

Impact study of AIM project and its relation to stabilization scenarios

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Topics

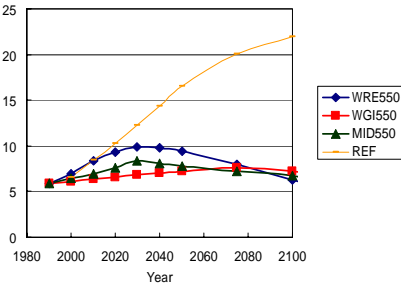
- Brief overview of AIM/Impact
- (Multi-gas) stabilization scenario and impact assessment
- New direction of AIM/Impact project
 - Development of communication tool between impact assessment result and policy decision

AIM/Impact [Global]

- Water resource
 - Water demand and supply
 - Flood
- Agriculture
 - Crops potential productivity
 - Economic assessment of impacts on crops productivity
- Health
 - Malaria
 - Diarrhea
- Natural Vegetation

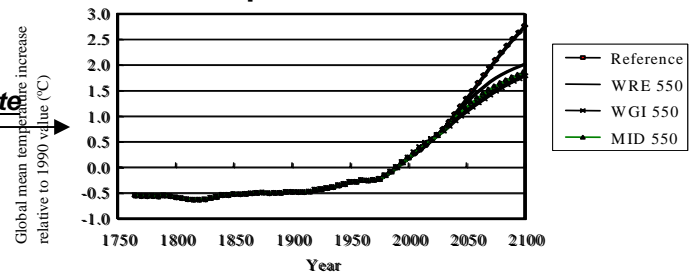
General procedure for estimating impacts in AIM/Impact

Emission scenario

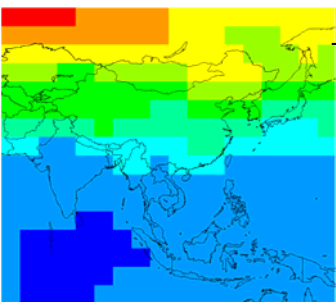


AIM/Climate

Global mean temperature increase

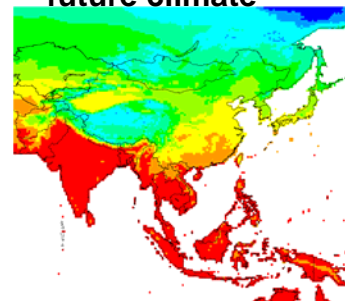


Spatial pattern of climate change provided by GCM



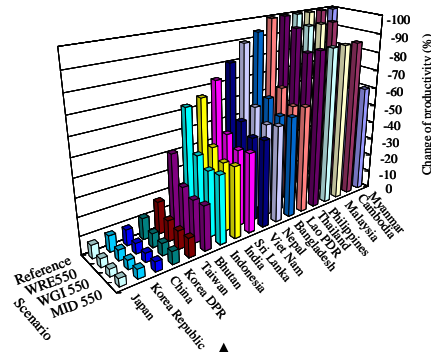
Condensation

Spatial data of future climate



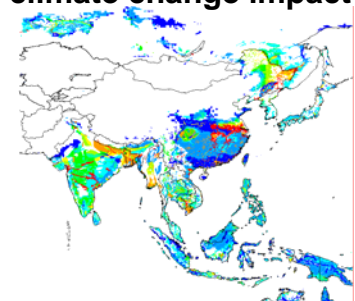
AIM/Impact

Country-wise impact

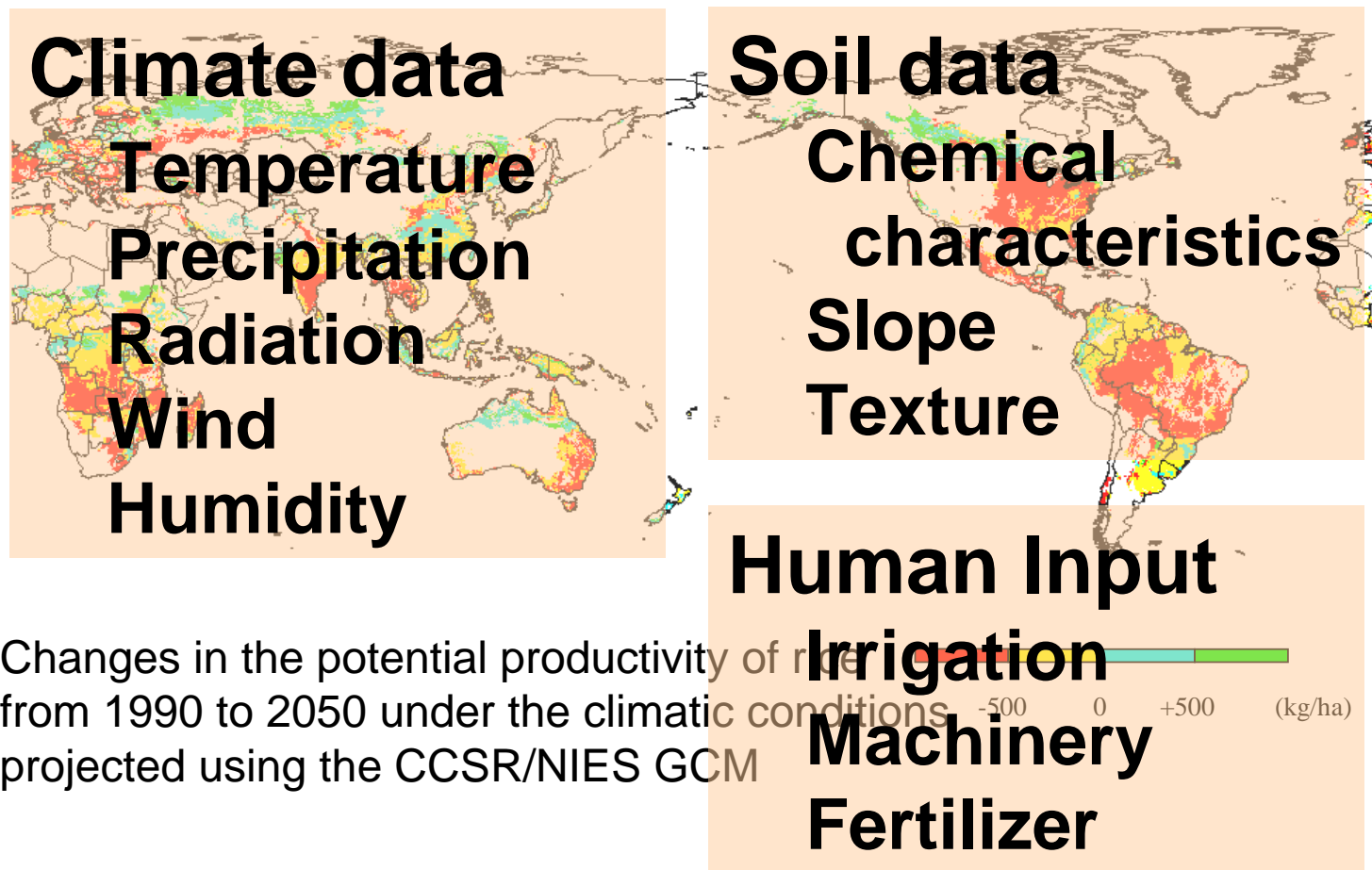


Aggregation

Spatial estimation of climate change impact



Crop productivity



Economic impact of climate change through crop productivity change

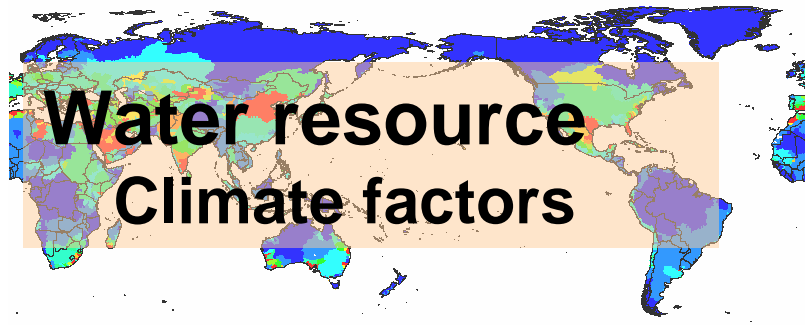
	JPN	CHN	IDI	CAN	USA	E_U
Producer price change (%)						
Rice	-0.01	-1.58	17.96	-40.16	-0.06	-4.93
Wheat	4.91	8.47	125.11	-13.10	4.76	8.92
Other grains	1.81	0.79	1.30	-4.39	-1.46	-3.36
Other crops	-0.01	-0.28	1.90	2.76	-0.10	-0.05
Livestock	-0.19	-0.09	2.84	-1.22	-0.59	-0.04
Other agricultural products	-0.15	-0.01	0.30	0.77	-0.07	0.04
Manufacture	0.03	-0.12	-1.10	0.61	0.03	-0.02
Services	0.03	-0.16	-0.93	0.69	0.02	-0.02
Production change (%)						
Rice	0.11	-0.25	-1.76	105.99	0.23	2.03
Wheat	0.00	-3.97	-0.04	14.77	-2.07	-3.64
Other grains	-15.56	-1.39	-1.53	89.41	-4.04	-6.50
Other crops	0.11	-0.07	-4.25	-2.26	0.25	-0.03
Livestock	0.09	-0.24	-2.27	0.94	0.03	-0.22
Other agricultural products	0.11	-0.27	4.00	0.69	0.04	-0.22
Manufacture	-0.01	0.31	-0.57	-1.62	0.03	0.05
Services	0.00	0.00	-2.62	-0.02	0.01	0.01
Consumer price index (%)	0.001	0.001	5.017	-0.513	0.017	-0.010
Income change per capita (%)	0.026	-0.236	-0.017	0.833	0.026	-0.009
Social welfare change (%)	0.022	-0.219	-4.892	0.343	0.009	0.003

Production
Crop productivity change
Tech. Improve
Labor Land

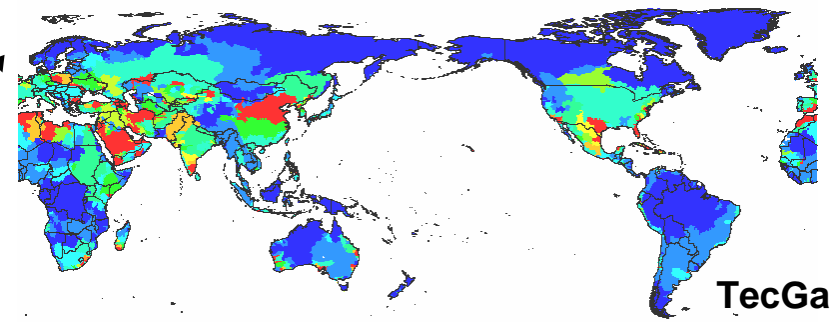
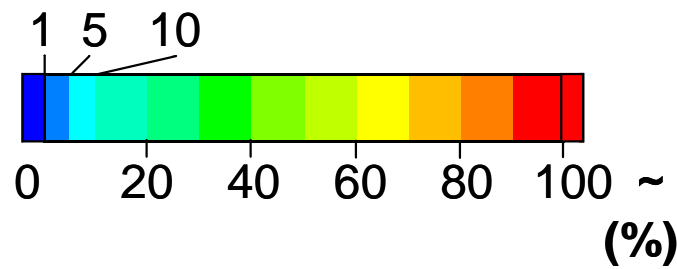
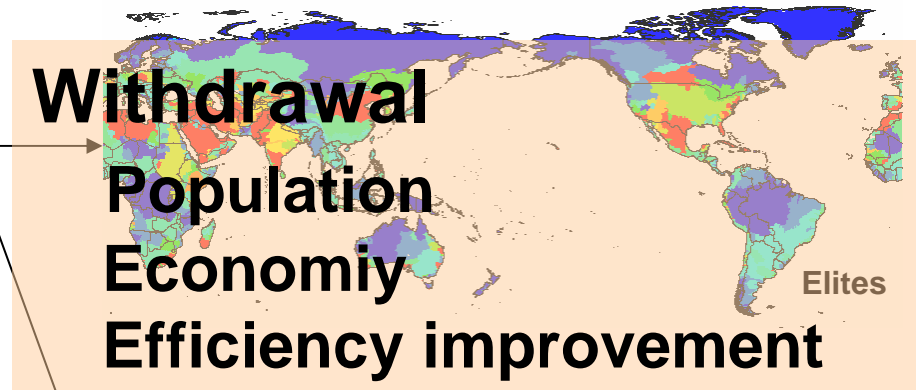
Demand
Population
Consumer preference
Trade
Tariff etc.

Water Stress Index (ratio between total withdrawal and renewable water resource)

2000



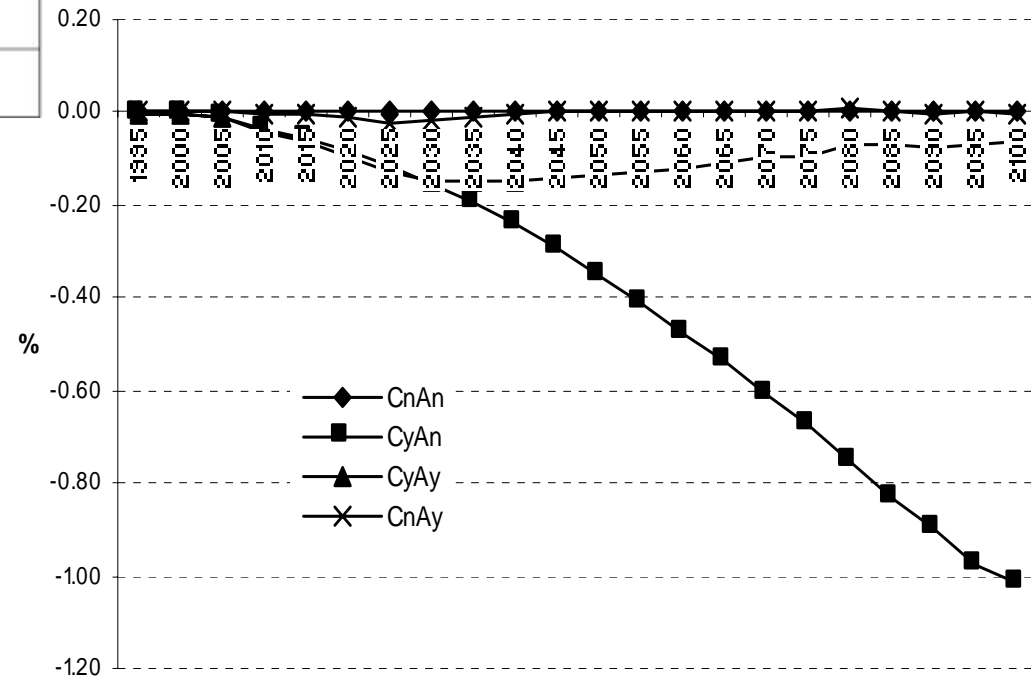
2100



Efficiency of investment in river flood prevention infrastructure (China case study)

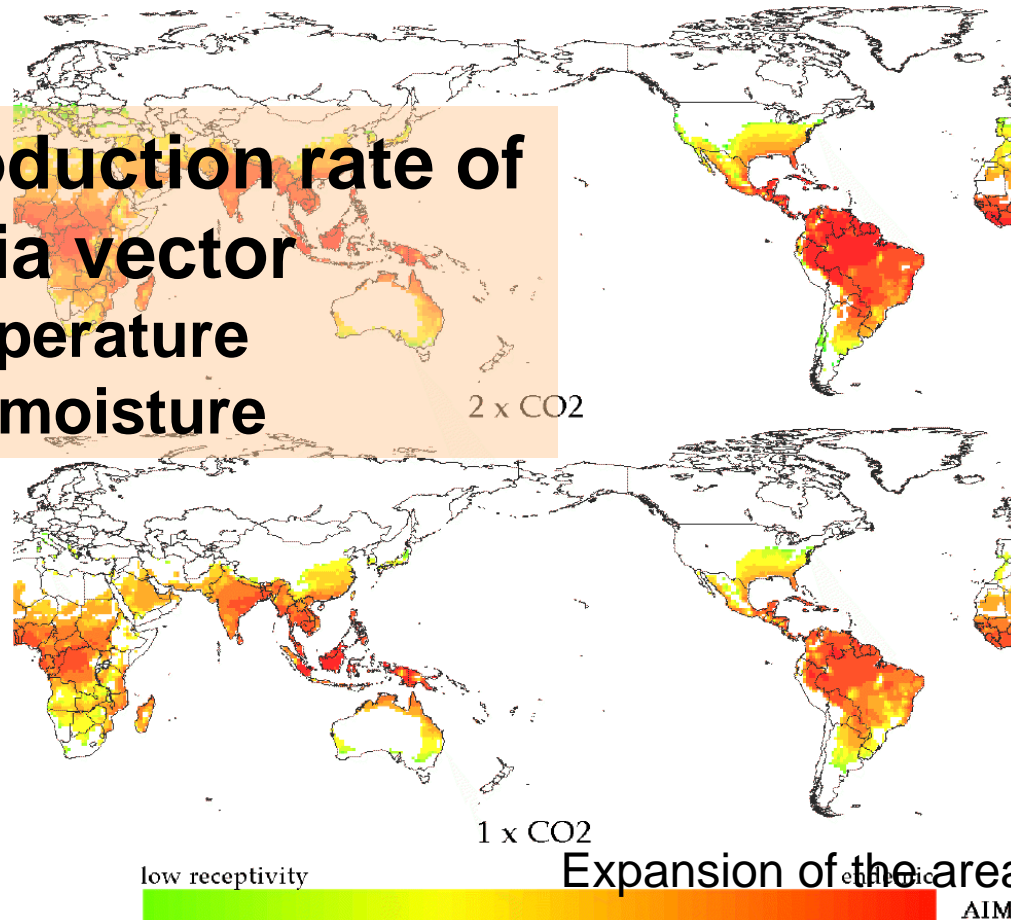
Scenarios considering policy options and climate change occurrence probability

		Climate change	
		No occurrence	Occurrence
Options of precautionary policy	No investment	CnAn	CyAn
	Investment	CnAy	CyAy



Health: Malaria

**Reproduction rate of
malaria vector**
Temperature
Soil moisture



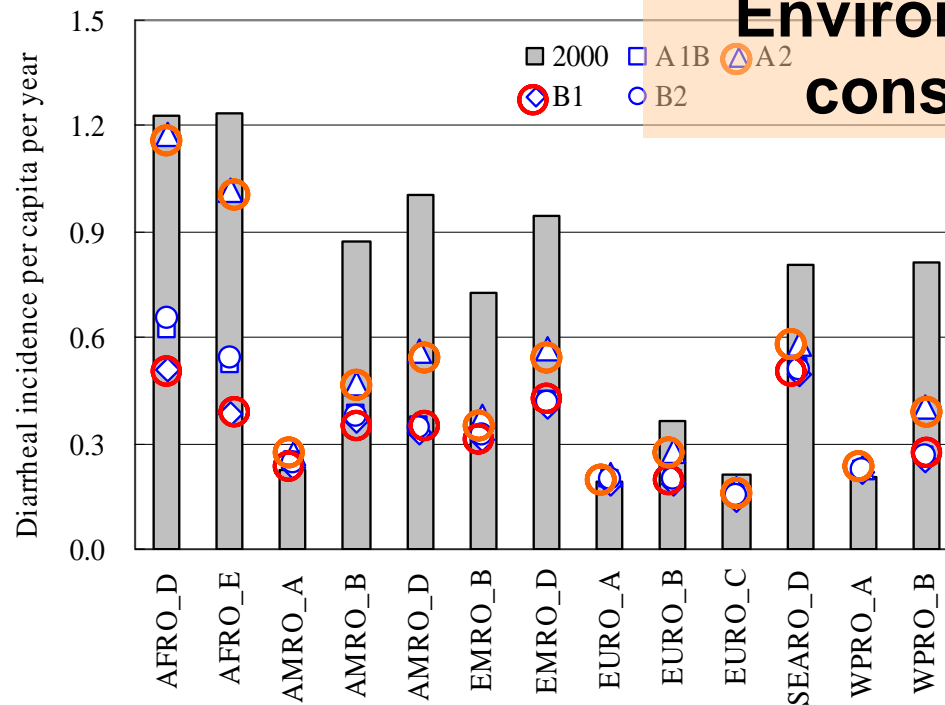
Expansion of the area affected by malaria

AIM

Diarrhea

Diarrhea / capita
Water supply coverage
Temperature

Water supply coverage
GDP/capita
Environmental consideration



Diarrhea incidence per capita per year in 2000 (bar graph) and in 2055 for 4 SRES scenarios (A1B, A2, B1, B2).

How new stabilization scenarios affect climate impact assessment?

- Through climate scenarios projected by GCMs or/and SCM
- Through assumption on adaptive capacity dependent of socio-economic or/and other factors
- Through land / labor / capital resources which are shared by energy production sectors and other human activities

Stabilization scenarios and climate scenario for impact assessment

- GCM experiments driven by variety of stabilization scenarios
 - It is usually infeasible and unexciting work for GCM modelers to simply repeat simulations.
- Utilization of SRES-based (or other existing) GCM simulation as substitution
 - Emission trajectory in 21st century may cause a significant difference on spatial pattern of climate change.
- Pattern scaling (SCM's result + GCM's spatially high-resolution info.)
 - Pattern scaling is based on the very rigid assumption.
 - Pattern scaling which considers spatial difference of climate changes caused by GHGs and Aerosols separately might be better for considering stabilization scenario.
- It is difficult for majority of impact researchers to judge what is the best way to develop climate scenarios.

Research needs

- Improvement of procedure to develop climate scenarios for impact assessment
 - We need to know what method is suitable for considering stabilization scenarios.
 - It requires to test validity of pattern scaling or alternative methods for developing climate scenarios.

Stabilization scenarios and adaptation

- Socio-economic conditions assumed in the background of stabilization scenarios affect adaptive capacity.
- Socio-economic scenarios reported in SRES scenario (4 regions in the world) was spatially too rough.
- GDPpc is not the only factor of adaptive capacity.

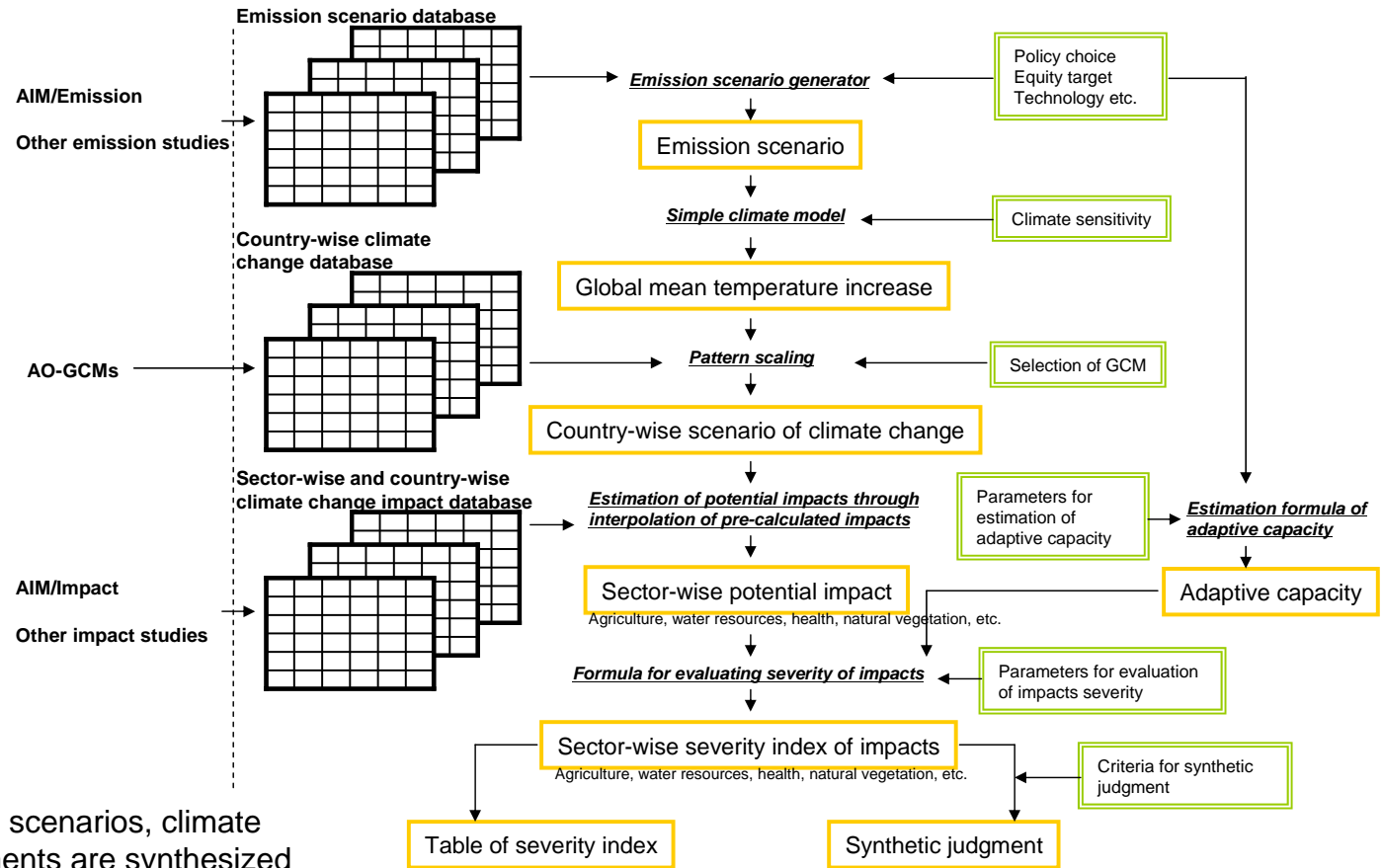
Research needs

- Socio-economic and other assumptions in each stabilization scenario in the format suitable for impact assessment
 - Spatial downscaling (dis-aggregation) of socio-economic scenarios
 - Provision of socio-economic factors other than GDP per capita assumed in the development process of stabilization scenarios.

Stabilization scenario and resources

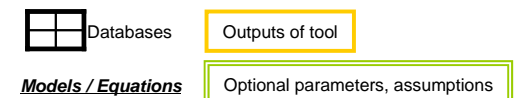
- GHGs mitigation options assumed in some stabilization scenarios may compete with adaptation options for the usage of limited resources.
 - Agricultural land for crop cultivation may be exploited by land for biomass farm in some scenarios.
- More comprehensive integrated assessment framework seems required to treat this relation.

AIM/Impact[Policy]



Existing knowledge on emission scenarios, climate projections and impact assessments are synthesized in AIM/Impact[Policy].

By choosing GHGs emission path from the scenario database and assuming some parameters, user can know consequent climate change impacts.





Knowledge which policymakers expect impact researchers to provide

- In order to avoid critical damages of climate change impact, what kind of emission path must we choose?
- How much will climate change impacts be different among different emission paths which have a same stabilization target?
- What adaptation strategies should we take, and when?
- How much will impact damage be affected by social-factors (ex. rate of technology improvement; international circumstances etc.)

Notable characteristics of AIM/Impact [Policy] (1/2)

■ Small CPU load

- Tool includes a database of country-averaged climate change (derived from GCM) and anticipated impact in a sensitivity analysis style. They are linked with the global temperature increase projected by simple climate model in order to estimate country-wise impact.
- Not only AIM/Impact's result, but the result of other impact studies are planned to be included in the impact database.
- Various stabilization scenarios can be examined easily.

Notable characteristics of AIM/Impact [Policy] (2/2)

- Treatment of uncertain parameters
 - Tool includes lists of adaptation measures with qualitative and quantitative information. But its difficult to predict what adaptation measures are taken and how effective they are, since it is quite dependent on characteristics of each society or impact receptor. This tool requires a user to decide these uncertain parameters from a range of value which depends on socio-economic condition. This feature is expected to increase user's acceptance to an output of the tool.

Conclusion

- Advanced procedure for developing climate scenarios might be needed for considering stabilization scenarios in impact assessment.
- Impact assessment wish for more spatially detailed socio-economic factors assumed in each stabilization scenario
- We are going to develop a new tool for bridging impact assessment results and policymakers.