



**INTERNATIONAL  
COUNCIL  
FOR SCIENCE**



**SCWS 2017**

Connecting the World  
for a Sustainable Future

# **Co-design for Transformation - Connecting the World for a Sustainable Future**

**Gordon McBean, CM, OOnt, PhD,  
FRSC, FAGU, FIUGG**

**President, International Council for Science  
Co-Chair, Governing Council, Future Earth  
Professor Emeritus, Western University, London, Canada**

**Presentation to:**

**Science Centre World Summit 2017  
National Museum of Emerging Science and Innovation  
(Miraikan)**

**futureearth**  
research for global sustainability



# SUSTAINABLE DEVELOPMENT

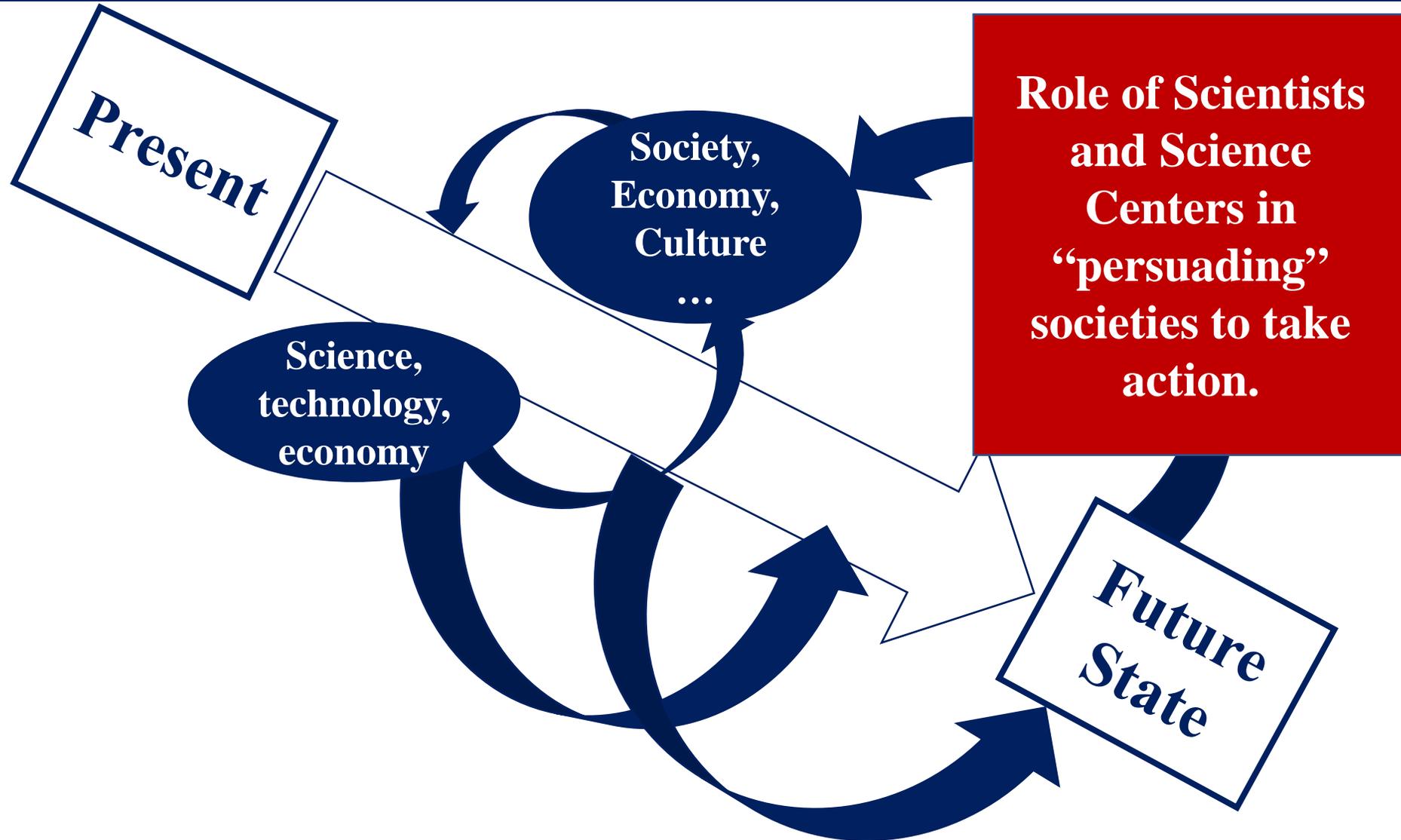
*“Humanity has the ability to make development sustainable - to ensure that it meets the needs of the **present** without compromising the ability of **future generations** to meet their own needs”*

*(World Commission on Environment and Development, 1987)*

## Keys:

- **linking social, economic, technology, science and environmental issues and the future with the present**
- **Evidence-based decision making – including understanding of our societies and how they “respond”.**

# SUSTAINABLE DEVELOPMENT



# SCIENCE FOR SUSTAINABLE DEVELOPMENT

## Keys: Evidence-based decision making:

- **Transdisciplinary science – across natural, social, economic, health, engineering, ...**
- **October 26, 2017 – International Council for Science (ICSU) and International Social Sciences Council voted (over 90%) to MERGE**
- **➡ International Science Council – ISC**
- **40 international scientific unions and associations + > 140 national/regional org.**
- **Vision of advancing all sciences as a global public good**

# SDGs – 17 with 169 Targets

**Interconnections**



# SDGs – Connecting across the Global Policy Agenda – Global 2030 Agenda



# A New Era

Global view from Space ~ 20th Century  
Genomic view on the atomic level ~ 21th Century

Earth is a part of the Universe beyond specific design and yet, all life forms are connected

Science and technology has provided a New Perspective  
"TSUNAGARI"



# SCWS 2017

Connecting the World  
for a Sustainable Future

## TSUNAGARI

Universally connected network

### Transformation

Science Communication  
Integrates and Applies  
Societies' Culture  
(Wisdom)

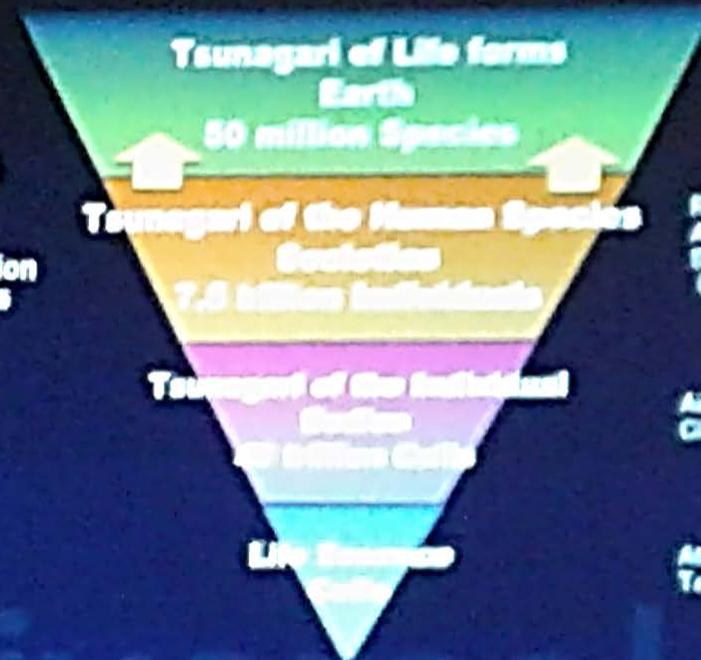
### Global Wisdom

Global Environment  
Biodiversity, Sustainability  
Symbiosis, Genome

Religion, Military, Nations, Politics,  
Arts, Technology, Education, Business,  
Science, Sports, Media  
(Human Culture)

Air, Water, Food  
Clothes, Shelter

Atmosphere, Energy  
Temperature, Light, Gravity



VENUE: 31/07/17-  
3/08/17  
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- Welcoming the adoption of United Nations General Assembly resolution A/RES/70/1, “Transforming our world: the 2030 Agenda for **Sustainable Development**”, in particular its **goal 13**, and the adoption of the Addis Ababa Action Agenda ... and the adoption of the **Sendai Framework for Disaster Risk Reduction**,

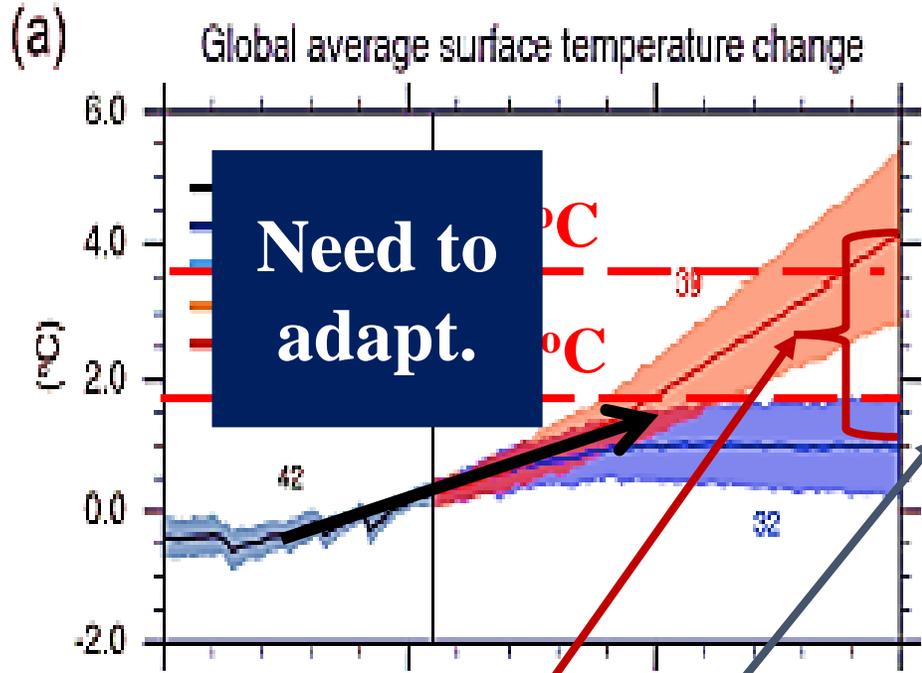
## Article 2

1. This Agreement, .. aims to strengthen the global response to .. threat of climate change, .. context of sustainable development and efforts to eradicate poverty:

(a) **Holding the increase .. global average temperature to well below 2 °C above pre-industrial levels and pursuing .. Limit .. to 1.5 °C .., significantly reduce the risks and impacts of climate change; MITIGATION**

(b) **Increasing the ability to adapt to the adverse impacts of climate change and foster climate resilience and low greenhouse gas emissions development, in a manner that does not threaten food production; ADAPTATION**

# Climate Projections for future



Relative to pre-industrial T 2050

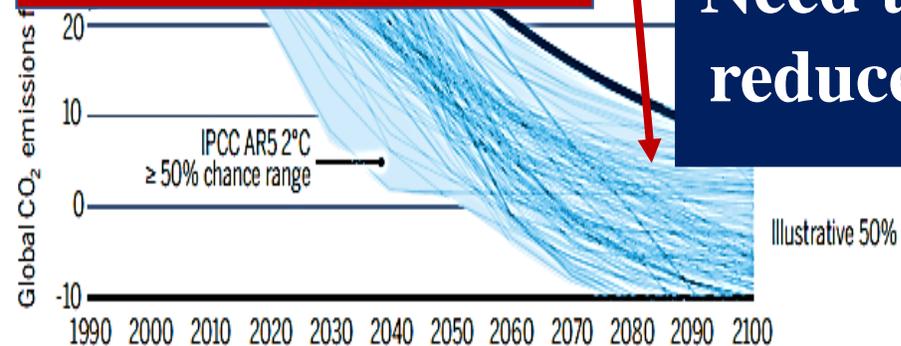
**Climate Projections  
Uncertainties:**  
**Natural Climate Science**  
**Human "climate" science**

**Societal Choices**

A Emissions pathways

**Role of Scientists  
and Science  
Centers in  
"persuading"  
societies to take  
action.**

**Need to  
reduce.**



*The post-2015 development agenda, financing for development, climate change and disaster risk reduction ...*

Lead - S&T  
Major Grp



*Ensuring credible links, ... between these processes will contribute to building resilience and achieving the global goal of eradicating poverty.” ...action within and across sectors by*

States at local, national, regional and global levels

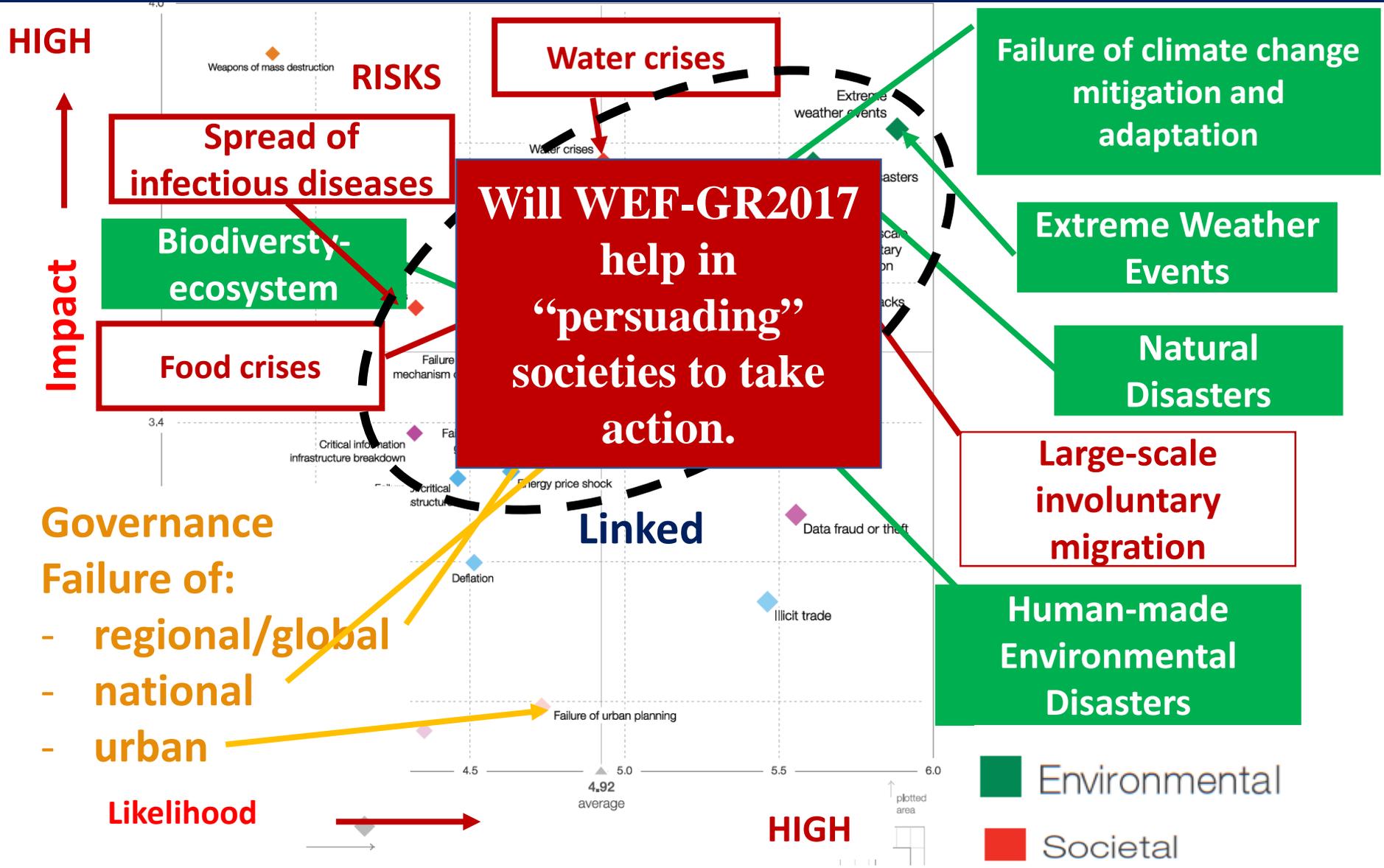
## Four priority areas for Disaster Risk Reduction

1. **Understanding disaster risk;**
2. **Strengthening disaster risk governance to manage disaster risk;**
3. **Investing in disaster risk reduction;**
4. **Enhancing disaster preparedness and to “Build Back Better” in reconstruction.**

**Global Forum on S&T  
Disaster Resilience 2017-  
Tokyo**

# Major Global Challenges – “Wicked” problems

## Global Risks 2017 - World Economic Forum



# ADDRESSING MAJOR GLOBAL CHALLENGES

**Global Policy  
Agenda  
2015-2030**



**Global Research  
Agenda**

**Paris  
Climate  
Agreement**



**Sustainable  
Development  
Goals**



**Disaster  
Risk Reduction  
Sendai**



**Urban  
Agenda  
2016**



**Integrated  
Science-Policy  
Interface**



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**ISC- 2018**

**CO-DESIGN**

## Science Centers

1. Join in
2. Communications to global community - connect the issues
3. Support – portray – explain the science
4. Motivate the populations – and governance.

# Looking back in history

It was  
**SPUTNIK**

Sputnik was the beginning of  
space-based observation which  
has totally changed our way of  
seeing our planet.

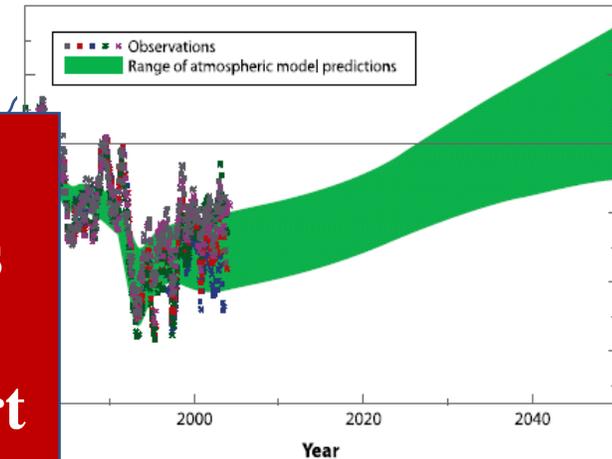
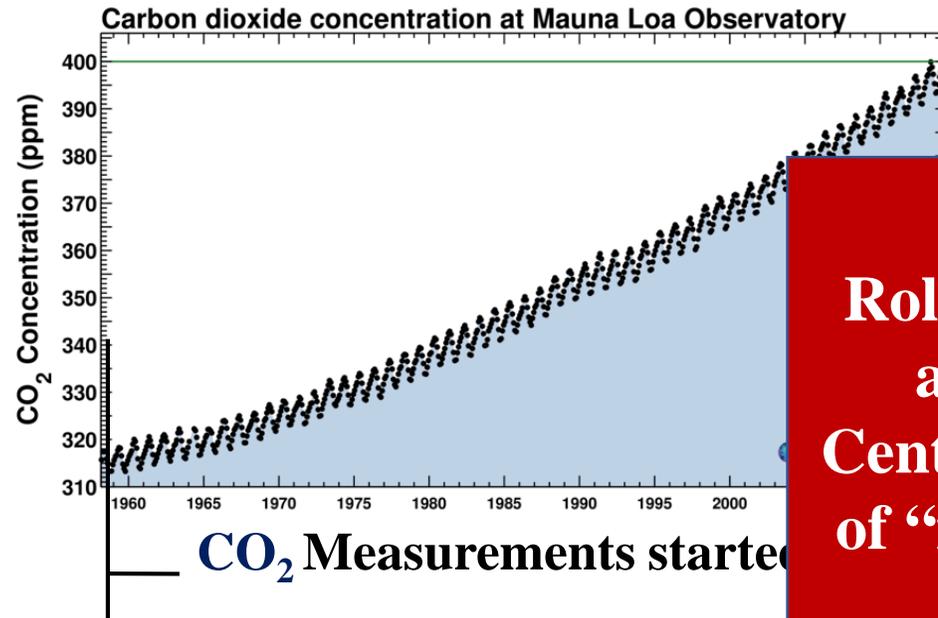


Space Exploration Gifts  
to Sustainable Future

Mamoru Mohri



# Greenhouse effect - Ozone Depletion



**Role of Scientists  
and Science  
Centers in support  
of “fundamental”  
science.**

Measurements started in 1957

## 1957 –quite a year

- Sputnik
- First systematic global carbon dioxide measurements
- First systematic global stratospheric ozone measurements
- **WHY?**
- **The International Geophysical Year (IGY) of the International Council of Science - ICSU**

# International Council for Science



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Key members and representatives of the ICS



ISSC

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- Now merging with International Social Sciences Council - International Science Council – ISC
- 40 international scientific unions and associations + > 140 national/regional org.
- Vision of advancing all sciences as a global public good



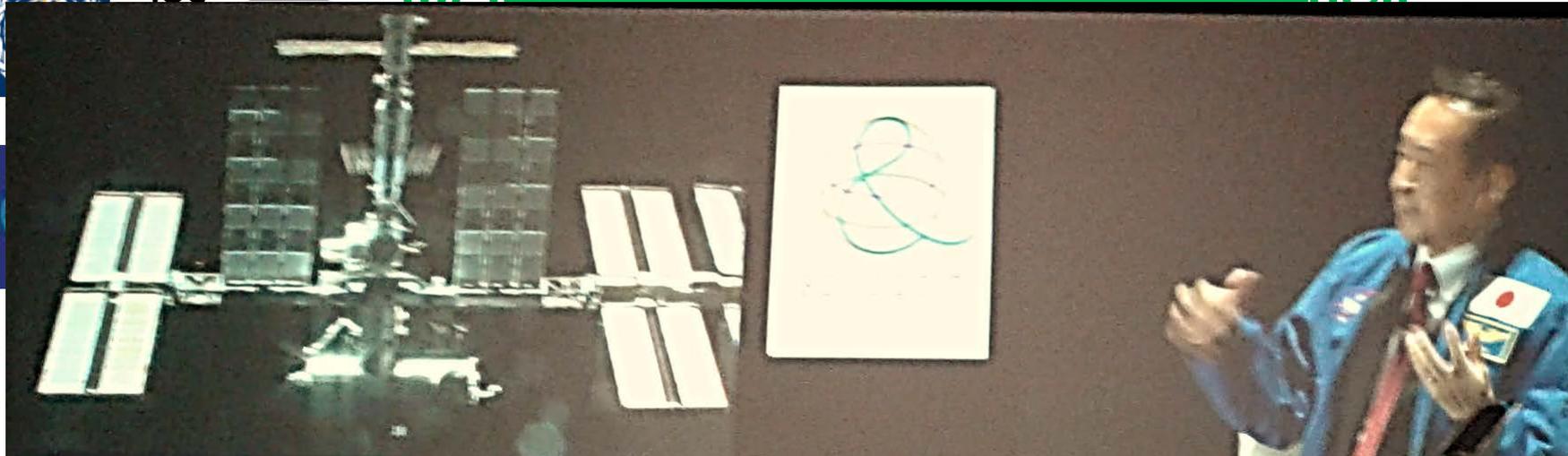
- Mission is to facilitate the analysis and prediction of climate variability and change for the benefit of society



IOC



Emissions → temperature + climate?



assessments.



advances society's ability to cope with high impact weather through research focused on improving time and utilization of weather

More extreme weather? Which types?  
How to get out forecasts?

# Planning and Conduct of Science Programs

- Traditional Research programs
- Design – working groups of scientists
- Conduct research and then report on what we found.
- **CO-DESIGN** – also called **participatory design** - is an approach to design attempting to **actively involve all stakeholders** (e.g. employees, partners, customers, citizens, end users) **in the design process to help ensure the result meets their needs and is usable**. Participatory design is an approach which is focused on processes and procedures of design and is not a design style. (Wikipedia)

# International Research Collaboration Future Earth

Transition  
Team  
2011-2012



2007-8



2008-



2012-



Earth System  
Science Partnership  
2001



WORLD DATA SYSTEM



Established  
1980



1985



DIVERSITAS  
1991



IHDP

International Human Dimensions Programme  
on Global Environmental Change

1996



2015



futureearth  
research for global sustainability

2016



2020+

The logo for Future Earth, featuring the word "futureearth" in a lowercase, blue, sans-serif font. The "e" in "earth" is stylized with a circular arrow around it.

futureearth

Research. Innovation. Sustainability.

A nighttime satellite view of Earth from space, showing the curvature of the planet and the glowing lights of cities and urban areas across the continents.

# Future Earth:

Accelerating transformations to  
global sustainability  
through research and innovation

**Amy Luers**  
Executive Director  
Future Earth

Image: NASA

**Goal:**

To provide the knowledge required for societies in the world to face risks posed by global environmental change and to seize opportunities in a transition to global sustainability



Governing Council

**Role of Scientists and Science Centers in co-designing science program and maximizing outcomes.**

*How can we “best” involve society to have approaches for the “right” future?*

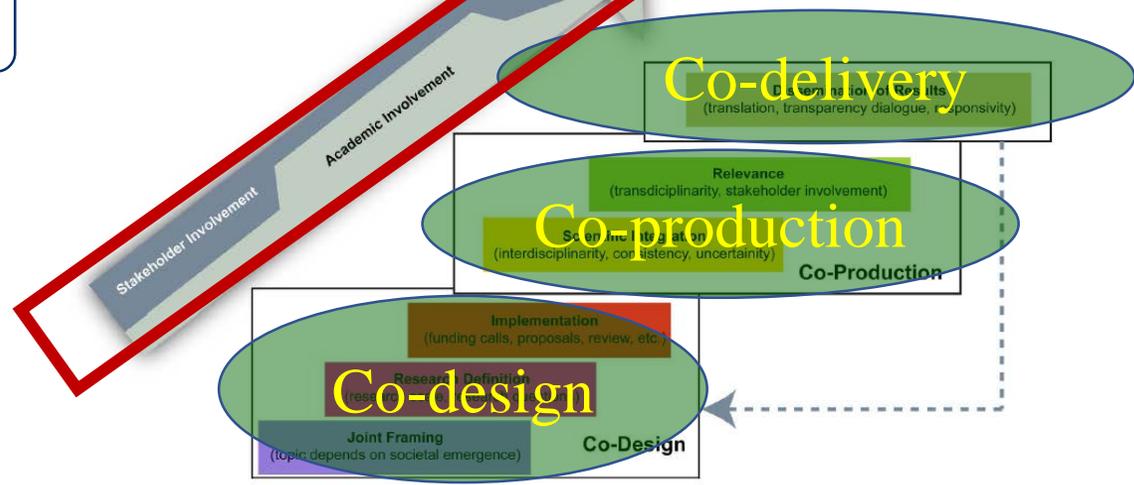


Figure 1: Steps and involvement in co-design and co-production of scientific knowledge<sup>4</sup>

**Knowledge-Action Networks are collaborative frameworks that facilitate highly integrative sustainability research.**

- **Their aim is to generate the multifaceted knowledge needed to inform solutions for complex societal issues.**
- **They are the essential links to key focal challenges.**

- **Water-Energy-Food Nexus**
- **Oceans**
- **Transformations**
- **Natural Assets**



- **Sustainable Development Goals**
- **Cities**
- **Health**
- **Finance & Economics**
- **Disasters**



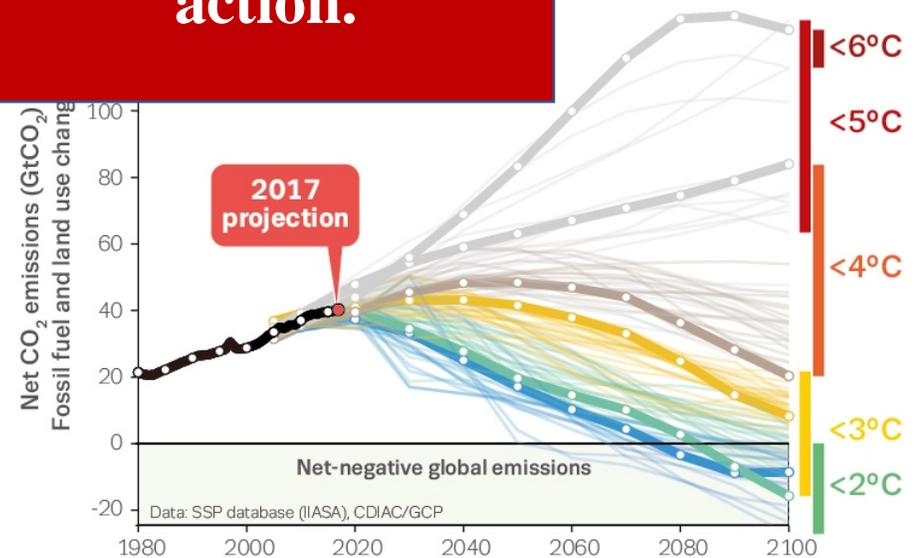
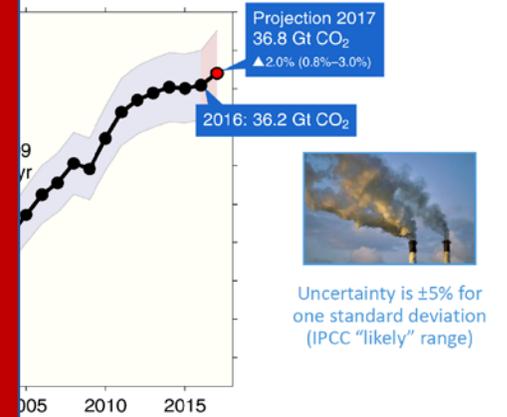
**Future Earth and the Earth League called “The 10 Science ‘Must Knows’ on Climate Change” delivered at the Bonn Climate Change Conference on 13 November.**

**11 November 2017  
Future Earth National  
Committee for Japan  
launched in Tokyo**



fossil fuel and industry: 36.2 ± 2 GtCO<sub>2</sub> in 2016, 62% over 1990  
n for 2017: 36.8 ± 2 GtCO<sub>2</sub>, 2.0% higher than 2016

**Role of Scientists  
and Science  
Centers in  
“persuading”  
societies to take  
action.**



# Seeding Problem-focused Collaborations

Fourth Industrial Revolution is transforming the way we live.  
Need to put **De-carbonization at the center** of this transformation.



Stockholm Resilience Centre  
Sustainability Science for Biosphere Stewardship



futurearth  
research for global sustainability



An integrated approach to research on disaster risk through: an international, multidisciplinary (natural, health, engineering and social sciences) collaborative research programme.

## Objectives:

1. Science for ... hazards, vulnerability and risk
2. Effective decision making ... .. risk interpretation to action
3. Reducing risk and curbing losses ...

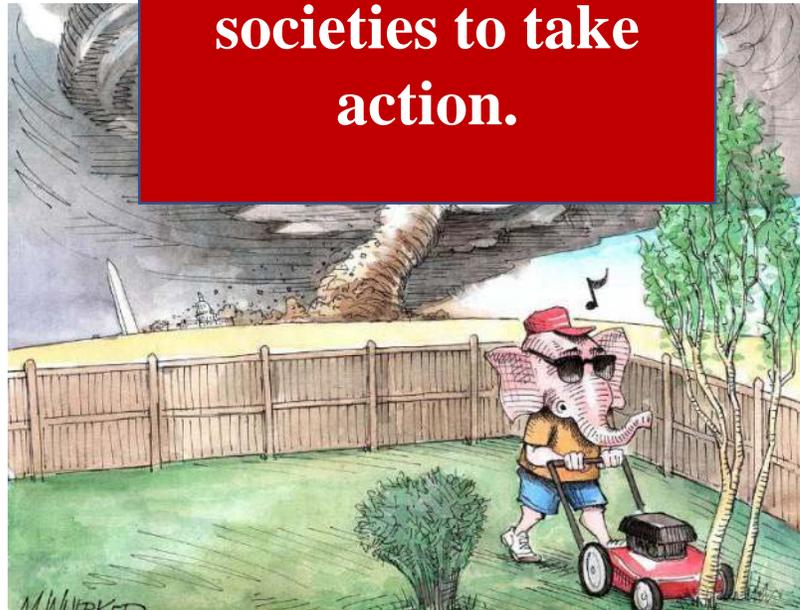
## IRDR International Centres of Excellence – ICOE (12)

1. Academy of Sciences located in Taipei, China
3. **Community Resilience** - Joint Centre for Disaster Research, Massey University, Wellington, New Zealand
6. **Risk Interpretation and Action** - Centre for Integrated Research on Risk and Resilience (CIRRR), Department of Geography, King's College London, UK
7. **Disaster Resilient Homes, Buildings and Public Infrastructure** - Institute for Catastrophic Loss Reduction. Western University, London, Canada
10. **Disaster Risk and Climate Extremes** - *Southeast Asia Disaster Prevention Research Initiative, National University of Malaysia*
12. **Spatial Decision Support for Integrated Disaster Risk Reduction**  
*Faculty of Geo-Information Science and Earth Observation (ITC), The University of Twente*

# Risk Interpretation to Action



**Role of Scientists  
and Science  
Centers in  
“persuading”  
societies to take  
action.**



**Science – all sciences – needs to  
address the issues of disaster risk  
management**

## **Risk interpretation to action:**

**When people and/or governments  
receive information on impending  
threat:**

- tornado, hurricane, hot-dry summer, etc.,
- What do they do? Actions
  - Nothing, “right” actions – which are “right”?;
- Why do they take these actions?
  - Politics; education; financial; socio-cultural; ...
- **GOVERNMENTS – WHAT ACTIONS DO THEY TAKE???**

# Disaster Resilient Homes, Buildings and Public Infrastructure

## Institute for Catastrophic Loss Reduction

*Building resilient communities*



'Research to action'

Co-design

Insurance Bureau,  
municipalities, engineers, ...

Role of Scientists  
and Science  
Centers in  
"persuading"  
societies to take  
action.



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UNITED NATIONS  
UNIVERSITY

Inter-Academy Medical Panel

**10-year interdisciplinary research effort whose overall aim is to generate policy-relevant knowledge that will improve health status, reduce health inequalities and enhance the well-being of urban dwellers. It will focus on the integration of natural, social, medical and engineering sciences using systems approaches to address the complexity of urban issues and their influence on health.**



**Science Committee**



**“Big Data in an Urban Context” - the challenges and opportunities of big data for urban health.  
Nov 30-Dec 4, 2015**

# Policy Issues for Science and Society

## Responsibilities of global science

To contribute to post-2015 frameworks, including the Sendai Framework, Agenda 2030, Paris Climate Agreement and the upcoming agenda.

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

## Develop fully global science capacity

Science for the benefit of all societies and “leaving no scientists behind”

## Science and Technology for Sustainable Development

Projecting science, technologies and societal change

## Challenging science policy and practice

Time to create the ‘conditions of possibility’, to support science for a sustainable and just world



# Develop fully global science capacity

**Climate Change & Cities**

Rapidly growing urban areas in the developing world provide opportunities for economic growth and yet these cities face significant challenges associated with rapid growth, diminished environmental quality and climate change. START is creating opportunities to facilitate knowledge generation and sharing for cities at risk, particularly coastal cities in Asia. START is also expanding these efforts into Africa.

## START Promotes Capacity Building through ...



Supporting Regional Research & Assessments



Promoting Innovation in Education



Enhancing Knowledge Sharing for Action

### BOARD MEMBERS



**Khotso Mokhele**  
(START Board Chair)  
Chancellor  
University of the Free State  
SOUTH AFRICA



**Mohamed Hassan**  
Co-Chair  
Inter Academy Panel  
ITALY



**René van Kessel-Hagesteijn**  
Director  
Netherlands Organization  
for Scientific Research  
NETHERLANDS



**Abdul Hamid Zakri**  
Chair  
Intergovernmental Platform  
on Biodiversity and  
Ecosystem Services  
MALAYSIA



**Ghassem Asrar**  
Director  
Joint Global Change  
Research Institute  
USA



**Joachim von Braun**  
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Center for Development  
Research (ZEF)  
Bonn University  
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**Mohamed El-Ashry**  
Senior Fellow  
United Nations Foundation  
USA



**Rémi Quirion**  
Chief Scientist Officer  
Research Funds of Quebec  
CANADA



**Hassan Virji**  
(Ex-Officio Member)  
Executive Director  
International START  
Secretariat  
USA



Cheikh Mbow



# Science Policy - Open Data in a Big Data World



Science International 2015



## OPEN DATA IN A BIG DATA WORLD - AN INTERNATIONAL ACCORD

- International science - issues of policy for science
- The Accord
  - opportunities and challenges
  - predominant issues
  - fundamental principles
  - distinctive voice of science
  - fundamental pre-requisites for maximising public benefit in developing countries.



awarded the Science Forum South Africa Science Diplomacy Award - "an international partnership which has made an outstanding contribution to harnessing scientific advice for multilateral decision-making."

More than one hundred science organisations around the world endorsed the Big Data Accord after its publication.

- ...promote discussion and adoption of these principles and their endorsement by ... bodies of science at national and international levels.

**Role of Scientists  
and Science  
Centers in  
“accelerating”  
global  
understanding.  
Decade of Global  
Understanding**

International Year of

**GLOBAL**   
*understanding*

2016

IYGU

PRO

International Council for Science (ICSU)

**I. Bokova, Director-General of UNESCO - World Science Day  
for Peace and Development - 10 November 2017**

**This year’s theme for the World Science Day for Peace and  
Development, Science for global understanding, encompasses  
UNESCO’s approach to develop scientific cooperation  
between and within societies, combining global sustainability  
and local actions and knowledge.**

The International Development Research Centre and The International Council for Science to collaborate on building capacity for science advice in the developing world



The International Council for Science (ICSU) has received a 3 year grant on behalf of INGSA from The International Development Research Centre in Canada to deliver a programme of ... [READ MORE](#)



**Science, Technology and Innovation with Society. Role of science advisers in the process.**

**theoretical and practical a to the use of scientific evic informing policy at all lev government.**

**Connecting INGSA and Science Centers and mutual “benefits”**

**policy mies, science,**

**International Government Advisers 1st mtg - A**



## **TOKYO PROTOCOL**

**On the Role of Science Centres and Science Museums Worldwide In Support of the UN SDGs With Actions Set Forth:**

**IV. Establish new and strengthen existing partnerships and collaborations**

**VIII. Accept the responsibility to serve as catalysts for better understanding and coordinated actions within communities**



**Role of Scientists and Science Centers in “saving” our planet – now and for many future generations.**



# Co-design for Transformation - Connecting the World for a Sustainable Future for Intergenerational and International Equity and Ethics – need actions now for the future



SCWS 2017

Connecting the World  
for a Sustainable Future



INTERNATIONAL  
COUNCIL  
for SCIENCE

futureearth  IRDR  
research for global sustainability Integrated Research on Disaster Risk

International  
Science Council

Thank you for your  
attention