

# The Role of Sustainable Design in the Current Refugee Crisis

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## ABSTRACT

This research paper discusses the question to which extent sustainable design by female designers can help mitigate humanitarian hardship caused by a refugee crisis. To examine this question, four sustainable design projects will be analyzed with respect to their ability to meet refugees' needs and the extent of their sustainability. After the presentation of the designs, several questions will be addressed. Specifically, the economic feasibility and effectiveness of the solutions in targeting issues that arise with a refugee crisis will be evaluated. The paper recognizes limitations of the presented designs in terms of providing structural, macro-level solutions to a refugee crisis. It then concludes by acknowledging the overall potential of sustainable innovation in relieving humanitarian hardship caused by a refugee crisis.

## 1. Introduction

This essay addresses the extent that the design of sustainable innovation by female designers can help mitigate humanitarian hardship caused by a refugee crisis. It specifically examines how three variables, female representation in design, the current refugee crisis and sustainable innovations mutually influence each other. Research in regard to interaction between the refugee crisis, sustainability and equal gender representation in design is quite unique. Yet it also ties into broader research regarding sustainable innovation, which is becoming increasingly important as social and environmental consciousness is challenged by climate-change related topics.

Several assumptions are taken for granted throughout the discussion of the research question. Firstly, I assume it to be true that global warming is going to increase over the next decade and that it is caused by human activities. Facing this climate challenge, the importance of sustainable conduct and design has gained relevance. Secondly, I assume the refugee crisis will not be resolved soon and that it will be a persisting matter throughout at least the next century. In this context, the refugee crisis refers to global migration caused by conflict, environmental damage, political persecution or war. The migration flow is in the direction of countries which have the ability to provide security and asylum. Thirdly, on the basis of testimony and academic papers, I assume that the industry of design and innovation is male-dominated and faces unequal gender representation (Hawkins, 2018; Bagnal, 2017; Cullen D., 2018; Fairs, 2018).

Throughout the course of this essay, I will be using the term sustainability according to the definition in the Brundtland Report, where sustainable development is understood as the 'development that meets the needs of the

present without compromising the ability of future generations to meet their own needs' (1987). This entails that in order not to compromise the needs of future generations, goods and services should be produced in a way that neither damages the environment nor exploits resources that cannot be replaced. A further clarification of terminology is necessary when referring to the refugees. Refugees in this context are understood to be persons forced to flee their home country due to threat of persecution, war or violence. Another term that may require clarification is design. According to the definition of the "Strate School of Design", on the one hand design is understood as an artistic expression of a designer's visions and on the other hand it is a creation of an effective tool or item that facilitates people's interaction with their environment.

The essay first examines which challenges of the refugee crisis have been targeted by female designers so far. The first challenge that will be addressed is water scarcity, that impacts the daily lives of refugees in camps in a great number of places all around the world. The second challenge sustainable designs have tackled is waste management of plastic and other materials that accumulate in refugee camps and in the process of refugee displacement. Thirdly, the challenge of housing and shelter that comes with the refugee crisis will be responded to in terms of sustainable design aiming to resolve this problem.

This essay then moves on to consider which particular designs have already been implemented and which designs would have the potential to additionally relieve humanitarian hardship. In order to do so, different case studies will be described. First, a multifunctional, sustainable tent designed for refugees by the successful JordanianCanadian designer Abeer Seikaly. Second, a recycling project called "BAG2WORK" by Didi Aaslund and Floor Nagler, first im-

plemented at a refugee camp on the Greek island Lesbos. Finally, the “SolarKiosk” by Andreas Spiess and Hubertus Dornieden that can facilitate the use of the smart device “H2Pro” by Cynthia Sin Nga Lam, which cleans water and produces power at the same time. Lastly, the essay discusses whether the implementation of these designs is scalable and compatible with the interests of all stakeholders. That is, whether these designs conform to the personal and cultural needs of refugees and whether they are economically feasible when implemented on a large scale and in the long term. The importance of addressing the research question, to which extent sustainable innovation by female designers can help mitigate humanitarian hardship caused by the refugee crisis, lies primarily in the topicality of the three factors examined in the context of this question. At first glance, the connection between these factors does not seem too apparent. However, throughout this essay their compatibility and their mutual reinforcement will be accentuated. Primarily by showing how sustainability is not only essential in use of natural resources but also in the way the refugee crisis is being dealt with and the restructuring of gender representation in a work field, such as design. The four case studies examined in the context of the research question then demonstrate how the three factors are harmoniously and effectively brought together.

## 2. Which challenges do the different designs aim to address?

The global community is currently facing the largest refugee crisis since World War II, experiencing extremely high levels of displacement of approximately 66 million people (EcoWatch, 2018). However, the majority of the world’s refugees have been taken in by developing countries (Amnesty International, 2015, p.31), whereas merely 0.7 percent of the global refugee population is displaced within Europe (Connor & Krogstad, 2016). Since the outbreak of conflict in Syria and the Arab Spring of 2011, the numbers of refugees have significantly increased (Alfred, C., 2015). In fact, Syrians currently constitute the largest refugee population in the world (Amnesty International, 2015, p.9). However, there are numerous other conflicts, both in Africa and Asia, that have forced people to flee their homes. For example, conflicts in South Sudan, Myanmar, Afghanistan or Somalia (Specia, M., 2018).

The ever more pressing and growing humanitarian, political and economic issues of the refugee crisis are being tackled from various different angles. Non-profit organizations, such as Amnesty International and Oxfam International contribute to resolving the crisis in terms of monitoring data, raising awareness and providing numerous ser-

vices for refugees (Rush, 2017, p.1). Whereas governmental organizations, such as the United Nations or European Union have addressed the issue in terms of policy making and try to reach consensus on migration cooperation and rights. Additionally, stakeholders such as individual governments, regional institutions and private sector actors also play a crucial role when it comes to dealing with problems related to the refugee crisis.

Although there are numerous stakeholders more directly involved in addressing the refugee crisis, there are also actors, such as innovative pioneers and designers, that tackle the challenges of the refugee crisis more indirectly by providing solutions derived from their particular field of expertise. Their aim is not to approach the problems of the refugee crisis from a political or legal angle, but rather to resolve everyday practical issues that refugees are facing globally. Practical challenges that have been identified and addressed by designers are the provisioning of housing and shelter, the shortage of drinking water at refugee camps and the issue of waste disposal, and management.

When considering the shelter and housing problem at most refugee camps, it is first and foremost a priority for all refugee camps to provide temporary housing in order to shelter refugees from adverse weather conditions and provide a safe and practical home. However, good housing is not only crucial by sheer virtue that it satisfies one of the most basic needs of every human being, it is also incredibly important in terms of emotional and physical wellbeing of refugees.

Nevertheless, numerous refugees are exposed to poor living conditions that affect their health and can even result in anxiety, depression or suicide (Coletta, 2018). For example, in the refugee camp Zaatari in Jordan row after row of housing barely offers shelter from freezing temperatures or flooding. In the camp Nyarugusu in Tanzania, refugees have to build their own houses from thatch and unbaked bricks so they can quickly be removed again at any moment (Cullen Dunn, 2015). The reason behind the lack of good shelters at refugee camps may possibly be that they are merely designed for temporary stays but often people end up having to stay in their shelters for several years. Most temporary shelters are made of plastic, which means they trap heat when its warm and get damp or cold at night, can easily collapse, catch fire and do not provide insulation to provide privacy (Nolen, 2015).

Poor housing conditions at refugee camps is an especially pressing issue because it affects the daily lives of so many refugees in terms of mental and physical wellbeing. It could be tackled by good design. Additionally, it is an important problem to solve because of its envi-

ronmental implications. Ideally, housing at refugee camps should have a minimal impact on the surrounding environment and therefore make use of natural resources, such as sun light and rain, as efficiently as possible in order to produce clean drinking water and clean power.

The second major problem linked to the refugee crisis concerns waste disposal that occurs during displacement as well as at refugee camps themselves. Before arriving at refugee camps, waste accrues on the refugees' journeys. Life jackets, plastic water bottles and deflated boats pile up on the shores of arrival countries (Wagner-Lawlor, 2016). However, the scope of the problem exceeds the issue of dealing with waste that accrues during displacement, it also relates to general waste management. The increase of population in countries such as Jordan, due to incoming flows of refugees, increased demand for waste services, which in turn heavily affected solid waste management (SWM) (Qdais, Gibellini, & Vaccari, 2017, p.1). As a consequence, SWM services have decreased in efficiency and performance. Although external aid is provided, for instance by EU-funded projects, which have helped to address the issue by aiming to improve SWM services in municipalities with the largest refugee camps, recycling of valuable materials remains underdeveloped and deterioration of SWM continues to raise concerns among the local population (Qdais et al., 2017, p.8).

Finally, moving on to address the issue of water scarcity. Although it may be apparent that water is a basic and daily need of every person, the difficulties that come with this need are often unknown. For example, the refugee camps in Jordan received the second largest share of Syrian refugees relative to its population size (UNHCR, 2018, p. 1). As one of the world's most water scarce countries (Von Mayrhauser, 2012), Jordan already struggled with water shortage before having to additionally provide water to refugees. One of Jordan's largest refugee camp is Zaatari. A year after opening it hosted 159,000 refugees, a number that highly exceeds its maximum capacity (EcoWatch, 2018). Although the camp's resident number reduced to 79,000 refugees it nevertheless struggles to bring in the amount of water that is needed to cover drinking, cooking, bathing and cleaning demands of the camp's residents (EcoWatch, 2018). However, due to the large size of this refugee camp, non-profit organizations have installed a wastewater treatment plant. It purifies approximately 80 percent of the wastewater produced in the camp, which significantly helps relieve Zaatari's clean water scarcity issue. Though, not all camps are large enough and have the means to install wastewater treatment plants, such as in Zaatari. In the face of climate change, Jordan is expected to continue experiencing worse

droughts and desertification in the next decades, which could pose additional problems to water management at the camps. Jordan is not the only area that faces challenges concerning water supplies for refugees. If water is not purified, contaminated water can possibly lead to outbreak of illnesses, such as the cholera outbreak in Haiti (EcoWatch, 2018). Overall, water technology is the key to improved well-being of refugees and necessary to meet their most basic needs.

### 3. Which successful designs have already been implemented and which designs would have the potential to additionally relieve humanitarian hardship?

The following sections introduce four different sustainable designs, that aim to tackle the main problem areas introduced in the previous section.

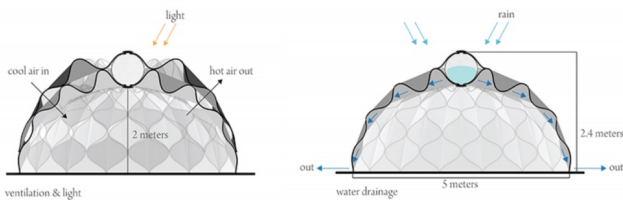
#### 3.1 "Weaving a Home" by Abeer Seikaly

First, concerning the housing and shelter struggle many refugees face at camps all over the world. After visiting the refugee camp Zaatari in Jordan and witnessing the poor housing conditions, Canadian-Jordanian designer Abeer Seikaly came up with a design project, "Weaving a Home", which proposes a bold solution to the shelter problem at refugee camps. It stands out in terms of being multifunctional, sustainable and highly adaptable to diverse weather conditions. However, it is a design project in the making and still needs technical enhancement before it can be produced according to the design plans.

Abeer Seikaly is working with engineers to develop certain materials needed to fulfill her goal of making the tent's fabric energy efficient. Abeer Seikaly is an accomplished Canadian-Jordanian designer who graduated from the Rhode Island School of Design with a fine art and architecture degree in 2002. She currently works as an architect, designer, artist and cultural producer. Her design "Weaving a Home" won the Lexus Design Award in 2013. Besides this project, Seikaly has also won 'The Rug Company's Wall-hanging Design Competition' in 2012 with her design "The Chandelier", a hand-woven wall hanger that redefines traditional craft. Amongst these achievements Seikaly has co-directed the Amman Design Week. All her designs are created with a high focus on cultural production. Her design "Weaving a home" for the refugee shelter is inspired by the mass influx of refugees from Syria to Jordan. She wanted to respond to the need of the refugees and create a shelter design that opposes the nonfunctional tents that are currently being used. Seikaly's design picks up the traditional architectural concept of tents and tempo-

rary huts of nomadic tribes. Additionally, it aims to provide comforts of modern life in terms of ventilation, light, water collection and drainage (Figure 1).

The most important feature of the tent is its durable, lightweight structural fabric, which can be rotated, expanded and contracted. This allows refugees to benefit from the shelter in different weather conditions by closing the tent in winter and opening it in summer (Figure 2). Moreover, the fabric can be folded, which facilitates transportation. The smart and flexible “structural fabric” poses a solution to the problem that tents currently used at refugee camps tend to be disengaged, unstable and highly susceptible to harsh weather conditions and other natural forces. Besides its smart fabric technology, which allows for stability and more importantly adaptability, Seikaly’s shelter design includes several crucial sustainable features. For example, it has a water storage basin at the top of the dome-like tent which allows for rainwater to be gathered for drinking and cooking purposes. Furthermore, in order for the tent to be energy independent, Abeer Seikaly intends to use a fabric that is able to absorb solar radiation and provide electricity (Nolen, 2015). Although, the design “Weaving a Home” has great potential it only provides a hypothetical solution as it has not been fully realized yet in line with the design plans.



**Figure 1:** Ventilation, Light and Water Drainage Functions of “Weaving a Home”

### 3.2 “BAG2WORK” by Didi Aaslund and Floor Nagler

Moving on to the second issue addressed in the previous section, being the excessive amounts of discarded plastic and rubber from life vests and boats that are disposed of after the refugees’ journey.

The Design project “BAG2WORK” has targeted this issue in creative ways as it converts the discarded materials into fortune-cookie like bags (Figure 3). The design is simple and the material consists only of 1 square meter of boat rubber, 4 life vest straps that function at shoulder straps and 35 rivets and rings to close the bag. The rubber and life vest materials are functional, as they are highly durable and waterproof. Moreover, the design accomplished to create a bag balancing maximum capacity of 21-Liter with a minimum amount of material. What stands



**Figure 2:** Views of “Weaving a Home” in Summer and Winter. Retrieved March 29<sup>th</sup> 2019 from abeerseikaly.com

out especially about this design is that it does not require a lot of expertise to be made. The recycled bag can be handmade with rivet guns and without power tools. This is an essential feature of the design since it was created not only to upcycle the vast material left behind at the beaches of the Greek island of Lesbos, but also to empower refugees by teaching them how to make the bags themselves. The social aspect adds another implicit function to this design that is also included in the name of the project. “BAG2WORK” as in “back to work” aims to give refugees a task in their everyday life at the camp and eventually is aimed at employing resettled refugees in the Netherlands to make bags and earn money by selling them. The basic idea behind the design is to convert boats and life vests into bags and refugees into employees, which makes the design both environmentally and socially sustainable.

The designers behind the project “BAG2WORK” are Didi Aaslund and Floor Nagler. They are two designers from Amsterdam, working as a team under the name ‘No Mad Makers’. Aaslund studied Interactive Performance Design and Fine Art at the ‘Hogeschool voor de Kunsten’ in Utrecht and Nagler graduated as a textile student from the ‘Gerrit Rietveld Academy’ in Amsterdam. When Nagler volunteered at the Greek island of Lesbos she first became aware of the masses of discarded life vests and boats on the beaches (Figure 4). This inspired her to turn the ma-

materials into something useful that could be of value on the onward journeys of the refugees. Thereafter she returned to the Netherlands and designed a prototype bag together with Aaslund. Once the prototype was developed, the two designers went back to the refugee camp on the Greek island Lesbos in March 2016 and started workshops that taught refugees to make the bags themselves. The refugees enjoyed the crafting process and started to teach others how to make the bags. The design project became such a success that “BAG2WORK” was then nominated for a New Material Award and exhibited at the Dutch Design Week in 2016. However, the implementation of the Kickstarter project of “BAG2WORK”, which was eventually supposed to create work for newly settled refugees in Amsterdam, failed to reach its funding goal and was thus never realized (No Mad Makers, 2016).



Figure 3: Fortune-cookie like bag. Retrieved March 29<sup>th</sup> 2019 from Dezeen.com



Figure 4: Discarded life vests and rubber

### 3.3 “H2Pro” by Cynthia Sin Nga Lam

Finally, the last issue that requires a solution is the clean water shortage at refugee camps. In this context, two designs will be introduced. One prototype, which purifies water and another product, which could facilitate selling and distribution of the prototype water purifier. Note, that the latter is not designed by a woman, however, the main focus remains on the first item since it is able to provide clean water. The second design is merely introduced to show how the water purification device could be introduced to refugee camps.

The design that poses a solution to clean water scarcity is the prototype device “H2Pro”, designed in 2014 by 17-year old Cynthia Sin Nga Lam. Cynthia Sin Nga Lam is Australian and was in high school when she developed the prototype model “H2Pro”. Her development of the “H2Pro” began in 2013 with her research on photocatalysis, with which she won at the Victoria Science Talent Search fair. In 2014 Lam became one of the 15 finalists of the Google Science Fair with her further developed project. Her prototype device “H2Pro” does not only produce clean drinking water, it additionally produces clean energy. The mechanism of this device works as follows. It sterilizes dirty water by means of a titanium mesh, which is activated by sunlight. The water is then split into hydrogen and oxygen during the photocatalytic reaction. The only additional step that is needed to produce clean power is flipping a switch to feed a hydrogen fuel cell. Other water purification technologies function similarly but require an additional source of power, whereas the “H2Pro” device by Lam is sustainable because it only needs sunlight and titanium mesh.

Although the device that Lam built is only a prototype model (Figure 5), she hopes that this model could also be used at a large scale. For instance, installing it on a rooftop would allow wastewater to be transferred through a titanium dioxide net and be sent through pipes to produce power and purified water. This model would be suitable for the use at refugee camps is because it is a low-cost product, which is easy to maintain and multifunctional.

### 3.4 “SolarKiosk” by Andreas Spiess and Hubertus Dornieden

The design that could facilitate the distribution and implementation of the “H2Pro” at refugee camps is the “SolarKiosk”. This architectural design addresses a variety of needs that the majority of refugee camps lack. The ongoing project “SolarKiosk” came into existence in 2017. It is a self-sustaining unit that, besides offering food and beverages, functions as a shop for solar-lamps and water-

purification systems (Figure 6). It is solar powered by the solar panels on its roof and constructed from local material (except for some electronic parts), for instance bamboo, wood or recycled goods.



**Figure 5:** Prototype model “H2Pro”. Retrieved March 27<sup>th</sup> 2019 from RealityPod.com

The main aim of this design is to provide sustainable energy in “off-grid” areas that have no connections to an electrical power grid or only have access to dirty drinking water. Since these “off-grid” conditions apply to the majority of locations of refugee camps, the “SolarKiosk” is well suited to cover the needs there. In fact, it has been implemented at Zaatari, one of the largest refugee camps in Jordan. However, most implementations of the “SolarKiosk” have been in rural areas in the Sub-Saharan Africa.

The design does not only provide sustainable energy and access to a diverse range of products, including water purification systems, but is also able to withstand harsh weather conditions and is easily transportable. It comes in different shapes and sizes according to the location’s needs, which allows refugee camps to use it for a variety of other services and not only as a shop. For instance, the “SolarKiosk” has been reused as a school at the refugee camp in Jordan.

The owners of “SolarKiosk” AG are Andreas Spiess and Hubertus Dornieden, who have worked together with Graft Architects in order to realize the project. Spiess is responsible for the legal work and has experience in the field of renewable energy, developing markets and entrepreneurship in the off-grid sector. Co-founder Dornieden is the CFO of “SolarKiosk” AG and has a degree in Economics Teaching from the Georg-AugustUniversity in Göttingen, Germany.



**Figure 6:** SolarKiosk in Botswana. Retrieved March 27<sup>th</sup> 2019 from Graft Architects

### 3.5 Is the implementation of the designs scalable and aligned with the interests of the stakeholders?

The question that follows from the above-mentioned presentation of sustainable designs targeting problems linked to the situation of refugees, is whether the implementation of these designs is scalable and aligned with the interests of the stakeholders? In order to address this question, it is relevant to first identify the stakeholders that play a relevant role in the context of design for refugees. The stakeholders taken into consideration for this sub-research question will be refugees and governments.

The most important stakeholders are the refugees themselves. The designs have been created in line with their assumed interests and serve the purpose of improving their lives. It is necessary to first consider which needs of refugees are most urgent and prevalent before determining whether the proposed design projects are aligned with the refugees’ interests. Despite this question being partly dealt with in the first research question it requires more extensive elaboration.

Alongside nutritional needs, satisfying refugees’ water demands is essential since water is not only required for drinking needs but also for cooking, cleaning and hygiene purposes. According to international humanitarian standards by the UNHCR, refugees should receive a minimum of 15 liters of clean water per person per day. Furthermore, providing satisfactory conditions of sanitation and hygiene is a necessity at camps in order to prevent communicable disease outbreaks (UNHCR).

While these basic needs required to satisfy the minimal living standard for refugees are usually being attended to, psychological needs of refugees are often disregarded. However, after experiencing violent conflict in their country of origin and facing mental distress during their displacement, refugees suffer from various mental health is-

sues, such as depression and anxiety (Sanghera, 2017). Social exclusion due to isolated accommodation and restrictive policies on education and welfare support have led to an increase of mental health problems (Sanghera, 2017). Refugees' needs include more than food, water and shelter. A necessary condition for their mental wellbeing is also access to public services and social integration (Sanghera, 2017).

This is perhaps the reason why the aspect of temporary housing at refugee camps has come under criticism. Kilian Kleinschmidt, a humanitarian expert, made it clear that designers should not design yet another shelter for refugees. At the "Good Design for a Bad World" talk at the Dutch Design Week in 2017, Kleinschmidt expressed his concern that refugees are increasingly being reduced to a category instead of simply being treated as regular human beings. Kleinschmidt stated that "They're not a species. So, there is no need for tech for refugees. Or design for refugees, or architecture for refugees" (Fairs, 2017). The architecture critic Rene Boer is also being interviewed at the talk and vehemently agrees with Kleinschmidt's stance. He argues that instead of micro solutions, such as having backpacks fabricated from lifejackets, the focus should be on designing structures and a socio-political system that removes physical and non-physical barriers preventing refugees from integration (Fairs, 2017). Therefore, the main issue is not that the terminology "design for refugees" is intrinsically counterproductive to improving the status quo but rather that the focus on micro-level designs for refugees' basic needs distracts from innovating designs targeting socio-structural problems.

The critical message at the Dutch Design Week was clear; we should accept that migration is a historically inevitable occurrence and instead of treating refugees as a special species, in need of all types of gimmicky design solutions, the focus of designers and policy makers should shift towards integrating them. This entails giving them fair opportunities and access into society. In order to do this, according to Kleinschmidt, temporary "storage facilities" and improvisational shelter solutions are counterproductive in the sense that they imply that refugees are expected to soon return to their country of origin. Essentially, this attitude fostered by temporary shelter solutions impedes on setting up structures that genuinely accommodate refugees' needs in terms of mental and social well-being. In the light of this criticism, it appears that Seikaly's shelter design has a clear downside since one of its main attraction, as Seikaly emphasized herself, is its transportability and temporary approach to an efficient living situation. Nonetheless, it attends to basic needs such as isolation from the heat or cold, electricity and water

supply. However, it brings up the question whether yet another shelter design simply is not constructive, given the overall structural situation and socio-political context of migration. The project "BAG2WORK" could be criticized by a similar argument. The diversity of micro-level design solutions, such as recycled life jacket backpacks, seems to undermine the importance of redirecting design to more broad, structural macro solutions (Fairs, 2017). Nevertheless, the intention of the project, despite its failure, was to actually make a big structural difference by providing work and thus giving back agency to refugees. Legal and organizational obstacles came in the way of developing a micro solution into a macro level project that had the potential to structurally empower refugees. Hence, the criticism does not undermine the "BAG2WORK" project as a whole but rather brings attention to the danger of designing many small-scale designs that do not appropriately address the needs of refugees in a bigger picture.

Finally, the question still remains to which extent set-ups like the "SolarKiosk", possibly selling the water purifier "H2Pro" by Lam, are aligned with the interests of the stakeholders. Despite its smart design and diverse functions, the "SolarKiosk" and "H2Pro" face serious criticism in that they are functionally efficient yet they are also quite costly to manufacture, import and construct on a large scale. Furthermore, importing a "SolarKiosk" requires complex logistics for implementation across different locations. In contrast, the governments that host refugees in camps demand local solutions, which are cheap but scalable. For instance, by 2015 Jordan had spent about \$6.6 billion since the Syrian refugee crisis began in March 2011 (Kaplan, 2015). Facing increased budget deficit and debt it seems unlikely that the Jordanian government would be able, let alone be interested, in introducing technologically smart designs on a large scale at their refugee camps. Another financing strategy for the respective designs would be donor based. However, according to the UN Refugee Agency, donor funding has decreased rapidly in the past years in a context of ever-increasing global needs.

Therefore, even if designs may not be meaningless in terms of addressing the social structure and attending to the refugee's needs, they may still not be optimal in terms of economic feasibility, considering how much the refugees are already a strain on governments' financial situations, especially in countries like Jordan (Kaplan, 2015).

#### 4. Conclusion

Against the backdrop of the ongoing refugee crisis, which is characterized by rising numbers of refugees fleeing their country of origin, certain problems have become ever more important to address. Countries, such as Jor-

dan, being the third most water scarce country in the world (Von Mayrhauser, 2012), have increasingly struggled to meet the refugees' water demands since the numbers of refugees at the camps keep exceeding the foreseen limit. Besides providing clean water, another extremely important problem that needs to be addressed is waste management at camps as well as waste generated on refugee's journeys. Not only have life vests and rubber boats been piling up on the beaches of the Greek island Lesbos but, additionally, a decrease in efficiency and performance of solid waste management services has become a problem since the demand for waste management has risen due to the influx of refugees. Finally, the instable, overcrowded and dehumanizing housing standards that affect the refugees' safety and mental health is yet another complex problem that needs to be tackled. Yet, it is important to acknowledge that these complex and far-reaching problems cannot be solved by design alone. Design may contribute an important part to change but effective policy making remains an elementary and necessary basis to solve problems of the current refugee crisis more extensively.

However, there has been a broad response to these problems in terms of sustainable designs aimed at alleviating them. The water problem has been tackled for instance by the smart water purification prototype "H2Pro" designed by Cythnia Sin Ngam Lam, which additionally is able to provide clean energy besides purifying dirty water. The waste issue has been targeted by the design project "BAG2WORK" by Floor Nagler and Didi Aaslund, which upcycles discarded life vests and rubber in a cost-efficient and simple way that empowers refugees to take matters into their hands and create a product they could potentially sell again. Abeer Seikaly has designed a multi-functional, sustainable shelter that is able to provide a stable but also easily transportable and flexible home, which ideally has access to clean electricity as well as a water tank that saves rain water.

Without a doubt, these designs have creatively solved some of the most pressing issues connected to the refugee crisis and furthermore have brought attention to women's accomplishment and representation in the field of design. However, there are several concerns that were raised at the Dutch Design Week. Among them a concern relating to an overflow of shelter designs which do not actually attend to the refugee's higher order needs or provide structural macro-level solutions. Another concern related to designs targeting the refugee crisis is the economic feasibility and budget constraints of countries hosting refugees. Especially the shelter design by Abeer Seikaly could become quite costly producing it on a large-scale since it features

more complex technology. Nevertheless, the examined designs merely hint at the potential of sustainable innovation in terms of addressing current global issues such as the refugee crisis. Without the aspect of sustainability, solutions to humanitarian crisis lack a long-term perspective in terms of feasibility, durability and effectiveness. It becomes ever more important, given larger climate change related challenges, to approach long-lasting humanitarian crises, like the world's refugee crisis, from a sustainable angle. This would allow innovative solutions applied to the refugee crisis to be more self-sustaining and to be compatible with the needs of the environment and stakeholders.

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