



# How to challenge Climate Change? Integration between adaptation and mitigation

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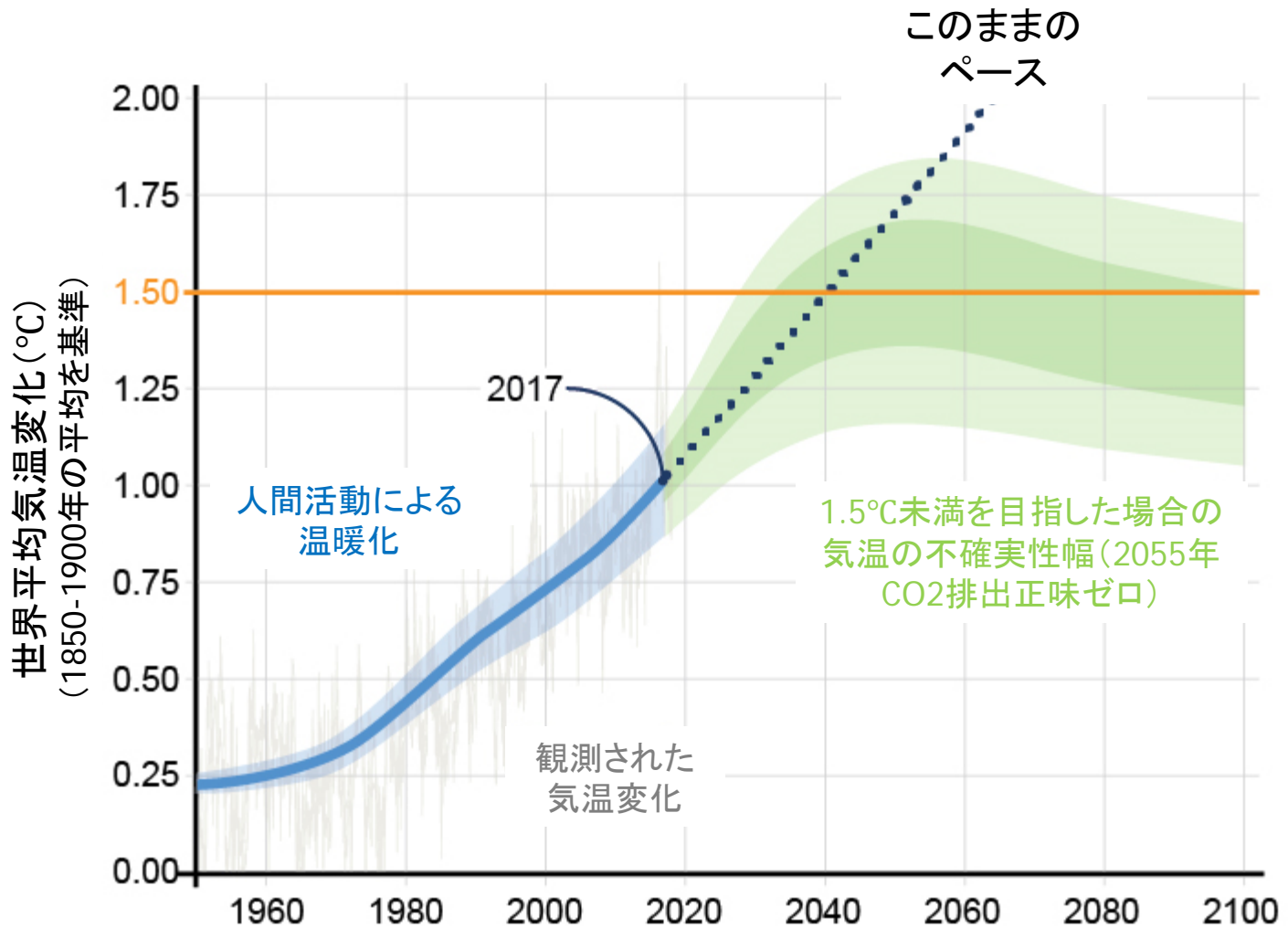
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Prof. Emeritus  
Institute for Future Initiatives  
Univ. of Tokyo

# IPCC Special Report Global Warming of 1.5°C



At Paris Conference,  
developing countries strongly  
requested.

October, 2018



(IPCC SR1.5 FAQ1.2より)

# International collaboration

- 2015 Big Changes
- Sendai Framework(Disaster Prevention)
- Sustainable Development Goals(SGDs)
- Paris Agreement



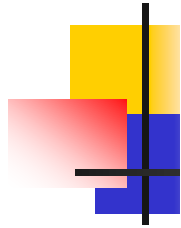


# Various issues around us!

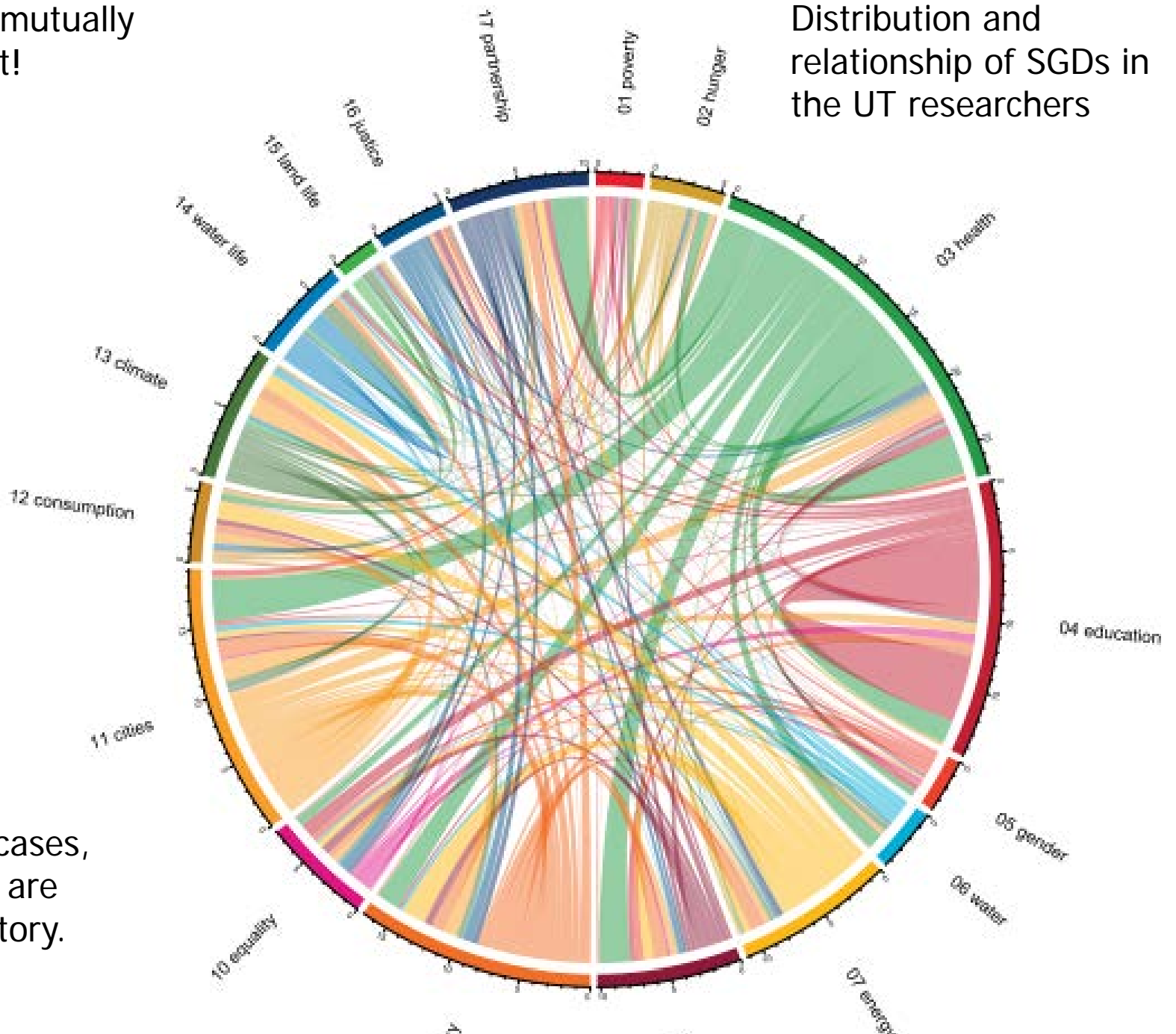
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- There are **many, many** issues.
- Issues are not independent.
- Solutions are dependent on a society.
- Many stakeholders with **different viewpoints and values**.
- When action is taken, **social agreement** is necessary.
- **How?**

SDGs are mutually dependent!

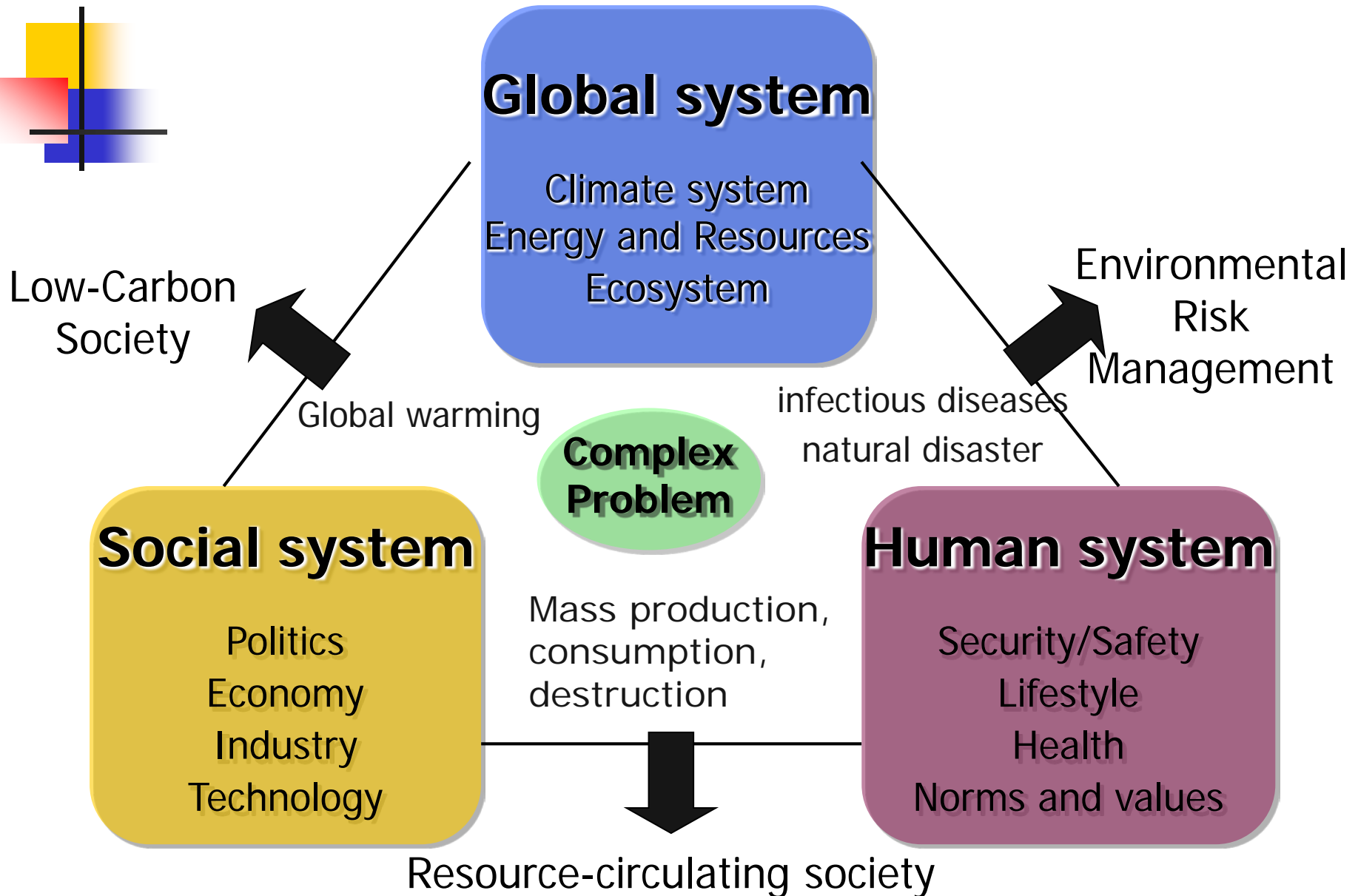
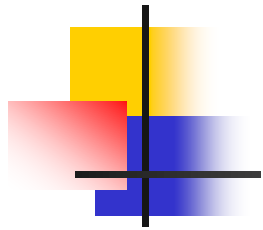


Distribution and relationship of SDGs in the UT researchers



In some cases, Solutions are contradictory.

# Linkages among three systems





# What is an “interaction” ?

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- Exchange of “Something”
- Energy
- Matter or substance
- Information
- Interactions of physical quantities are governed by physical laws!



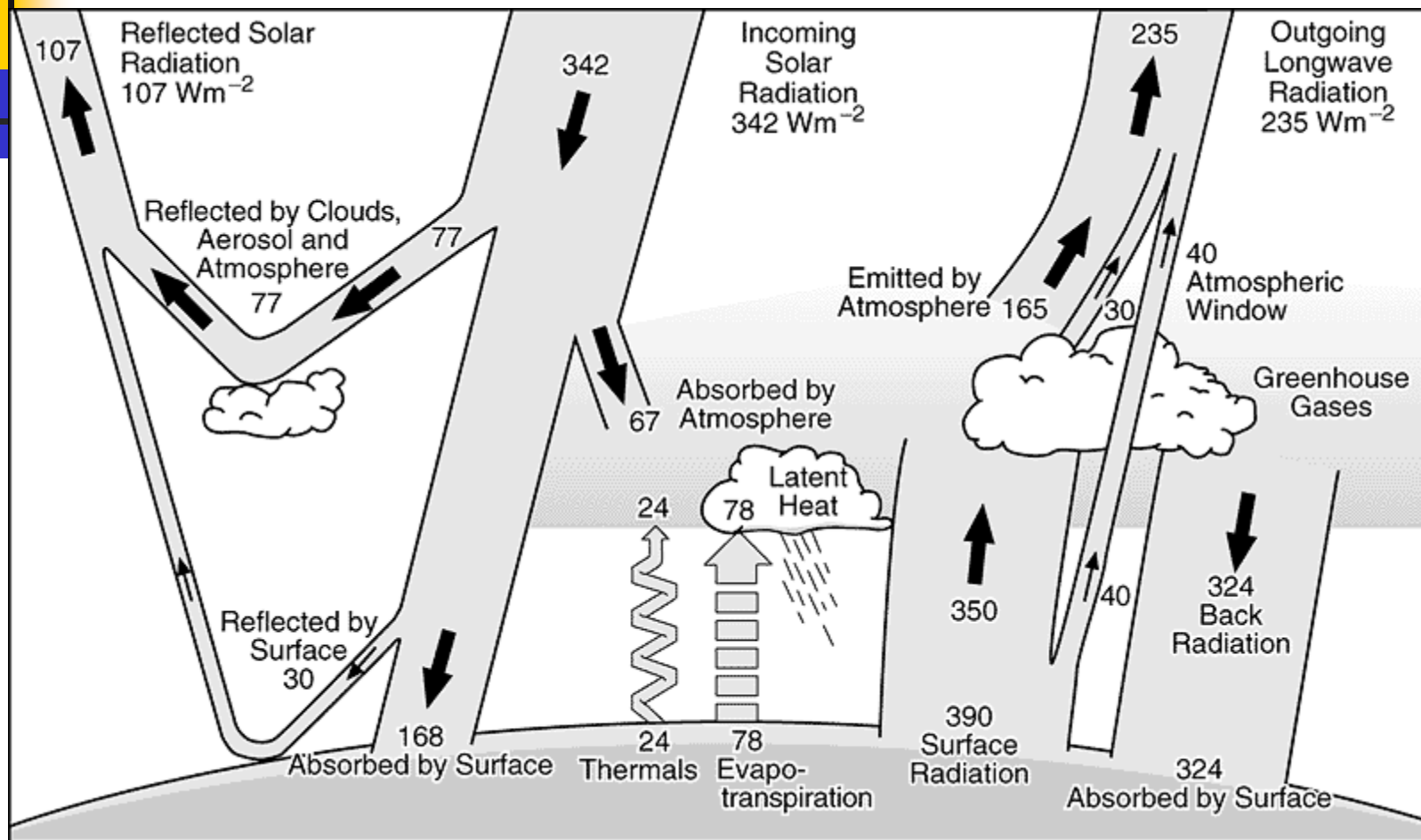
# Methodology in a Classical Physics



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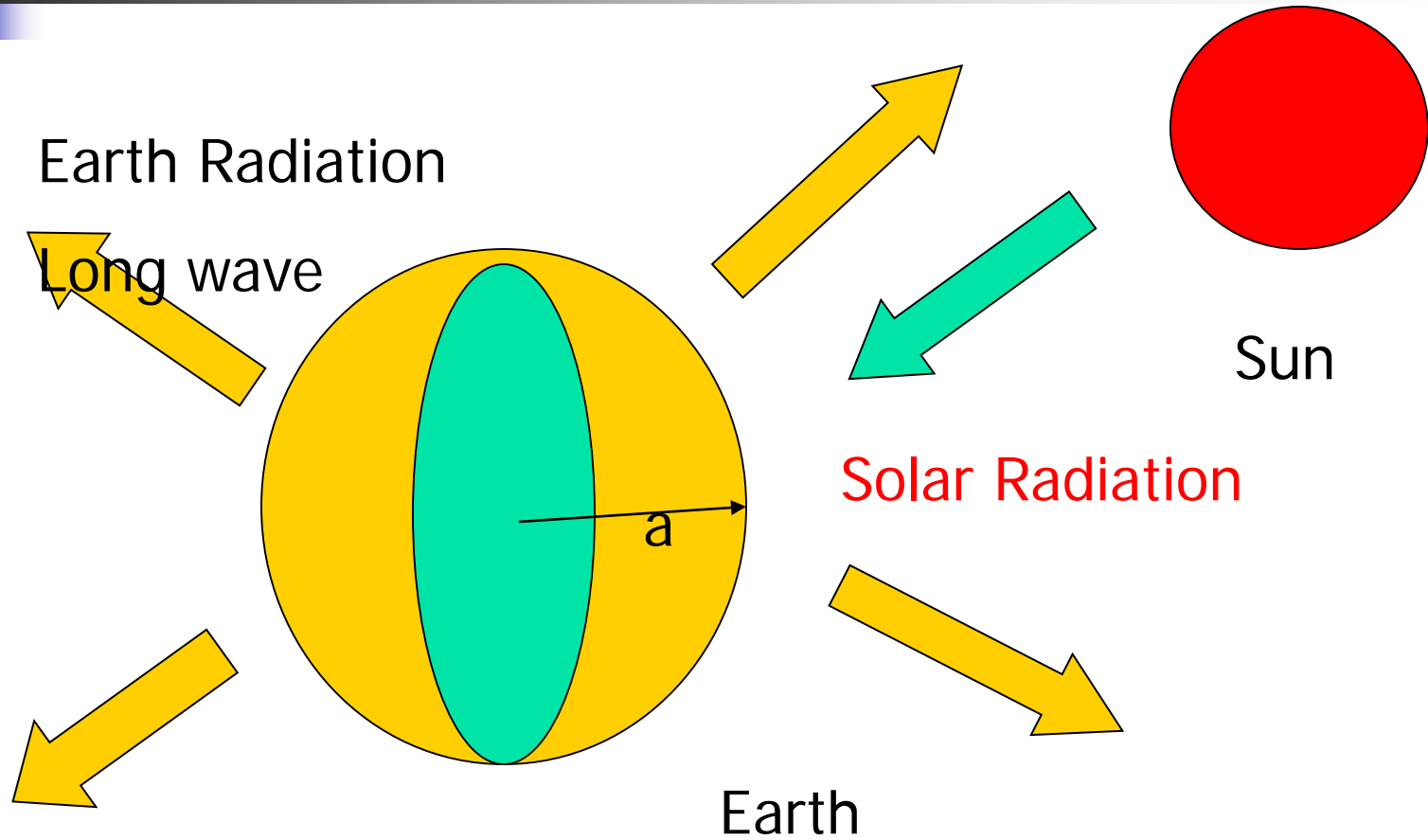
- Complicated System → Simplification
- Understand mechanism
- Exclude various factors
- Limit domain
- Space      Boundary Condition
- Temporal      Steady or periodic

# Radiation Balance(Energy Flow)



IPCC,AR4(2001)

# Radiation Balance on the Earth



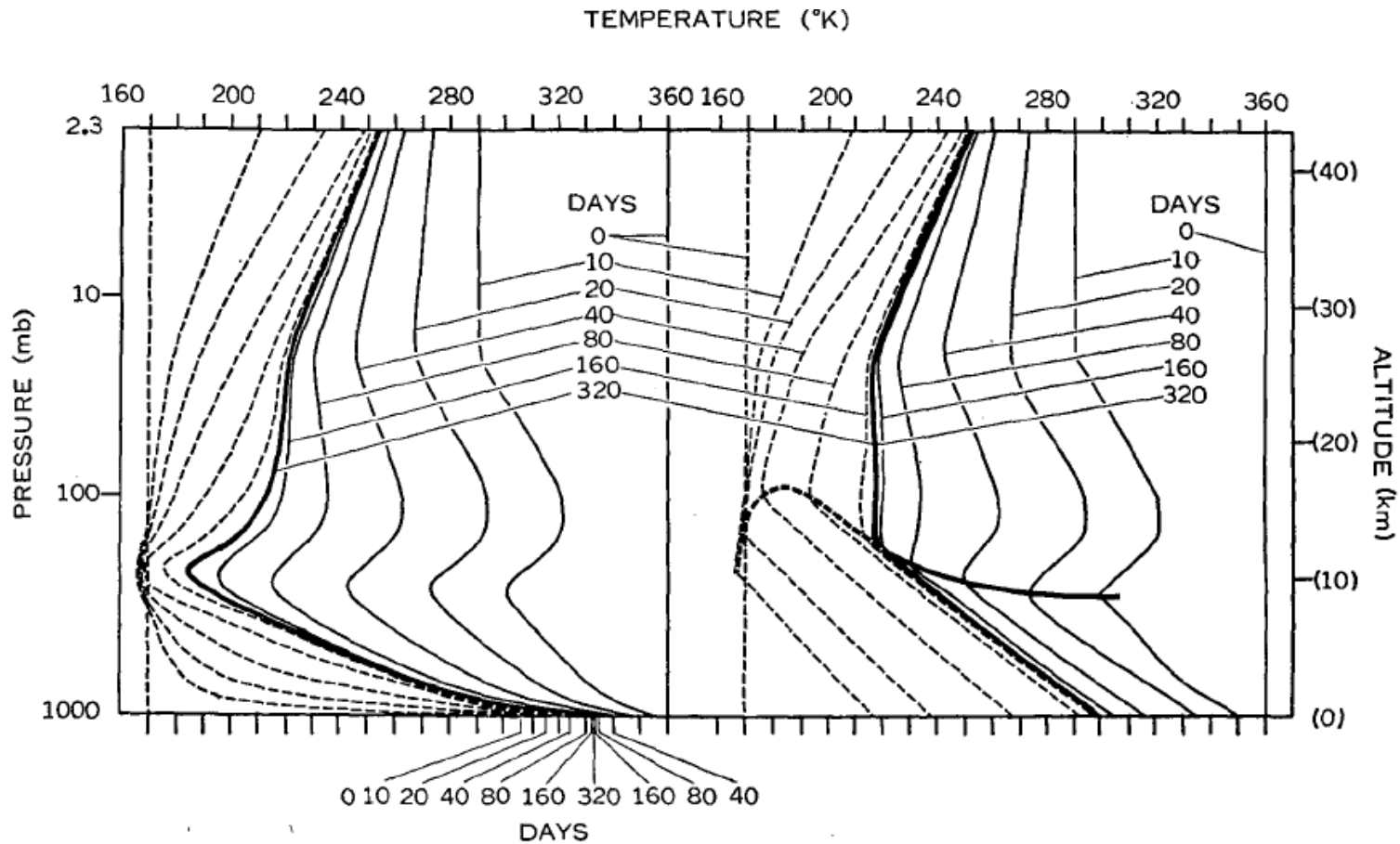


FIG. 1. The left and right hand sides of the figure, respectively, show the approach to states of pure radiative and thermal equilibrium. The solid and dashed lines show the approach from a warm and cold isothermal atmosphere.

# Radiative-convective Equilibrium Model

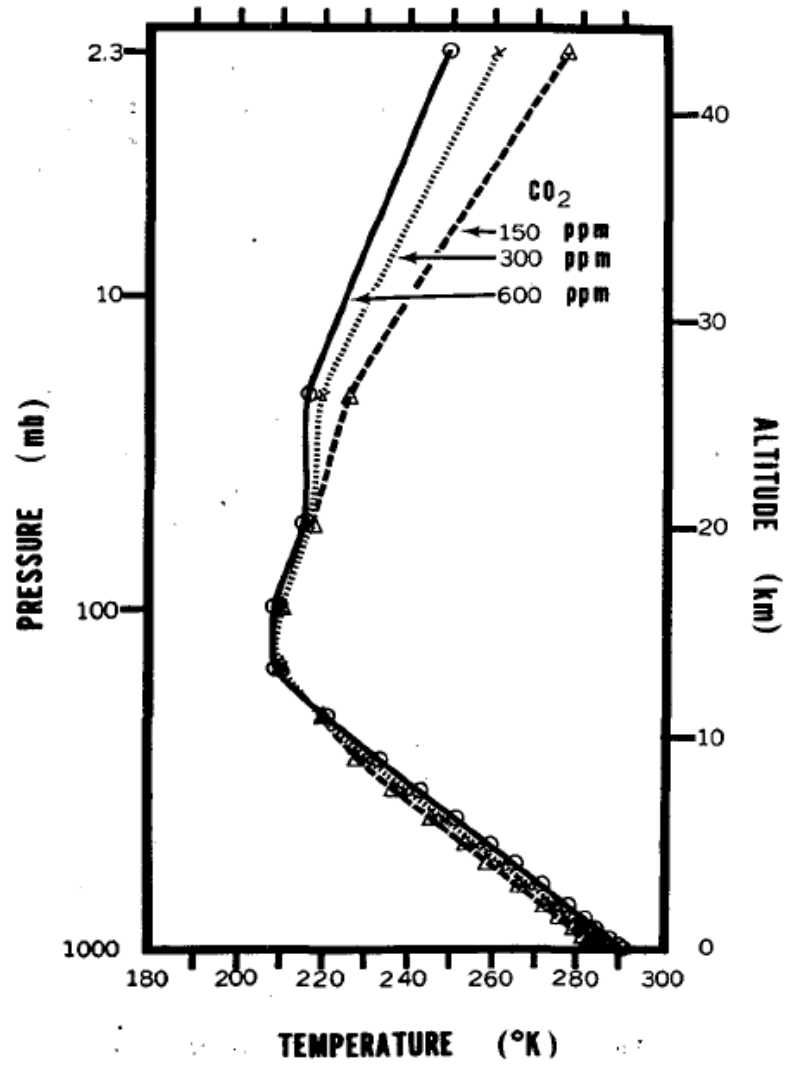


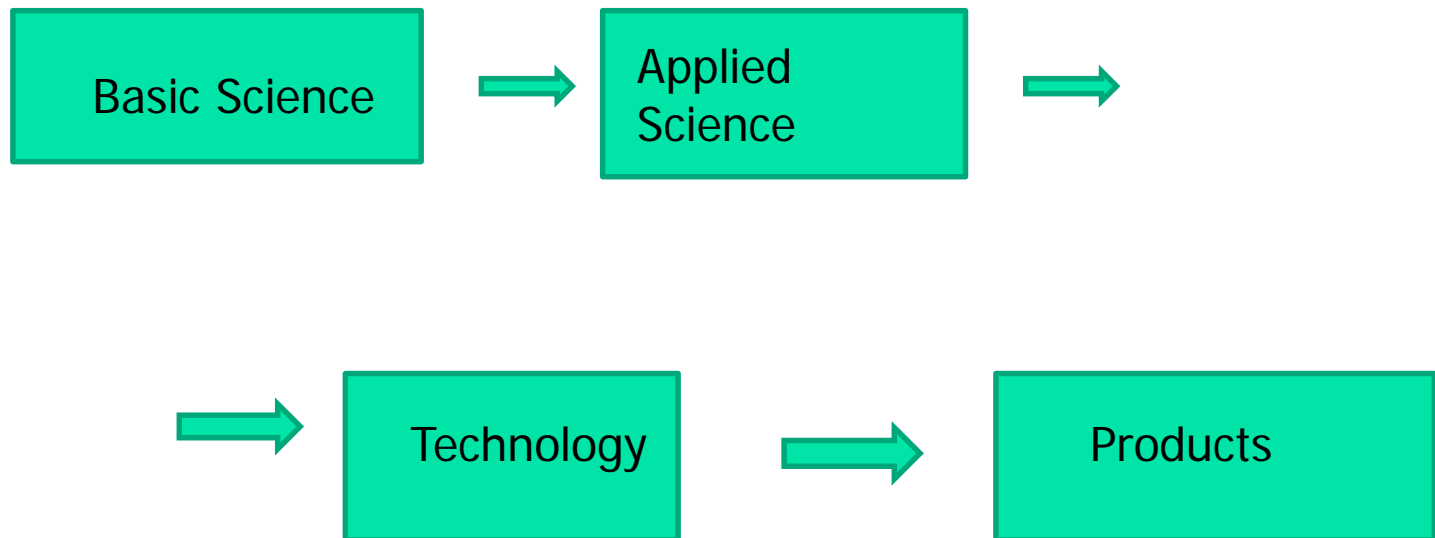
FIG. 16. Vertical distributions of temperature in radiative convective equilibrium for various values of CO<sub>2</sub> content.

# Science and Technology for Society(STS)



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- A Linear Model

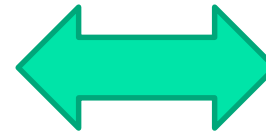




# Interactive Model

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Science and  
Technology



Society  
Issues  
Stake-holders



# Modern Issues,

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- Simple Principles does not work for individual cases.
- Especially, society issues
- Personal interests, and conflicts





# How to tackle these issues?

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- (1) Modelling      **Simulation**
- (2) A Big Data      **Data science and AI**
- (3) Indexing
- Quantitate   Estimate   vs   Qualitative
- **Communication and Platform**

# New tools

- High-end Super Computing
- Cloud Computing
- Big Data and SNS                      Networking
- We can treat a complex system as a whole?



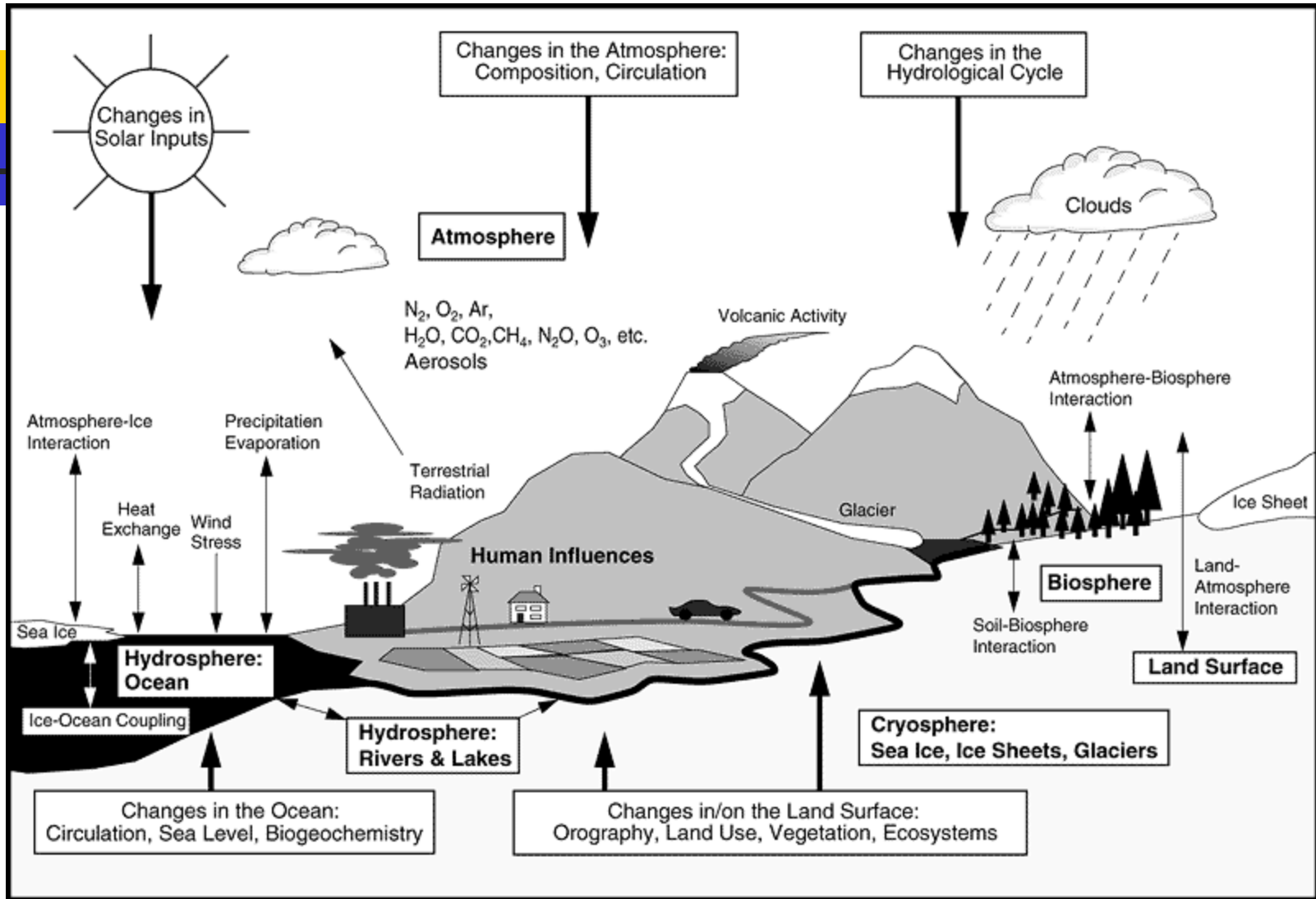


# Climate System

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- Many different components (physical, chemical, biological systems and so on)
- Many sub-systems with different characteristics!
- **Coupled** system
- **Mutual Interaction**

# Climate System

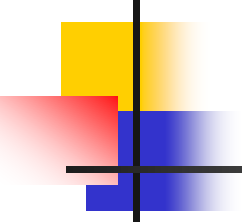




# Introduction of other sub-systems and couple them

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- Interaction is a key process!
- Time-scale is different
- Horizontal-scale is different!
- Coupler system is developed!



NWP

ENSO

Global Warming

Ice age

Days

A few Years

100 years

1000years

Atmosphere

Atmosphere

Atmosphere

Atmosphere

Ocean

Ocean

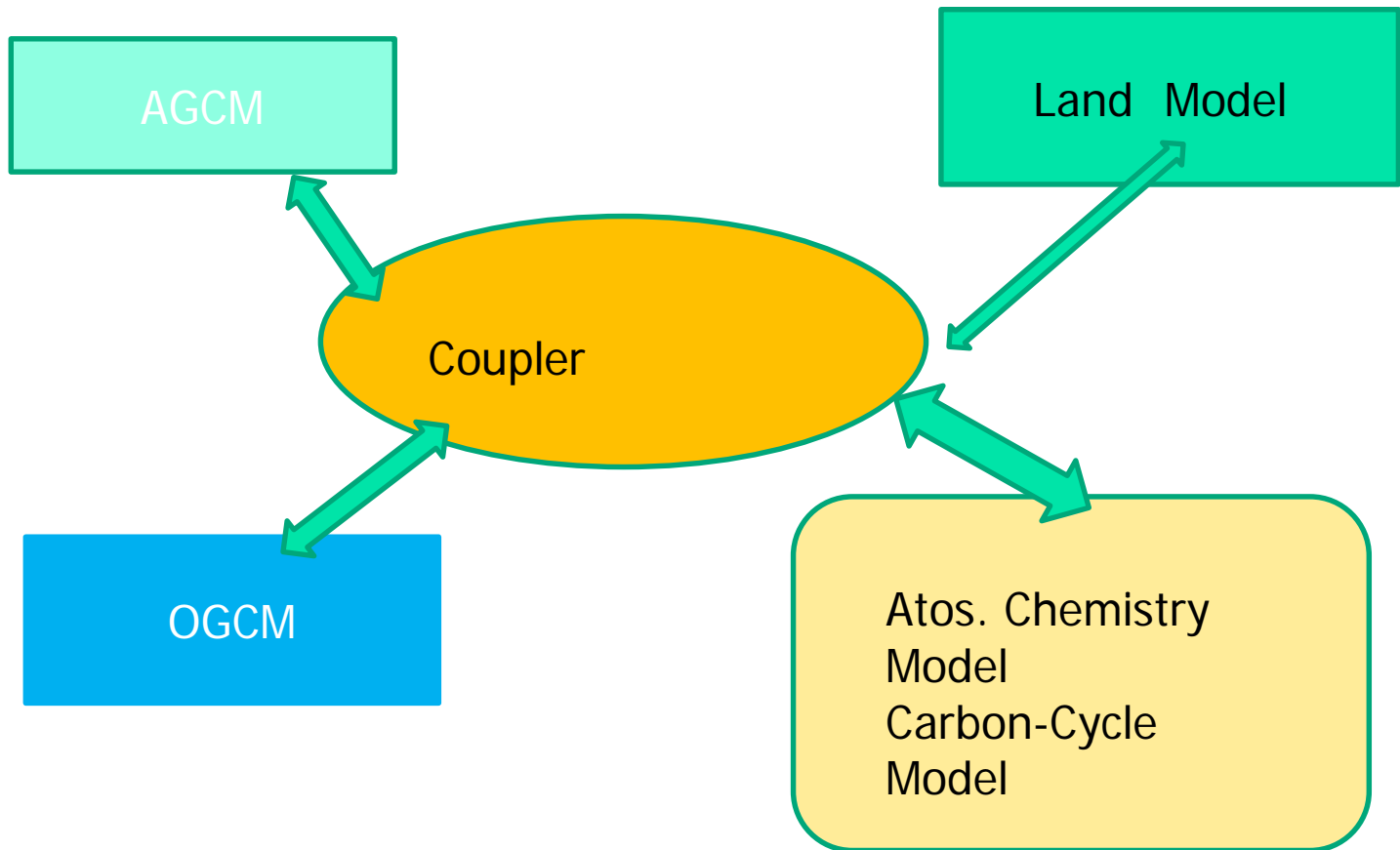
Ocean

GHG and LCLC

GHG and LCLC

Ice Sheet

# Coupler J-Cup



# Further expansion to Human Activity

(\*仮 あるいはMIROC-INTEG とか。MIROC5.0 をベースにしたバージョン)

## Climate (Land S. Model MATSIRO)

Soil temperature Soil wetness etc

## Water Remodel

### H08

Water Use of  
Agriculture and  
Industry Pollution

農作物収量

水の利用  
(農業・工業・生活)

浸食

肥料投入

森林火災  
によるCO2排出

土地利用による  
CO2排出

温室効果ガス  
収支

森林伐採

## Eco-System VISIT

C, N distribution between  
atmosphere, land and  
plants

## Crop Model PRYSBI2

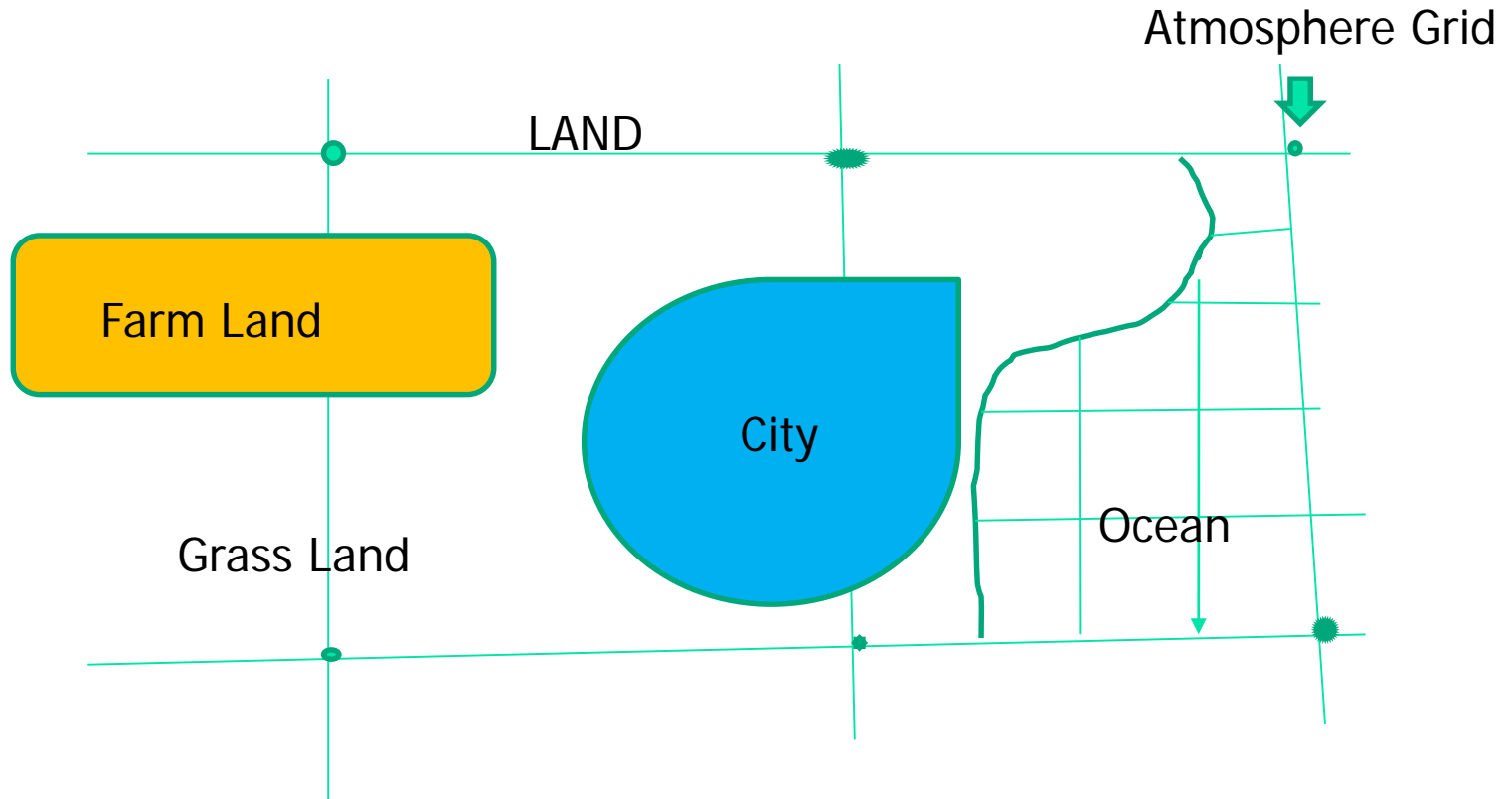
Crops, Bio-Energy, N-burden etc.

## Land Use Model TELMO

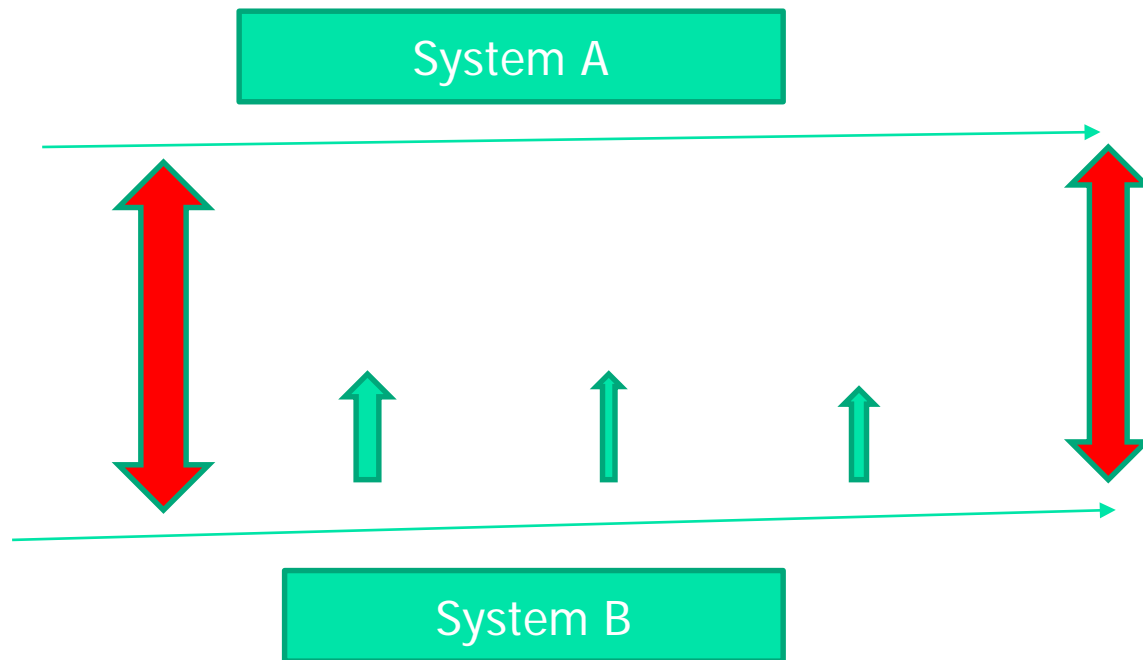
Land Use and Land Cover Change  
due to human activity



# How to handle a heterogeneous interaction?

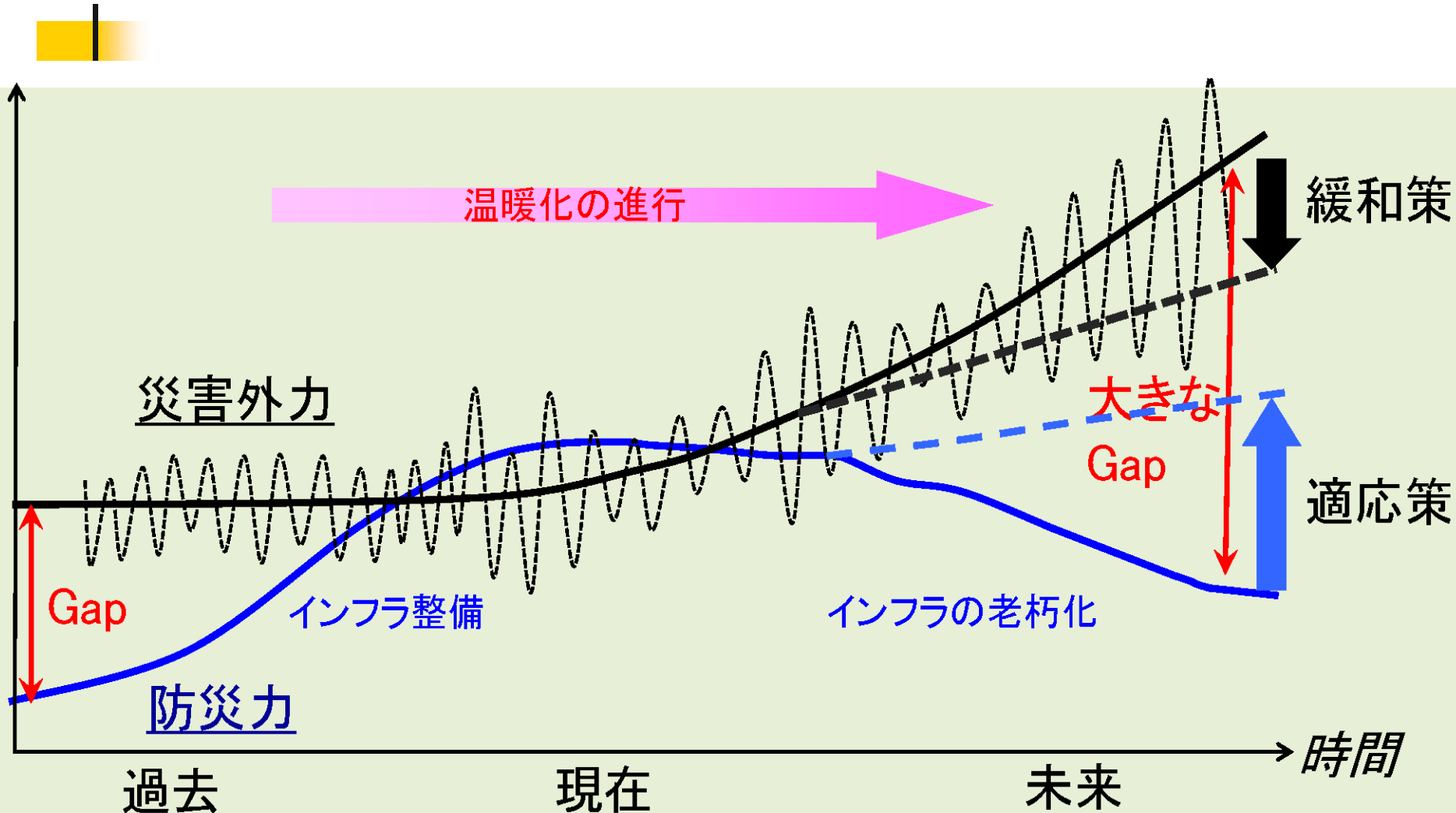


# Different time-scale



# Relationship between adaptation and Mitigation

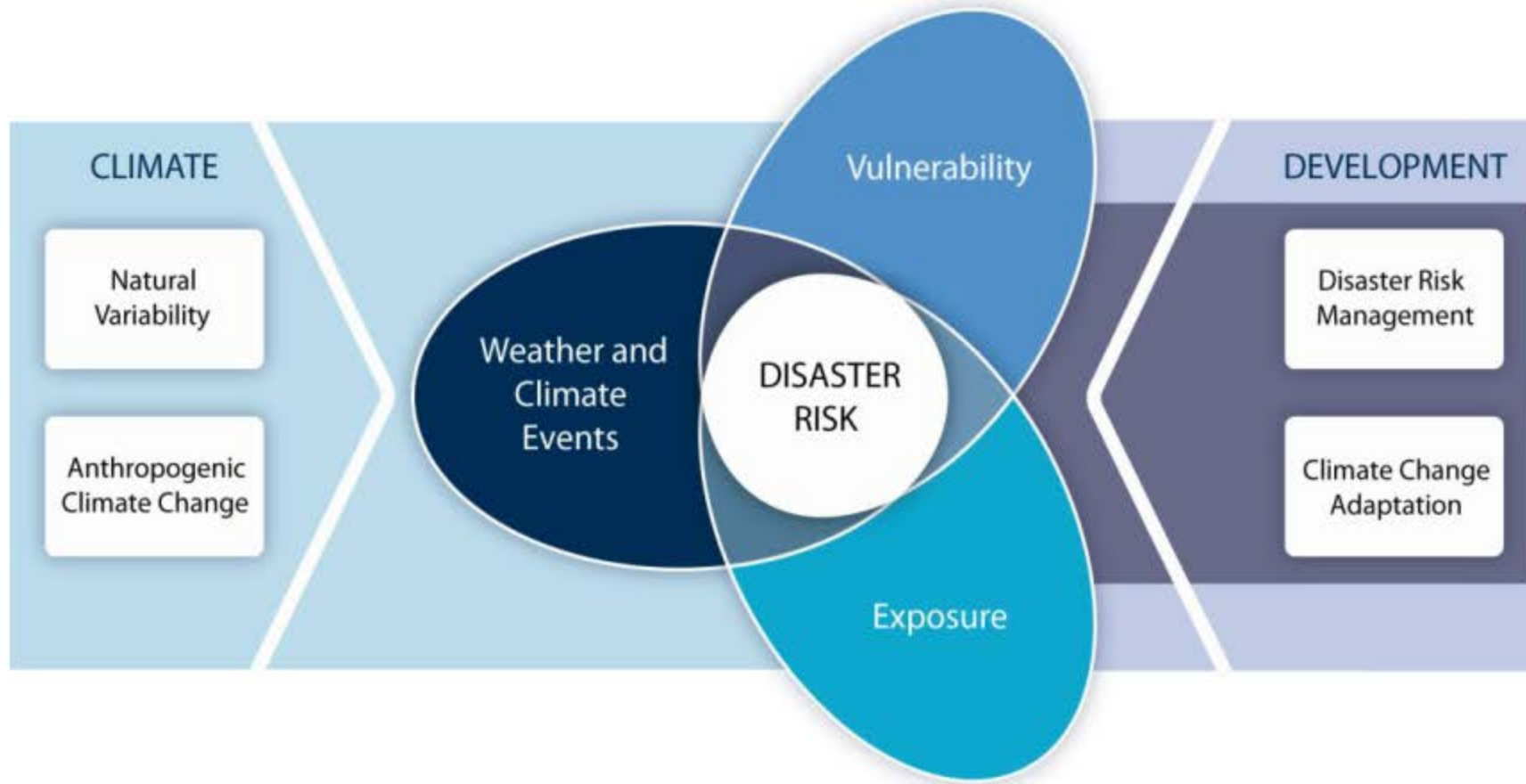
- Integration of mitigation options and adaptation options



叩かれっぱなしだったけど、  
何がどうなるかが見えた

叩かれっぱなし。更に災害の様相が見えない！（想定外のことが起こる）

Increasing vulnerability, exposure, or severity and frequency of climate events increases **disaster risk**





# Mitigation and Adaptation

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- Mitigation reduce carbon emission
- Individual technologies
- Systematic thinking way is important!
- Integration of individual technologies
- Design of Society
- Regional planning city and village

# Data Platform

# A-PLAT



気候変動適応情報プラットフォーム

Adaptation for the future.

CLIMATE CHANGE  
ADAPTATION  
PLATFORM, JAPAN



環境省

Ministry of the Environment



National  
Institute for  
Environmental  
Studies, Japan



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[National Adaptation Plan of Japan](#)

[Impact & Adaptation](#)

[Let's Adapt!](#)

[International Action](#)

## Adaptation Business in Japan

2017.6.9 Opened!



Featuring Japan's pioneer companies in the field of Adaptation Business.



LET'S ADAPT!  
Tips for  
Community  
and Society

IMPACT &  
ADAPTATION  
IN JAPAN



# Asia Pacific Adaptation Platform(AP-Platform)

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- Capacity Building of local government designing adaptation plan
- UT-NIES collaboration with Indonesian agencies



# Index

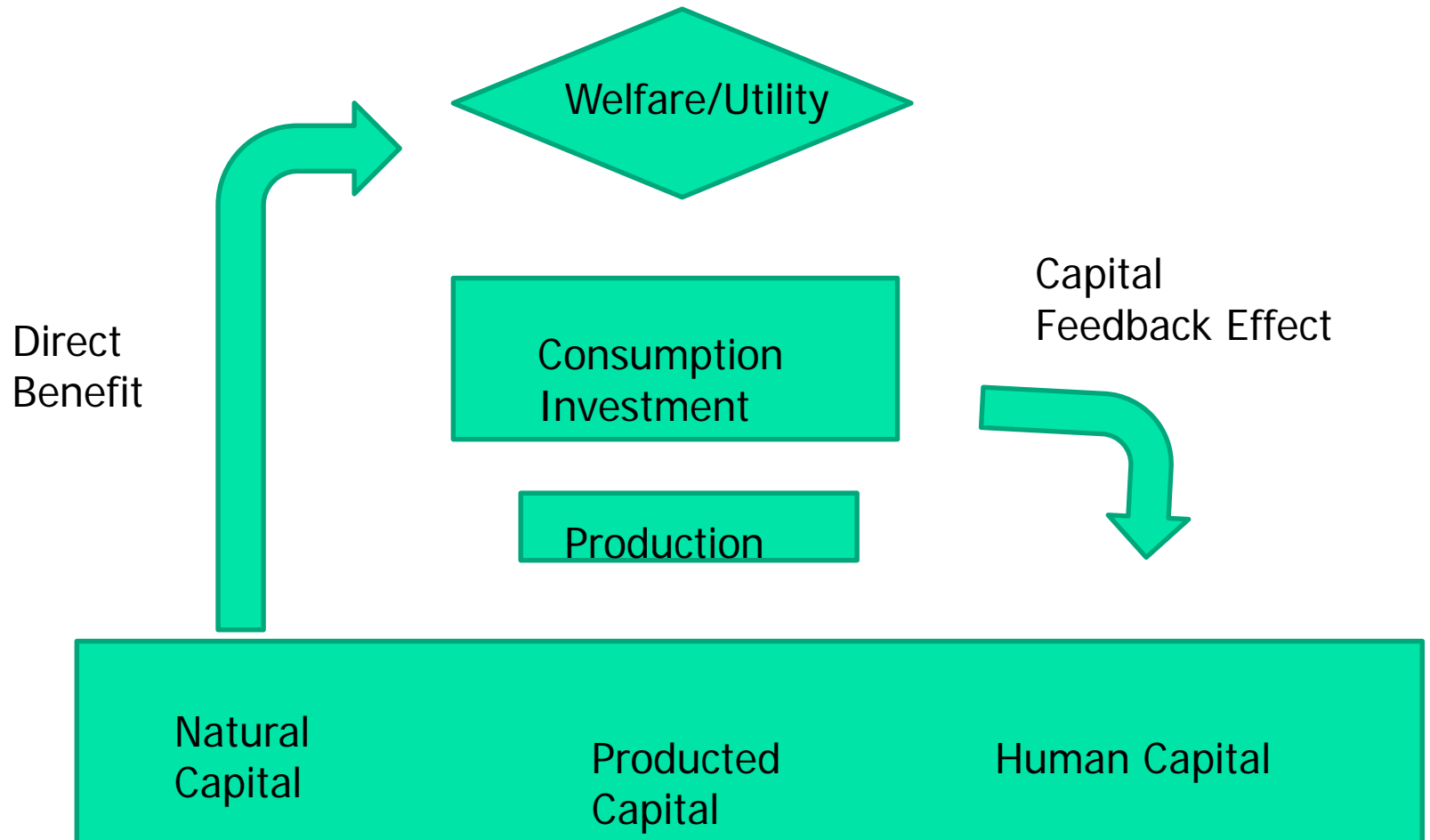
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- GNP
- GDP Production
- Sustainability Index
- Inclusive Welfare Index (IFI) etc.



# Inclusive Welfare Cycle

## IWI Index Evaluation





# Summary

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- For an integration study, integration by using a model is one possible way.
- A huge data
- Increase of computer power and AI
- Agent-based Model for human-behavior
- How to make a judgement?
- Index like a NDP or IWI