

The 5th AIM International Workshop
2000. Mar. 24-25, NIES

New Activities of Impact Model

Kiyoshi Takahashi, NIES

FY2000's research plan

- (1) Revision of water discharge and water demand models standing on the recent improvement of observed data on climate, water discharge, land-use and so on.
- (2) Impact projection with the latest results of general circulation models.
- (3) Development of new type models framework which provide macro economic policies for adaptation strategies to climate change.

(1) Revision of water discharge and water demand models standing on the recent improvement of observed data on climate, water discharge, land-use and so on.

Comparison of data availability between before and now.

10 years ago

Now

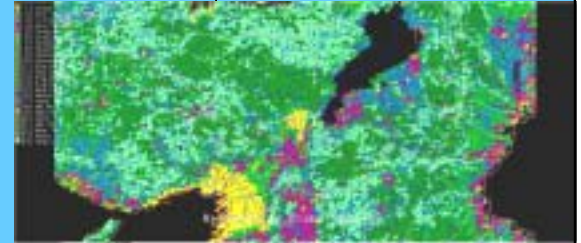
Future

30-years averaged monthly mean climatology (1951-1980)

Monthly mean climatology for each year from (1961 to 1996)

Olson's eco-system map

1km x 1km land-use map based on remote sensing



Water discharge at very limited stations

Global water discharge database compiled by hydrological stations' networks

How the models can be revised with the newly available data?

1. Development of program module to fit parameters of the water discharge model according to the observed water discharge database.
2. Reconciliation of land-use pattern by remote sensing to statistical data on crop land.
3. Comparison of simulated result of water discharge with the observed water discharge year by year. (How well extreme events are reproduced in the simulated result?)

(2) Impact projection with the latest results of general circulation models.

Impact assessment with new climate projections

Future climate projection by some GCMs over 4 (or 6) SRES scenarios will be completed soon. Climate change impact under those projections should be estimated, and compared with the old estimations over IS92 series. The results will be presented at the EMF workshop in the coming summer.

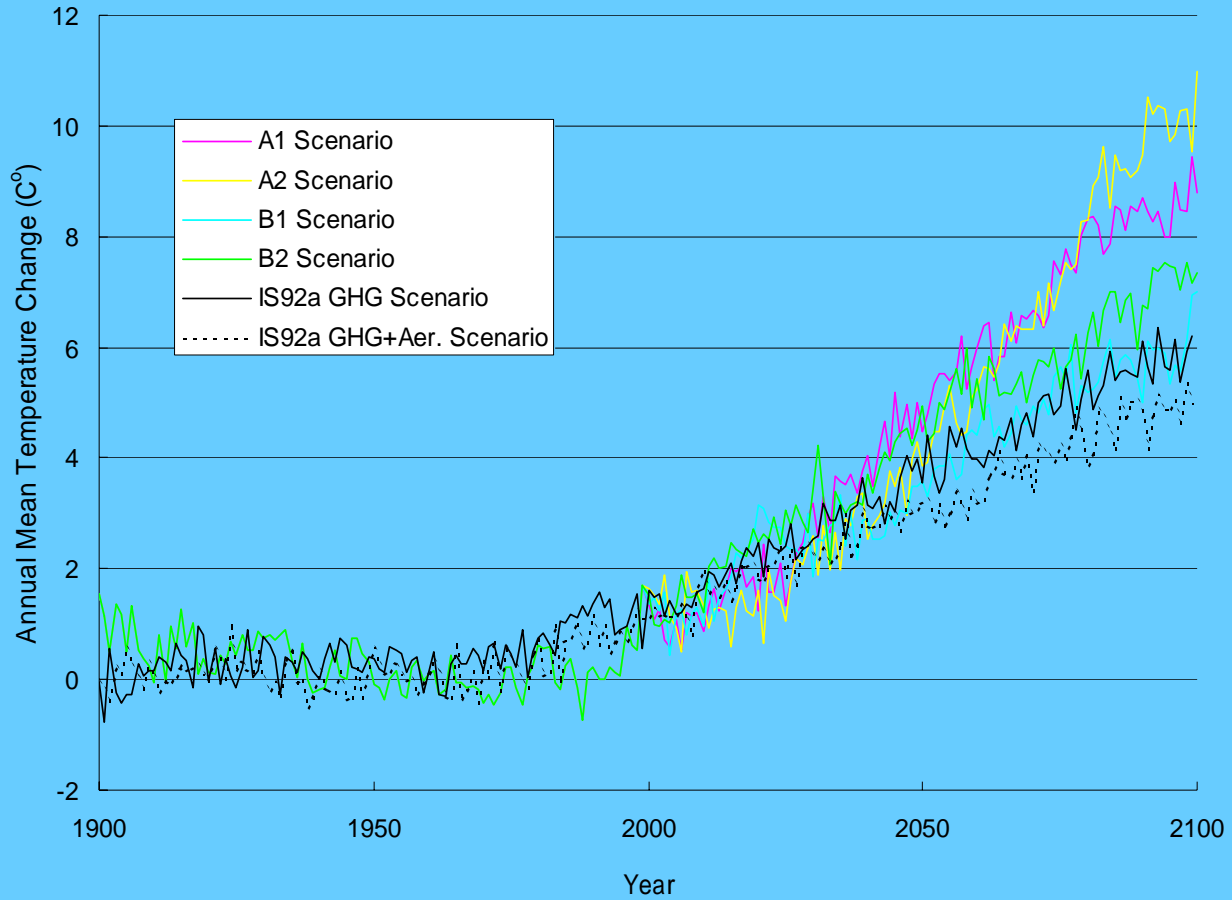
Utilization of regional climate model results

With the help of Prof. Lal (IIT) and Dr. Emori (NIES), we would like to start the impact assessment based on detailed climate projection provided by regional climate model (RCM). Because of specific character of RCM (daily variability etc.), the estimated impact may be quite different from the one with GCM.

Network of Japanese researchers to exchange ideas on how to utilize climate projections in impact assessment

There have not been good community to discuss about the methodologies to link climate model results and impact models, like TGCI in IPCC. AIM would like to appeal the necessity of such a community to other impact researchers, with our experience on impact assessments at global level.

Future Projections of Annual Mean Temperature Increase over Asia



Impact assessment with new climate projections

Future climate projection by some GCMs over 4 (or 6) SRES scenarios will be completed soon. Climate change impact under those projections should be estimated, and compared with the old estimations over IS92 series. The results will be presented at the EMF workshop in the coming summer.

Utilization of regional climate model results

With the help of Prof. Lal (IIT) and Dr. Emori (NIES), we would like to start the impact assessment based on detailed climate projection provided by regional climate model (RCM). Because of specific character of RCM (daily variability etc.), the estimated impact may be quite different from the one with GCM.

Network of Japanese researchers to exchange ideas on how to utilize climate projections in impact assessment

There have not been good community to discuss about the methodologies to link climate model results and impact models, like TGCI in IPCC. AIM would like to appeal the necessity of such a community to other impact researchers, with our experience on impact assessments at global level.

Impact assessment with new climate projections

Future climate projection by some GCMs over 4 (or 6) SRES scenarios will be completed soon. Climate change impact under those projections should be estimated, and compared with the old estimations over IS92 series. The results will be presented at the EMF workshop in the coming summer.

Utilization of regional climate model results

With the help of Prof. Lal (IIT) and Dr. Emori (NIES), we would like to start the impact assessment based on detailed climate projection provided by regional climate model (RCM). Because of specific character of RCM (daily variability etc.), the estimated impact may be quite different from the one with GCM.

Network of Japanese researchers to exchange ideas on how to utilize climate projections in impact assessment

There have not been good community to discuss about the methodologies to link climate model results and impact models, like TGCI in IPCC. AIM would like to appeal the necessity of such a community to other impact researchers, with our experience on impact assessments at global level.

(3) Development of new type models framework which provide macro economic policies for adaptation strategies to climate change.

Why we have to start new model study for adaptation?

In climate change impact studies at global scale, qualitative or quantitative damage or gains have been estimated under the changed climate.

However, the findings of those studies are not easy to be used for proposing adaptation strategies which we should take in early 21st century.

Adaptation strategies which can be taken in the early 21st century must have “robustness”, it means the strategies which will be of service even if climate change does not occur.

The investment on strategies which not only weaken the disaster damage caused by the current climate variability, but build the adaptation capacity against the long-term climate change can be one of the robust strategies.

To suggest such a policies, we decided to start development of the economic model which can evaluate strategy options considering both the near-term and long-term benefit.

To test feasibility of the study,

Focused adaptation strategy: Investment on long-life infrastructure to prevent flood disaster

Nation: China

Simulated term: 2000 - 2100

Result
GDP gain compared with the reference scenario
How much we should invest on flood control infrastructure in the coming next century

Basic equations of the model

$$Y=C+I+AD$$

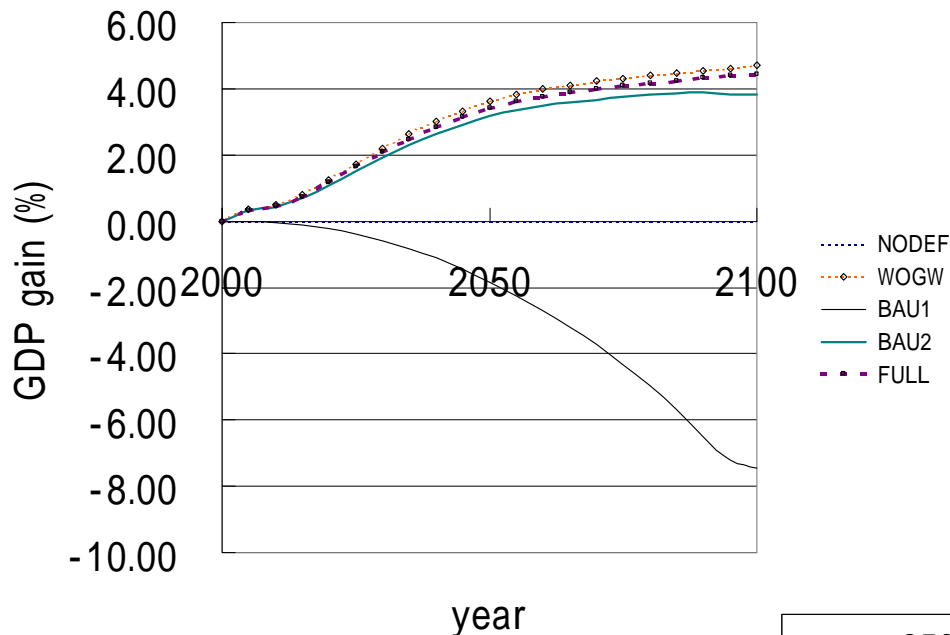
$$Y=A \times L^{1-\alpha} \times K^\beta \times (1-0.01 \times 10^{Z1 \times \text{Log}(\text{INR}/L)+Z0} \times (\text{DAM0}+\text{DAMREF}/6.25 \times T^2) / \text{DAM0})$$

Both current flood disaster under current climate and future climate will be decreased simultaneously as infrastructure for flood control per capita (INR/L) increases.

Y:	Production
C:	Consumption
I:	Investment
AD:	Investment on Flood Control Infrastructure
L:	Labor
K:	Capital Stock
INR:	Flood Control Infrastructure Stock
DAM0:	Flood Disaster Damage under current climate
DAMREF:	Flood Disaster by Climate Change at T=2.5
T:	Temperature Increase
Z0, Z1:	Parameters Derived from Japanese Historical Data

Scenarios

	Flood control stocks	Climate Change
NODEF	Y2000 Level Constant	No Climate Change
WOGW	Optimized without considering Climate Change	No Climate Change
BAU1	Y2000 Level Constant	Climate Change
BAU2	Optimized without considering Climate Change	Climate Change
FULL	Optimized with considering Climate Change	Climate Change



GDP Gain compared with the reference (NODEF)

Result

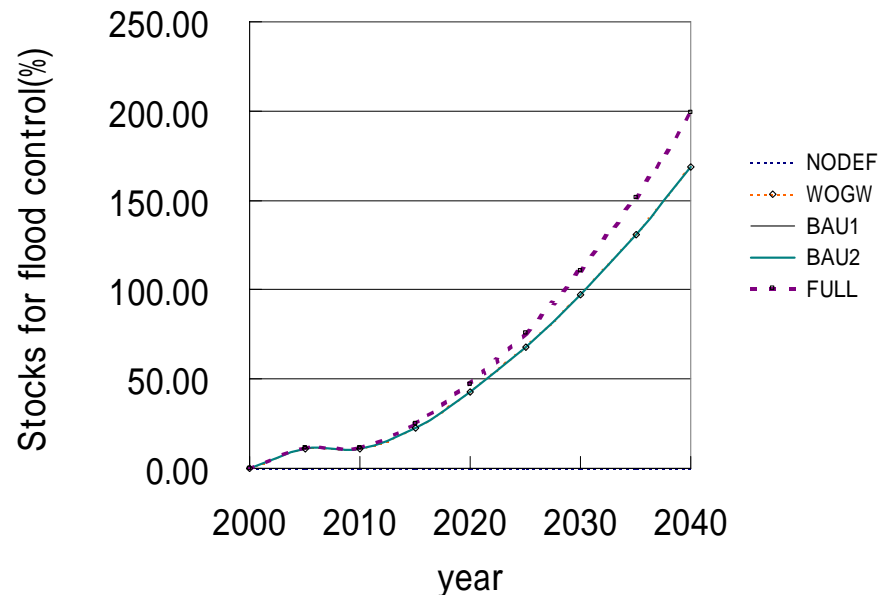
If stocks for flood control is kept at the constant level at y2000 and climate change occurs, GDP loss is serious in 2100.

Regardless of considering climate change or not, optimized investment on stocks for flood control from 2000 to 2030 are almost same.

Feasibility of the study depends on the availability of detailed data such as:

Current disaster because of extreme climate events

Disaster marginally avoided because of additional one infrastructure stocks



Stocks for flood control compared with 2000 level

