



Appropriate Technology for Inclusive Sustainable Development

1. Introduction

Although definitions abound, the most often used definition of sustainable development is that proposed by the 1987 Brundtland World Commission Report on Environment and Development, prepared for the General Assembly of the United Nations. Sustainable development is defined in this report as *development that meets the needs of present generations, without compromising the ability of future generations to meet their own needs*.¹ This was widely viewed as an approach by the UN to interlink and balance social, economic and environmental considerations in the pursuit of an improved quality of life.

Most of the recommendations outlined in the report indicated a focus on enhancing intergovernmental and cross-sectoral collaborations at the global community level, as an effort towards realising 'our common future', which is a phrase that ultimately became the formal title of the report and its intended mandate. It was envisaged that through such partnerships different member states would take on different, but shared, responsibilities to protect the Earth and to grow economies for sustainable development.

2. Sustainable Development Goals

The work of the Brundtland Commission created a basis for the UN's 2030 agenda for sustainable development, adopted in 2015, through which the sustainable development goals (SDGs) were established.² The SDGs are a collection of 17

interdependent goals interlinking social, economic and environmental considerations for inclusive sustainable development. Each of these goals consists of a set of targets and indicators designed to help member states realise improvements in key global common themes including: poverty reduction; human settlement; energy; water; and climate challenges. Though the SDGs are a global agenda, they have guidelines for implementation which encourage governments to take into consideration local contexts and developmental challenges and goals, in order to align the SDGs with their own national or regional development plans. The main objective of the agenda is to achieve global, inclusive sustainable development which will benefit people, economies and the planet; and will help attain 'the future we want' (an official slogan of the 2030 agenda for sustainable development).

3. Science, Technology and Innovation

Science, Technology, and Innovation (STI), together with intellectual property rights, are an important part of the discussion regarding the implementation of the SDGs.³ It is widely acknowledged by world governments that STI plays a significant role in helping the world to better understand natural systems, explore economic opportunities, and advance the welfare of humankind. Over the years, STI has greatly contributed to world economic development, through wide-scale economic concepts such as industrialisation. The introduction of industrial

technologies massively increased efficiencies and productivity in the work place. On the other hand, industrial technologies and innovations have significantly contributed to most of the socio-economic and environmental challenges the world is faced with presently. Many of these technologies are neither sustainable nor sensitive to the contexts in which they are applied.

3.1. Industrialisation

Industrialisation is defined as economic development that is based on factory production; division of labour; concentration of industries and population in certain geographical areas; and ultimately urbanisation. Constantly changing economic landscapes, together with population and environmental dynamics, continue to present both challenges and opportunities for the introduction of new technologies and innovation. While the introduction of mass-manufacturing and the factory system in 18th century Britain resulted in one of history's greatest economic advances, it also brought about major social upheavals, and in many ways perpetuated dependence and poverty.⁴ In addition, mass extraction of natural resources and the burning of coal for energy generation have greatly contributed to environmental challenges such as air and water pollution, and have increased the release of greenhouse gases into the atmosphere. Though societies continue to benefit from the developments associated with these technologies, including the introduction of electricity, the world's ecological systems continue to endure the impacts of such developments. The quest to address such challenges and to exploit related opportunities, continues to advance a consistent trend of industrial revolutions globally:

- 1st industrial revolution: introduced mechanization, water power and steam power technologies
- 2nd industrial revolution: introduced mass production, assembly line and electricity technologies
- 3rd industrial revolution: introduced computing and automation technologies
- 4th industrial revolution: introduces cyber physical system technologies

3.2. The fourth industrial revolution

The fourth industrial revolution is characterised by robotics, artificial intelligence, and cyber

physical systems (CPS). It is based on large-scale new technologies designed to increase efficiencies across sectors of the economy. Most of the research and development aspects of this industrial paradigm are being conducted and funded by first world countries, as was the case with previous industrial revolutions. Consequently, when these technologies are adopted by third world countries, they often fail to achieve the intended outcomes, since they are not aligned with the development priorities and the resources of third world countries. One of the greatest challenges encountered when implementing such technologies is the lack of clear policy frameworks which would create an enabling environment for harnessing resources and co-ordinating efforts.

4. Appropriate Technology

Appropriate technology can be defined as a set of techniques that makes optimum use of resources in a given environment, to provide services and improve the quality of life. The framework for implementing appropriate technology is based on the economic structure of the community in question; takes into consideration the environmental circumstances; and requires technologies that are easy to operate and to maintain. Most appropriate technologies are well established in communities and people already possess the skills to implement them; thus enabling a community development approach where people participate in their own development. This approach allows communities to draw from their indigenous knowledge systems (IKS), which are cost-effective; and it takes into consideration people's cultures, ethics, environment and existing social systems. Community development is arguably a significant component of sustainable development, as it helps create an enabling environment for people to provide innovative solutions fitting their development context and independent of complicated economic systems.

4.1. Examples of appropriate technologies

- Agroecology: an approach to sustainable farming that integrates food production with natural local ecosystems such as biodiversity and soil resources
- Agroforestry: an approach to land use management that combines agricultural

activities with forestry

- Rain water harvesting: collecting rain water for household use, construction and irrigation in farming practices
- Sand bag construction: building low-cost housing and various shelters from re-used bags filled with sand
- Solar energy: generating energy from the sun to cook and power appliances in households, factories and firms
- Roundabout water playpump: an approach to pumping water as kids play on the roundabout water pumping system
- Hippo roller: an efficient, low-cost technique of transporting water
- Food dehydrator: a solar-powered dehydrator for preserving and storing food, which could be an essential asset for communities with no access to electricity
- Earthen ovens: inexpensive ovens built out of sand and clay material, suitable for household and restaurant cooking/baking
- Clothes line drying: drying clothes with the sun and wind to reduce individual carbon footprint associated with drying machines
- Bio digesters: generating energy from organic waste for cooking, heating and lights

5. Roundtable Discussion

The CPLO recently hosted a roundtable discussion on Appropriate Technology and Sustainable Development. Speakers at the roundtable were Ms Tanaka Shumba, project co-ordinator at Sustainable Energy Africa (SEA); Mr David Hees, solar utility manager of the Ishack Project, Sustainability Institute; and Mr Mmboneni Muofhe, deputy director-general, Technology Innovation, Department of Science and Technology (DST).

Ms Shumba shared a presentation that highlighted some of the energy challenges in South Africa, including energy poverty in low income communities, and climate change effects as a result of dependence on fossil fuel sources for energy generation. The focus of her presentation was on the hot box training project that SEA has implemented across the country in partnership with metropolitan municipalities, to demonstrate alternative methods of cooking which are

accessible and affordable to low income communities. A hot box is an insulated bag that is designed for cooking, baking and cold-drink storage.⁵ Ms Shumba pointed out that communities which participated in the training were able to cut their consumption of electricity for cooking significantly.

Mr David Hees presented on the Ishack Project that has been widely implemented in Enkanini, Stellenbosch Municipality, in the Western Cape. Ishack is a subsidised off-grid solar electricity project for urban informal settlements, implemented by the Sustainability Institute in partnership with Stellenbosch Municipality through the Green Fund. The project provides interim electricity services for informal settlements while they wait to be connected to the Eskom grid. Mr Hees mentioned that this project was conducted to demonstrate a scalable and sustainable enterprise model for delivering off-grid electricity in informal settlements where basic services are a challenge.

Mr Muofhe spoke about a cross-sectoral approach to implementing appropriate technologies in order to achieve sustainable development. He laid great emphasis on the relationship between food technologies, health and food security. Highlighting that the most appropriate technologies would be those that encourage research on, and consumption of functional foods (eating what one needs to survive); which could serve as an approach to eliminate food-related diseases such as cholesterol, high blood pressure, and diabetes. He further spoke about technologies which could help societies maintain sustainable water resources as the demand for water increases, including high-tech filtration, desalination, and purification technologies.

6. Conclusion

New technologies are inevitable, but can be destructive if improperly managed. It is extremely important to take into consideration the local context and people's developmental needs and goals when adopting new technologies, while also reflecting on global success and failures. Furthermore, there should be coherent technology policies in place, which are in alignment with development priorities, to ensure that sustainable development is achieved. It would be beneficial for developing countries to expand

on their local knowledge and expertise, in response to introduced industrial revolutions such as the fourth industrial revolution. This could help reduce recurring dependence on developed countries, and allow developing countries to

pursue opportunities for economic growth based on their own physical and intellectual resources.

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¹ <https://www.sustainabledevelopment2015.org/AdvocacyToolkit/index.php/earth-summit-history/historical-documents/92-our-common-future>

² <https://sustainabledevelopment.un.org/?menu=1300>

³ <https://sustainabledevelopment.un.org/index.php?page=view&type=13&nr=1853&menu=1634>

⁴ <https://www.sahistory.org.za/article/lesson-industrial-revolution-britain-and-southern-africa-1860>

⁵ http://www.sosolar.co.za/index.php?option=com_virtuemart&view=productdetails&virtuemart_product_id=113&virtuemart_category_id=14&Itemid=618

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