Using the Sustainable Development Goals as a Basis for Strategic Sustainability Research and Policy

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Though there is a global consensus for the Sustainable Development Goals (SDGs), achieving their lofty ideals is far from certain. The scope of change needed to fulfill the targets among the SDGs, along with their urgent timelines represents a globally significant and challenging direction ahead. Systematic research can be an invaluable tool to promote the SDGs, yet much research simply uses the SDGs as a vehicle to validate and valorize ideas already presented and research already underway. While there is some research dedicated to track progress on the SDGs and track their interlinkages, this research remains largely isolated and limited for policy implementation. In this talk I will outline a proposed research framework to plan for SDG achievement. This framework uses the SDGs as a framework to concretize insights from strategic sustainability planning – a field historically plagued by vagueness. Simultaneously, this framework capitalizes on research frameworks developed for strategic sustainability planning focused on the SDGs – a set of goals without a strategic plan for implementation. The framework establishes research questions to relate across multiple scales of policy in order to develop coherent policy plans across multiple scales. It can help prioritize SDG areas, coordinate institutions for SDGs and in general help us explore dynamics in social-ecological systems. Reviewing research conducted at global, regional, and national scales, I will outline types of insights from dedicated SDG research that can promote SDG attainment.

Roles of Resilience Approach in Implementing Sustainable Development Goals

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The Sustainable Development Goals (SDGs) 2015-2030 cover a diverse range of issues with 17 goals and 169 targets spanning the dimensions of economic, social and environmental development, including poverty, health, disaster, sustainable cities, infrastructure, ecological diversity, access to clean water, climate change. In terms of implementing the goals, it is critical to note the issues around the goals and targets are interacted and interconnected in complex ways (the International Council for Science, 2017). Especially, in a modern risk society which is characterized by complexities and uncertainty, risk natures around issues of SDGs are dramatically changing in scope, severity and impact, driven mainly by globalization, climate variability and urbanization which impacts on human, natural and social systems from the local to the global levels.

From public policy perspective, given the above, there are three policy gaps in implementing SDGs: First, there is the lack of policy tools to address the complex linkages among SDGs which requires systemic approach to address not only issue linkages, but also relevant risks, systems, multi-stakeholders and changing environment. The International Council for Science (2017) has pointed out that the nature, strengths and potential impact of the related interactions depend on the policy options to pursue them through SDG 16 (good governance) and SDG 17 (means of implementation) which are key to turning the potential for synergies into reality. Furthermore, for means of implementation, the scientific community has emphasized the need for "systems approach" to sustainable development (e.g. Stafford Smith et al., 2012). However, specific governance tools or means for policy makers and practitioners in implementing the SDGs given the complexities have not been articulated yet.

Second, although the above systems approach are interrelated with the concept of resilience, the word of resilience is incorporated into SDGs sporadically. In fact, while the predecessor of SDGs, the Millennium Development Goals (MDGs) did not mention about resilience, "resilience" is one of key words in Goals in SDGs. For example, the following Goals have "resilience" elements:

- Goal 9: Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation) and resilient cities.
- Goal 11: Make cities and human settlements inclusive, safe, resilient and sustainable.

On the other hand, the problem for policy makers and practitioners is that SDGs do not provide the definition of resilience and specify how to address resilience.

Third, while the SDG 17 emphasizes the need for policy coherence and multi-stakeholder partnerships which are closely related to resilience approach based on systems approach, the relationship is not understood well among multi-stakeholders. Moreover, the existing researches do not address the linkage between SDGs and resilience based on systems approach well, and hardly provide policy or practical tools for implementing SDGs through resilience points of views.

The presentation will address the above policy gaps and articulate how resilience is interlinked with SDGs and how resilience approach built upon systems approach (i.e. enabling the capacity to create environments or systems that remain functionally intact when impacted by unexpected events, which is accomplished by emphasizing situational awareness and understanding "whole system" linkages

over short, medium and long term perspectives, Shimizu and Clark, 2019) can play roles in implementing SDGs.

More specifically, the presentation will provide 1) synthetic views of how resilience approach is interlinked with systems and their boundaries of SDGs, 2) analysis of how resilience approach can be applied to cases, and 3) policy implications for diverse stakeholders in addressing complex issues of SDGs.

Micro Grid with 100% Renewable Energy in Small Island Developing States
-Nexus of Energy, Environment and Economic Growth-

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The size of their population in Small Island Developing States (SIDS) are rather limited. The SIDS have a combined population of about 65 million [1], which is about one percent of the world's population. In SIDS almost 30 percent of population is living below 5 meters above sea level. Therefore, SIDS are known to be environmental vulnerable and to be most affected by climate change which is currently in progress.

On the other hand, the Intergovernmental Panel on Climate Change (IPCC) reported that emissions resulting from human activities are substantially increasing the atmospheric concentrations of the greenhouse gases, resulting on average in an additional warming of the Earth's surface [2]. Based on the reports from IPCC, policy makers in various countries including advanced countries, emerging economies, and SIDS have proposed energy policies to introduce renewable energy as much as possible to curtail emission of greenhouse gas. Although renewable energy is recognized as environmentally conscious source, skepticism is still lingering because of its high cost for investment and grid integration.

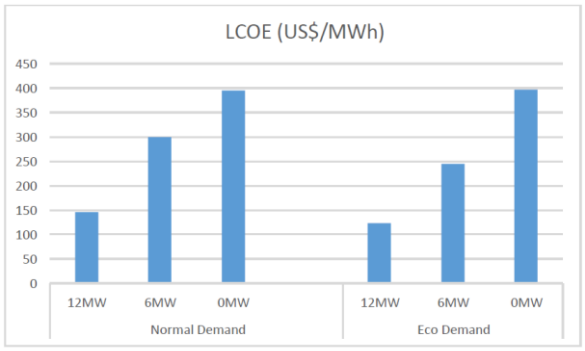
Firstly, we briefly review Sustainable Development Goals (SDGs) and discuss synergy and trade-off between goals [3]. We point out needs for concrete example of study on synergy and trade-off between goals in energy and climate change.

Secondly, we estimate electricity prices quantitatively for micro grids in Temburong area of Brunei with different share of renewable energy using an optimization model [4, 5]. Although Brunei is not categorized as SIDS in a precise sense, Temburong area is isolated enclave of Brunei and its geographical and demographical conditions are similar to many SIDS. For this reason, we treat Temburong area equivalent to SIDS. The estimated levelized cost of energy (LCOE) (UD$/MWh), which is quite close to electricity price except for profit of utility company, in micro grid is shown in Figure 1 as a function of capacity of diesel generator for normal and eco demand cases. 12 MW and 0 MW diesel generator corresponds to business as usual scenario and100% renewable energy scenario, respectively. While 100% renewable energy is technologically possible with the usage of electricity storage, the estimated price is about 400 US$/MWh, which is substantially higher than prices in the US (110 US$/MWh) and Japan (230 US$/MWh).

Thirdly, we discuss the effect of the estimated electricity price on GDP growth rate in

Temburong. The susceptibility analyses in South Africa, China, and the US show that 1% increase in electricity prices being associated with a 0.05% decreases in economic growth [6,7,8]. The susceptibility analyses imply that the estimated cost increase of 160% (=(400-150)/150) in 100% renewable micro grid corresponds to as high as 8% decrease in economic growth.

Finally, Nexus of energy, environment, and economic growth will be discussed. The estimated 8% decrease in economic growth gives significant negative impact on SIDS economy. High LCOE comes from high cost of the electric storage which required to integrate electricity generated using solar PV. This imply that 100% renewable micro grid is not economically feasible, although it is technologically possible. Therefore, we need innovative solution which consists of Hydrogen production using oversupply power by solar PV and the usage of hydrogen in gas turbine instead of diesel fuel. This makes possible to decrease the capacity of electric storage and to increase adjustment power of supply and demand with less CO_2 emission. Consequently, lower LCOE therefore higher economic growth will be attained without causing climate change resulting from human activities. This will provide invaluable insights toward the realization of SDGs.



LCOE = levelised cost of energy, MW = megawatt, MWh = megawatt hour.

Fig.1 LCOE in micro grid as a function of capacity of diesel generator for normal and eco demand.

[1] UN-OHRLLS, "SIDS in Numbers Climate Change Edition 2015", 2015.

[2] IPCC, "IPCC 1990 First Assessment Report Overview Chapter", 1990.

[3] David Le Blanc, "Towards integration at last? The sustainable development goals as a network of targets", DESA Working Paper No. 141, March 2015.

[4] Y. Ikeda, "Development of the Eco Town Model in the ASEAN Region through Adoption of Energy-Efficient Building Technologies, Sustainable Transport, and Smart Grids", ERIA Research Project Report 2015, No. 20, chapter 4, 2015/03.

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Measuring Distance to the SDG Targets: an assessment of where OECD countries stand

1. The 2030 Agenda for Sustainable Development, adopted by world leaders at the United Nations on 25 September 2015, sets out an ambitious plan of action for people, planet and prosperity, with the overarching objective of leaving no one behind. At its core are 17 Sustainable Development Goals (SDGs) comprising 169 targets.

2. This Study of the distances from the SDGs of selected OECD countries is designed to help governments as they consider developing national action plans, as well as to contribute to SDG mainstreaming across different OECD Directorates. It leverages the wealth of statistical data collected by OECD members and harmonised through OECD tools and processes. This booklet updates the Pilot Study, published by OECD in July 2016, by offering a wider set of indicators and more complete coverage of the Agenda 2030 targets, as well as a refined methodology for assessing distance to those targets.

3. This Study uses the latest information on various indicators available in OECD databases to establish countries' ***distances from individual targets,*** and presents results for a number of countries. These starting positions are measured in terms of the distance to be travelled by 2030. This requires ***setting end-values for the targets to be achieved by 2030***. The Study uses a flexible approach to target setting, with appropriate consideration being given to values specified either in the 2030 Agenda or in other international commitments, but also using the current range of OECD performance as a rating scale where no such benchmarks have been enunciated.

4. Taking as a reference the global indicator set endorsed by the UN Statistical Commission at its 47th session, OECD indicators have been selected based on criteria of ***relevance, ability to differentiate countries' performance, availability*** and ***statistical quality***. Applying these criteria, this document identifies 131 indicators covering 98 targets spanning all 17 Goals. It is, however, clear that ***many SDG targets cannot be currently measured adequately through data routinely collected by the OECD***, and that significant statistical work is needed to fill some of these gaps. ***The OECD is well positioned to advance this agenda,*** given its expertise in developing policy indicators and in assessing interconnectedness and policy coherence.

5. In order to help interested countries explore the trans-boundary effects or contributions of their policies and development patterns, this Study also proposes an initial assessment of countries' ***'global contributions'*** (e.g. aid flows to less developed countries or consumption-based carbon dioxide emissions) to meeting some of the targets in the 2030 Agenda.

6. While the assessment of starting positions has been undertaken at target level, the results can also be considered by Goal as well as through a global contribution lens. On average, ***OECD countries are currently closest to reaching targets related to water, climate, biodiversity, cities, poverty and oceans. They have the greatest distance to travel in relation to gender equality, education, the economy and jobs, and institutions.*** Indicators can also be aggregated by the '5 Ps' in the 2030 Agenda: People, Planet, Prosperity, Peace and Partnership. Based on this breakdown, OECD average ***scores are best on Planet, and Partnership, to a lesser extent on Prosperity,*** with ***People*** and ***Peace*** lagging behind.

7. It is nonetheless important to underscore that this assessment is based only on what can be measured today. ***The selected indicators enable only 57% of all the SDG targets to be evaluated***, and coverage is unequal across goals and the 5Ps. For example, while health and

education have at least one indicator per target, oceans are covered in a very limited way. Similarly, while over 80% of the targets in the *People* category are covered by at least one indicator, this is true for fewer than 40% of the targets in the *Planet* category. Given the limitations of current data, assessments of relative performance across the goals and 5Ps should be regarded as preliminary, and may change as more indicators become available in the future.

8. The variation in countries' distance to travel across both goals and targets, as well as the variation in data coverage, suggest that ***national priorities for implementing the SDG agenda should be set at target level***, rather than at the goal or 5P level.

9. Finally, this Study shows that, to implement the 2030 Agenda, countries may need to develop additional indicators and evidence to identify and track progress on policies that drive outcomes at the country level and that have significant trans-boundary impacts.