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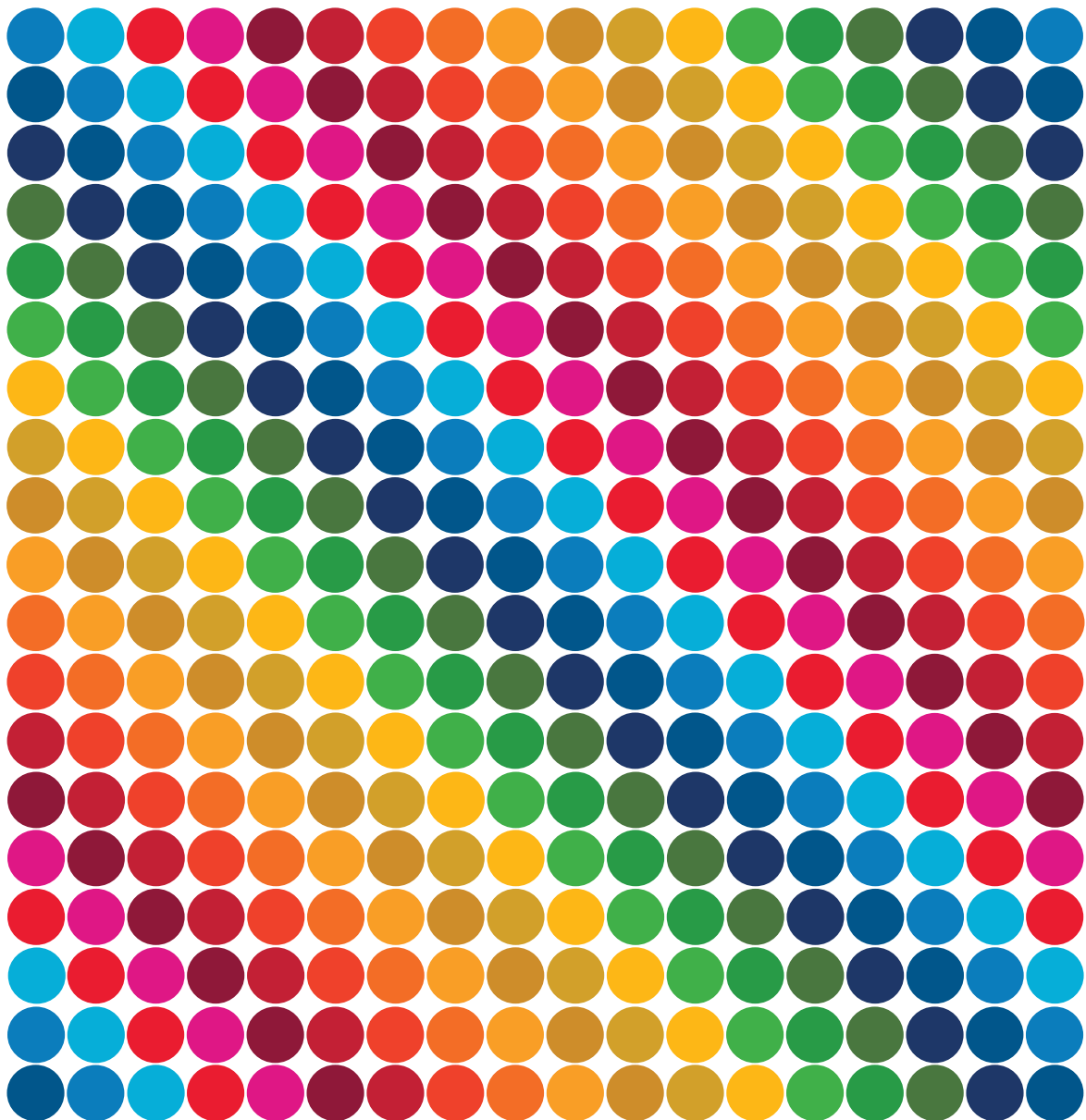
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# REPORT OF SYNLINK SDGs WORKSHOP

Research and Action Framework for  
Synergistic Scientific and Institutional Linkages  
between the SDG Targets

March 5th -7th , 2017

Glen Cove Mansion, New York, USA



Report of SynLink SDGs workshop

- Research and Action Framework for Synergistic Scientific and Institutional Linkages between the SDG Targets

March 5<sup>th</sup> -7<sup>th</sup>, 2017

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*Co- hosted by:*

*Global Environmental System Leaders Program (GESL), Keio University*

*UNU-IAS*

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# 1 Outline (concept and objective) of the workshop

The purpose of the workshop was to develop a research framework for securing effective implementation of actions to attain the SDG targets that are related to solving a problem in a sustainable manner. This requires two different, but inter-related, tasks. Firstly, is the need to understand interaction of the SDG targets in addressing a particular problem. For example, halving per capita food consumption by 2030 (12.3) has interactions with waste reduction (12.5) and effective use of resources (12.2), as well as zero hunger (2.1) and effective water use (6.4). This exercise requires both natural and social scientific knowledge on the interaction between economic, social and environmental dimensions of sustainable development. Secondly, is to consider institutional dimensions to address the targets, and develop governance mechanisms to enhance and facilitate synergistic interactions and to reduce and eradicate negative interactions. Here, two types of institutions need to be considered: interaction of formal institutions such as within and between UN and governmental organizations, and of informal institutions such as public-private partnerships and certificate schemes.

The workshop considered ways to address these two dimensions, and link up the two tasks in one framework of analysis, which will then be implemented by stakeholders. The intended outcome was to build a framework and present it in a journal, and implement it in case studies that may follow. A funding proposal for Belmont Forum’s *Transformation to Sustainability* was made for a case study or two.

Figure 1 Gap between effective interaction of SDG targets and institutional and governance reality



## 2 Opening session

### 2.1 OPENING SESSION BY NORICHIKA KANIE, PROFESSOR, KEIO UNIVERSITY AND SENIOR RESEARCH FELLOW, UNITED NATIONS UNIVERSITY INSTITUTE FOR THE ADVANCED STUDY OF SUSTAINABILITY (UNU-IAS)

Norichika Kanie provided an overview of the overall process of the workshop as well as introduced the research-action framework as a starting point for discussion. The purpose of the workshop was stated as to develop a research framework for **securing effective implementation of actions to attain the SDG targets** that are related to solving a problem in a sustainable manner. Framework should be realistic to use for solving the problems by stakeholders. The need for the application of “transdisciplinarity” was emphasized with the co-design, co-production and co-delivery of knowledge at the heart of the framework. It was argued that there is a need to develop theoretical framework for Knowledge-Action (theoretically warranted action) that can be used across multiple stakeholders. This includes a usable research framework for action; structures research on application of the frameworks; strategies; tools; guidelines; advisory activities; skills for active engagement/ praxis; and, significantly, full on co-participants with other stakeholders contributing to the actions and developments. As a starting point, a framework was proposed (Figure 1). The session was closed by going through the details of the programme of the following two days of the workshop.

Figure 2 Securing Effective implementation of actions to attain the SDG targets



## 2.2 OPENING SPEECH BY YASUSHI KIYOKI, GESL PROGRAM COORDINATOR & PROFESSOR, KEIO UNIVERSITY

Yasushi Kiyoki provided welcoming remarks to participants via skype and emphasised the need for sharing new ideas that focus on the global environmental system. Highlighting the need for an integration between cyber and digital spaces with the physical environmental space, it was illustrated that dynamic mapping with data mining by active multimedia systems can help provide actual knowledge propagation and actuation in the physical world. To catalyse this integration, it was argued that there was a need for a new value creation with connection merit. This can be achieved through process integration of a few areas, namely, technology & governance; physical space & cyber space technology and; emergent change & long-term change. While this requires innovation, evoking Jared Diamond's Collapse: How societies choose to fail or succeed, and illustrating the human journey starting from the Out of Africa mass immigration 82,000 years ago to the present, he argued that our history tells us that "Civilizations have never been created without innovation, and civilization has been created by challengers, and every civilization has disappeared if the society could not keep the consciousness of innovation. He closed with stating that the vision and mission is to always try to make "challenge to innovation knowledge creation, propagation, big data & knowledge systems. Additionally, there needs to be an element of passion in this pursuit.

## 3 Presentations

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### 3.1 ARCHITECTURE OF THE OVERALL FRAMEWORK

#### **3.1.1 How to deal with interactions between the SDGs - Dave Griggs, Professor, Monash University/ Future Earth**

Dave Griggs provided an overview of the draft framework proposed by the International Council for Science (ICSU) for understanding SDG interactions. Highlighting that while the UN Secretary General described the SDGs as “an indivisible whole”, the problem lies in the fact that everything from government departments to university faculties and international organisations operate in silos. Early studies undertaken with ICSU demonstrate that if countries ignore the overlaps and simply start trying to tick off targets one by one, they risk perverse outcomes. In order to meet this challenge a scoring system was devised utilising a simple 7-point scale of the influence of one goal or target to another. Ranging from +3 as indivisible to -3 as cancelling, the framework provides a scoring for both synergies and trade-offs amongst goals and targets. It is important to note that there are other dependencies that have to be taken into consideration when undertaking the scoring. This includes reversibility, directionality, strength and uncertainty. In the context of the SDGs, one of the key challenges to addressing interlinkages is in understanding and addressing the need for governments around the world to prioritise. While it is OK to prioritise the SDGs to reflect national contexts, it cannot be done on what is easy or achievable, on reporting what ‘makes you look good’ and/or ignore the implications of action on other SDGs. This highlights the need to take into account the interlinkages when taking action on the SDGs.

#### **3.1.2 Insights from Research on Governance Regarding Linkages among the SDGs – Oran Young, Professor Emeritus, University of California**

Oran Young provided a presentation based on research on governance in relation to the SDGs. Two broad themes, in particular, were relevant. These were addressing the problem of fit - creating and implementing institutions that are well-matched to the main features of the problems they are intended to solve; and interplay – managing interactions among distinct problems and institutions to minimize conflict and promote synergy. In the context of the SDGs, the paradigm of governance through goals was highlighted where goal setting rather than rule-making is adopted as the steering mechanism. Understanding this phenomenon requires skills in identifying the key features of problems and matching governance systems to these features, where there is a need for a set of institutional diagnostics. In relating the problem of interplay with the SDGs, it is argued that there are two agendas embedded in the SDGs – human security and planetary boundaries agenda. The challenge is to ensure that these agendas are synergistic rather than competitive. It was warned that there is also a danger of dueling goals, whereby fragmentation and dilution occur as diverse interest groups vie for attention and resources to make sure their goal is fully protected and promoted. He closed with offering some possible way forward including grouping the goals into a few linked priorities, focusing on crosscutting concerns and identifying meta-goals are goals that are essential to pursue all the others (i.e. order/justice).

#### **3.1.3 Orchestration - Rak Kim, Assistant Professor, Utrecht University**

Rak Kim introduced the concept of orchestration in relation to governing interlinkages through the SDGs.



Demonstrating previous work on interactions such as utilising network analysis in understanding the links of multilateral environmental agreements as well as mapping of institutional interactions, it is shown that there are already complex relationships between international regimes and institutions. Orchestration, defined as “directing or arranging (policies) coherently to produce desired effects” provides an indirect and soft mode of governance that is argued to be already used widely by international organisations, which “enlist and support intermediary actors to address target actors in pursuit of IGO governance goals”. While highlighting the role of the High Level Political Forum (HLPF) as a potential orchestrator of orchestrators, it is however argued that the HLPF needs to clarify an overarching goal by initiating a global dialogue through which an updated definition of sustainable development would eventuate. In summary, with the SDGs supposedly integrated and indivisible but still mirroring the silo structure, international organisations (IGOs) working through intermediaries may help cut across SDGs. However, IGOs themselves need to be orchestrated, and HLPF, as a key orchestrator of orchestrators, needs to initiate a global dialogue on a normative vision.

## 3.2 SCIENCE-POLICY INTERFACE IN ACTION

### **3.2.1 Global Sustainable Development Report (GSDR) & the Science-Policy Interface - Eeva Furman, Director and Professor, Finnish Environment Institute**

Eeva Furman provided an update on the activities of the Global Sustainable Development Report (GSDR) including its organisational setup, opportunities, threats as well as next steps including possible collaboration with the SDG Knowledge Action Network (SDG Kan). The GSDR was established to provide guidance on the state of global sustainable development from a scientific perspective, including lessons learned and addressing new and emerging issues, trends and actions. The drafting of the GSDR consists of an independent group of scientists which includes 15 experts from various backgrounds, scientific disciplines, institution as well as a balanced representation geographically and in terms of gender. The independent group of scientists are supported by a task team co-chaired by one representative each of the United Nations Secretariat, UNESCO, UNEP, UNDP, UNCTAD and the World Bank. The GSDR has the potential to become a key element of the follow-up and review process, with a non-negotiated report as its outcome and its success measured by its relevance. The first report is highly relevant to interlinkages, focusing on SDG interactions in an integrated and universal manner. Challenges are still prevalent, including balancing scientific rigour against policy relevance. More specifically, there is currently an under-representation in political and social science, sustainability governance, macro-economics and finances. Nonetheless, the GSDR has the potential to create strong links amongst science networks and orchestrate a network of networks. Moving forward, establishing collaboration, networks as well as having outreach to society will determine the success of GSDR. This includes aligning and coordinating timelines, objectives and networks with potential collaborators such as SDG Kan.

### **3.2.2 New entry points for Science at the UN in the context of the 2030 Agenda & SDGs - Alex Roehrl, Senior Economic Affairs Officer, UNDESA**

Alex Roehrl provided a UN perspective on the issue of addressing interlinkages and SDG interactions, and in particular, the science-policy interface. The SDGs along with other developments at IGOs provides unprecedented new entry points for science. This includes the HLPF, Technology Facilitation Mechanism (TFM), GSDR and the Voluntary National Reviews. The challenge remains in bridging the divide between science and politics where science is inherently uncertain and skeptical, while politics requires certainty where skepticism is heresy. Other factors such as issue of focus differs from long-term to short term,

and the ultimate target of win-win in science conflicts with the zero-sum game often applied in politics. The HLPF in particular has the mandate to address this issue with a function “to strengthen the science-policy interface”, including through GSDR. Beyond the HLPF, the Technology Facilitation Mechanism (TFM), consisting of a 10-member group of credible scientists, was created to harness science, technology and innovation to achieve the SDGs. The SDGs Voluntary National reviews, already commenced with 22 in 2016 and 44 in 2017 will also require scientific input at the national level. These are only a few examples where together, there are both new and old types of entry points for science at the UN which can be harnessed towards achieving the SDGs.

### **3.2.3 The SDGs Knowledge Action Network (SDG KAN) – Wendy Broadgate, Global Hub Director, Future Earth**

Wendy presented on activities of the Future Earth generally as well as the SDG Kan specifically. In general, Future Earth play a dual role as a global research platform to generate new knowledge as well as to catalyse transformation through solutions and societal engagement. In achieving this science-policy interface, research questions are co-designed with users from the research community as well as communities of practice. Knowledge Action Networks (KAN) are established in areas of Health, Decarbonisation, Oceans, Natural Assets, Water-Energy-Food Nexus, Transformations, Finance & Economics, Cities, as well as specifically on the SDGs. THE SDG KAN aims to catalyse scientific research to provide policymakers with knowledge and tools to help collaboration between sectors to meet the SDGs. This includes informing the UN GSDR & HLPF processes, and conferences including the Global Goals Conference in August 2017 and the SDGs and Earth Observations Conference in 2018. Specifically in relation to securing interlinkages, the SDG KAN is focusing on pathways to achieve goals simultaneously and address cross-cutting challenges, synergies and trade-offs. Towards this end, SDG KAN is undertaking collaboration with IIASA on The World in 2050 with the aim to provide tools that can help craft local, national and international policy.

## **3.3 SCIENTIFIC TOOLS**

### **3.3.1 The World in 2050 - Nebojsa Nakicenovic, Deputy Director General and Deputy CEO, International Institute for Applied Systems Analysis (IIASA)**

Nebojsa Nakicenovic gave insights in developing the World in 2050 project, utilising a backcasting approach to scenario analyses. The Global Energy Assessment provided a template and example where 2030 goals and targets were established. These were, universal access to modern energy, double energy efficiency improvement and double renewable share in final energy. By utilising historical data and possible scenarios (i.e. % of renewable energy deployment), the different scenarios for fuel mix was illustrated with possible transformational pathways identified. Interestingly and relevant to interlinkages, the scenario also coupled energy systems with global water withdrawal, which demonstrated the nexus between water and energy along with its trade-offs. In conceptualizing the World in 2050, one key link with sustainable development and SDGs is in including the concept of planetary boundaries and the aim of achieving global development within a safe and just operating space. The SDGs, more explicitly, is used as the 2030 target basis while a second target space is 2050 and beyond for achieving sustainability. The backcasting storyline, for example in the form of narratives, and joining them with the target spaces can highlight the transformational change required. The model and narrative storyline interpretations result in the sustainable development pathways. In such a complex system, a few factors must be taken into consideration. Firstly, there is a growing number of actors of change, including businesses, cities,

civil society, science and IGOs. The transformational pathways can also be bottom up (i.e. cities and national level) and not just top down at the UN or global level. Ultimately, the backcasting approach requires a system based thinking which looks at synergies, trade-offs and conflicts, where interlinkages across issues will play an important role.

### **3.3.2 Global Environmental System Leaders Programme - Yasushi Kiyoki, Professor, Keio University and GESL Program Coordinator and Wanglin Yan, Professor, Keio University**

Wanglin Yan and Yasushi Kiyoki introduced the Global Environmental System Leaders (GESL) programme to participants. Emphasising the need for interdisciplinary mode of studies, GESL was demonstrated as a programme that requires students to be innovative in pursuing studies that go beyond single disciplines.

## 4 Poster presentation on interactions of the SDG targets by GESL students

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### 4.1 INTRODUCTION

Students of the Global Environmental Systems Programme (GESL), presented their group and individual research in the context of addressing synergistic interlinkages of the SDGs.

### 4.2 GROUP PRESENTATION

#### **4.2.1 Visualising interactions through the 5D World Map: Synergies and Tradeoffs of increasing agricultural productivity (SDG 2.3) with biodiversity, water and climate in tropical countries - Alizan Mahadi, Chalisa Veksommai, Irene Eryln Rarhmawan and Jimmika Wijidechakul, GESL**

A demonstration of how the 5D World map can be used as a visual tool for addressing interlinkages was presented. Taking advantage of the various areas of research of the students, the interlinkages among these areas were studied by using the 5D world Map. Starting from the aim of doubling agricultural productivity (SDG 2.3), the interlinkages with the inter-linkages with biodiversity and forest cover (SDG 15.1), climate change (SDG 13), Water quality and efficiency (SDG 6.3 and 6.4) are investigated. As a demonstration, tropical countries with large forested areas, Brazil, Indonesia and Malaysia were selected. The investigation of interlinkages were carried out in two stages. Firstly, visualising the spatio-temporal trends of headline indicators in the mentioned areas using the a function in 5D world map demonstrates a possible correlation in terms of general trends were in general, each indicator is at an upward trend. To investigate the causality of these trends, the second stage zoomed in into each issue and location specific data which can be investigated through a search function of the 5D world map. This demonstrated that oil palm may be a critical node in addressing interactions as it interacts with climate change through deforestation and forest fires, reduces water quality near plantations and compete with agriculture for land. As a conclusion, while the 5D World Map may not conclusively infer, it is a useful tool to identify potential inter-linkages. It is recommended that the nexus between Agriculture-Biodiversity-Climate-Water should be researched more in depth and specifically, and that addressing Sustainable Palm Oil could potentially be a critical node that addresses multiple SDGs. Furthermore, either through the 5D database or other means, there is a need to have such databases for researchers as a collaborative platform.

### 4.3 INDIVIDUAL PRESENTATIONS

#### **4.3.1 Towards a Framework for implementing national level inter-linkages through SDGs: Review of tools to link the drivers and benefits of Forest Cover in Malaysia - Alizan Mahadi, GESL**

The Sustainable Development Goals (SDGs) implementation is required to be taken as an integrated package with the goals and targets indivisible from each other. The Global Sustainable Development Reports (GSDR) demonstrates the use of an integrated approach that looks at clusters of strongly interlinked issues rather than integrated assessments as a whole. But how do we coherently assess these inter-linkages, synergies and trade-offs for SDGs implementation of which are credibly based on scientific evidence, relevant to policy and legitimate in terms of its process? This poster presentation reviewed the current approaches utilized to implement the inter-linkages in the context of the SDGs. These approaches are then applied in the context of implementing inter-linkages of the drivers and

benefits of forest cover in Malaysia. The results demonstrate that by using a combination of existing approaches such as scoring of interaction of the SDGs by ICSU (Nilsson, et al., 2016), issue mapping through network analysis, and subsequently verified by basic scientific methods to infer causalities, clusters of strongly inter-linked issues at the national level, such as the Forest-Climate-Resilience nexus can be identified. In addressing the implementation of identified inter-linkages, and in particular, the institutional dimensions, a fragmented and siloed approach to address the Forest-Climate-Resilience nexus is found with various mandates and responsibilities across multiple government agencies. In conclusion, approaches that go beyond normative organizational arrangements and processes in particular are argued to be of importance, with dynamics of actor configurations and the understanding of intermediary functions such as through orchestration deserving special attention.

#### **4.3.2 Synergetic SDGs national level inter-linkages implementation: “Mapping the Water Sanitation for Sustainable Water-use” – Chalisa Veessommai, GESL**

The sustainable development goal is well known in the sustainable development research field. Because sustainable development has been defined as development that meet the present without compromising the ability of future generations to meet their own needs. Clean and accessible water are an essential part of the world we want to live in. There is sufficient fresh water on the planet. But economics increasing and poor infrastructure has caused millions of people (most of them are children) to die from diseases with inadequate water supply, sanitation and hygiene every year. In relation to this, water-quality analysis plays an important and an essential role in life, and an important aspect in designing environmental systems and management system. The most effective goal of SDGs in water areas that present in this poster address in goal 6 (clean water and sanitation, and 14 (life below water), which is represented the interaction among of (1) ensure access to safe water resources and sanitation for all. (2) Conserve and sustainably use the world’s oceans, sea and marine source. (3) Water usage. (4) Renewable energy product. (5) Irrigation and agriculture Usage. In this poster presentation, a river water-quality system is demonstrated to realize the SPA process and analysis multi water-quality parameters for interpreting water situation on water resource to public users. Finally, this poster describes the overall architecture for the river water-quality analysis system. It highlights the challenges of water-quality analysis field such as: (1) Local analysis of the water-quality in many places can be shared and visualized from the global viewpoints. (2) To develop the meta-level knowledge of river-water-quality databases for the environmental engineering field. (3) To provide the broader water-quality analysis with many spots along the river and among many rivers. And (4) to compare river-water-quality in the global scale: the global comparisons for water-quality analysis.

#### **4.3.3 Synergetic SDGs national level inter-linkages implementation: “Environmental system: Observation Deforestation Effect in Global Tropical Forest” - Irene Erllyn Wina Rachmawan, GESL**

The Sustainable Development Goals (SDGs) promotes countries under UN to combat deforestation by approaching using Goal 15 of desertification, land degradation, and the biodiversity loss by accommodating the rule to protecting the forest for sustainable environment. It is followed by 10 targets, which includes the integration of ecosystem and biodiversity values into national planning, development processes, and poverty reduction strategies and accounts, and a target to mobilize and significantly increase from all sources financial resources to conserve and sustainably use biodiversity and ecosystems. This poster presentation reviewed the new possible approaches utilized to implement the inter-linkages of the critical component of Goal 15 for addressing forest development to tackle deforestation, land degradation, and the protection of biodiversity, especially the target 15.2 and 15.3. In present circumstances, two of the main issues in forestry mentioned by the SDGs 15 are the high

number of deforestation activity in tropical forest and how to halt its effect on land degradation and biodiversity. Much of remaining tropical forest has been impacted by human activities and no longer retains its full function. Several international initiatives facilitate monitoring and evaluating the progress of this goal. These include the Indicators for the Annual change in forest area and land under cultivation. Area of forest under sustainable forest management as a percent of forest area, and annual change in degraded or desertification arable land (%or ha). Although, some indicators under the Strategic Plan of Reforestation address indigenous and traditional knowledge, new knowledge sharing system are needed to support process to address deforestation issues. More effort is needed on indicators that make sense at the local scale and this could be achieved through engaging local stakeholders, citizen groups and indigenous communities. In conclusion, different possible approach that may go beyond normative organizational are important, by the key role of scientist who dealing with real condition tends to be contributes high effectivity to develop the progress on tackling the problem of deforestation.

#### **4.3.4 Synergetic Inter-linkages for national SDGs implementation : “Knowledge-Based Sharing Platform for Sustainable Food Production” to support and monitor system for woman farmer – Jinmika Wijitdechakul, GESL**

Agriculture is the basic source of the food supply of all the countries of the world. The high demand for agricultural products is increasing every year due to the number of population that is also increasing. But the decline in crop productivity is facing to our societies. Knowledge-based sharing platform is able to utilize the information for crop condition monitoring and provide decision-making information for the working out of agricultural policy and commissariat. The research finding also aims to provide a future reference on SDGs contribution as: (1) Achieve food security and promote sustainable agriculture that aims for zero hunger in the future, (2) Ensure sustainable consumption and production patterns, and (3) Adapting farming for climate change that aims to take urgent action to combat climate change and its impacts. This research aims to provide the effective system to support the sustainable agriculture production that can be helped to increase high quality and quantity agriculture products. This is system mainly focus on women farmers according to Food and Agriculture Organization of the United Nations (FAO) said If woman had access to resources, on-farm yields could increase 20-30% and this extra output could reduce the number of hungry people in the world 12-17%. We classified the objective of this system in (1) household level for knowledge sharing, (2) community level for information sharing and (3) national level for market sharing, to promote women farmers in rural areas for expanding sustainable agriculture and to Produce food for combating starvation in their communities. This system also implement the sustainable development goals (Goal 1,2,4,5,6,7,8,12,13 and 15) and targets that related to sustainable agriculture to achieve the sustainable food production and zero end hunger in societies. Expected outcome are to (1) provide the technology and information to improve quality, increase crop and animal output, (2) integrate the collaboration among local farmers, state and national government and research institutes for achieving the sustainable agriculture, and (3) support the women farmer on food production process and acquire the actual data from them.

#### **4.3.5 Creation of Empirical Knowledge using ICT Tools for Sustainable Livestock Husbandry - Case Study of Mongolia – Ahmad Muzaffar Baharudin, GESL**

Livestock husbandry is a global contributor of socio-economic well-being by ensuring food security nevertheless, highly vulnerable to Climate Change impacts. In Mongolia, massive amounts of livestock die as extreme weather strikes. The simplistic hypothesis of Climate-Livestock mortality alone might be untrue. The fact is, nomadic husbandry culture is still being practice, the uncontrolled number of animals can lead to the degradation of grasslands. How various factors interact and inter-linked and how

do we collect the data? In this poster presentation, we introduce a novel system for livestock data aggregation towards creating new empirical knowledge for a sustainable livestock husbandry future. Through a combination of various off-the-shelf technologies such as Wireless Sensor network (WSN), solar panel and 2G/3G wireless communication technology, this system can improve conventional ineffective livestock data collection by a digitalized data aggregation process and contribute to the creation of empirical knowledge towards assisting better decisions and actions.

#### **4.3.6 The Application of the Assemblage Theory to Inter-Linkages Model – Vuk Radovic, GESL**

The Sustainable Development Goals (SDGs) is a set of aspirational ideas that build on a set of tangible targets and indicators that provide the bedrock on which these ideas can be achieved. The SDGs cover a vast array of social and scientific topics; some as diverse as womens' rights, cities, economics etc. all with the intent of providing a roadmap towards a more sustainable world in the future. A way of interpreting the goals and making tangible links between the different goals, targets and indicators is the "inter-linkages" model (Nilsson et al, 2016). The basic logic behind the inter-linkages model is that each goal, target and indicator is directly linked to each other goal, target and indicator within a rating scale that of +3 (very positive link, actively contributing to the other) to -3 (a very negative, or actively negating the other). The inter-linkages model has many theoretical similarities with the assemblage social theory (DeLanda, 2006) which is a social application of a philosophy introduced by Gilles Deleuze and Felix Guattari (Deleuze, Guattari, 1980). At its core it is a way of understanding all human interactions as being in concert with one another. DeLanda explains this point as *"in short, analysis in assemblage theory is not conceptual but casual, concerned with the discovery of the actual mechanisms operating at a given spatial scale"* (DeLanda, 2006, pg.31) It discards the Heideggerian notion of the essence of things (Heidegger, 1927) being at the foundation of existence, and suggests that all things have to be looked at as casual mechanisms acting upon one another, irrespective to scale. Within the paradigm of SDG interlink-ages, one can interpret this as suggesting that each goal, target and indicators acts upon each of each other not only at the scale of each but at each scale. This is to say that a certain indicator cannot be distilled to its essence, and that each only exists as an interaction between the many. The poster presented during the workshop illustrated the abovementioned interactions within the larger framework of urban theory and how such theory could be applied on the SDGs and their respective inter-linkages.

#### **4.3.7 Building a Sustainable Society by Developing Municipal Solid Waste Management Policies – Qiannan Zhuo, GESL**

In Sustainable Development Goals, which is signed by 193 countries in 2015 to achieve a sustainable society, 4 (G8, G9, G11, G12) out of 17 goals are related to the circular economy which shows the importance of circular economy to building a sustainable society. Making better treatment of wastes to close the linear economy and to encourage the resources circulate more efficiently is an important approach. In this research, the author compares current situations of circular economy in more than 30 major countries all over the world by analyzing their Material Flows from Input, Production, Consumption to Disposal. A comprehensive evaluation of each country by using various indicators for the 4 steps is undertaken. The result of this study points out some problems. Though developed countries show a relatively better state than developing countries, there is no big difference between developed countries and developing countries and there are still tons much progress required both for developed and developing countries. The significance of this research is to encourage countries/regions to exchange their technologies and know-hows on municipal solid waste management to smoothen the resources circulation for building a sustainable society.

## 5 Interactive discussions

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### 5.1 INTRODUCTION

Intensive and interactive discussions were held throughout the three-day workshop towards the objective of providing inputs into a research-action framework for addressing synergistic linkages of the SDGs. The format of the discussions began with small group discussions on each table (approximately 10 persons per group across six tables) as well as further broken down to dyads and triads (two or three person groups) to harvest ideas and inputs. This format allowed for the identification of the most important building blocks that can act as an action guidance on achieving the SDGs. These were identified as stakeholder, action coherence, tools and capacity building. Subsequently, a world café approach was utilized to further discuss the four identified areas with the aim of providing the guiding principles in each building block. The following sections provide a synthesis of the discussions as well as a breakdown of the key concepts harvested during the course of the workshop.

### 5.2 SYNTHESIS OF DISCUSSION

As a result of the three-day workshop, the final day of the workshop consisted of breakout sessions on of the four building blocks identified as critical for a research-action framework in achieving the SDGs. A synthesis of these four building blocks are elaborated below.

#### 5.2.1 Stakeholder

Defining what and who is a stakeholder is a challenge in the first place. Stakeholders can be distinguished between those who have stakes (are affected) and those who have agency. Their identities need not be tied to nation states or specific issues where ownership can be broadened trans-nationally and across scales. The UN major groups were often mentioned as an existing system for stakeholder engagement, though also highlighted to have substantial and structural flaws. In some cases and value systems, even nature is also considered a stakeholder. The scientific community plays a crucial role, with the need to strengthen the GSDR panel and/or better designing of science panels proposed.

In addressing inter-linkages, methodologies to identify stakeholders, and in accordance with the theory of change, those who are particularly with agency on addressing interlinkages should be established. How to institutionalise a space for people to empower action on SDGs and its interactions should be considered. There is a need for mapping of stakeholders at various levels and contexts. In overcoming silos, how to incentivise stakeholders to address areas beyond their mandate deserves attention. This also includes increasing access and the right to information, including a transparent monitoring and reporting system on inter-linkages can facilitate participation.

More specifically, three sets of stakeholders deserve special attention and reform to achieve synergistic interlinkages through the SDGs.

#### **High Level Political Forum (HLPF)**

Firstly, the HLPF is argued to be weak and requires strengthening. There is a need to further study the role of HLPF in orchestrating stakeholders and understand whether it needs to be reformed completely or incrementally. One (revolutionary) idea would be to replace it with a global bicameral assembly.



### **Science at the Global Level**

Science at the global level, which consists of two groupings, GSDR and ICSU need strengthening in terms of both financial resources as well as wider institutional reforms. With years of experience in representing the science community to policymakers, ICSU themselves should be opened up for a research to understand how to better bridge the gap between science and policy.

### **Role of Private Sector**

As the discussions were focused on governance rather than government, the role of the private sector in creating cross-cutting practices were highlighted as a key part of addressing interlinkages. Transformation across the private sector can incrementally lead to increased policy coherence across silos. In terms of communication, it may not necessarily be directly under the guise of SDGs or integration directly, but rather more generically such as in establishing uniform corporate practices and design principles have the potential of influencing integration and affect implementation by design practices that are more sustainable. Examples of this in the construction sector, such as Green Star, LEED and BREEAM, serve as a testament to private led standards from the professional industry. Conceptually the initial ranking system is conceived by the engineering/science community but it soon became self-regulating. Nonetheless, both positive and negative outcomes towards sustainable goals can currently be found, requiring the standards themselves to be aligned to SDGs and/or better practices more generally. For example, certain efforts by governments, agencies could be 'judged' via an impartial mechanism attributing scores to certain criteria. The private sector can also catalyse more understanding and awareness of consumers. An example of this was the 'heart-foundation-tick' which separates certain brands from others showing consumers that they are purchasing something that is 'better' than something else. A similar 'tick' could be used to formally identify something that falls within the SDGs. This would encourage a learning by doing process and encourage reflection about the SDGs.

### **5.2.2 Action Coherence**

In order to manage the many and complex interactions between SDG goals and targets new levels of coherence of action are required. How can the necessary action coherence be achieved, including coherence between sectors, institutions and stakeholders<sup>1</sup> and across different time and spatial scales<sup>1</sup>. The term “action coherence” was used to reflect that in order to manage the many and diverse interactions between SDG goals and targets a joined up approach is required in order to maximise potential synergies and minimise potential negative interactions or trade-offs.

In examining the ways to maximise action coherence it is useful to consider some of the reasons behind “action incoherence” or why interactions are often ignored or are not fully taken into account.

#### **1. Everything is siloed**

Government departments, company divisions, university faculties, international institutions are organised into discipline or sector based silos. There is good reason for this as it simplifies decision making and makes taking action easier.

#### **2. Systems are setup to be competitive**

Government departments compete for budget, businesses compete for market share, universities

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<sup>1</sup> E.g. see Stafford-Smith, M., Griggs, D., Gaffney, O., Ullah, F., Reyers, B., Kanie, N., Stigson, B., Shrivastava, P., Leach, M., O’Connell, D. (2016) Integration: the key to implementing the Sustainable Development Goals. Sustainability Science [on-line first], doi:10.1007/s11625-11016-10383-11623.

compete for research income and students, NGOs compete for philanthropic funding. In a competitive system it is difficult to form the partnerships necessary for managing interactions.

3. There is an overhead to acting coherently

There is an overhead in terms of time, effort and money to act coherently as people have to take the time to form partnerships and learn to understand an issue from other perspectives. This also takes effort and costs money for people to meet and work together.

The SDGs require a coherent approach to achieve the “indivisible whole”. But these three factors systematically and self-reinforcing provide incentives against working together. Thus it is not surprising that we are already starting to see fragmentation and turf wars as organisations take the lead responsibility internationally, nationally or locally for implementation of a particular goal or target.

**So how do you get coherence in an inherently competitive system?**

1. Set the rules of the game

Those with power and responsibility can require a joined up approach.

2. Add new rules or goals to the game

For example the move for businesses to require a social licence to operate has added a new rule to the game; B-company legislation is an institutionalised version of this.

3. Make the rules of the game universal

It is essential that everyone is playing by the same rules so that nobody can gain an advantage by not adhering to the rules (avoid free-riding).

4. Power distorts the rules of the game

Therefore systems that redistribute power need to be supported, such as international agreements, consumer power and labelling, and market knowledge.

5. Demonstrate the benefits of multi-stakeholder engagement

These can include greater financing, access to resources, greater influence/impact, the ability to address weaknesses and increased efficacy. In particular, formalised systems of multi-stakeholder engagement can balance (or at least expose) power issues.

6. Demonstrate that you get a better outcome

More work needs to be done to provide clear evidence that a joined up approach leads to better outcomes that justify the additional overheads.

**How do you set the rules of the game?**

Each sector has its own rules, for example business has industry standards, science has peer review and government has regulation. The challenge is to come up with mechanisms that are effective across the silos. These could include incentives and benefits (requiring a better understanding of those benefits), bottom-up activism by consumers acting coherently, participatory decision making, education/awareness and localised narratives. Mobilising consumers and the electorate are both key factors.

Different types of organisations and different levels within organisations will require different approaches. Critically, there must usually be a higher level of organisation that drives the change (this may be hierarchically higher such as national governments or more complex horizontally such as a consumer organisation), though their efficacy may depend on bottom up action.

**How do the SDGs help us to realign power structures?**

The SDGs provide normative principles to follow and a common direction to pursue and they give a

legitimacy to this direction. They provide a clear rationale and rallying point for a more coherent approach, and a scope for defining the breadth of stakeholders to be included in considering a particular coherence problem. They provide an opportunity to respond to clearly identified major problems through multi-stakeholder involvement, a transparent reporting process and through promoting coordination in national development plans. They thus support action by some higher level of organisation to establish coherence.

### **What are the properties required of institutional arrangements that are well suited to addressing the SDGs?**

They must be driven by a higher common purpose, e.g., the SDGs, rather than sector based, short term drivers. They must be flexible and participatory, involving all the relevant stakeholders that have expertise to bring to bear, which will bring new actors into the system. They need to be more flexible than in the past, adapting quickly to changing needs and new information. They must be able to work effectively across pillars or silos. They must be open and transparent so progress towards achieving the SDGs can be monitored and evaluated. They must provide a place for safe discussions and piloting solutions. They must be able to communicate effectively the benefits of meeting the SDGs and to move beyond empire building to partnerships for impact.

But it is not possible to simply replace all the current institutions, so what are the options? Reform of current institutions can and should happen but new institutions and mechanisms that are more fit for purpose will also be required. Understanding which approach is needed contextually is an important task.

### **So how do we get from the institutions and governance arrangements we have to those that we need?**

- There needs to be a clear demonstration of the value proposition of a coherent approach to delivering the SDGs.
- Focused multi-stakeholder fora need to be established at national and other levels
- Integrated national development plans and consequent integrated oversight ministries are one important approach at a national level.
- Helping institutions re-frame their goals (e.g. through their place in the SDGs) is important.
- Mechanisms for popularising, tracking and reporting on the SDGs need to be developed with good examples of success.
- Need to be realistic about and address power relations, for example the power of multinational companies, and develop incentives for some players to give up their power

### **5.2.3 Tools**

SDGs are inherently complex requiring tools to simplify them to aid its achievement. Tools can allow us to see the whole picture, ensure feasibility of implementation, help set priorities, and help us to grapple with complex issues.

The challenge is that there is a proliferation and overload of tools. Examples include scenario-based tools, conceptual frameworks, guidelines, visual tools, codes of conduct, sharing platforms, models, tools for checking mainstream systems, methodologies for analysis and assessment, learning networks, business tools as well as communication tools such as social media. Policy instruments such as legal, financial, market-based, educational and policy documents can also be considered tools. Furthermore, there is a lack of sharing of tools resulting in recreating the wheel all the time, which in turns, further

worsens the problem of having too many tools.

In order to address this challenge, there needs to be clear concept of tools in the context of facilitating a process towards sustainable development and addressing SDG interlinkages. Lessons from transdisciplinary research provide approaches to cluster the different types of tools required to address complex issues. It requires encompassing three types of knowledge - systems knowledge, target knowledge and transformational knowledge.

### **Systems Knowledge**

Systems knowledge describes how the system works. This is largely based on empirical evidence and provides information of the state of things, for example the state of environment. Understanding the system will also help to problematize the issue. For example, studies on the rate of biodiversity loss allows for the understanding that biodiversity loss has been accelerating for the past 50 years. Hence, systems knowledge allows the identification of what is the problem or issue at hand. Examples include the various methodologies for monitoring and evaluation as well as mapping of SDG interactions (such as the ICSU framework) as well as tools to understand drivers of change.

### **Target Knowledge**

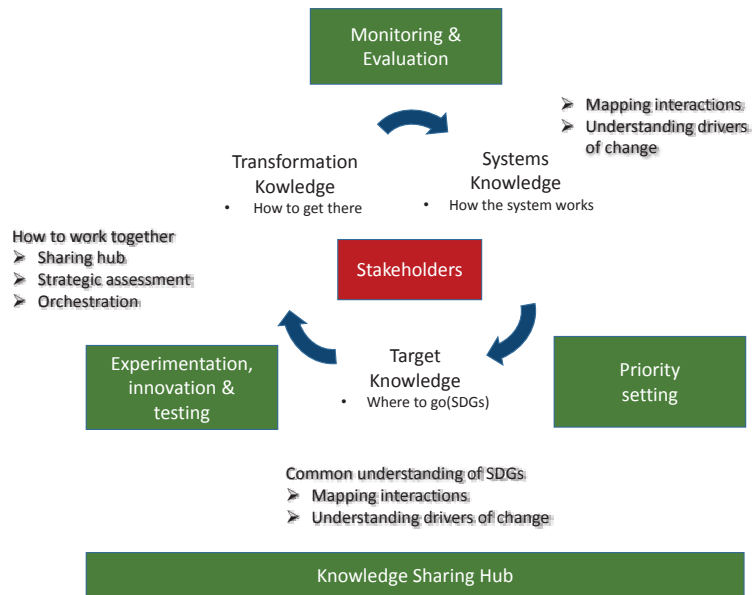
Target knowledge helps you understand where you want to go (from where you currently are). While knowledge achieved in systems knowledge helps identify the problem, it lacks the purposive aspect in understanding what are the better practices that are available. While the investigation of targets relies heavily on systems knowledge, it also requires taking into consideration practices of actors into account in understanding what are the desirable practices. In the context of the SDGs, this includes tools that build a common understanding of the SDGs such as platforms and online tools.

### **Transformation knowledge**

Transformation knowledge allows us to understand how you are going to where you want to go. Tools to help understand how existing practices can be changed must take into account both the target knowledge and systems knowledge. This requires normative and pragmatic level tools that can analyse possible transformative pathways. Examples include the scenario analyses tools such as the World in 2050 which allows for understanding the transformative pathways and its potential impacts. Tools to help orchestrate change is also another example where behavioral change can be affected.

Figure 3 demonstrates the relationship between the three types of knowledge. Beyond the tools that can be clustered into the three areas, many types of tools also intersect between them. For example, intersecting across systems knowledge and target knowledge are priority setting tools which requires understanding of targets and the current state of play. Monitoring and evaluation intersects both transformation knowledge and systems knowledge with the need to understand how to get there before monitoring the state of play. Experimentation, innovation & testing is often required as a learning by doing method before we achieve the knowledge of how to get there, intersecting between target knowledge and transformation knowledge. On top of that, a knowledge sharing hub encompasses all the types of knowledge as repository that can be accessed by all stakeholders.

Figure 3 Framework for organizing tools for synergistic interlinkages



#### 5.2.4 Capacity Building

Enhancing capacity to meet sustainability targets and ultimately to fulfill the SDGs themselves will require a concerted effort to overcome reductionist approaches to knowledge and the institutional fragmentation that reductionism engenders at many levels and in many settings. The resultant challenge is not limited to the traditional focus of strengthening the capacity of small or developing countries to participate effectively in international governance agreements. Overcoming institutional fragmentation is a critical challenge for advanced industrial societies as well.

Three factors make this challenge particularly critical under current conditions. First, what is now known as the Great Acceleration starting during the second half of the 20th century has produced a situation in which human actions are driving forces at a planetary scale and made the need to understand the dynamics of socio ecological systems a critical priority. In addition, rapid advances in knowledge in areas ranging from artificial intelligence through genetic programming, synthetic biology, and geoengineering are increasing the capacity of humans manipulate biophysical systems, a development that introduces a need for ethical principles and codes of conduct designed to ensure that new knowledge is used for appropriate purposes. A major consequence of these developments is the rise of increasingly complex systems characterized by high levels of connectivity, the prominence of nonlinear patterns of change, and the importance of emergent properties. All three factors highlight the importance both of the complexity of individual goals and of (often unintended) interactions among the SDGs. Together, they increase the importance of strengthening capacity to think in systemic terms among practitioners and analysts alike.

In the context of inter-linkages there is a need to recognise complexity through understanding the relationship between things in general, and the benefits to come from SDGs by addressing the interactions that are relevant to achieve them. Enhancing capacity to understand these systemic

processes and to steer them in a fashion needed to fulfill the SDGs will require adjustments in a wide range of institutions:

#### **Educational institutions**

The key to educational reform is to alleviate reductionism leading to an intense focus on relatively narrow topics and a lack of concern for the linkages that constitute a prominent feature of complex systems. This challenge arises at all levels from early childhood education to advanced training in business schools and medical schools. Addressing this concern must include curricular innovation both to integrate the natural and social sciences and to introduce an appreciation of humanistic concerns (e.g. values, ethics, and norms regarding the place of humans in the Earth system). Achieving success in this effort will require in turn a restructuring of educational organizations and of the incentive structures that are associated with the existing compartmentalization of these organizations.

#### **Scientific institutions**

Institutions at the national level (e.g. national academies of sciences) and the international level (e.g. the International Council of Science) need to play a prominent role both in reframing the research agenda and in building relations of trust between the producers of scientific knowledge and the users of that knowledge. While policymakers respond to numerous considerations in arriving at final choices about matters of importance to society, there is no substitute for evidence-based assessment of policy options. Scientific institutions can help to synthesize existing knowledge to highlight its relevance to current policy concerns and to clarify the nature and magnitude of remaining uncertainties. There is a need as well to frame research agendas with the concerns of policymakers in mind.

#### **Financial and corporate institutions**

Those who make investment decisions regarding large scale projects and control the flow of capital to new initiatives often fail to pay sufficient attention to the (often unintended and sometimes unforeseen) side effects of these activities, not to mention the longer term consequences affecting society as a whole. Particular gaps relate to the effects of new projects on ecosystem services that are hard to measure and that often affect the wellbeing of broader publics rather than those who stand to benefit directly from the initiation of new projects (e.g. investors and shareholders in the relevant corporations). One possible way forward regarding this problem would be to require environmental impact assessments (EIAs) for major private investments of a sort that are similar to those required for major public actions.

#### **Political institutions**

There is a need to strengthen capacity to address issues like the SDGs in political institutions all the way from the local level to the global level. Sometimes this is a matter of interagency coordination or even reorganization to alleviate the compartmentalization that produces tunnel vision and a lack of concern for broader systemic impacts of public actions. An additional problem concerns time horizons, since political decisionmaking typically operates on a short cycle (e.g. two-four years) that leads to a lack of attention to longer term matters of the sort emphasized in the SDGs.

#### **Civil society institutions**

There is also a need to empower actors in civil society not only by providing points of entry for NGOs into political processes but also by enhancing the capacity of these organizations to understand the linkages among individual elements of complex systems. One way forward would be to provide training for the leaders of NGOs to enhance their awareness of the interactions among issues and to strengthen their ability to direct their efforts toward the fulfillment of relevant SDGs.

Given the status of the SDGs as an initiative of the United Nations, a topic of particular interest

regarding the capacity needed to fulfill the SDGs concerns the reform of international organizational arrangements. The creation of the High Level Policy Forum (HLPF) is an opportunity. But the creation of this forum alone will not solve the problem of enhancing institutionalized capacity to address the SDGs and specifically to recognize the interactions among them. In this connection, it is worth considering the creation of an Intergovernmental Panel on Sustainable Development (IPSD) that would play a role similar to IPCC or IPBES in evaluating and distilling relevant knowledge or even the negotiation of a UN Framework Convention on Sustainable Development that would serve as a clearinghouse for knowledge relating to the fulfillment of the SDGs. A UNFCSO in particular might provide a constitutive foundation that would prioritize strengthening capacity as one of the essential building blocks for an effective effort to make progress toward fulfilling the SDGs over time.

### 5.3 KEY CONCEPTS HARVESTED IN INTERACTIVE & BREAKOUT SESSIONS

In developing a research-action framework for securing effective implementation of actions to attain the SDG targets, participants of the workshop were asked to identify key concepts towards this aim. The four building blocks and the key concepts highlighted by participants are highlighted below along with the key concepts illustrated through word clouds based on post it notes by participants on what is perceived to be the most crucial elements as key concepts in the framework.

#### 5.3.1 Stakeholder

Stakeholders can be distinguished between those who have stakes (are affected) and those who have agency. Their identities need not be tied to nation states or specific issues where ownership can be broadened trans-nationally and across scales. The UN major groups have substantial and structural flaws but is an existing system for stakeholder engagement. In some cases, and value systems, nature is also considered a stakeholder. The scientific community plays a crucial role, with the need to strengthen the GSDR panel and/or better designing of science panels proposed.

In addressing inter-linkages, methodologies to identify stakeholders, and in accordance with the theory of change, those who are particularly with agency on addressing interlinkages should be established. How to institutionalise a space for people to empower action on SDGs and its interactions should be considered. There is a need for mapping of stakeholders at various levels and contexts. In overcoming silos, how to incentivise stakeholders to address areas beyond their mandate deserves attention. Access and the right to information, including a transparent monitoring and reporting system on inter-linkages can facilitate participation. This includes exploring the establishment of a platform to promote citizen science.

*Figure 4 Word cloud in relation to discussions on stakeholders*



### 5.3.2 Action Coherence

Action coherence is broader than institutional coherence as it goes beyond institutions. Conventional governance structures aren't able to keep up with the pace of change. The pathway from the current scenario to a desirable future requires interventions that support action coherence to achieve the SDGs. Steering a systems change, an integrated approach that addresses multiple factors require cross scale interactions among issues, stakeholders, policy domains and levels. This must take into consideration that coherence require collaboration and partnership in an entire system based on competition.

There is need to understand how to forge commonalities between policy communities. The mechanisms of how emergent logic in policy communities who share ideas about the connectivity on different issues on the policy landscape should be understood. Beyond government, coherence amongst target audiences such as multinational corporations along with the possible interventions to involve them. Clear identification and alignment of benefits, such as, through cost benefit analyses and mapping should be demonstrated. Establishing shared narratives, vision and values with SDGs as a social contract should also take place. The proper and actual role of science panels to explain consequences of action should be investigated.

Figure 5 Word cloud relevant to discussions on action coherence



### 5.3.3 Tools

SDGs are inherently complex requiring tools to simplify them to aid its achievement. Tools can allow to see the whole picture, ensure feasibility of implementation, help set priorities, act as an equalizer, easy to implement, accessible and universal, and able to grapple with complex issues but usable by non experts. It can be used to create narratives and discourse.

Examples include scenario-based tools, conceptual frameworks, guidelines, visual tools, codes of conduct, sharing platforms, models, Tools for checking mainstream systems, methodologies for analysis and assessment, learning networks, business tools as well as communication tools such as social media. Policy instruments such as legal, financial, market-based, educational and policy documents can also be considered tools.

Challenges include the lack of sharing of tools resulting in recreating the wheel all the time, which in turns, creates a proliferation and overload of tools. Tools must also be adapted to the audience with its use to be guided.



Figure 6 Word cloud based on discussions on tools



### 5.3.4 Capacity Building

In the context of interlinkages there is a need to recognise complexity through understanding the relationship between things in general, and the benefits to come from SDGs by addressing the interactions that are relevant to achieve them. A narrative for a new social contract that goes beyond individual benefits towards collective benefits should be promoted to build appetite for contextually relevant action. Education may include both early education, action learning and life-long learning. Capacity building ‘of whom’ and ‘for what’ were identified. Key stakeholders include the next generation, civil society organisations, the scientific community, policymakers, and the private sector amongst many.

Examples of capacity building include (but not limited to) systems thinking, learning how to facilitate wide system change, networking abilities, training of trainers, and training for international development. In its implementation, there is a need to find ways to create multi-stakeholder demand for capacity building and not be dependent on government funding.

Figure 7 Word cloud relevant to discussions on capacity building



## 6 Summary

Adopting a co-design and co-production philosophy in conducting the workshop, scholars and practitioners relevant to the SDGs and addressing interlinkages from various backgrounds and disciplines came together with the aim of producing a research-action framework for securing effective implementation of actions to attain the SDG targets. Four building blocks emerged as the key elements to address interlinkages – stakeholders, action coherence, tools and capacity building.

Stakeholders address issues of agency, where the question of who can catalyse the changes as well as who are impacted being discussed. At the UN level, the HLPF, in particular, was highlighted as playing a key role as orchestrator of orchestrators, though institutional reform was suggested to take place in order for it to be effective. The role of scientists and bridging the science-policy interface was also highlighted with the GSDR providing an opportunity and entry point for scientific input. With action at the centre of the framework, the role of the private sector must also be taken into consideration as a key stakeholder to address interlinkages.

Action coherence emerged as a guiding principle to manage the diverse and complex interactions between SDG goals and targets. Calling for a joined-up approach, solutions to maximize potential synergies and minimize potential negative interactions sit at the heart of the framework and discussions. Ultimately, there needs to be a shift from merely understanding what the interlinkages are and have a clear value proposition communicated to the key stakeholders and those with agency.

Both tools and capacity building were highlighted as key mechanisms to both understand interlinkages as well as affecting behavioural change as transformative pathways towards SDGs. With an overload of tools currently available, there is a need to both identify the types of tools required and a knowledge hub that acts as a repository to disseminate these tools. An organizing framework was proposed in the discussions towards this end. In terms of capacity building, enhancing the understanding of the complex and systemic nature of the challenges is required. Reform is required not only in educational institutions but also scientific, financial and corporate, political and civil society institutions.

These building blocks can act as guidance to address interlinkages and interactions amongst SDGs. A checklist of key concepts over the duration of the workshop are summarized in the table below: -

PRINCIPLES TO ENABLE ACTION COHERENCE
Backcasting
✓ Integrated approach that addresses multiple factors
There needs to be a clear demonstration of the value proposition of a coherent approach to delivering the SDGs
✓ Long-term thinking
✓ Game change (rules of the game)
Participatory decision-making
✓ Bring new actors
✓ Co-design and new community creation (e.g. Future Earth)
✓ Legitimacy and definition on who should be involved
Adaptive governance
MECHANISMS FOR BEHAVIOURAL CHANGE
Systems to redistribute power relations
✓ Integrated national development plans and consequent integrated oversight ministries are

one important approach at a national level
✓ Helping institutions re-frame their goals (e.g. through their place in the SDGs) is important
✓ Need to be realistic about and address power relations, for example the power of multi-national companies, and develop incentives for some players to give up their power
✓ Focused multi-stakeholder fora need to be established at national and other levels
✓ Stakeholder-driven priority setting
✓ Enhance ability to create successful multi-stakeholder processes
Learning skills on facilitating stakeholders
Budget rules aligned with the SDGs
✓ Financial tools
Non-state market based tools
✓ Certification schemes
✓ Standard-setting
✓ Code of conduct
✓ Business sector tools including templates of SDGs planning for industry
✓ Other incentives
Communication tools
✓ Communicating success stories and best practices
✓ Establish shared and localized narratives
✓ Visual tools and online platform
New design of science panels
✓ Enhance SPI by regional network of scientists and building research communities in DCs
✓ Tools for adaptive governance
✓ Enhance adaptive capacity of institutions
✓ Learning by doing
✓ Learning network
✓ Promotion of citizen science (and its platform)
✓ [some major groups work effectively at HLPF]
Monitoring and evaluation
✓ Sustainability reporting
✓ Data sharing
✓ Transparency of data
✓ Mechanisms for popularising, tracking and reporting on the SDGs need to be developed with good examples of success
Scenarios and models
Integrated cost-benefit analysis (not just about economic costs)
✓ SDGs education
✓ Civil society awareness
✓ Skills of system thinking
<b>AGENCIES FOR CHANGE</b>
Nature
Review UN major groups
Local stakeholders
Private sector
National government in coordinating stakeholders

Beyond the four building blocks, there is a need to recognize the multi-level nature of the challenge of addressing interlinkages. Examples demonstrated that context matters and implementation will largely be undertaken at the national and local levels. Any framework must be cognizant of addressing this issue of scale and ensuring that it can be translated into various levels.

Participants agreed to continue the discussions on developing a research-action framework to secure effective implementation of the SDGs with a journal entry and research fund proposal targeted to be finalised before the High Level Political Forum in July 2017.

## Annexe I – List of participants of the Workshop

	First Name	Family Name	Organization	Position
<b>Researchers</b>				
1	Tanya	Abrahamse	South African National Biodiversity Institute	Chief Executive Officer
2	Albrecht	Ehrensperger	University of Bern	Head of Cluster Socio-Economic Transitions
3	Rajae	El Aouad	Hassan II Academy of Science and Technology. Morocco	Resident Member, Professor
4	Eeva	Furman	Finnish Environment Institute	Director of the centre, Professor
5	Peter	M Haas	University of Massachusetts Amherst	Professor
6	Rak	Kim	Utrecht University	Assistant professor
7	Nebojsa	Nakicenovic	International Institute for Applied Systems Analysis (IIASA)	Deputy Director General and Deputy CEO
8	Paul	Shrivastava	Concordia University	Professor
9	Mark	Stafford-Smith	CSIRO	Chief Coordinating Scientist
10	Anne	Sophie Stevance	International Council for Science (ICSU)	Science Officer
11	Oran	Young	University of California	Professor Emeritus
12	Ruben	Zondervan	Earth System Governance Project	Executive director
<b>UN organizations</b>				
1	Lis Mullin	Bernhardt	United Nations Environment Programme (UNEP)	Programme Officer
2	Ran	Kim	United Nations Department of Economic and Social Affairs (UN-DESA)	Governance and public administration officer
3	David	Le Blanc	United Nations Department of Economic and Social Affairs (UN-DESA)	Senior Sustainable Development Officer
4	Lucy	Mungai	United Nations Environment Programme (UNEP)	Civil Society Support-Legal
5	Aneta	Nikolova	UN ESCAP	Environment Affairs Officer

6	Alex	Roehrl	United Nations Department of Economic and Social Affairs (UN-DESA)	Senior Economic Affairs Officer
<b>Stakeholders</b>				
1	Steve	Waddell	NetworkingAction	Principal
2	Farooq	Ullah	Stakeholder Forum for a Sustainable Future	Director
<b>Governments</b>				
1	Csaba	Kőrösi	Office of the President of the Republic of Hungary	Director
<b>Organiser: Keio GESL and Future Earth</b>				
1	Wendy	Broadgate	Future Earth -Sweden	Global hub director
2	Dave	Griggs	Monash University/ Future Earth	Professor
3	Norichika	Kanie	Keio University/ Future Earth	Professor
4	Eri	Aoki	Keio University/ Future Earth	Project research associate
5	Wanglin	Yan	Keio University	Professor
6	Shiori	Sasaki	Keio University	Project Associate Professor
7	Kanako	Morita	Keio University/ Forestry and Forest Products Research Institute	Project Assistant Professor, Senior Researcher
8	Mari	Kosaka	Keio University	Project Assistant Professor
<b>Early careers: GESL students</b>				
1	Chalisa	Veesommai	Keio University	GESL student
2	Takuma	Nozawa	Keio University	GESL student
3	Ahmad	Muzaffar bin Baharudin	Keio University	GESL student
4	Irene	Erlyn Rachmawan	Keio University	GESL student
5	Vuk	Radovic	Keio University	GESL student
6	Alizan	Mahadi	Keio University	GESL student

7	Seinan	Saku	Keio University	GESL student
8	Jinmika	Wijitdechakul	Keio University	GESL student
9	Megumi	Wada	Keio University	GESL student

# Annexe II – GESL Student Poster and Presentations

## 6.1.1 Alizan Mahadi Poster Presentation

### Framework for Implementing National level Inter-linkages through the SDGs: Review of tools to link the drivers and benefits of Forest Cover in Malaysia

Alizan Mahadi  
Global Environment System Leaders (GESL), Keio University

#### INTRODUCTION

To address inter-linkages in social-ecological systems, an increasingly complex adaptive system, many solutions in science and society studies have obtained the need to not only expand cross knowledge, but also produce cross-usable knowledge (Clark et al., 2016; Clark & Holtkamp, 2006; Jordan, 2010; Lamp et al., 2012). Yet, much knowledge alone is proven to be insufficient for cooperation or coordination where implementation will require effective institutions (Hans, 2004). This review and application of tools to address inter-linkages is then divided into three main knowledge for identifying inter-linkages through policy concerns, tools and scientific tools, and institutional arrangements that to implement inter-linkages. The following tools demonstrate possible ways in an approach to address inter-linkages.

#### Usable Knowledge: Seeking of Interactions as a policy coherence tool

Mappling of interactions: Critical issue study can be identified through issue mapping and network analysis where the strength of the interlinkages can be visualized by the thickness of the line. The degree of the higher degree in other nodes, the most interconnected nodes (based on number of edges) are calculated with the higher degree in other nodes.

#### Usable Knowledge: Issue Mapping to Identify Inter-linkages

From Climate Resilience Review

#### Usable Knowledge: Identification of Strongly Inter-linked Sectors

Results: The results demonstrate that 1) Forest cover (85.34%), increases positively (both in driver and providing benefits) to a large number of target sectors and 3) clusters of strongly inter-linked nodes can be identified, for example linkages with water, soil, climate change and governance. Forest Climate Resilience and Linkage with water and agriculture.

#### Usable Knowledge: Basic scientific tools and data

From Monitoring Data

Forest - Climate Data

Forest Statistics

Year	Forest cover (%)	Forest area (ha)	Forest area (km²)
1980	70	1,000,000	100,000
1985	75	1,200,000	120,000
1990	80	1,400,000	140,000
1995	82	1,500,000	150,000
2000	84	1,600,000	160,000
2005	85	1,700,000	170,000
2010	85	1,800,000	180,000

#### Institutional Coordination Mechanisms: Review of mainstreaming biodiversity conservation in Malaysia

Cognitive level of intervention: The National Policy on Biodiversity Conservation (NBP) 2016-2025 with the goal to "protect, conserve and enhance the conservation of all biodiversity to ensure biodiversity's" benefits focus on mainstreaming. In 2008, A Common Vision on Biodiversity" was produced with the aim to support the "top-down" implementation of environmental planning and management from a largely sector-based to an integrated holistic approach" (NBP, 2016).

Institutional level of intervention: A national steering committee set up a coordinating platform with stakeholders from the National Biodiversity Research Centre (NBRC) as the science-policy interface. The steering committee provides a good starting point for policy coordination, however, while the institutional hardware and formal structure are established, the institutional software, adding with the informal discourse and processes require further understanding (Przyrak 1996; Connor and Dwyer 2004).

Political level of intervention: With the Deputy Prime Minister chairing the National Biodiversity Council (NBC) and that it is a high minister under the coordination. However, the federal government remains power over central provisions for forest and forestry of which has resulted in federal-state tensions (Khalidulnabi/Wells 2001).

#### Conclusion and Research Proposal

1. Forest Climate Resilience Review: Investigate the national level inter-linkages between forest-climate resilience

2. Dynamics of inter-linkages at the national level for SDGs implementation: Investigate the social network's analysis (SNA) to study the inter-linkages which indicate opportunities on the role of experts and operators communities in addressing inter-linkages at the national level.



## 6.1.2 Chalisee Veksommai Poster Presentation

### Synergistic inter-linkages for SDGs implementation: Mapping The Water Sanitation for Sustainable Water-use

Figure 1. The mapping of interaction

### Visualizing Interactions through the 5D World Map: Tradeoffs of Increasing agricultural productivity with biodiversity and water-quality parameters in tropical countries

Figure 2. The water-quality of Palm oil plantation Sungai river, Malaysia

Figure 3. The water-quality of Palm oil plantation in Indonesia

### Outline

Figure 4. The water pollution cycle

### Scientific Tools

Figure 5. Architecture of system

### Concept of 5D World Map System

Figure 6. Concept of 5D World Map System

### Conclusion and Research Proposal

- To make a possible way of the **analyzed results by integrating** the special knowledge resources in **environmental analysis and semantic computing** for creating the new analysis system in water quality field
- To **outline and demonstrate** the historical data and trend of **water sanitation condition and, cause and effect relationship with other targets**
- To propose the tools as **5D World Map System and rSPA processes for analyze and investigation the environmental conditions** as a water sanitation

**Keio University**  
Global Environmental System Leaders Program  
Yeekommai Chalisea (Ph.D. candidate)  
Email: chal-h@nmail.com, chaliae@stc.keio.ac.jp

A lot of analytical results exist in the field of water-quality, but these results are difficult for ordinary people to grasp due to the too scientific expression. This research has proposed a **new river water-quality system** to realize the SPA process and analysis of multiple water-quality parameters for interpreting water resource conditions.

### 6.1.3 Jinmika Wijitdechakul Poster Presentation



**Synergetic Inter-linkages for national SDGs implementation :  
"Knowledge-Based Sharing Platform for Sustainable Food Production : Supporting and Monitoring System for Women Farmers"**

Jinmika Wijitdechakul, Master and Year, Graduate School of Media and Governance, Keio University, Japan

**The Inter-linkages of SDGs on Agricultural Sustainability**



**Agriculture Across the SDGs**  
 Realizing the SDG targets is possible without a strong and sustainable agricultural sector.  
 Hence, focus has to shift to support the agricultural sector.  
 (Adapted from FAO, 2016)

**Research Proposal : The Smart Mama Farming**



**Expected Outcome**

To provide the technology and information to improve quality, increase crop and animal output.

To integrate the collaboration among local farmers, state and national government and research institutions for achieving the sustainable agriculture.

To support the women farmer on food production process and acquire the actual data from them.

**Major Research : UAV-Based Multispectral Imaging and Semantic Computing for Agricultural Analysis**



This study presents a new system of environmental monitoring by combining multispectral imaging analysis and semantic computing for agricultural condition monitoring. Specifically, we propose a method to realize the interpretation of agricultural health conditions as the automatic human-level interpretation by using a 4-dimensional multispectral semantic image space.

The proposed system of the agricultural monitoring model consists of: (1) Multispectral semantic image space creation with environmental indices that can be analyzed the healthy condition of agriculture and (2) Interpretation model to realize the comprehensive and information from multispectral image. Our proposed system of the interpretation model obtains a condition of agricultural analysis that can be derived from multispectral image and interpreted to the meaningful words.

**5D World Map System : Science and Innovation Tool for Global Farming Analysis**



**5D World Map System**

Agricultural change for solving the environmental problem with the function of farming, promoting and supporting the change in agricultural change. The change is supported in some environmental factors that are related to the change in agricultural change. The change is supported in some environmental factors that are related to the change in agricultural change. The change is supported in some environmental factors that are related to the change in agricultural change.

**Conclusion and Research Proposal**

This research proposal aims to provide the effective knowledge-based during studies to support the sustainable agriculture production that can be achieved through the use of digital agriculture products.

The research finding also aims to provide a change reference on SDG contributions on agriculture to the use of digital agriculture products in the use of digital agriculture products in the use of digital agriculture products.

(1) Change sustainable consumption and production patterns  
 (2) Adapting farming for climate change risks, aims to help farmers reduce or contain climate change risk effects.

**Jinmika Wijitdechakul**  
 Master and Year, Graduate School of Media and Governance, Keio University, Japan  
 Email: jinmika@med.keio.ac.jp

**Keio University**  
Irene Erlyn Wina Rachmawan  
Ph.D Candidate  
Global Environment System Leader  
MSc Program

**Synergetic inter-linkages for national SDGs implementing Environmental System: Observing Deforestation Effects on Soil Degradation in Global Tropical-Forest**

### 1 Inter-linkages Mind Map

**15 UN SDG**

Major research and proposed data sources for tropical forest degradation and deforestation include land and forest degradation, drought and floods, forest degradation, and forest degradation in the world.

Major research and proposed data sources for tropical forest degradation and deforestation include land and forest degradation, drought and floods, forest degradation, and forest degradation in the world.

**Synergetic Inter-linkages to reach SDGs (Goal 15)**

- 13.1 Climate Change
- 11.1 Urbanization
- 12.1 Industrialization
- 15.3 Deforestation Land degradation
- 14.1 Water
- 2.1 Agriculture
- 3.1 Health
- 4.1 Education
- 5.1 Gender Equality
- 6.1 Water
- 7.1 Energy
- 8.1 Economic Growth
- 9.1 Infrastructure
- 10.1 Inequality
- 11.1 Urbanization
- 12.1 Industrialization
- 13.1 Climate Change
- 14.1 Water
- 15.3 Deforestation Land degradation
- 16.1 Pollution
- 17.1 Partnership

**Policy Guidance Tools**

- Scientific Tools
- Policy Guidance Tools
- Stakeholder Tools

**Stakeholder Tools**

- Stakeholder Tools
- Stakeholder Tools
- Stakeholder Tools

### 2 Monitor SDGs Goal 15: Rate, Driver, and Impact

**Tropical deforestation due to**

- 1. Agricultural expansion
- 2. Logging
- 3. Pastoralism
- 4. Mining
- 5. Infrastructure development
- 6. Urban expansion
- 7. Industrialization
- 8. Climate change
- 9. Population growth
- 10. Land use change
- 11. Policy change
- 12. Economic growth
- 13. Urbanization
- 14. Industrialization
- 15. Deforestation
- 16. Land use change
- 17. Population growth
- 18. Economic growth
- 19. Urbanization
- 20. Industrialization
- 21. Deforestation
- 22. Land use change
- 23. Population growth
- 24. Economic growth
- 25. Urbanization
- 26. Industrialization
- 27. Deforestation
- 28. Land use change
- 29. Population growth
- 30. Economic growth
- 31. Urbanization
- 32. Industrialization
- 33. Deforestation
- 34. Land use change
- 35. Population growth
- 36. Economic growth
- 37. Urbanization
- 38. Industrialization
- 39. Deforestation
- 40. Land use change
- 41. Population growth
- 42. Economic growth
- 43. Urbanization
- 44. Industrialization
- 45. Deforestation
- 46. Land use change
- 47. Population growth
- 48. Economic growth
- 49. Urbanization
- 50. Industrialization

**Economic Impact**

- Decreasing GDP
- Policy Change
- Reorientation on forest land-use change

### 3 Research Outline

Deforestation is a big nature issue that can effect directly on human society and way of living. It is still remain as a big enigma on how non-expert people can contribute and monitor the activity of deforestation easily. Indonesia is one of the countries which hosting big area of forest that contribute to all the environmental support on earth, but deforestation massively occurs on forest land. In order to tackle this issue we proposed a new system to present the condition for deforestation after-effect. Deforestation word map system from integrated multi-database will be the expected outcomes of our research.

### 4 Scientific Tools

**3D World Map Concept**

- 3D World Map
- 3D World Map
- 3D World Map

**3D World Map for Deforestation Monitoring**

- 3D World Map
- 3D World Map
- 3D World Map

**Conclusion and Research Proposal**

1. Scientific Tools is one part of synergetic inter-linkage chain, that play a critical role to solve and discover new knowledge or solution for deforestation.
2. To expand the research on deforestation, policy and socio-economics nexus could be added as parameter in this research to bring deep analysis of deforestation.

Ph.D candidate, Irene Erlyn Wina  
erlynwina@keio.ac.jp, ireneerlyn@keio.ac.jp

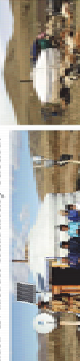
## Creation of Empirical Knowledge using ICT Tools for Sustainable Livestock Husbandry Study Case of Mongolia

**ACTIONABLE ROADMAP TOWARDS SUSTAINABLE LIVESTOCK HUSBANDRY**

**ICT as Tools to create Empirical Knowledge**

### Contextual Issues

Livestock husbandry is a global contributor of socio-economy well-being by ensuring food security nevertheless, highly vulnerable to Climate Change impacts. In Mongolia, massive amounts of livestock die as extreme weather strikes. The amyphate hypothesis of Climate-Livestock mortality alone might be untrue. The fact is, nomadic husbandry culture is still being practice, the uncontrolled number of animals can lead to the degradation of grasslands. How these various factors interact and inter-linked? We proposed a new system for Livestock data aggregation towards creating new empirical knowledge for a sustainable livestock husbandry future.



### Data Aggregation

Potential of Data for Changes

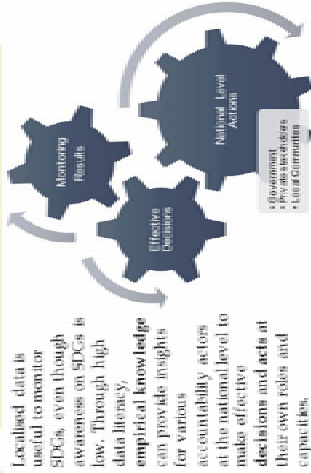
Context of Data	Conditions	Current Sources
• Livestock	• Income opportunities	• Veterinary Survey
• Herd	• Water availability	• Veterinary Agency
• Fertilizer	• Assets	• Satellite

• Public information gaps  
• Data incompatibilities  
• Data fragmentation

• Improve National Decision-Making

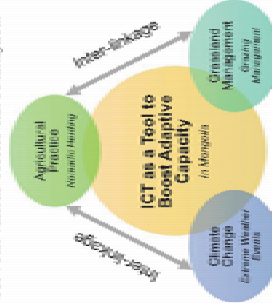
### Decisions & Actions

Localized data is useful to monitor SDGs, even though awareness on SDGs is low. Through high data literacy, empirical knowledge can provide insights for various accountability actors at the national level to make effective decisions and acts at their own roles and capacities.



### Analysis

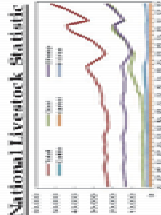
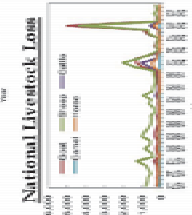
Through measurable parameters and indicators, the inter-linkages between various sectors can be analyzed.



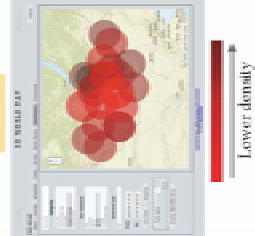
### Conclusion and Research Proposal

Lack of high resolution spatiotemporal data of livestock causes difficulties to analyze inter-linkages within the Livestock-Weather-Grassland nexus towards a measurable analysis. We propose a new digital livestock tracking system, which integrates Wireless Sensor Networks (WSN) and Mobile Communication technology to aggregate high resolution spatiotemporal data of livestock.

### Visualization


### National Livestock Spatial Distribution/Density Mapping 2015



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6.1.6 Vuk Radovic Poster Presentation

## The Application of the Assemblage Theory to Inter-Linkages Model - Case Study Australia

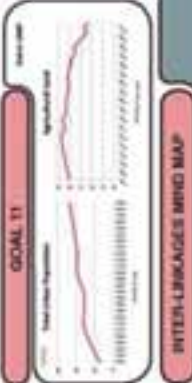


**DATA FOR AUSTRALIA**

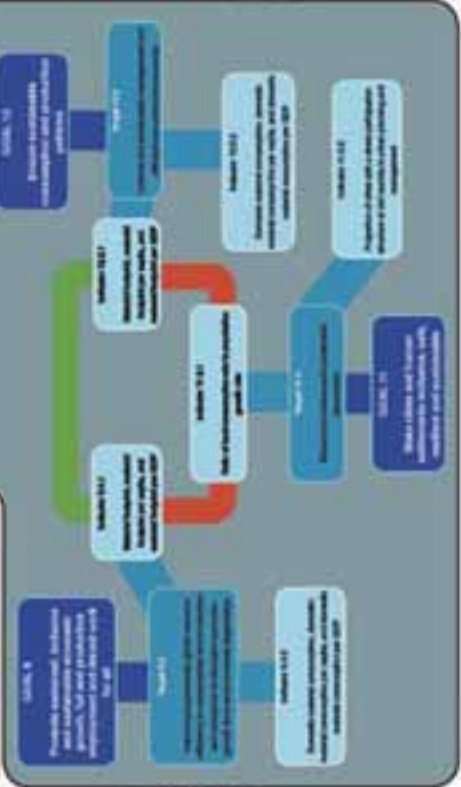
**GOAL 8 & 13**



**GOAL 11**



**INTER-LINKAGES MIND MAP**



**INTRODUCTION**

The Assemblage Theory (AT) is a new perspective on the world and the way things are put together. It is a new way of thinking about the world, one that is based on the idea of assemblages. Assemblages are collections of things that are put together in a particular way. They are not fixed or permanent, but they are always changing. AT is a new way of thinking about the world, one that is based on the idea of assemblages. Assemblages are collections of things that are put together in a particular way. They are not fixed or permanent, but they are always changing. AT is a new way of thinking about the world, one that is based on the idea of assemblages. Assemblages are collections of things that are put together in a particular way. They are not fixed or permanent, but they are always changing.

**APPLICATION**


The AT is a new way of thinking about the world, one that is based on the idea of assemblages. Assemblages are collections of things that are put together in a particular way. They are not fixed or permanent, but they are always changing. AT is a new way of thinking about the world, one that is based on the idea of assemblages. Assemblages are collections of things that are put together in a particular way. They are not fixed or permanent, but they are always changing.

**RESEARCH OBJECTIVE**

The research objective of this study is to explore the application of the AT to the Inter-Linkages Model. The study will explore how the AT can be used to understand the relationships between the different goals and indicators in the model. The study will also explore how the AT can be used to identify the key factors that influence the model's outcomes.

**Vuk Radovic**

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30.03.2017



# Developing Sustainable Society From Material Flow Aspect

## - An International Comparison Study on Municipal Waste Management -


Qiannan Zhuo

This study focuses on Material Flow but pays particularly attention to Municipal Waste Management. The aim of this study is to develop a sustainable society by making a circular Material Flow. This study follows Material Flow under From Input, Production, Consumption to Disposal to obtain a better understanding on Material Flow and its significance to economies. In this study, around 30 countries are selected to be done a comparison to recognize the different conditions of Municipal Waste Management in different countries.

### 1. Input

**12.2**  
By 2030, achieve the sustainable management and efficient use of natural resources

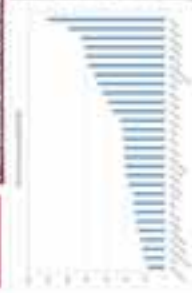
Material Footprint (MF) is a consumption-based indicator to assess raw materials productivity. There is a huge difference from country to country. The reason might be the different industry structure in different countries.



### 2. Production


**8**  
Promote inclusive and sustainable economic growth, employment, and decent work for all

Material Intensity (MI) which calculates from Domestic Material Consumption (DMC) and Gross Domestic Product (GDP) measures technological efficiency. The higher MI means a more efficient use of materials.



### 3. Consumption


Material Rate has a stronger relationship to GDP per Capita more than to GDP. A better environmental situation is higher GDP per Capita (well developed) countries might be the reason causes this result.



### 4. Disposal

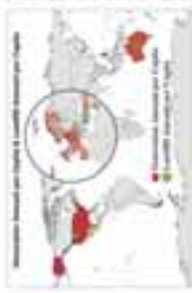
**12**  
By 2030, substantially reduce waste generation through prevention, reduction, recycling and reuse

There is a tendency that higher GDP per Capita countries generate more Municipal Waste than lower GDP per Capita countries. An abundant supply of both production and services can be completed in these countries.



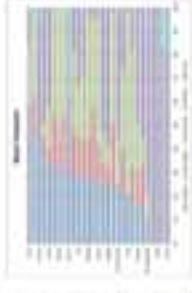
### 5. Waste Generation

Waste Generation per Capita, higher gross point shows more landfill amount per Capita. Usually higher generation leads to a higher landfill area the generation thought to be different.




### 6. Landfill


Landfill Area per Capita, higher gross point shows more landfill amount per Capita. Usually higher generation leads to a higher landfill area the generation thought to be different.




In this study, various indicators are used to evaluate the Material Flow. 4 (GVA, GVA/GDP) use of 17 Sustainable Development Goals (SDGs) mentions about Material Flow or Waste Management which shows the importance of circular Material Flow to build a sustainable society. The result of this study points out some problems. Though developed countries shows a better state than developing countries, there are still lots of room to progress both for developed and developing countries. This time only around 30 countries have been selected as the availability in the certain data for some other countries were not good enough. To have a comprehensive and deeper study, it is necessary to involve more countries next time.



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