Clinical and basic environmental studies in Nagoya University – a medical approach to solve environmental problems
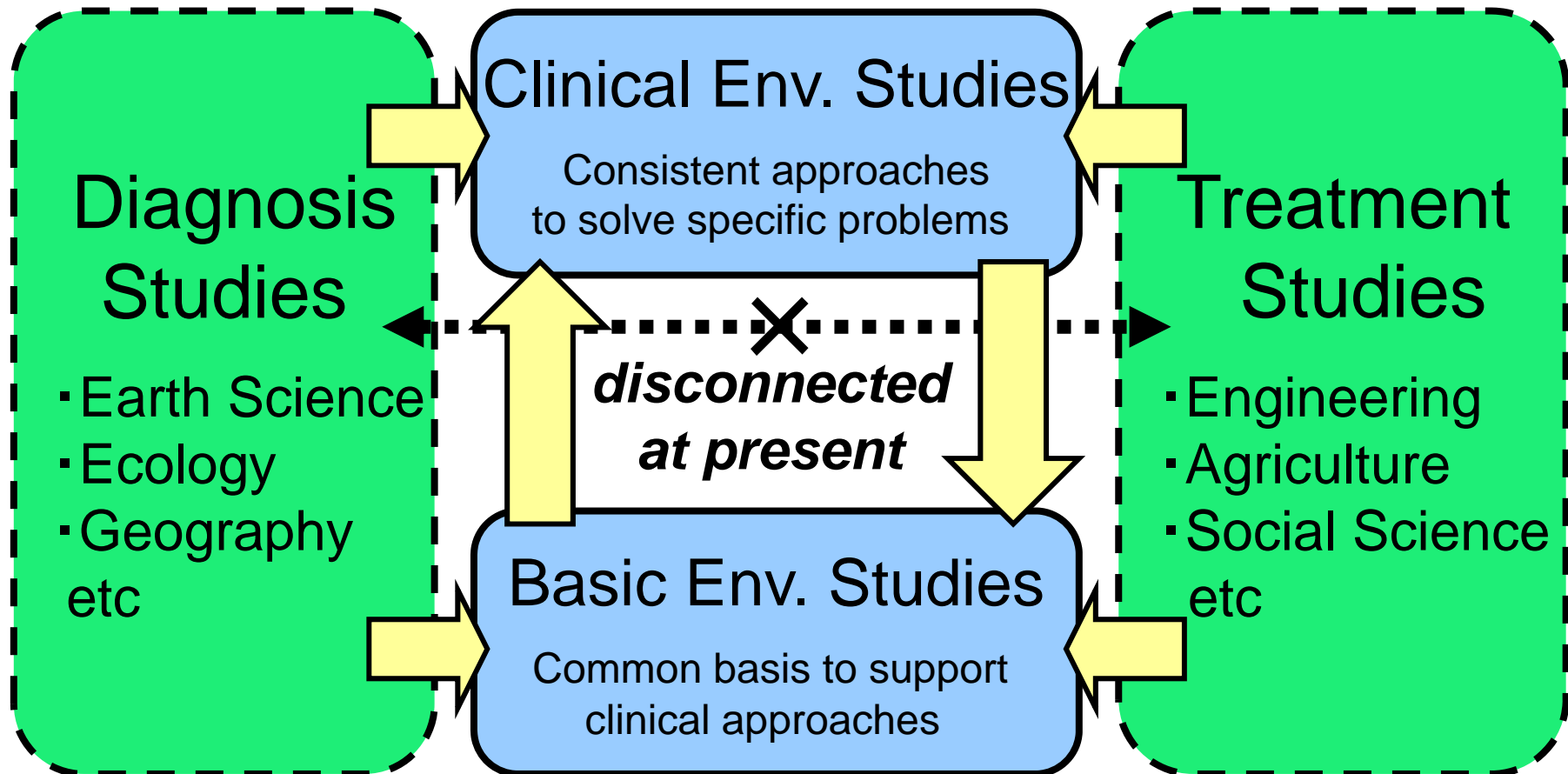
Takeshi NAKATSUKA

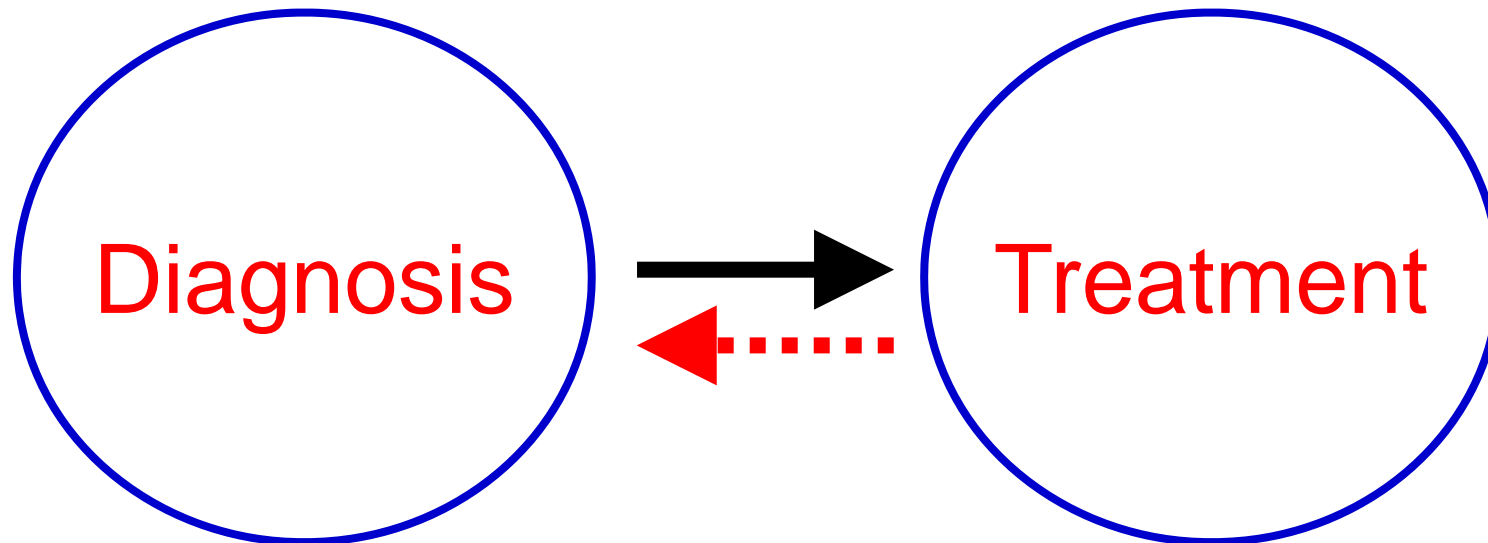（Graduate School of Environmental Studies, Nagoya University）
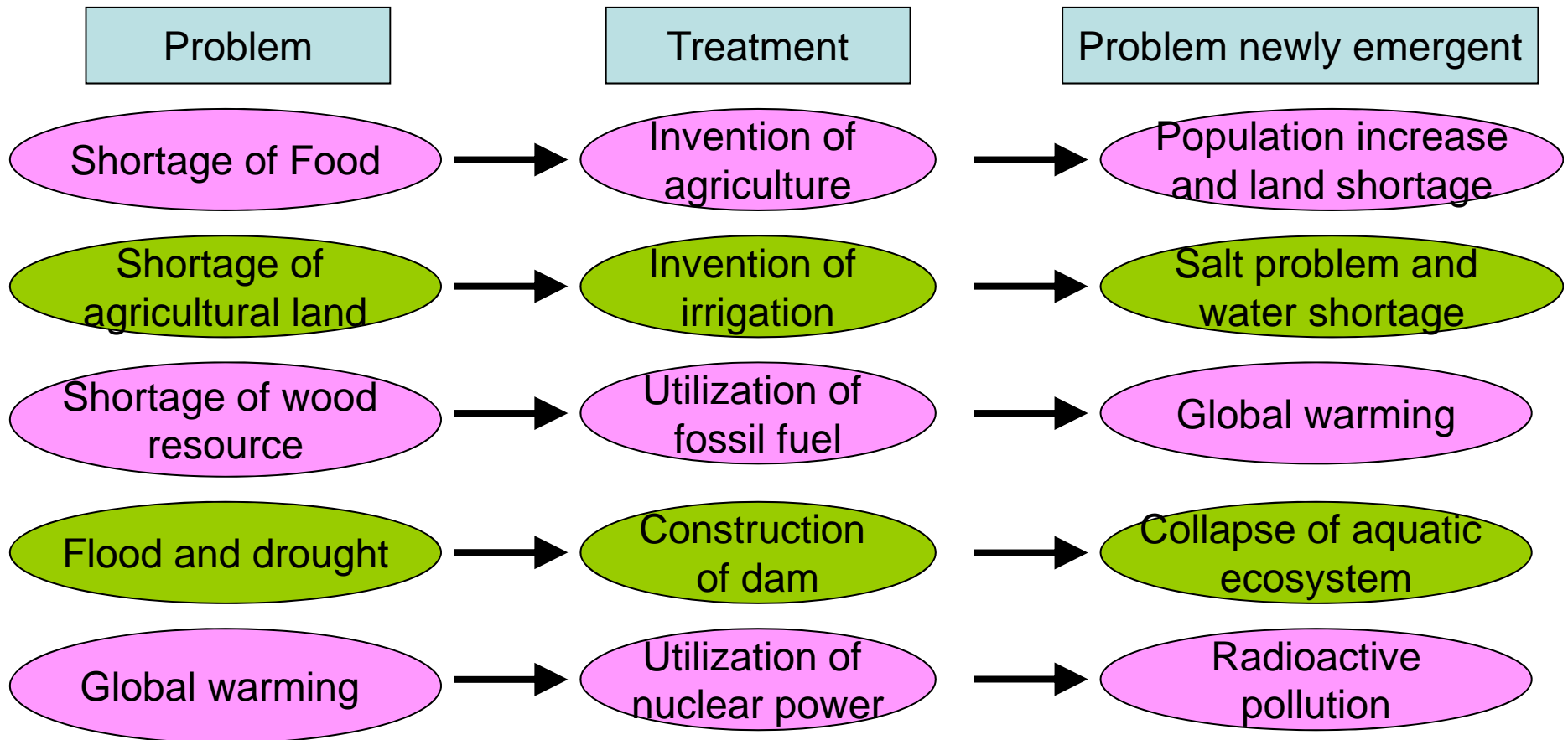
Why is "Clinical Environmental Study" necessary ?

Previous environmental studies

There are tight relations between diagnosis and treatment. However, they were only one-way relations, and both of diagnosis and treatment were studied separately. I think that we must carry out, not only "Treatment based on Diagnosis", but also "Diagnosis originating from Treatment".
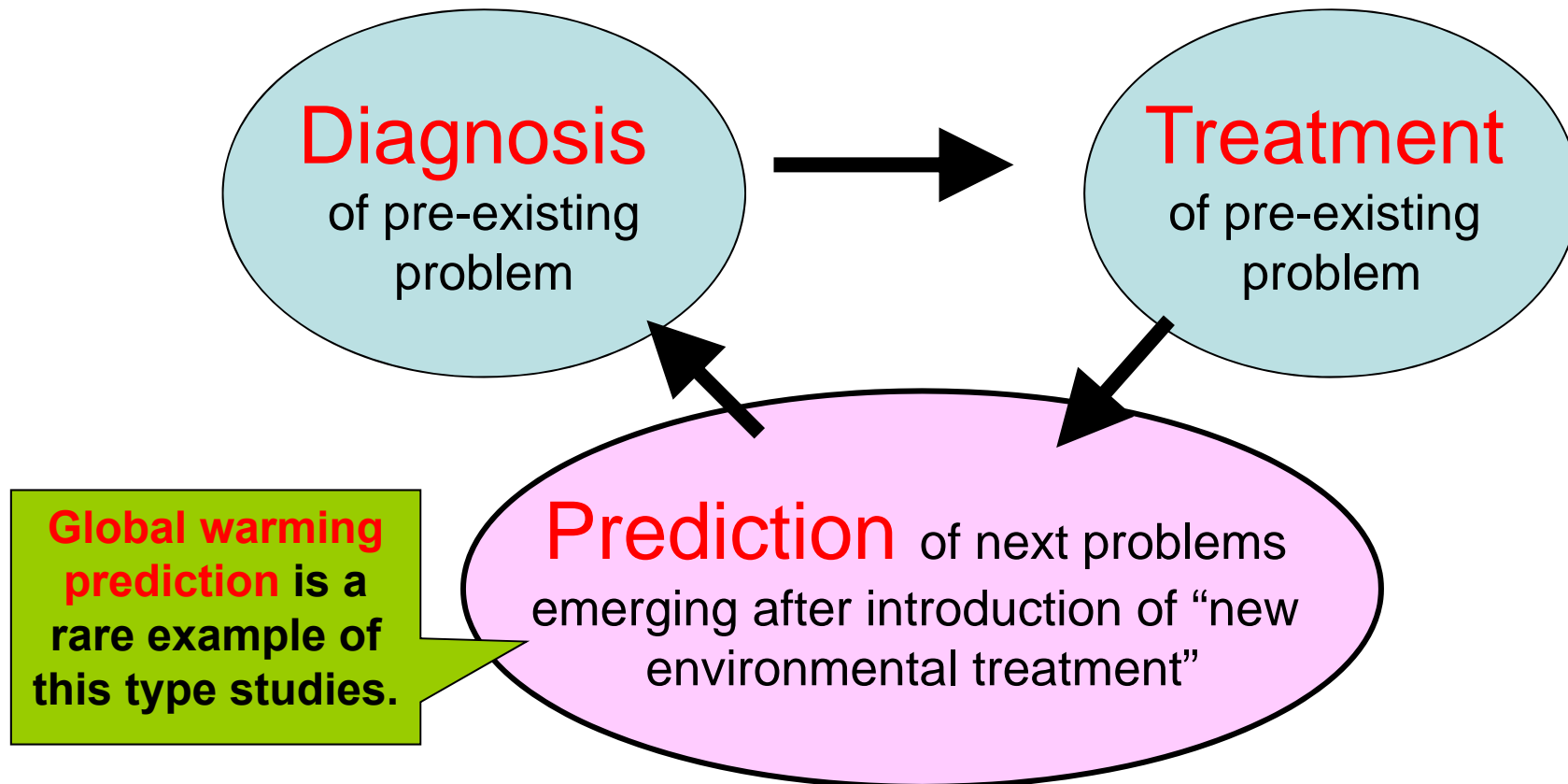
What does it mean to "treat" environmental problems?
-Views in human history-

Problem	Treatment	Problem newly emergent
Shortage of Food	Invention of agriculture	Population increase and land shortage
Shortage of agricultural land	Invention of irrigation	Salt problem and water shortage
Shortage of wood resource	Utilization of fossil fuel	Global warming
Flood and drought	Construction of dam	Collapse of aquatic ecosystem
Global warming	Utilization of nuclear power	Radioactive pollution

In the human history, "new environmental problems" always emerged after introduction of "new environmental treatment" !

How can we escape from the negative chains of environmental problems?
－Importance of "Prediction Type" of Environmental Research－

Diagnosis of pre-existing problem

Treatment of pre-existing problem

Prediction of next problems emerging after introduction of "new environmental treatment"

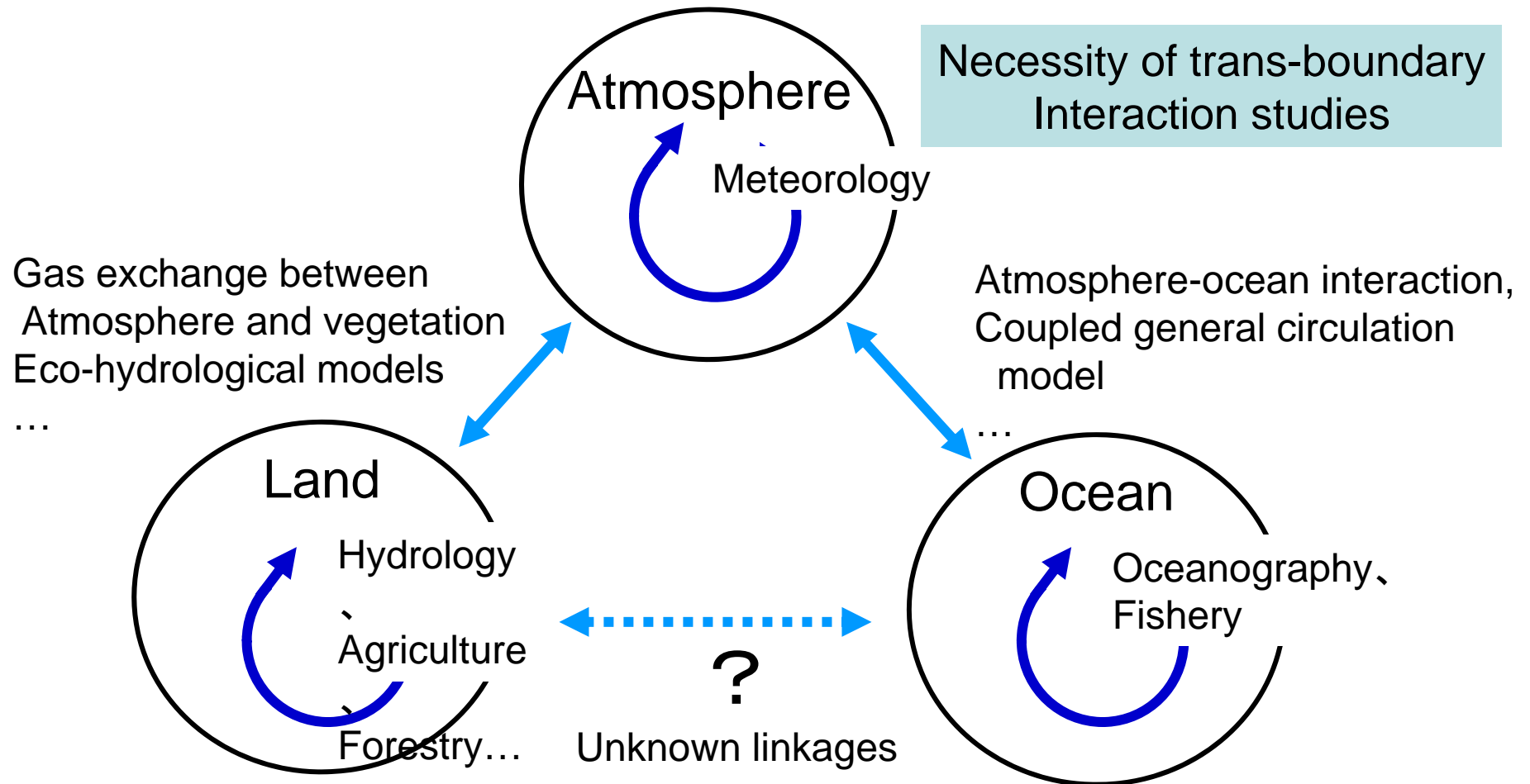Global warming prediction is a rare example of this type studies.

How can we predict the next environmental problems emerging in the future?

1. Develop our understandings of nature, technology and society.

 *It is effective to seek <u>"Security Holes"</u> in our understandings about Nature, Technology and Society.
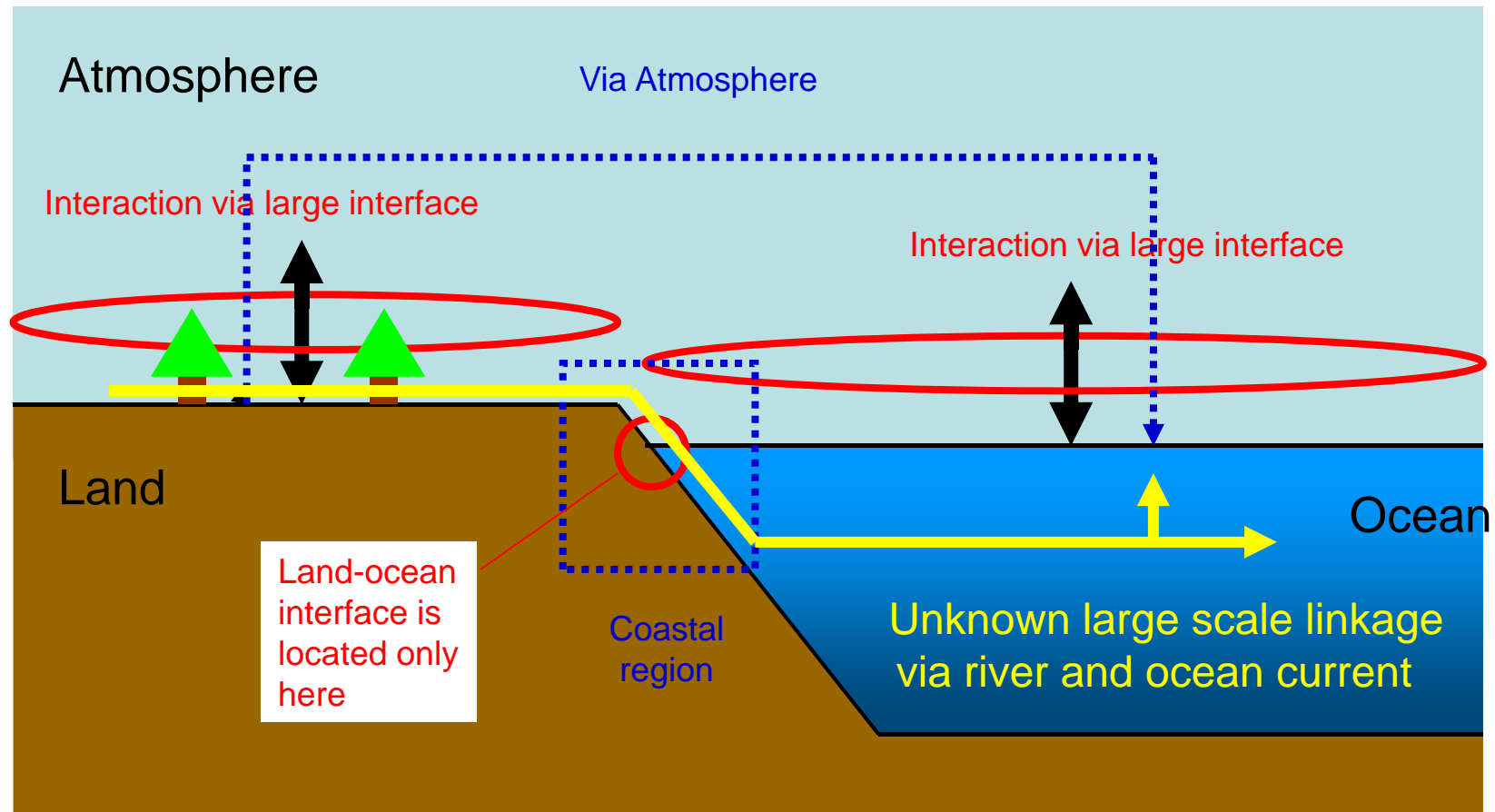
How to find "Security Holes" in Our Understandings for Nature, Technology and Society
― An example : "Trans-boundary Problems" ―

Atmosphere

Meteorology

Necessity of trans-boundary Interaction studies

Gas exchange between
Atmosphere and vegetation
Eco-hydrological models
…

Atmosphere-ocean interaction,
Coupled general circulation
model
…

Land

Hydrology

Agriculture

Forestry…

Ocean

Oceanography、
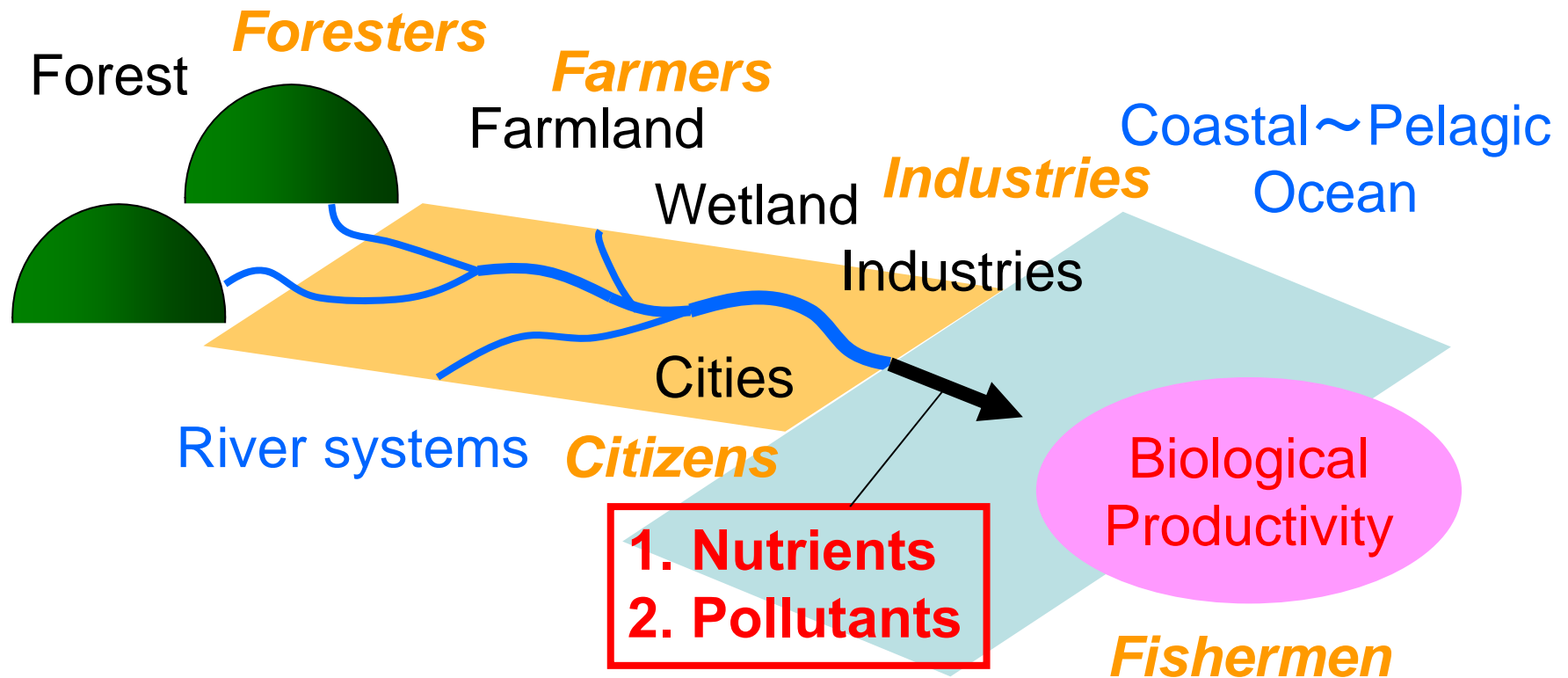Fishery

?

Unknown linkages

For a long time, Atmosphere, land and ocean have been studied separately.

Reason why land-ocean linkages have not been fully investigated

Material Transport from River to Ocean

Forest

Foresters

Farmers

Farmland

Wetland

Industries

Industries

Coastal～Pelagic Ocean

Cities

River systems

Citizens

1. Nutrients
2. Pollutants

Biological Productivity

Fishermen

1. Any treatments in an area may result in unexpected damages in another area.

2. It is difficult to manage the land-ocean trans-boundary system, because many different stake-holders take parts in this system asymmetrically.

How can we predict the next environmental problems emerging in the future?

1. Develop our understandings of nature, technology and society.

   *It is effective to seek "Security Holes" in our understandings about Nature, Technology and Society.

2. Detect the typical pattern of problem emergence .

   * Historical analyses of environmental problems must be helpful.

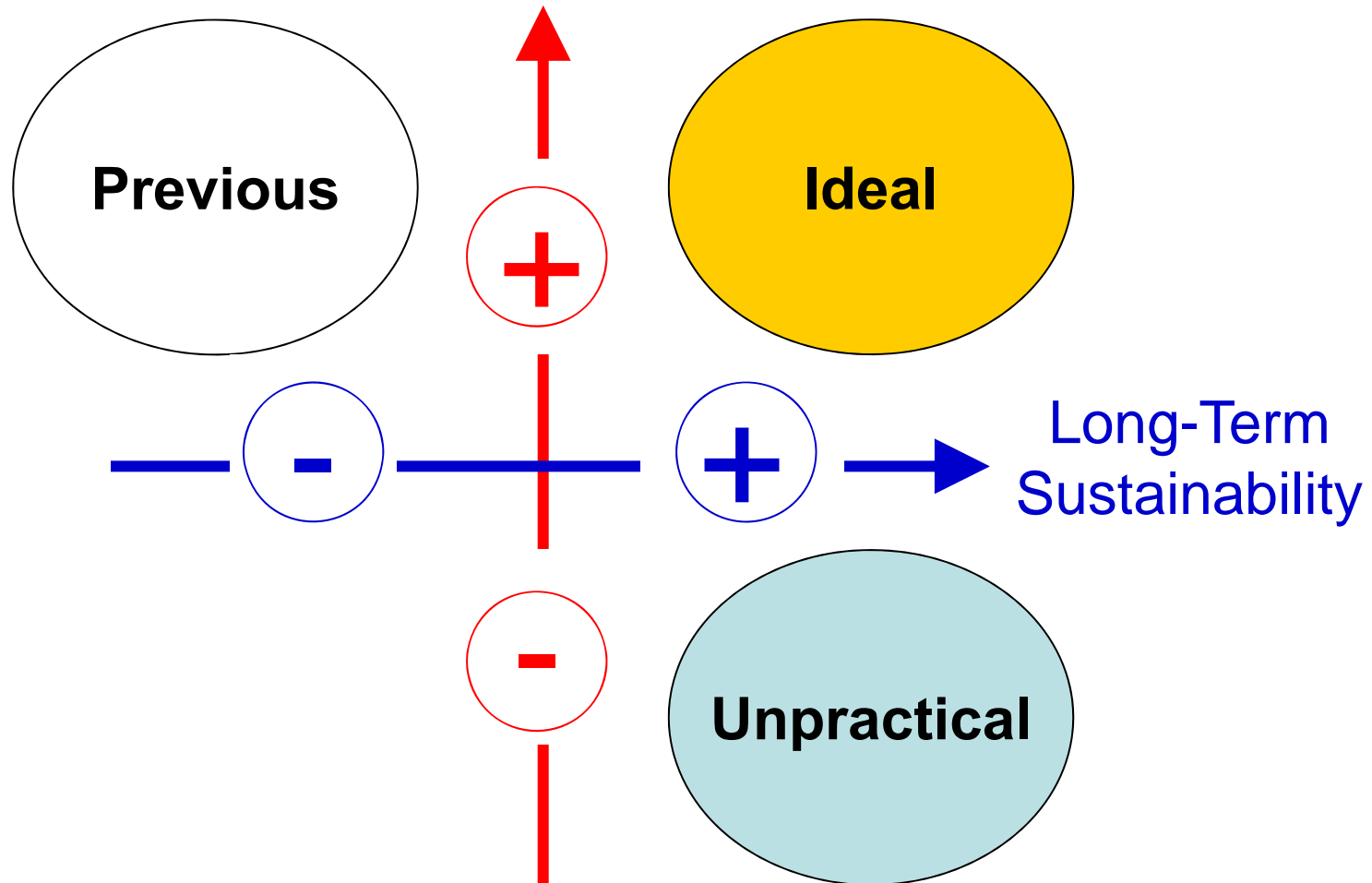# What is the typical pattern toward the emergence of new environmental problem?

"Adaptive technologies or institutions at micro-scale" for environment often cause "Non-sustainable results at macro-scale" for environment
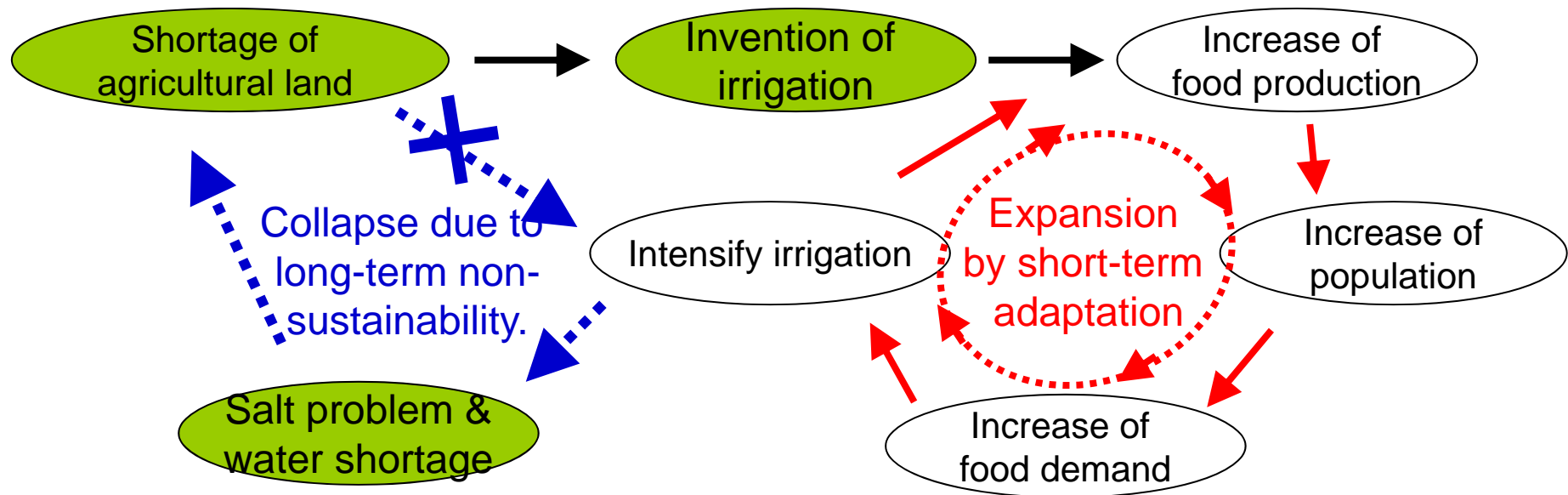
Evaluate present status of environmental technologies and institutions and consider logically their future impacts and feedbacks on environments themselves.

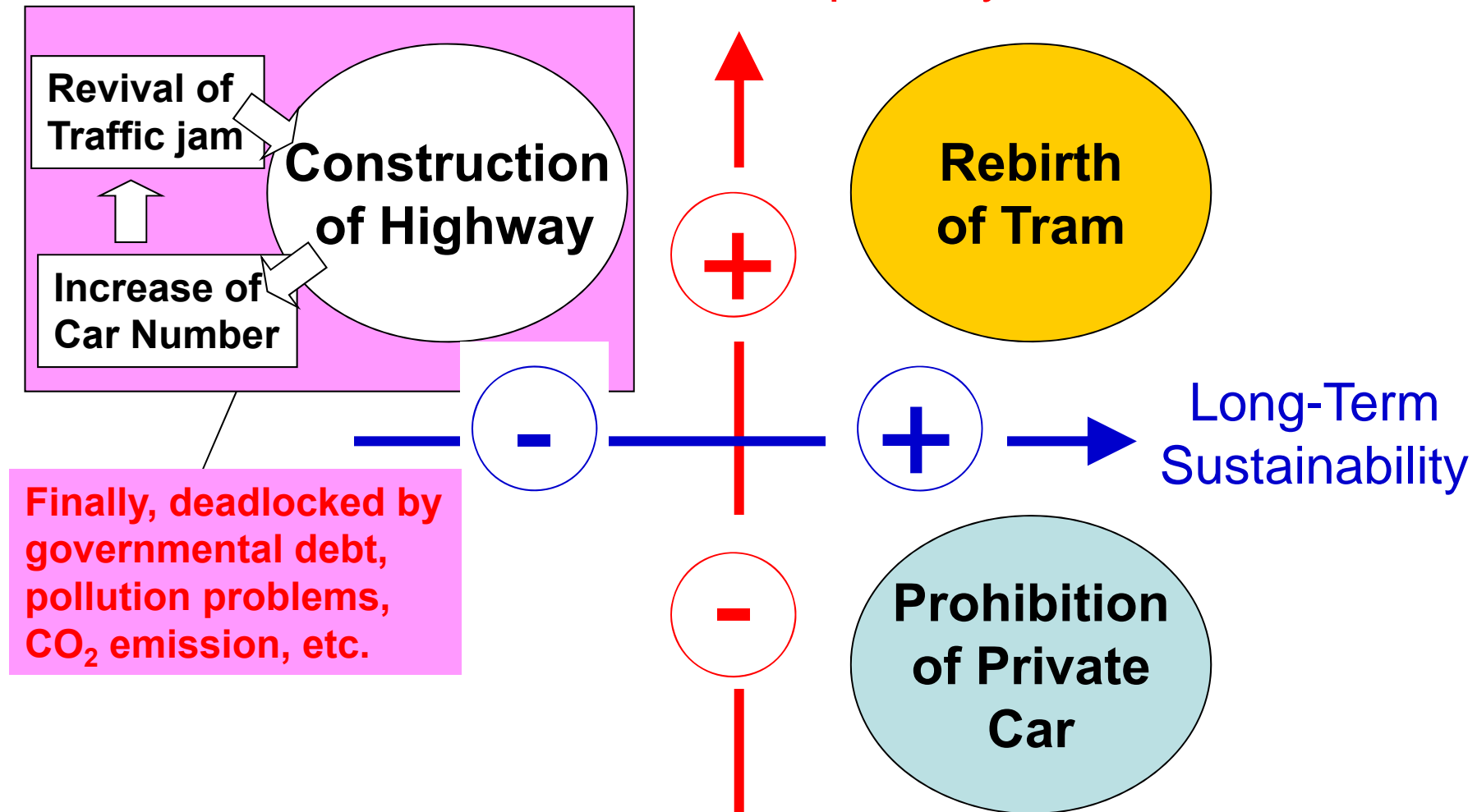# Adaptability & Sustainability of Environmental Treatment

We must try to predict both of "Adaptability and Sustainability" of any Treatments for Environmental Problems, simultaneously.

An example – "Traffic jam problem in a developing city"

Short-Term Adaptability

Revival of Traffic jam

Increase of Car Number

Construction of Highway

+

Rebirth of Tram

Finally, deadlocked by governmental debt, pollution problems, CO_2 emission, etc.

–

+

Long-Term Sustainability

–

Prohibition of Private Car

We must try to predict both of "Adaptability and Sustainability" of any Treatments for Environmental Problems, simultaneously.

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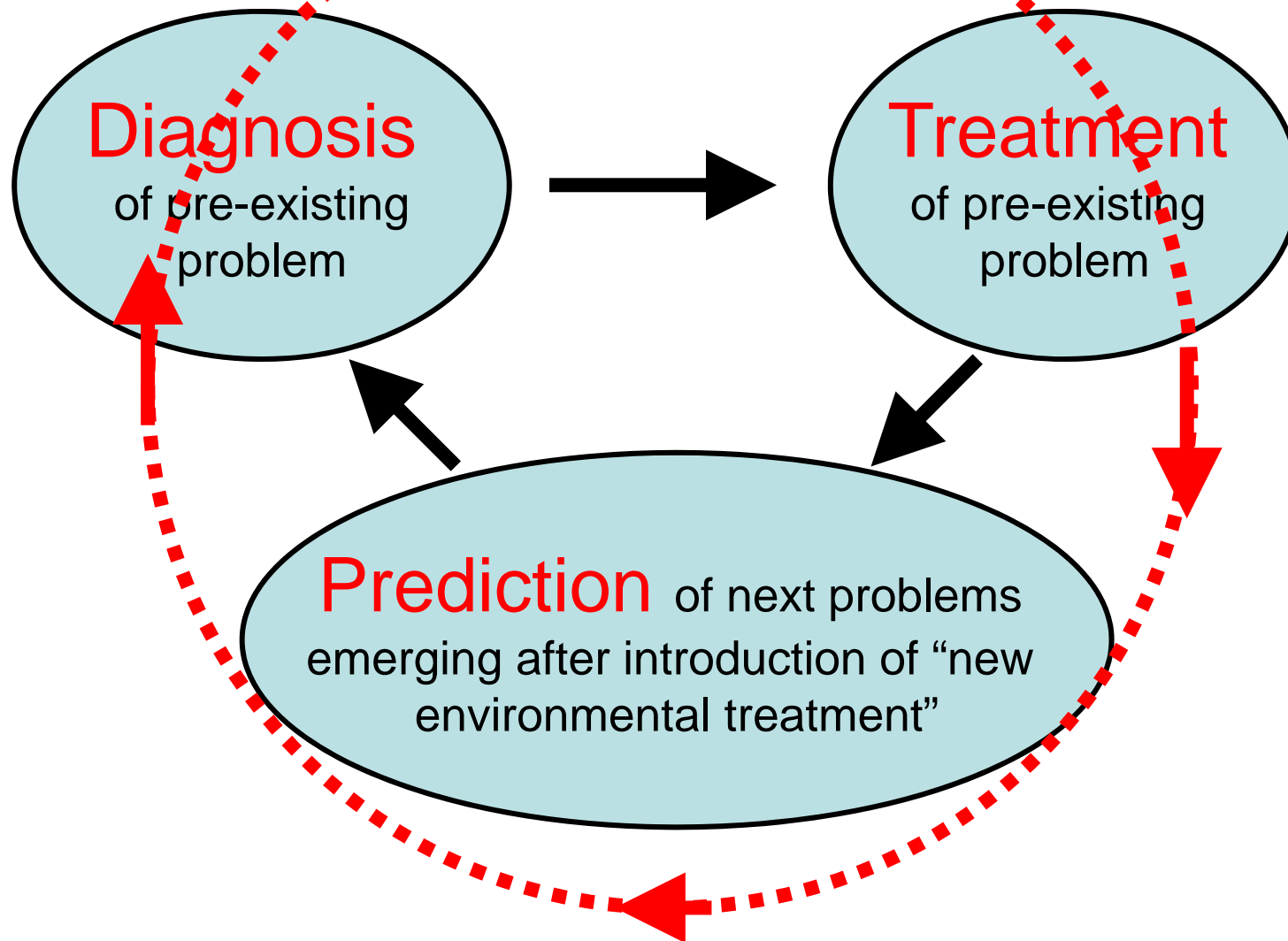
2. Detect the typical pattern of problem emergence .

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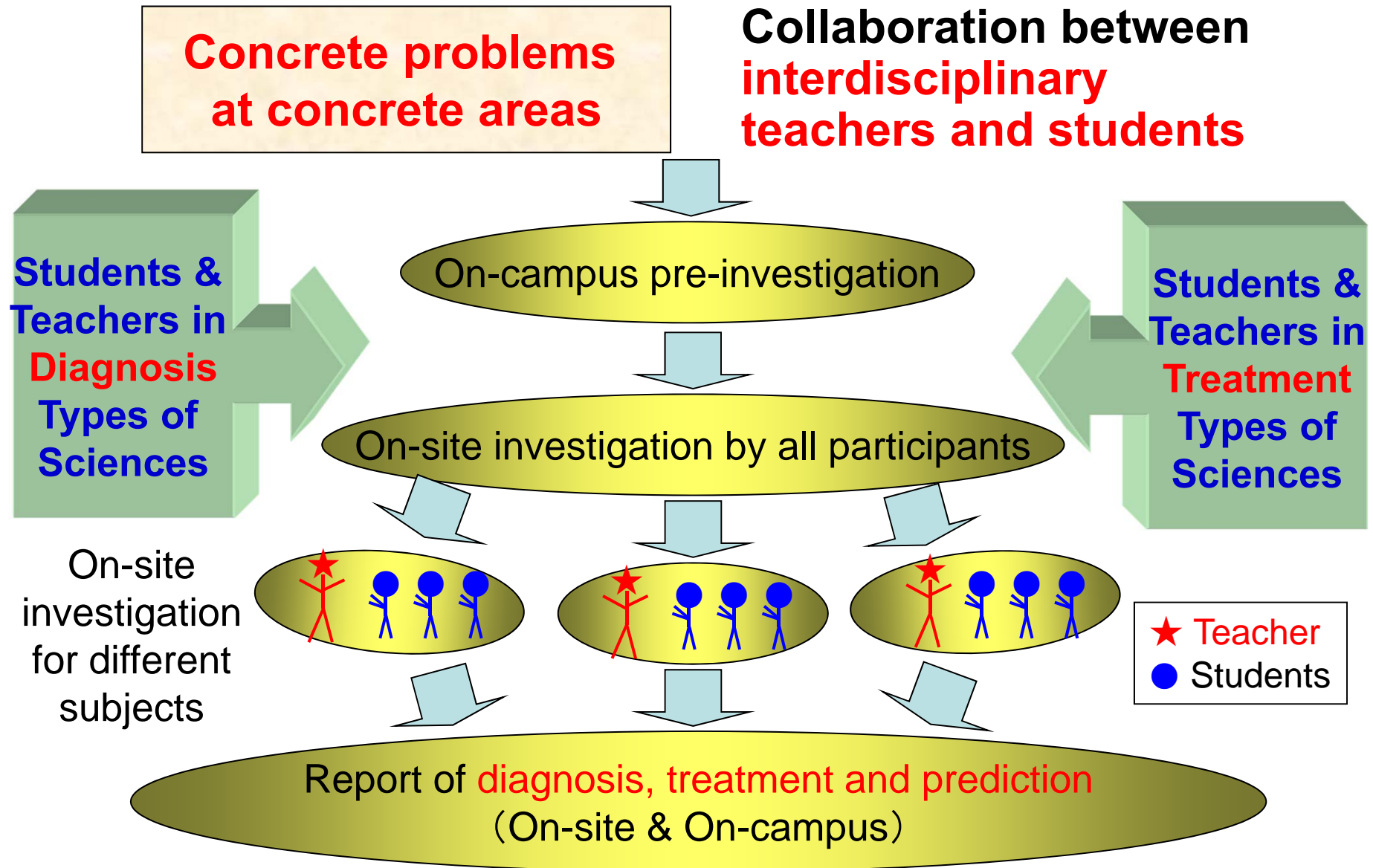3. Collaborate between diagnosis and treatment.

   * Without collaborations between them at "clinical field ", it is impossible to predict emergence of the future problem.

Practice of "Hypothesis Rotation" is necessary
along Diagnosis-Treatment-Prediction Cycle
for a concrete environmental problem at a clinical field.

Diagnosis
of pre-existing
problem

Treatment
of pre-existing
problem

Prediction of next problems
emerging after introduction of "new
environmental treatment"

On-site Research Training (ORT)
-The way to practice the hypothesis rotation-

Concrete problems at concrete areas

Collaboration between interdisciplinary teachers and students

Students & Teachers in Diagnosis Types of Sciences

On-campus pre-investigation

On-site investigation by all participants

Students & Teachers in Treatment Types of Sciences

On-site investigation for different subjects

★ Teacher
● Students

Report of diagnosis, treatment and prediction
（On-site & On-campus）

On-Site Research Training at Clinical Fields at different Three Regions in our GCOE

- 🌐 South East Asia
  Less developed（Laos）
- 🌐 North East Asia
  Rapidly developing（China）
- 🌐 Ise Bay (Ise-Bioregion)
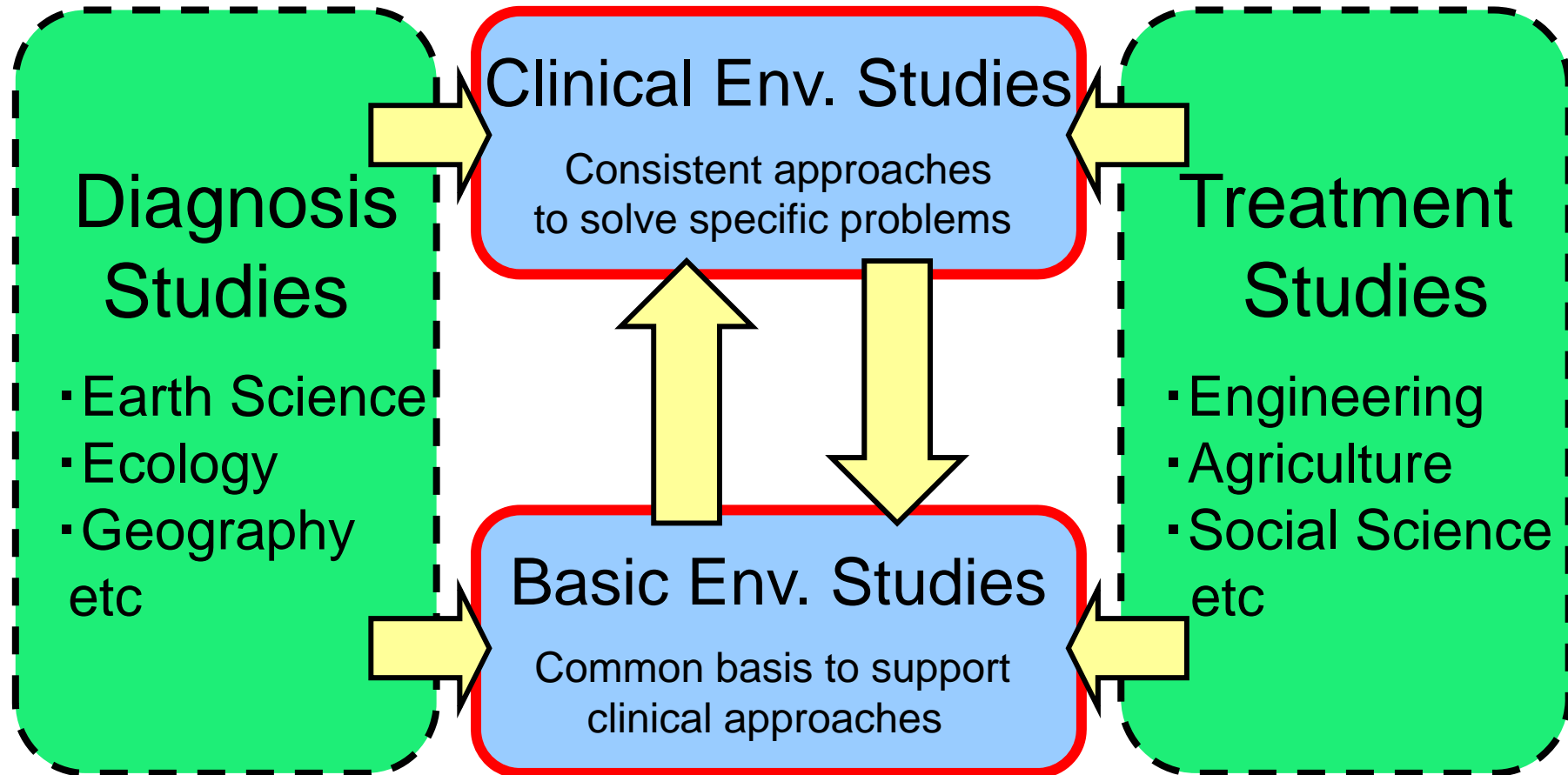 Developed（Japan）

Economically different stages of three regions

↓

Diagnosing of concrete environmental problems and making of treatment plan for them at a clinical field, for future prediction.