Title: **SUPPORTING SPOTLIGHT SDGs WITH AN ENGINEERED OPTION**

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Spotlight SDGs: Goal 6: Ensure availability and sustainable management of water and sanitation for all and Goal 7: ensure access to affordable, reliable, sustainable and modern energy for all

Sustainability Issue(s) Relevant to the Spotlight SDGs:
Easy access to clean drinking water and sanitation and modern energy are human rights that are unfortunately still not accessible for many. These SDGs are particularly fundamental for the sustainable development of these communities; however, many are struggling to afford a clean water system and reliable modern energy resources to meet their demands. Efficient use and distribution of water is critical to meeting the growing demands for water and increasing frequency and severity of floods and dry seasons caused by climate change. Moreover, while access to electricity in remote areas and research in renewable energy has begun to improve, a better approach to sustainable and low-emission energy is required, as 70 per cent of indigenous communities are still powered by diesel generators, which have negative impacts on the community's health and the environment. This briefing note will focus on these two SDGs as improving the current conditions by implementing a clean water system and giving access to renewable energy in struggling communities will lay the base for the annihilation of poverty and climate action for a more sustainable environment.

Background on Spotlight SDGs:
Canada's indigenous communities are disproportionately affected by the current poor drinking systems for remote communities and drinking water advisories. As of August 31st, 2019, "there are 7 boil water advisories and 4 do not consume advisories for a total of 11 drinking water advisories in effect in 11 water systems across 10 first nation communities only in British Columbia" (FNHA, 2019). Many remote communities suffer from a lack of clean water due to malfunctions in their current water purification system and limited water sources. Furthermore, we need to generate enough electrical power to meet the growing energy demands of Canada in a modern society as the demands for energy exceed the abilities of the current system, particularly for the remote communities which are harder to access. Though Canada is a developed country acting on various matters such as climate action and pollution, we still have a long way to go. We must engineer a robust solution order to provide safe, long lasting, and sustainable water and energy systems to relieve these communities.

Current Global and National Status of Spotlight SDGs:

Since 2000, progress has been made in increasing the population using safely managed drinking water from 61 to 71 percent yet remained unchanged in 2017. 785 million people still lacked basic drinking water service. (SDG Knowledge Platform, 2019). Currently, “approximately one third of countries have medium or high levels of water stress”, and “of 172 countries, 80 per cent have medium-low implementation or better of integrated water resources management” (SDG Knowledge Platform, 2019). Similarly, access to electricity in poor countries have been facilitated, and research in energy efficiency and renewability are steadily developing. The global electrification rate “rose from 83 per cent in 2010 to 87 per cent in 2015, with the increase accelerating to reach 89 per cent in 2017” (SDG Knowledge Platform, 2019). However over 800 million people remain without electricity. In terms of renewable energy, the global use of renewable energy has increased by over 18 per cent since 2010, proceeding to outpace the growth of total energy consumption in 2012. However, according to the Sustainable Development Goals Knowledge Platform, “achieving universal access to even basic sanitation service by 2030 would require doubling the current annual rate of progress”, and “an annual rate of improvement of 2.7 per cent” is needed to reach target 3 of the renewable energy goal (SDG Knowledge Platform, 2019).

Key Considerations:

Various factors surrounding the problem were explored in order to provide a solution that will encompass the societal, environmental and economical situation of the community. The primary goal is to provide remote indigenous communities with clean water and sanitation sites, using a renewable source of energy, additionally allowing us to meet energy demands. In order to produce the quantity and quality of water required by the residents for a long period of time, there must be a water source near by the community to draw the water from and pump to a treatment facility to distribute through a centralized or decentralized system. However, this process is reliant on the climate will may be negatively affected by global warming, as seasons of dryness may cause the lake to dry up, reducing the amount of water available to the community (Richard & Schafter, 2010). Furthermore, viable options to power such a treatment facility and provide a renewable source of energy to the village are often limited and heavily reliant on weather conditions. For instance, in the case of a sunny location with long summers, a photovoltaic system would be more appropriate than a wind farm or hydrodams. Another important factor is the stakeholders’ stance on the solution as “indigenous clean energy shift must be built on trust and respect” (Lovekin & Heerema, 2018). Community acceptance plays a large role in the transition between the consumption of fossil fuels and the use of green energy. Many remote communities’ reliance on diesel-based electricity “limits the energy available for them to thrive and grow — contributing to difficult economic conditions and social inequalities” (Lovekin & Heerema, 2018). However, many barriers still remain including the perceived and real high capital costs of remote renewable energy compared to diesel

systems, and the limited human capacity as staff resources are limited. Improving the community's perceived benefit of the solution will allow to further engage the community in changing old unhealthy habits and lay the base for a more sustainable environment

Engineered Option:

In order to meet the energy demands of remote communities as well as providing adequate water treatment systems to indigenous remote groups without compromising for environmental factors, renewable energy could be used to power water and desalination systems, hence combining water treatment technologies with green energy. The most common renewable energy powered water treatment system are photovoltaic and wind-powered desalination systems, however as solar technologies are more promising for powering water treatments in summer, the concept of a photovoltaic system would be more appropriate for powering a water treatment scheme. The light photons from the sun is captured by the solar panel cells, creating an electric current through a process called the photovoltaic effect (Microgeneration Alberta, 2018). By bringing new renewable technologies to remote communities, we will be able to shift from fossil fueled energy and diesel generators to a cleaner energy source while providing a maintainable water system to supply clean drinking water to the population.

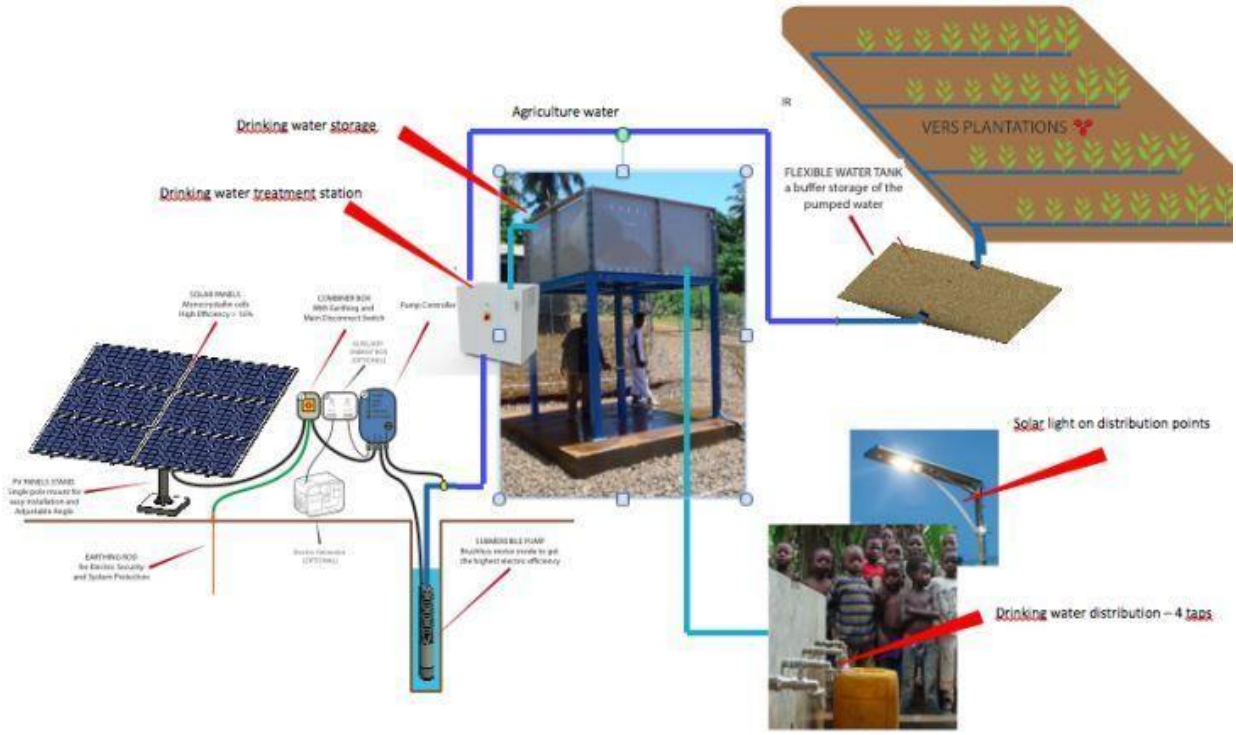

Figure 1. Photovoltaic Powered Water System. Retrieved from https://www.estiasynergie.com/tag/sotrad-water/

A Systems View:

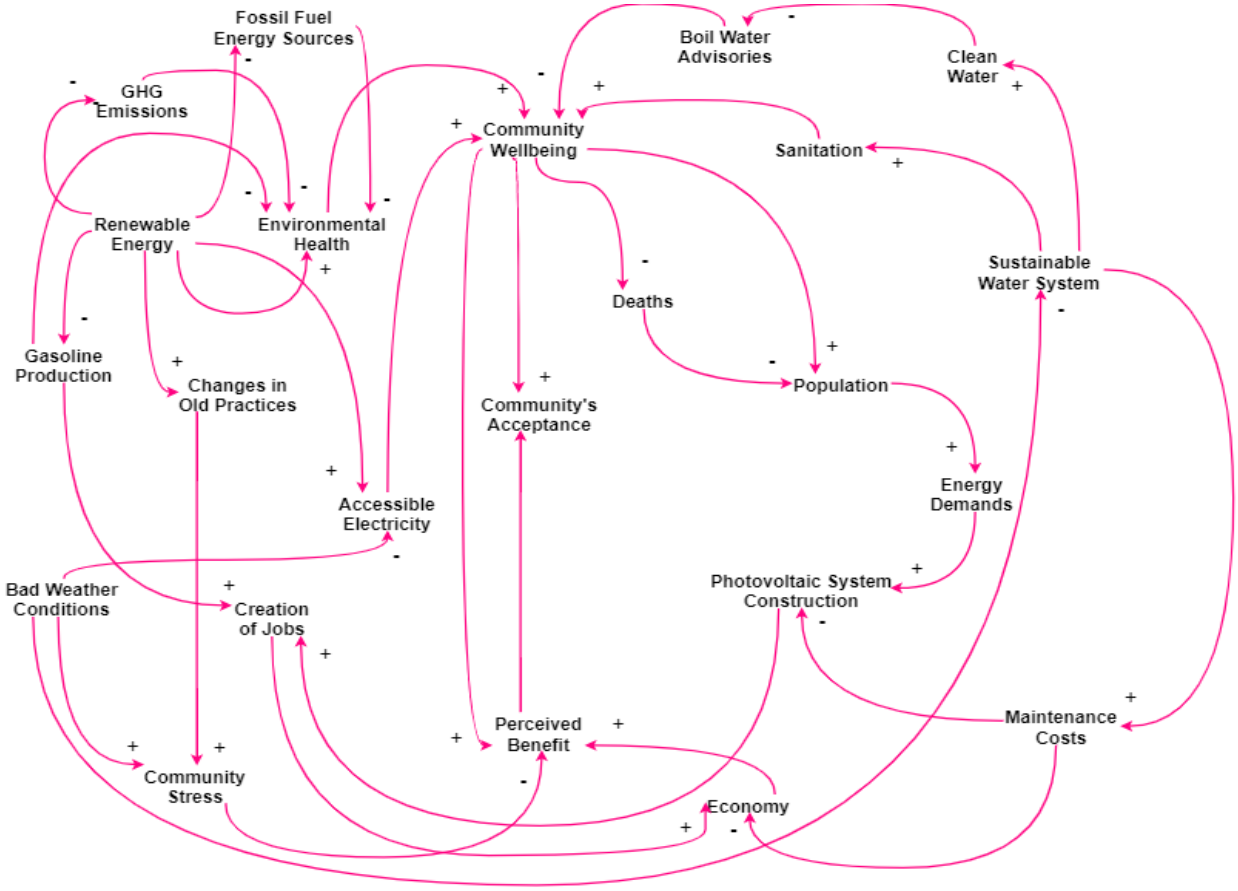

Figure 2. Photovoltaic Energy Source Causal Loop

Recommendation and Conclusion:

As access to modern energy and clean water are basic needs and fundamental for development and poverty reductions, a sustainable solution must be implemented to provide remote indigenous communities with the resources they need to improve their quality of life. Based on the location and climate of certain remote indigenous communities, a photovoltaic powered water treatment system would allow the distribution of clean drinking water to the community, while providing green renewable electricity to the community's homes. Solar technologies such as photovoltaic systems operate best for powering water treatment schemes "given the synergy between resource and load matching that exists in summer" (Microgeneration Alberta, 2018). Key considerations of the problem's scope were explored, including economic expenditures, environmental considerations, climate change, and society acceptance in order to account for all scales of this issue. This solution therefore shows the most potential in its ability to provide remote communities with a clean water system and reliable modern energy resources to meet their demands, while following a new and better approach to sustainable and low-emission energy.

APPENDIX 1: References

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