USE: SUSTAINABILITY CHALLENGE
ASSINMENT 2

SOLAR PARKS CASE ANALYSIS

GROUP TSC-C91d

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TABLE OF CONTENTS

- **Introduction** **3**
- **Assignment 2A** **4**
  - Promises analysis 4
  - Consequence analysis 7
  - Conclusion 10
- **Assignment 2B** **11**
  - Moral problem statement 11
  - Problem analysis 12
  - Revised moral problem statement 13
  - Options for action 14
  - Ethical judgement 15
  - Revised options for action 16
  - Reflection 17
- **Conclusion** **18**
- **References** **19**

CASE: SOLAR PARKS

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INTRODUCTION

The topic of this report is solar farms, in particular solar farms in Northern Africa. The Sahara Desert is considered a prime location for generating solar energy. There are many advantages of solar parks in this area, but unfortunately there are also disadvantages. This report consists of two separate parts, a descriptive and a normative analysis.

In the descriptive analysis, the different stakeholders involved in solar energy will be analysed. In the first half, the existing concerns and the solutions the new technologies have provided will be categorised per type of stakeholder. In the second half, the possible unwanted consequences that are caused by those solutions are discussed.

In the normative analysis, the ethical problems will be researched and some possible solutions will be formulated. First, the moral problem of this subject is explained. Then this problem will be further analysed and if possible, a revision is made. After that, possible plans to solve the problem are stated. These plans are then analysed on a moral point of view. With this information, a revised plan for actions is formulated.

DESCRIPTIVE USE ANALYSIS

User promises

Erik Westeneng

In the nineteenth century, technology was not yet focused on the use of the product. Machines were complicated and dangerous and the private user was not seen as a market.

The users can be classified into different groups. There are activists, who strive to improve the situation for the population. In case of solar parks, they could be human rights or environmental activists. How do the new solar parks affect the local population? Does it affect the climate of the region? As mentioned before, a great share of the materials for solar panels is mined in China. A concern for the activists could be the working conditions there and how they can be improved. A label similar to Fair-Trade could solve these concerns.

Another group is the tinkerers. Tinkerers miss certain functions in their product and want to improve it themselves. This is not a large group in case of solar energy, as the technology is not that simple or cheap.

The third group are professional users, like farmers or doctors. They use machines and instruments for their job. In some places, farmers live in areas that are not well connected to the power grid, so they have to come up with other ways to get access to electricity. Windmills and solar panels are the solution.

Users in the sources

Property owners buy land or a house. Most of the time, this is an investment with the hope the price will increase over time. If the view is blocked by solar panels, the property value will decrease. This will lead to a loss for the owner if they ever decide to sell their home or land. (Stronberg et al., 2019)

The land that is attractive for solar park developers is also attractive for the agricultural sector, since they both require a lot of sunlight. Farmers will have to decide whether to keep their most fertile piece of land or sell or rent it out to the developer. (Stronberg et al., 2019)

Activists strive to improve the quality of life on the work floor or in the region in general. Building solar parks near residential areas will ruin the view. But it will also affect the climate with the heat being absorbed by those parks. (Stronberg et al., 2019)

Another concern is that you cannot always choose if you receive green energy from the supplier. There are not two separate cables leading to every house with one for green and the other for 'grey' energy. It is one system for which multiple suppliers, which can be green or not, supply the electricity.

Other users

Solar energy is widely used all over the world. From households to businesses to international airports. The sources do not really cover the larger commercial users specifically.

Societal promises

Thijs Reijnders

There are also the societal issues that come with constructing large solar farms. Building and maintaining a solar park, for example, is too expensive at present time due to the technology's development. “18-30 cents per kilowatt-hour.” (Grand Challenges, 2019) Not everyone can pay these prices when we switch completely to this energy. This is why new/less expensive materials and more efficient solar panels are being researched. Furthermore, certain members of society are opposed to trading natural areas for huge parks, resulting in the loss of the country's biodiversity. Solutions are also being devised for this. “The solar parks can also be built in the areas that are now utilised for the cultivation of silage maize for biogas plants” (Schnitzler, 2019)

The construction of these solar parks causes challenges for various groups in society. The first is society's agriculture sector. They will lose part of their agricultural land and income and as a result the entire society will notice that fewer agricultural products are coming onto the market and that these products are becoming more expensive. Then there are some who enjoy being outside, the environmentalists. They find peace in nature and complain that it is being taken away from them. They also fear that the building endangers a variety of animal species that contribute to the area's biodiversity. Finally, as previously said, the lowest classes of society may struggle to pay for green energy when it becomes required.

In “Engineering the Future”, 4 promises are made: The promise of peace and progress, the urban promise, the national promise and the global promise. Only the promise of peace and growth applies to solar parks and its related stakeholders, because this promise ensures that everyone in society, even the meanest member, may develop and live a free and happy life. The others are technical and urban development-related and have nothing to do with the specified stakeholders.

The agriculture sector is mainly concerned with the loss of land and money. However, they will be well paid “between $21,250 and $42,500 a year” (Stronberg et al., 2019) by the energy companies. Environmentalists are particularly concerned about the loss of nature and biodiversity. However, it appears that “Solar parks have a huge potential for diversity, which can be very valuable for the protection of species.” (Schnitzler, 2019). Finally, the least fortunate members of society are unsure if they can afford the green energy. As previously said, extensive study is being conducted, implying that prices would decrease rapidly.

The construction of the connections between solar parks and the main electricity grid is a concern that is not discussed in our publications. As a result, a portion of the infrastructure will be closed for a period of time, which will be detrimental to society.

Promises to enterprise

Micke Viljoen

In the age of Promise technology's main promise to enterprise was the increase of business opportunities. The 19th century gave birth to two new types of entrepreneurs, the inventor-entrepreneur and the opportunity seeking entrepreneur.

The epitome of the Inventor-entrepreneur was Thomas Edison, a self-taught and trained engineer who became an independent inventor. Furthermore, he is arguably most well-known for revolutionising electrical lighting where he saw that the only electric lighting of that time, arc lights, were too bright. In order to compete with the gas-lighting industry he designed completely new technologies to supply electric lighting to customers; from the generators, the distribution system and up to the light bulbs.

The second type of entrepreneur was the opportunity seeking entrepreneur. They kept up to date with the latest technology by reading technical and engineering journals, attending lectures and visiting lectures and companies. One such entrepreneur was Fredrich Engelhorn the founder of the chemical company BASF. Engelhorn was a trained goldsmith who married into a wealthy family which afforded him the opportunity to change career. He first created a company which sold bottled coal gas inspired by one of his tenants: an engineer who worked in coal gasification. After that he saw one opportunity after another and at the 1900 World fair in Paris he announced that BASF possessed "without question the largest chemical factory in the world".

This conceptual frame can be applied to solar power. The company light year which produced the world's first 100% solar powered car is a great example of a business created by an inventor-entrepreneurs. Lex Hoefsloot, one of its co-founders, was studying at the Technical University of Eindhoven where he was the captain of the solar team and decided to quit his studies and create lightyear. (Solar Electric Vehicle 2022)

Journalists play a big role in the opportunity seeking entrepreneur's initial steps in starting a business. The article by author Ashley Jenkins titled "7 Ways to Invest in, and Start a Solar Farm Business in 2021" is a prime example of how entrepreneurs with non-technical backgrounds can get involved in the solar industry. (Jenkins, 2021)

When comparing the two examples above, it can be seen that the opportunity seeking entrepreneur will probably bring tried and tested techniques to the market while the inventor-entrepreneur will probably create innovative business. Both types of entrepreneurs play an important role. While one creates new technical solution the other distributes these solutions

The branding and image of a company is becoming more and more important. Today, consumers want to support companies who act in morally acceptable ways. The sources did not mention that creating a solar company gives entrepreneurs a way to create wealth in a way that aligns with consumer values, since most consumers support solar power.

User consequences

María Segura Sos

With the rapid progress of technology, users have had the opportunity to adapt to changes in the energy sector by replacing their obsolete and ephemeral source of energy with a more sustainable and durable one. It is not uncommon for conflicts to arise in the transition to low-carbon economies. The reality is that such conflicts are not only created between environmentalists and denialists, but also between users who are driven by economic interests. (Stronberg et al., 2019)

The farmers, for example, who are generally not environmentally concerned, see land sales from solar farm developers as an opportunity to earn a big income regardless of the weather.

Pavagada Solar Park in India is the largest Solar Park in the world, spanning a total area of 53km². The major problem the park faces is the difficulty of maintenance. To get the most out of solar parks and make them as efficient as possible, the solar panels need to be cleaned regularly to absorb as much sunlight as possible. This disadvantage increases as the size of the solar parks increases.

Sheshagiri Rao, an agricultural researcher, and farmer based near Pavagada, affirms that “while farmers who own the land are rewarded for leasing the area, shepherds who had grazing rights in their fields have been forced to sell”. Venkeapream village used to have herds of 2,000 to 3,000 sheep but only about 600 remain.

Underground water supplies are on the verge of collapse due to the high demand for cleaning solar panels. Local farmers bring in water to clean the panels. Still, it is insufficient, says developer Acme Cleantech Solutions: "It takes at least two litres of water to clean one panel" and the plant has more than 400,000; moreover, although there are robotic machines that clean them twice a month, most operators do not have them.

It was suggested that one of the possible solutions to the conflicts between farmers and shepherds was to open the gates of the park and allow sheep and other animals to enter. This would enable the animals to graze and eat the grass that grows between the panels, reducing the risk of fire in the area.

However, this may not only fail to reduce conflicts between users but may aggravate them.Although it would reduce the likelihood of fire, the animals could damage the solar panels and make them dirty, which would require more water and investment in cleaning. Fortunately, some companies are already making their first moves in the development of "waterless" cleaning (Vasanthi, 2020)

Society consequences

Antonis Papachristou

The development of technology has solved many of humanity's greatest challenges leading to a variety of technological promises. At the same time, technological innovations created consequences such as wars, severe class conflicts, colonial exploitation and deep concern over foreign competition.

Concerning the solar parks, many unintended consequences and conflicts arise for society. Local residents have expressed their concerns about the scale and safety concerns of solar parks, which could affect negatively the local area and environment. As mentioned in the source (Guardian, 2020), Helen Whately, the Conservative MP for Faversham and Mid Kent, said "the scale of the development would have a devastating impact by industrializing the countryside." Another example is The Campaign to Protect Rural England in Kent which has warned that the proposed battery storage facilities are five times the size of some of the largest storage projects in the world, which could raise the risk of explosions and fire. Also, if the waste of the industrial equipment that store the energy produced by the panels is not properly handled, it could be harmful to the health of the people in the community. The presence of solar parks changes the landscape and creates aesthetic degradation. A research team from Slovenia's University of Ljubljana has investigated that people perceived solar parks as ambiguous objects (Bellini, 2020).

Conflicts between solar developers and the environmental community will result to a slow transition to a low-carbon economy. For example, a proposed 500-megawatt solar farm on 6,300 acres in Spotsylvania County, Virginia is encountering resistance from residents and local environmentalists (Stronberg et al., 2019) . Moreover the agriculture sector will be affected since property owners care about the value of their lands. The construction of solar panels will block vistas and squeeze small farmers who lease land to grow crops (Chicago Tribune, 2020). Environmentalists and conservationists are worried about the land requirements that exceed the project's boundaries and consequently affects animal habitats, plant species, forest, and farmlands.

Regarding desert projects, solar panels will reshape desert lands and create health risks associated with blowing sands. Solar parks in the African region reveal a variety of ethical issues concerning the exploitation of developing countries for the development of technology. Using the Sahara deserts for the development of solar parks for the benefit other countries, creates a form of neo-colonialism similar to the colonialism in the Age of Crisis. The imbalance of power shows that history repeats itself since such technologies are originally developed for environmental purposes but are repurposed by others for their own benefit leading to social issues..

Enterprise consequences

Miguel Oliveira Prazeres

Conflicts and unintended consequences of solar park innovation have also arisen out of the increased proliferation of new businesses that attempt to benefit from this innovation. To analyse these technologies ramifications on enterprise means to examine how the emergence of solar parks as a technology and business opportunity has influenced it in contrast with its promises.

A prominent example of these consequences is how the prominence of solar parks has increased demand for land, which affected other land-intensive businesses, particularly the agricultural industry. Case and point, the Netherlands, as a result of increased use of land and frequency of solar park projects of scale, has passed a motion which introduces restrictions on the construction of large scale solar plants on agricultural land. Peter Segaar, a solar analyst, has said that these restrictions would not influence the development of this innovation; however, a decrease in the available land for such projects is a growing concern. We can now see that the uprising of this type of renewable technology is already modifying or, at the very least, a potential threat to how enterprise is run today. (Bellini, 2019)

In contrast, a significant number of companies have in some form incorporated the use of this innovation to benefit them, including giants such as IKEA, Apple, Walmart and others. (Sun Badger, 2022) A promise of this technology then seems to have materialized, as the use of such sustainable forms of energy are more present less non-renewable energies are needed. However, Enterprise may not necessarily be consequently changed for the right reasons. Programs such as the SDE+ (Dutch Renewable Energy Support Scheme) in the Netherlands give tax benefits to companies that adopt a sustainable form of energy, including solar energy, to willing companies. Then are businesses adopting this new technology in an attempt to be more sustainable while still being economically viable while pushing the sustainable agenda forward? or is it just a green-washing tactic applied by big corporations to get tax benefits while being perceived as companies of the future. Regardless of where these companies lie on the spectrum, the ecosystem of current Enterprise is being shaped by these technologies. (KC Green Energy, 2021)

Conclusion

Undoubtedly, technology and rising innovation do not only change the individual but the society and the mechanisms that run it. Solar panels' recent innovations are no different. Even though all analyses looked through different parts of history, they could not but come to some overlapping conclusions. Mainly that innovation, particularly when it comes to technology, holds an immeasurable promise that should not be ignored. However, in all analyses, it was not uncommon for a constant critical outlook of the fundamental consequences of how such a newity can and will influence the complex system humans have developed over millennia. There was an awareness of our species' adaptability and how this aspect interacts with upcoming technology in all sections. Moreover, how we adapt and the steps we take to do so lead then the logical concern for sustainability which was directly addressed in all our sections.

Comparatively to the previous assignment, it is clear that as the analysis develops further and becomes more complex, more specific issues are identified and focused on in each section. For example, social issues caused as a result of upscaling production/use of such technologies take more of a spotlight and climatic deterioration caused by a technology meant to help it begins to be discussed. By no means does this mean that the sections diverge on the final goal of this report, but rather shed light on the divergence of thought and which issues should get more attention.

As Winston Churchill once said, "Those that fail to learn from history are doomed to repeat it", and an analysis of the ramifications of technology and, in particular, solar panels are no different. Technologies shape us as individuals, as a society and as any system or enterprise. This shaping has been happening for centuries, and talking about the sustainability and fairness of these technological consequences has to be directly compared to its promises to truly develop and benefit society as a whole.

NORMATIVE USE ANALYSIS

Moral problem statement **Antonis Papachristou**

The relation between humans and nature changes dramatically through technological progress and the essence of modern technology. Balance between society, economy and environment is necessary to achieve sustainability.

Regarding the solar park industry, solar panels could expand renewable energy but a variety of moral issues come to the surface concerning sustainability. The main problem that will be answered throughout the Ethical Cycle is: Under what conditions are the construction of solar parks morally acceptable? In our case, we will focus on companies building solar parks in the Sahara to power the world and how such action develops power disparity between developed and developing countries and affects the climate of other countries . For example, the renewable energy investment company Low Carbon and London-based solar power plant specialist Nur Energie are looking forward to announcing an agreement for the development of the TuNur project, a 4.5 GW large-scale solar power plant to be built in the Tunisian Sahara (SolarPaces, 2017). This project will generate electricity for Europe via a submarine cable connected to the European grid in Italy.

The solar panels absorb the majority of sunlight but only a fraction of it is converted to electricity; the rest is reflected and returned to the environment as heat (Lu, 2022). This increase in the temperature could create unintended consequences in remote parts of land and ocean over different regions. According to research (Smith, 2021), this massive heat source in the Sahara has an impact in the circulation of global air and ocean and the global temperature shift will mainly affect the polar regions increasing this way the melting of ice in the Arctic. Drought in the Amazon and tropical cyclones hitting North American and East Asian coasts are phenomena investigated due to climate change caused by solar parks in Sahara (Lu, 2022).

Climate change is a global problem but in our situation some people are affected more than others, and for this the notion of fairness should be considered. The moral nature of the problem is the environmental and socio-economic impacts. Loss of the landscape, pollution/depletion of water, and reduced ecological connectivity between countries are conflicts related to the environment. Additionally, such solar projects could potentially lead to corruption of different actors resulting in the exploitation of developing countries for the development of technology and for their own benefit. Social issues including lack of work safety is surely a concern for the balance between technological innovation and human rights

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Problem analysis

Miguel Oliveira Prazeres

The problem in its most basic form concerns exploring the question, "under what circumstances should we build a solar park?". With the absence of a critical outlook, it may look that due to climate change, the necessity to transition to more sustainable energy sources might justify most solar park projects. However, the sheer scale of change and the mechanisms used to bring this about run deeper and are more complex, which require a more in-depth investigation of the morality of such a project.

A case study that may serve as an example is Nur Energie's project to build a large scale solar park in the Tunisian part of the Sahara desert. After growing concern about the dependency of the global north on Russian energy sources, an active attempt to change and diversify these have been put in motion. Consequently, a large-scale solar park began to be built in North Africa, producing energy directed to Europe. However, for many years, Tunisia has itself been energy dependent on Algerian energy and gets frequent energy cuts as a result. Wouldn't it then be of utmost importance that energy projects contribute to the country's energy self-reliance? Some scholars such as Hamza Ha Mouchene have described this as neo-colonialism since this project's potential lack of benefits for Tunisian individuals may result from reduced bargaining power with Europe. (Hamouchene, 2017)

It may also be essential to consider the project's climatic perspective. As solar energy becomes mainstream, this technology's innovation accelerates, and its benefits become more apparent. However, even though climate change is often portrayed as "we are in this together", there are countries more affected than others. So, for example, more frequent water shortages in Tunisia have to be compared to more recurring fires in Europe. Moreover, we must consider that this kind of project may be a "Green Grabbing" tactic as the appropriation of resource-rich underused land beyond a country's borders further perpetuates the overarching power that some countries and regions have over African resources. (Hamouchene, 2017)

In this ethical analysis, we will then prioritize moral values of justice and fairness not only to consider the environment versus the perpetuation of social issues but also to minimize the unethical use of sustainability labels plastered over solar parks as a new age mechanism for the perpetuation of power and exploitation over developing countries. We would primarily consider the lens through which Europe's energy sustainability should be put in direct clash with the economic sustainability of Tunisia when making a moral judgment, for example. How should governments interact with potential investments with its population's interests in mind?

Revised moral problem statement

Micke Viljoen

A moral dilemma is a situation where multiple ethical values come into conflict . In the initial problem statement two concerns were addressed. The first concern was the production of large scale solar parks could lead to unintended negative consequences on the climate. The second was the imbalance of power between wealthy countries and developing countries.

The main argument for switching to solar energy is to reduce the negative impact that current wide-spread energy generation has on the environment. Using the model (Lu, 2022) created by Dr. Zhengyao Lu, a researcher in Physical Geography at Lund University and Benjamin Smith, the director of research at the Hawkesbury Institute for the Environment at Western Sydney University, predictions can be made on how solar farms is the Sahara negatively affect the environment. By covering 50% of the Sahara with solar farms local temperatures

would rise by 2.5°C thereafter this heat would spread across the globe causing droughts in the Amazon and cyclones on Northern American and East Asian coasts. Many locations across the globe will be negatively affected by this, including wealthy countries. However, these effects could still be better than the effects caused by fossil fuels. Does solar power's risks outweigh its rewards? This becomes a complex technical question, which requires its own research and investigation. The presuppositions in the revised moral problem statement will be that solar power benefits the environment in respect to its alternative, fossil fuels. The moral question then becomes: Under what circumstances is it morally acceptable for wealthy countries to construct solar parks in sun abundant developing countries?

Dependency theory (Munro, 2018) is the notion that resources are sold by poorer countries to wealthier countries, bringing wealth to the latter at the expense of the former. As mentioned in the problem analysis, many historians and economists associated with Dependency theory argued that "Imperialism never ended, it just changed form" . For example, wages paid to workers in the global south are on average one fifth of the wages paid to their northern counterparts. Meaning that for every unit of embodied labour and resources the south exports it has to export many more units to pay for it. (Hickel, 2021) Should southern workers wages be increased, indirectly increasing the cost of clean energy? Solar energy has the power to become a major asset to the developing south but like many other resources it can also become another means in which it becomes dependent on the developed world.

The moral nature of the problem is that solar power in the Sahara could benefit the environment at the detriment of Northern African countries. What rules and regulations need to be put in place in order to prevent exploitation?

OPTIONS FOR ACTION

Maria Segura Sos

The problem analysis has led to the conclusion that the major conflicts faced in this case study include the overarching power of European countries over African resources and the lack of benefits for the Tunisians.

Solar energy produced on African soil is almost entirely exported to Europe. Pearl Uzokwe, the Sahara Power Group's Director of Governance and Sustainability, emphasises that governments and other groups must tightly regulate any energy program or future initiative to ensure that the African population benefits from commercial projects. "Supportive legislation, environmental consideration, safety, and sustainable development goals must all be adequately expressed in the agenda," Uzokwe argues. (Opara, 2019)

These regulations would include agreements limiting solar energy exports to European powers so that a portion of the energy generated by solar parks might be used locally. Countries with lower than 50% electrification rates, such as Tunisia, would become self-sufficient, eliminating the need to rely on neighbouring countries like Algeria. (Mohamed, 2022)

With a strong central government playing a large role in economics and reducing the dependence on imports, Tunisia could become an emerging economy with rapid economic growth and capital accumulation. (Parenti, 2011)

It should be noted that this first solution would be a drastic and complicated operation to negotiate. There are various economic interests involved and it is not possible to isolate trade deals that do not harm the integrity of the African continent given that most of the countries, including Tunisia, suffer from corrupt leaders. (Parenti, 2011) (Borgen Project, 2020)

Another option for action would be to introduce the “Improvement deals”. These deals avoid the corrupt hands and start by educating the Tunisian population and involving local businesses in the construction and development of the Solar Park.

A solar park of the size that Nur Energie's project is expected to build requires a lot of skilled labor and maintenance. According to Kevin Sara, CEO of Tunur, "the project will create around 20,000 jobs and help redress the inequality between Tunisia's wealthy coastal cities and underdeveloped hinterland" (Ejolt, 2018). With the appropriate training, the creation of jobs within the Tunisian population instead of the import of labor from Europe would result in direct income for the country and an increase in Gross domestic product.

One factor to bear in mind is that there will need to be agreements between the two parties; the government, and the corporation, to agree on subjects regarding the finance of the training of possible new employees.

ETHICAL JUDGEMENT

Thijs Reijnders

We must also analyse these options for action to verify that they are ethically viable and do not disproportionately disadvantage or benefit specific groups. We do this by employing an informal moral framework and use fairness as a dominant value.

We use fairness as our dominant value because huge initiatives like this one, which are regarded as innovative, may solve a problem for one group at the expense of another. An example is Shell, one of the world's largest oil and gas companies, which supplies many countries in Europe. The supply of these raw materials contribute enormously to the prosperity and development of these countries, but in Nigeria (where the raw materials come from) “the pollution has a severe impact on vegetation, crops, and fisheries, posing serious threats to ecosystems, as well as to the health and livelihoods of citizens.” (Corporate Justice, 2021)

The first option for action is to export some of the created energy to the Sahara's bordering (developing) nations, allowing Tunisia, for example, to become an emerging economy. From a fairness standpoint, this is a good solution because the project also helps to the (sustainable) development of these nations by using self-generated energy. However, there is a catch, because then this new energy has to be used for good purposes. After all, there are numerous corrupt regimes in North Africa and the Middle East, and these governments "exhibit various forms and levels of corruption that often include bribes, kickbacks, extortion, and nepotism." (Warf, 2015) As a result, there's a danger that energy will not be used for its intended purpose of developing the country but rather for making money. As a result, implementing this approach would be extremely complicated.

The second solution is the 'Improvement Deals' in which local people and companies are involved in the construction and maintenance of the solar parks. Of course, these local parties will have new employment and income opportunities, but that does not mean that these parties would also want that. Since this means they work for Europe, they build and maintain the parks while Europe benefits immensely. However, with this solution, the government is less likely to run away with the money and the local population not benefitting from it and thus more fitting then the first option.

Finally, you might consider whether it is not more convenient to split the yield rather than the energy (this applies to both alternatives). Perhaps poor nations have more needs for resources/money to help them grow their economies, educate their children, and so on, than they need for a supply of energy that they can't use yet.

REVISED OPTIONS FOR ACTIONS

Erik Westeneng

The solar parks that are being built in the Sahara desert are generating energy for the European market. Similar to a couple of centuries ago, European companies are using overseas territory for their own good.

One of the options for action offered was to not only transport the electricity generated to Europe, but also provide some of the energy to the African countries. This is a great idea, as their land is being used, so they should also be able to profit from that.

This solution creates a new problem. It would mean that less electricity is exported to Europe, because the same amount of electricity is divided over more people. How do we fill in that gap? Do we have to burn more coal to compensate for the decrease in electricity? Or do we just build more solar parks in the Sahara? More solar parks means also that more heat will be absorbed and emitted into the environment, heating up the environment and disturbing the global air circulation.

This can be solved by for example building more wind farms at sea, which is already happening at many places. Because wind farms receive a lot of criticism for ruining the views and endangering the wildlife (AGI, 2019), they can perhaps be temporary until a more efficient solar cell has been developed which could replace the current ones in the solar parks in northern Africa.

Another option mentioned is to educate and train the local population and business to get involved in building the solar parks themselves. This can generate many jobs, which will result in an increasing welfare.

Although, there may be some issues that are not mentioned. Tunisia is not a rich country, as the GDP per capita is 16 times smaller than in the Netherlands. (Country Enocomy, 2022) But it is still one of the richest countries in Africa. Tunisian companies might not have the funds to buy 'Fair-Trade' materials for the solar parks. Instead, they would have to resort to the cheaper ones which involve the exploitation of the Uyghur people in China.

A solution to this problem could be to keep the European companies involved after the training, but only as an assistant role. They can provide some money to buy the more sustainable materials if necessary or assist in other ways.

REFLECTION NORMATIVE ANALYSIS

None of the options for action are fully advantageous to our stakeholders because they either reduce the amount of electricity produced or increase total costs. However, we believe that the second alternative, which emphasises the need to train Africans to become highly skilled employees, is the most appropriate. This is a significant point since, while Tunur would have to invest in training, they would not have to look for European personnel and persuade them to relocate. Furthermore, because the African employees already reside in the area, Tunur would not be required to find and provide housing for them, nor would it be needed to pay for the costs of moving people and infrastructure from Europe.

Training workers has the disadvantage of taking a long time, and Tunur would have to engage professionals to oversee the training. This means they will have to compensate people who aren't contributing to the Solar Park's productivity. The park's production would have to be halted for a few months while workers who are willing to train for months without pay are trained.

However, in this situation, this will not be a significant issue because the money and time wasted during the training period will be less than the money lost if the company had to pay a percentage of the electricity produced to the Tunisian government instead. Furthermore, training the new personnel would take less time than securing an agreement with the Tunisian government on laws and legislation.

FINAL CONCLUSION

While analysing our USE case about solar parks, the descriptive and normative parts add to each other in order to conclude into an action plan. The first part expresses the view of the different stakeholders and how they are related to our case. After examining the promises and the corresponding consequences, part B followed. Part A's implications overlapped with the normative description, although it focused on morality and answered the question: Under what circumstances is it morally acceptable for wealthy countries to construct solar parks in sun abundant developing countries?

Because the descriptive analysis enables you to look at the case from many perspectives, it overlaps with the normative analysis. First an identification of the U-S-E stakeholders is made and their opinions on the challenges and solutions are analysed. Then the distinct points were stressed in the normative section to identify issues and answers. This allows us to have a more expansive picture of a case and, as a result, study it more thoroughly through the Ethical Cycle.

In addition, the descriptive section provided the group with a broad overview of the sustainability challenge in the context of solar energy, the stakeholders engaged, and the associated promises and consequences. The normative part focused on the morality rather than the technical aspects of our case. An analysis was made by breaking down the moral problems and providing options for actions. An investigation for the unintended consequences and conflicts of the solar energy industry was made from the perspective of a company responsible for a solar park project in the Tunisian Sahara.

By applying a moral framework that prioritises fairness we have concluded in part B into some action points. As mentioned in the part of ethical judgement, the first plan of action is to export part of the generated energy to the neighbouring (developing) countries, enabling Tunisia to become an emerging economy. Also, agreements limiting solar energy exports to European powers could be included in specific law regulations, allowing a part of the energy generated by solar parks to be used domestically. Lastly, by raising awareness on “Improvements deals” it will educate the Tunisian community and empower local businesses, avoiding corruption.

In conclusion, the analysis showed new findings regarding issues in the solar energy industry. Investment in such businesses might have several benefits, but it also poses threats to users and societies. The implications involving the environment, property owners, and solar developers creates an imbalance between them, with the weaker ones bearing the brunt of the impact.

These findings also demonstrate that climate change is more than an environmental issue. This means that, in order to tackle climate change, you must address not just the ecological, but also the social and economic issues that arise. Although it appears that the answers to climate change are straightforward and that the main issue is always money, we have now discovered that there are other social, moral, and economic issues to consider when seeking solutions.

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