishermen's village. The nature reserve and aquaculture are mutually beneficial. The project examines sustainable fishing, the preservation of corals reefs and the importance of ecological balance. At present, the financial gap between tourists and residents of the

fishing village is wide. When this gap narrows and tourists support the local economy this will encourage mutual respect between tourists and local residents.

The design proposes to transform the island into an eco-economic hub with extensive fish farming with installations of breeding zones and labs in combination with seaweed farming. In order to minimize the environmental impact of the intensification of the fish production, the Recirculating Aquaculture System (RAS) can be used [21]. The existing wave breakers will be used as ponds. The shallow zones are perfect for installing seaweed fields while the deep areas can serve as fish growing ponds. The architectural concept is expressed by a series of pavilions, designed with a specific architectural appearance that facilitates the new activities: a hatchery building, a workmen's space, a workshop space, an information point, and a restaurant. Although the pavilions have the same materials and dimensions, each of these pavilions has a unique relation with its surroundings. The pavilions blend into the landscape and accentuate surprising views on the nature reserve and its surroundings.



Figure 8. Fisherman and Sons [20].

To increase the coastal resilience mangroves are restored and replanted to prevent further coastal erosion. This action will also attract new wildlife. The created nature reserve invites visitors to experience local nature and wildlife. This gives them the opportunity to visit the Saadani National Park, to learn about the daily life of the Kunduchi fishermen and about native and contemporary fishing techniques.

6.3. Case 3. Sealab

The third design concept is highlighted by a sea lab as an educational hub, a kind of awareness center for the fragility of the oceans [22]. The goal is to revive the old aquatic sciences faculty site in Kunduchi into a place where the people of Kunduchi and scientists can combine their knowledge and work together to search for new sustainable solutions. This research centre, where academic and daily life knowledge of the fishermen are combined in a visitors centre, serves as a seamount. The architecture of the building represents a poetical ode to the sea. This seamount that brings the old site back into the spotlight will

attract visitors to explore the unique places of Kunduchi and the Tanzanian Coast with locally trained guides.

The beauty of this project lies in the coherence of the message: creating awareness for the fragility of sealife and the necessity of finding a good balance between man and nature. The design evokes this awareness in its program as well as in the spatial experience, the architectural construction and the technical detailing. The concept of a circle reflects the settlements of remote communities. The pure form triggers curiosity. The outside and inside of the building create intense experiences. The circle shaped building allows a 360 degrees overview over the fantastic environment. On the inside of the circle an almost spiritual place arises where the sea and the sky are the main characters. The morphology of the lab was inspired by biomimicry and craftsmanship of the fishermen in relation with sustainable techniques. The nature's toolbox and processes are adapted in the design. The wooden construction is based on the fisherman's craftsmanship to build and restore boats. The roof reflects the elegance and structure of palm leaves and creates natural ventilation. The interior walls are based on the construction of a beehive, the techniques that bees use to cool their hive and protect the honey.

This awareness centre provides the inhabitants of Dar es Salaam with important and interesting information on their natural resources and will surely become a touristic point of interest in the network of unique visitable sites along the coastline.

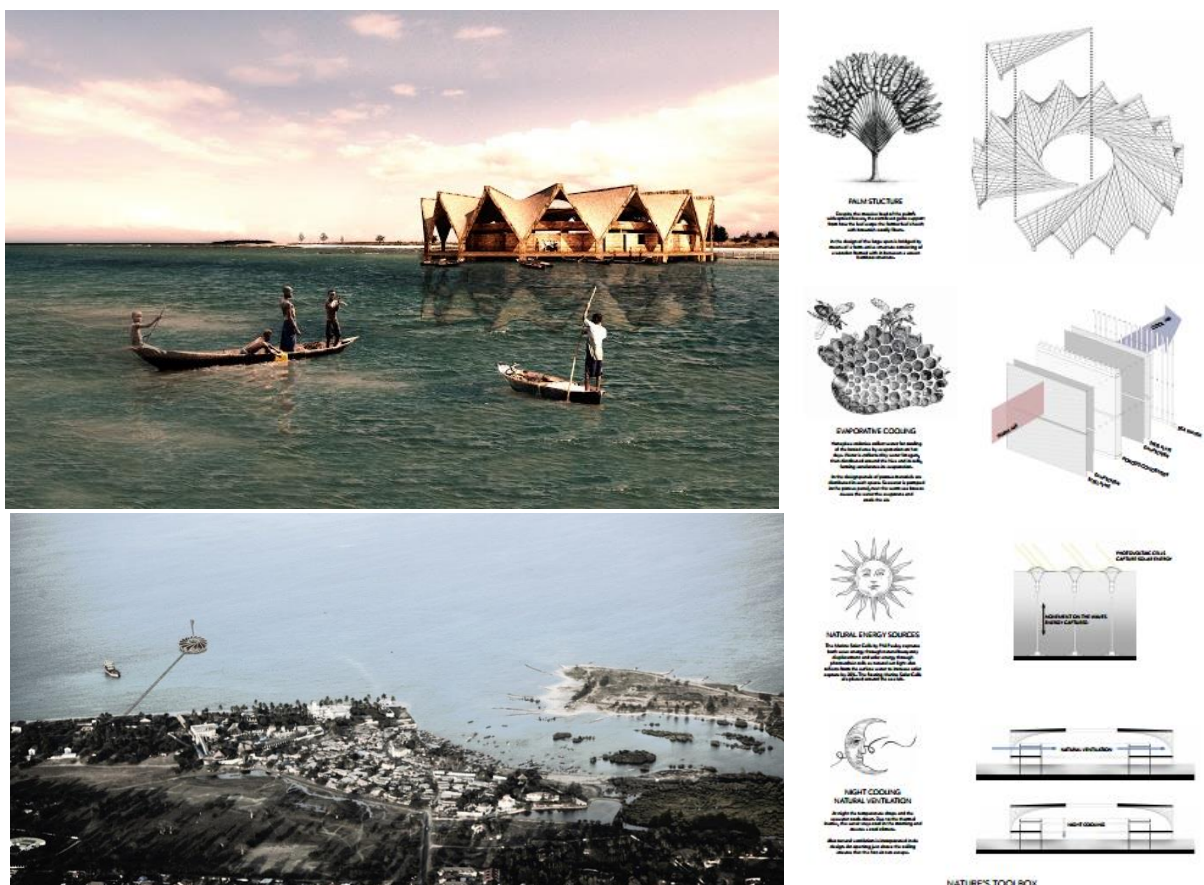


Figure 9. Sealab [22].

With this project, Frioni won the third prize of the Euregional Architecture Competition in 2015. The Euregional Prize for Architecture is a cross-border prize awarded annually to the best graduate project in one of the five participating schools of architecture in the so-called Euregion Meuse-Rhine, the European region spanning part of Germany, the Netherlands and Belgium. The jury report praised this

project for its technical precision and consistency. “This very sensitive project touches on global issues in a very humble way. Local knowledge, vernacular and craftsmanship shape the training and teaching centre for local fishermen. The project addresses the topic of overfishing and polluting our oceans and the aquatic building itself has been worked out into the smallest detail” [23].

7. Evaluation of the design proposals and effects of the proposed scenarios

The criteria applied for the design evaluation of the design proposals were coherent, appropriated and captivating. The evaluation matrix in table 1 gives information about the assessment of each case.

Table 1. Evaluation matrix

Criteria	Case 1. Food over Boundaries	Case 2. Fisherman and Sons	Case 3. Sealab
Coherent	The design decisions of this concept focus on creating a meeting point for all, for people of all walks of life in this city characterized by multi-culturalism and contrasts.	The design is the result of respectful social engagement and commitment. The project also pays attention to economic return for the local community and has a positive effect on the environment and the villages flood resilience.	This a well thought project, on all scales: from research to concept, from the urban level to the architectural project and from volume to detail. Sealab creates inspiring synergies, between all the stakeholders.
Appropriate	The creation of a series of ‘places’ by repeating and varying with one simple construction element and a sloped roof, makes this project affordable; easy to build and charming.	The project fits subtly in its surroundings and is respectful to the environment. The buildings are climate responsive in their concept and low-tech in their design.	Sealab accentuates the beauty and fragility of sea life by its architectural appropriateness. On the one hand it is a humble volume, inspired by biomimicry, on the other hand it draws attention by its unique and captivating formal appearance.
Captivating	In its well-thought location and simple but delicate structure, this project succeeds in respectfully linking all surrounding architectural elements. Being condensed to the elementary components, the design inspires by its formal simplicity and materiality.	The design proposal will be able to convince all viewers because of its humble and well-dimensioned pavilions that fit in naturally. The digital design skills of the designer make him visualize his narrative convincingly, poetically, even to the untrained (non-professional) viewer.	With its simple, archaic circular floorplan and palm leave-like roof structure, surrounded by the water, this pavilion immediately captivates the viewer. The drawing technique, inspired by Darwin’s analytic sketches of plants and insects, strengthens the narrative of this Sealab.

The values of the design proposals were also evaluated based on effects on sustainability and the development of an adequate concept with a long-term vision. The three cases have an appropriate function and deploy an architecture highlighting to increase the sustainability performances and the revitalization of the specific sites. The effects of these sustainable design strategies are a direct reference

to the problems of sustainability based on local, natural and economic aspects: connecting sites, landscapes and communities. As Deniz pointed out: “Environmental awareness and sustainability are not only environmental, but also ethical and social issues that new generations of designers should consider to minimize negative impacts of their works” [24]. Embracing environmental issues in design also will have a positive effect on students personal development in sustainable creative thinking because it strengthens potentials for comparative analysis and creative development of deep innovation.

In addition starting from the local socio-economic and environmental situation, these projects are firmly rooted in everyday reality of the site and the contemporary needs of the urban dwellers. Through low-tech interventions and by rephrasing the existing components, students turn this challenging situation into a positive opportunity for the city and its inhabitants.

8. Conclusion

Managing these fragile natural heritage sites according to the principles of sustainable tourism is a challenging task that starts from a holistic and forward-looking approach. The quality of a tourist destination is highly dependent on the natural and cultural heritage [7]. Being aware of the role of the cultural and natural heritage is an important element in strengthening the regional and global cooperation and a major step in the implementation of sustainable development [7].

Sustainable tourism has a particular focus on the preservation and protection of the environment with respect for the local culture. Chapter 28 of Agenda 21 for the Travel and Tourist industry emphasises that the local population should play a prominent role in projects for a sustainable tourism [25]. and cooperation between all actors’ [26]. Hence sustainable tourism should aim to maximize the benefits of tourism to the host community. The host community can be described as a complete social structure, including the local community, the private and public sector and the educational institutes. An integrated and integral approach is necessary.

The proposed solutions for the problems of Kunduchi are positive steps to attract both the interest of the host community and the policy makers. Education and communication belong to the core of the tourist concept and are essential for a sustainable future [27]. The commitment to sustainability must be reinforced. An important part of strengthening the commitment is the awareness of the issues. Knowledge is a key in the whole process.

9. Evaluation of the education project

This cross continental cooperative service learning project, undertaken by the two faculties of architecture, works out to everyone’s benefit and delivered a variety of experience. Dehabituation is one of the key-words in this academic experience for the Belgian students as well as for their Tanzanian counterparts. Everything the Belgian students think to know about urbanism, building and everyday life seems irrelevant in the Dar context. They have to start thinking ‘out-of-the-box’ which urges them to come up with surprising paths and innovative concepts. By empathically implementing new components, new synergies between present identities on site (people, buildings, natural resources and activities) take form to act as drivers for change. Because of this the projects cast new light on the existing qualities of the area and attract the attention of new public.

Resulting from a parallel design studio assignment, the positive effect of these projects lies not only in the content but also in the ‘new eyes’ that this intercontinental research by design collaboration brings. Multiple moments of reflection and interaction between the students during the academic year, stressed the added value of intercultural cooperation, improved and broadened the master projects and helped students to become better architects, prepared to cope with a changing society. By this project the sensitivity of the students for the social context is triggered. The architectural projects focus more on the ethical concerns averse of visual spectacle architecture but express a design with a sense of craftsmanship. This is consistent with the mission of the Faculty of architecture of the University of Hasselt which is strongly directed to sustainable and socially committed architecture. Because these projects had to deal with 'sustainable architecture' the exchange program can be seen as an adequate

contribution to the intercultural dialogue about sustainability within the multicultural society of today. In addition, this is also a benchmarking project to evaluate its own functioning and operation.

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Acknowledgments

The authors would like to thank the Flemish VLIR-UOS Programme for Institutional Universal Cooperation IUC for supporting this investigation; also would like to thank M. Frioni, S. Valy and L. Gilissen for their excellent work on the design of this project.