



**NTNU – Trondheim**  
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# Implementing Off-Grid Solar Solutions in Southeast Asia

A CSR-based Approach to Rural Development

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Globalization

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*“It is the absence of broad-based business activity, not its presence, that condemns much of humanity to suffering. Indeed, what is utopian is the notion that poverty can be overcome without the active engagement of business “*

Kofi Annan Paris, France, 14 June 2005 - Secretary-General's address to meeting on "The Business Contribution to the Millennium Development Goals"

## **ABSTRACT**

This thesis looks into the challenges facing agents implementing new technology in rural communities in Southeast Asia. The main focus is on solar energy as enabler for development, with a two-level analysis of the REC SolarBox and the LAMTIB Initiative. The methodology makes use of a sustainability SWOT framework and a comparison against proposed UN sustainable development goals (SDG). The specific objectives are to identify what extent solar energy solutions can meet the demands of rural communities in Southeast Asia, and how the implications comply with the post-2015 development agenda. The theoretical framework presents the concepts of globalization, sustainable development, CSR and megatrends. The questions are investigated in the context those concepts. The main findings are that there is significant potential for solar energy in rural areas of Southeast Asia, if the electrification comes with targeted modules aimed at development and management “on ground”. The LAMTIB Initiative aligns well with the proposed SDG framework, showing high convergence with eight of the seventeen goals, and medium convergence with five goals. Recommendations are proposed for current and future stakeholders of the LAMTIB initiative and similar projects.

## **PREFACE**

This master thesis completes two years of studies at the interdisciplinary master program Globalization: Politics & Culture at the Norwegian University of Science & Technology (NTNU). It was written during four months in spring 2015, under the Department of Industrial Economics & Technology Management (IØT).

The topic of the thesis is centered on rural development and solar energy in Southeast Asia and was chosen based on personal interest and previous experience. During fall 2014, I undertook an internship at Elkem Chartering in Singapore, where I was assigned the task of further development of the LAMTIB initiative – a multi-stakeholder development project based on solar energy.

I would like to thank both of my supervisors for the help and support along the way. Associate professor John Eilif Hermansen from IØT has been supportive of my work and has taken interest in both the thesis itself, and the project content. Managing partner Tom Preststulen from Elkem Chartering has co-supervised the thesis. His strong belief in the future of solar and our abilities to save the world has been both a motivation and an inspiration to carry on. I would also like to thank project engineer Vishal Vijay and vice president Gavin Adda from REC – one of the main partners in the project. Thank you for taking the time to share your insights and thoughts on solar technology and solar markets in Southeast Asia.

Further, I would like to thank my family for always having believed in me during my time in university. I would also like to thank Gleb Sizov for technical assistance, and for having the patience to stick up with me, and my old MacBook. Last but not least, I would like to thank my co-intern and boatmate, Marte Blekastad Forset. Thank you for all the new experiences shared during fieldwork, office hours and leisure activities in Southeast Asia.

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## **LIST OF ABBREVIATIONS**

ADB:	Asian Development Bank
ASEAN:	Association of Southeast Asian Nations
CSR:	Corporate Social Responsibility
EIA:	(US) Energy Information Administration
GDP:	Gross Domestic Product
HIC:	Hatchery in Container
HLPF:	High Level Political Forum
ICT:	Information and Communication Technology
IPBES:	Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services
IPCC:	Intergovernmental Panel on Climate Change
ISO:	International Organization for Standardization
LAMTIB:	Leapfrogging Autonomous Micro Technopolis in Boxes
LDC:	Least Developed Countries
LLDC:	Land-locked Developing Countries
MDG:	Millennium Development Goal(s)
MIC:	Middle Income Countries
MPI:	Multidimensional Poverty Index
MPM:	Multi-company Project Management
NIC:	Nursery in Container
OWG:	Open Working Group
R&D	Research and Development
REC:	Renewable Energy Corporation
RTC:	Real-time Communication
SDG:	Sustainable Development Goal(s)
SE:	Social Enterprise
SIDS:	Small Island Developing States
WCED:	World Commission on Environment and Development

# 1 INTRODUCTION

Rural areas in Southeast Asia are underprivileged in regards to energy investments. Due to lower population density and lower purchasing power, those areas are considered less lucrative for large-scale infrastructure investments. As a result, rural populations are falling behind, widening the gap between rural and urban areas. Alternative, more cost-efficient solutions are therefore needed.

Off-grid solutions might prove efficient in this context, providing a mobile and locally accessible solution for smaller communities. This thesis looks into the case of the REC SolarBox and the LAMTIB Initiative (Leapfrogging Autonomous Micro Technopolis in Boxes), which are developed to target rural areas, offering clean and affordable energy from the sun. The system is based on a container solution, including multiple modules aimed at development purposes.

The focus on renewable solutions is increasing, also in a developing context. As the Millennium Development Goal (MDG) Framework expands in 2015, a new agenda will follow. The proposed Sustainable Development Goals (SDG) enhance the role of sustainability and environmental concerns on the development agenda, and clean energy can have a prominent role in tackling the challenges addressed.

## 1.1 Background

The world is wealthier than it has ever been. We make more, sell more, and consume more than ever before. Yet, 3 billion people – nearly half the world’s population – live on less than 2,5 US dollars a day. The 1% of the richest, on the other hand, controls half the world’s wealth – and their share is increasing (Piketty, 2014). Development studies shows that inequality prolongs poverty and slows economic growth (Berg & Ostry, 2011). The world economy, measured in real gross domestic product (GDP) has been growing at an annual rate of 3.8% on average over the last five decades (Tani, 2015). This unprecedented growth has also left substantial environmental footprints. The consequences are evident in the form of sea-level rise, desertification, extreme weather and ecosystem loss. According to the UN Intergovernmental Panel on Climate Change (IPCC) (2014), we will have to lower current greenhouse gas emissions by 40-70% by 2050, if the global warming is to stay within the two degrees celsius goal. A striking question is thus, how the earth, with its current 7.2 billion people can manage such a target, when global economic growth and prosperity over the last two centuries have

been perfectly correlated with the extraction of natural resources? The world's population is predicted to reach 9.6 billion people by 2050 – and the fastest population growth is believed to take place in the least developed countries (LDCs) (UN, 2013). How can we create a more prosperous world for everyone, while simultaneously safeguarding the very basis of human existence?

There are currently 1.2 billion people in the world lacking electricity. A further 2.5 billion are defined as “underelectricified”, meaning the connection is weak, and power outages are common (Economist, 2015). As the world population continues to grow, as does the world economy, the global energy demand will increase substantially. According to the political independent agency US Energy Information Administration (EIA), global demand is predicted to increase by 56% between 2010 and 2040 (2014). Although renewable, non-carbon emitting resources are on the rise, fossil fuels still account for 80% of world's energy supply – and is likely to continue to be the prime supplier in the poorer parts of the world, if political incentives and actions are not put forward. With the constantly decreasing costs of renewables, as new technological solutions and markets of scale are emerging, incentives for tapping the poorer market segments grow stronger.

## **1.2 Research topic**

This thesis examines how companies' CSR policies can be applied for rural development purposes within the solar energy sector in Southeast Asia, and to what extent they comply with the CSR definition as provided by the ISO 26000 standard: "Guidance on social responsibility" (2010), as well as the 2015 UN Sustainable Development Goals (SDG). The theoretical background and concepts will be used to analyze the empirical case, the LAMTIB Initiative - Leapfrogging Autonomous Micro Technopolis in Boxes, which makes use of the REC Solar technology (PV Hybrid) – hereby named SolarBox.

## **1.3 Research problem and question**

The research problem concerns the challenges facing agents implementing new technology in local, rural communities. The main focus is on solar energy and its role in enabling development.

The research presented in this thesis is guided by the following questions: a) To what extent can solar energy solutions meet the demands of rural communities in Southeast Asia, and b)

how do the implications comply with the post-2015 development agenda? These questions are investigated in the context of globalization, sustainable development, CSR and megatrends.

#### **1.4 Related research**

Solar energy is cost-efficient and in many cases a competitive alternative to fossil fuels for the poorer populations of the developing world. This applies in particular to those segments who live in the lesser connected areas, areas in which infrastructure investment requires high capital expenditures, combined with a scattered low population density and an extremely price sensitive consumer base. Van Campen, Guidi and Best (2000) have looked at solar PV system's effects on rural development in particular. They find that the success of such programs is dependent on an integrated strategy, where services are provided through packages, such as health care, education, lighting and water.

Riksrevisjonen, the Norwegian control mechanism for national policies published a report in 2014, looking into the effects of the governmental development aid based on renewable electrification in Africa. They concluded that the effects of the large-scale investments, in which the Norwegian state-owned company SN Power was a major stakeholder, did not manage to reach the poorest segments of the population (Riksrevisjonen, 2014). Except from the de facto investments in infrastructure, which clearly generated labor demand and external economic effects, little long-term effects were observed. The report explains the gap in intentions versus outcome with a narrow focus on hydropower (in areas where both wind and solar are lucrative sources of energy), insufficient planning, and the lack of equilibrium in the electricity markets. Although being overly enthusiastic about the project's potential, and realizing the areas of application, the local population could not afford to connect to the grid over a longer period of time. As a consequence the supplier was left without any sustainable demand, nor any predictable revenue.

The lack of sustainability and long-term approach is by no means unique to development projects in Africa. If we set purely economic sustainability issues aside, we see just as much a lacking focus on environmental sustainability issues. Through the Community Power concept, a Bangladeshi development initiative aiming at bridging the digital gaps with renewable energy solutions, Geirbo (2011) finds that lack of local geological and climate conditions create significant challenges within ICT and electricity infrastructure projects in rural areas. She applies a new approach, emphasizing the gap between the populations within developing

countries, rather than solely the traditional North-South divide. This perspective reflects the global inequality trends, where the continuous economic growth leads to decreasing inequality *across* countries, as predicted by the *Kuznets curve* (Kuznets, 1955), and rather increasing *within* countries (UNDP, 2013).

Another, yet crucial point in terms of sustainability, is the question of technical understanding. As mentioned in the case of electrification in Africa, the community might well be aware of the application areas of the new technology and the development purposes in which the technology plays a major part. A question arises whether the local community is aware of the practicalities concerning the equipment. Are the technical specifications clearly communicated? Have detailed instructions been given in terms of maintenance? Are roles and responsibility identified? Research has shown that such elements of culture, communication and know-how in the project implementation process is not only a key factor to the project's immediate success, but also a crucial asset to the project's long-term sustainability and survival (Holm, 2015).

Balisacan, Piza & Edillon (2005) have looked into rural development for the Southeast Asian region in particular. They found that there is a need for investments in infrastructure, education and technology in order to reach the millennium development goals (MDGs) which expire in 2015.

Research done on companies' CSR involvement show that measurements and examination of corporate external behavior is an effective way to influence policies and actions (Porter & Kramer, 2006). A challenge, however, is the reliability of measurements and revealing the real impact.

## **1.5 Thesis structure**

The structure of this thesis is organized as follows. Section 2 gives an overview of the theoretical framework, introducing the concepts of globalization, sustainability, CSR and megatrends. Section 3 presents the methodology, including methods applied and discussions concerning research quality. Section 4 describes the case in depth, with proof of concepts and company overview. Section 5 takes on the two-step analysis, whereas section 6 summarizes the results. Section 7 discusses the findings, and proposes some recommendations. Finally, section 8 concludes the thesis.

## 2 THEORETICAL FRAMEWORK

The theoretical framework is built on four major, meta-concepts; globalization, development, sustainability, and CSR. I have chosen the wording *meta* because they are all overreaching concepts, covering not only several academic disciplines, but also considerable theoretical sub-categories, with divergent views on the significance and impact of the concept itself. While each concept constitutes its own theoretical groundwork, they are also cross-disciplining. Especially the concept of globalization, which is a multi-dimensional phenomenon, is heavily and increasingly interlinked with the concepts of CSR, sustainability and development. Further, the concepts of development and sustainability are increasingly acknowledged as mutually dependent upon each other. The proposed SDG policy framework is perhaps the strongest indicator as to how development and sustainability interfere, and how the issues of environmental concerns and poverty-alleviation are being addressed in the same policy framework. Such an alignment is not only changing the ways in which targets are set (and met), but also changing the theoretical starting point from which research is being done. Despite being disciplines in their own right, they have within this context been linked together under the merged concept of *sustainable development*. I will in the following define and clarify the different concepts mentioned, how they have emerged and developed, and to what extent they are relevant in the context of the case. Based on the concepts, certain *big trends*, or *megatrends* will be identified, and further constitute the perspective for the analysis in section 5.

### 2.1 Globalization

The process of globalization, shaping the interconnected world we live in, has not been linear. Since gaining its first grounds in the mid 19<sup>th</sup> century, it has been through several setbacks, through what is described by Findlay and O'Rourke as “*waves of globalization*” (2007). The concept encompasses several dimensions. In its complexity, it is broadly defined by Jessop as “a [...] series of multisentric, multiscalar, multitemporal, multiform and multicausal processes” (2002, p. 113-114). Its impacts can be observed across political, economic, cultural and social spectra, and are often crossing borders in its interdisciplinary, interconnective and transnational nature.

When seeking to define the process of globalization in a manner that is suitable for the purpose of this paper, I have chosen to focus primarily on the phenomenon of economic globalization. This is by no means an attempt to undermine the impact globalization has had on political, social and cultural realities, but rather a recognition as of how complex the phenomena of

globalization is, and thereby of the need to target the scope. Further, it can be argued that the very nature of the global economy, and its constant expansion, is increasingly encompassing the other aspects, interfering with political organizations, impacting social patterns and changing cultural values. Moreover, it is still the most widespread custom within development purposes (as in this case) to measure outcome in economic terms. Positive change in the *gross domestic product* (GDP) is still the main indicator of progress for developing countries. A further discussion of development measures will continue in sub-section 2.3., but the important note is that economic globalization has significant impacts on all aspects concerning development – from the local to the global level.

Dicken (2011), which primarily focuses on economic and geographical embedded globalization, defines globalization as “a complex, indeterminate set of processes operating very unevenly in both time and space” (p. 9), with “the increasingly complex geography of production, distribution and consumption” (p. 3). A major characteristic of those processes, is the divisions that can be observed, on dimensions such as North-South, rural-urban, connected-offgrid, global-local, and so on. The latter division has been a focal point in many studies on the impacts of globalization on the local level, creating the term *glocalization*, which emphasizes the role of the *local* embeddedness in the *global* universe (Robertson, 1995). If the concept is understood as a two-way, dynamic relationship between global and local, an important implication is how the local is replicated multiple times in the process of becoming global, meaning that several aspects of globalization are results of glocalization (Beyer, 2007). This serves to show how what is today considered global, be it business practices or economic trends, are in fact originally locally embedded.

The process of globalization is a dynamic and reinforcing one, and the process is accelerating. The economic centers of today can be the periphery in the future. An example of this, and crucial in our context, is the reemergence of Asia as an economic power. According to Dicken (2007), this resurgence has been “the most important global shift in the geography of the world economy during the past 50 years” (p. 29).

There are diverging views on the impacts and implications of globalization, and a central debate is whether the process is the source of – or the solution to – the problems observed. Issues such as poverty, inequality and climate change are all global issues, affecting people across borders, and increasingly being addressed on a global scale, in international fora and transnational organizations. Yet, there is skepticism among certain activists and scholars. The so-called *anti-*



*globalizers* argue that the very forces of globalization, symbolized by market liberalization and multinational corporations, are destructive in their nature, contributing to increased inequality and environmental damage. The *pro-globalizers* on the other hand, see globalization as a solution, seeking an intensification of cross-border activities. The neo-liberal policies of trade and economic development have become the epitome of this view, which saw its emergence throughout the 1980's, driven by the Washington institutions<sup>1</sup>. The policies of the latter were determinant not only in terms of trade regulations and international business – it also had a significant impact on development aid programs until the 1990s (Goldin & Reinert, 2012). Later, critics argued that those policies in fact increased inequalities, and created dependency (Haque, 1999). The following period of aid moved away from the free-market mentality, and towards a more intergovernmental focus. In recent years, a new wave of criticism has targeted the inefficiency of aid programs, pointing at lacking entrepreneurial activity, as well as long-term strategies (Collier, 1999). What was intentionally meant as a move away from capitalist thinking and market-liberal strategies had rather created new dependencies. Still, a significant bulk of bilateral aid is given through binding purchase agreements on products and services, which one can argue is indeed very capitalist in nature. Further, institutional aid tends to come with strict conditionalities, which are often reflecting the political interests of the contributing nation states (Alesina & Dollar, 2000).

Understanding the perceptions of the global forces and the processes they drive, is crucial when addressing the issue of development – even on the local level. As climate change and inequality issues are becoming increasingly global in their effects and implications, so are the policy frameworks aimed at solving them. When addressing development outcomes on the local level, we can observe a change in the attitudes and the definition of pre- and post-modernized livelihoods. Rigg (2007) illustrates this perceptual change in table 1.

### **Table 1. Livelihood orientation: past and present**

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<sup>1</sup> The institutions most commonly referred to as the Washington institutions, are the International Monetary Fund (IMF), the World Bank, the General Agreement on Tariffs and Trade (GATT) (now World Trade Organization), and the US Treasury Department.

<i>Past livelihoods</i>	<i>Current livelihoods</i>
Subsistence-oriented	Commercially oriented
Inward-looking	Outward-looking
Sedentary	Mobile
Egalitarian	Unequal
Corporate (community-oriented)	Individualistic
Self-reliant	Dependent
Tranquil	Competitive

Source: Rigg (2007, p. 71)

Livelihoods are changing and developing, as the conditions of the economic and cultural environment changes. However, the process is not linear, nor is it homogenous. Based on the assumptions illustrated by Riggs, one can argue that poorer countries have been “left in the past”, and that the very characteristics of livelihood orientation is development stagnant. Creating an understanding of underdevelopment based solely on global forces, is however too simplistic. As argued by Amin (2004), “establishing a link between globalization and inequality is fraught with difficulty, not only because of how globalization is defined and how globalization is measured, but also because the entanglements between globalization forces and “domestic” trends are not that easy to separate out” (p. 218). Thus, the role of glocalization, as previously discussed, is crucial in the context of understanding livelihood development.

The forces of globalization and changing livelihoods are closely related to flows of information and knowledge. As an increasing share of those flows are becoming digital, access to the communication technologies is a determinant of development. The digital divide, as described by Geirbo (2011), illustrates how ICT is to some extent reinforcing already existing inequalities. It can be defined as “the gap between groups of people that have access to digital media, and those who do not” (Geirbo, 2011, p. 107). The picture is not completely black and white, however. Keeping in mind that certain solutions are scarcely distributed, certain segments of the population may still be defined as “don’t-haves”, given the very limited access and applicability. This applicability in turn, can be constrained by external factors and enablers, such as energy supply (which will be the main focus in this paper), communication skills and access, language, awareness and technical know-how, to mention a few. We will look closer into those factors in the case description (section 4) and analysis (section 5).

## **2.2 Sustainable development**

As the ecological impacts of globalization is accelerating and becoming more complex, the term sustainable development has been re-defined and re-phrased multiple times, framing the

interests and scopes of a variety of stakeholders. Originally addressed by the Brundtland Commission in 1987, the term has later been altered into a more subtle definition, as a concept that “embodies integration, and understanding and acting on the complex interconnections that exist between the environment, economy, and society” (Drexhage & Murphy, 2010).

Where there traditionally has been a strong emphasis on the environmental aspects, more recent contributions pay equal attention to the aspects of social and economic progress. The economist Jeffrey Sachs sees sustainable development as a three-dimensional system, which enables the world economy, the global society and the earth’s physical environment to operate in a synergy. These three dimensions are, which we will see in the following, reflecting the priorities of the new development goals, proposed for the post-2015 agenda.

### **The Sustainable Development goals (SDGs)**

The Sustainable Development Goals is the result of a long process of negotiations and broad discussions. The inclusive and transparent process, lead by the Open Working Group (OWG) is rather historic in UN terms, involving a broad range of stakeholders from academia, NGOs and the UN system. The SDG framework is the continuation of the Millennium Development Goals (MDG), which ran from 2000 to 2015. The most significant change in terms of content is the increased awareness of environmental challenges, and the link between social, economic and environmental progress. Secretary General of the UN, Ban Ki-Moon, has identified six “essential elements” within the SDG proposal: dignity, prosperity, justice, partnership, planet and people (2014, p. 20). These six elements are reflecting the three dimensions in the framework, which we will look closer at.

The process leading up to the Post 2015 development framework reflects important milestones in the human and environmental policy agenda. Some of the most defining events are listed in table 2.

### **Table 2. Events defining the international agenda for sustainable development**

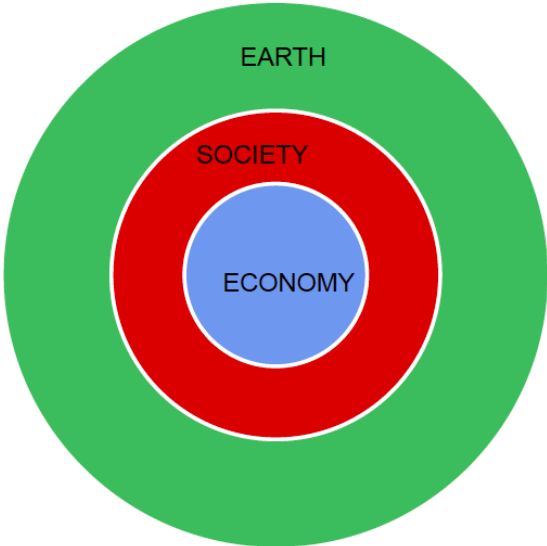
<i>When</i>	<i>Where</i>	<i>What</i>
1972	Stockholm	UN Conference on the Human Environment,
1977	Nairobi	UN Convention to combat Desertification
1983	New York	World Commission on Environment and Development (WCED) is established.
1987	New York	“Our Common Future” was published
1992	Rio	UN Conference on Environment & Development
1994	New York	UN Framework Convention on Climate Change becomes effective
2000	New York	The Millennium Summit & MDG launch
2002	Johannesburg	The UN Conference on Environment & Development
2009	Copenhagen	The UN Climate Change Conference
2012	Rio de Janeiro	The UN Conference on Sustainable Development
2012	Doha	The UN Climate Change Conference
2013	New York	The Open Working Group on SDG is established
2014	Lima	The UN Climate Change Conference
2015	Paris	The UN Climate Change Conference

The SDG framework suggested as of spring 2015 consists of 17 main goals. This is a significant increase from the Millennium Development Goals (MDG), which consisted of only eight. Researcher Nina Vik, in the Norwegian delegation to the UN Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services, (IPBES), explains the quantitative increase as a strategy to not only raise awareness of the challenges ahead, but also as a way of including developed countries (personal communication, June 5, 2015). Rather than engaging richer countries in solely financial matters, they now have defined roles within the implementation, with targets to be met at home. Such targets will to a large extent encompass environmental issues. A question thus, is how this revised focus will influence the agenda of poverty-alleviation.

The broader, multi-stakeholder perspective on development, which is a significant change from the MDG framework, is not only reflected in the process, but also in terms of content and quality. The MDG framework has been criticized for focusing too narrowly on developing countries, leaving merely a support function for the developed countries. New in the SDG framework is the equal inclusion of the developed countries, reflected in the quantitative increase in goals (from 8 to 17), and 169 proposed targets. Moreover, the MDG critique sees the pure focus on poverty alleviation as a constrain, leaving too little room for human rights and environmental concerns (N. Vik, personal communication, June 5, 2015). These are issues

that also concern middle- and higher income countries, thus the sustainability dimension of the new framework creates a broader platform for participation and implementation.

The holistic perspective on development reflected in the new goals, has defined a broader role for business. The three dimensions; environmental, social and economic, have been identified also within business models and management studies. John Elkington (1998) suggests the triple bottom line to illustrate how businesses should pay attention to not only profits, but also people and planet (3P). He illustrates the three dimensions with a blue, red and green line, respectively. Griggs et al. further classifies the three dimensions, seeing the earth as a prerequisite for all activity, a basis for existence. Next in line comes the society, which operates the economy. Lastly, in the inner circle comes the economy, which cannot operate without the two outer circles being in place. An important distinction between the two scholars is the grading of importance between the three dimensions. While Elkington sees the challenge from a business, or micro perspective, Griggs represents a macro perspective. In the context of the SDG agenda, this distinction is important. How will the framework balance the considerations represented in each dimension and the interests of stakeholders involved? Figure 1 illustrates how a combined micro-macro model might look like, with the 3P model integrated into the new paradigm of sustainability (Griggs et al., 2013).



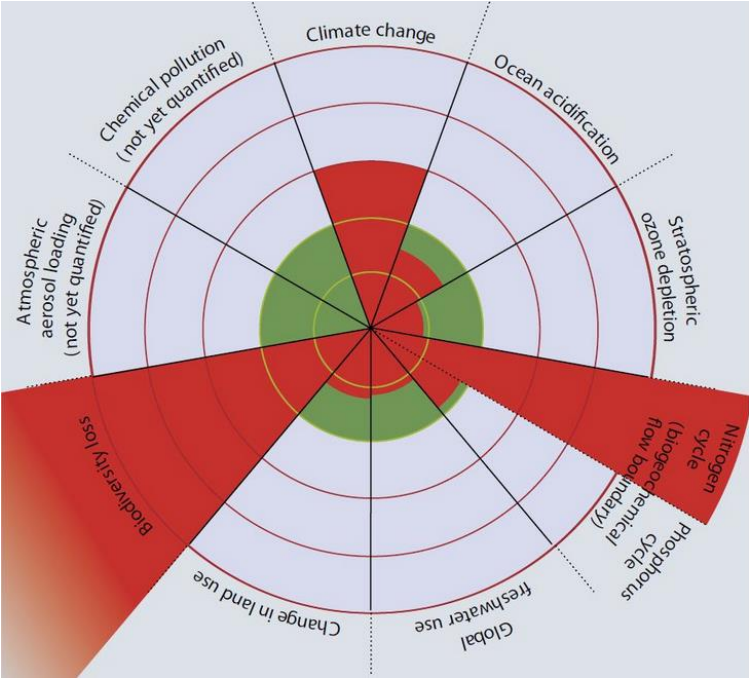
**Figure 1. Combining the micro and macro sustainability perspectives. Source: Elkington (1998), Griggs et al. (2013)**

The general SDG policy framework is calling for international action and the role of states and institutions, and might be interpreted as a top-down approach. Despite an increased focus on

the grassroots level and the role of livelihoods in development (Rigg, 2007), political initiatives are to a large extent concentrating on the macro level. It can be argued that large-scale intergovernmental institutions such as the UN are in their right to focus primarily on the action of states, which constitute their member base. However, there are examples of how cooperation on the intergovernmental level, have failed in the past (Altshuler, 2000). Such failed initiatives apply both in terms of human development and the environmental action – the two major concerns addressed in the SDG framework.

**Environmental sustainability**

The focus on environmental concerns and climate change within the context of development was introduced with by the Brundtland commission, and is still the core dimension sustainability interpretations. As an increasing amount of research reaffirms the effects of economic activity on Earth’s environment, the issue has gain higher priority on the political agenda. Figure 2, illustrates how the Earth’s “planetary boundaries” are being pushed by anthropogenic pressure, and how some boundries have already been broken.



**Figure 2. Earth’s Planetary Boundaries. Source: Rockström et al, 2009**

Rockström et al define planetary boundaries as the limits within which “safe operating space for humanity with respect to the Earth system” (2009, p.472 ). As illustrated, three of the biophysical systems have already been overstepped. The richest countries and populations

are still in charge of the major environmental degradation and pollution, while the poorest nations and population segments will suffer the most (Sachs, 2015).

Steger (2010) defines the process as "the globalization of environmental degradation" (p. 85). In a North-South perspective, there are two major concerns. The global South is seeing unprecedented population growth, inducing pressure on local and regional livelihood and environments. The global north, and increasingly MICs, has adopted lavish consumption patterns, putting increased pressure on the environmental boundaries. These two dimensions are both being addressed in the SDGs.

### **Social sustainability**

In his book *The Age of Sustainable Development*, Sachs defines this social sustainability as one that enables the wellbeing of people, distributed throughout society. He identifies five major concerns of the distributive dimension: *inequality*, *extreme poverty*, *social mobility*, *discrimination* and *social cohesion* (2015, p. 11-12). The MDG framework, which ran from 2000 to 2015 sought to tackle the challenges represented within those dimensions, and succeeded in several areas. The question, however, is how social aspects of development can be best measured. GDP data, which is by far the most applied measurement of development is a purely economic measurement, and does not say little about the *distributive dimensions* mentioned by Sachs.

Alternative measurements have later been identified, seeking to take wellbeing into account. The Social Progress Index (SPI) is among the most recent. Michael Porter, chairman of the Advisory board to the SPI, describes the imperative as a more holistic perspective on success: "Where there is an imbalance between economic success and social progress – we find that this creates a situation of instability" (Porter, April 15, 2015). The holistic view on development persuades much of the sustainable development framework, and one can argue that measurements such as the SPI are better suited for measuring development outcomes of the post 2015 agenda.

### **Economic sustainability**

The economic dimension of sustainability concentrates on the role and interests of business on the micro level, and global growth on the macro level. The major concern for the economic development is continued growth. The path out of poverty for the developed countries and

richer populations of the world has been by enhancing continued economic growth (Sachs, 2015). However, continued growth based on contemporary production and consumption patterns, is not a sustainable way forward for the remaining bottom billion. There is a need for increased awareness on the role of business, and to find new, redistributive ways of creating development. Technology will come to play a significant role in the new economy, as automatization gains new ground (Elliot, 2014). The three bottom lines, as identified by Elkington (1998), play a major role in a balanced, 3P model economy. The question is, however, to what extent businesses and governments are willing to lower short-term profits in order to protect medium-term social aspects and long-term environmental concerns. A major challenge with environmental change is that it takes time to see consequences – and many processes are irreversal (Rockström et al., 2009).

### **2.3 CSR**

Corporate Social Responsibility (CSR) is an increasingly applied term in businesses vocabulary, as consumers are becoming increasingly aware of topics such as community impact, sustainability and eco-friendly value-chains. The concept has multiple definitions, dependent on the perspective and interests of stakeholders (Dahlsrud, 2008). One definition of the concept describes it as “the responsibility of companies towards people, society and the environment that are affected by their activities” (Norwegian Ministry of Foreign Affairs, 2009: p. 7). The overall goal is for companies, in cooperation with the external social environment, to contribute to broader goals in society, such as poverty-alleviation, employment, education, awareness and welfare.

Businesses of today do no longer operate in a vacuum where they can free themselves from the external environment. The process of globalization, as discussed above, has created interconnectedness, complex value chains and production networks, and markets are becoming increasingly global in character. How companies choose to manage such external relations is defining their position, both in regards to strategic assets and sustainable value creation. Figure 3 serves to illustrate such external relations, and the roles of the different stakeholders.





**Figure 3. Companies' external relations. Source: Norwegian Ministry of Foreign Affairs (2008-2009)**

Stakeholders are identified as the market (clients/consumers), owners, society, employees and suppliers. CSR policies can thus be seen as ethical guidelines for the business' external relations, providing advice for interaction. Those guidelines are often categorized according to extent of active cooperation and involvement on social issues. van Tulder and van der Zwart (2005) identify four different approaches to CSR, dependent on the degree to which the corporation involves actively:

*Inactive:* A "business of business is business" approach to external relationships, which indicates a low concern with social responsibility

*Reactive:* A rather risk-averse orientation, based on the interests of protecting the firm and its reputation

*Active:* An approach based on ethical values, regardless of demand or pressure from stakeholders

*Proactive:* An interactive approach involving external stakeholders, with the purpose of "doing well by doing good"

The different approaches are based on different ethical perspectives on the role of business. A challenge for companies and CSR initiatives is thus to identify certain guidelines that can constitute a CSR policy framework. The ISO26000 standard have developed certain criteria for CSR management, which can serve as such guidelines. Their definition of the concept describes CSR as "the impacts of its decisions and activities<sup>2</sup> on society and the environment through transparent and ethical behavior" (2011). The criteria for businesses to be engaged in CSR, state that organizations must:

- contribute to sustainable development, including health, and the welfare of society
- take into account the expectations of stakeholders
- be in compliance with applicable law and consistent with international norms of behavior
- be integrated throughout the organization and practiced in its relationships<sup>3</sup>

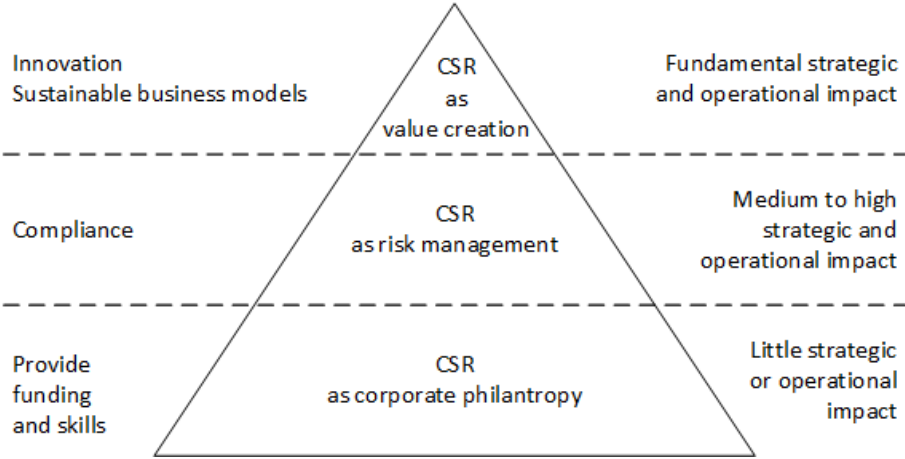
As from the definition, it is clear that factors such as decision-making outcomes and core activities, and the impact they play on the external environment are key issues to be addressed in a further assessment of CSR policies and practice. The external environment has two dimensions, the social on the one hand, and the ecological on the other. Further, it is evident that such a basis for analysis, takes into account not only the intentions (policies) of the company in regards to CSR, but also the actual outcome and *impact of decisions and activities*. This implies that the ISO standard as an analytical framework, and thus the analysis for this paper, will apply a rather utilitarian approach to the CSR issue, leaving a certain emphasis on the outcome of those policies and plans in question. This is in contrast to purely duty-based business ethics, where actions are carried out according to public demand – towards what the company feels obliged to do. In a global economy, in which costumers gain increasing awareness of ethical concerns, the difference between the two approaches may seem more evident than before. There is an increasing demand for transparency in decision-making processes and codes of conduct, led by the processes of globalization. With increasing accessibility of technology, means of communication and knowledge, divergence in policies and de facto actions of businesses are more visible than before (Larkin, 2003). However, we have to keep in mind that this trend is a two-way street. In a market of increasing awareness, consumers might be not only more critical, but also more receptive towards initiatives on CSR,

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<sup>2</sup> Activities in this regard include products, services and processes

<sup>3</sup> Relationships in this context refer to activities within the sphere of influence

having established the groundwork for interpretation of the implications at stake. This two-way dialogue introduces new possibilities for businesses that are well prepared and ready to make change, both internally and externally.



**Figure 4. The three stages of the CSR Pyramid. Source: Norwegian Ministry of Foreign Affairs (2008-2009)**

The company’s approach to CSR is ultimately reflected in policy and actions. Figure 4 serves to illustrate that there are different understandings of the notion of CSR, from a corporate perspective. The pyramid shape illustrates the necessity for improvement many businesses face. As the noted by the Economist, “corporate social responsibility [...] is now mainstream. Yet, very few businesses are doing it well” (2008). CSR has become a buzzword, but there is still significant potential for companies to identify their area of impact. As stressed by Kolk and van Tulder (2010) there is still limited follow-up on companies’ actions from NGOs and civil society.

A CSR-based development project following the social enterprise (SE) model, can reveal social impact on multiple levels. The SolarBox and LAMTIB initiative are carried out from a development perspective, while running a business model of economic, self-sufficiency and sustainability in the long run. The analysis in section 5.1. and the following discussion will seek to identify the role of the main stakeholder (REC) in this context, based on the models and criteria presented in this section.

## 2.4 Megatrends

The complex process of globalization, along with the buzzwords of sustainability and CSR as presented above, encompass the reality in which firms orientate their activities. *Big trends, global trends or megatrends* are collective terms used to describe shifts within this reality. Megatrends can be defined as "global, sustained and macroeconomic forces of development that impact business, economy, society, cultures and personal lives, thereby defining our future world and its increasing pace of change" (Singh, 2012, p. 4). We can say that megatrends shape the external environment in which businesses operate. Strategies for future operations are based on these trends, with the aim of preparing the organization for challenges and opportunities ahead.

Global think tanks and consultancy firms continuously update their take on the future, and the megatrends that they see shaping business environment. In table 3, some major global trends are identified by five such institutions: KPMG, Ernest & Young (EY), PricewaterhouseCoopers (PwC) and World Business Council for Sustainable Development (WBCSD). The time frame stretches from 2015 to 2030 for most reports, which aligns with the sustainable development agenda.

**Table 3. Megatrends 2015-2030**

<i>KPMG</i>	<i>EY</i>	<i>PwC</i>	<i>WBCSD</i>
Individual:	Urban world	Technological breakthrough	Rapid urbanization
<ul style="list-style-type: none"> <li>• Demographic</li> <li>• Rise of the individual</li> <li>• Enabling technologies</li> </ul>	Digital world	Rapid urbanization	Economic growth & increased demand
Global economy:	Global market place	Demographic & social change	Climate change & scarcity
<ul style="list-style-type: none"> <li>• Interconnectedness</li> <li>• Public debt</li> <li>• Economic power shift</li> </ul>	Resourceful planet	Shift in global economic	
Physical environment:	Entrepreneurship rising	Climate change & resource scarcity	
<ul style="list-style-type: none"> <li>• Climate change</li> <li>• Resource stress</li> <li>• Urbanization</li> </ul>	Health reinvented		

Sources: KPMG (2013), EY (2015) PwC (2014) and WBCSD (2014).

We can see from the trends presented, that certain trends are repeated among the institutions. Rapid change is an inevitable, common feature that global actors will face, and the arenas for

change are technological, social, environmental, economic and political. Changes related to development (social and demographic) and environment form the most important trends creating the main framework for CSR management in a sustainability context. Following this logic, the following trends have been identified:

- Global economic shift
- Rapid urbanization
- Resource scarcity
- Entrepreneurship rising
- Enabling technologies

The Greek philosopher Heraclitus famously phrased that “nothing about the future is inevitable, except change”. A Chinese contemporary of his, Sun Tzu argued that “the wise leader exploits the inevitable” (Keagly & Blanton, 2014, p. 509). In other words, strategy formation is the management of exploiting change, and planning to overcome the challenges it poses. The trends identified above, will be the guidelines forming the external environment in the sustainability analysis of the REC SolarBox in chapter 5. The following methodology section will explain the process further.

### 3 METHODOLOGY

This thesis is a qualitative examination of the implementations and possibilities of technology-driven development, and its implications for rural livelihoods. The empirical case is analyzed against two frameworks; a revised SWOT tool, and the proposal for the Sustainable Development Goals (SDG). The SDGs and the Sustainability SWOT (sSWOT) look into (potential) development outcomes and the REC’s CSR strategy respectively. A further discussion on each, and their content will be given in the following sections.

#### 3.1 Methodological framework

The methodological framework, after which the thesis is organized, is divided according to a 6C system, where Challenge, Context, Concepts, Construct and Conclusion constitute the main five pillars. In addition, there is a Case, which influences the research problem. As illustrated in figure 5, there is a linear relation between the main five pillars, and a parallel interaction with methods and analysis.

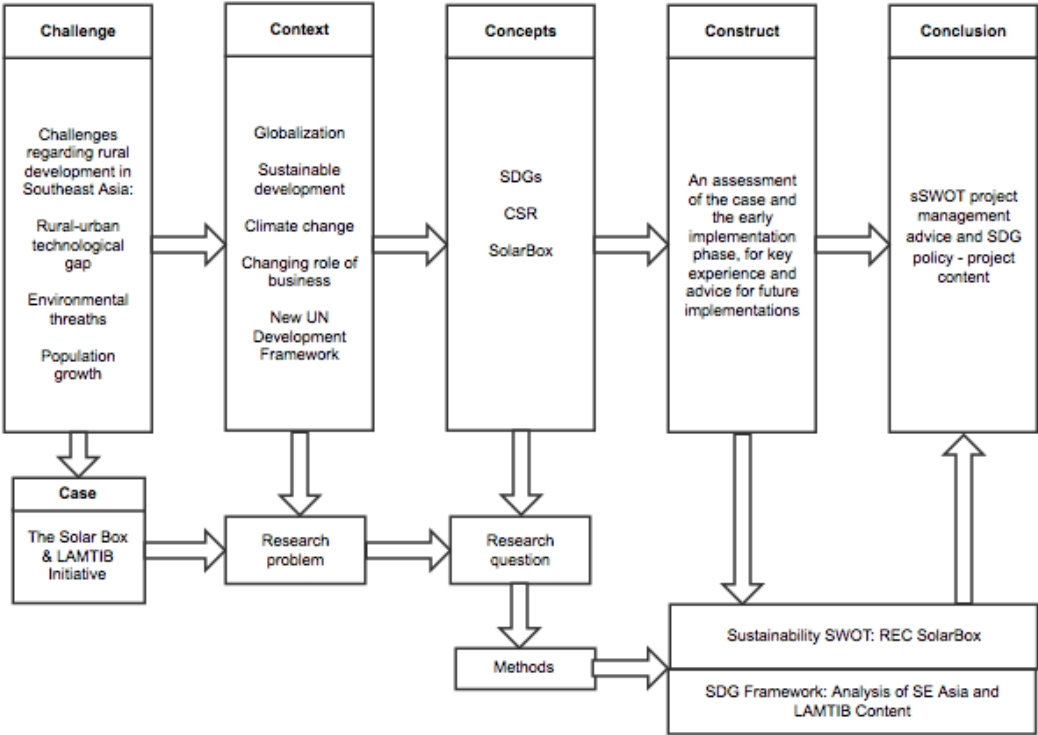


Figure 5. Methodological framework

The desired outcome, as phrased in the Conclusion pillar, is a set of recommendations for further advance of the project (Case), in the rural development context and the solar markets in Southeast Asia (which are further influenced by the broader, global picture).

### **3.2 The case**

The case, upon which the analysis is based, is the initial phases of implementation of the LAMTIB project pilot, with a container-based solar electrification system (REC SolarBox) as the driving technology. Leapfrogging Autonomous Micro-Technopolis in Boxes (LAMTIB) is a technology-based development initiative aimed at rural areas, targeting communities which have access to natural resources, but lacking the means and the knowledge to effectively and sustainably explore the opportunities those resources may offer. *Leapfrogging* in this context is defined by Davison et al. (2015) as the process of “[skipping] over the successive generations of technology to the most recent versions that are much greater” (p. 2).

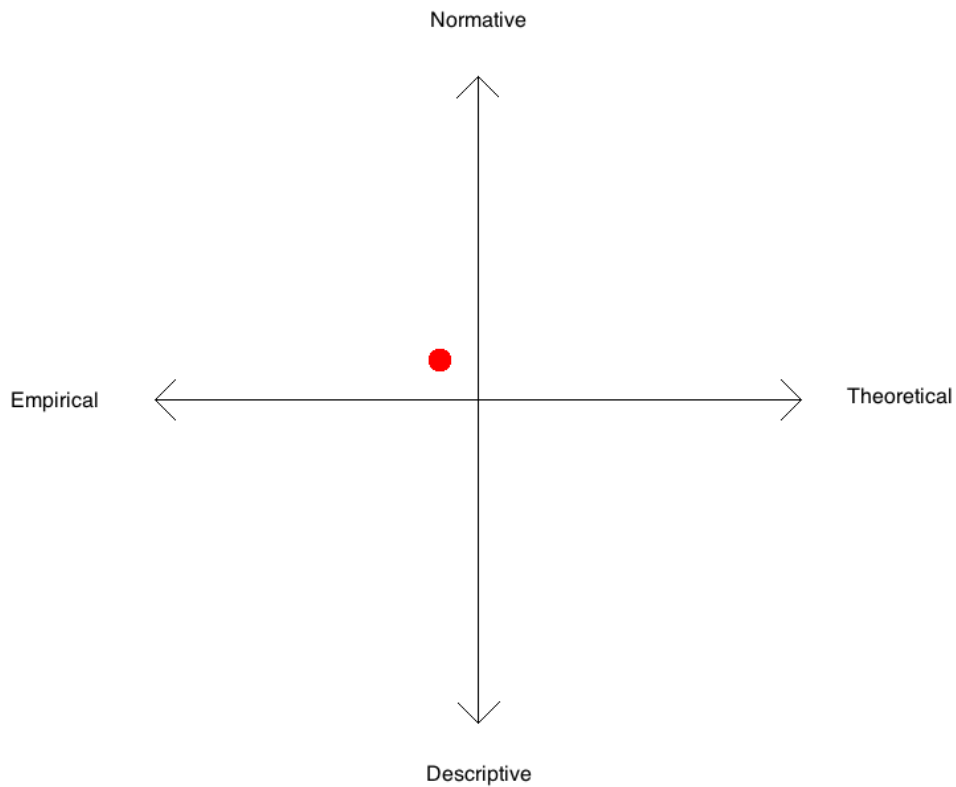
A further description of the case, with project content and company background, follows in section 4.

### **3.3 Multidimensional approach**

The choice of methodology should reflect the complexity of the problem, and its wider context, and be able to address both theoretical and empirical concerns in a valuable manner. Given the limited number of boxes installed, a quantitative approach would not give valid results, and the results will not be applicable. Rather, a qualitative approach is chosen, focusing on the key lessons from the project so far, and future prospects. The theoretical framework is based on key findings from previous research on new technologies and rural development, and the crossroads between them, and has been used to exemplify and illustrate both the possibilities and the obstacles in such projects.

#### **3.3.1 Focal point**

A challenge for case-based research with a strong empirical essence, is balancing between the case and the theoretical framework, and finding the synergies between them. Another major concern when applying a case-based approach with external stakeholders is choosing (and maintaining) the right balance between the descriptive and the normative. From a two-dimensional perspective, it can be illustrated this way:



**Figure 6. Focal point of analysis**

Because the examined case is a pilot project, drawing some key lessons from the implementation process is the main outcome of the research. Such field-based experience from the initial phase of the project is not only vital to the project longevity per se, but may also constitute a value added to the field of project-based CSR, within lesser-developed rural areas in particular. Contributions as such, will consist of a somewhat stronger normative approach, as the overall goal will be to avoid certain pitfalls in the future. Although it is in the nature of research to strive for objectivity, certain normative recommendations will be inevitable in this context. However, the case-based experience and fieldwork, referred to during the analysis, will be examined applying a theoretical framework presented in the previous chapter.

### **3.4 Analytical tools**

#### **3.4.1 Sustainable Development Goals (SDGs)**

The new UN development framework, the SDGs, will be used as an analytical tool, with the aim of examining to what extent the LAMTIB initiative and its potential modules complies with the international development agenda. Such an examination is not only relevant to the project's short-term priorities – it is also crucial to any long-term strategy. The SDG framework



and the attached initiatives will, if successfully implemented, run from January 2016 and set the standard for the post-2015 development agenda. Actors within the development field, seeking funding and support, do wisely in complying with those policies.

As described in the theory section, the SDG framework consists of 17 goals and 169 targets. The proposed goals are subject to a long-term, open process, and they are now likely to be implemented as phrased in the proposal, both in regards to quantity and content. Thus, they reflect a global consensus on what should be the priorities on the development agenda for the next 15 years. The indicators, however, are still under debate, and are likely to change. Moreover, the detailed content is mostly large-scale, macro-economic goals, where it will be hard to measure LAMTIBs contributions. Hence, they are only used to create a general picture of the intentions of each SDG.

The 17 goals will be presented in order, and the LAMTIB content will be analyzed according to each of them, seeking to clarify to what extent the initiative has managed to take into account the priorities of the global development agenda. Then, LAMTIB is given a score, either high, medium or low, as a measurement of the extent of the project’s compliance with the new development agenda. The criteria for the analysis are classified as follows:

**Table 4. Criteria for convergence scores between SDG and LAMTIB**

<i>Score</i>	<i>Criteria</i>
High:	There is a clear and strong convergence between the project’s <i>content</i> and the SDG intentions, and the goal’s main topic and aim has to be included in a separate project module. The <i>high</i> score reflects concrete content.
Medium:	There is a significant convergence between the <i>intentions</i> of the project and the SD goal. However, there is still a lack of practical content reflecting those intentions. The <i>medium</i> score reflects potential.
Low:	There is a weak or no direct connection between the project’s content or intentions and the content within the SD goal. This is primarily a statement of priorities. The <i>low</i> score reflects differing scopes and SDG macro content.

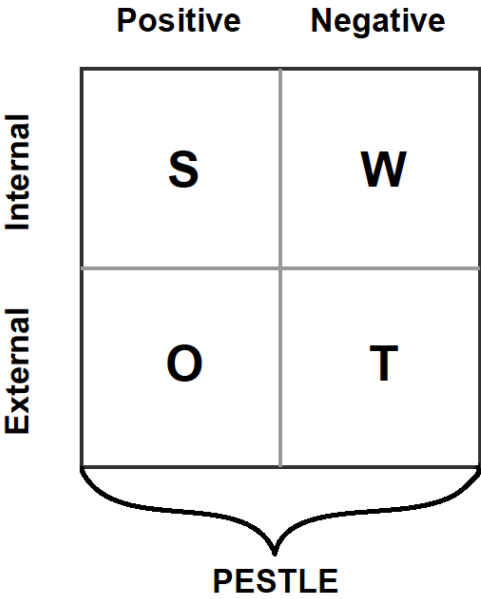
Where there is clear overlap (high), the project can make use of the global agenda, focusing on those issues. Where there is potential (medium), the project can seek to further develop content in convergence with the development policies. Where focus is diverging (low), the project does not comply with the policy content of that specific goal. This is not to say that the project has

failed or lost opportunities, but rather a positive sign, showing that some necessary priorities have been made. Further, as the analysis will show, it reflects a different actor perspective. LAMTIB represent the business/civil society sphere, thus forming part of the micro environment. Because the UN is operating mainly on an international level, a large extent of the SDG framework calls upon the macro environment. This picture might change as targets are being set and specified.

**3.4.2. Sustainability SWOT**

While the SDGs are set out to address both social and environmental challenges, we have to keep in mind that they in the end are decided by politicians on an intergovernmental level, and that the UN member states are the main actors responsible for meeting the targets. When looking at the potential outcome of a single project, we need additional tools.

The traditional SWOT (Strengths, Weaknesses, Opportunities and Threats) analysis is a common tool applied in business cases. With the aim of uncovering characteristics with a project or a firm, the team can be better prepared to avoid pitfalls and maximize potential. The tool is most commonly applied on commercial cases, operating in a competitive market, and usually uses an entire industry, a product, a place or a person as the focal point of analysis. It is most commonly divided into external and internal factors, as illustrated in the figure below:



**Figure 7. Classic SWOT Matrix**

The external factors (opportunities and threats) examine the macro environment. As illustrated, they constitute the basis for a PEST(LE)<sup>4</sup> analysis, thus looking at factors such as political, environmental, social, technological, legal and environmental/ethical realities. What distinguished these factors from the internal ones is that they are usually out of the control of the unit of analysis. It is thus the role of a SWOT examination to identify those challenges in the macro environment, and to find those characteristics *within* the organization that makes it possible to cope with those challenges, and to enhance new opportunities.

The SWOT matrix is mainly associated with, yet not limited to, profit-maximizing actors in a competitive environment. The SE model embedded in the structure of the SolarBox and the LAMTIB initiative does diverge from the traditional business models because it is based on CSR and philanthropic support, which might to some extent provide protection from the toughest market competition. This is particularly the case for the early phase of the project, where the initiatives' success will be measured by other standards than only break-even time.

In the context of this study, the focal point needs to reflect upon several of those aspects, including the solar industry, the SolarBox as a product, and the Southeast Asia region as an operating market. The location-specific aspects, with regards to demographic and cultural characteristics, will be linked to the empirical evidence from the Philippines specifically, and Southeast Asia in general.

The idea of sustainability pervades much of the project's content, which requires for a broader perspective to analyze the non-profit aspects of the initiative in a fruitful manner. The World Resource Institute (WRI) has come up with a revised SWOT framework, taking into account the sustainability issues facing companies in today's global economy. The Sustainability SWOT (sSWOT) is aimed at organizational assessments "across internal departments, as well as suppliers, customers, or other stakeholders on strategies to create and sustain long-term value" (Metzger, Putt Del Pino, Prowitt, Goodward, & Perera, 2012, p. 1). The main difference between the sSWOT and the traditional SWOT, in addition to the pronounced sustainability focus, is that it starts from a broader, macro-economic point, with emphasis on *megatrends*, or *big trends*. Those can be environmental issues, such as climate change, but it can also be

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<sup>4</sup> The PESTLE framework (extended from the PEST analysis) is a macro environment analysis tool looking at Political, Economic, Social, Technological, Legal and Environmental (or Ethical) factors. See Hopkin (2013) for a further discussion on the PESTLE-SWOT relationship.

political, technological or social issues – all factors that would otherwise constitute a PESTLE analysis. Thus, the macro environment within the sSWOT framework can be identified not only in the external factors, but also in the starting point of trends. The idea of sustainability as a link connecting those trends with the economic priorities of the organization is embedded in the core of the sSWOT, and shows how internal factors are increasingly connected to the external macro factors in times of change. Such an overlooking, macro analysis underlines the global connectedness of organizational management, as the external environment have increasing impact on everyday decisions and outcome.



**Figure 8. Sustainable SWOT Analytical Framework. Source: Metzger et al. (2012, p. 2)**

The pyramid shape illustrates how the analysis starts with the broad picture, and narrows down step by step to become increasingly company-specific and action-oriented. The “prioritize” and “act” box on top of the pyramid, illustrates the importance of incorporating the results in the organization’s future plans and policy framework, and is a significant difference from the traditional SWOT. This is particularly relevant to projects in the start-up phase, which will have a lot to gain from identifying threats and weaknesses and finding corresponding solutions early on. However, such policy changes and initiatives will not prove successful if the decision-making basis, being the previous steps of the pyramid, lacks a broad approach, taking multiple

views and inputs into account. The basis, which is constituted of *big trends*, is developed throughout the theoretical framework as megatrends (2.4), and will be used in the sSWOT analysis in section 5.1.

Seeing the REC SolarBox and the LAMTIB initiative as an integral part of a global framework, the sSWOT provides a tool for understanding the challenges and opportunities ahead, and how early-stage experience can strengthen the project's position to tackle those difficulties and create new possibilities. The overlooking picture, which would otherwise require a PESTLE or similar macro-environmental analysis, can now to a larger extent be integrated into the analysis, which further underlines the interconnectedness between internal and external factors.

The weaknesses discussed related to policy outcome and broad assessment, are sought overcome by the extensive research which makes the groundwork for the analysis, and the inclusion of both external and internal stakeholders in this process. As described in the data chapter, communities, technicians and company executives have been sought included in the process. However, it was not possible to involve everyone, due to time constraints and conflicting schedules.

As illustrated in figure 8, the framework goes through four main stages, with six boxes and eight questions attached. All stages will be addressed, starting with the trends, as identified in the theoretical chapter, leading up to some recommendations in the *priorities* and *action* sections.

### **3.5 Data collection**

The data collected for this study is mostly the results of the experiences made during an internship in Southeast Asia in fall 2014. The study is a continuation of a written analysis and reports conducted in this period, thus the data collection time frame spans nearly a year, from August 2014 to May 2015. The data material constitutes of both primary and secondary data, which will be further explained in the following sub-chapters.

#### **3.5.1 Primary data**

As the project is in its early phase, primary data is a significant part of the data collected. There was little information covering the implementation results and experiences, as well as the overall structure of the project. As the research team, consisting of two interns, also has played

an important part in developing the project's content, data has been created and gathered throughout the entire process. Throughout this process, the researchers were left with certain perceptions on development implications and challenges, based on the experiences and impressions from the internship period. The researcher acknowledges the problems such integrated roles can create in regards to reflexivity and transparency. This is further discussed in the quality considerations. Apart from constituting a reflexivity challenge, such a method is also creating a stepwise deductive-inductive process (SDI) in which the research takes place (Tjora, 2013). This process implies a back-and-forth relationship between theoretical framework and empirical data, and reflects upon the non-linear process within which qualitative research and process assessment often takes place.

The primary data material is a combination of internal reporting and analysis, picture material, informal interviews/conversations and focus groups, and general observation. The following sub-sections will further describe the different types of data collected, and the methods used.

A total of seven fieldtrips were undertaken, in the period between September 2014 and March 2015. Among the places visited, one is an operating site, and another five are potential sites. Additionally, a field visit was made to the REC plant in Tuas, Singapore. The fieldwork is listed chronological as followed:

**Table 5: Fieldwork**

<i>Country</i>	<i>Type of visit</i>	<i>Dates</i>
Philippines	Site visits, interviews	07. -11.11.14
Vietnam	Site visits	10. -16.11.14
Cambodia	Site visits	07. -11.11.14
Singapore	Company/plant tour	19.11.14
Myanmar	Site visits, interviews	05. -21.15
Singapore	Interviews	21. -24.03.15

**Table 6: Seminars & Conferences**

<i>Conference</i>	<i>Relevant topics</i>	<i>Location</i>	<i>Dates</i>
Energy Solutions for Asia	(Renewable) energy	Singapore	30.10.14
Responsible Business Forum 14	Sustainability	Singapore	24.- 26.11.14
Norwegian Business Delegation	Infrastructure, energy, education	Yangon	02.- 04.12.14
Vision 2030	The Post-2015 Agenda, global health & education	Trondheim	02.- 03.03.15
World Environment Day 2015: Knowledge for Change Towards a Sustainable Society	The SDGs, sustainability, environmental challenges and policies	Trondheim	05.06.15

### 3.5.2 Secondary data

The secondary data obtained, has been collected with the objective of finding up-to-date, quality-assured information on the concepts involved in the research topic. The theories presented, as well as the related studies discussed are gathered from journal articles, academic theses and books. Many of the written sources are part of the syllabus in related courses, while others have been gathered solely for the purpose of this study. The online literature search has been undertaken through multiple databases and academic search engines, which are accessible through the NTNU system. The most important ones have been Scopus, Bibsys, Oria, ISI Web of Knowledge and Google Scholar. The latter has been applied mostly for specific articles and authors, due to the limited quality criteria of its content, as well as the combined ranking algorithm, which may induce and reinforce the Matthew Effect<sup>5</sup>

Search has been done exclusively in English, but some of the sources revealed and deemed relevant, have been in Norwegian, in addition to English. English sources have been preferred, due to the applicability of the research, and the reliability of the findings, in terms of possibilities to verify the sources. Based on the theoretical search history within all engines used, I have identified the following search queries, that have been repeatedly used during the desk-research: *development, sustainability, SDG, (corporate) social responsibility, sustainable value chains, solar, globalization, glocalization, rural, renewable energy, sSWOT, SWOT, PESTLE, bottom billion.*

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<sup>5</sup> In this context defined as the accumulative advantage that academic contributions might get when applying a popularity-based citation ranking or commercially oriented algorithms.

## **3.6 Quality considerations**

The following sub-sections will clarify on different aspects regarding research quality, and explain how the quality criteria have influenced the choices made during the research process.

### **3.6.1 Validity**

#### **Types and definitions**

Validity refers to “the accuracy and trustworthiness of instruments, data and findings in research” (Bernard, 2011, p. 41), and is usually divided into several sub-forms, dependent upon the type of research conducted. In the context of this qualitative, case-based study, two main types are identified and discussed, as described by Neuman and Robson (2004). *Internal validity* can be defined as a measure of whether the results are accurate for the specific sample and phenomena examined. The *external validity* asks to what extent the results can be generalized to encompass other samples or cases, within the same context – in other words, whether the case or sample chosen is representative.

#### **Internal validity**

Internal validity, to be more specific, is a question of correlation versus causation. If a correlation is present, how can we be sure whether this in fact is a cause-effect? This is a challenge to the social sciences in particular, because the use of experiments is trickier, and in many cases controversial. Within the context of LAMTIB, with clear independent and dependent variables, defined as technology tools/modules and development outcomes respectively, this is a crucial issue. In fact, increased attention is drawn towards the internal validity of development projects and –studies, as in the case with the Millennium Development Project (MDP) and the lack of verified control groups (Clemens & Demombynes, 2011). The problem, for those not familiar with the MDP critique, is that development projects are implemented in a broader context of global forces, which is not only accelerating, but also multidimensional and complex. How can we verify the extent to which the observed development outcomes in such projects are due to implemented tools, and not merely a result of the improved macro environment in the country or region? The findings of Clemens and Demombynes (2011) showed that while there was clear progress in the selected Millennium Villages, similar progress could be found in other, non-participatory villages around, in which the prerequisites were the same. In a LAMTIB context, this is a crucial concern that needs to be addressed in the long-term perspective. As this research is being conducted, the project is in



its early phase, and there are yet limited implications on development. The external validity is perhaps of greater interest in the short term, leaving greater implications on the further development of the project and its new sites.

### **External validity**

External validity, within the context of LAMTIB and this study, asks whether the experience from the post-pilot implementations can be easily transferred to future site installations. As further discussed in the PESTLE analysis, the outcome of the analysis is biased towards the situation in the Philippine and the pilot site, as this is where the more tangible proof of implementation is found and conducted. This implies that the external validity is somewhat constrained by geographic and cultural considerations, which may indeed be very site specific. What can be transferred, however, are the internal characteristics of the LAMTIB content and apparatus – and its ability to respond to external concerns – many in which are likely to be similar and non-site specific, cross-border concerns. This may apply to the the technical aspects in particular.

Another concern within the context of external validity is the extent to which findings can be generalized to development projects in general. As mentioned, the LAMTIB initiative is a sui generis initiative, both in the sense of content and theoretical focal point. However, the development narrative is not fixed. We now observe a shift towards a more business-driven approach to aid (Annan, 2005), and results may have implications to coming initiatives operating within the same context.

### **3.6.2 Reliability**

Reliability, which deals with the extent to which repeated studies conducted by the same or other researchers would come to the same conclusions, is in this context subject to several issues. I have strived for an open reflection on the methods and data that have been used in the research process, in order to secure the transparency. This is in turn increasing the reliability of the research, securing that repeated examinations of the case and the issues addressed will come to overlapping conclusions. However, the case and the context are not constant factors. Within the development discipline, the narratives are shifting, as are the every-day realities where the changes take place. Although such changes do not occur over night, the issue of conception is an important factor, as it is influenced by the trends and the perceptions of the wider framework. Further, the case itself will likely change too, as the project expands in scale and content.

Development in general, and project implementation in particular, does not always have one ultimate goal, but rather form part of a process. As a consequence, conclusions may run the risk of being vague. This holds for qualitative examinations in particular, as there are no quantitative measurements in place. The lack of a proper policy framework and goals, as well as the limited number of case-based evidence within the project, further contributes to this weakness.

As the project is multi-stakeholder based, and is transnational and inter-disciplinary in character, gaining a deep, extensive understanding of all factors in place is a challenge. The researcher admits that despite her long-term involvement with the project, the complexity has been a challenge to overcome. Systematically structuring and analyzing content that has a yet a very limited empirical base and with little comparison is challenging, and will seem even more so if one is not familiar with the background.

Another question concerning reliability is whether the informants have self-interest in the project and its outcome. As previously discussed, the role and perceptions of the researcher is important, but so are those of the local communities and the stakeholders. Those perceptions are not static, and are thus likely to change as the project emerges. For instance, people having high hopes for the project, may show enthusiasm and interest at an early stage, which they gladly share with the researcher. Such emotions, however, will most likely change to a more negative attitude, should the project fail to provide what has been promised or aimed for.

Lastly, it is crucial to point out the difference between descriptive parts of the project, and the implications of it on the other. As with the overall complexity of the project, this has been another challenge to clarify on. Whether this is clear or not, may have implications on repeated or follow-up studies, and thus on the study's reliability.

### **3.6.3 Transparency**

In retrospective, the conducted fieldwork could have been more systematically organized and planned. A field diary with impressions and observed details would clearly have made the different experiences more comparable, as well as contributing to a greater degree of reflexivity. Planning interviews and institutionalizing procedures would have made the data more reliable and easier to compare, and a greater extent of raw data would have contributing to the transparency of the study, in terms of being easier to present and share. Due to changes in plans, troublesome communication, uncertain expectations and time constraints (research objectives were not the main reason for the team to undertake those trips), data collection was

undertaken when possible in regards to time and access to information. Further, such changes to the process may at the same time have contributed to a different outcome in the data content. Knowing they are objects of research, participants are likely to adjust their behavior and answers towards what they assume is the “right” behavior in the eyes of the researcher. This phenomenon is often described as the *Hawthorne Effect* (Salkind, 2010, p. 561).

#### **3.6.4 Ethical concerns**

This thesis is carried out under the supervision of the Norwegian University of Science & Technology, and is thus subject to the ethical considerations expressed in the ethical guidelines<sup>6</sup>. As they tend to deal less with external relations such as the challenges related to data collection and fieldwork, the considerations are based on a framework developed for the social sciences. Burnham et al. identify the following five major concerns to which researchers should pay attention (2008, p. 286):

*Beneficence* or the avoidance of harm: researchers ought to seek to do good rather than cause harm

*Veracity* or the avoidance of deception: they ought to tell the truth and keep promises

*Privacy* or autonomy: individuals have a right to limit access to information about themselves

*Confidentiality*: closely related to the notion of privacy, the right to control the use of information about oneself

*Consent*: the notion of informed consent, often recommended as an operational principle for the conduct of research

The overall intention of the research in this study is to contribute in a fruitful manner to the development discourse. Experience from the fieldwork and implementations in an early phase will necessarily involve dealing with factors that are not yet ready to be examined. The aim, however, is for the informants and the stakeholders to benefit from both the process and the result. Being able to address concerns and get involved at an early phase is crucial in regards to

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<sup>6</sup> Further details regarding ethical research guidelines can be found at <http://www.ntnu.no/etikkportalen> and <https://lovdata.no/dokument/SF/forskrift/2007-06-08-593>

creating local involvement and empowerment; and the research process may in fact contribute in that manner.

As far as the notion on veracity is concerned, the researcher has been subject to two supervisors – one internal and one external. This might have contributed to making the process more transparent, and empirical facts regarding the project even more detailed and correct. In regards to the data collection and veracity, the subjects have not been granted any promises, and the research team has been clear on the long-term prospects of the project, making clear that no short-term gain or false expectations are within sight.

In terms of privacy and confidentiality, no personal information is revealed, nor collected in the process. The exception is the use of documentation material in terms of pictures. Those are taken by the research team and the REC employees, and are published with the consent of the objects involved.

The aim of the observations and conversations has always been to obtain an impression of the thoughts, perceptions and experiences of the project implementation and its potential, both among local communities as well as external stakeholders. The research team has at all time strived to obtain a focus on the vulnerable position in which many of the research objects are. Due to the limited amount of sensitive data, few considerations regarding confidentiality have been made. In the few cases where considered accurate, such considerations are regarding corporate confidentiality rather than personal information. Actors in the solar industry are facing tough competition, and protecting strategies and related information is key not only to the corporation involved, but also to the project itself, as it to a large extent rely on the competencies and good-will of the stakeholders.

A challenge related to that of corporate concerns, is the researcher's involvement with stakeholders. The researcher has been committed to the project through a 4 months internship in the fall 2014, during which the fieldwork was conducted, there might be a certain conflict of interest, as it is in the researcher's interest that the project will succeed. However, this is most likely a returning challenge for case studies and project implementation research, as cases are rarely chosen randomly – there is usually a certain link between the researcher and the case, in terms of knowledge and area of interest. It is important to state that the researcher was not paid during the internship, and that the stakeholder's economic contributions to the research process are limited to cover travel expenses.

### 3.6.5 Limitations

Having a rather limited data material, as well as a solely qualitative approach, several limitations can be identified. Focusing merely on one case, the LAMTIB initiative/SolarBox, the study gives a detailed picture of the implementation process and the short-term implications of this particular development project. However, it is in the nature of an in-depth case study with a very limited number of cases, that the outcome cannot automatically be generalized to other development projects. As described in the following sections, the LAMTIB case is unique in the sense that it has specific technological content, a particular geographical and demographic focus and outspoken targets for the development outcome. However, there are clearly *aspects* of the results that are transferable to similar projects. There might be some isolated ideas for policy implications within renewable energy and non-grid solutions, cross-cultural and cross-lingual knowledge management and communication, SE models in rural areas, among others. If the project proves successful in the long run, a stronger evidence-based pool of experience will develop, leaving the analysis and the applicability of the results more tangible. Further, it will strengthen the longevity of the research, leaving a clearer basis for analyzing whether a cause-effect relationship does exist. This is a crucial aspect of the limitations with development projects – and the study of their implications. As global forces continue to change the patterns of everyday life – crossing and challenging the traditional narrative of north/south divide – we cannot automatically conclude that all positive development outcomes within a particular village is due to the project implementation. It is in the very nature of the interpretive paradigm that we seldom can induce change and control for external effects. This is merely a longitudinal concern, and it is thus crucial that potential follow-up studies of the project manage to take this limitation into account when addressing extent of change and implications.

A further, clear limitation of the study is the way in which the suggested SDG policy is applied. Due to time constraint, as well as a need for narrowing down the scope, a wider discussion of the content and implications of the SDGs has been left out in this work. For a broader discussion the reader may look into the work of Jeffrey Sachs (2015) or the background for the Open Working Group (OWG) (Appendix). Despite of those limitations, however, a review of the policy framework is present indirectly, through the comparative analysis of the LAMTIB content, thus pointing at policy areas where the two either coincide or diverge. Even though the intention of such a comparison is not aimed at the framework per se, a significant divergence between the two will necessarily imply that a further investigation is needed – to clearly identify

which different development narratives that make up basis for the policies. A divergence will naturally not identify or suggest which one is the more or less successful – especially as they are both initiatives not yet being implemented in full scale.

## **4 THE CASE**

### **4.1 Background**

The LAMTIB initiative is a development project seeking to empower rural communities in off-grid areas through access to affordable technological solutions (Aunemo & Forest, 2014). These *enabling technologies*, Information and communication technologies (ICT) and solar energy, are the main pillars of the project, making possible the implementation of six other modules. The project was launched as a development initiative from Norwegian stakeholders, based in Norway and Singapore. The main stakeholder, Elkem Chartering, is the managing actor; insofar the project is not yet fully operated as an NGO.

### **4.2 The Initiative**

The initiative was put forward based on an idea of managing partner in Elkem Chartering, and project manager of the LAMTIB initiative, Tom Preststulen:

During more than 40 years, I have been working with rural areas in Africa, South America and Asia. Gradually I also learnt more about new technologies, some even disruptive, especially within renewable energy like solar and wind, web real time communication, logistics, and niches within food production. A couple of years ago, it just dawned on me that some of the underprivileged people living in areas with natural resources, but without such facilities, can in fact leapfrog out of poverty, if they want to, and if more people like me, and institutions, can help kick-starting progress. (T. Preststulen, personal communication, May 14, 2015).

### **4.3 Aim**

The aim of the LAMTIB project is defined by the project manager as: “Helping to make available to lower tier populations in regions with under-used natural resources, current breakthrough and later on disruptive technologies and drive growth of employment and decrease of urbanization” (T. Preststulen, personal communication, June 28, 2014).

## **4.4 Stakeholders**

In addition to Elkem Chartering and REC, who are responsible for logistics and energy respectively, there are several other actors involved in the project. These are representatives from both business and non-profit, and are further described in Appendix V. REC, as the focal partner in this context, will be fully described in the following section.

## **4.5 REC**

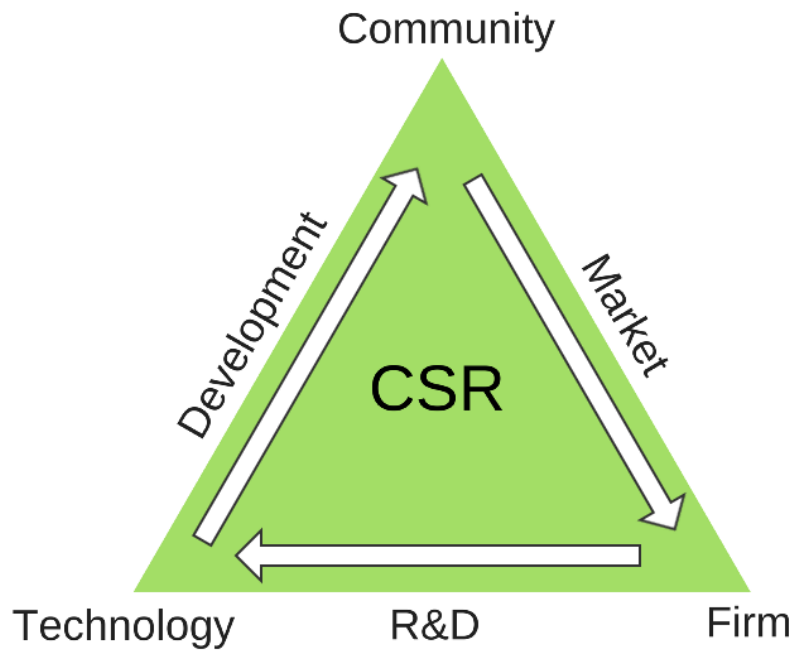
### **4.5.1 Company background**

*REC Solar ASA* is Chinese-owned solar panel producer, with its production facilities based in Singapore. Originally Norwegian, it was acquired by Elkem and China Bluestar Group in 2014/2015. Since the company was established in 1996 it has gained international experience, both in mature and emerging markets. They now employ 1600 people.

### **4.5.2 CSR Strategy**

REC is providing 1-2 containers for the project on a yearly basis. It is further stating in its annual sustainability report that they are “looking for further social projects that can be implemented together with partners and bringing to life REC’s ambitious vision” (2013, p. 14). It is further stated on the company website that the firm “recognizes that it is a key player in the communities in which it operates and regularly gives back to good causes around the world.” Among the project they have participated in, within a CSR framework, several NGOs have been receivers of direct financial support. Figure 9 serves to illustrate this strategy, where the firm (REC), provides its technology to communities, seeing opportunities for new customers in the long run.





**Figure 9. Theoretical model for REC' CSR engagement<sup>7</sup>**

REC, which has got significant experience within solar, has invested significant in R&D, contributing to the “solar revolution” (Barnham, 2015). Such investments are not solely contributions to mature markets, but are also cheaper solutions for smaller, more price-sensitive market segments, such as the SolarBox. Through the end product (if used for the right purposes) REC can contribute to development in local communities, thus creating their own market base in the longer run, while positioning themselves as a socially conscious and responsible brand – both within local communities and global markets.

The use of company-specific products and equipment in a development perspective is a possibility for the company to market its products in new markets, creating interest and curiosity for new technologies, within areas that hardly would access product information otherwise. From a development perspective it is important to be aware of the marketing purpose of such initiatives. However, the target group are still reached, and in a more direct manner than is the case of financial support to projects not related to the company's core business. Another factor that should be taken into account is the possibilities for maintenance and supply of spare parts that comes with such integrated CSR programs. Failing to supply a quality product, even in lower segments of the markets, is a poor marketing strategy for the company.

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<sup>7</sup> The model is developed by the author herself, based on the understanding of REC strategy for CSR.

## 4.6 Proof of Concept

The SolarBox constitutes 80 solar panels, which are put in a 20 feet standardized container. As shown in picture 1, the panels are distributed on top of the container, and around the box. The container solution is price competitive, robust and efficient for shipment, making the SolarBox an ideal case for emergency situations. In case of extreme weather, the panels can be easily dismantled, and stored safely in the container.



**Picture 1. SolarBox Installation in Barangay Sungko, Bantayan. Photo: Vishal Vijay/REC.**

## 4.7 Project Content

**Web RTC** (Web Real-time Communication) constitutes the connectivity aspect of the project, and is provided by Singapore-based software company Temasys Communications. Through a satellite the local community can gain access to information and means of communication, as well as remote control engineering of the solar panel installations (see section...) ICT solutions are likely to play an important role in energy management in the future, by monitoring emissions and savings (WBCSD, 2014).

**Water** is a scarce resource, unevenly distributed. Today, approximately 750 million people lack access to clean drinking water, of which 186 millions live in Southeast and East Asia, and Oceania (WHO & UNICEF, 2014). Privatization of water resources is a challenge in many parts of the developing world, and might impose charges that are unbearable to the poorest segments of the population. The alternatives to expensive water might be polluted and toxic reservoirs. The LAMTIB Initiative wants to provide water below market price, with technology

that can significantly lower the production costs. The intention is to make possible for families and communities to reallocate water expenses towards other, long-term investments and developing purposes.

**Sanitation** solutions are often poor or lacking in rural areas, and might serve as a proxy indicator of urban-rural gaps. In fact, 9 out of 10 people defecating in the open, live in rural areas (WHO & UNICEF, 2014). The LAMTIB Initiative has adopted a broad perspective on the issue, seeing education access, gender issues and health in relation with sanitation. The idea is to initially provide mobile toilets, which can be working in symbiosis with the ecosystem, and make use of the waste to other purposes.

**Food** security is an issue on the rise, as a growing population and changing climatic conditions interfere with traditional cultivating practices and limits. The LAMTIB Initiative has two solutions in the food module: the Hatchery in Container (HIC) and the Nursery in Container (NIC). The former involves the process of cultivating larvae for use in the sea farm. The immediate access to larvae, produced and monitored with the help of solar electricity from the SolarBox, eliminates long travel distances, thus increasing the survival rate of the larvae. The desired outcome is an increase in aquaculture output and efficiency, thus augmenting the quantity of secure protein sources from fish for the population, while creating potential income from exports of more valued species, such as sea cucumber and abalones. The sea farm is under operations in the Santa Cruz barangay in the Philippines, and the accompanying HIC is under development.

The NIC is a plant cultivation solution, based on aquaponics. The process of aquaponics reuses the waste from the fish as a nutrient for the plants, while the plants provide a filter for the waters where the fish is kept. The whole system is tank-based and will be a supplement to the sea farm activities in Santa Cruz.

**Education** is closely related to human development, and is, despite major improvements in recent years, millions are still kept out of school for various reasons. For poor families, the alternative cost of schooling is often high. Further, the issue of education is not merely a question of quantity. Quality considerations are just as important. According to UNICEF, 130 million children in school are not learning the minimum requirements (2013).

Knowledge can be shared faster than ever before – across borders and disciplines, and among people. If digital access and knowledge is not evenly distributed, the education gap is likely to

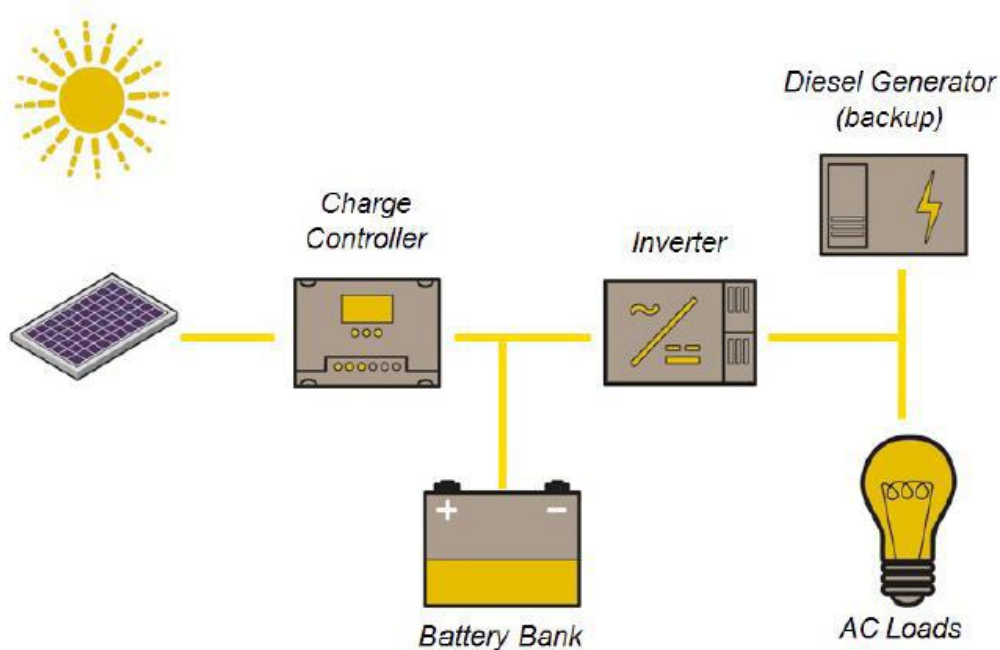
increase in certain aspects, as education takes on new platforms and fora. The digital divide is a proxy for the rural-urban divide, and requires a targeted effort towards the rural, off-grid areas. The LAMTIB solution for education is to raise general knowledge and awareness through the use of online education systems. Through a screen, which will be mounted between two containers and run on solar electricity, the community can gain access to global knowledge centers through the satellite system. The system is on the planning stage for both Sungko and Santa Cruz barangays.

**Healthcare** access in poor, rural areas is often hampered by long distances, brain drain and high costs. With diagnostic telemedicine and medical expertise, such challenges can be overcome. In the Sungko Banrangay the local community has been equipped with a telemedicine system, which is operated by the Philippine Red Cross.

**Small-scale business** operations, as exemplified with the above mentioned sea farm project in Santa Cruz, creates economic activity in the local community, which might serve to empower people and increase purchasing power. Such effects may further trigger demand, which fosters further production and innovation. The idea within the LAMTIB context is to source untapped, raw materials locally, in a sustainable manner, and to integrate the different activities, creating a value chain reaching demand in mature markets. With solar energy access and Internet connection, local businesses can expand their feasibility area and gain information regarding production and markets.

## **4.8 PV Technology**

The amount of energy from the sun reaching the Earth's surface in one hour is greater than annual energy demand of the entire world population (Tsao, Lewis & Crabtree, 2006). The process where the photons from the sun are utilized to produce electricity is called the photovoltaic (PV) effect, and is the basis of the REC PV Hybrid. The hybrid (figure 10) consists of the solar panels, which is the main energy generator, and has an additional backup in the diesel generator, in times of shifting weather conditions.



**Figure 10. SolarBox System. Source: REC (2014).**

The excess energy is stored in a battery bank, with storage capacity ranging from 15 to 60 kWh daily, dependent on solar PV array size. The whole system can be controlled both within the container’s own monitor room, or remotely, from the REC Singapore monitoring center. In regards to the LAMTIB initiative, the latter will be the preferred solution in the initial phase, due to lack of local experience with the equipment.

#### **4.9 Geographical orientation**

The LAMTIB initiative has a primarily focus on Southeast Asia, with an interest of making global impact in the long run. This applies both for south Asia, as well as Africa. The latter, with its favorable weather conditions and huge untapped geographical areas, has attracted a significant bulge in solar investment in the recent years (The Economist, 2015).

In the short to medium term, five countries have been in focus. They are the Philippines, Cambodia, Vietnam, Myanmar and Indonesia. Among these, fieldwork has been undertaken in all but the latter.

“[...] grid connections in poor countries are scarce and unreliable, and developing them would take too long, especially in remote areas where the poorest live. Besides, the

power industry's old business model of delivering through the grid over long distances is in retreat everywhere, including in rich countries". (The Economist, 2015, p. 8)

#### **4.10 Current sites**

There are currently two partly operating sites in the project, both located in the Philippines. The two have been subject to multiple field visits and research, and are further described in the following.

##### **4.10.1 Barangay Sungko, Bantayan, Philippines**

The initial site for the launch of the PV Hybrid was in the Sungko barangay (village) in Bantayan, This island, located in the central Visayas region in the Philippines, was hit by the Haiyan typhoon in November 2013, causing devastating harm to the ecosystem and the local livelihoods. The container was launched in 2014, as an aid-relief response, in corporation with the local Philippine section of the Red Cross. The modules in place in Bantayan, in addition to the solar panel installations, is a satellite, which enables the remote control of the system, and the healthcare module, in the form of a mobile telemedicine kit and the human resources from the red cross.

##### **4.10.2 Barangay Santa Cruz, Rhonda, Philippines**

An additional site has later been identified and is currently in the process of receiving the second container of the project. The Santa Cruz village, which is located in the west coast of Cebu island, has played an important part in the practical implementation of the food production module, with abalone and sea cucumber production for exports. As soon as the container is installed, and cheap electricity generated, the sea farm can make use of stable energy supply for its larvae production, which is extremely sensitive to temperature changes and blowout in the grid. Other modules will also be made possible once the box installation is in place, with the population having expressed particular interest in the water and ICT solutions.

## 5 ANALYSIS

The two-level analysis consists of one technological, business-oriented part with focus on the REC SolarBox and the solar sector, followed by a more extensive analysis of the LAMTIB content.

### 5.1 Sustainable SWOT analysis

The following section will examine the SolarBox content in a long-term perspective, based on both internal and external factors. The SWOT framework, which is revised for the sustainability context, is further described in the methodological framework in chapter 3.

#### 5.1.1 Megatrends

The sustainability SWOT framework makes use of certain megatrends as a context of the following pyramid of analysis. As clarified in the theoretical section, the following trends are identified as useful in our context:

- Global economic shift
- Rapid urbanization
- Resource scarcity
- Entrepreneurship rising
- Enabling technologies

The following SWOT analysis of the REC SolarBox will reflect upon these trends. This holds in particular for the external factors; opportunities and threats.

#### 5.1.2 Threats

As a starting point for the analysis, we are asked us to identify sustainability challenges that may impose treats to future business value (or SolarBox operations and longevity in this case). Threats are identified within the following categories:

*Environmental* threats can be identified on micro and macro level, in the form of local weather conditions and climate change respectively. Solar panels are obviously best operated in sunny areas, and need to take all-seasonal weather conditions into account. Southeast Asia is a sun-rich region and is well suited for solar as an energy source. However, most countries have rainy seasons, where sun radiation will decrease. Further, the climate change will challenge the

predictability of seasonal weather. Other energy solutions could be considered as an additional solution, for instance micro wind turbines for island areas close to the sea, or in mountainous with significant altitude.

On the macro level, environmental treats are composed of climate change and extreme weather. Sea levels will rise, for instance, pose a significant threat for island states of S.E. Asia, where estimated sea level rise is set to 0.9 m by 2100. (Stern, 2006). Such a change will have dramatic regional effects, and will have a large impact on the basis of existence for millions within the coastal areas in question. Combined with a preceded population growth in some of those areas, the risk is even increasing as a result of the demographic factor. This might change the overall conditions for the Box, and its operations. The system is generally robust, with a container that can store the panels, and easily be removed. If those strengths are to come in useful, local communities have to get information and training on how to tackle such emergency situations and storage of equipment. So far, our conducted fieldwork revealed that this know-how was not yet communicated in a clear manner.

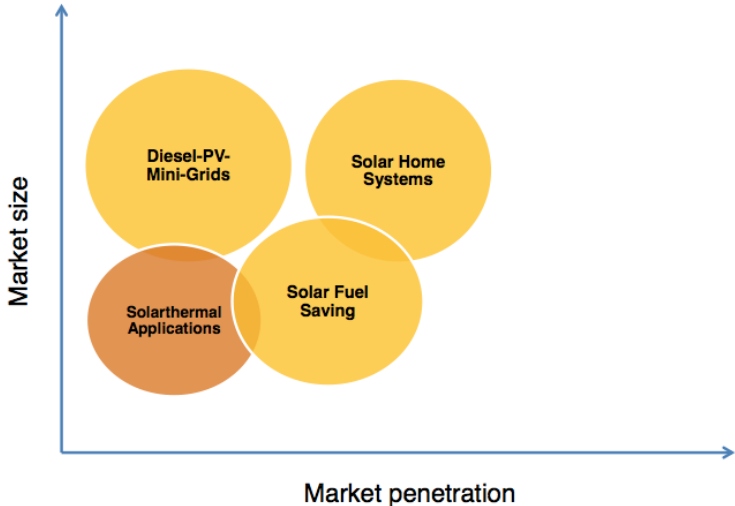
*Technical* treats in general often include competitor's technologies and R&D. In a CSR-based development project, the threat of new technologies is less relevant, as the main objective in the short-medium term is not profit maximization. In the longer run, however, REC must ensure that the panels are updated to provide sufficient efficiency, at a competitive cost. Another threat for the SolarBox is related to communications systems, as the SolarBox is reliant on remote monitoring. The attached satellite, which is installed in Bantayan, enables Internet connection, which further enables the REC control center in Singapore to access system information and monitor the equipment. With no strategy for skilled or specialized competence on ground, the system becomes vulnerable to signal interference.

*Markets* represent threats both within the renewable sector specifically, as well as in the energy market in general. Those can be in the form of customer base insecurities, shifts in competing utility markets and changing supply chains. In terms of customers, the target market for the SolarBox is among the poorest communities in the region, representing a group of highly price sensitive customers. In the short term, REC provides the equipment on a philanthropic or heavily discounted basis, as social enterprise model within their CSR framework. In the longer run, however, the strategy is to establish oneself within emerging markets, creating product awareness and demand. Thus, a clear strategy from REC is to reach out to population dense areas, where economic growth and increased purchasing power is inevitable – either as part of



the project or as part of macro-economic trends in general. This strategy represents a risk to REC if growth is not induced. Even if the purchasing power increases due to growth, it is further a question of demand. Identifying the interests of the local population, and how it might change, is thus crucial. There is a difference of externally identified *needs* and internally expressed *wants*, which is well illustrated in the research of Karamchandani, Kubzansky and Lalwani: “Our research with microfinance customers in rural India showed that when given a choice between beneficial products, such as solar-powered lanterns and low-energy stoves, and aspirational products like mobile phones and gold coins, 85% of customers opted for the latter” (2011, p. 4). Inducing demand by marketing and awareness will turn out costly in the longer run, as it will increase the price tag to the end customers, which are already extremely price sensitive. Thus, the REC should run extensive pre-investment research for the targeted sites, making sure that locational criteria is met. Trends of purchasing power increase, and market research uncovering customer base and interest might be a good place to start.

In regards to other market considerations, demand for solar might be influenced by fluctuations in fuel prices in the short-medium run. As of June 2015, price pr barrel has been down approximately 50% in one year. This might increase demand for diesel- generated energy in off-grid areas, which is a direct competitor to the SolarBox. Average diesel price in the Philippines (where the first container has been put up), was \$0.66 in Q2 of 2015 down from \$0.98 for Q2 2014 (Philippine Department of Energy, 2015). Although a lower fuel price lowers the cost of the back-up diesel generator in the SolarBox, it simultaneously increases the alternative cost of renewable solutions, making a fully-diesel operated system more lucrative in a purely economic perspective. The regional competition faced from other off-grid solutions is illustrated in figure 11.



**Figure 11. Off-grid Market Segments in Southeast Asia. Source: Dietz (2014).**

When looking into solar investments in general, an important distinction has to be clarified, namely the lack of any self-regulation between installations and usage. For some large-scale renewable projects, the installed capacity has not been utilized, creating a capacity-usage gap (Guo, Zusman & Moe, 2014). Turning from large-scale, state owned investments, and down to private, small-scale units, such as the SolarBox, the same logic is valid: Installations of renewable energy resources for lesser-developed rural areas might indeed look good on paper. As a CSR strategy, such initiatives can easily gain customer support and loyalty, create trust in value chains and impress both governments and NGOs. The key is, however, to what extent the installations are being *put to use*. If solar is to have any value added for off-grid communities, the equipment will have to be used for productive purposes.

Other volatilities of concern within markets are those of supply chains. However, REC has to a large extent overcome this, having integrated the whole value chain from silicon to panels and shipping, through the acquisition with Elkem.

*Political* priorities influence the future prospects for the SolarBox, and for solar in general. The SolarBox, as a tailor-made solution for off-grid areas, will not serve its purpose in areas that are already fully grid-connected. Grids are often large-scale investments, decided upon by government, and thus subject to long-term policy objectives. Identifying large-scale projects of physical infrastructure is therefore key. Further, other types of infrastructure that are not directly energy-related might also play a role. Roads, for instance, facilitate the building process, thus influencing the investment decision. While a grid connection is diverging with the strategy of the SolarBox, it might still induce potential for the REC, depending on choice of energy sources.

For solar in a broader perspective, political priorities form incentives and influence energy markets. Shifts in policies, thus, can determine the future of energy markets and economic subsidies, upon which the REC can benefit – or face competition. Specific threats in this respect are fossil fuel subsidies, unforeseen taxation on solar production and usage, and changes in competition regulations. The utility death spiral – the belief that utilities will lose out in the competition with renewables – is creating incentives for the non-renewable supply side to demand fair market competition in energy markets.

*Legal* threats mainly concern locational aspects of the box. As the strategy is to skip administrative layers and arrange the installations on the local level, legal disputes regarding license to operate may occur with higher-level authorities. Land dispute is another potential threat, as the 80 solar panels will require some space in the proximity to the box. The initial area required is only between 200 and 500 m<sup>2</sup>, but capacity increase and additional modules may occupy more space.

It is important for the SolarBox and the project to minimize the insecurities imposed by legal threats, by making clear arrangements and finding alternative sites nearby which can be used on short notice. This is not only a question of security and predictability. Legal concerns constitute main obstacles to investments in Southeast Asia (Yap, 2013). Eliminating such concerns might prove important for the project's funding.

### **5.1.3 Opportunities**

The sSWOT framework identifies an opportunity as “a growing gap where [REC] can create new solutions for environmental challenges” (Metzger, 2012, p. 14). The demand for renewable solutions and solar energy is on the rise (Barnham, 2015), benefiting from a green movement and increasing environmental awareness. As we will see in the examination of strengths (5.1.4), REC is well positioned to meet demand from those new markets.

The expansion of the solar industry is backed by a significant amount of resource sub-supply. Silicon, which is main ingredient in solar panels, is the second most abundant element in the earth's crust - only oxygen is more plentiful. This is an opportunity for large-scale growth on long-term supply, contrary to the competing mature markets of coal, oil and gas. Conventional fossil reserves will be empty within a 50 years time frame, and are subject to increasing political pressure (Sachs, 2015). If the world is to reach the target of limiting global temperature rise to two degrees celcius, 70% of current reserves must be left in ground (Barnham, 2015). If stronger political incentives are enforced, a vacuum in energy supply may arise, and create vast opportunities for companies being well positioned.

The world population continues to grow, and so does energy demand. Poorer populations reaching higher purchasing power constitute tomorrow's energy markets, and significant changes are happening in Southeast Asia. The region is sun-rich, which creates a stable environment for operations. Further, the region has a favorable demographic dividend, creating opportunities not only in terms of private markets, but also from manufacturers, who base their

production operations in the region. New opportunities may stem from business-to-business (B2B) demand. Another opportunity may be created by the rapid growth for food demand. Solar-powered green houses can meet and answer environmental, social and economic concerns simultaneously. The SolarBox can thus serve as a pilot, testing food-modules in a small-scale format.

The SolarBox is developed with the possibility to attach modules, as presented in section 4. Those modules represent technological areas outside the expertise of REC. When integrating those modules and making agreements with external suppliers and NGOs, new partnerships can be made that benefit both local communities and REC. It represents an opportunity for the firm to position itself as a CSR conscious actor, and establish relationships that might prove beneficial in other arenas of corporate operations in the longer run. Further, the company can be an early adapter to the new development agenda. The SDG proposal is yet to be passed on the UN level, however, much of the content has already been through an extensive consultative round. Thus, the main issues and actions addressed are likely to go through.

#### **5.1.4 Strengths**

A company's strengths can be qualities observed both internally and externally. How company employees and customers perceive the firm's trademark is relevant in this context. Addressing a company's strengths, however, requires a differentiation between intentions and perceptive qualities on one side, and de facto performance on the other. Mission and vision statements form an important component of firm's sustainability focus (Sánchez, 2015), and despite being intentional, they set a standard that may influence operations, as they are measured according to their own statements by the external environment. Trends of ultratransparency might be strengthening this tie between policies and actions, as the civil society is increasingly following up on the responsibilities of business, exploiting the resources of the digital era (G. Fu, personal communication, November 25, 2015).

The REC mission statement is phrased as follows:

"We create value through efficient and sustainable solar products, services and investment opportunities, together with our parties to better meet growing electricity needs globally" (REC Solar ASA, 2013).

Several strengths can be identified from this statement. *Value creation* takes form in the integrated value chains that REC represents. The Tuas production unit, which is *strategically*

*located* between emerging markets in the shipping hub of Singapore, has integrated the steps from wafers, via cells to panels. Further on in the value chain, and more relevant for the SolarBox, the containers are shipped now mother company, Elkem Chartering. Such integrated value chains limit the need for third parties and enhance *efficiency*, both in terms of time and costs. Further, it allows for *mobility*, which comes with the container solution. This was proven in the case of the Bantayan SolarBox, when the team efficiently reached the affected area and quickly installed the basic components of the SolarBox.

In terms of costs, the REC SolarBox as an integrated solution is indeed cost efficient. Basing the concept on standardized containers is price competitive both in terms of materials/equipment and transportation. However, the REC solar panels themselves are not the cheapest on the market. Chinese manufacturers can produce panels that are significantly cheaper, and for installations of scale, aggregated price difference will be considerable. In the case of the SolarBox, there are other considerations that might prove just as critical as that of price. The *quality* of the REC panels is *internationally recognized* with a 25 years guaranteed lifetime for each panel. This proves as a concrete example of how the sustainability issue can become more than just a buzzword frequenting corporate policies – the solar industry, and silicon production in particular, is an energy intensive process, and improved product longevity is thus a significant promotion of sustainability.

The sustainability aspect, however, is not particular to certain aspects of REC. Operating in the renewable industry companies are automatically branded as sustainable. Even though the production process is energy intensive, environmental accounting provides a positive bottom line in the long-term perspective (Barnham, 2015). *Clean energy* is a strength in an increasingly environmentally conscious market, and a direct response to the threats of environmental change, which we will return to. The clean energy benefit is further reflected in the company's vision, stating that "everyone benefits from electricity directly from the sun" (REC Solar ASA, 2013). In regards to the SolarBox, REC has managed to elaborate on the first word in their mission, by reaching out to a segment of the global population, which due to low purchasing power rarely benefits from the newest technological solutions.

In addition to the company vision and mission, the core values may prove useful when examining internal factors. Further, values may serve as guidelines for future decisions and strategies, as the company works towards building the brand recognition around them. The REC values are stated the following way:

- We are responsible
- We are experienced
- We are collaborative
- We are straightforward

To what content do these four, self-defined qualities strengthen REC's ability to perform with the SolarBox? To answer that, we will look into each of the four values.

Invoking the quality of being *responsible* comes with certain expectations. However, the potential for positive gains is vast, if the company lives up to its values and redeem external expectations. Corporate behavior in times of transparency and CSR will be measured against the company's own policies and values, as those are self-identified characteristics, thus representing some sorts of minimum requirements as to what can be expected.

Responsibility in regards to the SolarBox has multiple dimensions. In the social context, REC will be expected to operate in a manner that complies with local interests and integrates the local community in to the operation process. In the environmental context, responsibility reflects the very core of REC's activity, as a substantial provider of a renewable energy. With the SolarBox, REC even makes clean energy available for a segment that is otherwise excluded from energy markets – taking responsibility for an inclusive green trend.

REC has significant *experience*, both in the solar industry in general, and in Southeast Asia in particular. Founded in 1996, the company has been part of the major solar R&D and -revolution, and is undoubtedly among the more experienced actors in the industry. However, experience is not soley a question of competitive advantage in the market and trustworthness in customer relations. It is just as much about expectations. Building on experience, the company will be expected to deliver on its promises, thus they cannot simply blame failures on regular start-up trouble. In other words, the SolarBox, despite being in its initial phase and unique in character, might be judged on the overall market experience of the mother company REC. Protecting the reputation of an experienced actor should thus be a priority.

REC's ability to *collaborate* is crucial in the context of a multi-partner project such as the SolarBox. In order to allow for the remote control, which is a standardized REC solution, they have teamed up with Terasys, which provides Internet connection through satellite in off-grid areas (Appendix V). The remote control is in itself strengthening the longevity of the box and its equipment, and shows the need for cooperation for the system to work according to plan.

A collaborate spirit implies taking the local needs and interest into consideration when making decisions, reflecting the previous discussed responsibility. This also implies the ability to follow up the project.

Identifying as *straightforward* creates expectations within the external environment that the company has adapted (or will pursue to adapt) a direct and honest communication style, with a message that is easy to understand. For the SolarBox and the local community, this will imply being clear and realistic in terms of expectations, opportunities and limits. In the non-verbal sense, it may further send the idea of a company that keeps its promises and delivers – leading to action, not only empty words. This is a strength in that it may enhance efficiency, skipping unnecessary bureaucratic levels, which is the core strategy of implementation for the LAMTIB initiative.

### **5.1.5 Weaknesses**

Weaknesses of the SolarBox are identified as core elements within RECs operations and the SolarBox' design and implementation, that may create challenges to project operations on site.

On the company level, RECs face a challenge in regards to the environmental accounting in their production. Although solar energy is renewable and an optimal solution in many situations, the silicon processing and panel production require vast amounts of energy. This is a weakness in terms of positioning the company as a green alternative throughout the entire value chain. In regards to sustainability concerns and marketing, such environmental bottom line accounting is important. However, the latest report shows significant improvements in energy consumption and emissions (REC Solar ASA, 2014).

The diesel-generated back-up system is another weakness in a purely environmental perspective. Although the diesel back-up is only for excess use, other systems, such as a micro wind turbine could be run by night when the sun cannot run the system. This is mostly a question of increasing environmental friendly content, and will naturally be subject to price considerations.

Other considerations in regards to the SolarBox more specifically, there are several concerns that should be addressed. Firstly, the box will ultimately face price competition. REC is not the cheapest option in the solar market. China is a global leader in the solar industry manufacturing, and its companies offer the cheapest solutions. For price sensitive markets such as the rural areas at stake in the project, other competitive strengths can be of little interest.

REC should be able to clearly justify the costs, and opt for cheaper solutions when feasible. A lower value will also lower the potential loss in case of extreme weather or other harsh conditions.

Another weakness with the SolarBox, is related to communications. The SolarBox is reliant on remote monitoring, especially in the early phase of implementation. The attached satellite, which is installed in Bantayan enables Internet connection, which further enables the REC control center in Singapore to access system information and monitor the equipment. With no strategy for skilled or specialized competence on ground, the system becomes vulnerable. Remote control will be of little use if there is no local know-how on the ICT systems. When the research team visited the Bantayan site months after the initial installation, the box was shut down, because the remote control in Singapore could not access the system. There was only one person who had access to the ICT system on site, but this person was lacking the equipment, and had other development projects to run in the area. This serves to show the system vulnerability when knowledge transfer is lacking and clear roles and responsibilities are not identified. This applies not only on the personal level, but also in terms of identifying stakeholders who are committed to the project on a long-term basis.

A further concern regarding plans and stakeholders, are the uncertainties around future CSR policies. The REC acquisition may impose changes to CSR activities and plans in the future, and is a weakness to the SolarBox's sustainability as development initiative.

## **5.2 LAMTIB convergence analysis with SDGs**

We have now looked into the potential for solar in developing S.E. Asia, through the REC and the SolarBox. The following section further analyses the content of the LAMTIB initiative, on the background of the SDG framework, to see how the LAMTIB initiative complies with the post-2015 development agenda. When found relevant, a brief background on current situation and trends are given for the policy issues of the different goals. The goals and targets referred to, are attached in appendix II.

*Goal 1            End poverty in all its forms everywhere*



Among the 1 billion people living in extreme poverty worldwide, a significant share lives in the emerging markets of Southeast Asia<sup>8</sup>. Contrary to previous assumptions (Collier, 2007), the poorest, at least relatively, no longer live in the poorest countries (LICs), but rather in middle-income countries (MICs) (Sumner, 2012). Rising inequality, reinforced by an increasing rural-urban divide, creates significant challenges to poverty alleviation strategies. As the LAMTIB initiative is concentrating its efforts in the Southeast Asian region, the results of a purely geographic interpretation of an *everywhere* approach is not within sight in the short term. However, the project's mission of gradually spreading out to other areas, with both South Asia and Africa in scope, might open up the ground for LAMTIB as a global player within poverty alleviation. Having a more narrowly defined geographical context for the project's pilot and initial phase does not automatically conflict with a wider geographical focus later on. However, it is crucial to be aware of the context in which the project was initiated and implemented, as many of the key learnings from this phase are not necessarily transferable to other situations and locations. Such a process will have to be highly attentive to site-specific characteristics, such as cultural aspects and geographical conditions.

However, as a micro-initiated project, with the opportunities of scale, the project has potential to become a significant player in the regional poverty alleviation field. The initial geographical scope, with emphasis on rural areas, covers significant areas where poverty implications pervade communities and livelihoods. Further, the initiative's initial aim of poverty alleviation (section 4), strengthens the overlap with the SDG framework. The project gets a *high* convergence score for Goal 1.

*Goal 2      End hunger, achieve food security and improved nutrition and promote sustainable agriculture*

Malnutrition-related poverty and food security will in the foreseeable future be closely related to climate change, agricultural resource allocation and production efficiency. The food module of LAMTIB which has both a land- and a sea-based sub-program, aims to tackle those issues. It has the three development-aimed focal points. Firstly, the management and daily operations of the installations will require certain human resources, which will employ parts of the village

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<sup>8</sup> Extreme poverty is here defined according to the 2005 World Bank inflation-adjusted poverty line, and includes all people living on less than \$1.25 a day. Exact, aggregated numbers for the region have proved difficult to find, due to lacking data and insufficient reporting in several SE Asian countries.

inhabitants. Secondly, and more important in this context, the output is aiming at contributing to the regional food supply, being a sustainable alternative to traditional, and less space-efficient alternatives. And this leads us over to the third focal point of the food module, namely the sustainable and eco-friendly strategy under which the hatchery and nursery solutions are developed. Many seaside villages in the concerned areas are facing the challenges of global warming and pollution, both in terms of rising sea levels and poisoned or overfished waters. Finding sustainable alternatives, which are not only part of a global solution to those ecological challenges, but also creating predictable food supply and income is key under in regards to poverty alleviation in a context of a globally changing ecosystem and an increasing population.

In the Santa Cruz village in Cebu, in which the LAMTIB hatchery module is in place, one of the most striking challenges as of recent years has been the impoverished waters, as a result of overfishing. A constant increase in food demand as a result of population growth has put enormous pressure on the marine species, with unsustainable methods of trapping killing the goose that lays the golden egg. One method mentioned while we were there, was the use of explosives, which clearly did not threaten only the species sought after, but the whole ecosystem.

The 2004 tsunami struck hard in Southeast Asia, killing untold thousands of people and destroying innumerable villages, fishing communities and already precarious livelihoods for years to come. The LAMTIB initiative illustrates, through its operations in the Philippines, that the potential for food production in harmony with environmentally sustainable principles is significant. Further, the externalities, such as stable employment opportunities, tap into other development goal targets. The initiative gets *high* overlap on Goal 2.

### *Goal 3        Ensure healthy lives and promote wellbeing for all at all ages*

The policy content of this goal includes maternal health, child mortality, disease treatment, diet and lifestyle, and access and quality of public health care – areas in which the statistics for Southeast Asia show striking gaps (Chongsuvivatwong et al., 2011).

Implementation policies will naturally vary tremendously between developing and developed countries. From the perspective of the former, major concerns include public healthcare budgets, access and information, and price sensitivity. From a LAMTIB perspective, the challenges of access is sought dealt with through the telemedicine module, which enables

diseased people of the rural areas to access medical care instantly, through real-time communication with healthcare centers and personnel. The equipment on site has so far been operated by healthcare workers from the Philippine Red Cross, but with such equipment even less skilled operators can make use of the system, given basic understanding of the technology. In this regard, the technology can be a productive counter-measure to the problem of brain drain in developing countries in general, and rural areas in particular.

The next step in the process of implementing the healthcare module is a storage system for medicines and vaccines, where a fridge run on solar energy can keep the medical equipment under the right conditions, and readily available for the local population.

An immediate concern, which is also the framing of Goal 3, is the equal, cross-generation access to healthcare. The project management must ensure that technical skills and trust in digital equipment does not become an obstacle to the active use and effectiveness of the system.

Another, yet related challenge that has to be solved, is that of language. Younger people might be more accustomed to the use of English, as a consequence of digitalization. Local (and especially native languages), must be respected and if possible integrated into the module in such a way that it does not discriminate against certain strata of the population.

If the concerns discussed are carefully taken into consideration, the potential for the healthcare module of LAMTIB might be a positive contribution towards the fulfillment of Goal 3 in the areas of operation. Specifics in the targets, such as maternal health (3.1), sexual health service and information (3.7), general health coverage (3.8), vaccines and medicines (3b), training and retention (3c) and disasters (3d) are all issues where the healthcare module can contribute in a positive manner. The convergence rate in policies and content is therefore *high* for development goal 3.

*Goal 4        Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all*

Aggregate school enrolment in Southeast Asia has increased over the past years, and for primary education, the picture is positive (World Bank, 2014). However, UNESCO (2015) statistics show significant standard deviation within the region. While some countries, such as Laos and Cambodia, show significant decrease in out-of-school children, others show negative

or flat trends for primary education. For Indonesia, the numbers present a volatile curve, yet with a net doubling for the 2001-2012 period. For the Philippines, there has barely been any improvement.

For secondary education, data is often lacking. A major challenge is the high dropout rate on this stage, due to high alternative costs of schooling, long distances and short-term perspectives on the education investments. The latest data for Myanmar show an enrolment rate of 50% for 2010. For Indonesia, numbers are significantly better, with an improvement from 78% to 83% from 2010 to 2012. What these data do not show, however, are the drop out rates. For Myanmar, 50% into secondary school enrolment, a dropout rate of 50% implies that only 25% of the population completes more than 6-7 years of education. As emphasized by Sachs (2015), the technological shift has resulted in an increased demand for knowledge and vocational skills. Primary school only provides for the basics – the skills required for a modern labor market comes from secondary and tertiary education. High dropout rates thus contribute to a further strengthening in the income inequality and the urban-rural divide, as previously discussed.

The LAMTIB initiative seeks to cope with the knowledge gap by including long-distance learning in its project content. The education module of the project provides the local population with access to courses and tutorials, especially developed for the everyday purposes of rural livelihoods. A specific challenge related to such a targeted approach, is the definition of needs. Who are to define them, and how will they be set if the demands are diverging, or even contradictory? One example illustrating this is the following experience from our fieldwork in Santa Cruz, Philippines. When introduced to the concept, and the potential outcome, the locals asked whether they could get walkie-talkies and came up with the solution of charging them on solar electricity. Although one can make practical use of walkie-talkies and more traditional means of communication, it is not a means of communicating long-distance and connecting the local community to the urban centra of global knowledge, nor can they be described as “leapfrogging”. If the education technology is to contribute to the prosperity of those communities, some clear goals have to be defined. Those goals will have to be in line not only with local needs, as it is understood by the LAMTIB management, but also with the interests of the local community. One of the major mistakes of both business models and charity projects targeting the bottom of the pyramid is the ignorance of what these people actually want (HBR, 2013). Acknowledging the difference between *wants* and *needs* is crucial, and for social enterprises, it is all about *combining* the two of them.

The concept of lifelong learning, as stated in goal 4, can be seen as an expression of the modern economy and the higher demands for knowledge and skills. Lifelong learning has two implications in this context. Firstly, it is a mean for re-integration of school dropouts back into educational institutions. Secondly, it is the realization that the dynamics of the knowledge economy requires the skill to adopt to change and to constantly gain new input. Education is becoming a continuum, enabled by new methods and platforms of learning.

There is a common theme of quality, lifelong learning and broad inclusion in SDG 4. Examining the attached targets more closely, those themes are concretized through a focus on *learning outcomes, adult and youth training, gender equality and vulnerable groups*. Further, the topics of sustainable development are included as desirable learning outcomes of schooling and information access, with focus on human rights and environmental issues. This creates a direct link between development goal 4 and the other 16 goals, and further enhances the tradition for seeing education as an enabler for progress in other development areas.

The education module in LAMTIB, which is built around the issues of combating long distances, gaining access to knowledge, connecting with global knowledge centers, and providing vocational training, has a vast potential in contributing to positive outcomes on development goal 4. To reach out across gender divides and age groups, however, it is important that technical expertise and training to make use of ICT equipment is provided to ensure a low-threshold supply of educational services and activities. Based on the significant potential to contribute to the education goal and targets, the convergence rate is valued to *high*.

#### *Goal 5      Achieve gender equality and empower all women and girls*

From a gender issue perspective, there is evidence that empowering women further empowers livelihoods, which again contributes to a positive development for communities and societies. (Rigg, 2007). Four of the Southeast Asian countries have managed to close the gender gap in both health and survival (Bekhouche et al., 2013). The Philippines outscores the other countries with a high margin, being among the ten most gender equal countries in the world, according to the 2014 Global Gender Gap Index (GGGI) (Hausmann, 2014). This is due to female participation in business management and legislation, among others. The other Southeast Asian

countries in question, score far lower, with the following positions<sup>9</sup>: Thailand (61), Vietnam (76), Indonesia (97), Malaysia (107) and Cambodia (108).

The LAMTIB initiative does not yet have a clearly framed policy on female participation. However, the project has so far proved efficient in female inclusion. In the sea farm in Santa Cruz, a female manager is running the farm, controlling the processes and managing the group of employees, which are otherwise only men. As we have seen from the GGGI, the Philippines is in a unique position of female inclusion in the work place, having built a business culture in which gender equality has become the norm, rather than the exception. Similarly, we see low scores in the neighboring countries, which imply that the experience from the Philippines cannot automatically be duplicated there. Cultural particularities will have to be considered individually for each country and for the local region.

Insofar, the project lacks any clear guidelines or unique modules on female participation in the project. Based on the experience from the Philippines, there is however good reason to believe that the project might be able to integrate female empowerment into its core policies, and use women's participation as a criteria towards local communities willing to participate in the project. LAMTIB gets a *medium* convergence score for development goal 5.

#### *Goal 6      Ensure availability and sustainable management of water and sanitation for all*

The issues of water and sanitation constitute two separate, though related modules of the LAMTIB Initiative. Both modules are developed based on the concern of water and sanitation being proxies for the urban-rural divide, with less priority given to rural areas (WHO, 2012). Further, the challenges regarding water and sanitation serve well to illustrate the uneven forces of globalization: While more than 6 billion people have access to a mobile phone, only 4.5 billions have access to proper sanitation facilities (World Toilet Organization, 2015).

The targets attached to development goal 6, focus on universal access to water and sanitation solutions (6.1 and 2), waste management (6.3), freshwater and ecosystem management (6.4, 6.5 and 6.6). In regards to the LAMTIB context, 6.1 and 6.2 are the areas where the project may have the most significant impact in the short run. In terms of freshwater scarcity, the

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<sup>9</sup> A total of 135 countries worldwide were included in the 2014 GGGI.

examination of solutions has so far looked into technology, which can filtrate existing water sources nearby, thus providing a price competitive alternative to existing solutions. Due to the clear policy focus on water and sanitation, with two modules, the convergence rate between LAMTIB and SDG 6 is valued to be *high*.

*Goal 7          Ensure access to affordable, reliable, sustainable and modern energy for all*

The PV Hybrid, as the core driver of the project and its modules, offers a clean and sustainable alternative to diesel generators, which are common in off-grid areas today. Solar energy, when excluding investments and installation costs, is an *affordable, reliable, sustainable and modern* solution, thus covering all the aspects of goal 7. It is a competitive alternative to diesel generators, and even to the grid in certain areas, where ROI will prove to low and break-even time will be too long. The solar energy within the LAMTIB is community-based, and not a grid-solution, thus imposing a certain development-purpose for the energy use. Unlike similar projects where households can be connected and pay for the use, the LAMTIB initiative seeks to make use of the electricity to drive innovation and economic activity, thereby creating sustainable growth and prosperity. The off-grid character of the project is further enabling the energy to reach out to those areas where grid investment is not financially feasible in the short-medium run. Thus, the aim of providing energy “for all”, as stated in goal 7, is at core of LAMTIB. Further, as a competitor of the diesel generator and – grids, solar solutions in scale will be significant contributors in the increased share of renewables in the global energy mix in the years to come, as is the aim in target 7.2. Rather than a large-sale contributor, LAMTIB may prove as an initiator and serve as an example in this context, triggering demand and interest for solar investments in Southeast Asian markets. These factors contribute to a *high* convergence rate between LAMTIB and SDG 7.

*Goal 8          Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all*

Finding a stable income is a major concern in many rural areas of Southeast Asia. With steadily growing populations, employment opportunities in the metropolises serve as pull factors for the younger generations, further triggering the process of urbanization. Creating jobs in rural areas gives the younger population incentives to stay, and is a central counterweight measure.

However, there are several preconditions that must be in place for such measures to have effect. Firstly, an initiative has to be economically sustainable. This implies that the activity has to generate certain revenue, and answer to market demand. Secondly, there has to be local interest. If the jobs created cannot make use of local competencies, it will not be competitive in rural-urban context. Thirdly, employment measures also need to provide non-economic value creation to the communities, in the form of human capital and capacity building. In an increasingly competitive labor market, new initiatives seeking to create and provide employment opportunities for the poor need to look into trends and needs for the future work force.

With the focus on inclusive growth, as expressed in development goal 8, parts of the concerns addressed above are taken into account. The concept of inclusive growth is a way of balancing the need for rapid economic growth (as a means for poverty alleviation) with the need for a stable and long-term involvement of the economy, across sectors and socio-economic population segments (Ianchovichina & Lundström, 2009)

Inclusive employment opportunities is a major concern of the LAMTIB Initiative, realized through the small-scale business module, and exemplified by the sea farm project in Santa Cruz. The three main concerns addressed regarding the local labor force and – markets, are sought overcome by a requirement of local participation and a stake in the project. Areas where the population is willing to support the project by providing a limited, personal stake, will be prioritized, as certain sunk costs and motivation will support the project's chances to prove worthwhile and sustainable.

When looking at the 10 attached targets for sustainability goal 8, few are of direct relevance to LAMTIB. 6 of the targets are concerning policy areas and economic activity that are not prime concerns of the project. However, as the link between rural development, youth unemployment and sustainable development is at core of the LAMTIB mission, there is a significant convergence on the labor issue. The convergence rate for goal 8 is therefore rated to *medium*.

*Goal 9 Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation*

The LAMTIB initiative seeks to encourage innovation and local entrepreneurship, by providing the means to self-empowerment and active participation. However, the small-scale business



activities that are suggested in the case description (section 4) are not what traditionally are interpreted as industrialization. Looking closer at the targets, the emphasis is further circling around large-scale infrastructure (9.1), both in terms of physical energy infrastructure (9.4) and financial infrastructure (9.3). In regards to the latter, the role of small-scale businesses is mentioned in particular. Target 9.4. mentions clean technologies, which is the main driver in the LAMTIB initiative. In 9.5c moreover, the need for affordable ICT solutions and Internet access to all is mentioned as a top priority – coinciding well with the RTC system of LAMTIB. Despite those similarities, goal 9 is targeting nation states, and calling upon international efforts and large-scale investments into R&D, infrastructure and industrialization. In terms of targeted regions, Africa is mentioned in particular, along with small island developing states, landlocked -, and least developed countries (SIDS, LLDC and LDC), in which the majority of both the latter types of countries are located in Africa.

Despite some converging focus areas, the LAMTIB initiative does not aim at developing physical infrastructure – the project is specialized on areas lacking physical infrastructure, providing an instant, mobile alternative to the grid, that can be operational on a local level. In terms of non-tangible infrastructure, such as knowledge transfer and communication, the project might provide certain value. As the overall focus in goal 9 is on large-scale solutions, the convergence score is still *low*, at least for the short to medium term.

#### *Goal 10      Reduce inequality within and among countries*

As discussed by Sachs (2015) the issue of inequality has multiple dimensions. LAMTIB, with its focus on rural, off-grid areas, is aiming to tackle the divides along the rural-urban and the connected-offgrid dimensions. The two are often coinciding, and may further serve as a proxy for income inequality. Little of the content in goal 10 is concerning projects or business initiatives and activity. Targets 10.2 call upon the global society to empower and include all segments of society, regardless of socio-economic factors. The other targets are solely on a macro level, with targets 10.3-5 concerning legal aspects, and 10.6-7 concerning international decision-making. The seemingly low convergence nonetheless challenged by the inequality concerns that are embedded in LAMTIB as an initiative, aiming to challenge the above mentioned divides. Balancing those considerations, the convergence score is set to *medium*.

*Goal 11 Make cities and human settlements inclusive, safe, resilient and sustainable*

The LAMTIB initiative is specifically targeting rural areas, as a means of counterbalancing the urban-rural divide. Counter measuring the de population from rural areas may be an indirect result. To further understand the potential impact, we need to look into the urbanization rate to get a further insight on how the project might interfere locally with rural-urban mobility. The urbanization growth rate in Southeast Asia was 2.2% on average between 2005 and 2010, which is lower than global average (UN ESCAP, 2011). Further, the trend shows decreasing growth. Nonetheless, growth is positive, inducing continued rural-originated population growth in urban areas. According to the UN, the lack of sustainable urban development in the developing world, is putting the poor at specific risk. They are more likely to live in slums, which may easily be affected by extreme weather, and might find it harder to build sustainable livelihoods in the urban areas (UNPD, 2013). Decreasing growth rates is not surprising, as they are measured on a basis of highly populated cities, following decades of rapid urbanization. Thus, the implications might be even more significant in the rural areas, as development policies and initiatives are increasingly targeting urban areas. Birth rates in rural areas tend to be higher than in urban areas (Haub, Gribble & Jacobsen, 2011), and are followed by demand for a number of basic services, already lacking in supply. The LAMTIB initiative might play an important role in providing such services in rural areas. However, it will not be likely to countermeasure an already existing trend of decreasing growth rates into cities. In which case we would need to measure in de facto *de-ruralization*, rather than urbanization. In addition, Goal 11 is mainly targeting macro-economic policies of urban green development. The LAMTIB-SDG therefore scores *low* on convergence for Goal 11.

*Goal 12 Ensure sustainable consumption and production patterns*

The content of SDG 12 and its eight proposed targets, are mostly of macro-level concern, with policies of rationalizing, waste management and out phasing of fossil fuels. Governments and large-scale businesses of commodities are major influencers on the agenda of consumption and production, influencing entire populations and markets respectively. Further, changing consumption patterns have little effects in areas where the population is not yet deemed consumers. In a potential LAMTIB country such as Myanmar, for instance, only 4% of the population is considered consumers (Aunemo, 2015). Clearly, the spread of knowledge and know-how for emerging populations, as suggested in targets 12.2 and 12.8 might seem efficient

in the long run, as those people eventually become consumers. However, much of consumption and waste management will be handled in medium- to higher income countries, where the consumption is significant, thus representing a considerable potential for environmental protection measures and action. Due to the need for macro policy measures and more developed market focus, the convergence score for goal 12 is set to *low*.

*Goal 13      Take urgent action to combat climate change and its impacts*

The effects of climate change have been visible in the Southeast Asian region for years already. Rising sea levels impose pressure on financially weak and vulnerable island states, which are also prone to the devastating effects of tsunamis – effects that, although not human induced, also have immense environmental consequences. The effects of the 2004 earthquake and following tsunami had severe impact on local livelihoods in the region, as the environmental conditions changed significantly.

There is an important divide between climate change on one side, and its impacts in terms of managing change on the other. The former requires international agreements and synchronized effort on the macro- and global level – with results we can only observe in a longer perspective. It might well be that initiatives such as the SolarBox and the LAMTIB initiative, with climate friendly, non-fossil solutions can be a source of inspiration. However, it is more likely to act as a rescue player in the short to medium term. The container concept, as explained in section 4, is a highly mobile solution, aimed at reaching coastal areas efficiently. The first container on Bantayan, was an effort to reach out after the 2013 typhoon hit the island. As phrased in target 13.b, action should be taken to “promote mechanisms for raising capacities for effective climate change related planning and management, in LDCs, including focusing on women, youth, local and marginalized communities”. As a disaster relief system, the SolarBox has considerable potential, being mobile, and ship-ready. However, the experience from Bantayan has also showed that the concept needs to be developed further and improve its systems for knowledge transfer and site operations. Although efficiently reaching the area, little has happened in terms of activities and community-based development in the Sungko community. The major challenges have been local initiative, cooperation and communication among the stakeholders, and clear policies and targets. Those weaknesses are further discussed in section 5.1. However, due to its proved efficiency and further potential, the coverage scores is *medium*.

*Goal 14 Conserve and sustainably use the oceans, seas and marine resources for sustainable development*

The Southeast Asian region has vast water resources, with a rich biodiversity. The marine industry accounts for a significant share of global supply, and exports are increasing. Indonesia, Vietnam, Thailand and the Philippines are among the top 10 global fish producers (ASEAN, 2015). However, changes related to extreme weather, climate change and pollution pose significant threats to ecosystems and to rural livelihoods, which are often oriented around fishing activities. Overfishing and economic conflicts are further creating pressure on fish stocks, posing a threat to regional food security.

The targets under Goal 14 acknowledge the threats to marine sustainability, suggesting protection from overfishing, acidification and nutrient pollution, to mention a few. On the macro-economic level, subsidies are suggested removed, as pure economic incentives often conflict with sustainable fish stocks. As we can observe, policies are directed both towards the fishing industry itself, as well as towards the larger, marine and land environment. In regards to LAMTIB's marine activities, in the form of sea farming and the HIC concept, many aspects of the targets are well preserved. Organic nutrients and production, market access, and sustainable production are key components of the initiative, and are evident in the activities at Santa Cruz. After production started, fishers in the area have experienced increased output, in waters where a large amount of the stocks were previously gone. The ecosystem of the sea farm, as explained in section 4, is created such that the outside marine environment can make use of the waste from the site, thus creating a sustainable, integrated operation. The project scores a *high* convergence rate with Goal 14.

*Goal 15 Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss*

Deforestation and loss in biodiversity are significant challenges in Southeast Asia. In some countries, action has been taken and net reforestation rates have become positive (Patunru, 2013). In others, however, the trend is negative, showing a lack of policies and law enforcement to protect biodiversity.

The LAMTIB initiative aims to make use of natural resources in a sustainable manner, with a particular focus on sea species. On the terrestrial level, as phrased in goal 15, a small tree farm of malangay trees have been planted at the Santa Cruz site. Setting a standard in regards to sustainable natural resource management is core to the project. However, policies regarding deforestation and biodiversity have to be initiated (and enforced) on the macro- and supranational level. Thus, the possibilities for LAMTIB to pose significant influence is *low*.

*Goal 16 Promote peaceful and inclusive societies for sustainable development provide access to justice for all and build effective, accountable and inclusive institutions at all levels*

The ethnic conflicts and civil uproar prevailing in certain parts of Southeast Asia is undoubtedly consisting a challenge to sustainable and long-term development. As conflict prevails, the efforts towards development initiatives and local commitment are in many cases drawn towards internal disputes, allocating resources towards non-productive aims (Rigg, 2007). When the conflict is more institutionilized, violence is not only hampering development – it may reverse the process. This is in particular the case in terms of human rights such as education, sanitation, protection and so on. When war prevails, the alternative cost of schooling is higher, and societies are locked in the so-called *conflict trap* (Collier, 2007). In terms of peaceful and inclusive societies, alligning societies to common effort is key. When personal interest is reflected in the common gain, an effort towards the common good is likely to reflect that (Smith, 2010). This element is at the very core of the LAMTIB initiative, with a business model encouraging active participation and a community-based stake in the project. However, efforts through the LAMTIB initiative will not influence the macro level in the countries they operate in the short to medium run. If the project is to influence institutions on the national level, the project needs long-term commitment and activities of scale. It is part of the LAMTIB plan of action to target local communities directly, skipping higher bureaucratic and political decision levels in the process. Further, part of the strategy is seeking out to communities who can provide a long-term commitment and where the equipment will indeed be safe and put to productive use. Conflict areas are thus unlikely to be targeted by the locational assessment in the first place.

The micro-level, community-based orientation of the LAMTIB initiative does not coincide directly with the content of goal 16, but is rather supplementary to the macro-level capacity building. The convergence score is therefore *low*.

*Goal 17 Strengthen the means of implementation and revitalize the global partnership for sustainable development*

Goal 17 differs partly from the other 16 goals in that it is sectioned into the categories finance, technology, capacity building, trade and systemic issues. At first glance, there is a strong presence of macro economic policy concerns, and there might seem like there is little room for smaller actors to find their role among the targets. The “means of implementation” will in most cases be considered direct implications of the SDGs, and should thus be examined as a macro policy framework upon which the LAMTIB initiative and other development initiatives can rely (funding programs, human resources, etcetera). Such a supportive framework will have to take into consideration the needs of the stakeholders involved within all the respective policy areas, as well as their specific characteristics. The new development goals will need to thoroughly assess the needs of the (poorer) population of the developing world, and should be reflected in the implementation tools initiated under Goal 17.

The attached targets, do concern several aspects concurring with the LAMTIB content and other micro level actors. In regards to technology, for instance, target 17.6 aims to “...enhance North-South, South-South and triangular regional and international cooperation on and access to science, technology and innovation, and enhance knowledge sharing [...]”. Target 17.7, moreover urges the global society to “[...]promote development, transfer, dissemination and diffusion of environmentally sound technologies to developing countries on favorable terms [...]”. The focus on renewable technology as the core driver of the LAMTIB initiative suggests a long-term, sustainability focus, where technology can form the solution – in line with the global development agenda. Cooperation and technology access across the traditional North-South divide is further enabled in the LAMTIB initiative through ICT solutions and web-based education modules.

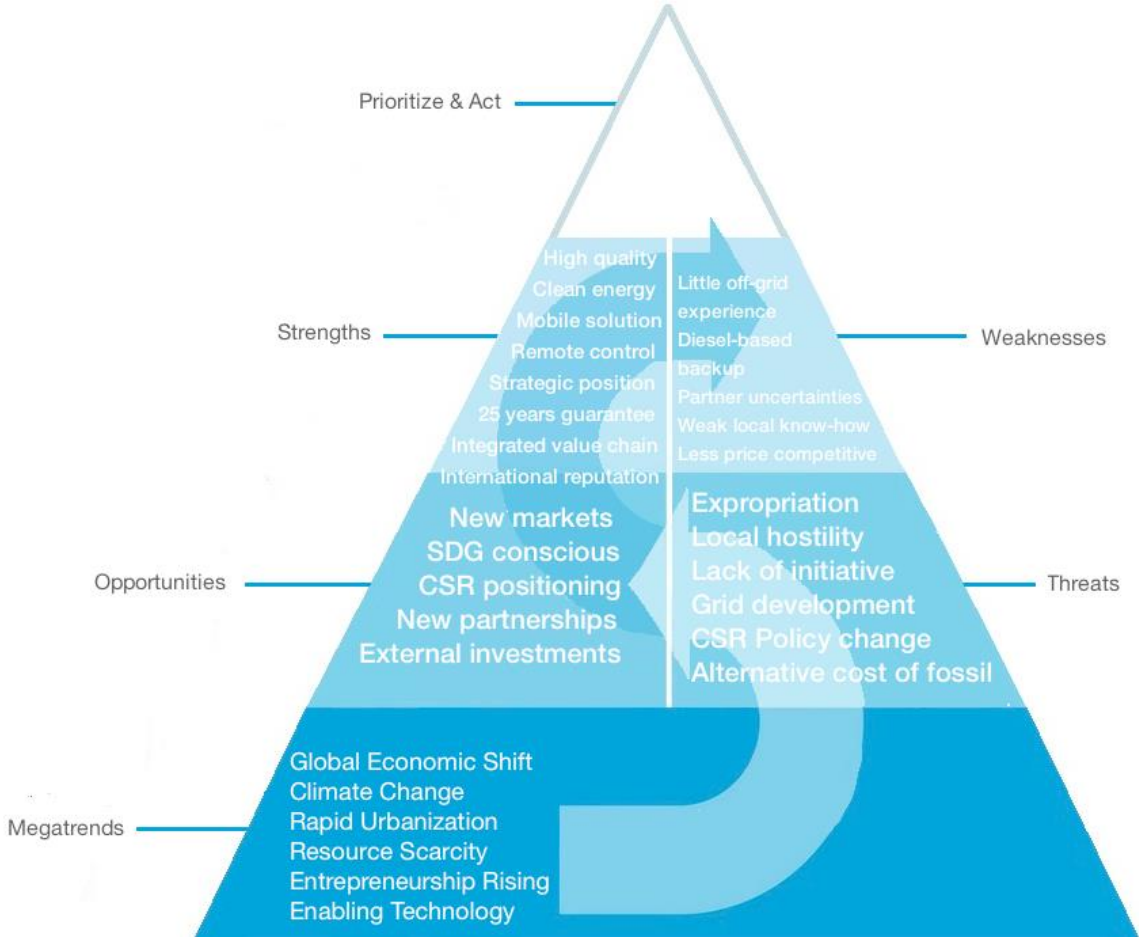
Additionally to the enhancement of innovative technologies, there is clear policy convergence in terms of encouraging multi-stakeholder partnerships. Targets 17.16 and 17.17 call upon partnerships on multiple levels and dimensions. Such cooperation may “mobilize and share knowledge, expertise, technologies and financial resources” (17.16), which in turn are crucial means for fulfilling the SDGs. 17.17 urges to “encourage and promote effective public, public-private, and civil society partnerships, building on the experience and resourcing strategies of partnerships.

Due to the significant macro and supranational political content and framework characteristics of goal 17, the content reaches beyond the areas of influence of a micro initiative as LAMTIB. However, there are clear converging areas of interest and action, including *environmentally sound technology*, the *involvement of business* through *multi-stakeholder* projects and *knowledge sharing*. Goal 17 thus gets a *medium* convergence score.

# 6 RESULTS

Figures and tables presented in this section constitute the results from the two-level analysis in the previous section. They will be further discussed in section 8, and form the basis for recommendations given for future project implementations.

Figure 13 illustrate the sSWOT analysis results for REC and the SolarBox in a summarized manner. The results from the analysis reveal both threats and opportunities based on the megatrends of the global macro environment, which further challenges REC and the SolarBox to prepare by making use of strengths and lowering the influence of weaknesses. Priorities and actions are summarized within the recommendations in section 7.



**Figure 12. Sustainability SWOT for REC and the SolarBox.**

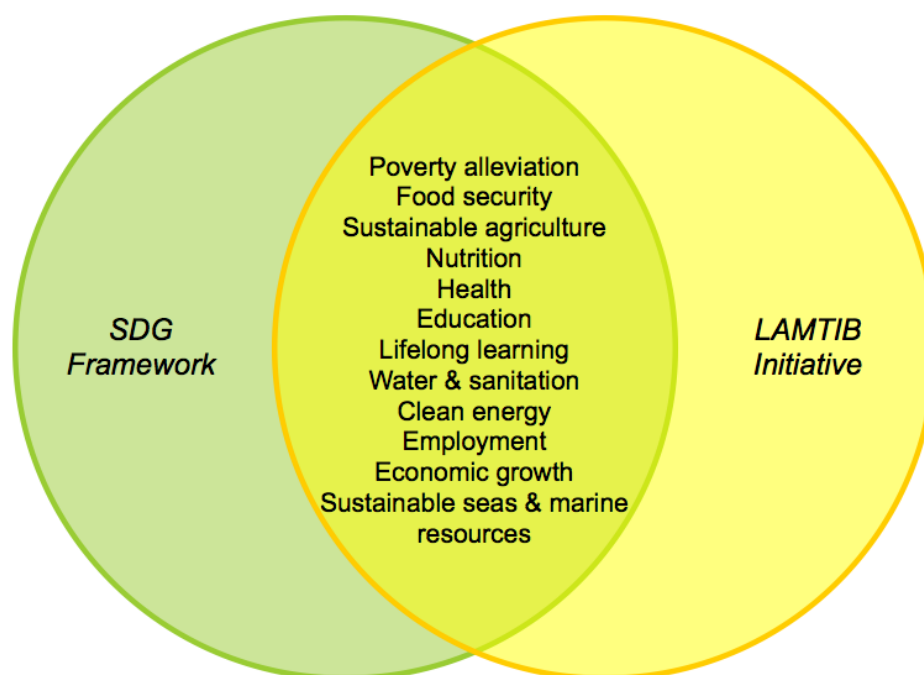
Table 7 illustrates the convergence scores for the second analysis. There are eight goals where the LAMTIB initiative proves to have developed specific strategies that align with the new development agenda.



**Table 7. Convergence scores between LAMTIB and the SDGs. Scores H, M, L correspond to high, medium and low convergence respectively.**

<i>Goal</i>	<i>Score</i>	<i>Goal</i>	<i>Score</i>	<i>Goal</i>	<i>Score</i>
1	H	7	H	13	M
2	H	8	H	14	H
3	H	9	L	15	L
4	H	10	M	16	L
5	M	11	L	17	M
6	H	12	L		

Figure 12 illustrates the convergence between the LAMTIB Initiative and the SDG Framework, with the policy areas concerned in those eight SDGs. The rate of high convergence areas is 47%. Further, the initiative shows medium convergence with five other goals.



**Figure 13. High convergence policy areas between LAMTIB and the SDG Framework**

## 7 DISCUSSION AND RECOMMENDATIONS

The assessment of REC and the SolarBox reveals significant potential.

As defined by ISO (2010), the criteria for successful CSR operations are as follows:

- Contribute to sustainable development, including health and the welfare of society
- Take into account the expectations of stakeholders
- Be in compliance with applicable law and consistent with international norms of behavior
- Be integrated throughout the organization and practiced in its relationships

Through the SolarBox, REC as an actor can contribute to sustainable development on all the three dimensions of the concept as described in section 2. In terms of health and welfare, these can be linked to the healthcare module in the short run, and the broader social development of local communities in the long run. Considerations towards external stakeholders should include local communities as stakeholders, empowering their role in the project and their own development process. This is a question of sustainability in the context of making the sites self-sufficient.

For an SE model with a development purpose, international law and norms can rather be exchanged with the global development agenda. As the analysis has shown, the LAMTIB initiative has a significant convergence with the UN sustainable development agenda. The goals and targets are not yet set however, so the management should follow up the process and look for further opportunities.

As an isolated technology, SolarBox comes under the lowest category on the CSR pyramid (figure 4). As stressed by Van Campen et al., there is a need for a “package” solution in order to reach significant development outcomes in technology-driven projects. If the SolarBox concept manages to further develop the container, adding modules from the LAMTIB Initiative, the project might enhance sustainability and community integration. If those modules are to prove efficient, the project team should strengthen presence on site in the early phase. Our experiences from the fieldwork showed that activity and interest for the technology increases significantly when technical expertise is present. Interest and enthusiasm are preconditions for the local community to learn and adapt to the installations, thus physical presence from the team is a question of the sustainability of the project. In the medium-long run this knowledge and know-how should be transferred to the locals who seem willing and capable of running the site.

They can in turn pass on this knowledge within the community. This way, the project can ensure local commitment, responsibility and a feeling of belonging.

Based on the discussion above, the following recommendations are given:

- Attach modules to the SolarBox on a permanent basis
- Consider using renewable energy sources as a diesel backup substitute
- Identify local needs and wants, with clear emphasis on the latter
- Make technical, illustrated manuals, both written and audio-visual, in local languages to facilitate every-day operations and encourage local involvement
- Define clear policies on the different modules in accordance with the SDG framework
- Develop of common criteria framework for locational decisions
- Strengthen project's visibility on areas of high convergence scores with SDG framework to enhance collaboration
- Consider developing stronger content on areas of medium scores in the long run
- Follow up on the post-2015 agenda, and observe changes in the SDG framework as the proposals are further debated and passed

## 8 CONCLUSION

We have now looked into the challenges facing agents implementing new technology in rural communities in Southeast Asia. The research questions asked regarding the extent of solar energy solutions meeting the demands of rural communities in Southeast Asia, and how the implications comply with the post-2015 development agenda. The analysis revealed that there is a significant potential for solar energy as a solution for electrification in rural areas of S.E. Asia. However, development outcomes are dependent upon a “package solution”, to ensure that the equipment proves useful. Thus, the research confirms the findings of Van Campen, Guidi and Best (2000). Further, there is a need to identify not only needs, but also the interests of the local population. This applies both in terms of commitment to the project, as well as the long-term strategic product positioning for commercial stakeholders.

In regards to the SDG framework, the LAMTIB initiative shows strong potential as a significant actor on the post-2015 agenda. The examination of the project’s content finds that there is a high convergence with the eight of the seventeen SDGs. These are regarding the general topics of food, education, renewable energy and economic activity, as specified in development goals 1-4, 6-8 and 14. High convergence scores might induce new possibilities for partners and funders, as the policy content moves higher up on the international development agenda. Further, five goals were given a medium score, implying that there is a potential for further development on those areas. Low scores were given where the LAMTIB content does not match the SDG policies. This is not to imply a weak strategy on the behalf of LAMTIB, but rather a realization of necessary priorities as a small-scale, micro actor.

The findings are based on the Southeast Asia-specific LAMTIB case and the REC SolarBox technology; recommendations are given based on the future progress of the case-specific content. However, many of the challenges and opportunities revealed might be generalized to other small-scale development initiatives or social enterprise businesses in developing countries. Further, the sustainable CSR model developed for the REC (figure 9) might provide a theoretical framework across sectors for commercial actors engaging in social enterprise models.

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## APPENDICES

### Appendix I: Open Working Group Proposal for Sustainable Development Goals: Introduction

1. The Rio+20 outcome document, *The future we want*, inter alia, set out a mandate to establish an Open Working Group to develop a set of sustainable development goals for consideration and appropriate action by the General Assembly at its 68<sup>th</sup> session. It also provided the basis for their conceptualization. The Rio outcome gave the mandate that the SDGs should be coherent with and integrated into the UN development agenda beyond 2015.
2. Poverty eradication is the greatest global challenge facing the world today and an indispensable requirement for sustainable development. The Rio+20 outcome reiterated the commitment to freeing humanity from poverty and hunger as a matter of urgency.
3. Poverty eradication, changing unsustainable and promoting sustainable patterns of consumption and production and protecting and managing the natural resource base of economic and social development are the overarching objectives of and essential requirements for sustainable development.
4. People are at the centre of sustainable development and, in this regard, Rio+20 promised to strive for a world that is just, equitable and inclusive, and committed to work together to promote sustained and inclusive economic growth, social development and environmental protection and thereby to benefit all, in particular the children of the world, youth and future generations of the world without distinction of any kind such as age, sex, disability, culture, race, ethnicity, origin, migratory status, religion, economic or other status.
5. Rio+20 also reaffirmed all the principles of the Rio Declaration on Environment and Development, including, inter alia, the principle of common but differentiated responsibilities, as set out in principle 7 thereof.
6. It also reaffirmed the commitment to fully implement the Rio Declaration, Agenda 21, the Programme for the Further Implementation of Agenda 21, the Plan of Implementation of the World Summit on Sustainable Development (Johannesburg Plan of Implementation) and the Johannesburg Declaration on Sustainable Development, the Programme of Action for the Sustainable Development of Small Island Developing States (Barbados Programme of Action) and the Mauritius Strategy for the Further Implementation of the Programme of Action for the Sustainable Development of Small Island Developing States. It also reaffirmed the commitment to the full implementation of the Programme of Action for the Least Developed Countries for the Decade 2011–2020 (Istanbul Programme of Action), the Almaty Programme of Action: Addressing the Special Needs of Landlocked Developing Countries within a New Global Framework for Transit Transport Cooperation for Landlocked and Transit Developing Countries, the political declaration on Africa's development needs and the New Partnership for Africa's Development. It reaffirmed the commitments in the outcomes of all the major United Nations conferences and summits in the economic, social and environmental fields, including the United Nations Millennium Declaration, the 2005 World Summit Outcome, the Monterrey Consensus of the International Conference on Financing for Development, the Doha Declaration on Financing for Development, the outcome document of the High-level Plenary Meeting of the General Assembly on the Millennium Development Goals, the Programme of Action of the International Conference on Population and Development, the key actions for the further implementation of the Programme of Action of the International Conference on

Population and Development and the Beijing Declaration and Platform for Action, and the outcome documents of their review conferences. The Outcome document of the September 2013 special event to follow up efforts made towards achieving the Millennium Development Goals reaffirmed, inter alia, the determination to craft a strong post-2015 development agenda. The commitment to migration and development was reaffirmed in the Declaration of the High-Level Dialogue on International Migration and Development.

7. Rio+20 outcome reaffirmed the need to be guided by the purposes and principles of the Charter of the United Nations, with full respect for international law and its principles. It reaffirmed the importance of freedom, peace and security, respect for all human rights, including the right to development and the right to an adequate standard of living, including the right to food and water, the rule of law, good governance, gender equality, women's empowerment and the overall commitment to just and democratic societies for development. It also reaffirmed the importance of the Universal Declaration of Human Rights, as well as other international instruments relating to human rights and international law.

8. The OWG underscored that the global nature of climate change calls for the widest possible cooperation by all countries and their participation in an effective and appropriate international response, with a view to accelerating the reduction of global greenhouse gas emissions. It recalled that the United Nations Framework Convention on Climate Change provides that parties should protect the climate system for the benefit of present and future generations of humankind on the basis of equity and in accordance with their common but differentiated responsibilities and respective capabilities. It noted with grave concern the significant gap between the aggregate effect of mitigation pledges by parties in terms of global annual emissions of greenhouse gases by 2020 and aggregate emission pathways consistent with having a likely chance of holding the increase in global average temperature below 2° C, or 1.5° C above pre-industrial levels and it reaffirmed that the ultimate objective under the UNFCCC is to stabilize greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system.

9. Planet Earth and its ecosystems are our home and that “Mother Earth” is a common expression in a number of countries and regions, and Rio+20 noted that some countries recognize the rights of nature in the context of the promotion of sustainable development. Rio+20 affirmed the conviction that in order to achieve a just balance among the economic, social and environmental needs of present and future generations, it is necessary to promote harmony with nature. It acknowledged the natural and cultural diversity of the world, and recognized that all cultures and civilizations can contribute to sustainable development.

10. Rio+20 recognized that each country faces specific challenges to achieve sustainable development. It underscored the special challenges facing the most vulnerable countries and, in particular, African countries, least developed countries, landlocked developing countries and small island developing States, as well as the specific challenges facing the middle-income countries. Countries in situations of conflict also need special attention.

11. Rio+20 reaffirmed the commitment to strengthen international cooperation to address the persistent challenges related to sustainable development for all, in particular in developing countries. In this regard, it reaffirmed the need to achieve economic stability, sustained economic growth, the promotion of social equity and the protection of the environment, while enhancing gender equality, women's empowerment and equal employment for all, and the protection, survival and development of children to their full potential, including through education.

12. Each country has primary responsibility for its own economic and social development and the role of national policies, domestic resources and development strategies cannot be overemphasized. Developing countries need additional resources for sustainable development. There is a need for significant mobilization of resources from a variety of sources and the effective use of financing, in order to promote sustainable development. Rio+20 affirms the commitment to reinvigorating the global partnership for sustainable development and to mobilizing the necessary resources for its implementation. The report of the Intergovernmental Committee of Experts on Sustainable Development Financing will propose options for a sustainable development financing strategy. The substantive outcome of the third International Conference on Financing for Development in July 2015 will assess the progress made in the implementation of the Monterrey Consensus and the Doha Declaration. Good governance and the rule of law at the national and international levels are essential for sustained, inclusive and equitable economic growth, sustainable development and the eradication of poverty and hunger.

13. Rio+20 reaffirmed that there are different approaches, visions, models and tools available to each country, in accordance with its national circumstances and priorities, to achieve sustainable development in its three dimensions which is our overarching goal.

14. The implementation of sustainable development goals will depend on a global partnership for sustainable development with the active engagement of governments, as well as civil society, the private sector, and the United Nations system. A robust mechanism of implementation review will be essential for the success of the SDGs. The General Assembly, the ECOSOC system and the High Level Political Forum will play a key role in this regard.

15. Rio+20 reiterated the commitment to take further effective measures and actions, in conformity with international law, to remove the obstacles to the full realization of the right of self-determination of peoples living under colonial and foreign occupation, which continue to adversely affect their economic and social development as well as their environment, are incompatible with the dignity and worth of the human person and must be combated and eliminated.

16. Rio+20 reaffirmed that, in accordance with the Charter, this shall not be construed as authorizing or encouraging any action against the territorial integrity or political independence of any State. It resolved to take further effective measures and actions, in conformity with international law, to remove obstacles and constraints, strengthen support and meet the special needs of people living in areas affected by complex humanitarian emergencies and in areas affected by terrorism.

17. In order to monitor the implementation of the SDGs, it will be important to improve the availability of and access to data and statistics disaggregated by income, gender, age, race, ethnicity, migratory status, disability, geographic location and other characteristics relevant in national contexts to support the support the monitoring of the implementation of the SDGs. There is a need to take urgent steps to improve the quality, coverage and availability of disaggregated data to ensure that no one is left behind.

18. Sustainable Development Goals are accompanied by targets and will be further elaborated through indicators focused on measurable outcomes. They are action oriented, global in nature and universally applicable. They take into account different national realities, capacities and levels of development and respect national policies and priorities. They build on the foundation laid by the MDGs, seek to complete the unfinished business of the MDGs, and respond to new challenges. These goals constitute an integrated, indivisible set of global priorities for

sustainable development. Targets are defined as aspirational global targets, with each government setting its own national targets guided by the global level of ambition but taking into account national circumstances. The goals and targets integrate economic, social and environmental aspects and recognize their interlinkages in achieving sustainable development in all its dimensions.

## **Appendix II: Sustainable Development Goals with associated targets<sup>10</sup>**

### **Goal 1. End poverty in all its forms everywhere**

1.1 by 2030, eradicate extreme poverty for all people everywhere, currently measured as people living on less than \$1.25 a day

1.2 by 2030, reduce at least by half the proportion of men, women and children of all ages living in poverty in all its dimensions according to national definitions

1.3 implement nationally appropriate social protection systems and measures for all, including floors, and by 2030 achieve substantial coverage of the poor and the vulnerable

1.4 by 2030 ensure that all men and women, particularly the poor and the vulnerable, have equal rights to economic resources, as well as access to basic services, ownership, and control over land and other forms of property, inheritance, natural resources, appropriate new technology, and financial services including microfinance

1.5 by 2030 build the resilience of the poor and those in vulnerable situations, and reduce their exposure and vulnerability to climate-related extreme events and other economic, social and environmental shocks and disasters

1.a. ensure significant mobilization of resources from a variety of sources, including through enhanced development cooperation to provide adequate and predictable means for developing countries, in particular LDCs, to implement programmes and policies to end poverty in all its dimensions

1.b create sound policy frameworks, at national, regional and international levels, based on pro-poor and gender-sensitive development strategies to support accelerated investments in poverty eradication actions

### **Goal 2. End hunger, achieve food security and improved nutrition, and promote sustainable agriculture**

2.1 by 2030 end hunger and ensure access by all people, in particular the poor and people in vulnerable situations including infants, to safe, nutritious and sufficient food all year round

2.2 by 2030 end all forms of malnutrition, including achieving by 2025 the internationally agreed targets on stunting and wasting in children under five years of age, and address the nutritional needs of adolescent girls, pregnant and lactating women, and older persons

2.3 by 2030 double the agricultural productivity and the incomes of small-scale food producers, particularly women, indigenous peoples, family farmers, pastoralists and fishers, including through secure and equal access to land, other productive resources and inputs, knowledge, financial services, markets, and opportunities for value addition and non-farm employment

2.4 by 2030 ensure sustainable food production systems and implement resilient agricultural practices that increase productivity and production, that help maintain ecosystems, that strengthen capacity for adaptation to climate change, extreme weather, drought, flooding and other disasters, and that progressively improve land and soil quality

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<sup>10</sup> To be finally concluded on the UN United Nations Climate Change Conference 2015

2.5 by 2020 maintain genetic diversity of seeds, cultivated plants, farmed and domesticated animals and their related wild species, including through soundly managed and diversified seed and plant banks at national, regional and international levels, and ensure access to and fair and equitable sharing of benefits arising from the utilization of genetic resources and associated traditional knowledge as internationally agreed

2.a increase investment, including through enhanced international cooperation, in rural infrastructure, agricultural research and extension services, technology development, and plant and livestock gene banks to enhance agricultural productive capacity in developing countries, in particular in least developed countries

2.b. correct and prevent trade restrictions and distortions in world agricultural markets including by the parallel elimination of all forms of agricultural export subsidies and all export measures with equivalent effect, in accordance with the mandate of the Doha Development Round

2.c. adopt measures to ensure the proper functioning of food commodity markets and their derivatives, and facilitate timely access to market information, including on food reserves, in order to help limit extreme food price volatility

### **Goal 3. Ensure healthy lives and promote wellbeing for all at all ages**

3.1 by 2030 reduce the global maternal mortality ratio to less than 70 per 100,000 live births

3.2 by 2030 end preventable deaths of newborns and under-five children

3.3 by 2030 end the epidemics of AIDS, tuberculosis, malaria, and neglected tropical diseases and combat hepatitis, water-borne diseases, and other communicable diseases

3.4 by 2030 reduce by one-third pre-mature mortality from non-communicable diseases (NCDs) through prevention and treatment, and promote mental health and wellbeing

3.5 strengthen prevention and treatment of substance abuse, including narcotic drug abuse and harmful use of alcohol

3.6 by 2020 halve global deaths and injuries from road traffic accidents

3.7 by 2030 ensure universal access to sexual and reproductive health care services, including for family planning, information and education, and the integration of reproductive health into national strategies and programmes

3.8 achieve universal health coverage (UHC), including financial risk protection, access to quality essential health care services, and access to safe, effective, quality, and affordable essential medicines and vaccines for all

3.9 by 2030 substantially reduce the number of deaths and illnesses from hazardous chemicals and air, water, and soil pollution and contamination

3.a strengthen implementation of the Framework Convention on Tobacco Control in all countries as appropriate

3.b support research and development of vaccines and medicines for the communicable and non-communicable diseases that primarily affect developing countries, provide access to affordable essential medicines and vaccines, in accordance with the Doha Declaration which affirms the right of developing countries to use to the full the provisions in the TRIPS agreement regarding flexibilities to protect public health and, in particular, provide access to medicines for all

3.c increase substantially health financing and the recruitment, development and training and retention of the health workforce in developing countries, especially in LDCs and SIDS

3.d strengthen the capacity of all countries, particularly developing countries, for early warning, risk reduction, and management of national and global health risks

### **Goal 4. Ensure inclusive and equitable quality education and promote life-long learning opportunities for all**



- 4.1 by 2030, ensure that all girls and boys complete free, equitable and quality primary and secondary education leading to relevant and effective learning outcomes
- 4.2 by 2030 ensure that all girls and boys have access to quality early childhood development, care and pre-primary education so that they are ready for primary education
- 4.3 by 2030 ensure equal access for all women and men to affordable quality technical, vocational and tertiary education, including university
- 4.4 by 2030, increase by x% the number of youth and adults who have relevant skills, including technical and vocational skills, for employment, decent jobs and entrepreneurship
- 4.5 by 2030, eliminate gender disparities in education and ensure equal access to all levels of education and vocational training for the vulnerable, including persons with disabilities, indigenous peoples, and children in vulnerable situations
- 4.6 by 2030 ensure that all youth and at least x% of adults, both men and women, achieve literacy and numeracy
- 4.7 by 2030 ensure all learners acquire knowledge and skills needed to promote sustainable development, including among others through education for sustainable development and sustainable lifestyles, human rights, gender equality, promotion of a culture of peace and non-violence, global citizenship, and appreciation of cultural diversity and of culture's contribution to sustainable development
- 4.a build and upgrade education facilities that are child, disability and gender sensitive and provide safe, non-violent, inclusive and effective learning environments for all
- 4.b by 2020 expand by x% globally the number of scholarships for developing countries in particular LDCs, SIDS and African countries to enroll in higher education, including vocational training, ICT, technical, engineering and scientific programmes in developed countries and other developing countries
- 4.c by 2030 increase by x% the supply of qualified teachers, including through international cooperation for teacher training in developing countries, especially LDCs and SIDS

## **Goal 5. Achieve gender equality and empower all women and girls**

- 5.1 end all forms of discrimination against all women and girls everywhere
- 5.2 eliminate all forms of violence against all women and girls in public and private spheres, including trafficking and sexual and other types of exploitation
- 5.3 eliminate all harmful practices, such as child, early and forced marriage and female genital mutilations
- 5.4 recognize and value unpaid care and domestic work through the provision of public services, infrastructure and social protection policies, and the promotion of shared responsibility within the household and the family as nationally appropriate
- 5.5 ensure women's full and effective participation and equal opportunities for leadership at all levels of decision-making in political, economic, and public life
- 5.6 ensure universal access to sexual and reproductive health and reproductive rights as agreed in accordance with the Programme of Action of the ICPD and the Beijing Platform for Action and the outcome documents of their review conferences
- 5.a undertake reforms to give women equal rights to economic resources, as well as access to ownership and control over land and other forms of property, financial services, inheritance, and natural resources in accordance with national laws
- 5.b enhance the use of enabling technologies, in particular ICT, to promote women's empowerment
- 5.c adopt and strengthen sound policies and enforceable legislation for the promotion of gender equality and the empowerment of all women and girls at all levels

**Goal 6. Ensure availability and sustainable management of water and sanitation for all**

6.1 by 2030, achieve universal and equitable access to safe and affordable drinking water for all

6.2 by 2030, achieve access to adequate and equitable sanitation and hygiene for all, and end open defecation, paying special attention to the needs of women and girls and those in vulnerable situations

6.3 by 2030, improve water quality by reducing pollution, eliminating dumping and minimizing release of hazardous chemicals and materials, halving the proportion of untreated wastewater, and increasing recycling and safe reuse by x% globally

6.4 by 2030, substantially increase water-use efficiency across all sectors and ensure sustainable withdrawals and supply of freshwater to address water scarcity, and substantially reduce the number of people suffering from water scarcity

6.5 by 2030 implement integrated water resources management at all levels, including through transboundary cooperation as appropriate

6.6 by 2020 protect and restore water-related ecosystems, including mountains, forests, wetlands, rivers, aquifers and lakes

6.a by 2030, expand international cooperation and capacity-building support to developing countries in water and sanitation related activities and programmes, including water harvesting, desalination, water efficiency, wastewater treatment, recycling and reuse technologies

6.b support and strengthen the participation of local communities for improving water and sanitation management

**Goal 7. Ensure access to affordable, reliable, sustainable, and modern energy for all**

7.1 by 2030 ensure universal access to affordable, reliable, and modern energy services

7.2 increase substantially the share of renewable energy in the global energy mix by 2030

7.3 double the global rate of improvement in energy efficiency by 2030

7.a by 2030 enhance international cooperation to facilitate access to clean energy research and technologies, including renewable energy, energy efficiency, and advanced and cleaner fossil fuel technologies, and promote investment in energy infrastructure and clean energy technologies

7.b by 2030 expand infrastructure and upgrade technology for supplying modern and sustainable energy services for all in developing countries, particularly LDCs and SIDS

**Goal 8. Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all**

8.1 sustain per capita economic growth in accordance with national circumstances, and in particular at least 7% per annum GDP growth in the least-developed countries

8.2 achieve higher levels of productivity of economies through diversification, technological upgrading and innovation, including through a focus on high value added and labour-intensive sectors

8.3 promote development-oriented policies that support productive activities, decent job creation, entrepreneurship, creativity and innovation, and encourage formalization and growth of micro-, small- and medium-sized enterprises including through access to financial services

8.4 improve progressively through 2030 global resource efficiency in consumption and production, and endeavour to decouple economic growth from environmental degradation in accordance with the 10-year framework of programmes on sustainable consumption and production with developed countries taking the lead

8.5 by 2030 achieve full and productive employment and decent work for all women and men, including for young people and persons with disabilities, and equal pay for work of equal value

8.6 by 2020 substantially reduce the proportion of youth not in employment, education or training

8.7 take immediate and effective measures to secure the prohibition and elimination of the worst forms of child labour, eradicate forced labour, and by 2025 end child labour in all its forms including recruitment and use of child soldiers

8.8 protect labour rights and promote safe and secure working environments of all workers, including migrant workers, particularly women migrants, and those in precarious employment

8.9 by 2030 devise and implement policies to promote sustainable tourism which creates jobs, promotes local culture and products

8.10 strengthen the capacity of domestic financial institutions to encourage and to expand access to banking, insurance and financial services for all

8.a increase Aid for Trade support for developing countries, particularly LDCs, including through the Enhanced Integrated Framework for LDCs

8.b by 2020 develop and operationalize a global strategy for youth employment and implement the ILO Global Jobs Pact

### **Goal 9. Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation**

9.1 develop quality, reliable, sustainable and resilient infrastructure, including regional and trans-border infrastructure, to support economic development and human well-being, with a focus on affordable and equitable access for all

9.2 promote inclusive and sustainable industrialization, and by 2030 raise significantly industry's share of employment and GDP in line with national circumstances, and double its share in LDCs

9.3 increase the access of small-scale industrial and other enterprises, particularly in developing countries, to financial services including affordable credit and their integration into value chains and markets

9.4 by 2030 upgrade infrastructure and retrofit industries to make them sustainable, with increased resource use efficiency and greater adoption of clean and environmentally sound technologies and industrial processes, all countries taking action in accordance with their respective capabilities

9.5 enhance scientific research, upgrade the technological capabilities of industrial sectors in all countries, particularly developing countries, including by 2030 encouraging innovation and increasing the number of R&D workers per one million people by x% and public and private R&D spending

9.a facilitate sustainable and resilient infrastructure development in developing countries through enhanced financial, technological and technical support to African countries, LDCs, LLDCs and SIDS

9.b support domestic technology development, research and innovation in developing countries including by ensuring a conducive policy environment for inter alia industrial diversification and value addition to commodities

9.c significantly increase access to ICT and strive to provide universal and affordable access to Internet in LDCs by 2020

### **Goal 10. Reduce inequality within and among countries**

10.1 by 2030 progressively achieve and sustain income growth of the bottom 40% of the population at a rate higher than the national average

10.2 by 2030 empower and promote the social, economic and political inclusion of all irrespective of age, sex, disability, race, ethnicity, origin, religion or economic or other status

10.3 ensure equal opportunity and reduce inequalities of outcome, including through eliminating discriminatory laws, policies and practices and promoting appropriate legislation, policies and actions in this regard

10.4 adopt policies especially fiscal, wage, and social protection policies and progressively achieve greater equality

10.5 improve regulation and monitoring of global financial markets and institutions and strengthen implementation of such regulations

10.6 ensure enhanced representation and voice of developing countries in decision making in global international economic and financial institutions in order to deliver more effective, credible, accountable and legitimate institutions

10.7 facilitate orderly, safe, regular and responsible migration and mobility of people, including through implementation of planned and well-managed migration policies

10.a implement the principle of special and differential treatment for developing countries, in particular least developed countries, in accordance with WTO agreements

10.b encourage ODA and financial flows, including foreign direct investment, to states where the need is greatest, in particular LDCs, African countries, SIDS, and LLDCs, in accordance with their national plans and programmes

10.c by 2030, reduce to less than 3% the transaction costs of migrant remittances and eliminate remittance corridors with costs higher than 5%

### **Goal 11. Make cities and human settlements inclusive, safe, resilient and sustainable**

11.1 by 2030, ensure access for all to adequate, safe and affordable housing and basic services, and upgrade slums

11.2 by 2030, provide access to safe, affordable, accessible and sustainable transport systems for all, improving road safety, notably by expanding public transport, with special attention to the needs of those in vulnerable situations, women, children, persons with disabilities and older persons

11.3 by 2030 enhance inclusive and sustainable urbanization and capacities for participatory, integrated and sustainable human settlement planning and management in all countries

11.4 strengthen efforts to protect and safeguard the world's cultural and natural heritage

11.5 by 2030 significantly reduce the number of deaths and the number of affected people and decrease by y% the economic losses relative to GDP caused by disasters, including water-related disasters, with the focus on protecting the poor and people in vulnerable situations

11.6 by 2030, reduce the adverse per capita environmental impact of cities, including by paying special attention to air quality, municipal and other waste management

11.7 by 2030, provide universal access to safe, inclusive and accessible, green and public spaces, particularly for women and children, older persons and persons with disabilities

11.a support positive economic, social and environmental links between urban, peri-urban and rural areas by strengthening national and regional development planning

11.b by 2020, increase by x% the number of cities and human settlements adopting and implementing integrated policies and plans towards inclusion, resource efficiency, mitigation and adaptation to climate change, resilience to disasters, develop and implement in line with the forthcoming Hyogo Framework holistic disaster risk management at all levels

11.c support least developed countries, including through financial and technical assistance, for sustainable and resilient buildings utilizing local materials

### **Goal 12. Ensure sustainable consumption and production patterns**

12.1 implement the 10-Year Framework of Programmes on sustainable consumption and production (10YFP), all countries taking action, with developed countries taking the lead, taking into account the development and capabilities of developing countries

- 12.2 by 2030 achieve sustainable management and efficient use of natural resources
- 12.3 by 2030 halve per capita global food waste at the retail and consumer level, and reduce food losses along production and supply chains including post-harvest losses
- 12.4 by 2020 achieve environmentally sound management of chemicals and all wastes throughout their life cycle in accordance with agreed international frameworks and significantly reduce their release to air, water and soil to minimize their adverse impacts on human health and the environment
- 12.5 by 2030, substantially reduce waste generation through prevention, reduction, recycling, and reuse
- 12.6 encourage companies, especially large and trans-national companies, to adopt sustainable practices and to integrate sustainability information into their reporting cycle
- 12.7 promote public procurement practices that are sustainable in accordance with national policies and priorities
- 12.8 by 2030 ensure that people everywhere have the relevant information and awareness for sustainable development and lifestyles in harmony with nature
- 12.a support developing countries to strengthen their scientific and technological capacities to move towards more sustainable patterns of consumption and production
- 12.b develop and implement tools to monitor sustainable development impacts for sustainable tourism, which creates jobs, promotes local culture and products
- 12.c rationalize inefficient fossil fuel subsidies that encourage wasteful consumption by removing market distortions, in accordance with national circumstances, including by restructuring taxation and phasing out those harmful subsidies, where they exist, to reflect their environmental impacts, taking fully into account the specific needs and conditions of developing countries and minimizing the possible adverse impacts on their development in a manner that protects the poor and the affected communities

### **Goal 13. Take urgent action to combat climate change and its impacts<sup>11</sup>**

- 13.1 strengthen resilience and adaptive capacity to climate related hazards and natural disasters in all countries
- 13.2 integrate climate change measures into national policies, strategies, and planning
- 13.3 improve education, awareness raising and human and institutional capacity on climate change mitigation, adaptation, impact reduction, and early warning
- 13.a implement the commitment undertaken by developed country Parties to the UNFCCC to a goal of mobilizing jointly USD100 billion annually by 2020 from all sources to address the needs of developing countries in the context of meaningful mitigation actions and transparency on implementation and fully operationalize the Green Climate Fund through its capitalization as soon as possible
- 13.b Promote mechanisms for raising capacities for effective climate change related planning and management, in LDCs, including focusing on women, youth, local and marginalized communities

### **Goal 14. Conserve and sustainably use the oceans, seas and marine resources for sustainable development**

- 14.1 by 2025, prevent and significantly reduce marine pollution of all kinds, particularly from land-based activities, including marine debris and nutrient pollution
- 14.2 by 2020, sustainably

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<sup>11</sup> Acknowledging that the UNFCCC is the primary international, intergovernmental forum for negotiating the global response to climate change

manage and protect marine and coastal ecosystems to avoid significant adverse impacts, including by strengthening their resilience, and take action for their restoration, to achieve healthy and productive oceans

14.3 minimize and address the impacts of ocean acidification, including through enhanced scientific cooperation at all levels

14.4 by 2020, effectively regulate harvesting, and end overfishing, illegal, unreported and unregulated (IUU) fishing and destructive fishing practices and implement science-based management plans, to restore fish stocks in the shortest time feasible at least to levels that can produce maximum sustainable yield as determined by their biological characteristics

14.5 by 2020, conserve at least 10 per cent of coastal and marine areas, consistent with national and international law and based on best available scientific information

14.6 by 2020, prohibit certain forms of fisheries subsidies which contribute to overcapacity and overfishing, and eliminate subsidies that contribute to IUU fishing, and refrain from introducing new such subsidies, recognizing that appropriate and effective special and differential treatment for developing and least developed countries should be an integral part of the WTO fisheries subsidies negotiation \*

14.7 by 2030 increase the economic benefits to SIDS and LDCs from the sustainable use of marine resources, including through sustainable management of fisheries, aquaculture and tourism

14.a increase scientific knowledge, develop research capacities and transfer marine technology taking into account the Intergovernmental Oceanographic Commission Criteria and Guidelines on the Transfer of Marine Technology, in order to improve ocean health and to enhance the contribution of marine biodiversity to the development of developing countries, in particular SIDS and LDCs

14.b provide access of small-scale artisanal fishers to marine resources and markets

14.c ensure the full implementation of international law, as reflected in UNCLOS for states parties to it, including, where applicable, existing regional and international regimes for the conservation and sustainable use of oceans and their resources by their parties

## **Goal 15. Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss**

15.1 by 2020 ensure conservation, restoration and sustainable use of terrestrial and inland freshwater ecosystems and their services, in particular forests, wetlands, mountains and drylands, in line with obligations under international agreements

15.2 by 2020, promote the implementation of sustainable management of all types of forests, halt deforestation, restore degraded forests, and increase afforestation and reforestation by x% globally

15.3 by 2020, combat desertification, and restore degraded land and soil, including land affected by desertification, drought and floods, and strive to achieve a land-degradation neutral world

15.4 by 2030 ensure the conservation of mountain ecosystems, including their biodiversity, to enhance their capacity to provide benefits which are essential for sustainable development

15.5 take urgent and significant action to reduce degradation of natural habitat, halt the loss of biodiversity, and by 2020 protect and prevent the extinction of threatened species

15.6 ensure fair and equitable sharing of the benefits arising from the utilization of genetic resources, and promote appropriate access to genetic resources

15.7 take urgent action to end poaching and trafficking of protected species of flora and fauna, and address both demand and supply of illegal wildlife products

15.8 by 2020 introduce measures to prevent the introduction and significantly reduce the impact of invasive alien species on land and water ecosystems, and control or eradicate the priority species

15.9 by 2020, integrate ecosystems and biodiversity values into national and local planning, development processes and poverty reduction strategies, and accounts

15.a mobilize and significantly increase from all sources financial resources to conserve and sustainably use biodiversity and ecosystems

15.b mobilize significantly resources from all sources and at all levels to finance sustainable forest management, and provide adequate incentives to developing countries to advance sustainable forest management, including for conservation and reforestation

15.c enhance global support to efforts to combat poaching and trafficking of protected species, including by increasing the capacity of local communities to pursue sustainable livelihood opportunities

## **Goal 16. Promote peaceful and inclusive societies for sustainable development, provide access to justice for all and build effective, accountable and inclusive institutions at all levels**

16.1 significantly reduce all forms of violence and related death rates everywhere

16.2 end abuse, exploitation, trafficking and all forms of violence and torture against children

16.3 promote the rule of law at the national and international levels, and ensure equal access to justice for all

16.4 by 2030 significantly reduce illicit financial and arms flows, strengthen recovery and return of stolen assets, and combat all forms of organized crime

16.5 substantially reduce corruption and bribery in all its forms

16.6 develop effective, accountable and transparent institutions at all levels

16.7 ensure responsive, inclusive, participatory and representative decision-making at all levels

16.8 broaden and strengthen the participation of developing countries in the institutions of global governance

16.9 by 2030 provide legal identity for all including birth registration

16.10 ensure public access to information and protect fundamental freedoms, in accordance with national legislation and international agreements

16.a strengthen relevant national institutions, including through international cooperation, for building capacities at all levels, in particular in developing countries, for preventing violence and combating terrorism and crime

16.b promote and enforce non-discriminatory laws and policies for sustainable development

## **Goal 17. Strengthen the means of implementation and revitalize the global partnership for sustainable development**

### **FINANCE**

17.1 strengthen domestic resource mobilization, including through international support to developing countries to improve domestic capacity for tax and other revenue collection

17.2 developed countries to implement fully their ODA commitments, including to provide 0.7% of GNI in ODA to developing countries of which 0.15-0.20% to least-developed countries

17.3 mobilize additional financial resources for developing countries from multiple sources

17.4 assist developing countries in attaining long-term debt sustainability through coordinated policies aimed at fostering debt financing, debt relief and debt restructuring, as appropriate, and address the external debt of highly indebted poor countries (HIPC) to reduce debt distress

17.5 adopt and implement investment promotion regimes for LDCs

### **TECHNOLOGY**

17.6 enhance North-South, South-South and triangular regional and international cooperation on and access to science, technology and innovation, and enhance knowledge sharing on mutually agreed terms, including through improved coordination among existing mechanisms, particularly at UN level, and through a global technology facilitation mechanism when agreed

17.7 promote development, transfer, dissemination and diffusion of environmentally sound technologies to developing countries on favourable terms, including on concessional and preferential terms, as mutually agreed

17.8 fully operationalize the Technology Bank and STI (Science, Technology and Innovation) capacity building mechanism for LDCs by 2017, and enhance the use of enabling technologies in particular ICT

## CAPACITY BUILDING

17.9 enhance international support for implementing effective and targeted capacity building in developing countries to support national plans to implement all sustainable development goals, including through North-South, South-South, and triangular cooperation

## TRADE

17.10 promote a universal, rules-based, open, non-discriminatory and equitable multilateral trading system under the WTO including through the conclusion of negotiations within its Doha Development Agenda

17.11 increase significantly the exports of developing countries, in particular with a view to doubling the LDC share of global exports by 2020

17.12 realize timely implementation of duty-free, quota-free market access on a lasting basis for all least developed countries consistent with WTO decisions, including through ensuring that preferential rules of origin applicable to imports from LDCs are transparent and simple, and contribute to facilitating market access

## SYSTEMIC ISSUES

### **Policy and institutional coherence**

17.13 enhance global macroeconomic stability including through policy coordination and policy coherence

17.14 enhance policy coherence for sustainable development

17.15 respect each country's policy space and leadership to establish and implement policies for poverty eradication and sustainable development

### **Multi-stakeholder partnerships**

17.16 enhance the global partnership for sustainable development complemented by multi-stakeholder partnerships that mobilize and share knowledge, expertise, technologies and financial resources to support the achievement of sustainable development goals in all countries, particularly developing countries

17.17 encourage and promote effective public, public-private, and civil society partnerships, building on the experience and resourcing strategies of partnerships

### **Data, monitoring and accountability**

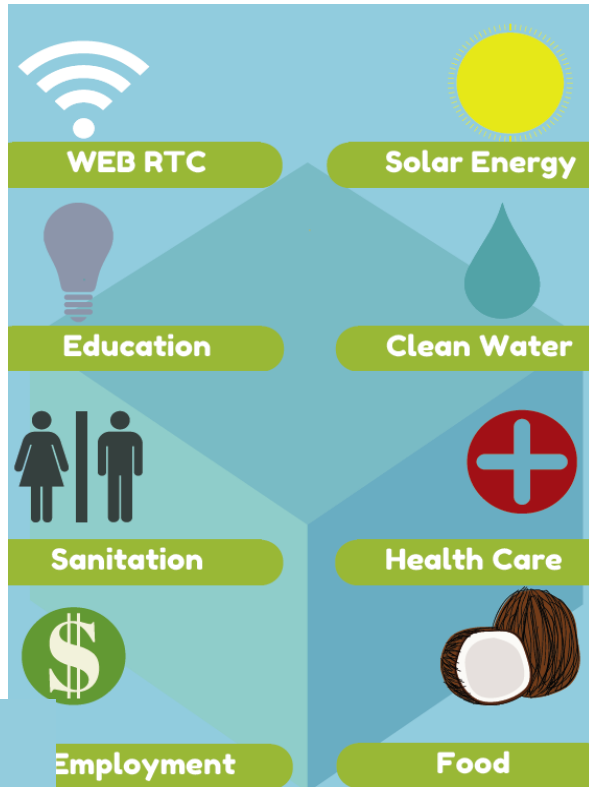
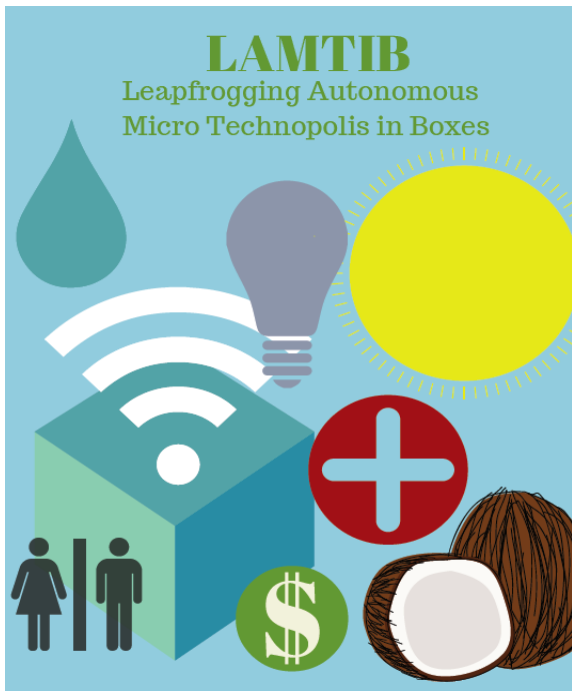
17.18 by 2020, enhance capacity building support to developing countries, including for LDCs and SIDS, to increase significantly the availability of high-quality, timely and reliable data disaggregated by income, gender, age, race, ethnicity, migratory status, disability, geographic location and other characteristics relevant in national contexts

17.19 by 2030, build on existing initiatives to develop measurements of progress on sustainable development that complement GDP, and support statistical capacity building in developing countries





# Appendix III: LAMTIB FLYER



## Web RTC

Web real-time communication technology, as provided by software company Temasys, enables local communities to communicate with the world.

## Education

With ICT Technologies, online education modules and real-time training sessions can overcome the challenge of costs and distance, providing remote areas with new skills and knowledge

## Sanitation

Among the 2,5 billion people in the world lacking access to adequate sanitation facilities, 70% live in rural areas. LAMTIB seeks to provide simple, yet efficient solutions for rural areas.

## Employment

LAMTIB seeks to leapfrog communities through long-term development, creating value added through small-scale businesses and favourable distribution channels.

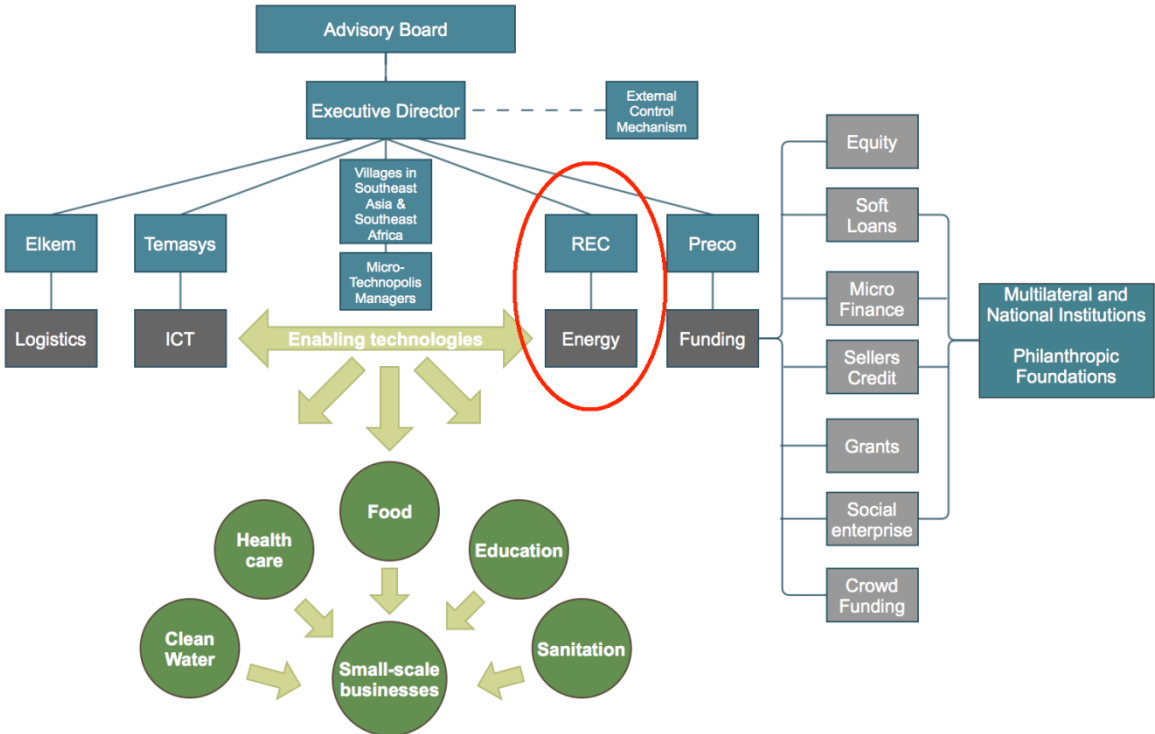
## Our Partners

PRECO



To learn more, please visit our website:  
[www.lamtib.org](http://www.lamtib.org)

**Appendix IV: LAMTIB Organizational Structure<sup>12</sup>**



**LAMTIB Business Plan, Aunemo & Forset, 2014**

<sup>12</sup> Content for analysis of this thesis is encircled

## Appendix V: LAMTIB Partners & Stakeholders

*Preco* is a private holding company, and the primer initiator of the project. They provide the start capital in order for the project to be able to kick-start the lease of the first containers, and the institutional set up for the finances. In the longer run, businesses, international institutions and NGOs are invited to engage as partners, both in terms of funding and human resources.

*Elkem* is a Norwegian material-producing company, world leading in the micro-silica market. The company is currently was acquired by China National Bluestar Group Co. Ltd. in 2011. Elkem has a mission to be producing in a sustainable manner, stating that their “guidelines for maintaining Elkem’s social responsibility describes the overarching requirements related to the organization of the work on social responsibility, areas of responsibility within the organization and routines for ensuring compliance with the basic principles of described in ‘Principles for social responsibility’. The principles provide and overview of what Elkem emphasizes in connection with safeguarding basic human rights, the employees’ rights as workers, environmental concerns, a sustainable exploitation of natural resources and business integrity”.<sup>13</sup>

*Temasys Communications* This Singapore-based tech start-up launched its real-time communication plug-in in May 2014, which makes the basis of the company’s core activities. As a newly established business, the software company has so far no written documents on their CSR policies. However, their Web RTC platform is integrated as one out of two enabling technologies for the LAMTIB initiatives, making possible the long-distance and real-time communication within and across rural areas in the region.

*Philippine Red Cross* is the NGO chosen on site on the pilot container in the Philippines. The Philippine branch of the Red Cross goes back to 1947. According to their website, they have “truly become the premier humanitarian organization in the country, committed to provide quality life-saving services that protect the life and dignity especially of indigent Filipinos in vulnerable situations”.<sup>14</sup> They carry out different kinds of development-related tasks in the specific area, but it is especially within the areas of disaster management services and health services that they are committed to the LAMTIB initiative and the Bantayan container.

*Gaia Mariculture* is a Singapore-based company, with its core activities in the Philippines. Established in 2010, their mission is to provide new solutions to current problems within the aquaculture sector. As another relatively new actor, and partner of LAMTIB, they have not yet developed a pure CSR policy, but the responsibility and awareness strategies of the company is integrated in the mission of the company itself. The farmers employed at the sea farm in the Philippines are locals, who are being trained by marine biologists based in Singapore. As stated in the company mission, the company “aspires to pass down knowledge of rightful farming techniques to the locals in the Philippines to perform our share for the environment as well as poverty alleviation. Many impoverished coastal communities exist in developing countries, we want to extend our helping hands to help the poor stand up along their feet by teaching them aquaculture as a marketable form of scientific discipline and skills, and also to be proper stewards [for] the environment in order to deliver [a] sustainable food resource”<sup>15</sup>.

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<sup>13</sup> *Elkem Sustainability Report 2013*, available from <https://www.elkem.com/documents/top-menu-documents/sustainability-reports/Elkem-sustainability-report-2013.pdf>

<sup>14</sup> *About the Philippine Red Cross*. Available from <http://www.redcross.org.ph/about>

<sup>15</sup> *Gaia Mariculture: Mission*. Available from <http://www.gaia-queenabalone.com/#!gaia-mariculture/c1bjr>