

# Introduction of Climate Change Impact Assessment System

Model Of inTegrated Impact and Vulnerability Evaluation of climate change  
(MOTIVE)

&

Development of framework for decision support integrated impact assessment  
platform and application technology for climate change adaptation  
(DIRECTION)



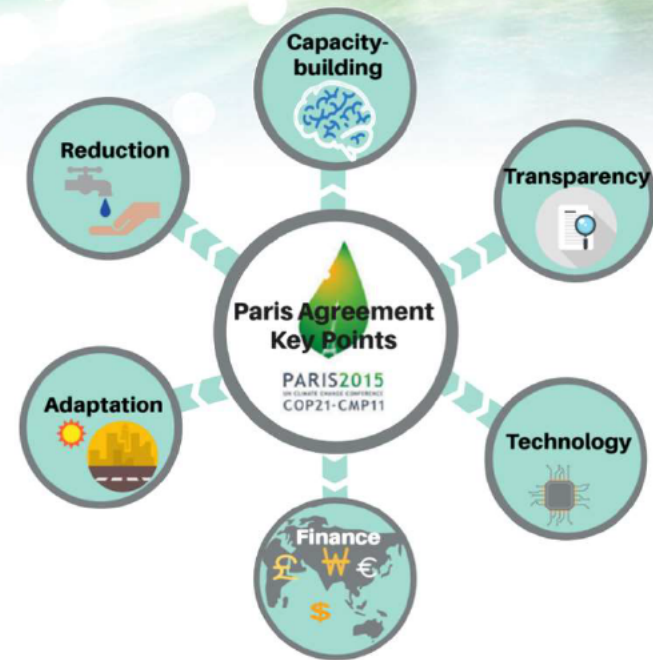
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## Background

- The Paris Agreement was adopted in December 2015 which includes a global goal on adaptation of enhancing adaptive capacity, strengthening resilience and reducing vulnerability to climate change in the context of the temperature goal of the Agreement (The United Nations Framework Convention on Climate Change(UNFCCC)-The Paris Agreement 2015)
- “The risk with the greatest potential impact in 2016 was found to be a failure of climate change mitigation and adaptation. This is the first time since the report was published in 2006 that an environmental risk has topped the ranking.” (World Economic Forum, 2016).

⇒ Response to the climate change is essential.



## The Global Risks Report 2016

Top 10 risks in terms of  
Impact

- 1 Failure of climate-change mitigation and adaptation
- 2 Weapons of mass destruction
- 3 Water crises
- 4 Large-scale involuntary migration
- 5 Energy price shock



# Background



## Major Risks



### Health

#### Increase in death, disease and infectious disease due to climate increase, heat wave, disasters

- Heat wave death toll : ('30s) 4,820 → ('50s) 11,673
- Disease burden(KRW) due to heat wave and abnormal temperature : ('10s) 53 billion → ('20s) 103.9 billion → ('50s) 1 trillion 437.7 billion

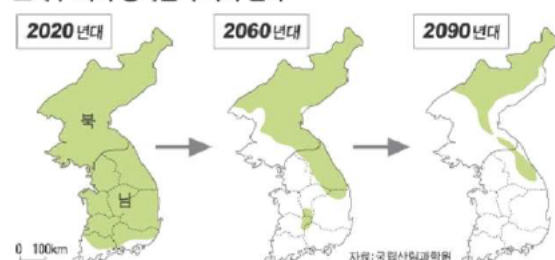


### Ecosystem

#### Biodiversity decline, aggravation of habitat, increase in pests and forest

- Rapid loss of endemic species, increase survival rate of pest, etc.

소나무 최적 생육빈식 지역 변화



### Water

#### Rainfall changes, water management degeneration due to increases in flood and droughts



### Land/Coast

#### Urban heat island due to climate increase and disasters, SOC function degradation, Coast erosion, increase flooding vulnerability

- Roads, rivers, and other public facilities are 87% of the extreme weather related damages and 59% of the restoration expenditure
- Due to the concentrated population and infrastructure density, climate change impacts and damages are greater

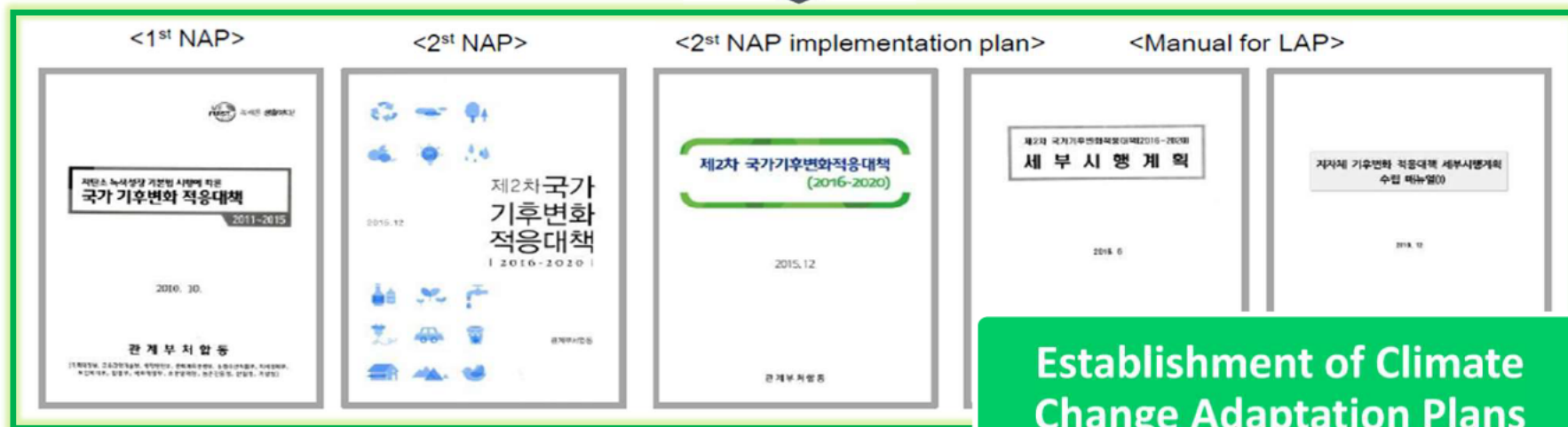


# Background



## Climate Change Adaptation Plans

To cope with Climate Change Risk...





## Background

- Decision-makers and other stakeholders **need reliable science-based information** to help them respond to the risks of climate change impacts and opportunities for adaptation
- Effective adaptation plans must be based on scientific research that shows future risks of climate change.
- Need for Scientific Tools**
  - To overcome uncertainty about climate change in future
  - To support decision making regarding climate change in consideration of planning scale and timeline
- Types of Scientific Supportive Tools**
  - Climate information management system
  - Models for impact & vulnerability assessment

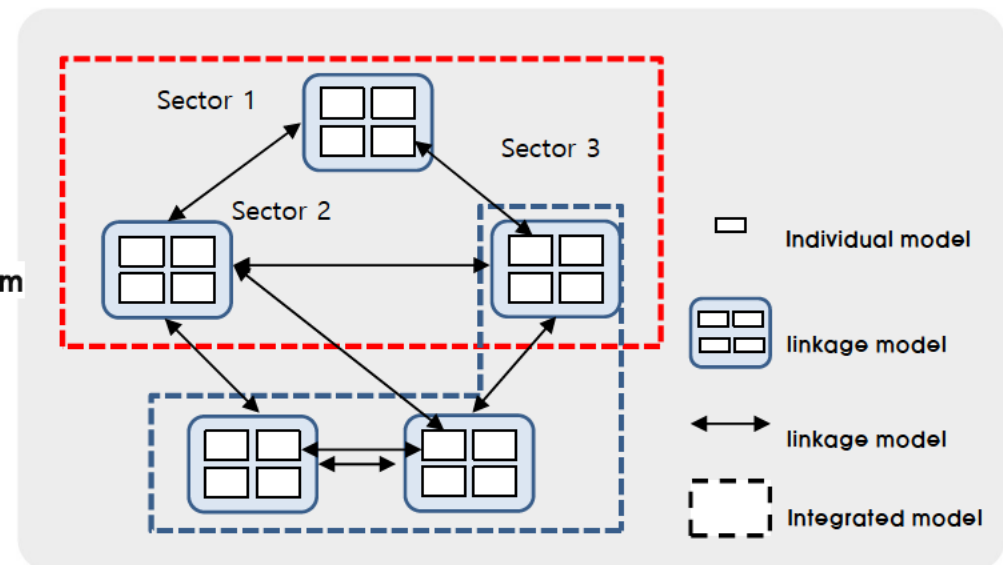
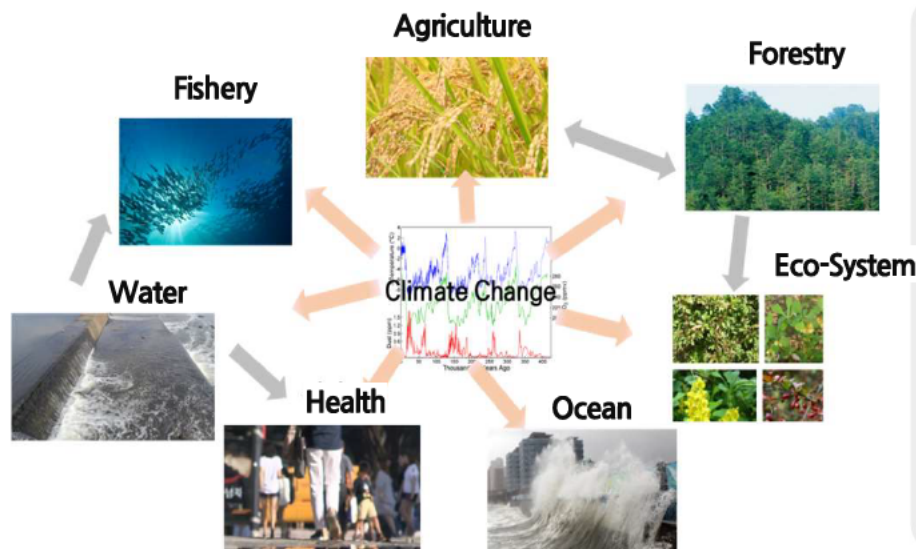


⇒ **Need Supportive Tools for CC Policy Implementation**

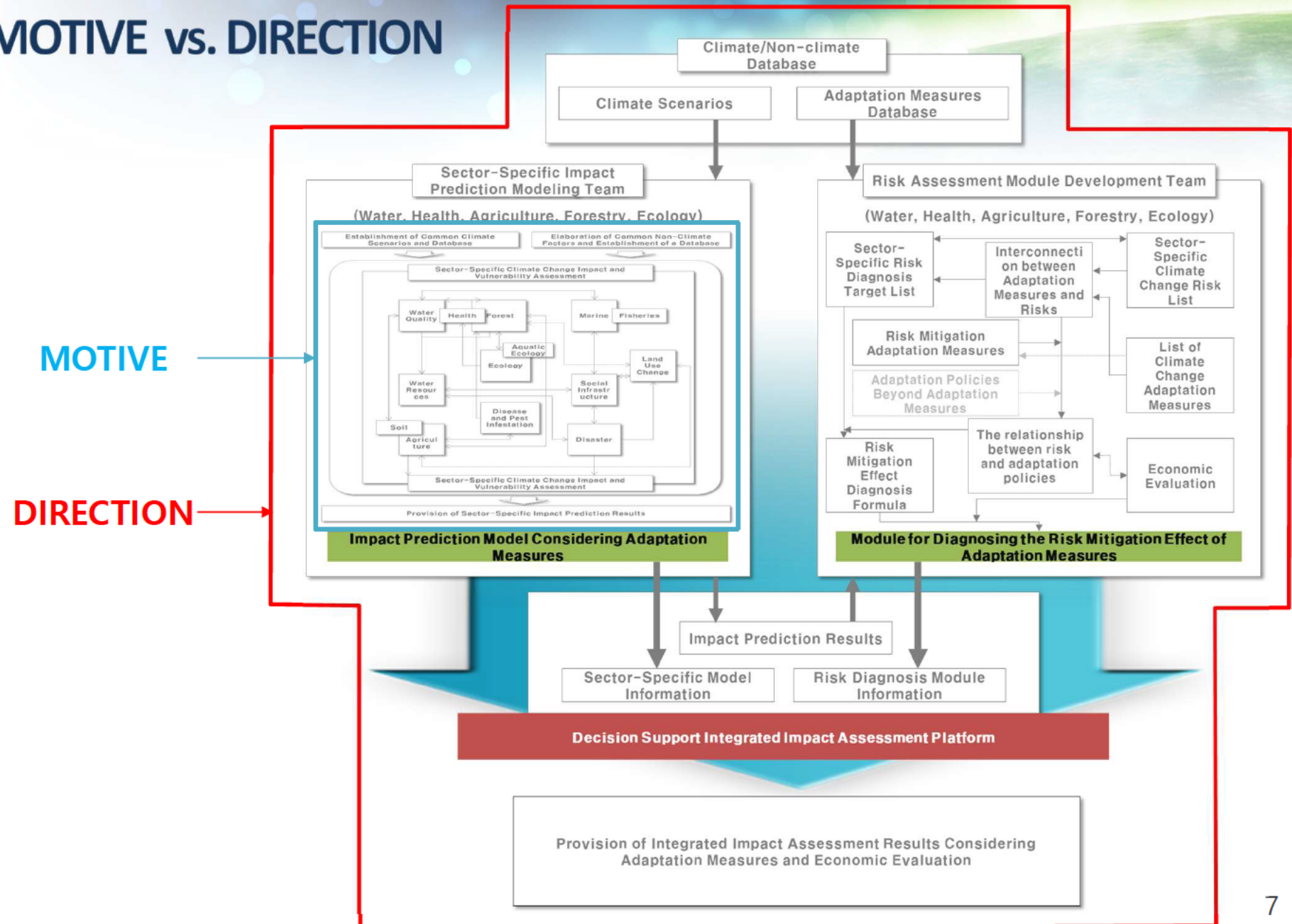
## Background

- Lack of **integrated impact and vulnerability assessment** based on scientific evidence
    - Climate change impact and vulnerability assessment **without considering across different sectors**
    - **Use of different DB for each study, Index-based assessment** with weight values **by expert opinions**
    - Need to establish **scientific climate change adaptation policies** with **minimization of mal-adaptation**
    - Development of '**Risk Assessment**' to **communicate with adaptation policy**
- ※ to utilize setting priority of adaptation plan

### < Concept of Integrated Assessment Model >

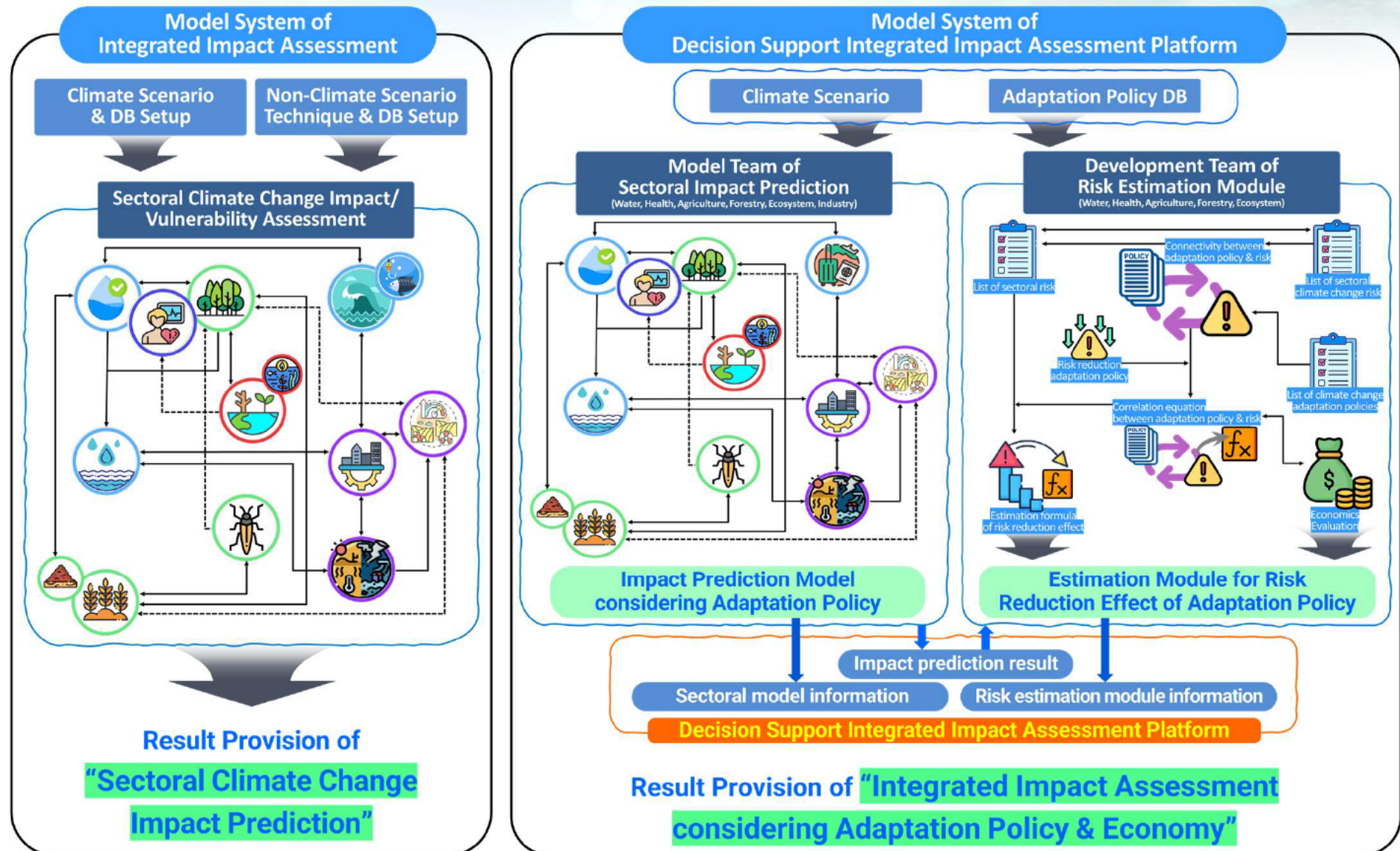


# MOTIVE vs. DIRECTION





## MOTIVE vs. DIRECTION



## MOTIVE vs. DIRECTION

### ■ Climate Change Scenarios

- (MOTIVE) Meteorological Agency and KEI Scenarios
- (DIRECTION) Meteorological Agency and two or more new scenarios

→ Resolution of model uncertainty through ensemble analysis using multiple climate change scenarios is necessary.

### ■ Climate Change Assessment Models

- (MOTIVE) Development of models in six areas: health, water management, agriculture, forestry, ecosystems, marine and fisheries.
- (DIRECTION) Development of models in six areas: health, water management, agriculture, forestry, ecosystems, industry, along with risk assessment modules and economic evaluation modules.

→ Decision support is needed for selecting impact assessment items by sector reflecting the opinions of policymakers and evaluating the effectiveness of adaptation measures.

## MOTIVE vs. DIRECTION

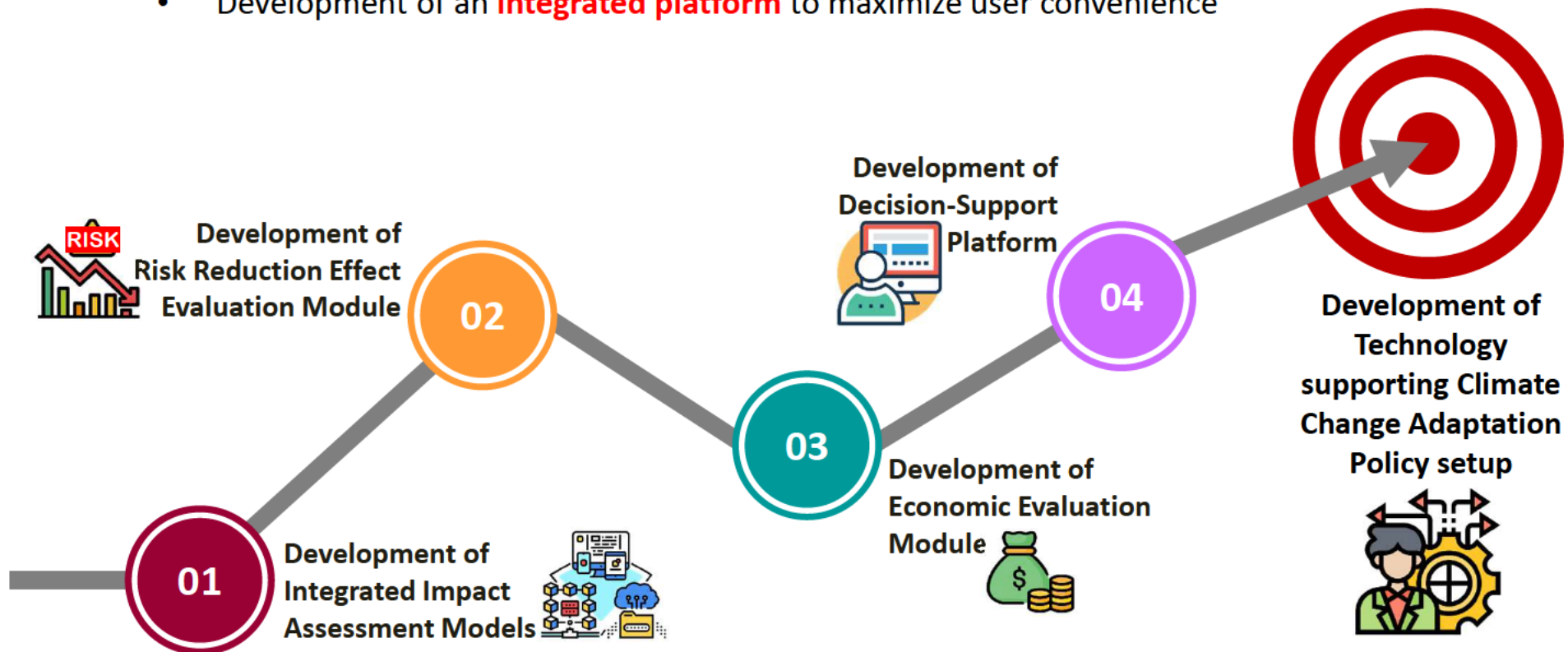
- Integrated Impact Assessment Platform for Adaptation Measures Support
    - (MOTIVE) Providing impact assessment results and image information by local government through result inquiry.
    - (DIRECTION) User-driven model operation and result presentation centered on impact assessment simulation and result inquiry.
- Decision support is necessary for selecting sector-specific impact assessment items reflecting the opinions of policymakers and evaluating the effectiveness of adaptation measures.

	MOTIVE	DIRECTION
Outcome	Integrated Impact Assessment Model	Decision-Support Integrated Impact Assessment Platform
Composition	Intra-sector and Inter-sector Impact Assessment Model	Intra-sector and Inter-sector Impact Assessment Model, Evaluation Module for <b>Risk Reduction Effect</b> , Evaluation Module for <b>Economic Effect</b>
Result	Projected Impact Results of Climate Change	Projected Impact Results of Climate Change, Risk Reduction Effects <b>Considering Adaptation Measures</b> , and Economic Evaluation of Risk Reduction Effects
Utilization	Utilization of Sectoral Impact Assessment due to Climate Change	Utilization for <b>Decision-Making</b> in Diverse Sectors in Selection for Adaptation Measures to Cope with Climate Change



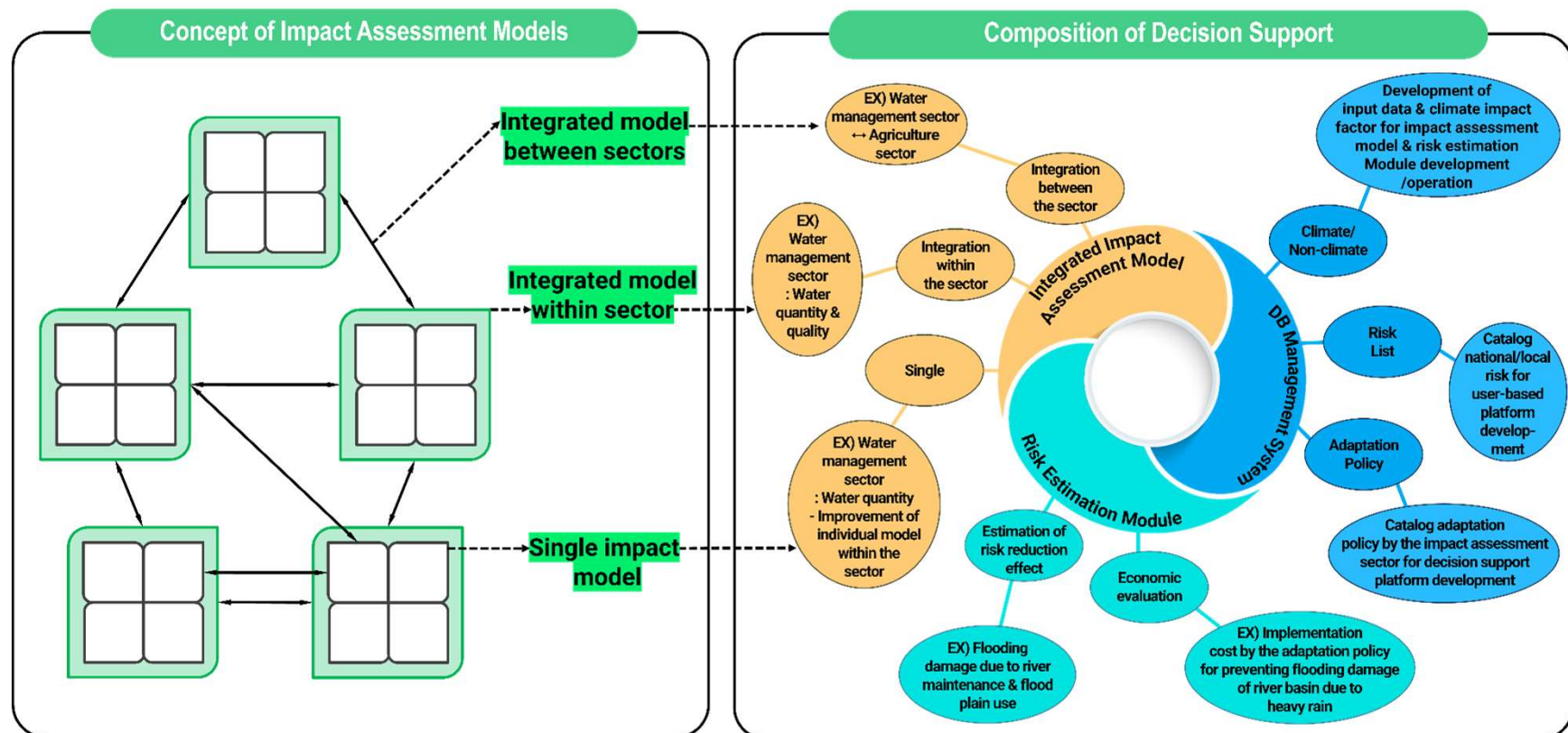
## Goal

- Development of a "**Decision-Support Integrated Impact Assessment Platform**" considering sectoral impact prediction results, adaptation measures, and an evaluation of economic effects
  - Development of **integrated impact assessment models** based on climate change risks
  - Development of **evaluation modules for risk reduction and economic effects** of adaptation measures
  - Development of an **integrated platform** to maximize user convenience



## Goal

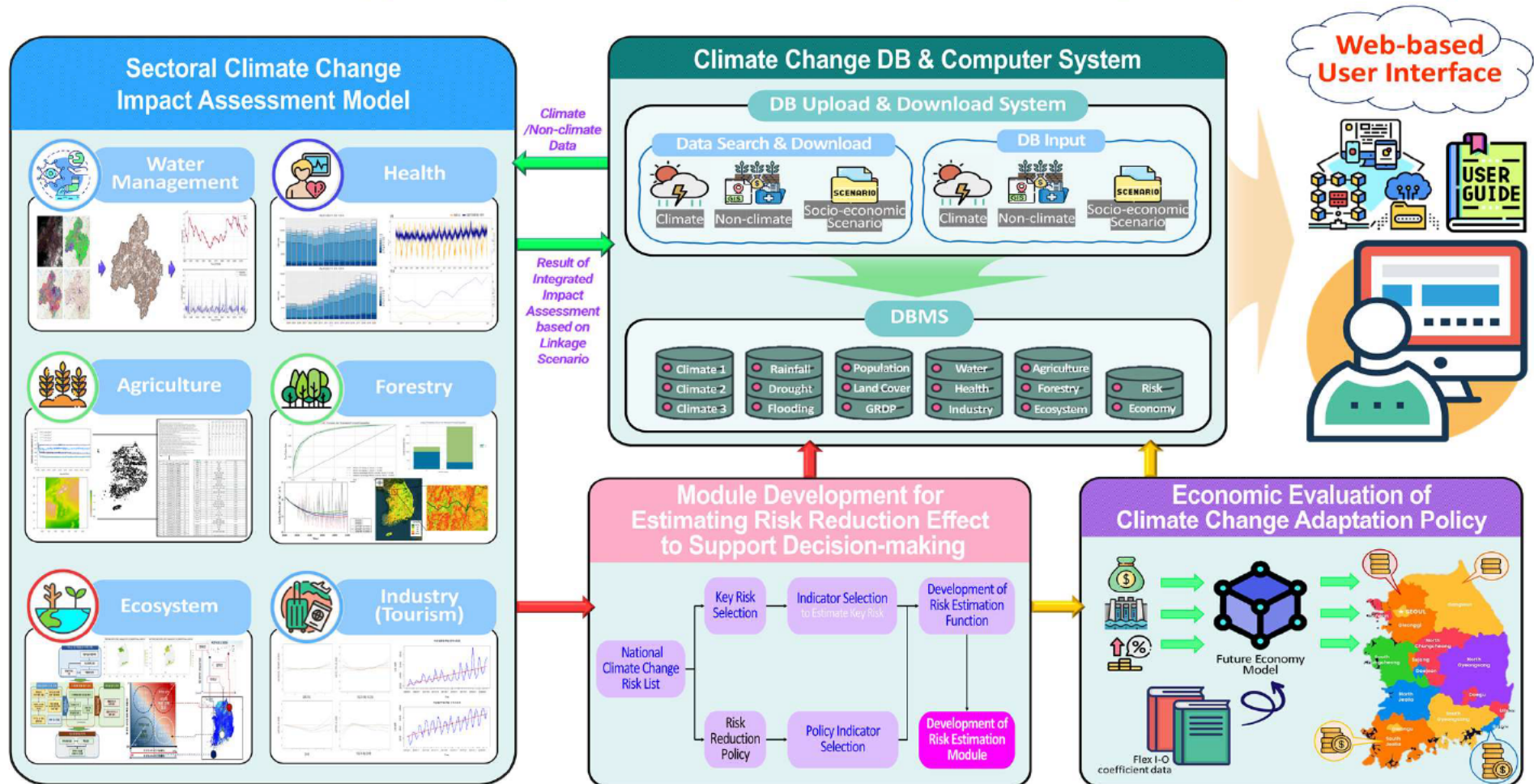
- Parts of integrated impact assessment model  
: Integration within sector / Integration between sectors
- Parts of risk reduction evaluation module  
: Evaluation of risk reduction effect both for physical and economical aspects of adaptation policies



# Goal

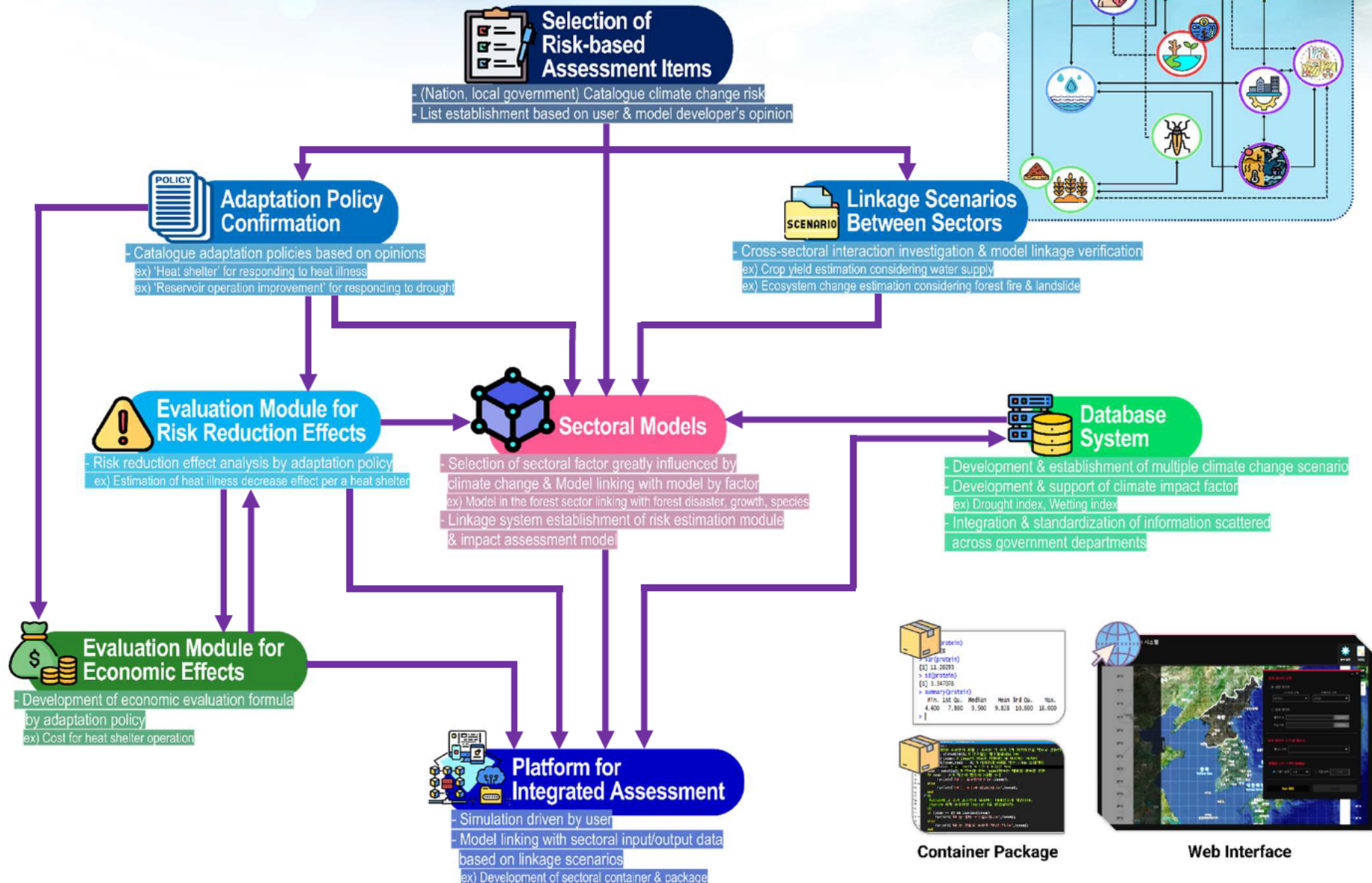
## “Decision Support Integrated Impact Assessment Platform

for Supporting the Establishment of Climate Change Adaptation Policy”





# DIRECTION Development Procedure

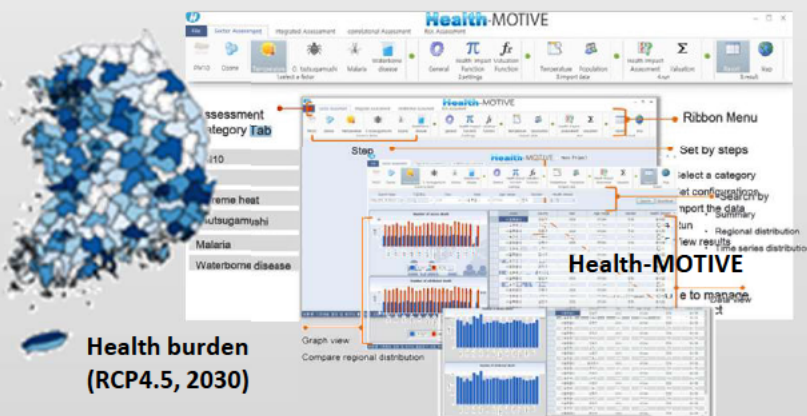


## Framework – Sectoral Models



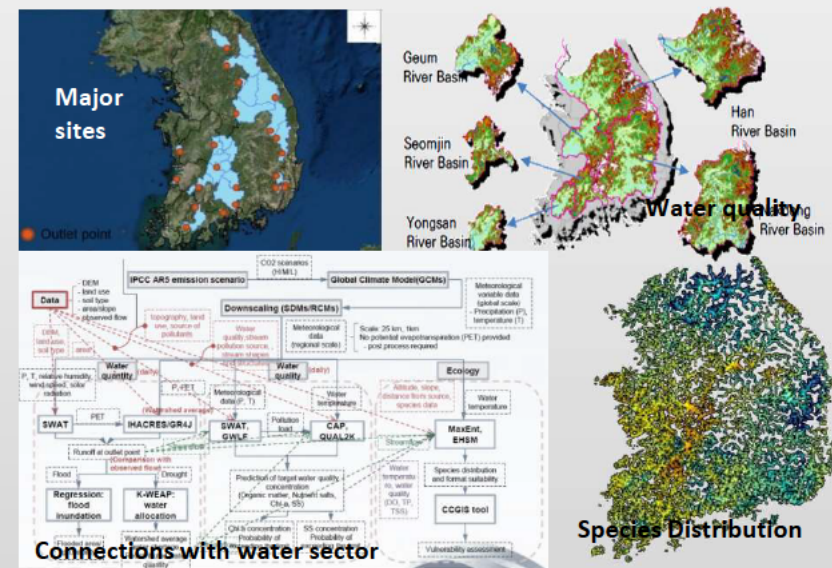
### Health

- **MOTIVE-HEALTH** - Health impact assessment tool for climate change
  - Assessment health impact of health, infectious disease and air quality changes
  - Integrate each part of the assessments into one value, select a function; health impact function and valuation function
  - **Factors: heat wave, air pollution, infection, vector-borne disease**



### Water

- Provide **water quantity, quality, and ecology** projections to the inter-related sectors
  - Generated by our MOTIVE-water team with some new models, focus on the cross-sectoral impact
  - **Factors: water quantity/quality, aquatic ecology**



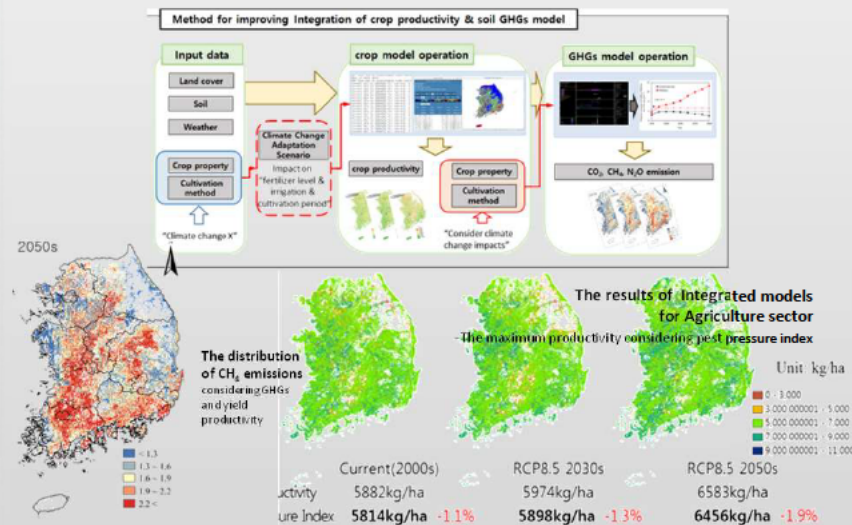


# Framework – Sectoral Models



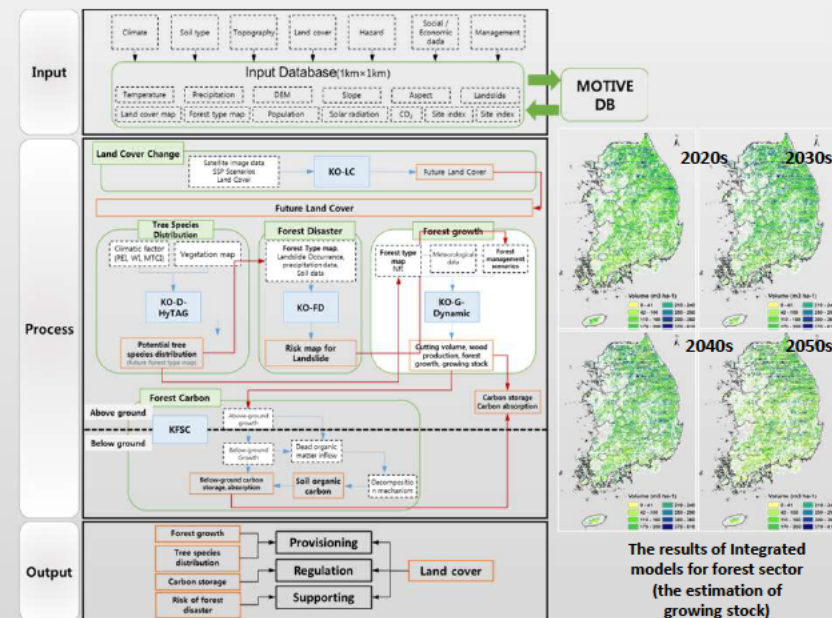
## Agriculture

- **Integrated models** for Agricultural sector
  - To develop site-specific climate change impact and vulnerability assessment models in agriculture
  - **Factors:** suitable and for cultivation, crop productivity, farmland greenhouse gas cycle, pest, eco-system service



## Forest

- **Integrated models** for Forest sector
  - To build integrated models for Forest sector
  - **Factors:** species distribution, forest growth, carbon circulation, forest disaster(landslide), land coverage change



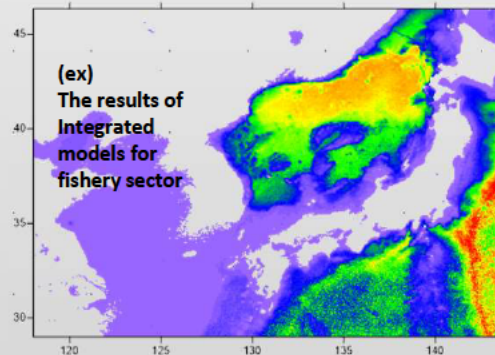
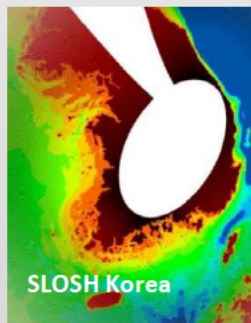


## Framework – Sectoral Models



### Ocean/Fishery

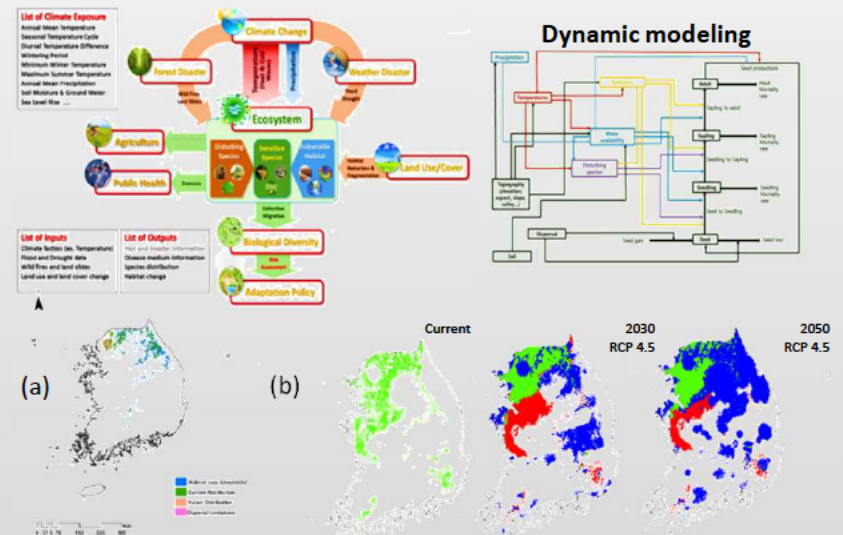
- **(Ocean) Integrated model for Korean peninsula – SLOSH Korea**
  - To develop a model for assessing impact and vulnerability of flooding coastal region induced by typhoon surges and sea level rise
- **(Fishery) Integrated models for Fishery sector**
  - To predict the changes in potential fisheries production in accord with changes in spatial-temporal primary production in the ocean, to integrate models of ocean circulation, primary production, and biomass size-spectrum model



### Ecosystem

#### ▪ Ecosystem Integrated Model

- To develop individual models of climate sensitive species, invasive species, and vulnerable habitat (factors)
- To integrate these models with other sectors' models for assessing climate change impacts and vulnerability to ecosystems

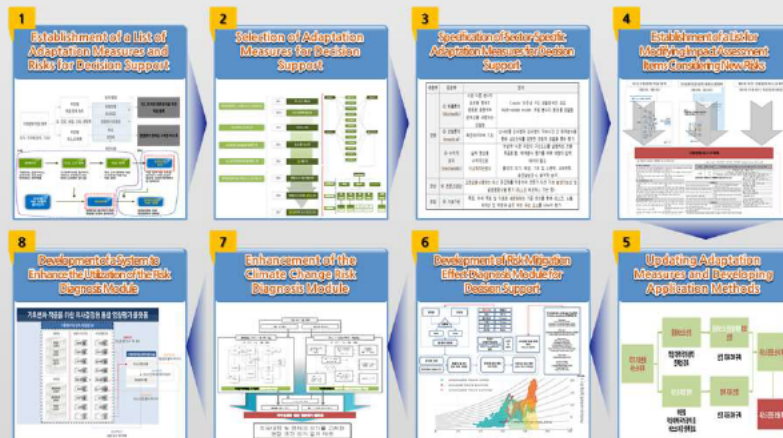


# Framework – Sectoral Models



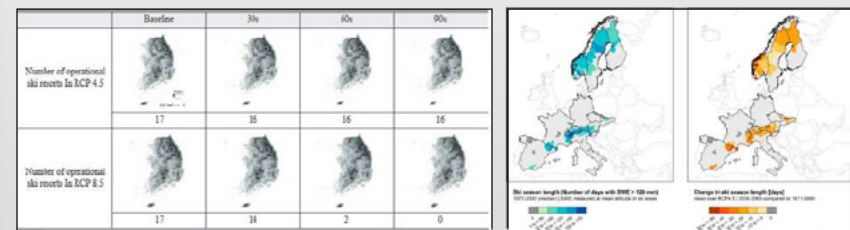
## Risk Reduction Effect Evaluation

- **Development of Risk Mitigation Effect Diagnosis Module**
  - Quantification of the Effectiveness of Current Climate Change Adaptation Measures in South Korea through Climate Change Risk Diagnosis Methods
  - Providing Opportunities for Efficient Formulation and Implementation of Adaptation Measures for Effective Climate Change Adaptation



## Economic Evaluation

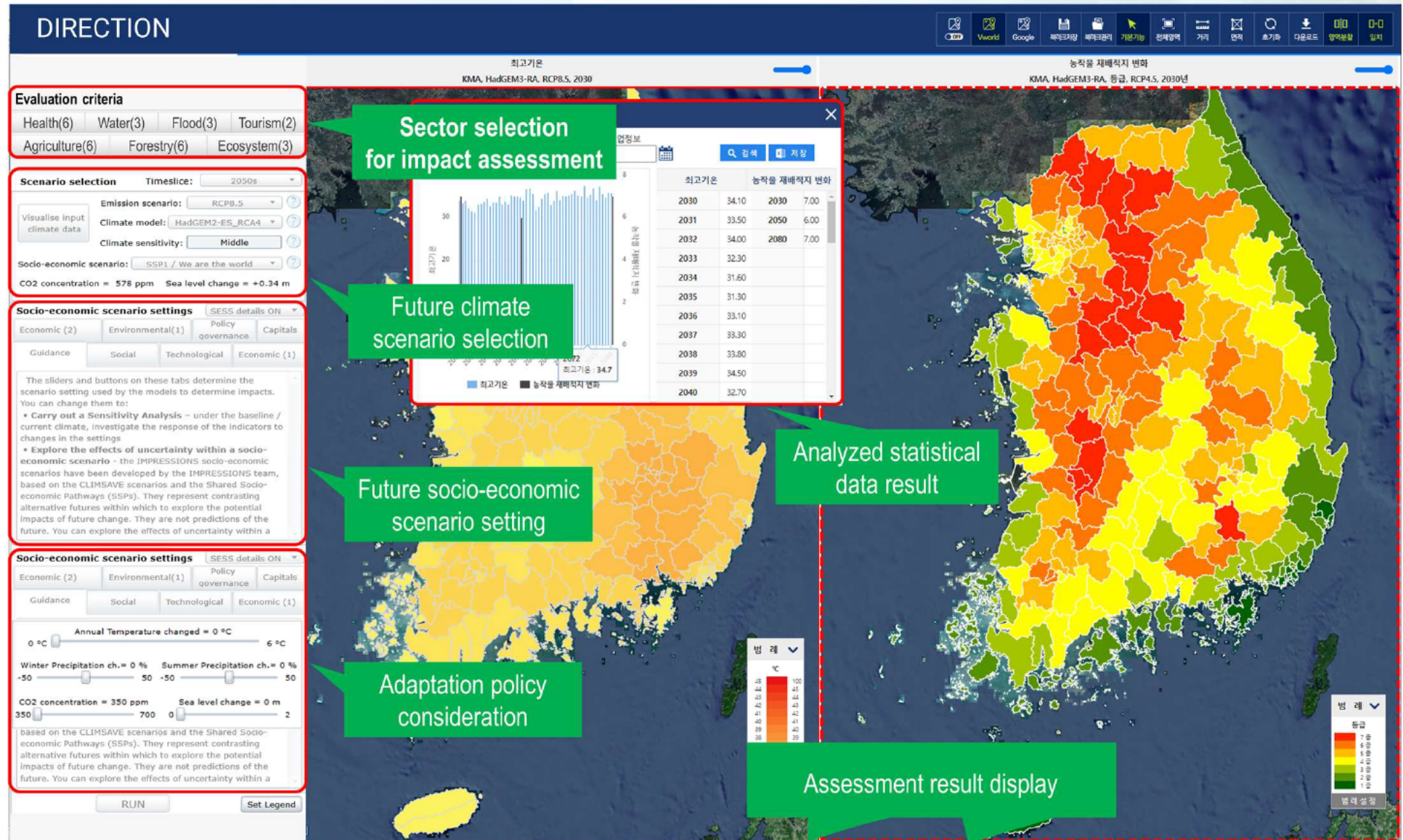
- **Economic Evaluation**
  - Presenting the basis for decision-making by evaluating the economic effectiveness of adaptation measures
  - Enhancing and integrating impact assessment, risk reduction effects of policies, and economic evaluation modules to strengthen the accuracy and reliability of the effectiveness analysis
  - Directly calculating regional characteristics, actual input costs, and reduced damage amounts, providing various policy options



The tourism industry related to winter activities such as skiing and snowboarding is predicted to face challenges due to rising temperatures, leading to increased maintenance costs and a potential decrease in net profit, making operations economically unviable.



# Display Tool – Result Viewing Page





# Outcomes and Effects

Diagram of Outcome

Outcome

(User-Friendly GUI(web&stand-alone) Based System)

Effects

## On Policy

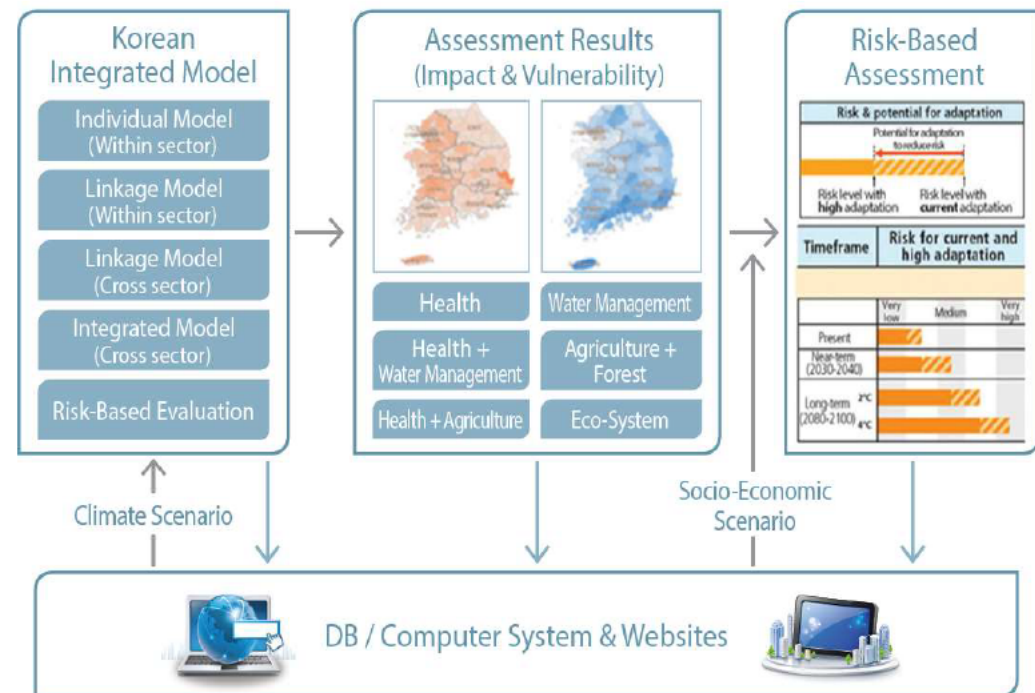
- Establishment of foundation for efficient national climate change adaptation policy
- Minimizing mal-adaptation by prioritizing based on scientific analysis

## On Industry and Economy

- Increasing the number of professional employment through creation of new jobs in climate change adaptation sector

## On Technology

- Establishment of scientific grounds for integrated management technology of CC daptation
- Establishment of national risk management system to cope with climate change





**THANK YOU  
VERY MUCH !**