16th AIM Workshop

Development of Integrated Impact Assessment System to Support Climate Change Policy

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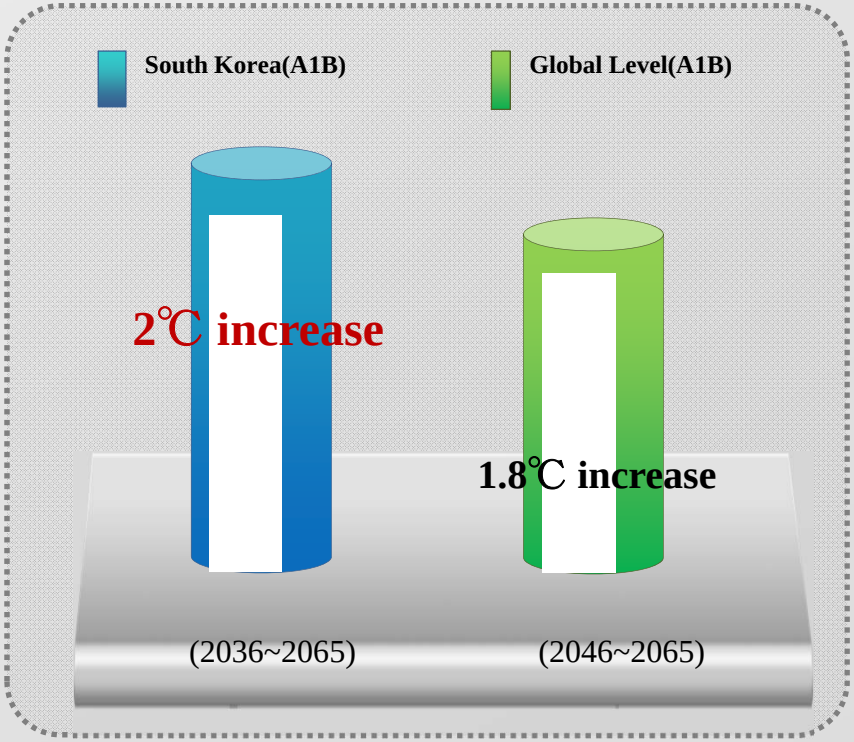
Contents

Background & Necessity

Background & Necessity

Acceleration of climate change

- 0.74℃ increase of average global temperature for last 100 years, 0.45℃ increase for last 25 years
- Sea levels rising faster than expected: 18cm ~ 59cm rising
- Even if it is possible to limit the global temperature rise to **2℃, two billion people** will suffer from water shortages and **20~30% of animal and plant species** will be in danger of extinction.(IPCC)



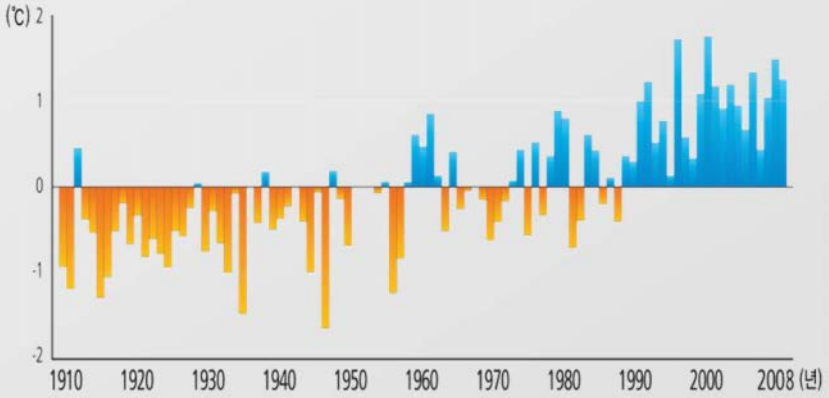
▲ **Temperature Rise Outlook by KMRI (South Korea & Global Level)**

Background & Necessity

Climate Change Impacts on Korea

Temperature

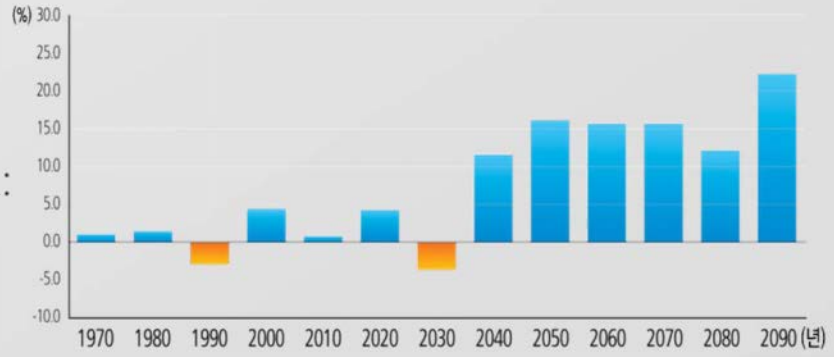
- Temperature rise of 6 major cities in Korea:
  +1.7℃/100 yrs**(Global average: 0.74℃)**
- Temperature rise prediction(A1B)
  2020s: + 1℃ 2050s: + 2℃
  2100s: + 4℃**(Global average: 1.8~4℃)**



▲ **Temperature Change of 6 Major Cities in Korea**

Precipitation

- Precipitation rise of 6 major cities in Korea:
  +19%/100 yrs
- Precipitation rise prediction(A1B)
  2050s: +15% 2100s: +17%



▲ **Precipitation Outlook of Korea**

Background & Necessity

Progress of National Climate Change Adaptation Master Plan

- Low Carbon, Green Growth Law enforced (4/4/2010)
- Strategy for drafting the National Climate Change Adaptation Master Plan established (17/5/2010)
- Consultation sessions with stakeholders held (21/7~20/8/2010)
- Plan reported to the Cabinet and confirmed (9/2010)
- National Climate Change Adaptation Plan (10/2010)

Need Quantitative Information

Development of integrated impact assessment system for supporting decision-making process

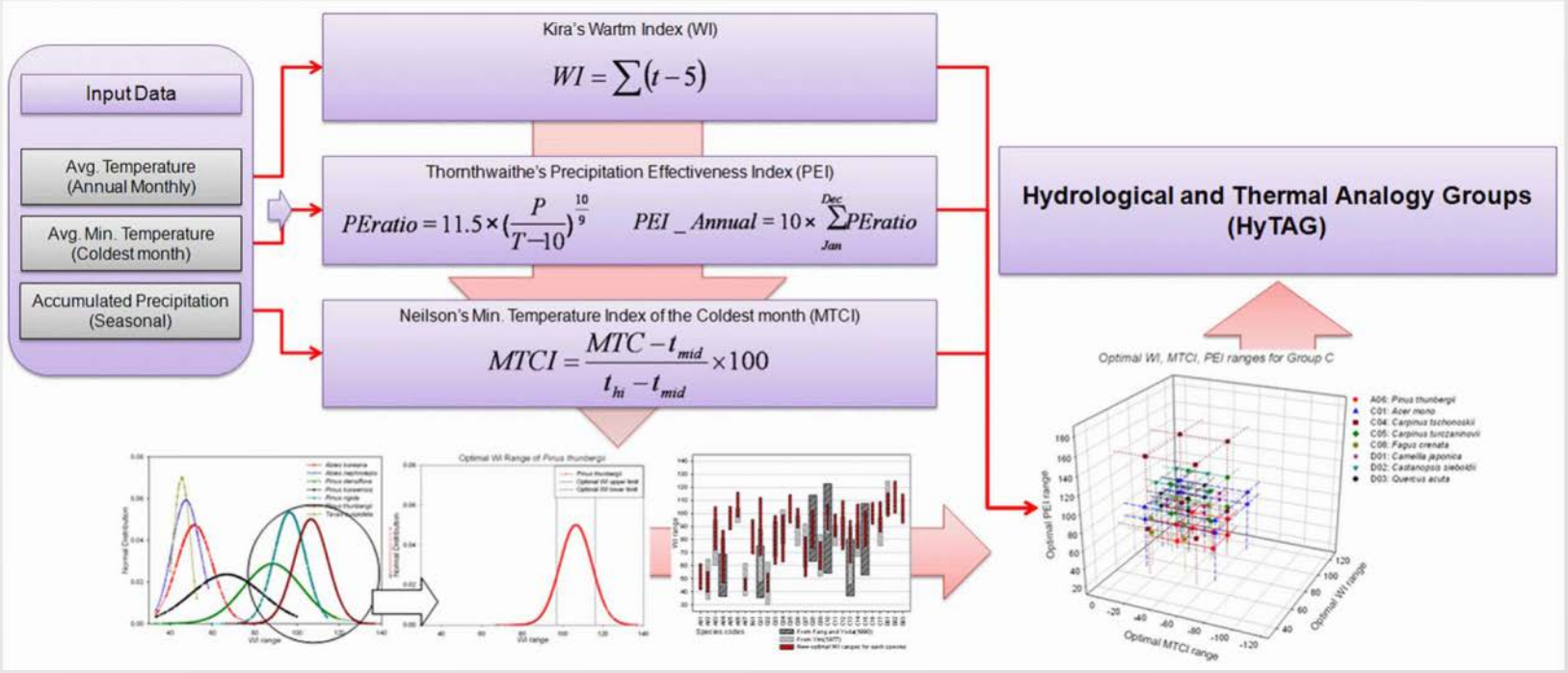
Pilot Studies

1. Forest Ecosystem (National Level)
2. Water Quality (Regional Level)

Pilot Study: Forest Ecosystem

Impact & Vulnerability Assessment

- Predicted changes in South Korea's forest ecosystem by using MC1(MAPSS CENTURY1), TAG (Thermal Analogy Groups), HyTAG (Hydrological and Thermal Analogy Groups) models



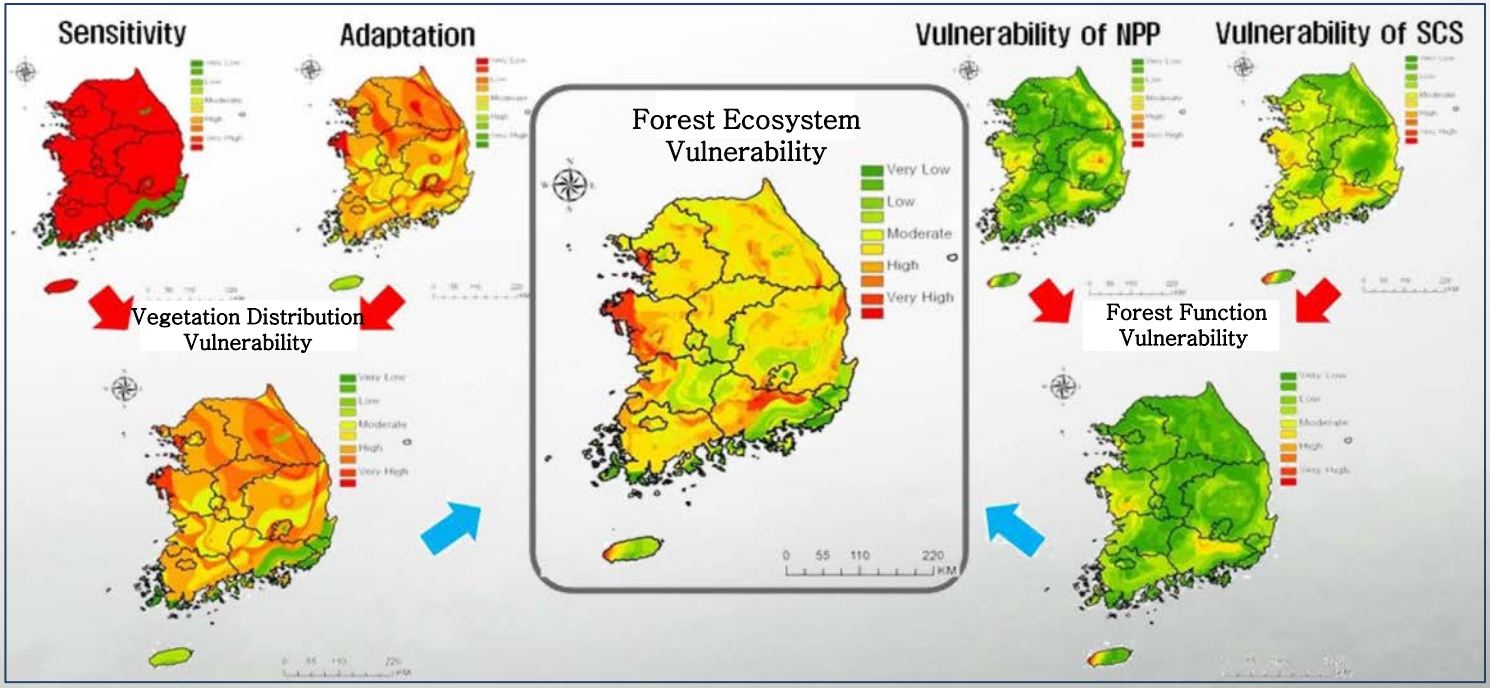
◂ HyTAG model framework

Source: Choi et al., 2010

Pilot Study: Forest Ecosystem(Cont.)

Impact & Vulnerability Assessment

Forest Ecosystem VRI = Vegetation Distribution VRI(HyTAG) +
Forest Function VRI(MC1)

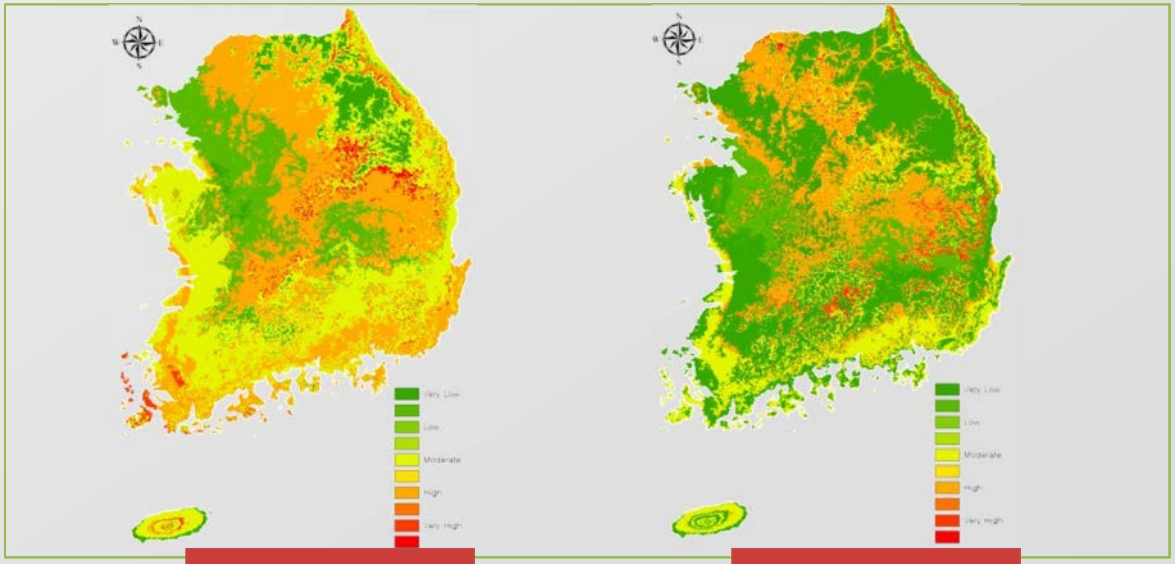


Source: Choi et al., 2010

Pilot Study: Forest Ecosystem(Cont.)

Vegetation Distribution Vulnerability

	A2		B1	
	Area (km^2)	Rate (%)	Area (km^2)	Rate (%)
Very High	13,784	14.12	2,858	2.93
High	37,357	39.30	18,129	18.58
Moderate	16,830	17.24	9,244	9.47
Low	21,732	22.27	27,761	28.45
Very Low	6,891	7.06	39,602	40.58
Total	97,594	100	97,594	100

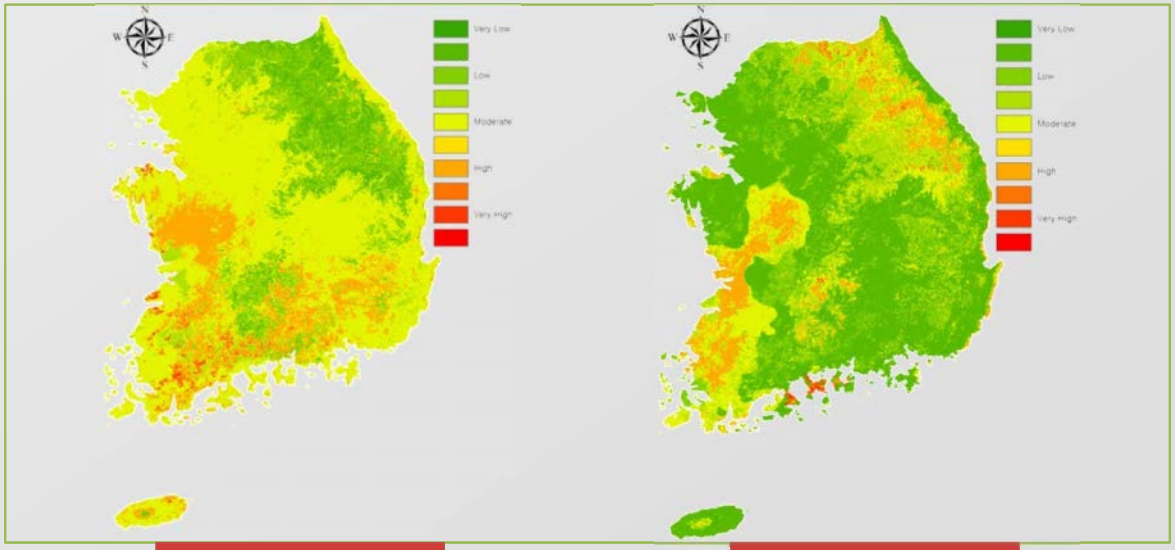


A2 B1

Pilot Study: Forest Ecosystem(Cont.)

Forest Function Vulnerability

	A2		B1	
	Area (km^2)	Rate (%)	Area (km^2)	Rate (%)
Very High	415	0.43	84	0.09
High	5,282	5.41	6,305	6.46
Moderate	56,047	57.43	13,132	13.46
Low	21,766	22.30	27,658	28.34
Very Low	14,084	14.43	50,415	51.66
Total	97,594	100	97,594	100

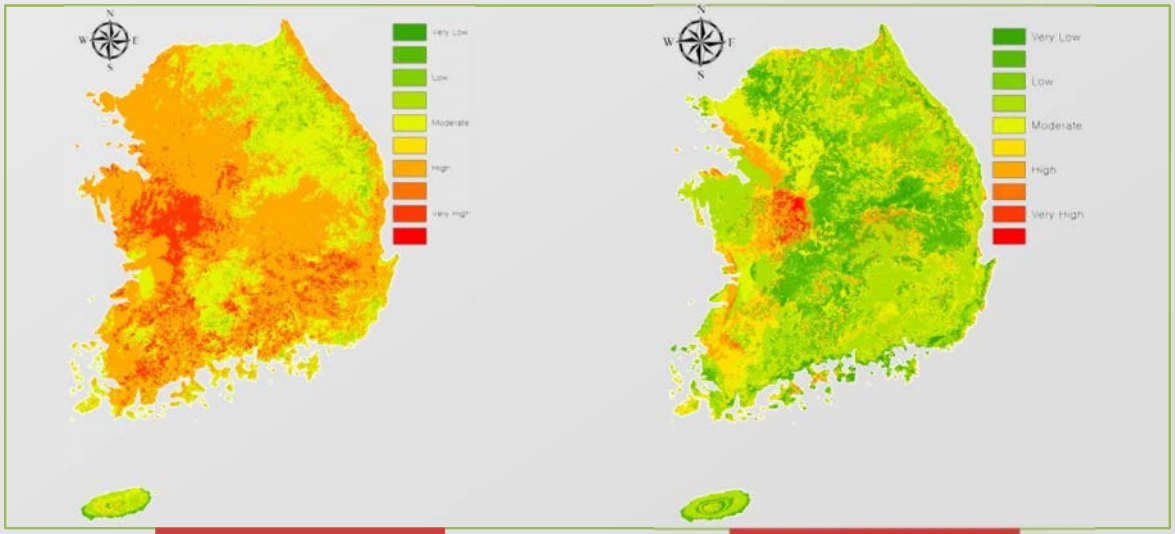


A2 B1

Pilot Study: Forest Ecosystem(Cont.)

Forest Ecosystem Vulnerability

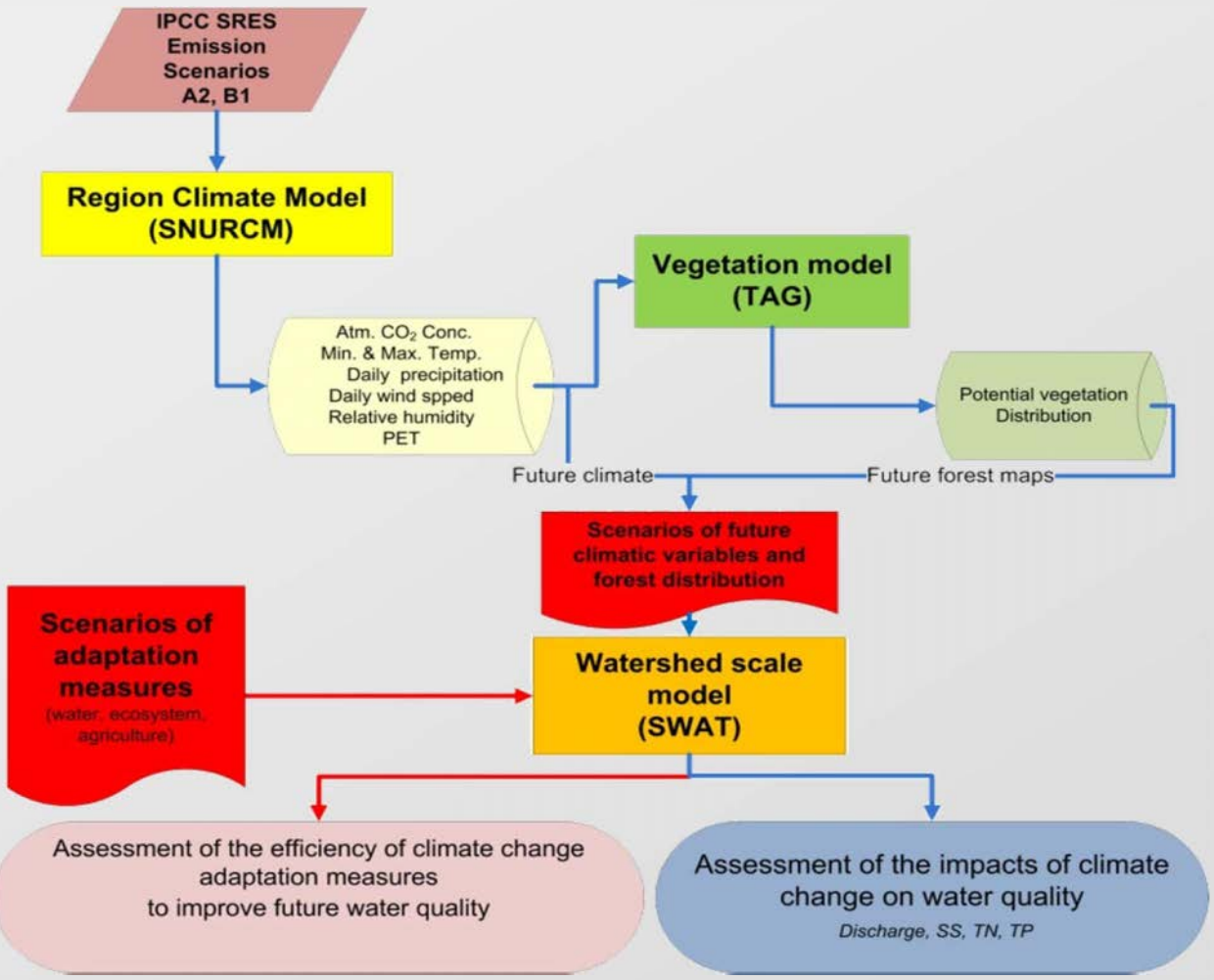
	A2		B1	
	Area (km^2)	Rate (%)	Area (km^2)	Rate (%)
Very High	2,377	2.44	1,220	1.25
High	51,673	52.95	7,244	7.42
Moderate	29,759	30.49	29,072	29.79
Low	12,649	12.96	30,328	31.08
Very Low	1,136	1.16	29,730	30.46
Total	97,594	100	97,594	100



A2 B1

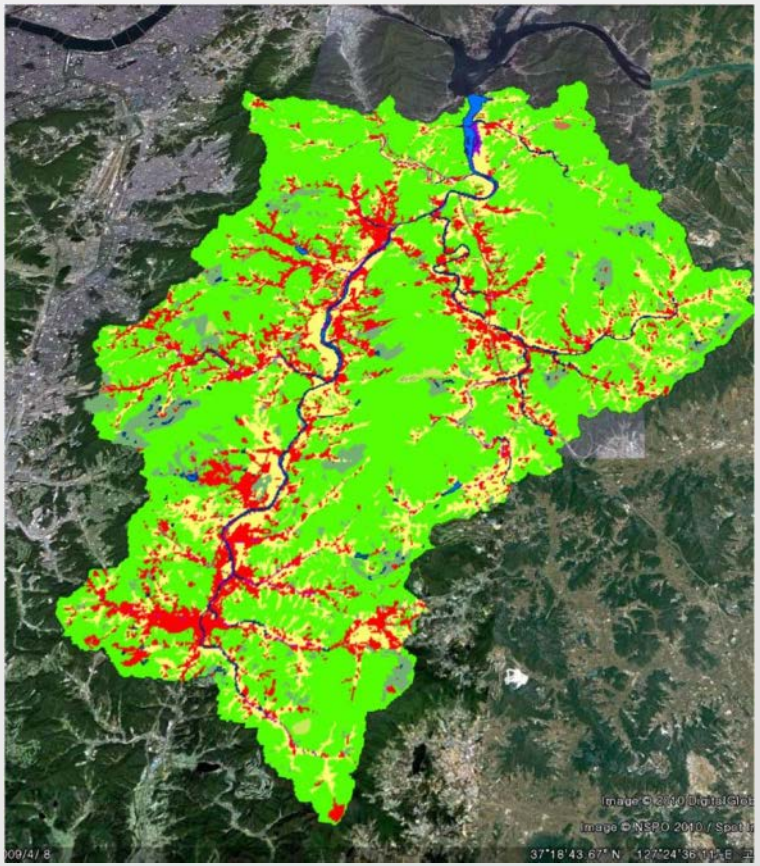
Pilot Study: Water Quality

Impact & Vulnerability Assessment



Pilot Study: Water Quality(Cont.)

Study Area

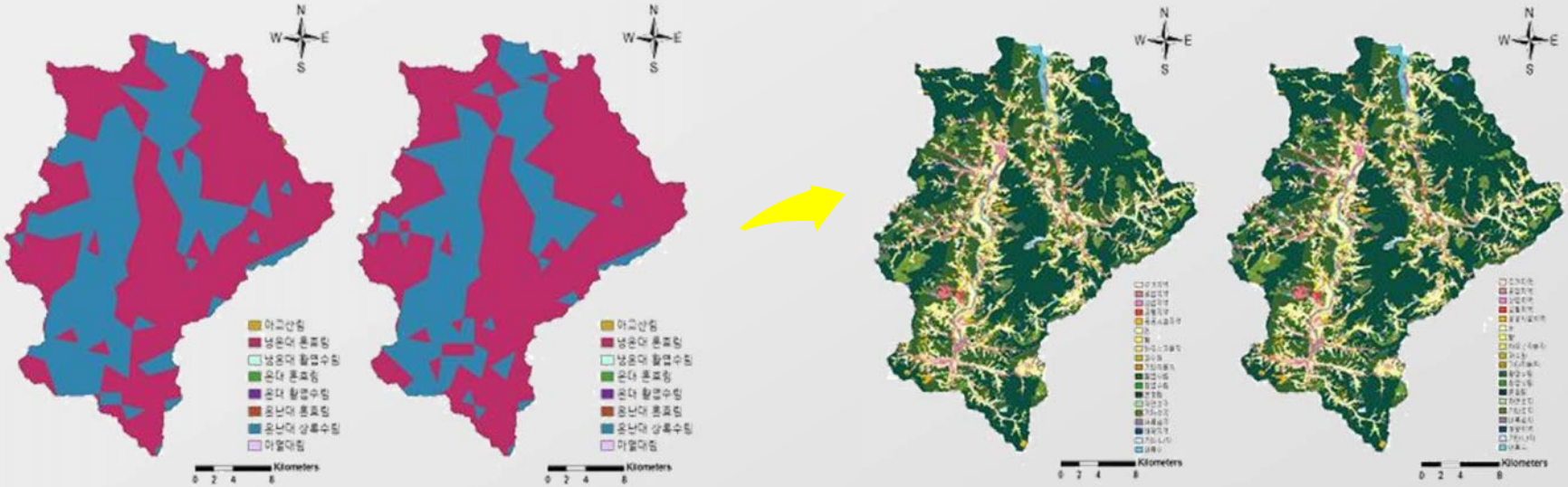


- Area: 560 ㎢
- Land Use: Crop 23%,
  Urban 12%, Forest 65%
- Regional Scale
  - Abundance of input data
  - Reasonable sampling scheme at a specific spatial-temporal scale

Pilot Study: Water Quality(Cont.)

Coupled Forest Ecosystem and Water Quality Model

Applied B1 scenario



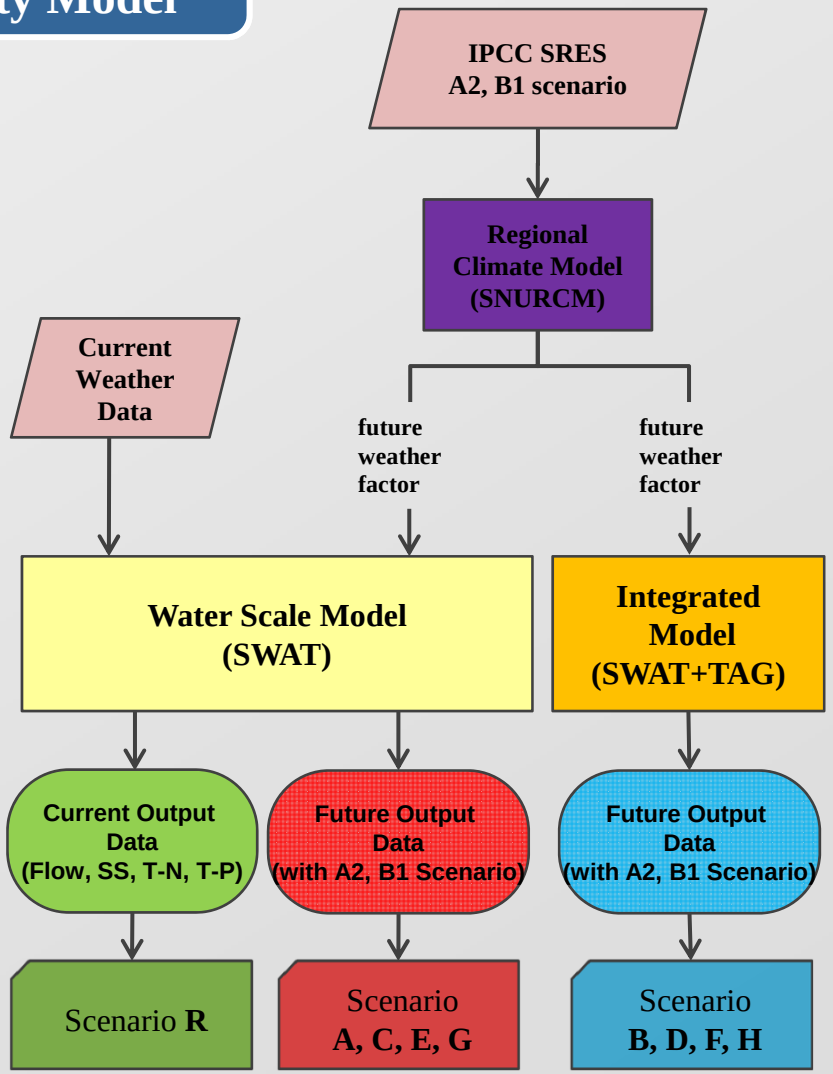
	A2 (km^2)			B1 (km^2)		
	Broad-leaf	Needle-leaf	Mixed	Broad-leaf	Needle-leaf	Mixed
Current	187	134	36	187	134	36
Near Future (2046-2065)	247	3	106	109	0	247
Far future (2080-2099)	37	0	320	91	0	265

Pilot Study: Water Quality(Cont.)

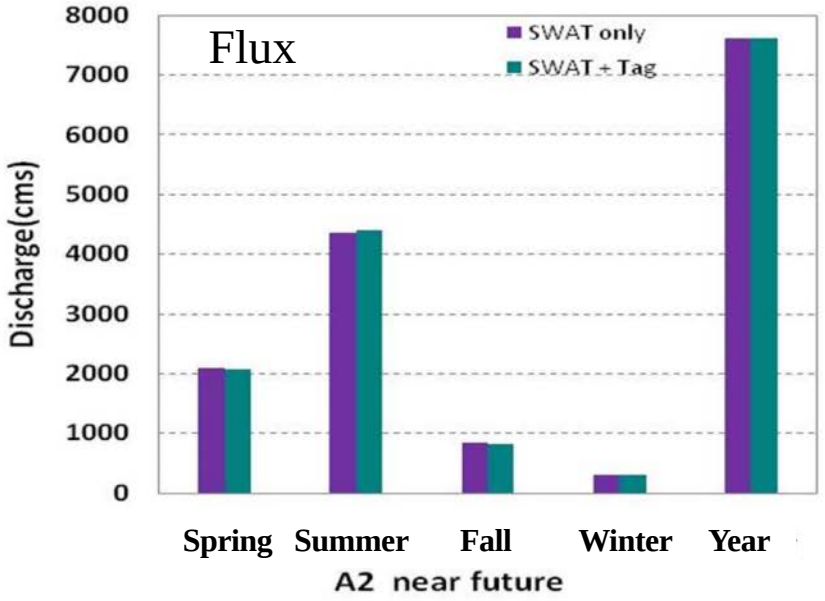
Coupled Forest Ecosystem and Water Quality Model

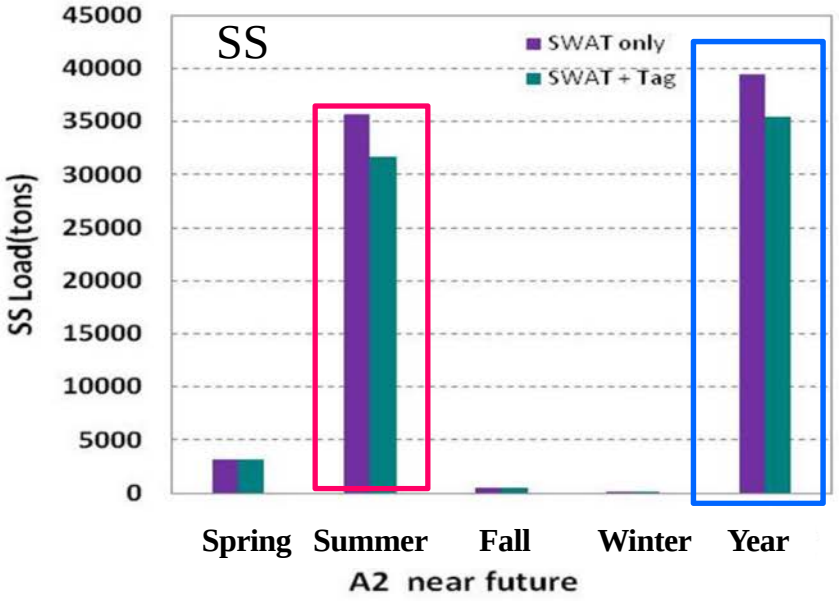
Q, T-N, T-P, SS			water scale model (SWAT)	Integrated Model (SWAT+TAG)
Current (1980-1999)			Scenario R (Reference)	
Future	A2	Near future (2046~2065)	Scenario A	Scenario B
		Far future (2080~2099)	Scenario C	Scenario D
	B1	Near future (2046~2065)	Scenario E	Scenario F
		Far future (2080~2099)	Scenario G	Scenario H

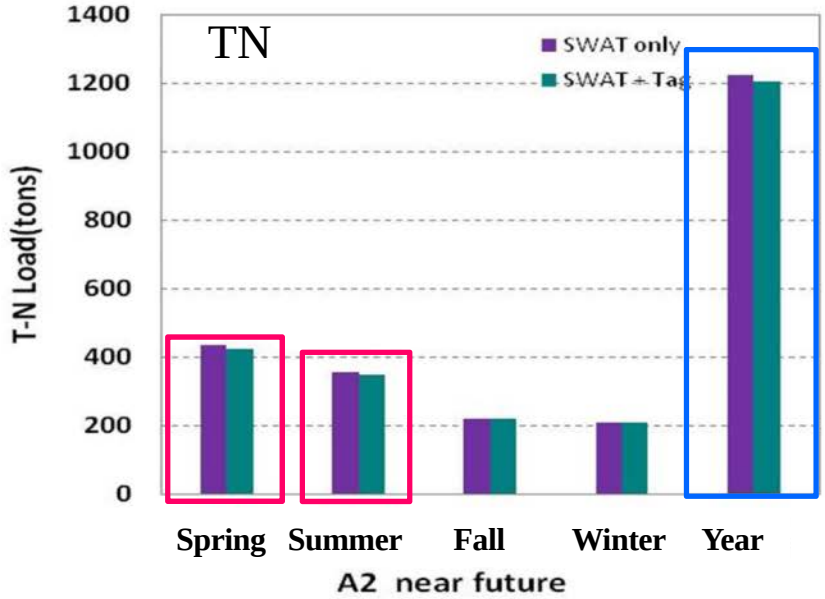
Framework of multi-standard analysis

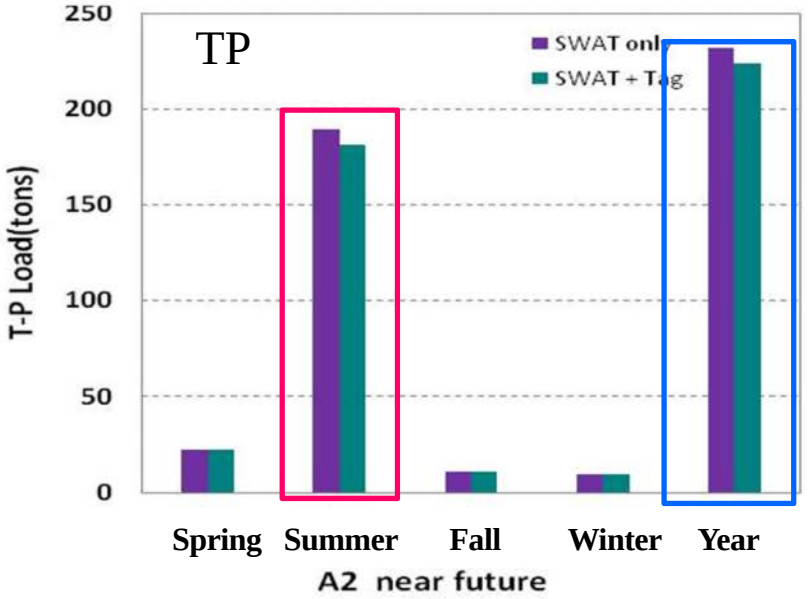


Climate Change Impact vs.
Climate Change + Forest Distribution Change (A2)



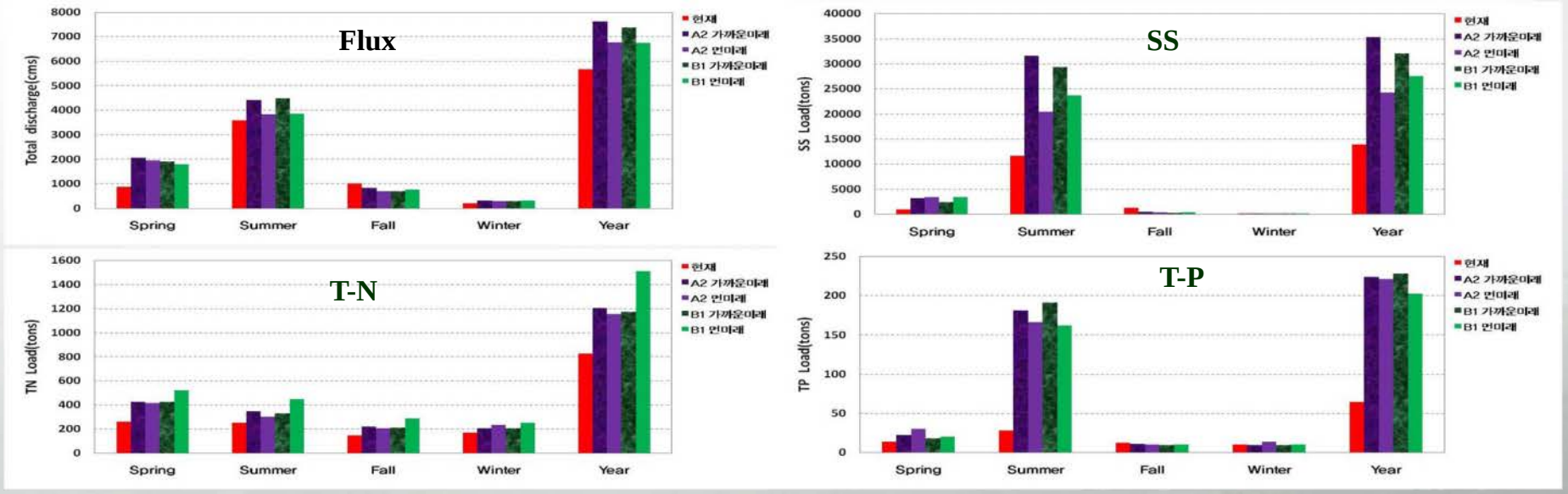






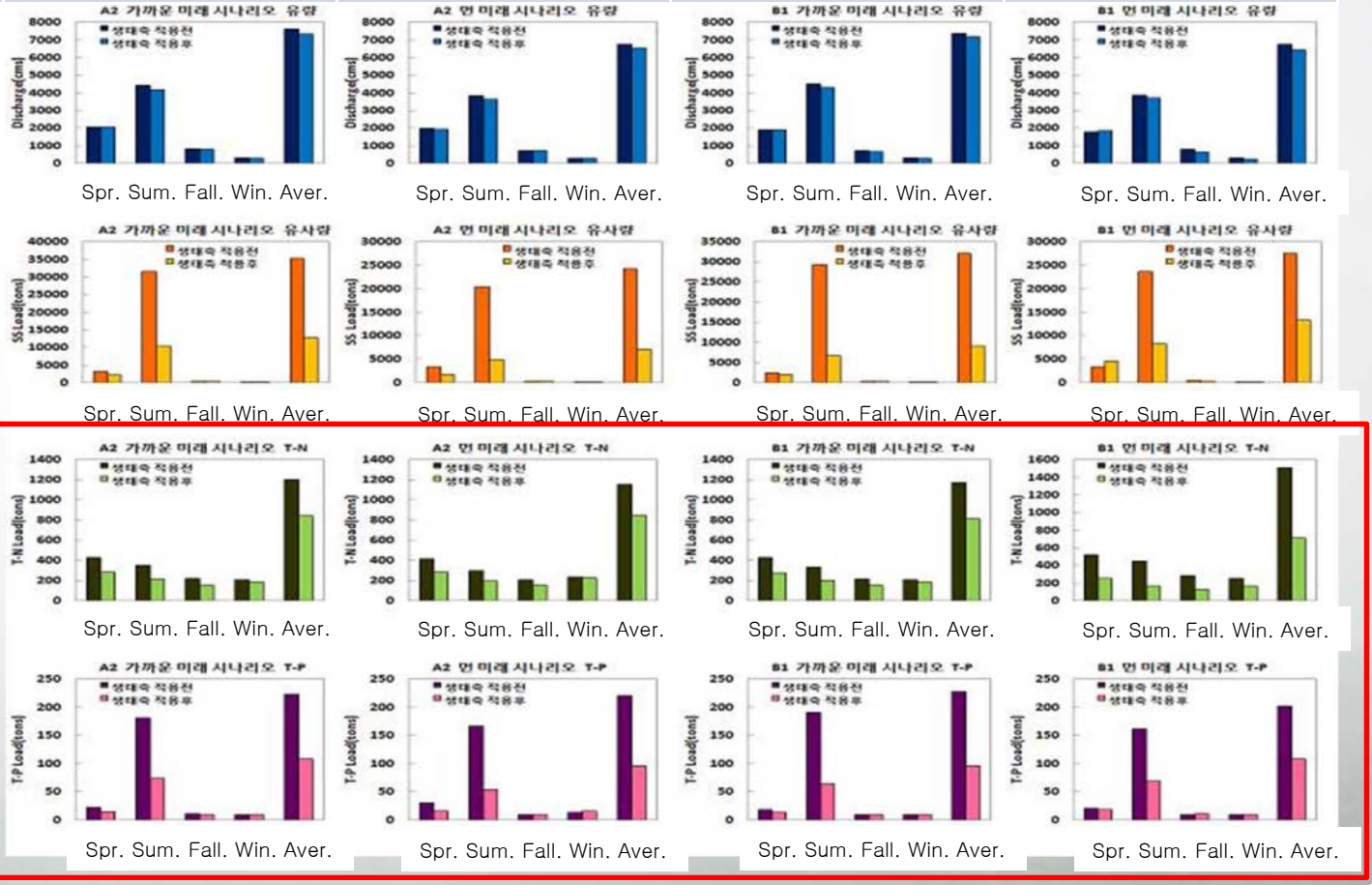
Current, A2 and B1 Scenarios

Annual rate of change	A2		B1	
	Near future	Far future	Near future	Far future
Flux	26% ↑ (Spring 57% ↑)	16% ↑ (Spring 54% ↑)	23% ↑ (Spring 53% ↑)	16% ↑ (Spring 51% ↑)
SS	61% ↑ (Spring 71% ↑)	43% ↑ (Spring 73% ↑)	57% ↑ (Spring 61% ↑)	49% ↑ (Spring 72% ↑)
TN	31% ↑ (Spring 39% ↑)	28% ↑ (Spring 377% ↑)	30% ↑ (Spring 39% ↑)	45% ↑ (Spring 50% ↑)
TP	71% ↑ (Summer 85% ↑)	71% ↑ (Summer 83% ↑)	72% ↑ (Summer 86% ↑)	68% ↑ (Summer 83% ↑)



A2 and B1 Scenarios applying Ecological Network Policy

Reduction rate	A2		B1	
	Near future	Far future	Near future	Far future
TN	30.3↓	26.5↓	30.5↓	52.8↓
TP	51.5↓	56.3↓	57.7↓	46.5↓

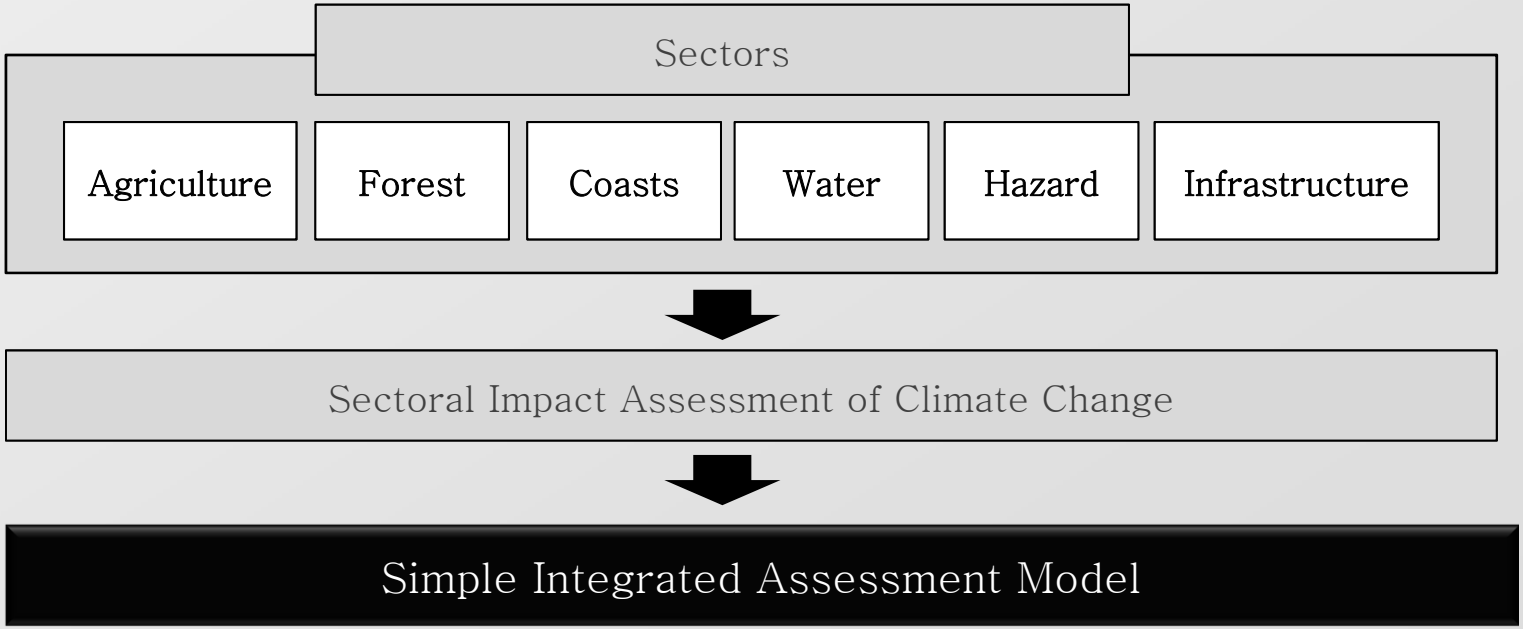


Future Studies

Future Studies

Development of Impact Assessment model

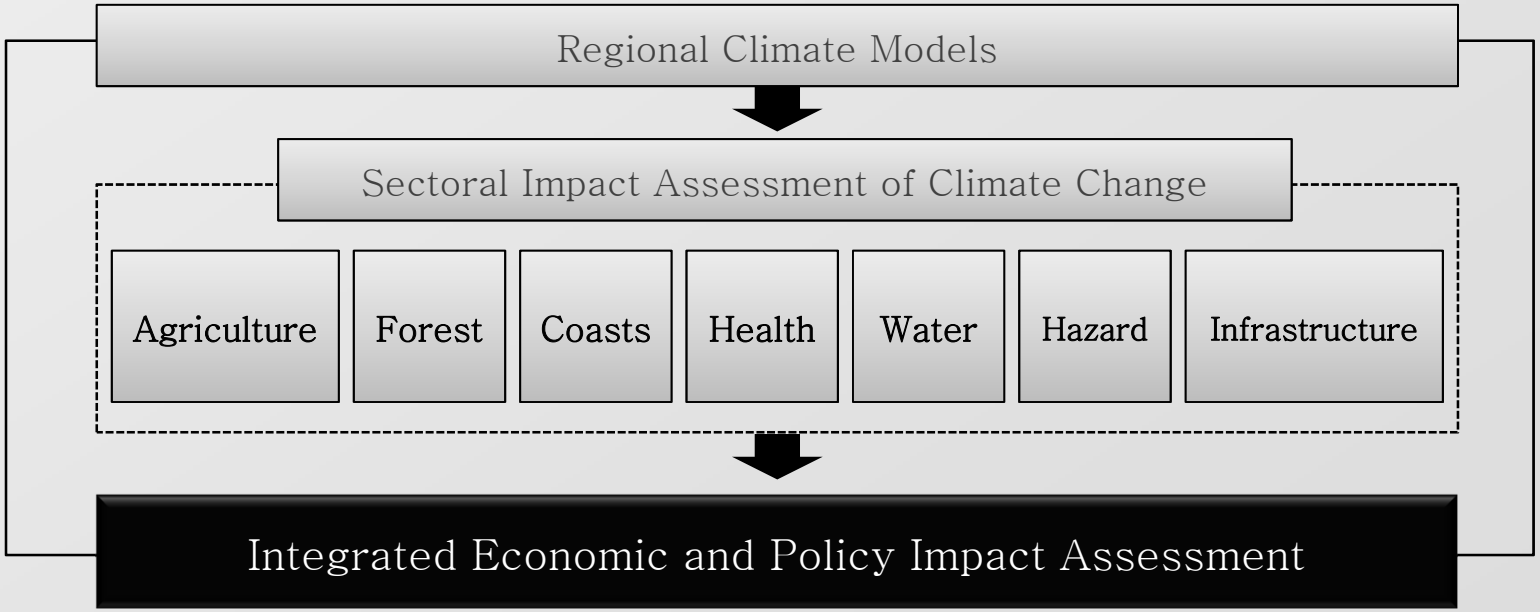
- To develop integrated impact assessment system, it should be noted that ① sectoral impact assessment based on aggregate database, ② sectoral impact assessment using aggregate impact assessment, and ③ needs to integrate sectoral results and policy implementation.



Future Studies

Development of Impact Assessment model

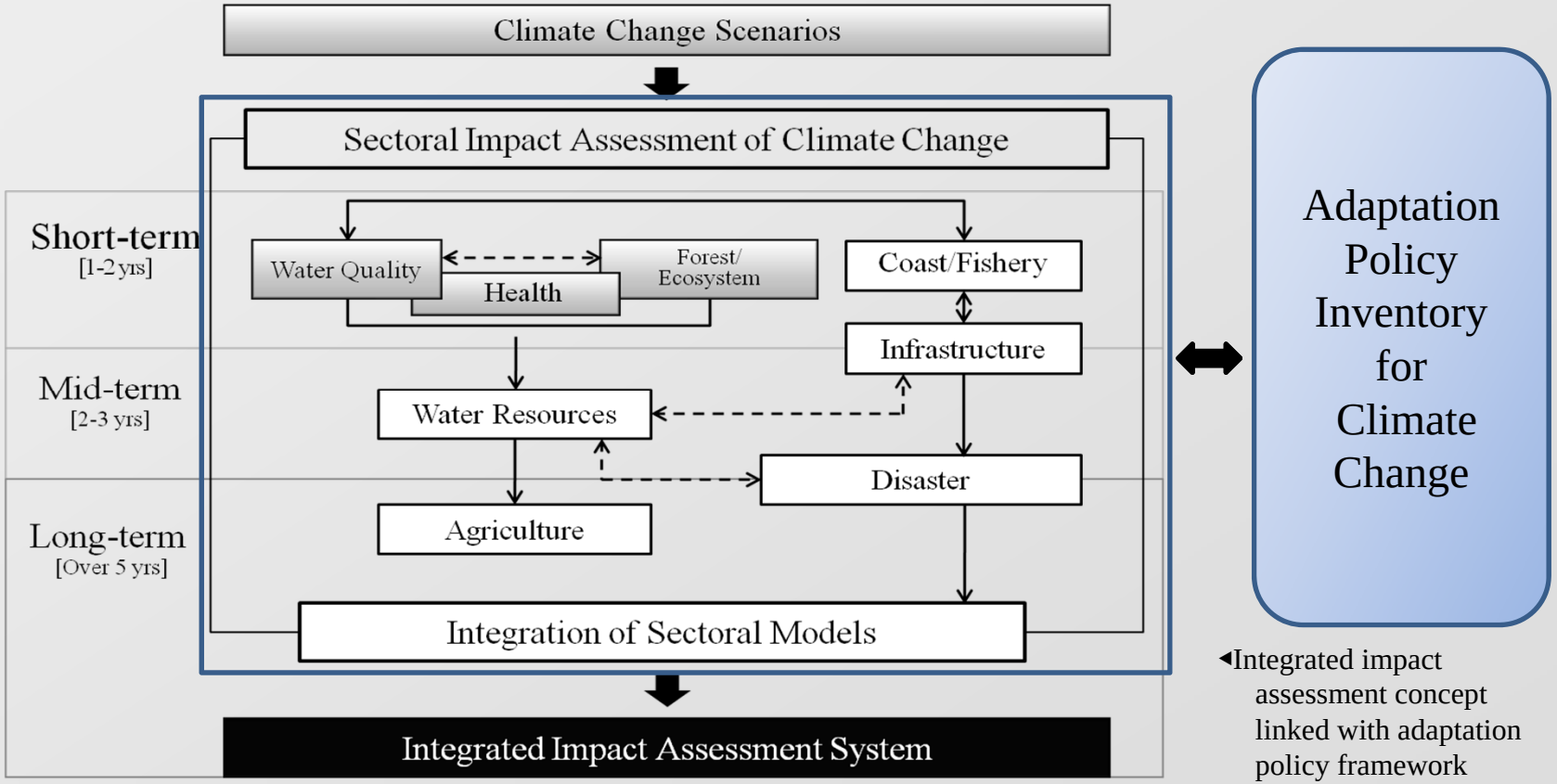
- However, it's difficult to develop multi-regional and multi-sectoral impact assessment due to database limitations.
- Simple Integrated Assessment Model: Develop tools and instruments for effective climate change adaptation
- Provide policy support indentifying potential impacts of climate change in Korea



Future Studies

Next Step

- Support climate change policy by focusing on the integrated impact modeling system to assess potential impacts of climate change in regional areas



◂Integrated impact assessment concept linked with adaptation policy framework

Thank you for your attention!!