

# DEVELOPING AN INCLUSIVE PROMOTIONAL STRATEGY FOR SOLAR DECATHLON AFRICA 2019

Rabat, Morocco IQP 2018

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## SOLAR DECATHLON AFRICA

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# 1. Introduction

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As climate change intensifies, communities around the globe are forced to take action. Sustainable technologies and renewable energies are becoming more prominent. Buildings consume a majority of the world's energy and are therefore one of the primary targets for sustainability reform (Jelle, 2011). Net-zero energy buildings produce and consume the same amount of energy; essentially, a net-zero house can operate independently of the energy grid. This concept now has widespread appeal and a number of countries are even integrating it into building codes.

Countries around the world have identified solar power as the one of the most promising methods of clean energy. In an effort to promote innovative solar technology, the United States Department of Energy (DOE) has organized a series of international competitions titled 'Solar Decathlon'. During these events, teams from international universities compete to design the best net-zero energy house. Since 2002, one hundred forty-one collegiate teams have participated in Solar Decathlons spanning five continents (U.S. DOE Solar Decathlon, 2017). Involvement in the competition gives students a global perspective and prepares them to enter the workforce as energy-conscious members of society.

Accomplishments such as the Noor Power Station in Ouarzazate and the 22<sup>nd</sup> Conference of the Parties in Marrakech demonstrate that Morocco is emerging as a global leader in solar energy. Towards this end, the DOE will partner with Institut de Recherche en Energie Solaire et Energies Nouvelles (IRESEN) in Rabat to host the first Solar Decathlon AFRICA in 2019. In 2011, the Ministry of Energy, Mining, Water and Environment founded the research institute. IRESEN dedicates funding, facilities, time, and expertise toward researching and developing alternative energies, with a focus on solar power. Across three locations in Morocco (with a fourth in progress), IRESEN supports five hundred forty researchers involved in thirty-seven projects (IRESEN, 2017). Their mission to develop cutting-edge technology while adapting the projects to "national context" distinguishes IRESEN as the perfect host for Solar Decathlon AFRICA 2019 (IRESEN, 2017).

Even with these qualifications, hosting an international competition for the first time on the African continent poses many challenges. While the basic format of the Solar Decathlon will remain the same, IRESEN must adapt a communication strategy to promote the event specifically to the continent. Additionally, IRESEN is responsible for persuading teams to participate in the Solar Decathlon. Components of a successful competition could include the number of university teams competing, adequate corporate sponsorship, qualified and impartial judges, a well-prepared site, and careful collaboration with the local residents affected by the event.

Our team's goal is to develop a strategy to foster communication between the Solar Decathlon AFRICA organizers and participants. In order to achieve this goal, we established the following three objectives:

1. Identify the advantages of participation in the Solar Decathlon from the perspective of the participants
2. Gauge current interest of Moroccan students in Solar Decathlon AFRICA
3. Assess willingness of industry stakeholders to support Solar Decathlon AFRICA teams.

We present a literature review of relative background information and methodology for data collection. With this information, we aim to provide IRESEN with a strategic communication plan based on our analysis of archival research, survey, and interview data.

## 2. Literature Review

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The first section of this chapter presents a brief history of the Solar Decathlon. This background illustrates the purpose of the Solar Decathlon competition as a whole and provides the foundation for discussing future competitions. The next section focuses more specifically on the available information about Solar Decathlon AFRICA 2019. This chapter also provides broader socio-political context for the role the competition may play in Africa's energy development. The fourth section identifies the interest of stakeholders, and how the Solar Decathlon might be affect them. Finally, we touch on two case studies that highlight important lessons from technological demonstrations.

### 2.1 History of the Solar Decathlon

The Solar Decathlon has evolved to include 141 collegiate teams and over 18,000 participants. There have been thirteen completed competitions and there are currently five in progress (U.S. DOE Solar Decathlon, 2017). These decathlons have impacted perceptions on sustainable energy design on a global scale. Overall, the solar decathlon has “educated the public about the benefits, affordability, and availability of clean energy solutions by generating widespread media coverage and harnessing digital tools to reach millions of people” (U.S. DOE Solar Decathlon, 2017). The competition has impacted the United States in particular due to the involvement of the U.S. Department of Energy.

The United States Department of Energy (DOE) started the Solar Decathlon in 2002 and tasked college students to “design and build full-size, solar-powered houses” (U.S. DOE Solar Decathlon, 2017). The first competition, held on the National Mall in Washington DC, consisted of 14 teams from United States universities. The DOE planned to continue the Solar Decathlon as a biannual event in the United States. Since then, it has become an international competition with teams from different nations, and in 2010 was held for the first time outside the United States in Madrid, Spain. Now spanning four continents and including multinational teams, there are five decathlons planned for 2018 and 2019.

### 2.1.1 Solar Decathlon Competition Format

The scope of the decathlon involves considerable planning to ensure a fair and comprehensive process. First, the DOE and international organizers sign a Memorandum of Understanding (MOU) announcing the competition. Two to three years before the competition occurs, the call for proposals explains the specifications for the particular decathlon and usually includes the rule book. Universities make their own teams or partner with other universities and submit design proposals (U.S. DOE Solar Decathlon, 2017). After the teams submit their proposals, the hosting organization selects the teams that will compete; each decathlon has approximately 16 to 20 teams.

Through the following 20 to 24 months, the teams submit deliverables, including a schematic design summary, digital project representation, and public exhibit materials (U.S. DOE Solar Decathlon 2017 Rules, 2017). With each successful deliverable, the teams receive a portion of the funding to offset financial costs (El-Korchi, personal communication, November 3, 2017). About two weeks before the competition occurs, each team ships their house in parts to the venue and constructs the house in ten days (WPI team finishes strongly, 2013). During the next ten days, judges score each building, and members of the public can visit each submission (U.S. DOE Solar Decathlon, 2017).

In the 2017 Solar Decathlon, judges evaluated each contestant's house based on the following ten categories: architecture, market potential, engineering, communications, innovation, water, health and comfort, appliances, home life, and energy (see Figure 1, below) (U.S. DOE Solar Decathlon 2017 Rules, 2017).

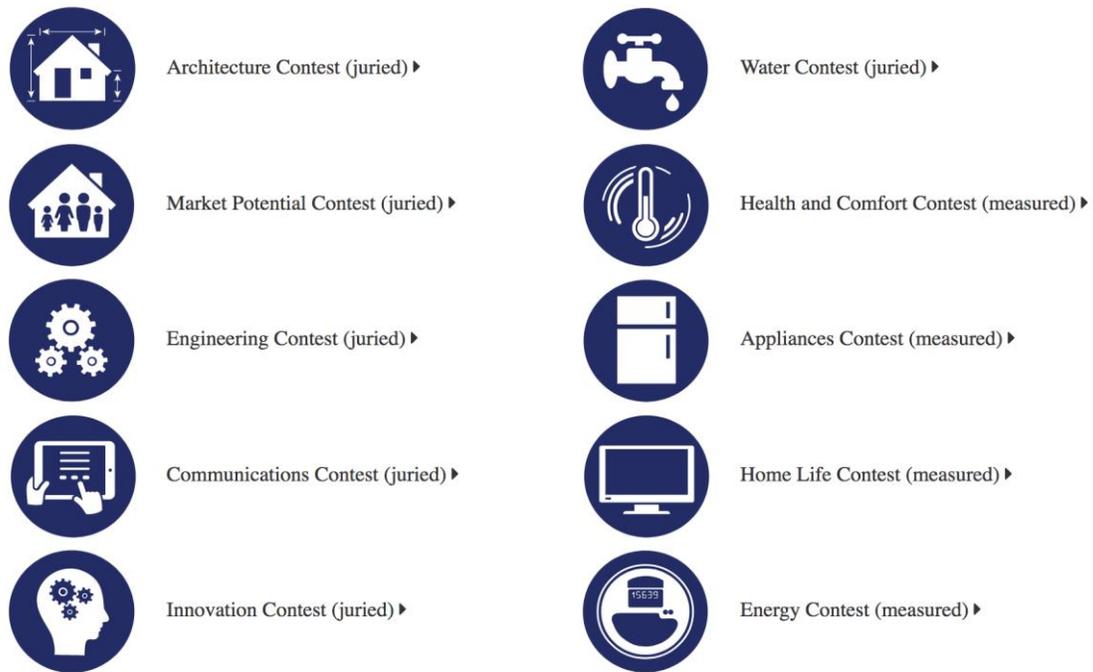


Figure 1: List of contests in Solar Decathlon 2017 held in Denver, Colorado and how the teams were scored. (U.S. DOE Solar Decathlon 2017 Rules, 2017).

Each contest is either objectively measured or scored by a jury, consisting of a panel of experts in their respective fields. For example, the jury scores the architecture contest based on the environmentally-friendly design and integration into the final product. The jury scores market appeal on the building's overall attractiveness to the team's target market. The jury evaluates communication based on the team's final website, personal tours and presentations to the general public (Solar Decathlon China 2013 Rules, 2013). After the competition, the teams are responsible for taking the house back with them or selling it. This is the basic outline of the Solar Decathlon; however, the specifics of the competition can change as solar technology evolves and the location of competition varies.

## 2.2 Solar Decathlon AFRICA 2019

The DOE posted the first announcement of Solar Decathlon AFRICA on their website in 2016 and is as follows:

On November 15, 2016, the Moroccan Ministry of Energy, Mines, Water, and the Environment (MEMEE); the Moroccan Research Institute in Solar Energy and New Energies (IRESEN); and the U.S. Department of Energy signed a memorandum of understanding to collaborate on the development of Solar Decathlon AFRICA, a competition that will integrate unique local and regional characteristics while following the philosophy, principles, and model of the U.S. Department of Energy Solar Decathlon. The competition is expected to take place in 2019 (U.S. DOE Solar Decathlon, 2017).

IRESEN has the opportunity to adapt Solar Decathlon AFRICA from the U.S. model to the African context. First, all universities will need to “design highly energy-efficient, solar-powered and affordable homes adapted to our African climate and location” (Solar Decathlon AFRICA Request for Proposals, 2017, p. 3). Teams from all nations will design and construct a house inspired by an African region of their choice.

Additionally, the adapted ten contests are as follows: architecture, engineering & construction, market appeal, communications & social awareness, appliances, home life & entertainment, sustainability, comfort conditions, electrical energy balance, and innovation (Solar Decathlon AFRICA Request for Proposals, 2017). These contests differ slightly from the Solar Decathlon held in Colorado in 2017; IRESEN added the sustainability contest in place of water. Sustainability is a measure of the use of natural resources and long-range impacts of architecture, engineering and construction, communication and social awareness, and market appeal (Solar Decathlon AFRICA Rules, 2017). All of these decisions fall under the jurisdiction of the host, IRESEN.

### 2.2.1 Partner Profile: IRESEN

We will work directly with the Institut de Recherche en Energie Solaire et en Energies Nouvelles (IRESEN), to promote interest in Solar Decathlon AFRICA. “The Ministry of Energy, Mining, Water and Environment, with the participation of several key players of the energy sector in Morocco” founded IRESEN in 2011 (IRESEN, 2017). IRESEN’s goal is to research solar technology and educate Moroccans about the potential of solar as a primary energy source by continuously revolutionizing the Moroccan energy source landscape (IRESEN, 2017).

IRESEN receives funding from its many partner organizations and uses those funds to support research projects (Idrissi, personal communication, December 5, 2017). IRESEN sends out calls for proposals, from which it selects the most promising or significant projects to fund. Once IRESEN selects a project, the institute provides up to 5 million dirhams to accomplish the project's goals. As of November 2017, IRESEN has sent out ten calls for proposals and is currently working on 37 different projects. These projects have an underlying goal of obtaining “a process, a service or a product 100% Moroccan that can be valued on the market” (IRESEN, 2017).

With the research institute primarily focused on solar energy sources, the majority of IRESEN's projects involve photovoltaics. For example, the SOLEIL project worked on the “optimization of a photovoltaic power plant integrated to the network and highly integrated locally” (IRESEN, 2017). However, these projects apply to all facets of life in Morocco, not just as an energy source for the national grid. The Dessalement project worked on using solar energy to desalinate water for human consumption, and the FrigoSolaire project developed a solar refrigerator capable of being transported by a delivery tricycle (IRESEN, 2017).

IRESEN supports research into sustainable energy through several satellite locations throughout Morocco (see Figure 2, below).



Figure 1: Map of IRESEN's planned satellite locations (IRESEN, 2017)

The Blue Water Park will specialize in water desalination both for human consumption and irrigation, and the Bio Energy Park will deal primarily with the use of organic substances as a source of energy. The Green Energy Park in Ben Guerir is currently the only completed location. Researchers at IRESEN use this site for testing and researching renewable energy (IRESEN, 2017). IRESEN is also working on developing three other locations, each focused on a specific facet of sustainable living. The Green (& Smart) Building Park, the site of the 2019 Solar Decathlon, focuses on “integrating renewable energies in the building sector” (IRESEN, 2017). This constant work integrating sustainable living into Moroccans’ daily lives makes IRESEN the perfect candidate to host the Solar Decathlon AFRICA.

### 2.2.2 Competition Site: Ben Guerir

Solar Decathlon AFRICA will be held in the town of Ben Guerir 60 km north of Marrakech and 180 km south of Casablanca (see Figure 3, below) (Google, n.d.).



Figure 3: Location of Ben Guerir with respect to Casablanca and Marrakesh (left), and a zoomed-in map of Ben Guerir (right).

With a population of 88,626, Ben Guerir is significantly smaller than either of these two major Moroccan cities (Ben Guerir Population, 2014). However, the proximity to major tourist cities allows for convenient additional housing space. IRESEN’s new facilities, in addition to the

proximity of the prestigious Mohammed VI Polytechnic University, deem Ben Guerir an ideal site for the Solar Decathlon AFRICA.

### 2.3 Morocco as a Hub for African Inclusivity

The U.S. Department of Energy made the decision to title the competition hosted by IRESEN “Solar Decathlon AFRICA.” While there have been more specific regions within the titles such as “Solar Decathlon China,” the DOE has named other decathlons after much broader regions: for example, “Solar Decathlon Europe” and “Solar Decathlon Middle East”. Rather than “Solar Decathlon Morocco” or “Solar Decathlon Northern Africa,” the DOE decided that this Solar Decathlon would take the name of the continent. This choice illustrates an overarching theme of unity in Africa.

The sustainability trends of the continent indicate the challenge of presenting a unified Africa. By 2100, the United Nations projects the African population to increase from 1.2 billion to 4.3 billion people (United Nations Population Division, 2015). This is the largest projected increase in the world (see Figure 4, below).

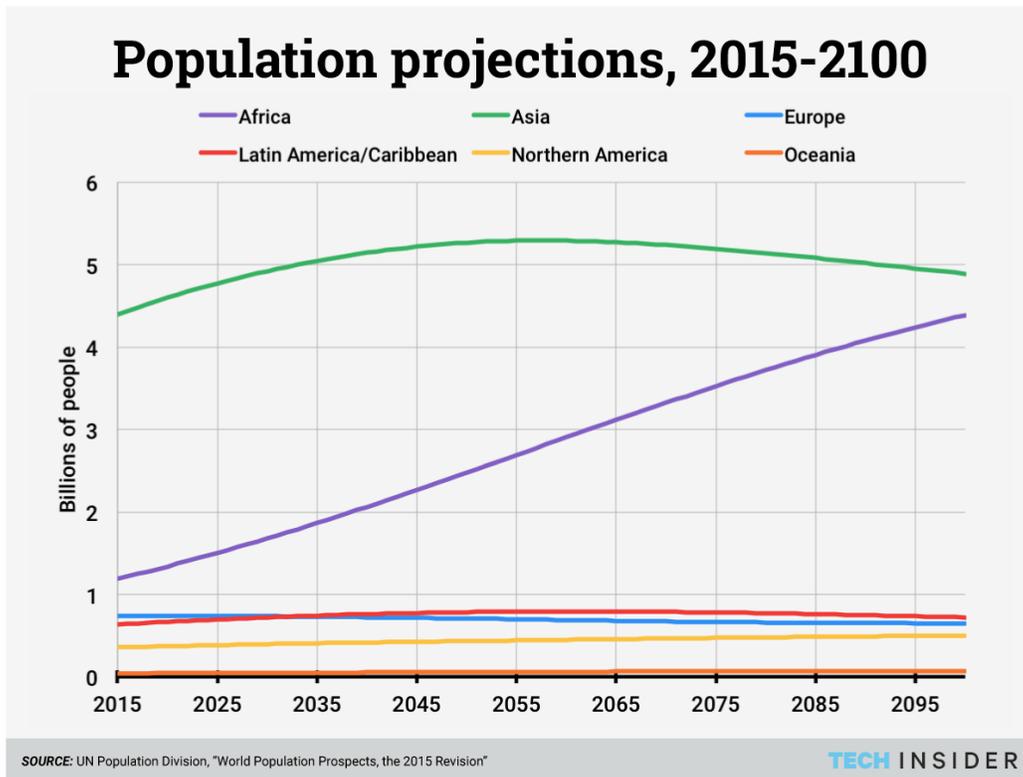


Figure 4: World population projections from 2015 to 2100 by continent (United Nations Population Division, 2015).

Reasons for this population boom in Africa include high fertility rates (average number of children per woman), gains in life expectancy, and decreases in child mortality rates (Baer, 2015). As a result of population growth, the energy demand of the continent increases. In 2014, a World Energy Outlook report claimed that 620 million people in Africa lived “without access to electricity” (Al-Saffar et al., 2014). This disparity reveals the potential for African countries to adopt clean, renewable, and abundant energies as a method to provide electricity to its citizens. Hosting a Solar Decathlon competition in Africa presents the continent with a unique opportunity to respond to these challenges on a world stage.

Although political and social complexity throughout African countries raise diplomatic issues (Armstrong, 2017), Solar Decathlon AFRICA is also an opportunity for these countries to present a face of unity toward the goal of energy sustainability. These countries will be able to engage in meaningful dialogue regarding the prioritization of adapting to sustainable energy.

Morocco possesses experience in facilitating these type of discussions, most notably hosting the 22nd Conference of the Parties in Marrakech in 2016. Beginning in 1994, the United Nations Framework Convention on Climate Change (UNFCCC) commissioned meetings called Conference of the Parties (COP) to have countries come together in the effort to mitigate global warming (Matthews, 2012). The UNFCCC has held a conference every year since 1994, and COP21 held in Paris in 2015 captured the world’s attention with the Paris Agreement. This bold initiative aims to limit greenhouse gases and the global temperature increase to under two degrees Celsius, particularly by holding developed countries responsible for reducing their emissions and providing funding for developing countries (Raouf, 2016). Therefore, the steps taken at COP22 were vital to how the public views the feasibility of the Paris Agreement. By successfully hosting the conference, nicknamed the “Action and Implementation” conference, Morocco confirmed their role as a global leader in the climate change arena (Elcano Royal Institute, 2016).

Geographically, Morocco has great potential for success in converting to renewable energy - specifically solar energy. The World Data Center for Meteorology estimates that the global average of annual sunshine hours is 2334 hours (Osborn, 2017), yet many regions of Morocco record around 3000 hours (see Figure 5, below).

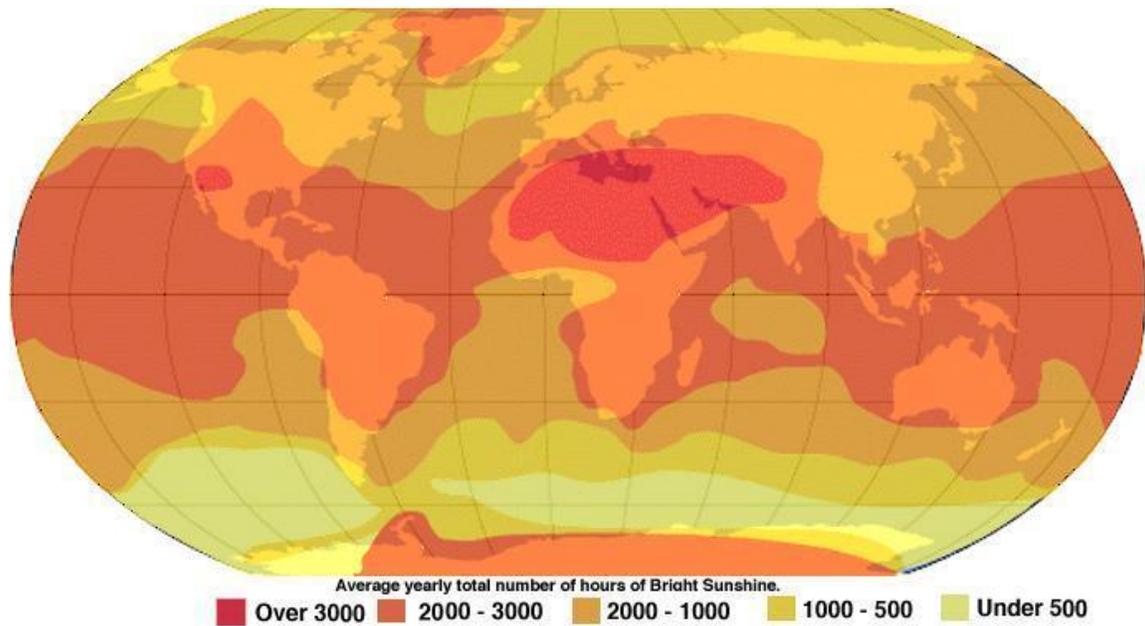


Figure 5: World map of annual sunshine hours (Houston Museum of Natural Science, n.d.).

Most notably, the city of Ouarzazate receives an average of 3416 hours of sunshine annually (UNdata, 2010). This level of solar irradiation allows for large energy yield from photovoltaic technology such as expansive solar panel plants. Beyond the logistic feasibility of solar power in Morocco, political and economic factors also contribute to its potential as a global leader in renewable energy.

The Kingdom of Morocco is a constitutional monarchy, and King Mohammed VI is a self-proclaimed leader of reform and social progress. At the young age of 35, he inherited the throne following the death in 1999 of his more rigid father former King Hassan II (Maghraoui, 2001). King Mohammed VI is particularly enthusiastic about presenting Morocco as a global example for the implementation of renewable energy. The country's overarching goal is to convert 42% of power resources to renewable energy by 2020, and 52% by 2030 (Gruber et al., 2017). Morocco's energy infrastructure is conducive to this advancement.

A major distinction between Morocco and other countries in the Middle East and North Africa (MENA) region is that Morocco is "labor abundant" and a "net oil-importer" (see Figure 6, below) (Griffiths, 2017).

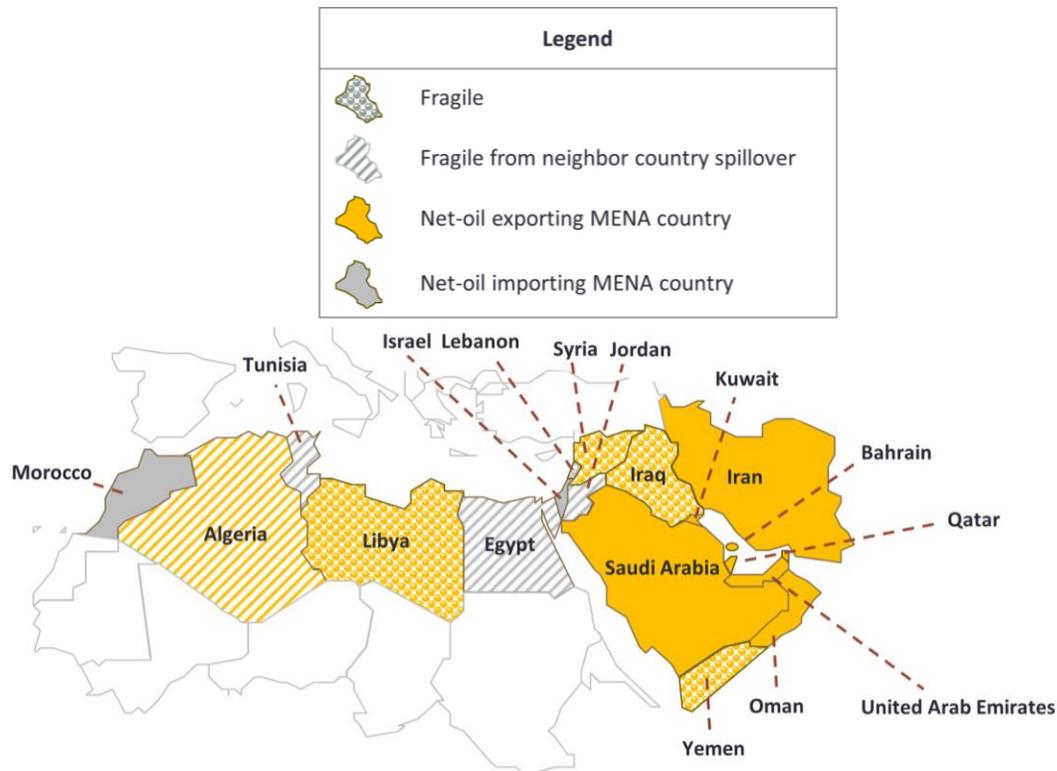


Figure 6: A map of some MENA countries displaying oil trade and stability (Griffiths, 2017).

In a 2015 interview with *The Guardian*, Moroccan Minister Delegate in Charge of the Environment, Dr. Hakima el-Haite explains that 94% of Morocco’s imported energy consists of fossil fuels. This overwhelming dependence on imports results in vulnerability to volatile fossil fuel prices, especially considering the increasing energy demand as population grows (Steinbacher, 2015). One Moroccan official from the Ministry of Energy, Water, and the Environment (MEMEE) claimed, “The energy transition is not a choice, it’s a necessity” (Steinbacher, 2015). Morocco, at the government level, considers moving away from this foreign energy dependence the number one driving force of renewable energy development.

Morocco demonstrates ideological commitment to the transition to renewable energy, but the country is also making tangible accomplishments toward this effort. The best example is the Noor Power Station in Ouarzazate, which when completed will be the world’s largest concentrated solar power plant (Neslen, 2015). A World Bank Report from June 2017 confirmed that the project is on track financially, and the plant is successfully supplying energy to the Moroccan grid. Eventually, as production rates increase even further, Morocco plans to

outsource this energy to areas throughout Europe and the Mediterranean (Moore, 2013). King Mohammed VI's ultimate goal is to provide renewable energy to Mecca (Neslen, 2016).

These opinions and accomplishments regarding renewable energy are only representative of Morocco at the government level; on-site research is necessary to further analyze the perspectives of Moroccan citizens - their awareness, concerns, and hopes for solar power.

## 2.4 Stakeholders Beneficiaries and Social Relevance

Solar Decathlon events involve a large cast of stakeholders. This section identifies the stakeholders of Solar Decathlon AFRICA 2019 and their respective relationship to the event. These stakeholders include students, universities, industry, government, and local residents. When working on an event of this caliber, it is important to consider the effect of the decathlon on the stakeholders. All parties have many opportunities to benefit, including learning experiences, political change catalysts, and local area upbuilding.

The purpose of the Solar Decathlon is to promote solar technologies and to gain exposure for regional strategies that local communities can adopt. The hope is that public engagement with the models will serve as pilots for new markets (U.S. DOE Solar Decathlon, 2017). Strategic Niche Management (SNM) is a unique approach to the development and incorporation of technologies. The basic principle of SNM is to create a safe space or community to test and run trials on new technologies. Niches provide a collaboration space where innovators feel comfortable making mistakes and trying new strategies to advance the technology. These technologies are generally not yet competitively priced or adequately established enough to be adopted as common practice in the industry. Investors are often uncomfortable investing in or exploring a new technology; the technology needs time to develop and prove itself before investment. (Heiskanen, Nissilä, & Lovio, 2015).

In the case of the Solar Decathlon AFRICA, students and university faculty on Solar Decathlon teams are the innovators (see Table 1). These innovators aim to make positive advancements in the solar technology and sustainable design fields. Students and faculty individually benefit through their participation, gaining knowledge and experience (U.S. DOE Solar Decathlon, 2017).

<b>Stakeholder Group</b>	<b>Interest</b>	<b>Assets</b>
<b>University Students</b>	Education and hands on project experience	Ideas, knowledge, labor
<b>University Faculty/ Administration</b>	Using the Solar Decathlon to bolster curriculum and compliment student work. May also receive grant or research money	Industry connections, leadership, knowledge
<b>Government Agencies</b>	Supporting solar energy and pushing Morocco toward energy goals	Money, power to change laws and policy, far-reaching communication, expansive networks
<b>Potential Industry Sponsors</b>	Learning more about sustainable technologies, opportunity to advertise and test products	Money, connections, power to shape future industry
<b>Local Residents</b>	Bring positive attention and technologies to local area, boosting economy	Real estate

Table 1: Identified stakeholders for Solar Decathlon AFRICA 2019.

IRESEN needs investors to provide support for niches. For the Solar Decathlon AFRICA, the government will be a key player. Government agencies and companies can give funding to demonstrations such as the Solar Decathlon. The Solar Decathlon is an opportunity for the government to further support solar technology development (Griffiths, 2017). Investors may include energy companies, construction and architectural firms, banks, and realtors (Moore & Higgins, 2016). A successful demonstration can promote and legitimize the new technology.

In order to further develop and flourish in the global energy industry, a larger network needs to witness the viability and value of solar technology (Heiskanen, Nissilä, & Lovio, 2015). The innovation and effort of university students and faculty drive the Solar Decathlon. Additionally, the cooperation of local residents will further facilitate the competition. Communicating the objectives and benefits of the Solar Decathlon to these stakeholders is vital to the success of the Solar Decathlon (Neslen, 2016; Climate Investment Funds, 2016; Solar GCC, 2015).

## 2.5 Relevant Case Studies

To better understand how to best develop a promotional strategy and increase the impact of the Solar Decathlon in Morocco, we evaluated two case studies that featured some of the lessons learned from hosting global events. First, we compared two building demonstration projects to explore which factors led to greater success. Second, our team investigated promotional strategies used at the Solar Decathlon China in 2013.

### Case 1. Technology Demonstration Projects

#### *Luuku House*

In 2010, a Finnish university team designed the Luukku house to compete in the Solar Decathlon Europe. The team needed money for the material and construction costs of the project, so they turned to public funding bodies. A public funding body is a public entity with resources that can be utilized to assist a group towards positive change. A Finnish Innovation Fund, Sitra, was one of the major funding bodies that assisted the team. Sitra became actively engaged in the project and learned about the possibilities of solar technology. After the house ranked first in the Architecture category of the Solar Decathlon, Sitra witnessed firsthand the incredibly positive media attention that the house attracted both to itself and to all of Finland. After the Solar Decathlon, Sitra decided to launch its own project with the aim of tearing down legal and market barriers currently inhibiting solar energy in Finland (Heiskanen, Nissilä, & Lovio, 2015). This example showcases how a successful demonstration can engage and teach its stakeholders the value of a new technology. A university team alone cannot change the entire energy industry, but several affluent organizations working together can begin to create change.

#### *Nicholson Development*

If a demonstration project fails to advertise to key stakeholders, it may have little impact on the uptake of new technologies into the mainstream industry. The Nicholson development in Melbourne Australia is an innovative apartment and retail complex built in 2011. The development has a very high energy efficiency rating, incorporates solar technology, and maintains a below market-average cost.

At the time of its construction, the developers imagined that this project would serve as a model for the industry. While the physical Nicholson development was certainly a success, the envisioned impact on the building industry seemed to fall short (Moore & Higgins, 2016). A study by Trivess Moore and David Higgins gathered opinions on the Nicholson project from 14 key industry stakeholders in and around Melbourne. Most of the stakeholders agreed that environmental sustainability was the morally right direction to pursue. However, they also believed the market did not value sustainability and therefore pursuing sustainability was not always the best decision economically. Some stakeholders noted that if the value of environmental sustainability increases in the eyes of the market and consumers, then it will be easier for industry investors to pursue new environmental technologies (Moore & Higgins, 2016). Most stakeholders were unaware that the Nicholson development was able to maintain competitive pricing while incorporating many new sustainable technologies. These interview results show that the developers of the Nicholson project did not effectively communicate the successes of the project to most stakeholders. As a result, the Nicholson project had a small impact on the building industry's impressions of sustainable design.

The Luuku project was more successful because the team contacted and engaged interested companies in the project early on. The Nicholson development was an innovative building, but relevant stakeholders were not informed of the project's novel ideas. Stakeholder communication proved to directly influence the level of impact each project had. When participants directly involved in the Luuku project conveyed the project outcomes to the entire community, there was a larger effect on the building industry. These outcomes from the Luuku house helped to prove and legitimize new technologies with factual evidence. In the Luuku project, the government played a large role in assisting with the spread of information and also provided additional support after the completion of the project (Heiskanen, Nissilä, & Lovio, 2015). These two case studies showcase the importance of communication on large scale demonstration projects.

## Case 2. Solar Decathlon China 2013

The city of Datong hosted China's first Solar Decathlon from August 2-13, 2013. The event hosted "37 universities and more than 1,000 university students from 13 countries [taking]

part in the integral design and manufacturing process,” including a team of WPI students (Solar Decathlon China, 2016). Despite 90°F temperatures during the opening weekend, the Solar Decathlon China had double the attendance of the previous US and European Solar Decathlons, attracting 54,000 visitors (U.S. DOE Solar Decathlon, 2017).

Solar Decathlon China achieved record-breaking attendance through vigorous advertising. The organizers of the competition placed advertisements on television, radio, and banners around the local area (Van Dessel, personal communication, November 6, 2017). This increased the public awareness of the competition, increasing the number of potential visitors. To further encourage public attendance, the city created four new bus lines dedicated specifically to bringing people to the competition location (SD China, 2016).

To get the 37 participating universities involved, the organizers primarily used online promotional material. The official Solar Decathlon website, hosted by the U.S. Department of Energy, has a page dedicated to each of the competitions located abroad. On this page the organizers laid out general information about where and when the competition would be taking place, as well as a link to their own website for more information. This separate website contained all details pertaining to the competition for both participants and the general public. WPI initially learned about the 2013 competition from these websites. The information provided on the website encouraged WPI to create a team and submit a proposal. After the host selected the WPI team, the website was critical in staying up to date with requirements and deadlines throughout the competition (Van Dessel, personal communication, November 6, 2017). Although we expect additional factors led to this success, the organizers of Solar Decathlon China removed the main website that typically contains this information.

China’s preparation and extensive promotional strategies for Solar Decathlon China in 2013 resulted in record breaking attendance and a positive experience for the WPI team (Van Dessel, personal communication, November 6, 2017; U.S. DOE Solar Decathlon, 2017). The promotional strategy of this competition can serve as a model for future decathlons, including Solar Decathlon AFRICA.

## 2.6 Literature Review Summary

In summary, the current literature reveals five key points that will inform our work in Morocco. First, detailed documentation exists regarding past Solar Decathlons. This information

is helpful to understand the scope of a Solar Decathlon competition. The information regarding IRESEN reveals a pre-existing network of industry and government contacts and previous experience in sustainable energy development. Background regarding the geo-political context of Morocco and Africa demonstrates a unique opportunity for Africa to come together under the leadership of Morocco. From the information gathered on stakeholders, we explore the relationships between all relevant parties. The case studies highlight the importance of communication, organization, and advertising. Our methodology aims to further our team's understanding of these issues and to assist IRESEN in the development of a communication strategy.

## 3. Methodology

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The goal of our project is to develop a strategy to foster communication between the Solar Decathlon AFRICA organizers and participants. We will gather information from a sample of past and potential participants including university students and industry stakeholders. To successfully complete our goal, our three objectives are as follows:

1. Identify the advantages of participation in the Solar Decathlon from the perspective of past participants
2. Gauge current interest of Moroccan students in Solar Decathlon AFRICA
3. Assess willingness of industry stakeholders to support Solar Decathlon AFRICA teams.

To accomplish these objectives, we will collect data utilizing archival research, interviews, and surveys. Our team outlines the strategies for each objective in detail below.

### 3.1 Identifying Participation Advantages

Our team's first objective is to identify the advantages of participation in the Solar Decathlon. We will conduct archival research of existing sources that discuss the impacts of the Solar Decathlon on past participants. For example, teams often create blogs for the competition to document their project experiences. These blogs will serve as primary sources that speak of both challenging and rewarding moments for the students.

There are also secondary sources that can provide information regarding the impacts of the Solar Decathlon. In 2012, the DOE commissioned Lockheed Martin to conduct the "Impact Evaluation of the U.S. DOE's Solar Decathlon Program." This report provides extensive data comparing 334 former Decathletes with groups of non-Decathlete students (Barnes, 2012). The report considered points such as "learning from the Solar Decathlon compared to regular coursework," "preparation of Decathletes to enter the clean-energy workforce," and "impact of participation in a Solar Decathlon on getting a job in the clean-energy workforce" (Barnes,

2012). The in-depth analysis of this data, combined with rigorous statistical methods, provides a wealth of information on the impacts of Solar Decathlon participation.

To supplement the research from these sources, we will also conduct a series of semi-structured Skype interviews with WPI's members from the 2013 Solar Decathlon China team. This is convenience sampling of all past participants of the Solar Decathlon. Professor Van Dessel has provided the list of team members, and we will e-mail all of these past participants requesting a 15-minute Skype interview. We will first ask questions regarding how they got involved in the competition, their main motivations for participating, and how involvement in the Solar Decathlon has impacted their life - both professionally and culturally. We will also ask about the time commitment involved in participating, as this may be an important aspect for potential participants. As a part of the semi-structured format, we will allow for the interviewees to expand on any answers and talk open-endedly about the experiences they feel were most impactful (see Appendix A).

In order to summarize the archival research and interview responses, we will paste the text from the blog posts, impact report survey responses, and interview transcripts into a tag cloud program such as Word Cloud. The program will identify key words and phrases used by past participants to describe their Solar Decathlon experience and tally the frequency at which these phrases appear. We will develop a ranking system for the key motivations and benefits based on frequency. This rubric will present the most prominent, positive aspects of the Solar Decathlon from the team's point of view. This information will be helpful for the development of a promotional strategy executed by IRESEN in the future.

### 3.2 Gauging Current Interest

Our second objective is to assess the current interest of Moroccan students in Solar Decathlon AFRICA. To accomplish this, we will first create a mock-up pamphlet to promote the competition. This pamphlet will be informed by our archival research and will advertise the competition via three separate approaches. For example, one of these approaches may be to emphasize the excitement of using cutting-edge technology in a Solar Decathlon. Our research will inform our decision on which approaches to include in the pamphlet. Each section of the pamphlet will have images and some text describing aspects of Solar Decathlon AFRICA. Once the mock-up pamphlet is complete, we will number each element (text or image). This numbered

pamphlet will serve as both a tool for collecting quantitative data and a talking point during our intercept surveys.

Our team will conduct intercept surveys at three Moroccan universities. uniRank has created a list of the top 22 Moroccan universities based off accreditation, types of degrees offered, and number of face-to-face courses (uniRank, 2017). To select the three universities for our intercept survey, we will use convenience sampling to limit the list to universities located in either Rabat, Casablanca, or Marrakech. Once our team randomly selects three universities, IRESEN will initiate contact with each university and facilitate our visit.

At each selected university, our team will set up a table at a central campus hub such as a food court or campus center. Once on site, we will determine methods to attract more attention to our table. To administer the survey, our team will ask passing students if they are willing to participate. To encourage participation, we will offer a small incentive such as entrance to a raffle. Intercept surveys allow us to collect observer data and clarify any confusing questions (Rea & Parker, 2014). Our team will ask students about their interest in the competition, the pamphlet and awareness of Solar Decathlon AFRICA (see Appendix B). During the survey, we will ask students to select which elements of the pamphlet they find appealing or eye-catching. We will record these selections and use them to create a heat map indicating the parts of the pamphlet which stand out the most.

The results of the surveys will be useful in revising the pamphlet and creating a final draft. Our team will adjust the pamphlet to focus more on the topics which students found appealing. We will also choose the graphics that were the “hottest” on the heat map. The survey response will inform the focus and information included in the final pamphlet. The responses will allow our team to improve the quality of the pamphlet and to better advertise the competition to students. We will give the final pamphlet to IRESEN as it has the potential for international promotion.

### 3.3 Assessing Possible Industry Sponsorship

Our third objective is to gauge willingness of industry stakeholders to support or sponsor Solar Decathlon AFRICA teams. This support can come in the form of money, materials, time, mentorship, or access to facilities. IRESEN’s role as a green energy research institute in

Morocco involves building relationships with relevant companies and organizations in the energy industry.

Our first step will be to obtain a contact list of organizations potentially interested in being involved with the Solar Decathlon from IRESEN. IRESEN will facilitate the interviews with contacts and industry companies located in Rabat. The semi-structured interview will include questions on the types of projects the company is interested in sponsoring. Our questions will also gauge stakeholder interest in the solar energy and sustainable design fields. Lastly, we will ask companies how much they know about the Solar Decathlon (see Appendix C). From the results of this survey, we will create a list of potential organizations most likely to sponsor aspects of the competition. IRESEN can use this list to aid teams in finding sponsors.

### 3.4 Data Management

We do not expect to require translators for the past participant interview or the intercept surveys; IRESEN has informed us that most of their employees and university members speak English. However, we will likely require translators for the industry sponsor interviews. Our team will arrange these details with IRESEN once we arrive in Morocco. For intercept surveys, we will ask participants at the beginning of the session to interject with questions if they require clarification. We will speak slowly, enunciate clearly, and avoid any slang.

### 3.5 Timeline

In our collaboration with IRESEN, we present a timeline for our eight weeks in Morocco in order to keep data collection and analysis on track (Project Management Research, 2016):

Timeline	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8
	1/7-1/13	1/14-1/20	1/21-1/27	1/28-2/3	2/4-2/10	2/11-2/17	2/18-2/24	2/25-3/3
Archival Research								
Personal Skype Interviews								
Analysis 1								
Intercept Survey with Brochure								
Interviews with Possible Industry Sponsors								
Analysis 2								
Final Report								

Table 2: Gantt Chart for methodology schedule for our eight weeks in Morocco.

## 4. Conclusion

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Solar Decathlon AFRICA is an extraordinary opportunity for countries around the world to advance the movement for clean energy as well as engage in meaningful discussion regarding collaboration. In order to take full advantage of this opportunity, the early stages of the competition must include effective communication between the host and the participants. Our project is to develop a strategy for fostering this communication between IRESEN, university teams, and potential sponsors. We will identify impacts of participation in the Solar Decathlon, gauge current participation interest (focusing on Moroccan universities), and assess willingness of industry stakeholders to support the competition. Our findings will allow us to present options to IRESEN for what the communication platforms could look like, and how each could aid IRESEN in the promotion of Solar Decathlon AFRICA.

Once in Morocco, we will employ archival research, surveys, and interviews to collect this data. We will summarize resultant quantitative and qualitative analysis in a report with recommendations for IRESEN. We are grateful for the opportunity to be a part of Solar Decathlon AFRICA, and we look forward to our collaboration in Morocco!

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# Appendices

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## A. Participation Advantage Video Interview

### **Entrance Page of Interview I:**

*“We are interested in understanding the advantages of participation in the Solar Decathlon. You will be asked to answer some questions about your experience. Please be assured that your responses will be kept completely anonymous.*

*The study should take around fifteen minutes to complete. Your participation in this research is voluntary. You have the right to withdraw at any point during the study, for any reason, and without any prejudice. If you would like to contact the Principal Investigators in the study to discuss this research, please e-mail IRESEN18@wpi.edu.*

*By starting the video interview, you acknowledge that your participation in the study is voluntary, you are 18 years of age, and that you are aware that you may choose to terminate your participation in the study at any time and for any reason.” (modified from Qualtrics)*

### **Interview I Questions:**

1. How did you initially hear about the Solar Decathlon?
2. How did you get involved in the competition?
3. What was your initial motivation for participating?
4. Can you describe the commitment necessary for participating in the competition? (in terms of time, courses, money, etc.)
5. What interdisciplinary skills did you learn from the Solar Decathlon?
6. Has your Solar Decathlon experience impacted your professional career? If yes, briefly explain how.
7. Has your Solar Decathlon experience impacted your world view? If yes, briefly explain how.

8. Has your Solar Decathlon experience impacted your perspective on sustainable energy?  
If yes, briefly explain how.
9. Is there anything else you would like to share about your Solar Decathlon experience?

## B. Current Interest Intercept Survey

### Entrance Page of Survey I:

*“We are interested in understanding current interest in the Solar Decathlon. You will be presented with information relevant to the Solar Decathlon and asked to answer some questions about it. Please be assured that your responses will be kept completely anonymous.*

*The study should take around three minutes to complete. Your participation in this research is voluntary. You have the right to withdraw at any point during the study, for any reason, and without any prejudice. If you would like to contact the Principal Investigators in the study to discuss this research, please ask the person who gave you this survey or if it is after survey completion, e-mail IRESEN18@wpi.edu.*

*By starting the survey, you acknowledge that your participation in the study is voluntary, you are 18 years of age, and that you are aware that you may choose to terminate your participation in the study at any time and for any reason.” (modified from Qualtrics)*

### Survey I Questions:

1. What do you study?
2. How many years have you been at this university?
3. If you could work for any company after you graduate, which company would it be?
4. Have you heard of the Solar Decathlon competition?
  - a. If yes, how did you hear about the competition?
5. Are you aware of the Solar Decathlon AFRICA competition being held in Morocco in 2019?
  - a. If yes, how did hear about it?
6. While you quickly skim this pamphlet... (team member hands participant the pamphlet)
  - a. Which section appeals the most to you?
  - b. Which picture caught your attention?
  - c. Which section of that looks most interesting?
7. Would you be interested in learning more?
  - a. (If yes, hand out business card with Solar Decathlon AFRICA information)

## C. Industry Stakeholder Interview Questions

### Entrance Page of Interview II:

*“We are looking to gauge current interest in the Solar Decathlon. You will be asked to answer some questions about your company and its potential relationship with the competition. Please be assured that nothing you say during this interview will be contractually binding in any way. Responses will be used solely to assess the possibility of a future collaboration with the Solar Decathlon.*

*This interview should take around fifteen minutes to complete. Your participation in this research is voluntary. You have the right to withdraw at any point during the study, for any reason, and without any prejudice. If you would like to contact the Principal Investigators after this interview to discuss our research, please e-mail IRESEN18@wpi.edu.” (modified from Qualtrics)*

### Interview II Questions:

1. Tell us a little bit about your company’s values.
2. Does your company participate in any career fairs?
3. Would your company be interested in investing in renewable energy?
4. Would your company be interested in sponsoring a project focused on sustainable building design?
5. Would your company be interested in being involved in an international competition at a university level?
6. Have you heard of the Solar Decathlon?
  - a. If no, team member gives explanation
  - b. If yes, how did you hear about it?
7. Are you aware that Solar Decathlon AFRICA will be hosted in Morocco in 2019? If yes, how did you hear about it?
8. What factors are most important to your company when deciding to sponsor a project?
9. If you were to be involved in Solar Decathlon AFRICA, in what ways would you want that relationship benefit your company?
10. How does your company value project vs classroom experience when hiring?