# Interactions and Interdependencies of the Sustainable Development Goals: The Role of the Ocean

Hans-Peter Plag
IEEE
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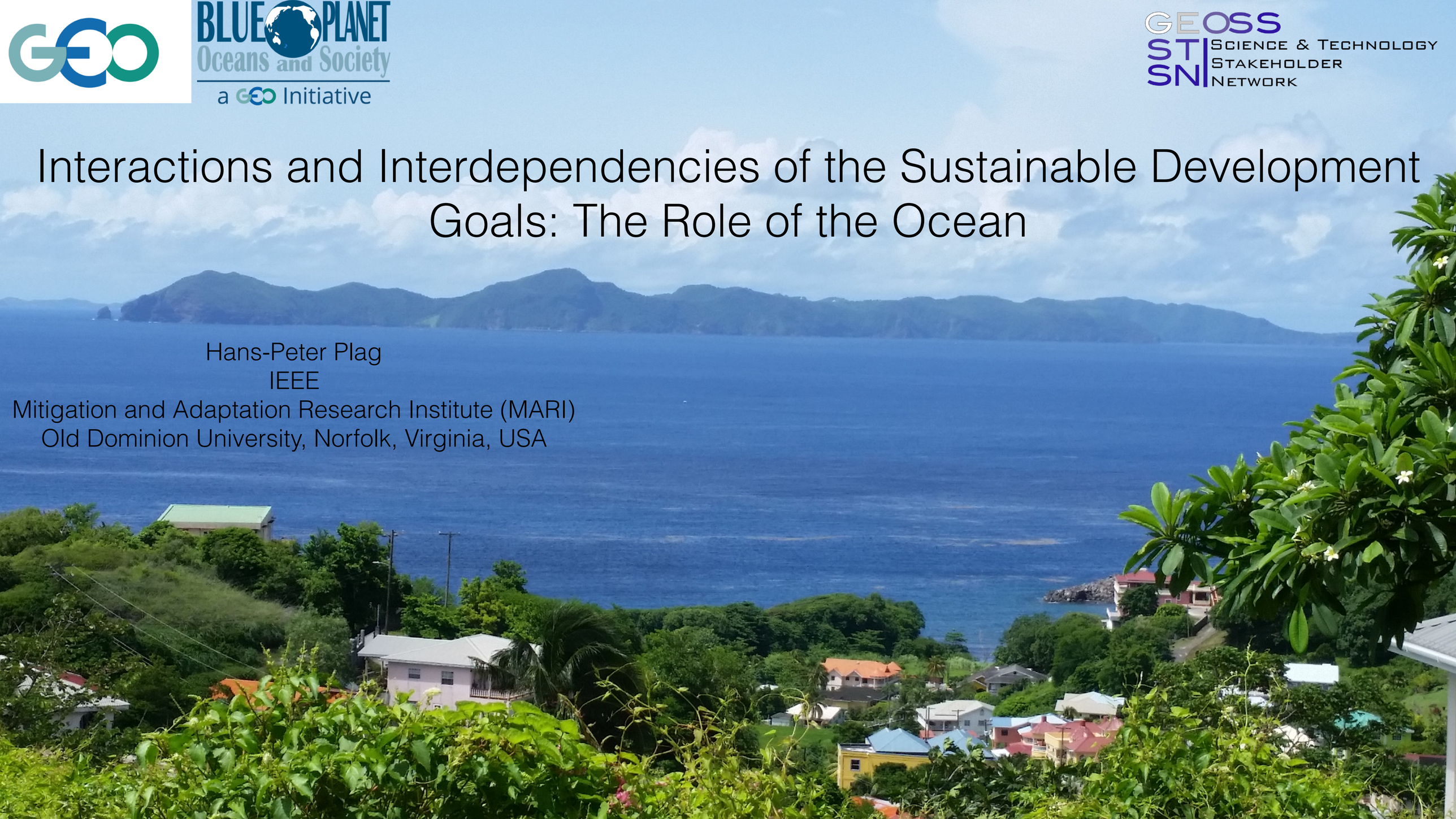
Old Dominion University, Norfolk, Virginia, USA



# Interactions and Interdependencies of the Sustainable Development Goals: The Role of the Ocean

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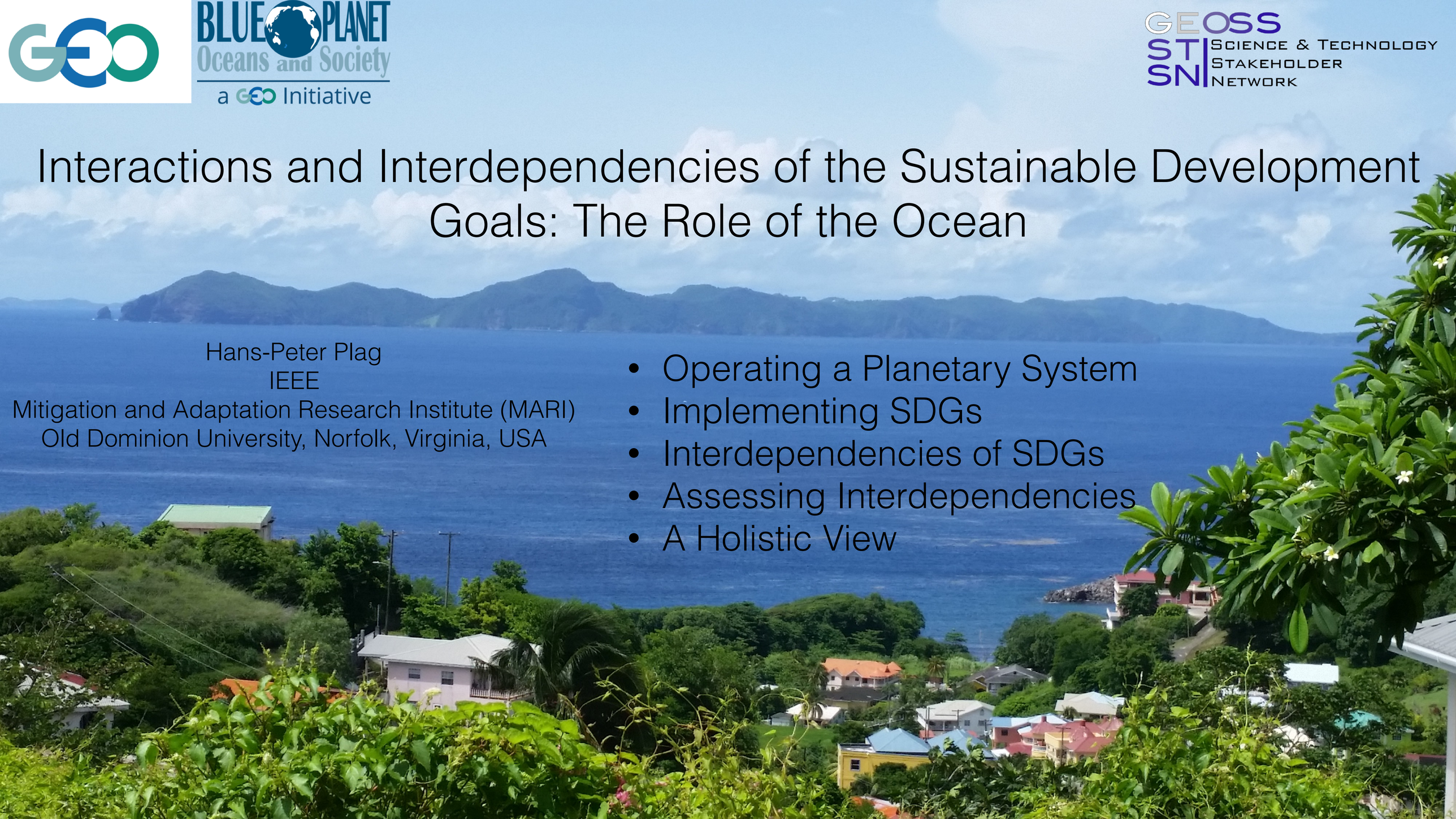
- Operating a Planetary System
- Implementing SDGs
- Interdependencies of SDGs
- Assessing Interdependencies
- A Holistic View



# Operating a Planetary System

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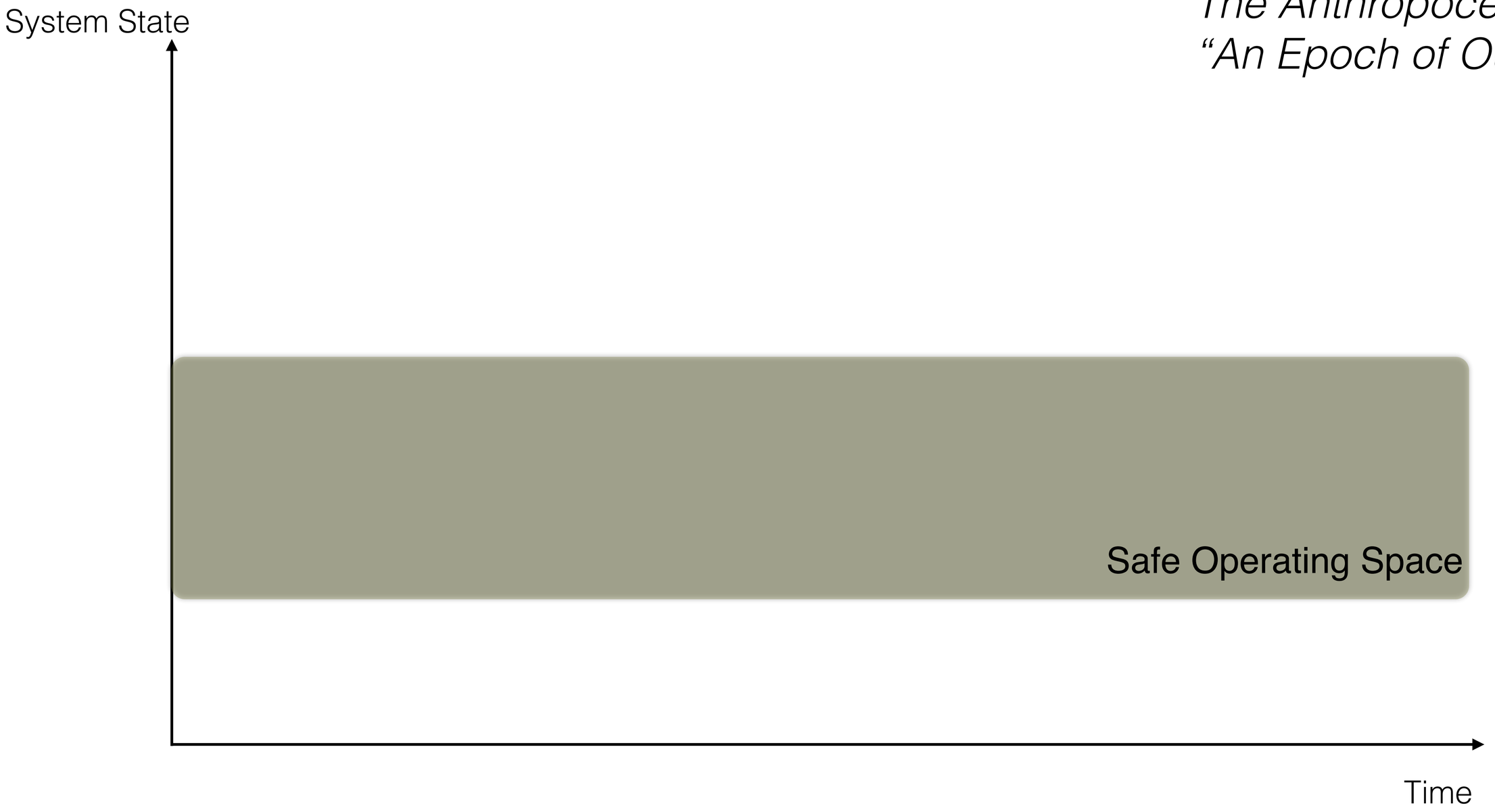
*The Anthropocene*
*"An Epoch of Our Making"*



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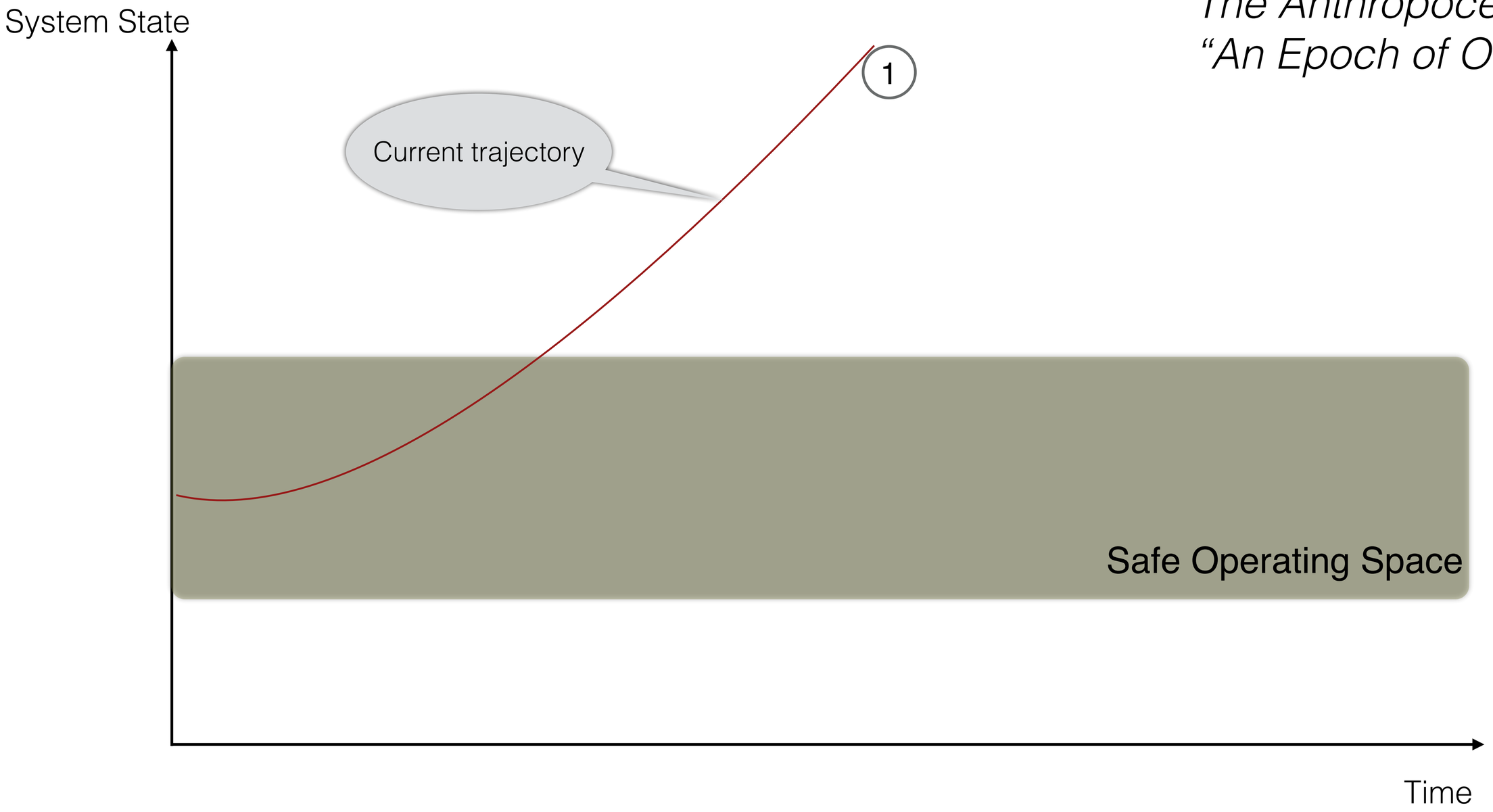

# Operating a Planetary System

*The Anthropocene*
*"An Epoch of Our Making"*

System State

1

Current trajectory

Insects

## A giant insect ecosystem is collapsing due to humans. It's a catastrophe

Insects have triumphed for hundreds of millions of years in every habitat but the ocean. Their success is unparalleled, which makes their disappearance all the more alarming

# Operating a Planetary System

*The Anthropocene*
*"An Epoch of Our Making"*

System State

1

Current trajectory

**Richard Steiner, Contributor**
Professor, conservation biologist (www.oasis-earth.com)

## From Anthropocene To Ecocene By 2050?

10/18/2017 04:56 pm ET | **Updated** 2 hours ago

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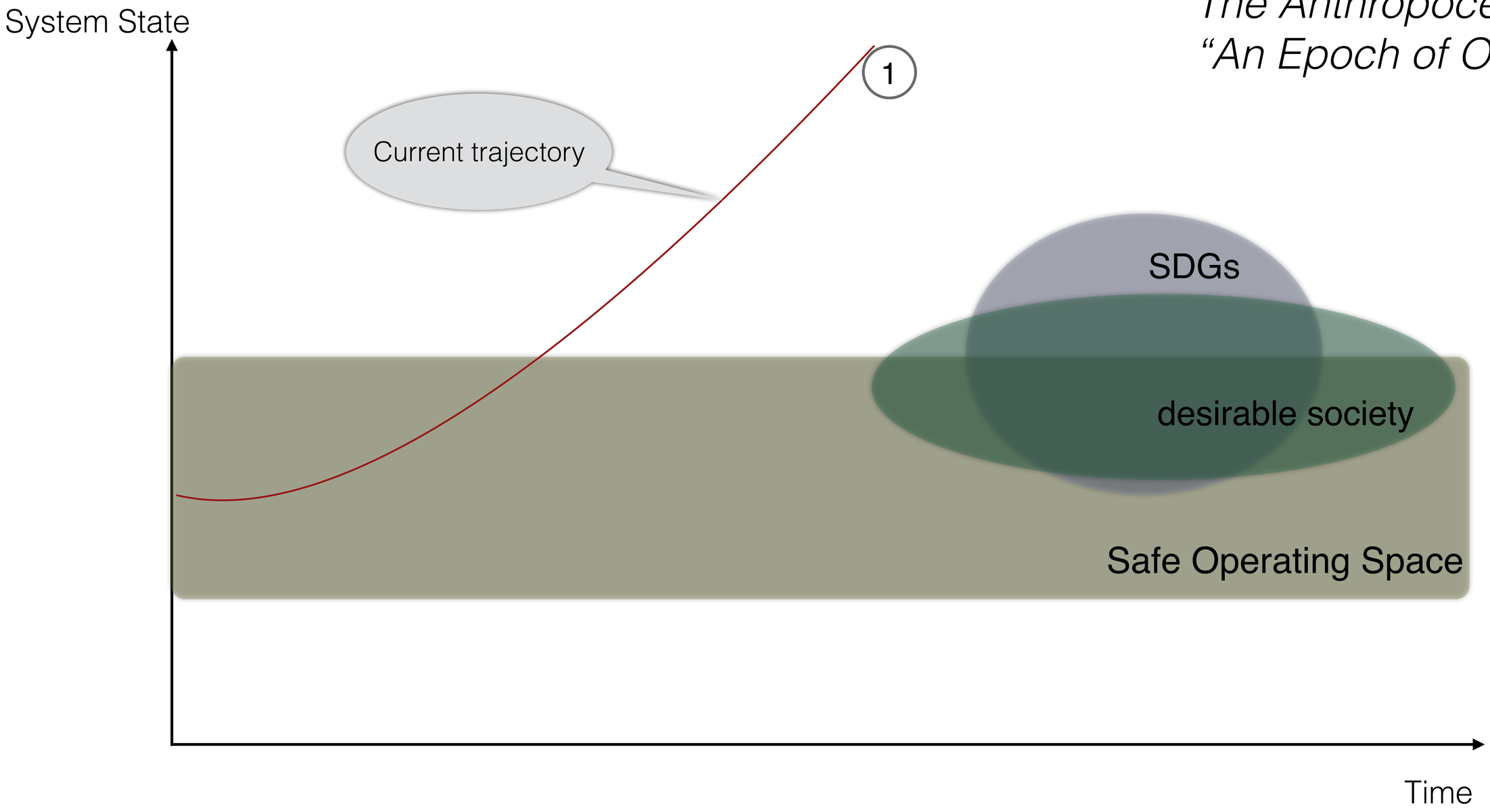

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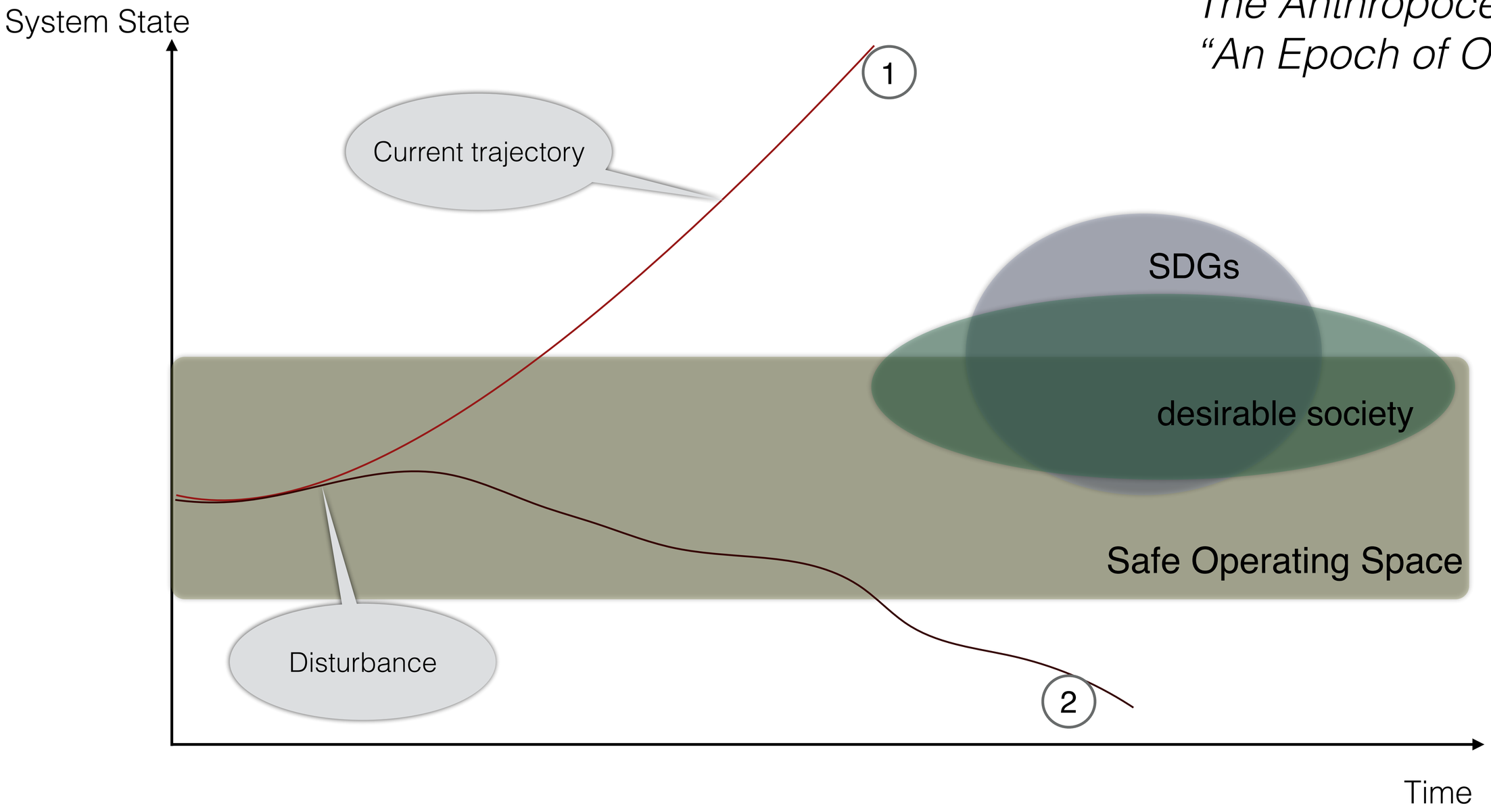

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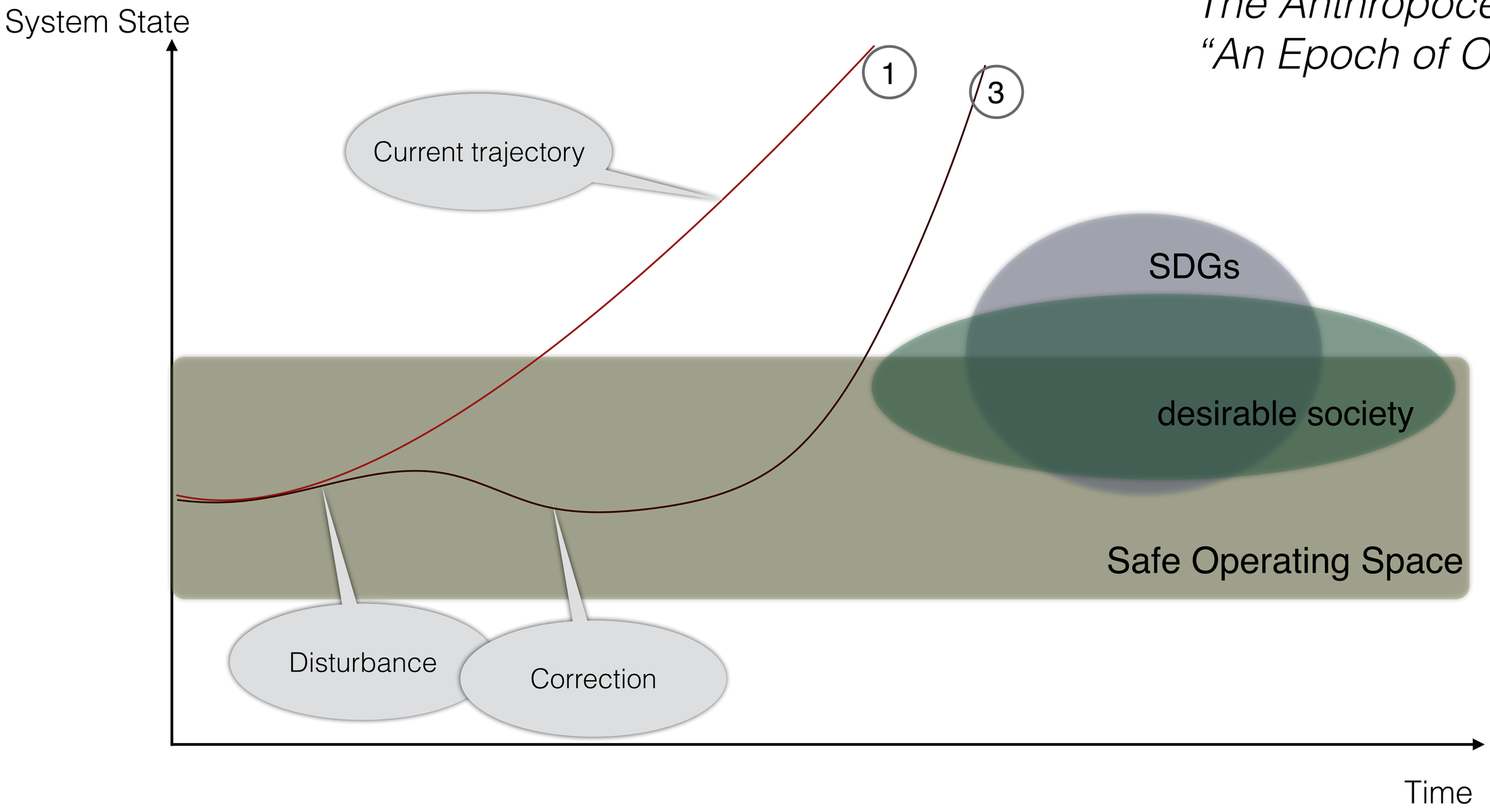

# Operating a Planetary System

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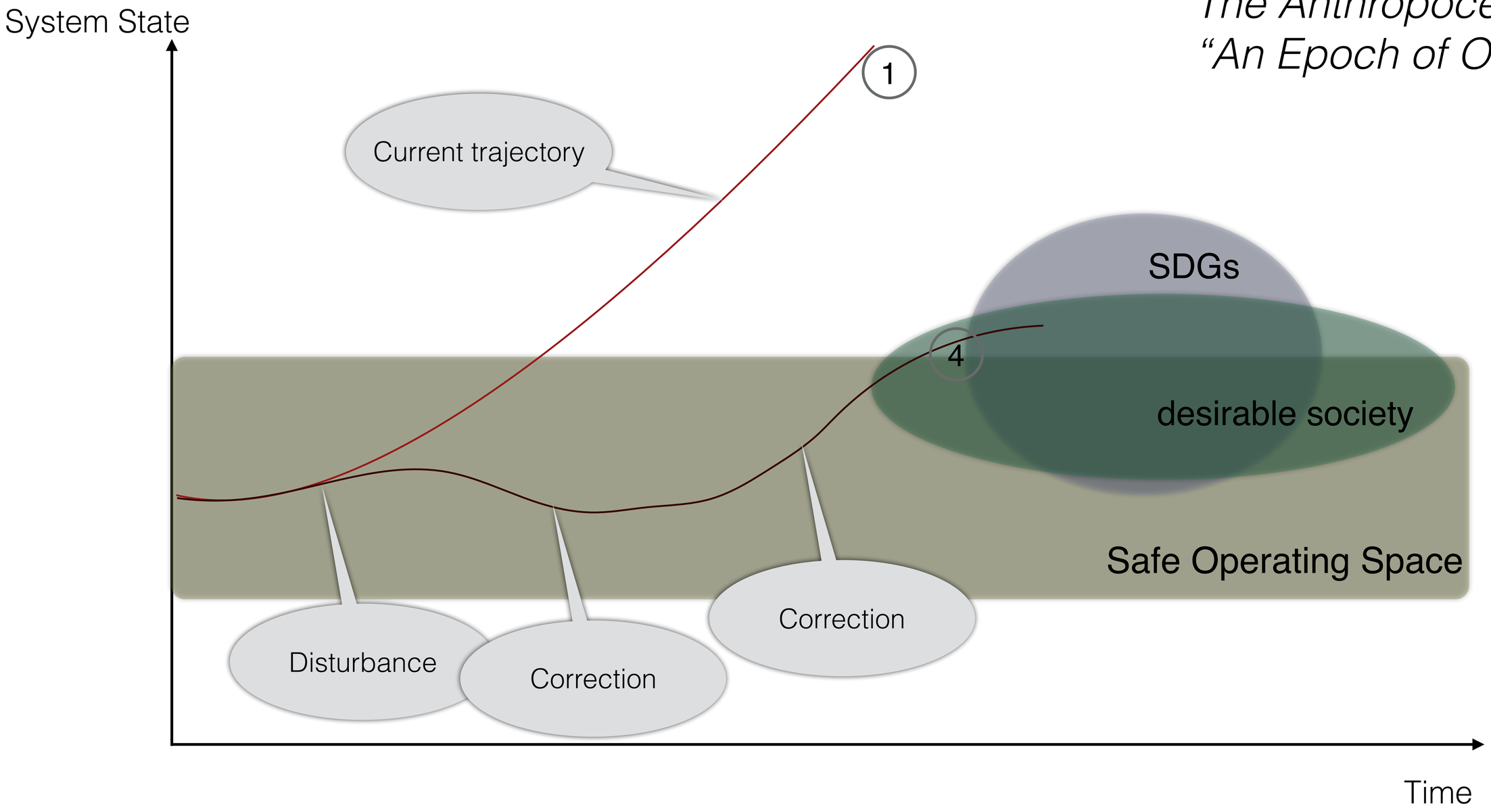


# Operating a Planetary System

Determining the System Future through Policies?

*The Anthropocene*
*"An Epoch of Our Making"*

- What might happen?
- Possible threads and hazards
- Knowing the system trajectory

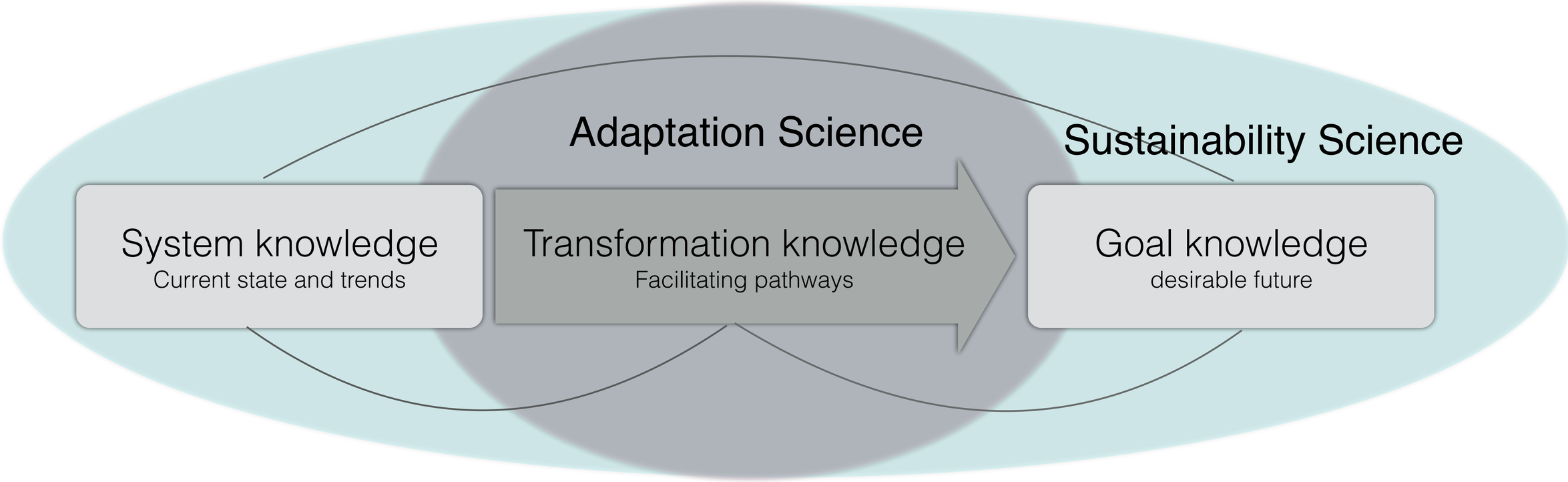
} System Knowledge

- What do we want to happen?

} Goal Knowledge

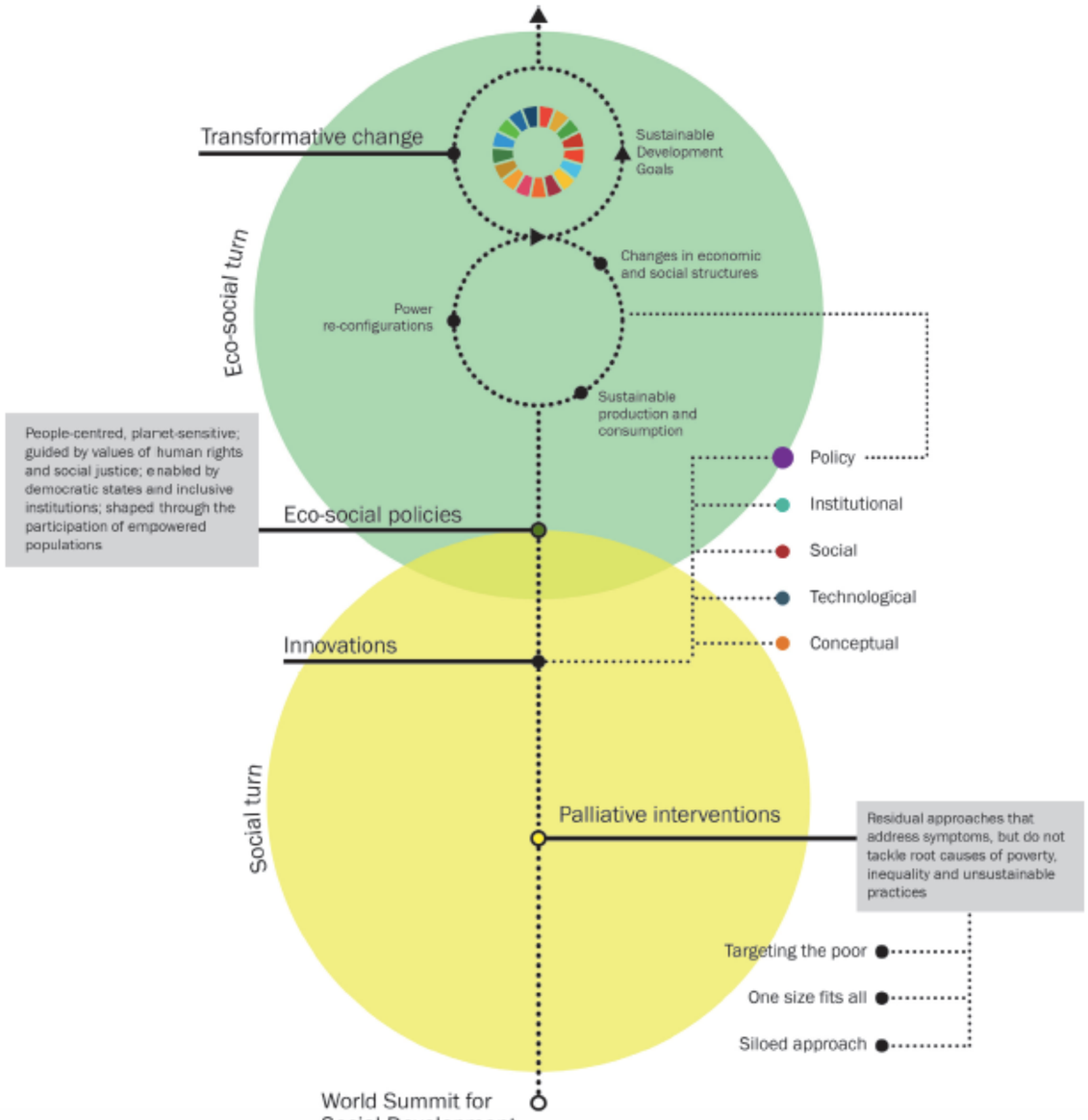
- How can we impact the system trajectory?

} Transformation Knowledge

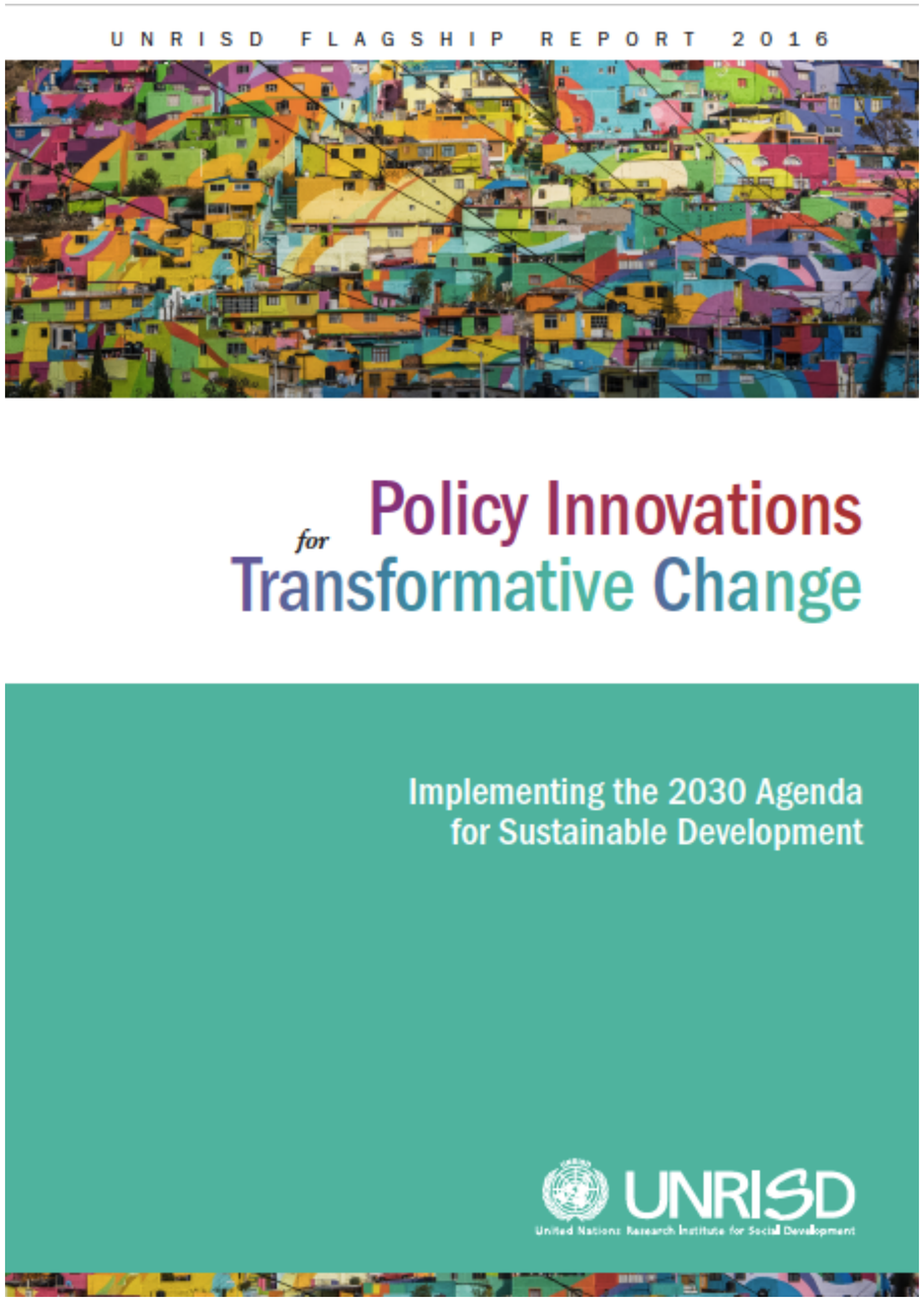


# Implementing SDGs


Figure 0.1. **Understanding transformative change**



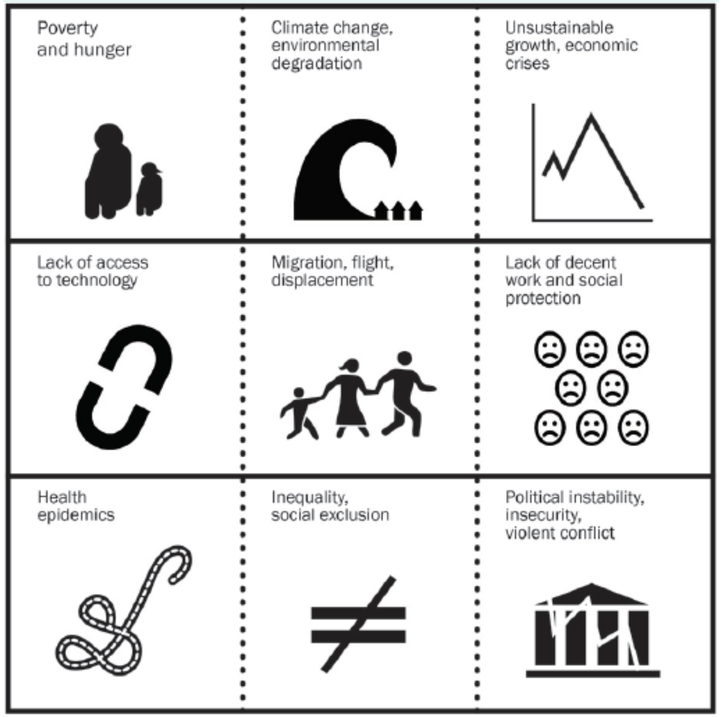
# Implementing SDGs




## Global challenges:

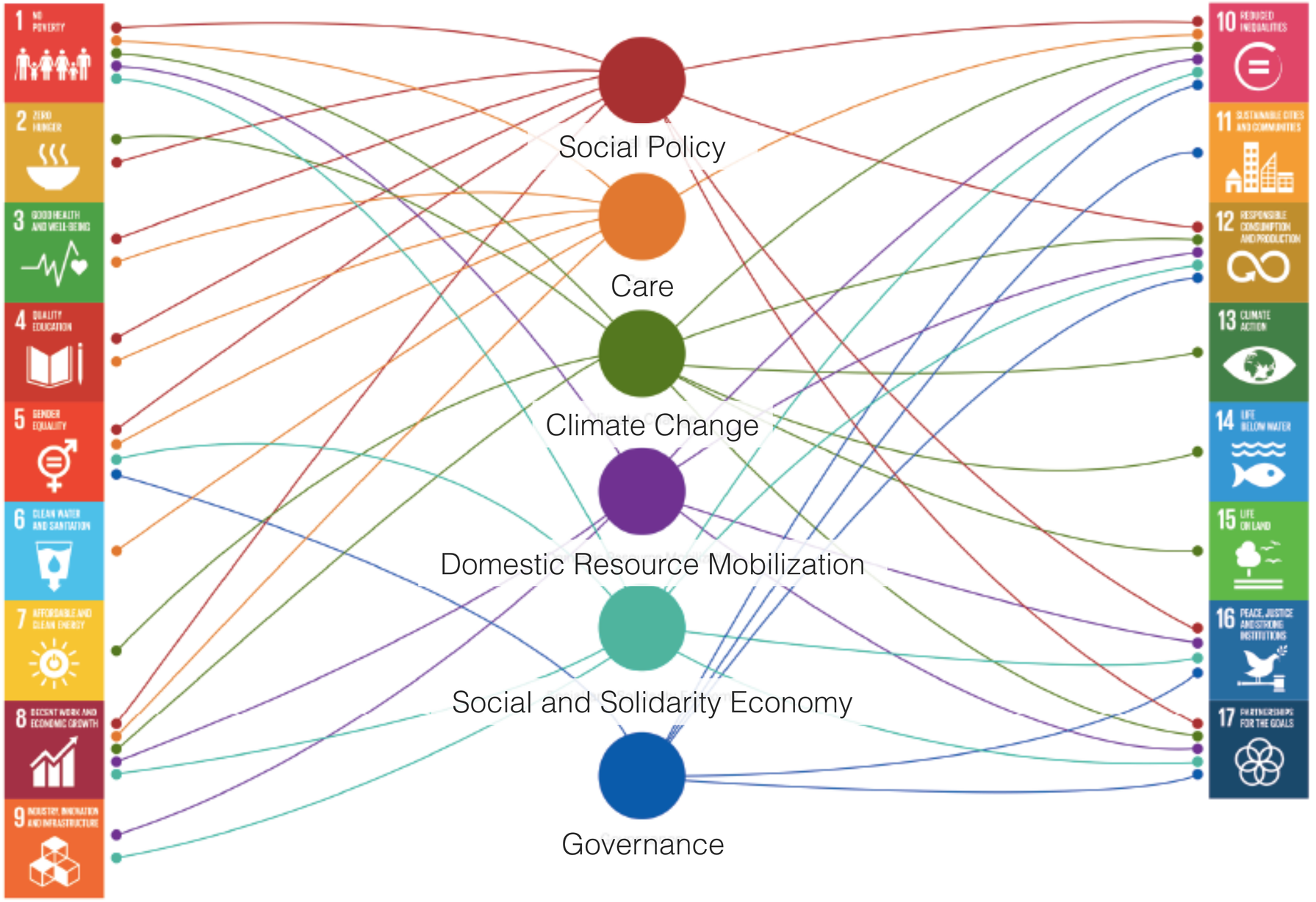
- Poverty and hunger
- Climate change and environmental degradation
- Unsustainable growth, economic crisis
- Lack of access to technology
- Migration, flight, displacement
- Lack of decent work and social protection
- Health epidemics
- Inequality, exclusion
- Political instability, insecurity, violent conflict

Figure 0.2. **Global challenges of our time**



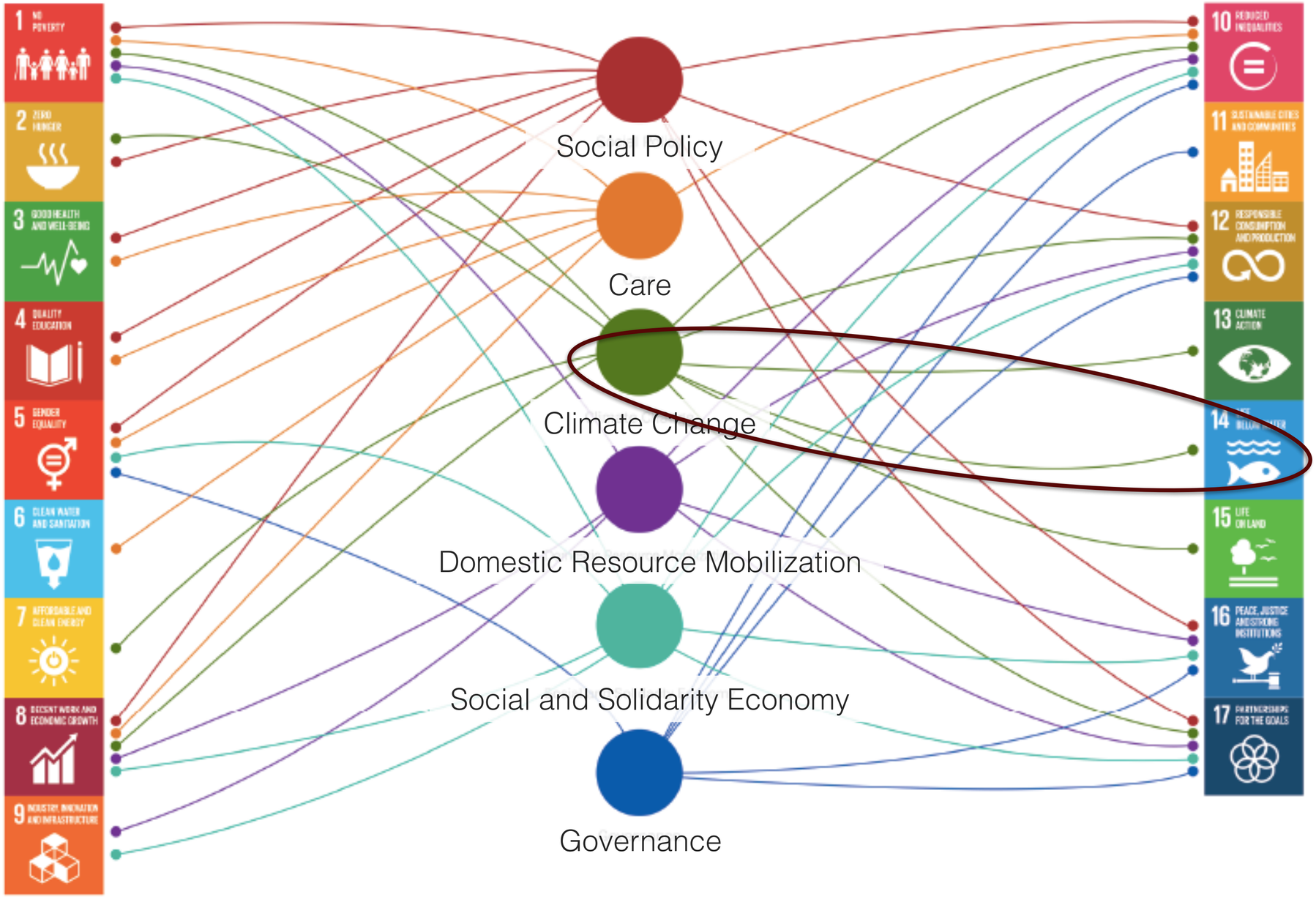
# Implementing SDGs


Figure 0.3. **Mapping policy areas for transformative change:** The UNRISD Flagship Report and the SDGs

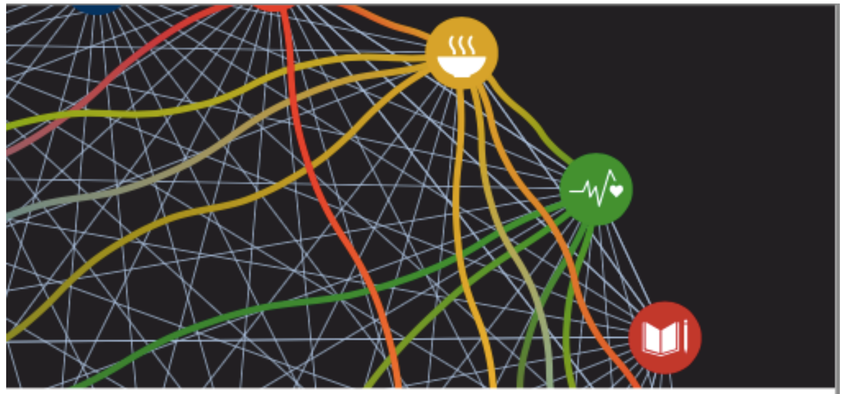


# Implementing SDGs


Figure 0.3. **Mapping policy areas for transformative change:** The UNRISD Flagship Report and the SDGs

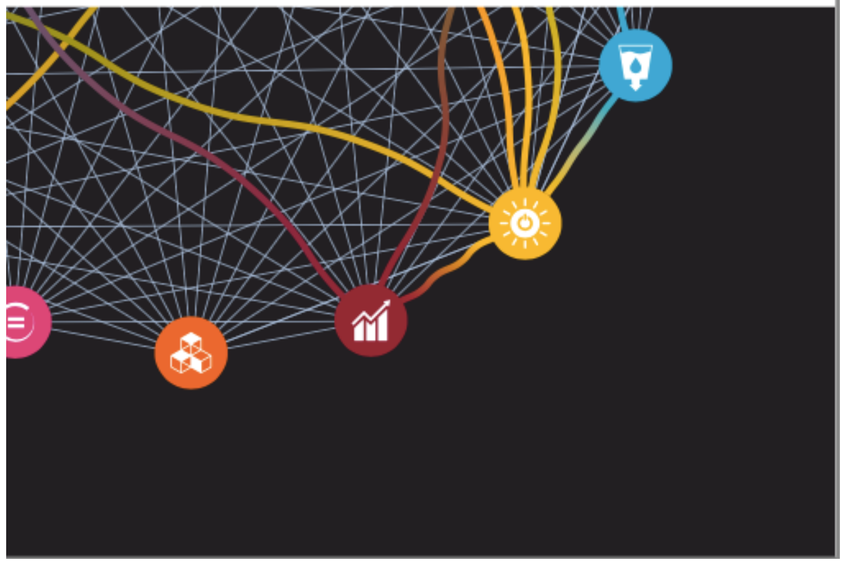


# Assessing Interdependencies



A GUIDE TO
SDG INTERACTIONS:
**FROM SCIENCE TO IMPLEMENTATION**

INTERNATIONAL COUNCIL FOR SCIENCE



## GOALS SCORING

**INDIVISIBLE**
The strongest form of positive interaction in which one objective is inextricably linked to the achievement of another. Reduction of air pollution (12.4) is indivisible from improved health and reducing non-communicable diseases (3.4).

**+3**

*Outdoor and indoor air pollution is responsible for 7 million deaths annually, as well as respiratory and cardio-vascular disease but also increases in perinatal deaths. In 2012, ambient (outdoor) air pollution was responsible for 3 million deaths, representing 5.4% of the total deaths. Worldwide, ambient air pollution is estimated to cause about 25% of the lung cancer deaths. Major urban centers in low and middle-income countries are the most exposed to this burden. (WHO, 2016).*

**REINFORCING**
One objective directly creates conditions that lead to the achievement of another objective. Increasing economic benefits from sustainable marine resources use (14.7) reinforces the creation of decent jobs and small enterprise in e.g. tourism (8.5 and 8.9)

**+2**

*Sustainable and diversified strategies for using the marine resource base open up opportunities for small enterprises in fisheries or other harvesting and associated value-addition activities, as well as activities related to tourism. Many SIDS and LDCs that are rich in these resources also have poor, vulnerable and marginalized coastal communities.*

**ENABLING**
The pursuit of one objective enables the achievement of another objective. Developing infrastructure for transport (9.1) enables participation of women in the work force and in political life (5.5)

**+1**

*Affordable public transport promotes social inclusion, more equal access to different parts of the city, and enabling employment for marginalized groups. In many places, women do not have access to a car and depend on public transport, walking or bicycling to get around, to work places and to social or political activities (INCE, 2016; GSDR, 2016)*

**CONSISTENT**
A neutral relationship where one objective does not significantly interact with another or where interactions are deemed to be neither positive nor negative. By 2025, prevent and significantly reduce marine pollution of all kinds, in particular from land-based activities, including marine debris and nutrient pollution (14.1) is consistent with target 3.5 Strengthen the prevention and treatment of substance abuse, including narcotic drug abuse and harmful use of alcohol.

**0**

*There is no significant interaction between the two targets.*

**CONSTRAINING**
A mild form of negative interaction when the pursuit of one objective sets a condition or a constraint on the achievement of another. Conserving coastal areas (14.5) and development of safe affordable housing and basic services (11.1) may constrain each other

**-1**

*Establishing protection areas in the coastal zone and expanding urbanization, infrastructure or transport risks spatial competition especially in densely populated areas. Integrated coastal zone management and marine spatial planning tools are readily available to mitigate spatial competition.*

**COUNTERACTING**
The pursuit of one objective counteracts another objective. Ensuring access to safe, nutritious and sufficient food can counteract sustainable water withdrawals (6.4) and reduction of chemicals releases (12.4)

**-2**

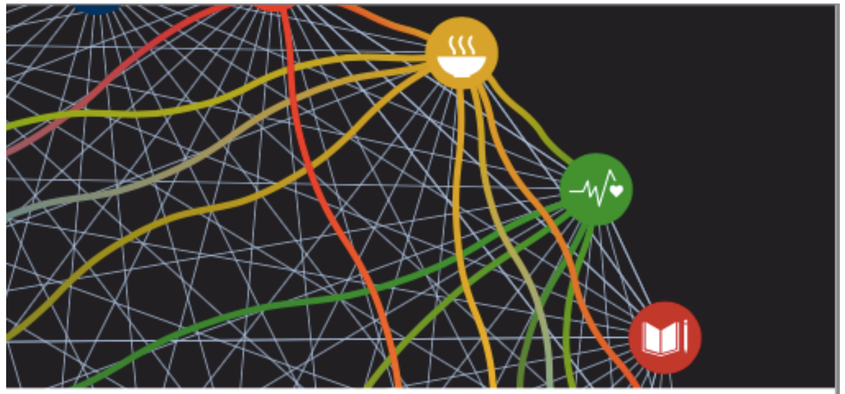
*Increasing productivity in agriculture is a necessary (but not sufficient) condition to improve food security. In many places, this might entail increased and/or better irrigation as well as increased use of agro-chemical inputs.*

**CANCELLING**
The most negative interaction is where progress in one goal makes it impossible to reach another goal and possibly leads to a deteriorating state of the second. A choice has to be made between the two. Developing infrastructure (9.1) could be cancelling the reduction of degradation of natural habitats in terrestrial ecosystems (15.1)

**-3**

*In underdeveloped regions, developing roads, dams, and power grids might be a high priority, although it will cause some unavoidable fragmentation of habitats and compromising the integrity of the natural ecosystem, leading to risks to biodiversity as well as social risks.*

# Assessing Interdependencies



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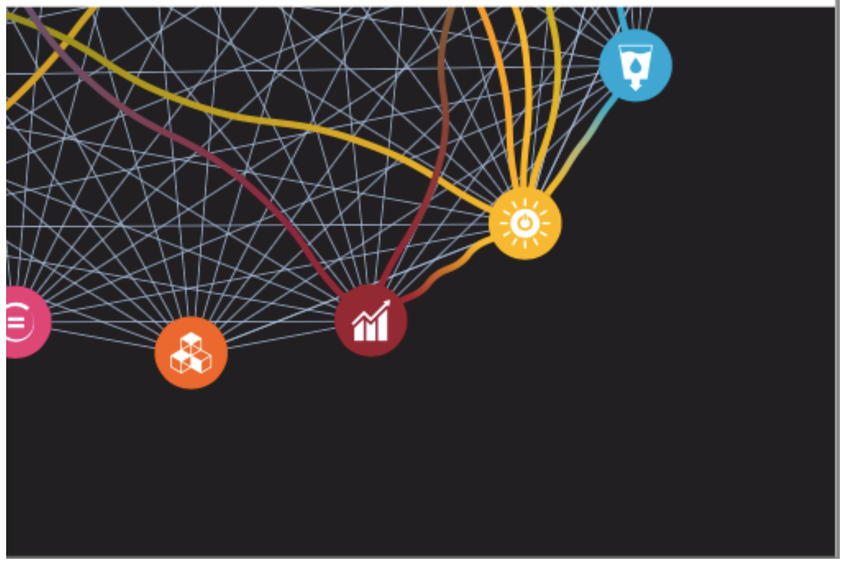

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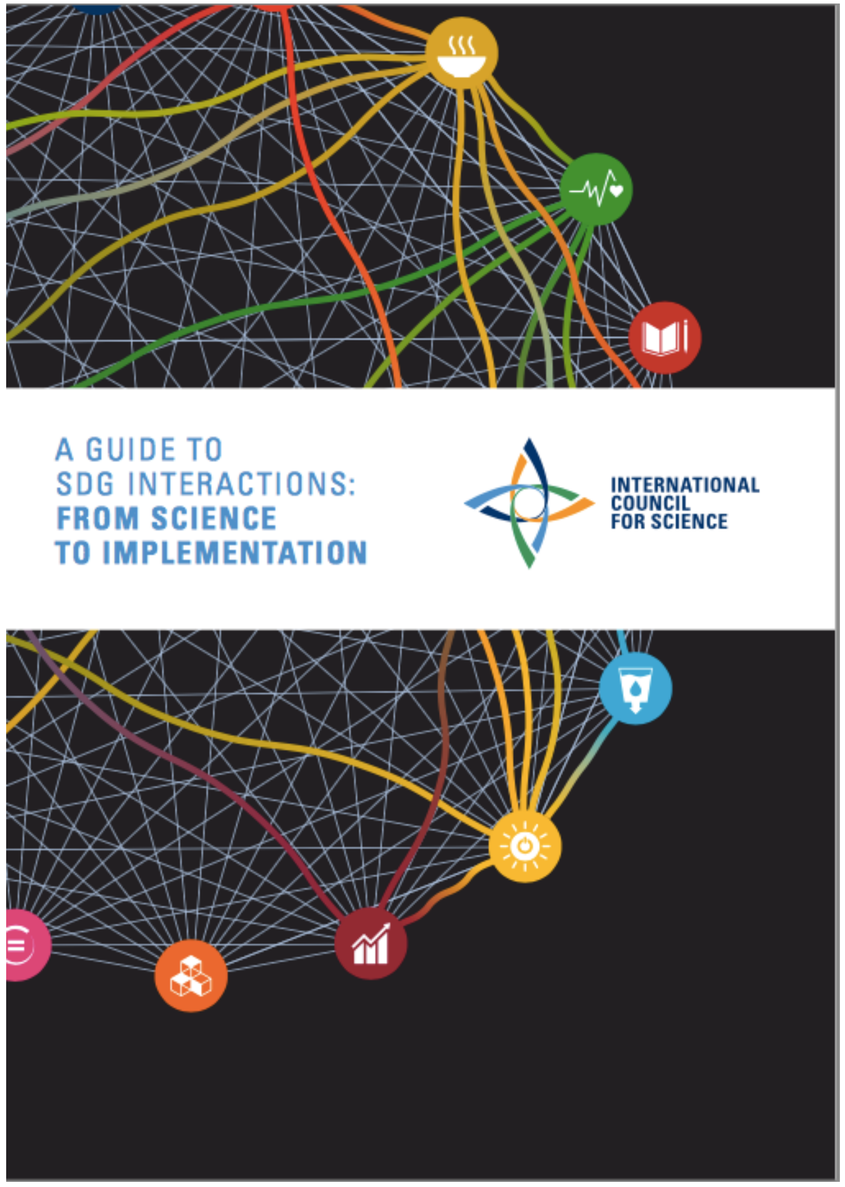
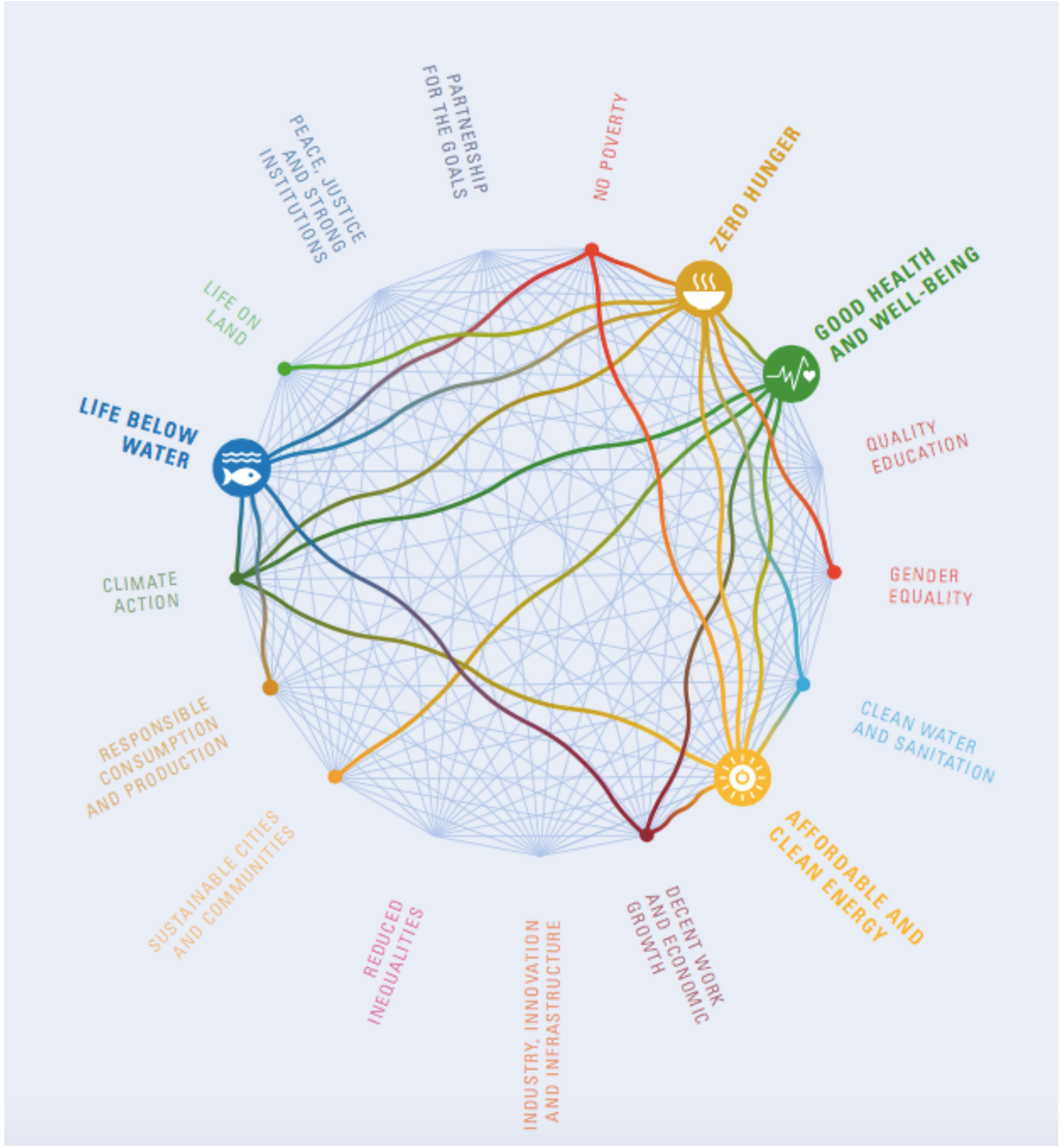


# Assessing Interdependencies

## SDG14 CONSERVE AND SUSTAINABLY USE THE OCEANS, SEAS AND MARINE RESOURCES FOR SUSTAINABLE DEVELOPMENT

*Stefanie Schmidt*
*Barbara Neumann*
*Yvonne Waweru*
*Carole Durussel*
*Sebastian Unger*
*Martin Visbeck*

1 NO POVERTY

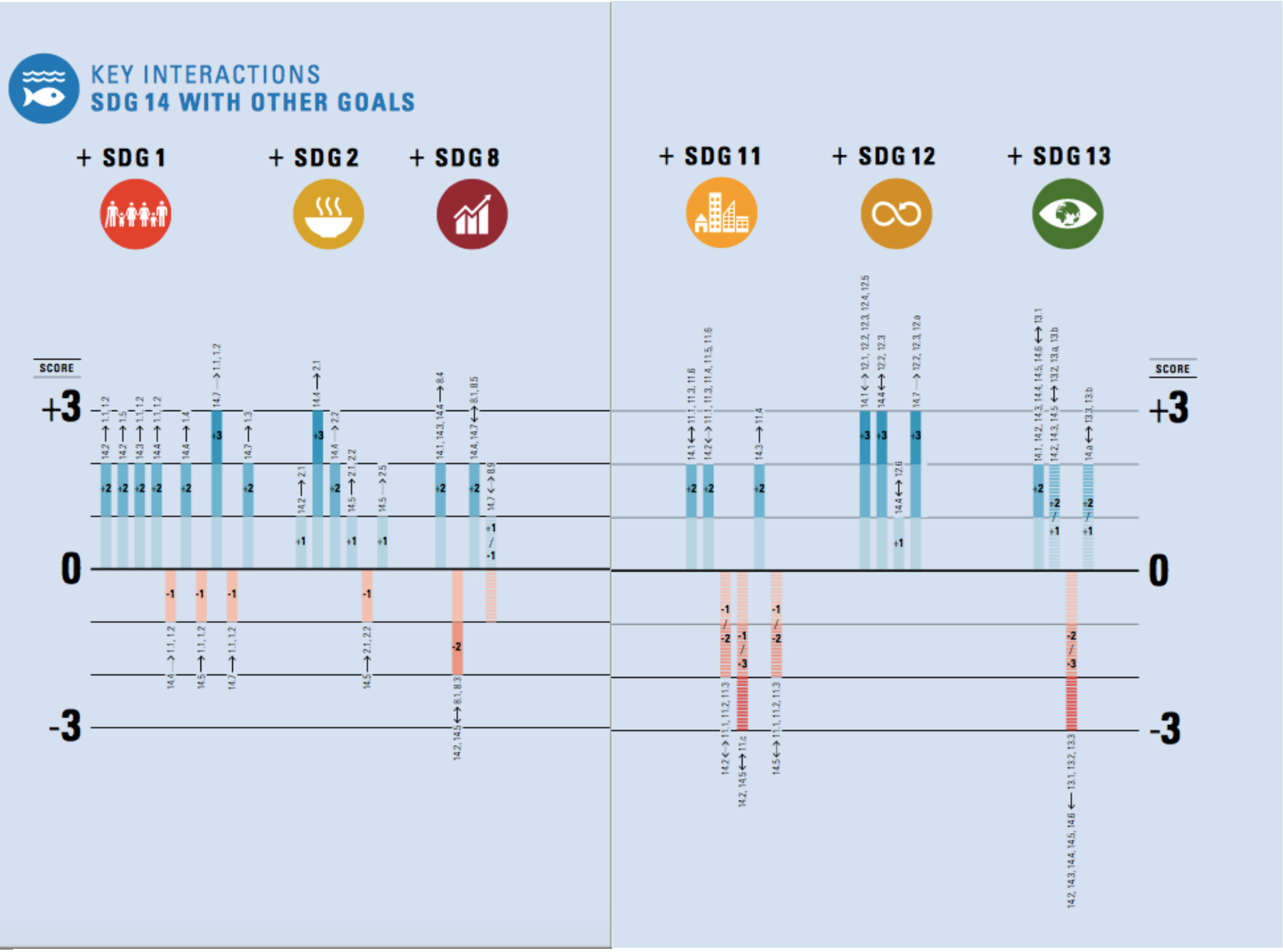
2 ZERO HUNGER

8 DECENT WORK AND ECONOMIC GROWTH

11 SUSTAINABLE CITIES AND COMMUNITIES

12 RESPONSIBLE CONSUMPTION AND PRODUCTION

13 CLIMATE ACTION



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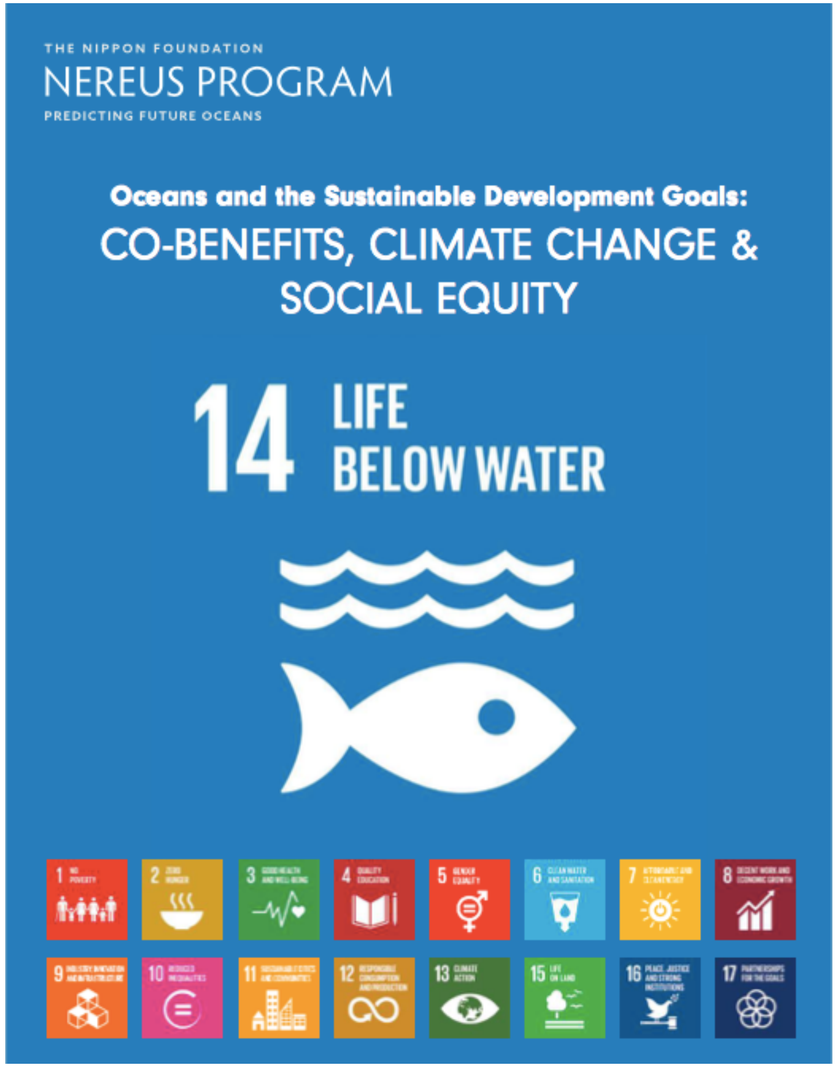

# Assessing Interdependencies


# Assessing Interdependencies

**Illustrative linkages among SDG 14 targets**

| From target \ To target | 14.1 Marine pollution | 14.2 Management of coastal and marine ecosystems | 14.3 Ocean acidification | 14.4 Restore fish stocks | 14.5 Protect 10 percent of marine areas | 14.6 Reform fishery subsidies | 14.7 Increase benefits for SIDS and LDCs | 14.a Scientific knowledge and technology transfer | 14.b Access to resources and market for small fishers | 14.c Implement international law |
|---|---|---|---|---|---|---|---|---|---|---|
| 14.1 Marine pollution | | → | | → | → | | → | | → | |
| 14.2 Management of coastal and marine ecosystems | → | | | | → | | → | | | → |
| 14.3 Ocean acidification | | → | | → | | | → | | → | |
| 14.4 Restore fish stocks | | → | | | | | → | | → | → |
| 14.5 Protect 10 percent of marine areas | | → | | → | | | → | | → | |
| 14.6 Reform fishery subsidies | | | | → | → | | → | | → | |
| 14.7 Increase benefits for SIDS and LDCs | | | | | | | | | | |
| 14.a Scientific knowledge and technology transfer | → | → | → | → | → | → | → | | → | |
| 14.b Access to resources and market for small fishers | | | | | | | → | | | |
| 14.c Implement international law | → | → | → | → | → | → | → | → | → | |

Source: Authors' elaboration.
Note: Arrows indicate linkages from targets in the first column to other targets. Blue: positive link/ potential synergy. Red: negative link/ potential trade-off. Green: variable.

*LeBlanc et al., 2017*

**Important links of target 14.1 with the rest of the SDGs**

| SDG | From | To | Description of link | Geographic level |
|---|---|---|---|---|
| SDG 2 Food security | | X | Pollution of marine and coastal areas makes seafood improper for human consumption | Local National |
| SDG 2 Food security | X | | Efforts to increase food production on land or aquaculture may increase pollution of coastal areas | Local National |
| SDG 3 Health and well-being | | X | Pollution of coastal areas negatively impacts health and well-being | Local National* |
| SDG 6 Water | X | | Wastewater (industrial and residential) and agricultural runoff cause pollution of sea. | Local National* |
| | X | | Wetlands protect water quality by trapping sediments and retaining excess nutrients and other pollutants such as heavy metals that may otherwise end up in the sea. | National |
| SDG 8 Economic growth and employment | X | | Economic activities (e.g. agriculture, transport, tourism, minerals extraction, aquaculture) generate ocean pollution | Local National* |
| SDG 9 Industrialization and infrastructure | X | | Industrial by-products and waste (e.g. heavy metals, chemicals, particulate matters) pollute oceans. On the other hand, efforts to improve the quality of infrastructure and planning for industrialization could have large positive impact on coastal areas currently detrimentally impacted by industry. | Local National* |
| SDG 11 Cities | X | | Pollution from urban activities (solid and liquid) causes pollution in oceans. | Local National* |
| SDG 12 Sustainable consumption and production | X | | Pollution can be reduced through reduced waste generation, and cleaner production methods | National Regional Global |
| SDG 13 Climate change | | X | Pollution acts with other stressors to hamper the resilience of ecosystems to climate change | Local National |
| SDG 15 Terrestrial ecosystems | X | | Management of terrestrial ecosystems may increase or reduce pollution loads to oceans | Local National* |
| SDG 16 Peaceful and inclusive societies | X | | Effective institutions in general help achieve effective control of and reduction in pollution | National Regional Global |

Source: Authors' elaboration.
* Indicates potential for transboundary effects.

# Assessing Interdependencies

**Implementing the Ocean SDG in the Wider Caribbean: state of play and possible ways forward**



**Report prepared for the Partnership for Regional Ocean Governance (IDDRI, IASS, TMG and UNEP)**

**by**

**Lucia Fanning[1] and Robin Mahon[2]**

**April 30, 2017**

[1] Marine Affairs Program, Dalhousie University, Halifax, Nova Scotia, Canada
[2] Centre for Resource Management and Environmental Studies (CERMES), University of the West Indies, Cave Hill Campus, Barbados

The critical issues include:

- overfished/declining fish stocks,
- loss of habitat and biodiversity,
- marine and land-based sources of pollution,
- invasive species, primarily lionfish,
- climate change impacts.

*Fanning and Mahon, 2017*

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The critical issues include:

- overfished/declining fish stocks,
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- marine and land-based sources of pollution,
- invasive species, primarily lionfish,
- climate change impacts.

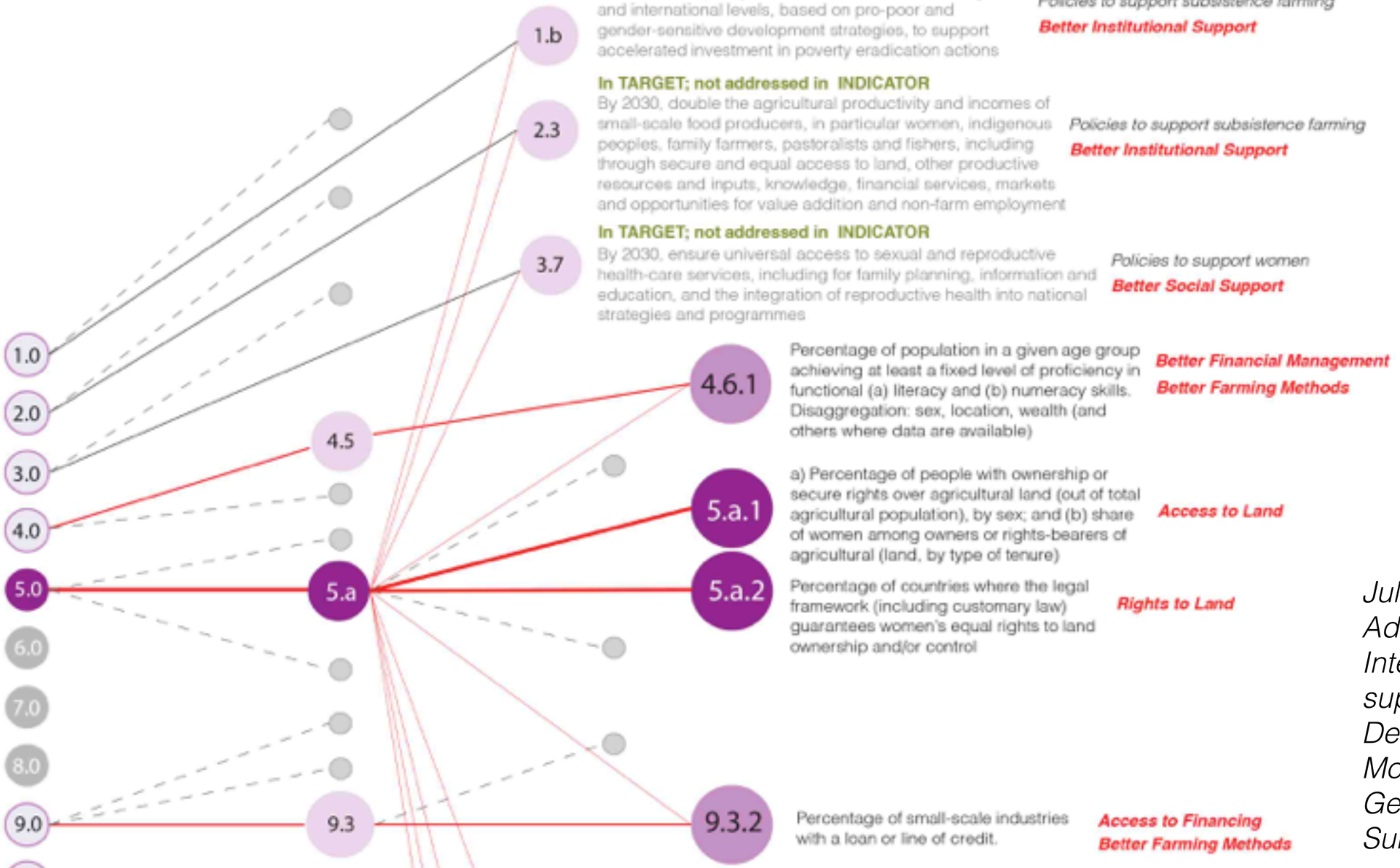
Symptoms, not “Issues”/ Causes

*Fanning and Mahon, 2017*

# Assessing Interdependencies

## 4 Interdependencies and interactions of SDGs, Targets and Indicators

- SDG interdependencies




*Jules-Plag and Plag, 2016. Addressing SDG Interconnections and supporting SDG Policy Development with Agent-Based Models: The Example of Gender Equality and Subsistence Farming*

# The Life of a SDG: How to grow into a successful SDG?

What do I need to learn?

Do I understand the challenge?

Who can help me?

Am I on the right track?

Who is going to be impacted?

What should I do?

2030

2015

T 2.5
T 2.1
T 2.2
T 2a
T 2b
T 2.4
T 2.3

2 ZERO HUNGER



*Plag, 2017*

# The Life of a SDG: How to grow into a successful SDG?

What do I need to learn?

What do all the other guys need to do so that I can be successful??

How am I going to impact the other guys?

2030

Am I on the right track?

Do I understand the challenge?

Who is going to be impacted?

Who can help me?

What should I do?



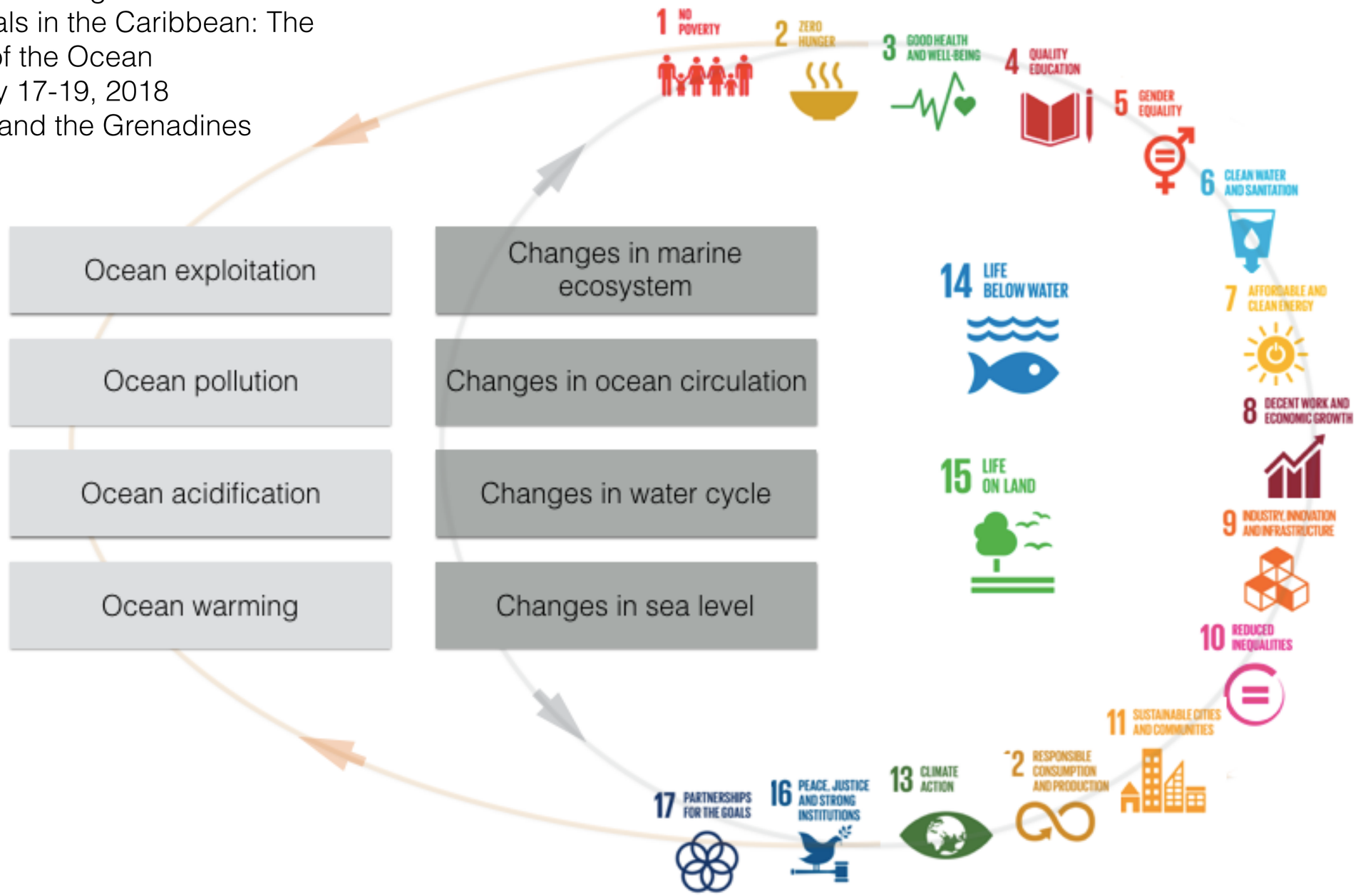

2015

Credit: Impact Hub Network/Flickr under Creative Commons License

*Plag, 2017*

# Assessing Interdependencies

Implementing & Monitoring the Sustainable Developments Goals in the Caribbean: The Role of the Ocean
January 17-19, 2018
Saint Vincent and the Grenadines



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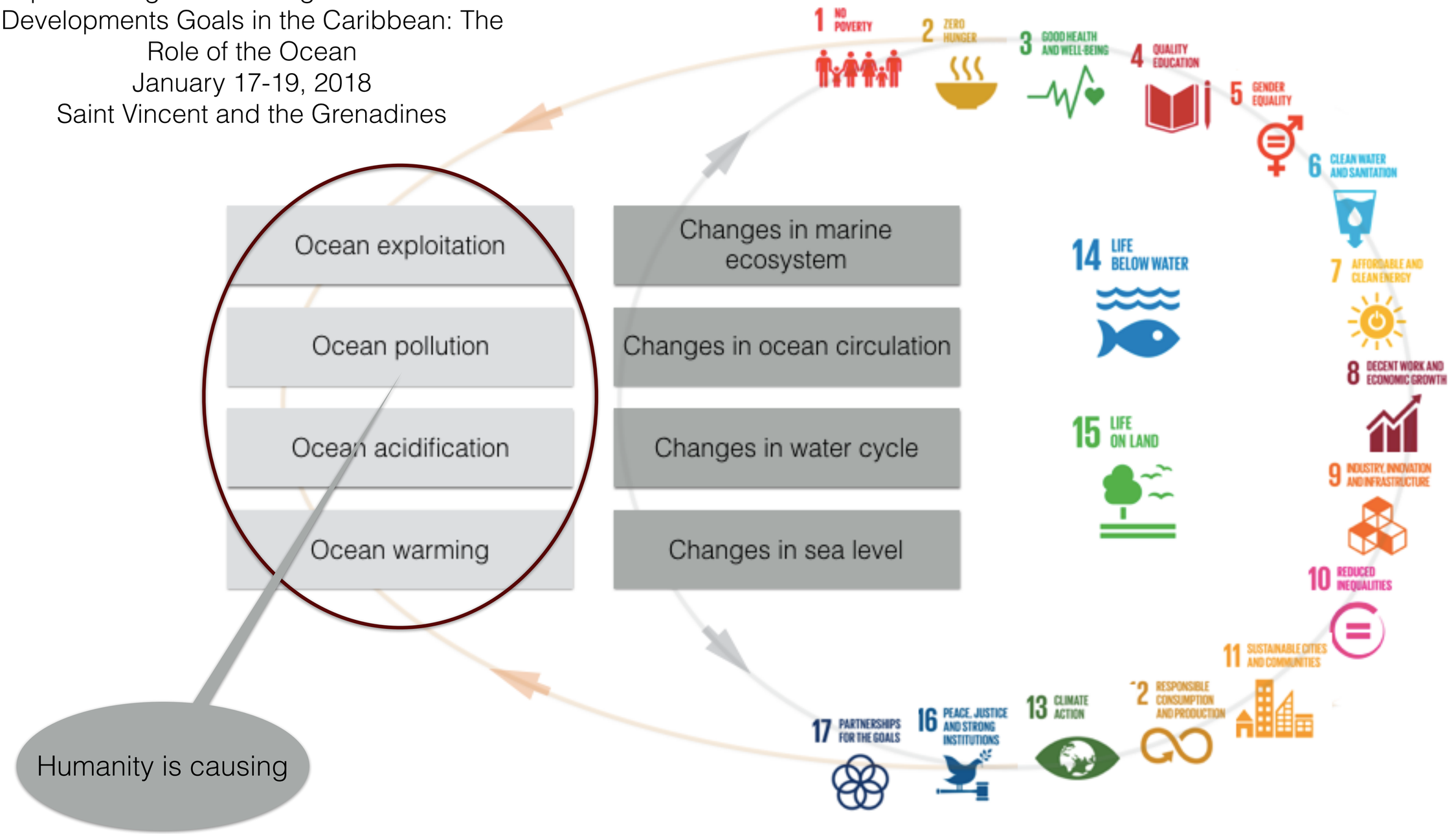

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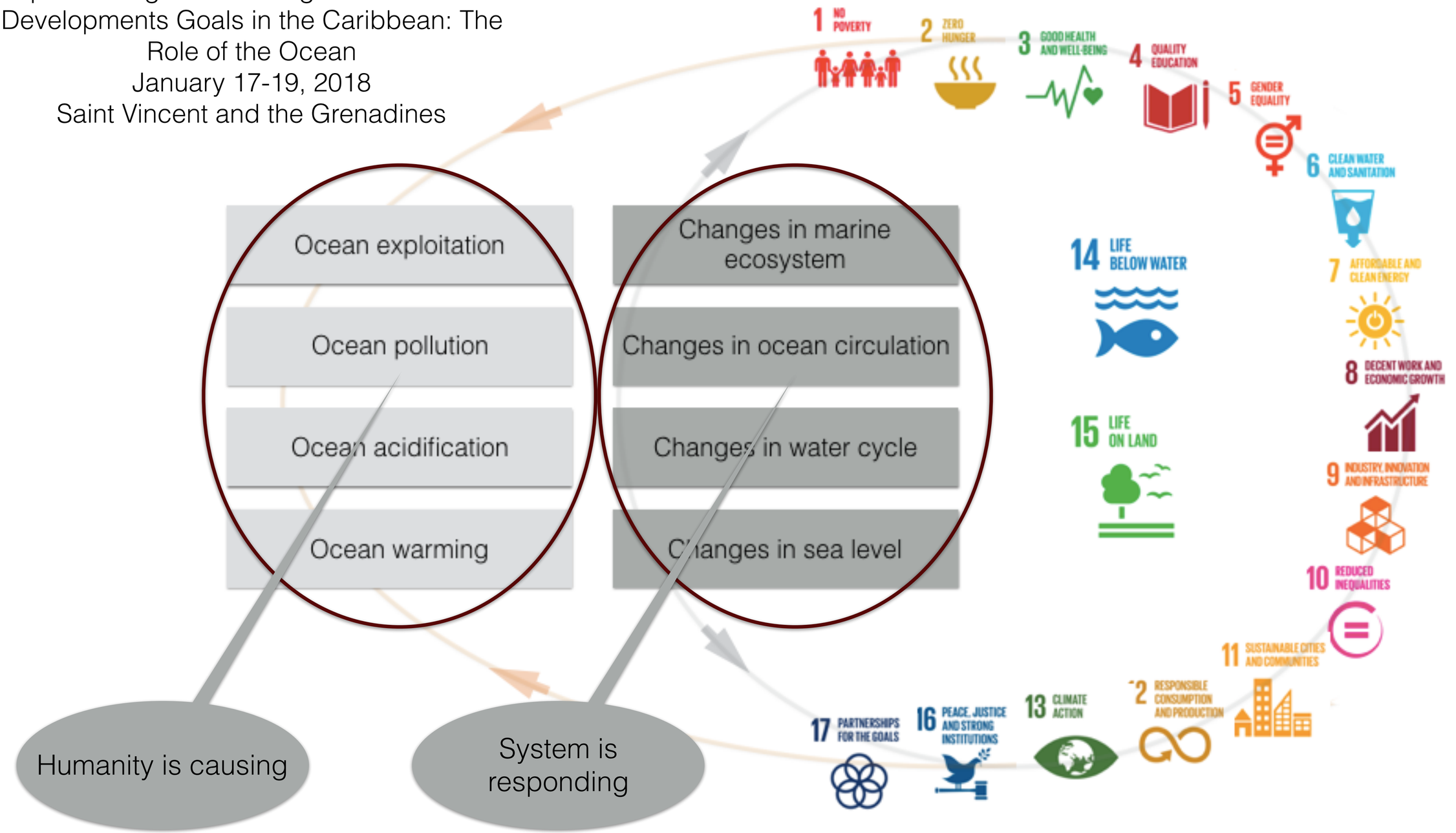


# A Holistic View

# A Holistic View

## Feeding a growing Population

# A Holistic View

Feeding a growing Population

Accelerating energy flow by accelerating C cycle

# A Holistic View

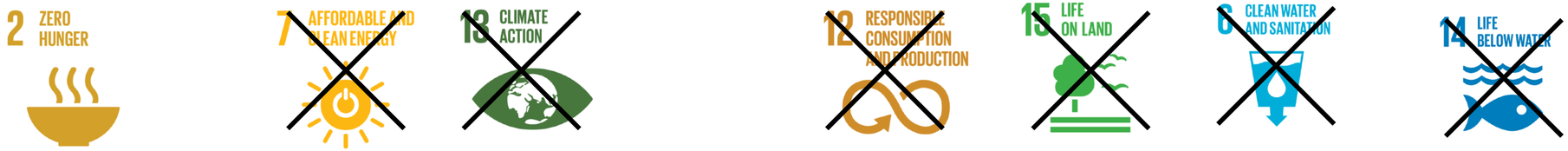
Feeding a growing Population → Accelerating energy flow by accelerating C cycle → Accelerating N and P cycles → Changing land use



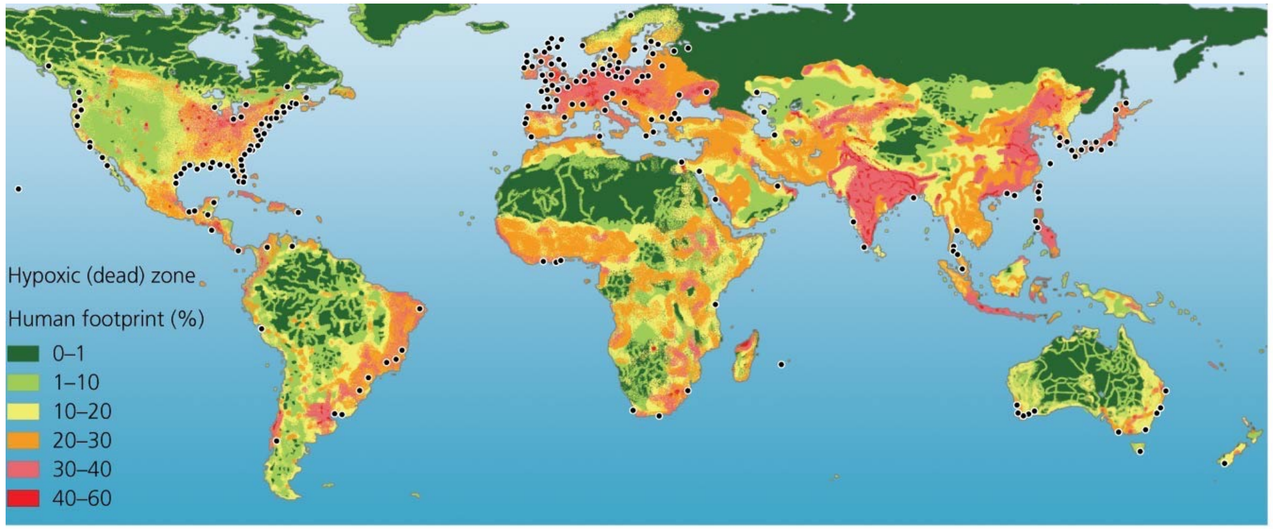



# A Holistic View

Feeding a growing Population → Accelerating energy flow by accelerating C cycle → Accelerating N and P cycles, Changing land use → Overload of ocean with nutrients

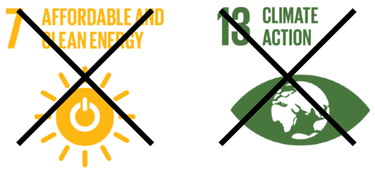



## Hypoxic (dead) zones



# A Holistic View

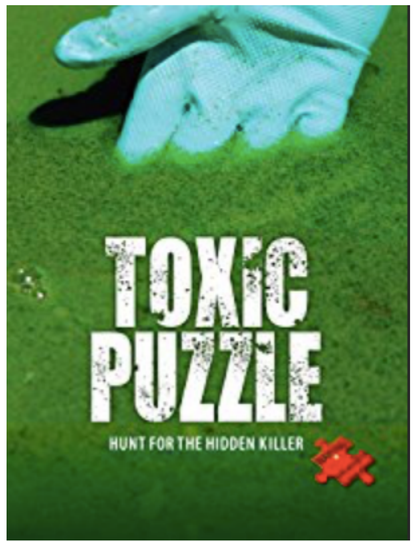
Feeding a growing Population → Accelerating energy flow by accelerating C cycle → Accelerating N and P cycles, Changing land use → Overload of ocean with nutrients → Toxins





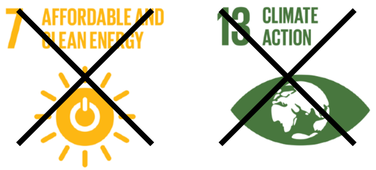
On their quest to learn more about toxic substances produced by cyanobacteria, Dr. Paul Cox and his team discover a link between cyanobacteria and ALS, Alzheimer's, and Parkinson's.




*Director: Bo Landlin, 2017*

# A Holistic View

Feeding a growing Population → Accelerating energy flow by accelerating C cycle → Accelerating N and P cycles / Changing land use → Overload of ocean with nutrients → Toxins

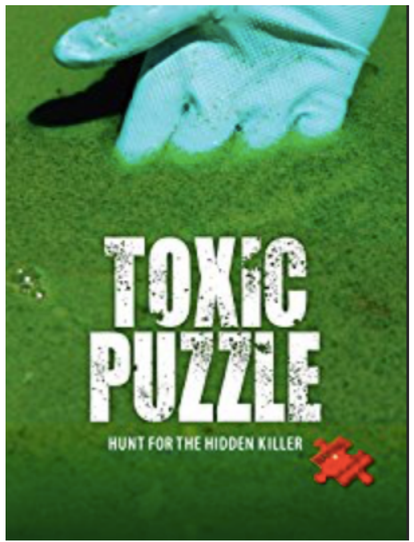







Overload of ocean with carbon


On their quest to learn more about toxic substances produced by cyanobacteria, Dr. Paul Cox and his team discover a link between cyanobacteria and ALS, Alzheimer's, and Parkinson's.




*Director: Bo Landlin, 2017*

# A Holistic View

Feeding a growing Population → Accelerating energy flow by accelerating C cycle → Accelerating N and P cycles / Changing land use → Overload of ocean with nutrients → Toxins

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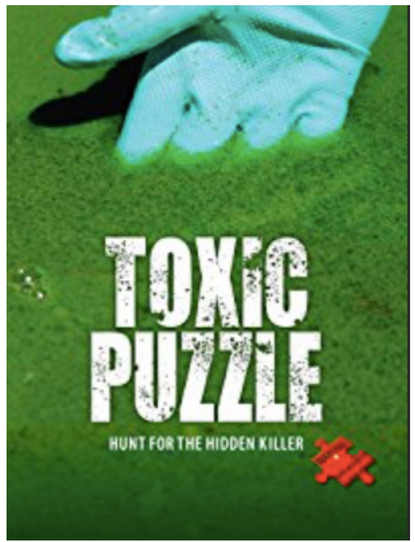


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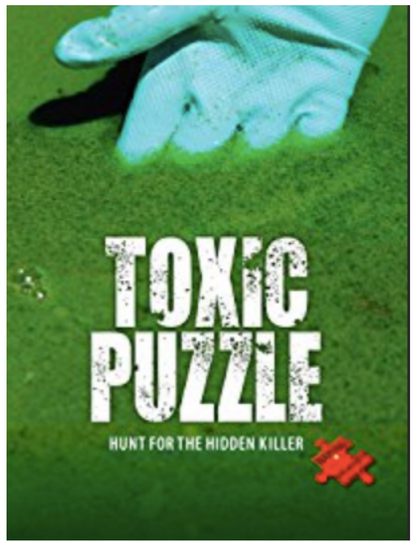


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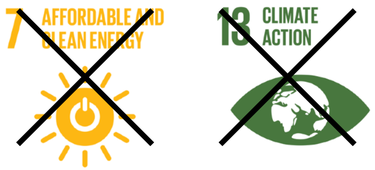





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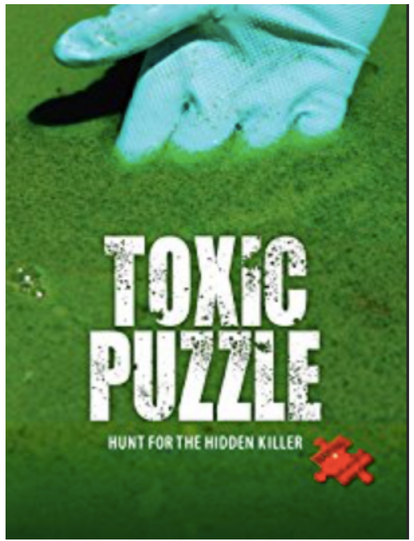
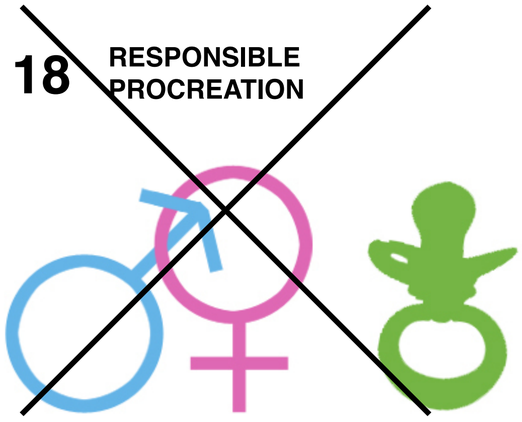



*Director: Bo Landlin, 2017*



# A Holistic View

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Earth: Our Life-Support System

The Ocean is crucial in the life-support system

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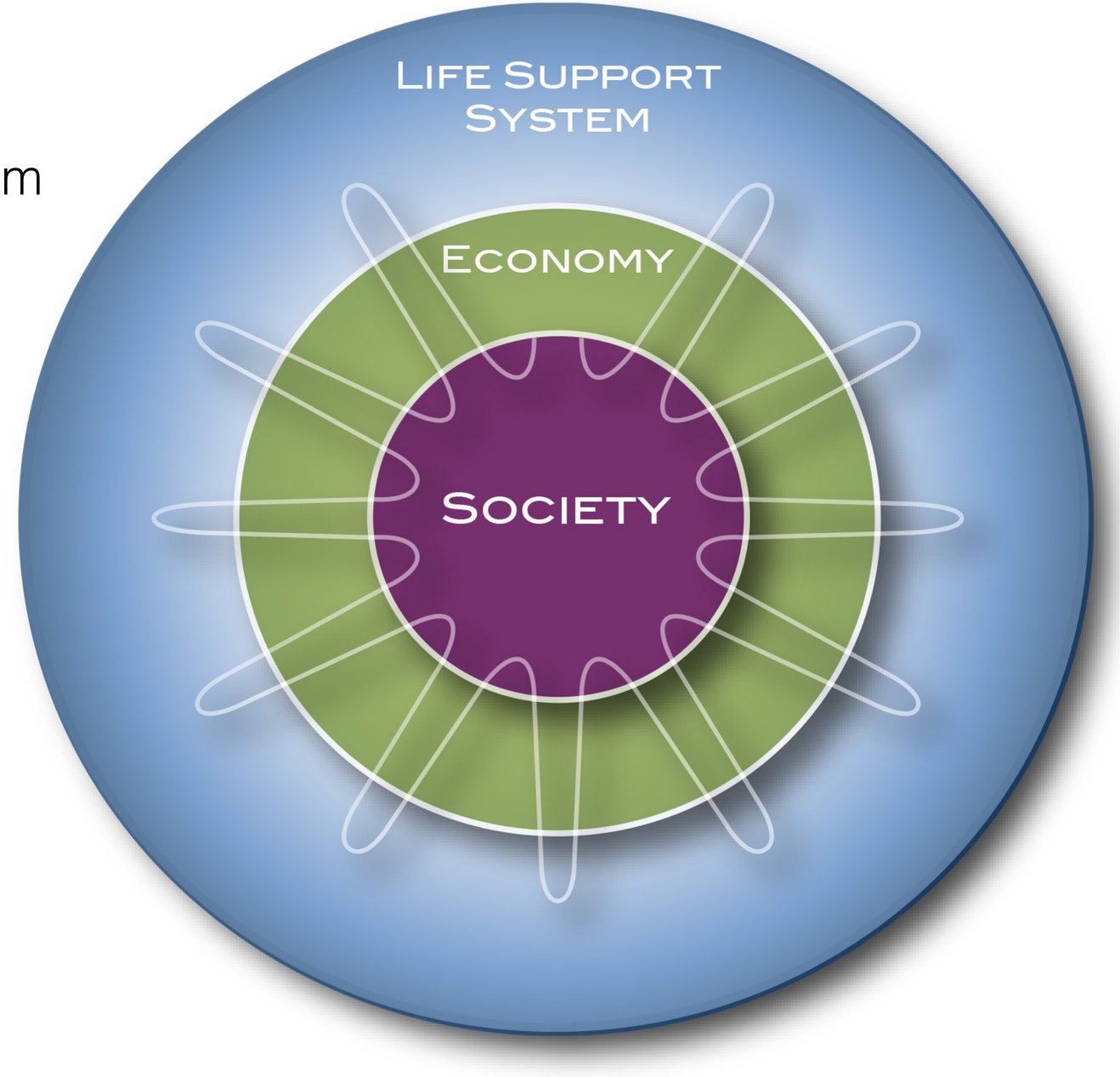

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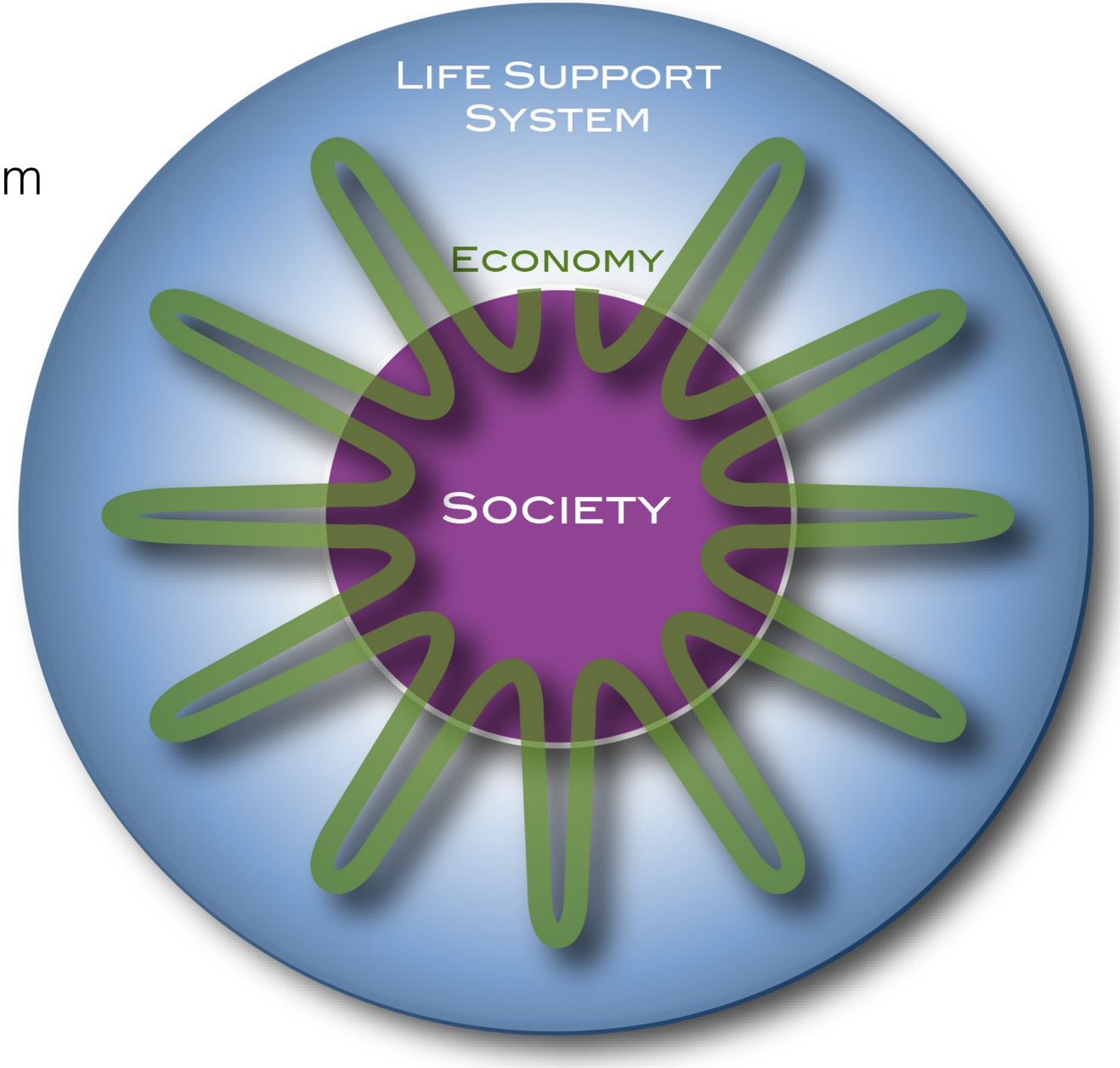
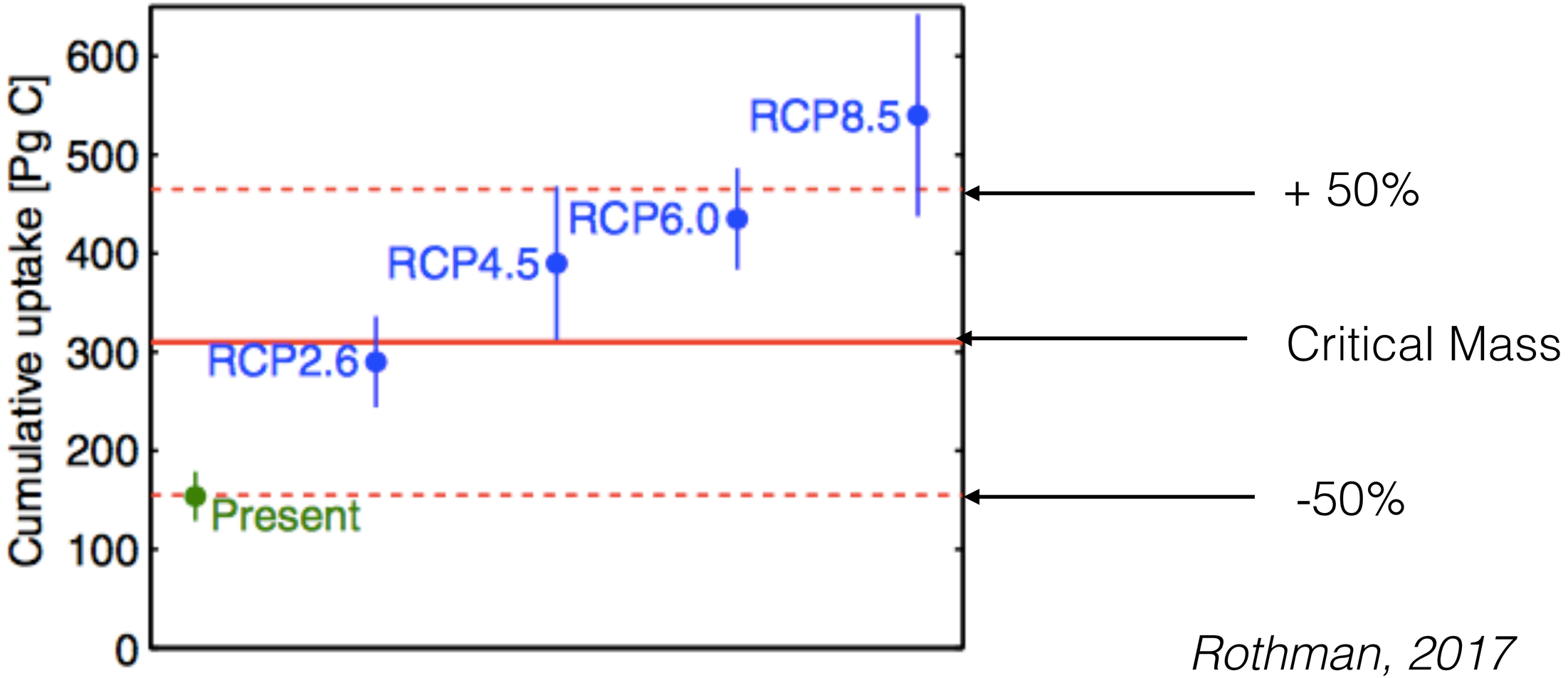
Flows have accelerated in the last 100 years



# A Holistic View

## Threshold for Ocean Carbon Uptake



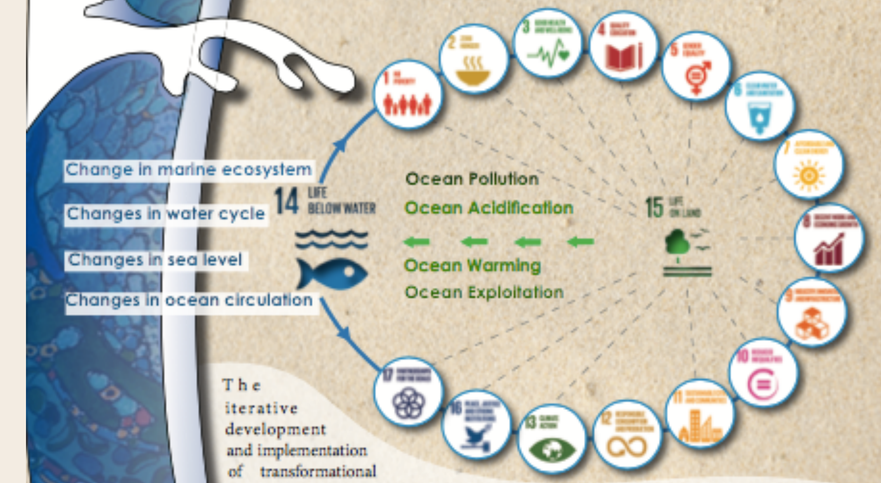

*Rothman, 2017*

Implementing & Monitoring the Sustainable Developments Goals in the Caribbean: The Role of the Ocean
January 17-19, 2018
Saint Vincent and the Grenadines

Implementing and Monitoring the
**Sustainable Development Goals**
in the Caribbean:

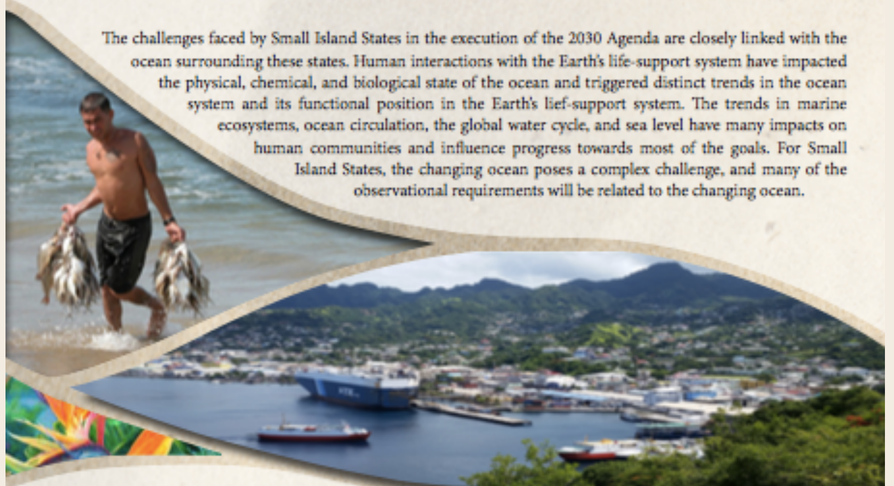
# The Role of the Ocean

The implementation and monitoring of the seventeen Sustainable Development Goals (SDGs) of the United Nation 2030 Agenda for Sustainable Development pose wicked problems to society, that is, socio-economic and cultural problems that are difficult or nearly impossible to solve because of incomplete or contradictory knowledge, the number of people and opinions involved, the large economic burden associated with progress towards a solution, and the interconnected nature of these problems with other problems. All of this applies to making progress towards the SDGs.




The iterative development and implementation of transformational policies to reach the targets hinges on knowledge derived from data related to the state and trajectory of the Earth system. Likewise, validating these policies and monitoring progress towards the SDG Targets depends observations of the human and non-human environment. The Group on Earth Observations (GEO) prioritizes support of the 2030 Agenda. Among others, the GEO Initiatives "Earth Observations in Service of the 2030 Agenda for Sustainable Development" (EO4SDGs) and "Oceans and Society: Blue Planet" focus on data needs of the SDGs. To better serve the 2030 Agenda, a detailed knowledge of the observational requirements to serve the 2030 Agenda is required, and creating this knowledge necessitates a system approach considering the data needs of the full set of the SDGs.

**Workshop**
January 17 - 19th 2018,
**St Vincent and the Grenadines**



The challenges faced by Small Island States in the execution of the 2030 Agenda are closely linked with the ocean surrounding these states. Human interactions with the Earth's life-support system have impacted the physical, chemical, and biological state of the ocean and triggered distinct trends in the ocean system and its functional position in the Earth's lief-support system. The trends in marine ecosystems, ocean circulation, the global water cycle, and sea level have many impacts on human communities and influence progress towards most of the goals. For Small Island States, the changing ocean poses a complex challenge, and many of the observational requirements will be related to the changing ocean.

## Workshop Scope and Participation

In a collaborative effort of GEO Initiatives, governments of the Caribbean Small Island States, United Nations Agencies, and regional non-governmental organisations, a workshop is organized that will bring together stakeholders engaged in the implementation and monitoring of the SDGs in the Caribbean Small Island States with the goal to link these efforts to required ocean observations and to engage in the co-creation of the knowledge supporting these efforts. Collaborating with the governments in the Small Island States and participating in their efforts to implement the 2030 Agenda is a novel avenue for those providing Earth observations to better understand what ocean observations are required and what products are available to inform decisions. These requirements, where possible, will be matched to existing data sets and services to create the knowledge needed by the governments and the people in the Caribbean Small Island States, and gaps will be addressed where such products don't exist or are not accessible.

http:www.gstss.org/2018_Ocean_SDGs
Contact: hpplag@mari-odu.org

## Workshop and Project Outcomes

The main outcomes of the project include a workshop report summarizing the deliberations, and a white paper detailing the relevance of ocean observations for the implementation and monitoring of SDGs in Caribbean Small Island States. The white paper will provide details on how to ensure and improve support of SDG implementation and monitoring with data and products and how to facilitate the co-usage of the products. These outcomes inform GEO initiatives engaged in supporting the 2030 Agenda. The workshop also will identify a demonstration project on the use of Earth observation in creating ownership of the SDGs in governments and public in the Caribbean.