Development of Climate Change Risk Assessment Tool (CCRAT) for Business Sector

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Research background
I. Research background

1. Needs of business sector

- **Survey on climate risk perception of business sector in Korea (KEI, 2012)**

  - likelihood of climate risk impact on their business

<table>
<thead>
<tr>
<th>&lt; public enterprise &gt;</th>
<th>&lt; private enterprise &gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td>very likely</td>
<td>very likely</td>
</tr>
<tr>
<td>11.1%</td>
<td>11.4%</td>
</tr>
<tr>
<td>somewhat likely</td>
<td>somewhat likely</td>
</tr>
<tr>
<td>55.6%</td>
<td>52.9%</td>
</tr>
<tr>
<td>neutral</td>
<td>neutral</td>
</tr>
<tr>
<td>24.4%</td>
<td>27.1%</td>
</tr>
<tr>
<td>somewhat unlikely</td>
<td>somewhat unlikely</td>
</tr>
<tr>
<td>8.9%</td>
<td>8.6%</td>
</tr>
<tr>
<td>very unlikely</td>
<td>very unlikely</td>
</tr>
<tr>
<td>0.0%</td>
<td>0.0%</td>
</tr>
</tbody>
</table>
1. Needs of business sector

- Survey on climate risk perception of business sector in Korea (KEI, 2012)
  - necessity for mitigating expected damage of climate risk

### < public enterprise >
- very necessary: 31.1%
- somewhat necessary: 44.4%
- neutral: 15.6%
- somewhat unnecessary: 6.7%
- very unnecessary: 0.0%

### < private enterprise >
- very necessary: 37.1%
- somewhat necessary: 50.0%
- neutral: 12.9%
- somewhat unnecessary: 0.0%
- very unnecessary: 0.0%
1. Needs of business sector

- **Survey on climate risk perception of business sector in Korea (KEI, 2012)**
  - readiness through adaptation policy and risk management plan

<table>
<thead>
<tr>
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<th>&lt; private enterprise &gt;</th>
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<tbody>
<tr>
<td>readiness for climate risk</td>
<td>20.0%</td>
<td>11.4%</td>
</tr>
<tr>
<td>making adaptation plan in the near future</td>
<td>22.2%</td>
<td>21.4%</td>
</tr>
<tr>
<td>no adaptation plan or policy in the near future</td>
<td>40.0%</td>
<td>54.3%</td>
</tr>
<tr>
<td>making adaptation plan after specific damage</td>
<td>8.9%</td>
<td>10.0%</td>
</tr>
<tr>
<td>unnecessary in the near future</td>
<td>6.6%</td>
<td>1.4%</td>
</tr>
</tbody>
</table>
I. Research background

2. Gaps between science and business in climate change

- **Why do they not start making adaptation plan now?**
  - inadequate information to business sector: uncertain and difficult
  - no implication to CEO: nonfinancial perspective and cost-centered mechanism
  - unconcern about some phenomenon in the 2100 year

- **Climate change adaptation in business sector**
  - not scientific problem but adequately mainstreaming problem
I. Research background

2. Gaps between science and business in climate change

- Reducing the gap between science and business perspective
  - scientific numbers and climate modeling results \(\rightarrow\) understandable and user-friendly risk explanation
  - difficult and uncertain information \(\rightarrow\) monetary information
  - long-term forecasting \(\rightarrow\) short-term forecasting
  - ambiguous, focusless, and comprehensive adaptation policy \(\rightarrow\) strategic and safety-centered policy

climate change impact and vulnerability assessment

reinterpretation from science to business risk

suggesting monetary information

adaptation policy focusing on short term management
I. Research background

3. Research Purposes

- making the climate risk assessment tool and suggesting adequate information for business sector

  ① making the climate risk assessment tool using semi-quantified risk analysis

  ② providing the guideline for adaptation policy in business sector

  ③ suggesting the information and educating the adaptation plan making process using participatory planning process
I. Research background

4. Research Methods

- **systematic climate risk classification**
  - five abnormal weather event of climate change
  - three possible damage behavioral factor of business sector
    - input factors for production (labor, capital), selling, management

- **semi-quantified risk assessment using probability and checklist**
  - socially observed damage patterns related weather event using text-mining method
  - estimating posterior probability using Bayesian statistical approach
  - making education program using participatory planning method
Development of CCRAT
II. Development of CCRAT

1. Principles of development

- **Principle 1: user friendly**
  - transforming climate change impact to descriptive risk relating business operation and market

- **Principle 2: appropriate information**
  - suggesting the monetary and financial outcome as the climate risk assessment

- **Principle 3: general application**
  - enabling any company to use the risk assessment process
II. Development of CCRAT

2. Structures of CCRAT

- **Systematic classification of climate risk in business sector**
  - five abnormal or extreme weather event: heat wave, cold wave, heavy rain, flood, heavy snow
  - specifying three possible damage behavioral factors to nine factors
    - labor, structure, facility, raw materials, goods and services, logistic, sales, management, and production process

- **Code of climate risk (A-E)**
- **Code of damage in business sector (1-9)**
- **1. labor**
- **2. structure**
- **3. facility**
- **4. raw materials**
- **5. goods and services**
- **6. logistic**
- **7. sales**
- **8. management**
- **9. production process**
II. Development of CCRAT

2. Structures of CCRAT

- **Checklist for climate risk assessment**
  - eight items for readiness about selected climate risk
  - transforming outcome of checklist to numeric form

- **Semi-quantified risk assessment**
  - outcome of subjective assessment from checklist → constructing the base of estimating conditional posterior probability
  - prior probability distribution → frequency of socially observed damage
  - climate risk probability → regional climate projection database by Korea Meteorological Administration (2012)
II. Development of CCRAT

2. Structures of CCRAT

- **DB for calculating possible future damage**
  - a statement of profit and loss
  - financial statements
  - inputting six financial factors: tangible assets (structure, facility), sales, inventory asset, sales cost, selling and administrative expense

- **Four Korea economic growth scenarios**
  - high growth (2% growth a year)
  - average growth (1% growth a year)
  - low growth (-0.5% growth a year)
  - no change (base scenario)
II. Development of CCRAT

3. Functions of CCRAT

- **Climate risk assessment**
  - Risk selection and inputting the outcome of checklist
II. Development of CCRAT

3. Functions of CCRAT

- Climate risk assessment
  - estimating the future damage as financial factor and RCP scenario (4.5/8.5)
II. Development of CCRAT

3. Functions of CCRAT

- Climate risk assessment
  - showing the risk matrix and risk factor for risk management priority
4. Adaptation plan guideline for business sector

- **Plan guideline for climate risk management and adaptation**
  - suggesting the guidelines to manage climate risk shortly
  - the methods to make management plan for climate adaptation
  - examples and form of plan
  - purposes, risk assessment, adaptation strategy, and implementation policy
II. Development of CCRAT

5. Five steps of risk assessment and developed tools

- **Step 1: risk screening** → climate risk card

  - Step 1: Risk screening
  - Step 2: Risk selection
  - Step 3: Risk assessment
  - Step 4: Damage estimation as risk assessment
  - Step 5: Making risk management policy
II. Development of CCRAT

5. Five steps of risk assessment and developed tools

- **Step 2**: risk selection → climate risk list sheet

- **Step 1**: Risk screening
- **Step 2**: Risk selection
- **Step 3**: Risk assessment
- **Step 4**: Damage estimation as risk assessment
- **Step 5**: Making risk management policy
II. Development of CCRAT

5. Five steps of risk assessment and developed tools

- **Step 3**: risk assessment → checklist and CCRAT

- **Step 1**: Risk screening
- **Step 2**: Risk selection
- **Step 3**: Risk assessment
- **Step 4**: Damage estimation as risk assessment
- **Step 5**: Making risk management policy
II. Development of CCRAT

5. Five steps of risk assessment and developed tools

- **Step 4**: estimation $\rightarrow$ CCRAT

- **Step 1**: Risk screening
- **Step 2**: Risk selection
- **Step 3**: Risk assessment
- **Step 4**: Damage estimation as risk assessment
- **Step 5**: Making risk management policy
II. Development of CCRAT

5. Five steps of risk assessment and developed tools

- **Step 5**: making management policy \(\rightarrow\) adaptation plan guideline

<table>
<thead>
<tr>
<th>Step 1</th>
<th>Risk screening</th>
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<tbody>
<tr>
<td>Step 2</td>
<td>Risk selection</td>
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<tr>
<td>Step 3</td>
<td>Risk assessment</td>
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<td>Damage estimation as risk assessment</td>
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<td>Step 5</td>
<td>Making risk management policy</td>
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2nd Training program for business sector
Ⅲ. Training program for business sector

1. Information for climate change adaptation

- **How to provide the information about climate change adaptation**
  - understanding what they want to know
  - focusing the target to mainstream the adaptation
  - providing the information to apply various purposes
  - educating the methods to make the plan and implementation for oneself
Ⅲ. Training program for business sector

2. Risk management training program for climate change adaptation

- 2\textsuperscript{nd} Risk management training program for climate change adaptation
  - integrating lecture and practice (20min lecture + 30min practice)
  - suggesting the tools for practice (risk card / notebook / CCRAT / risk selection sheet)
  - total 17.5 hours intensive training (6/25 ~ 6/27)
3. Results of risk management training program

- Participation of 14 company
  - private company: Kyung Dong Construction, Daegu Tech, Korail, CJ Construction, AREX, Donga-otsuka
  - public company: Incheon International Airport Corporation, Korean National Park Services, Korea Gas, SUDOKWON Landfill site management corporation, Mine Reclamation corporation, KOSEP, KOSPO, Korea expressway corporation, Korea district heating corporation
3. Results of risk management training program

- Participation of 14 company
Implication
IV. Implication

- Governance for business sector

- Change of awareness
  - Middle manager of company
  - Government official
  - Researcher

- Corporate sustainability management
  - GRI 4 guidelines for adaptation
  - sustainable management for climate change
Thank you