

An Analysis of the Distribution of Areas and People Vulnerable to Climate Change in Korea

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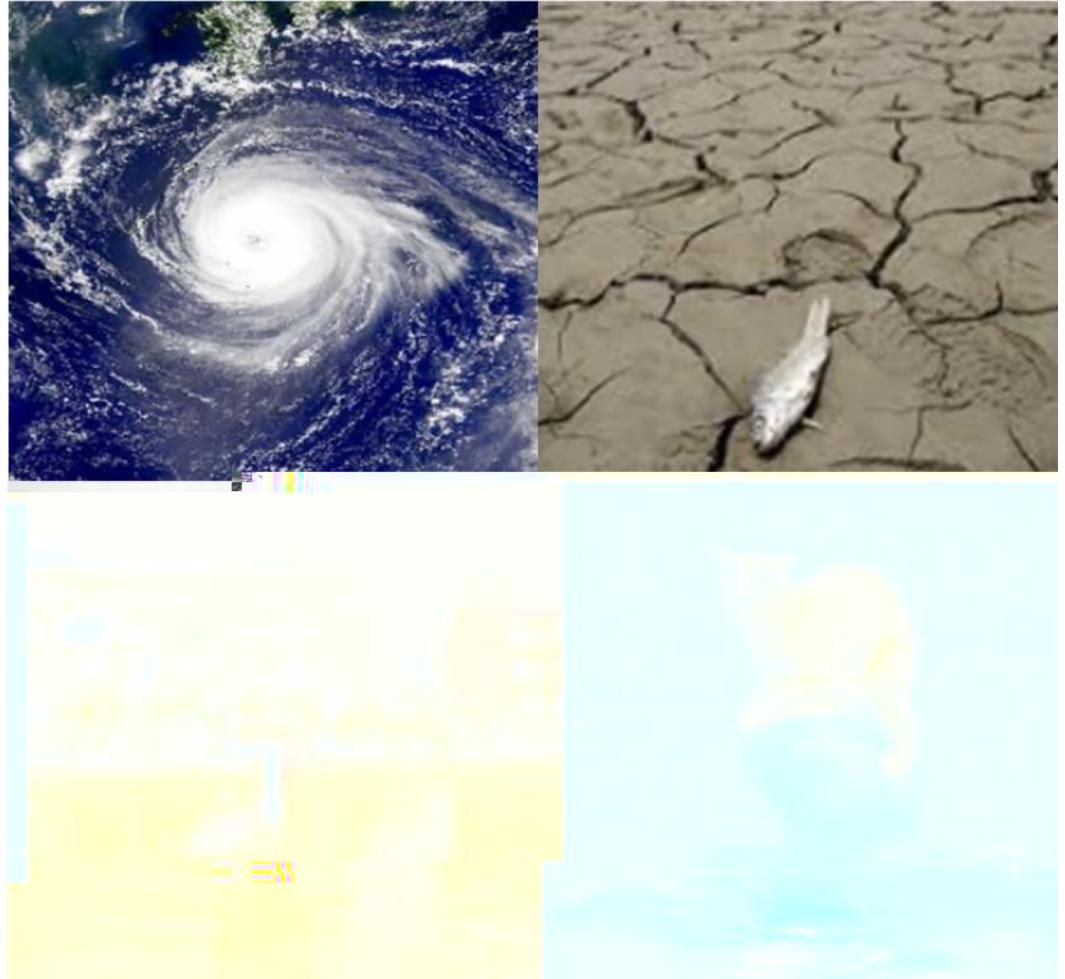
Outline

- Introduction
- Areas Vulnerable to Climate Change
- People Vulnerable to Climate Change
- People and Areas Vulnerable to Climate Change
- Summary & Discussion
- Concluding Remarks

Introduction

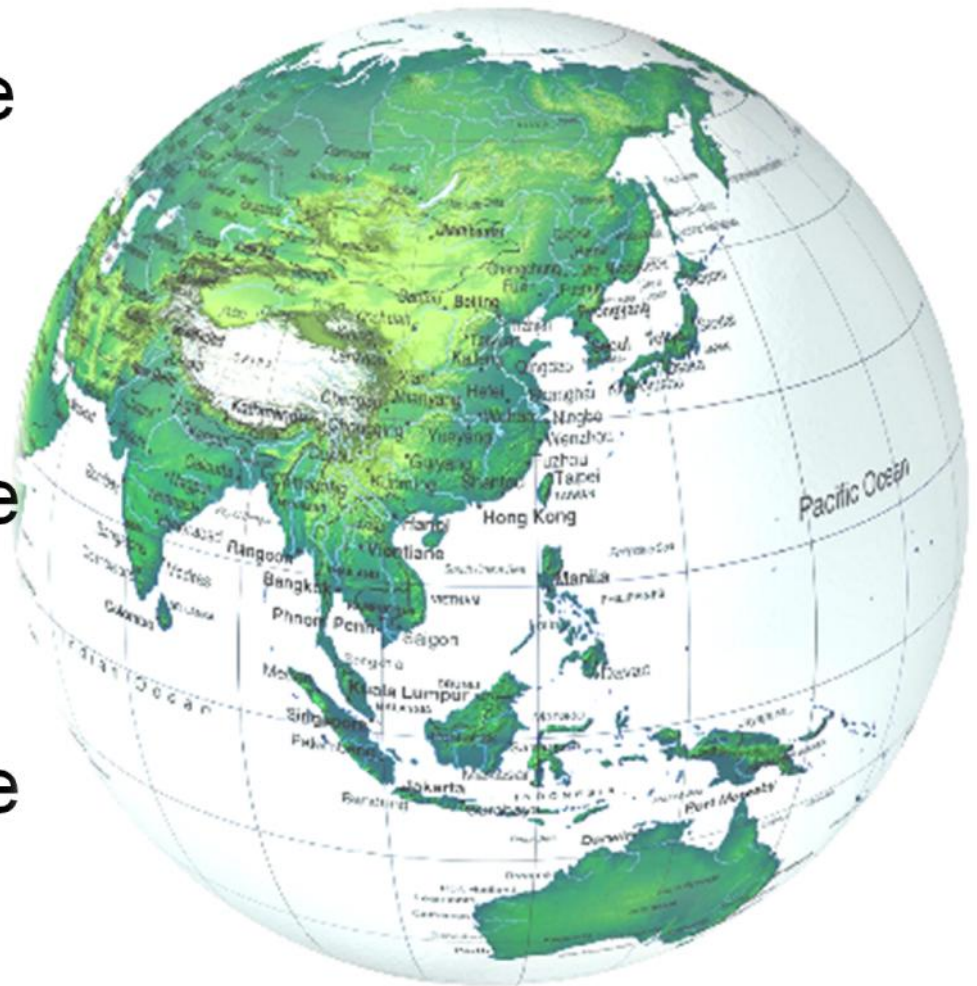
Impacts of Climate Change

- Slow onset events
 - Sea level rise
 - Ocean acidification
 - Mean temperature rise
- Extreme events
 - Heat waves
 - Droughts
 - Wild fires
 - Floods
 - Cyclones
 - Cold waves
 - Heavy snows
 - etc.



Impacts of Climate Change

- All areas and people are exposed to climate change.
- Some areas and groups of people are more exposed than others and more vulnerable to climate change.

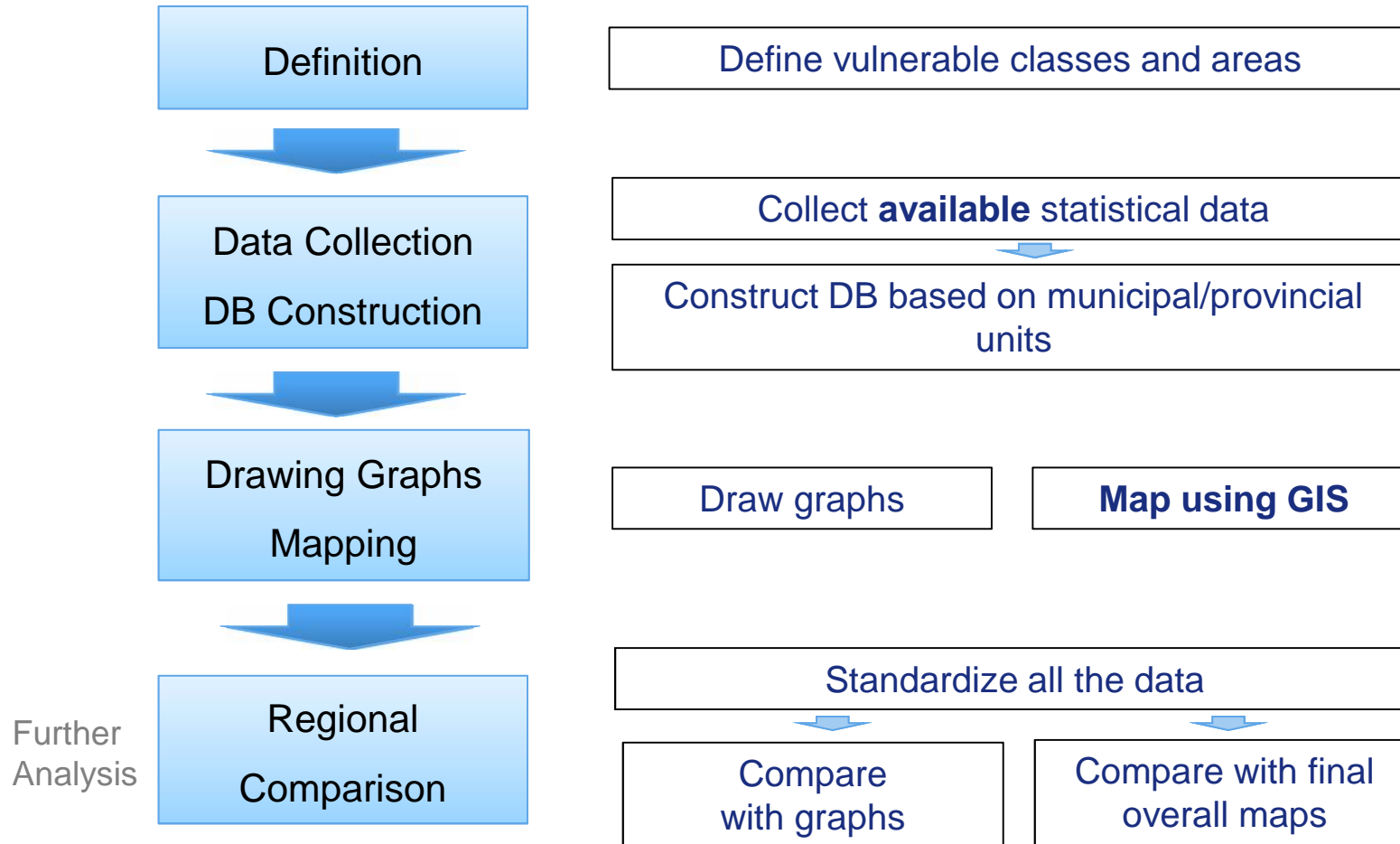


Damages from Climate Change Impacts

- Chicago heat wave in 1995
- European heat wave in 2003
- Hurricane Katrina in 2005
- European cold wave in 2012
- etc



The Flow Chart of Analysis



Areas Vulnerable to Climate Change

Definition of Vulnerable Areas

- What areas are vulnerable to climate change?
 - More exposed to climate related events than others
 - Easily damaged by climate related events
 - Lacking adaptive infrastructures



Categories for Identifying Vulnerable Areas

Natural disaster proneness

- Frequency and intensity of natural disasters increased.
- Land slide risk increased due to heavy rain and slopes of the country.

Costal Areas

- Coastal areas are exposed to the sea level rise and are under the potential of salt water intrusion

Areas with climate change related vector-borne diseases

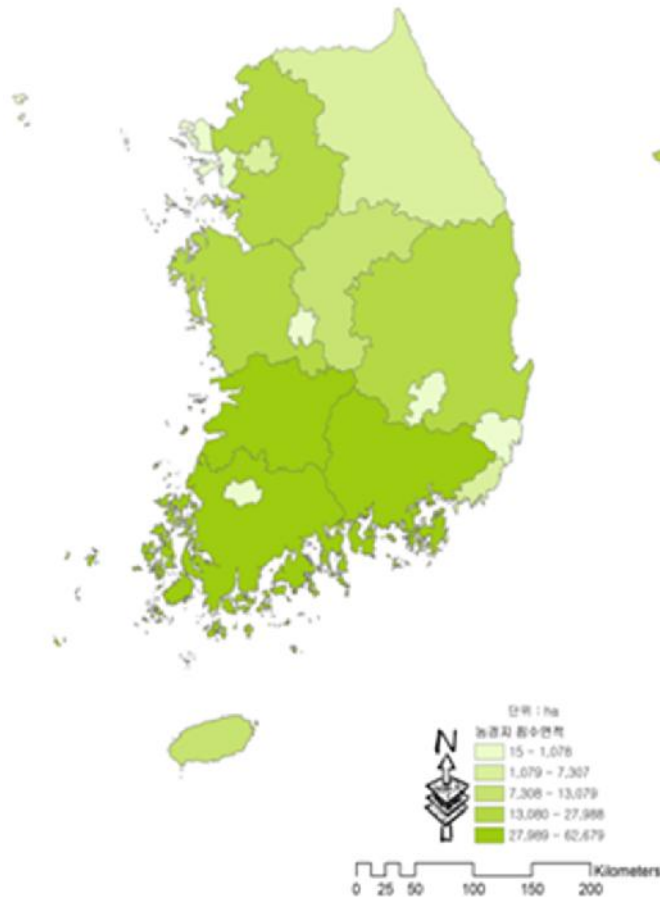
- Vector-borne diseases are spread according to changes in climate.
- Habitats and reproduction of mosquitoes are expanded.
 - The Demilitarized Zone (DMZ) between South and North Koreas witnessed increased occurrences of malaria lately.

Categories for Identifying Vulnerable Areas

Categories	Subcategories
Natural Disaster Prone Areas	People afflicted by natural disasters
	Death toll from natural disasters
	Property damage cost
	Flooded urban areas
	Flooded agricultural area
Forest Related Disasters	Wild fires
	Deforestation
	Landslide proneness
Coastal Zone	Sea level rise
Vector-borne Diseases	Tsutsugamushi
	Malaria
	Dengue fever
	Japanese encephalitis

Distribution of Vulnerable Areas

Disasters



Total Flooded Agricultural Areas
(by Province)



Total Areas Afflicted by Wild Fires
(by Province)

Distribution of Vulnerable Areas

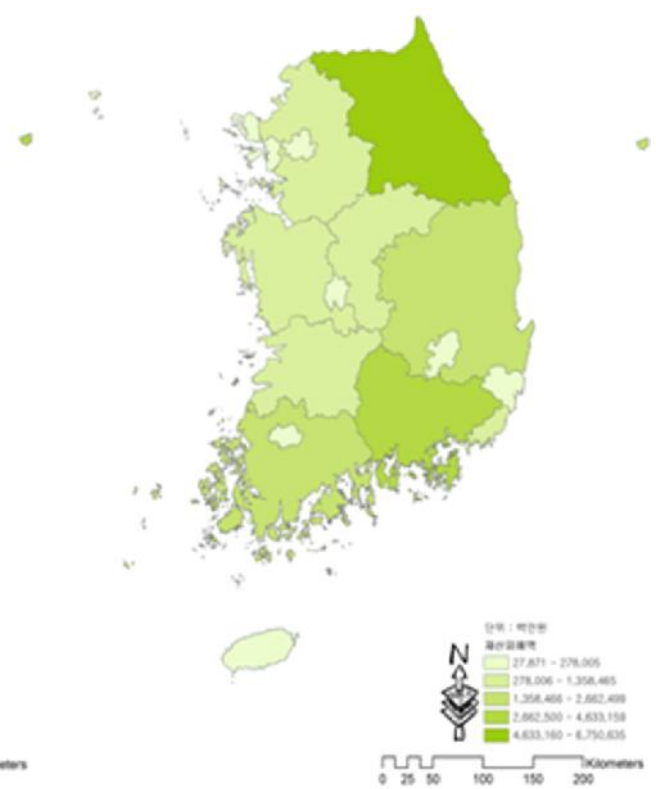
Disasters



Disaster Afflicted People



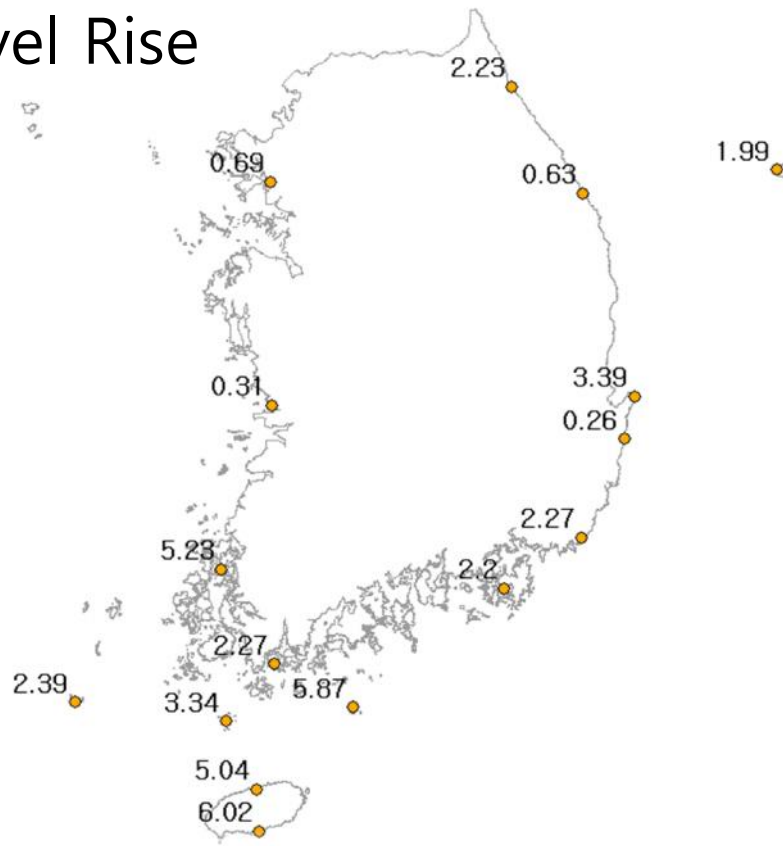
The Death Toll



Property Damage

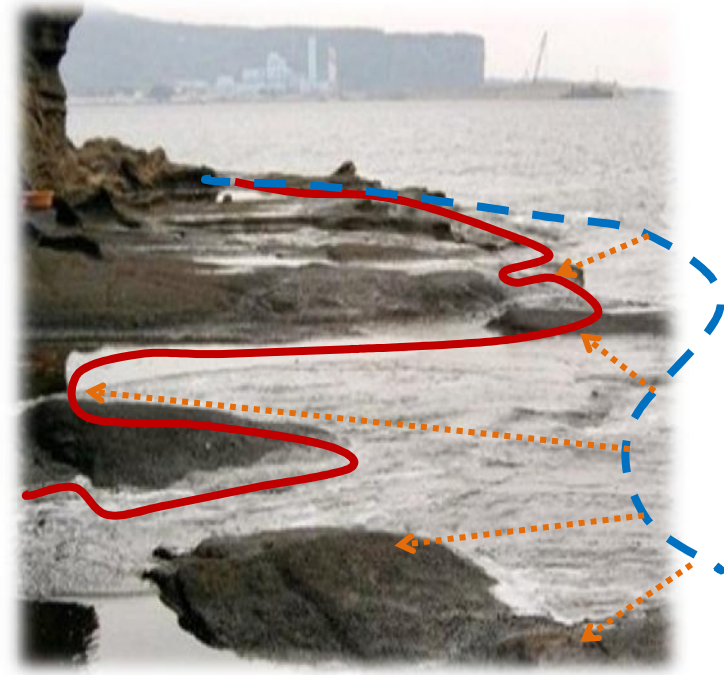
Distribution of Vulnerable Areas

Sea Level Rise



Sea Level Rise around the Korean Peninsula (mm/yr)

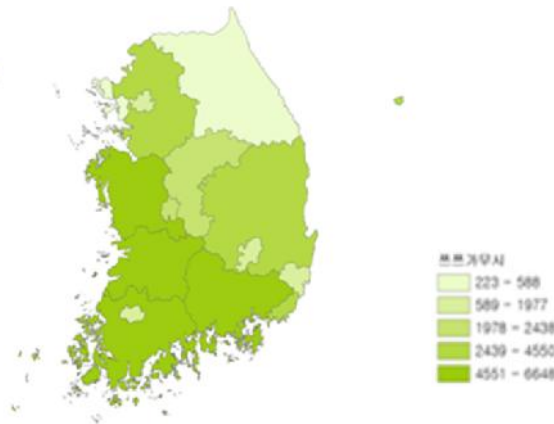
Observed periods differ across spots.



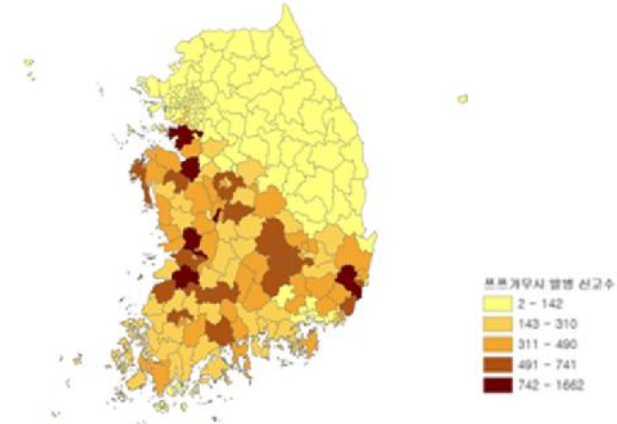
Sea Level Rise at Yong-Mu-Ri, Jeju: By 22cm over Past 43 Years

Distribution of Vulnerable Areas

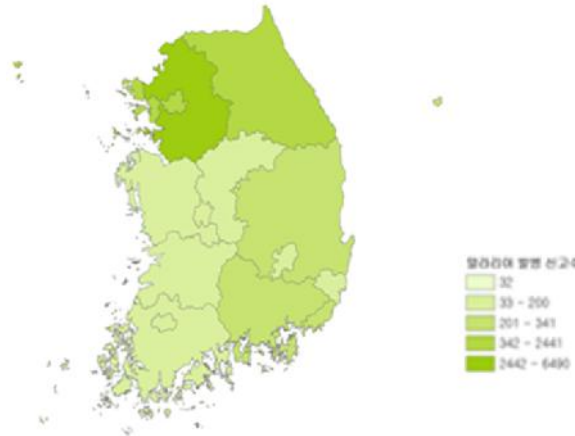
Vector-borne Diseases



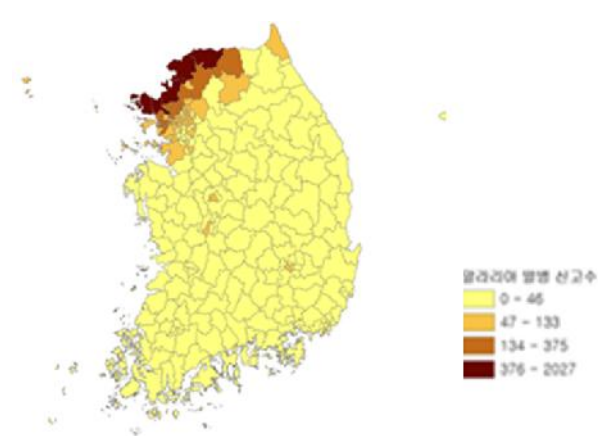
Reports on Tsutsugamushi (Scrub Typhus)
(by Province)



Reports on Tsutsugamushi (Scrub Typhus)
(by County)



Reports on Malaria (by Province)



Reports on Malaria (by County)

People Vulnerable to Climate Change

Definition of Vulnerable People

- What groups of people are vulnerable to climate change?
 - Exposed to climate change
 - Sensitive to climate change
 - Lacking adaptation capacity
- More specifically?
 - Old or very young
 - Economically difficult
 - Information deficient
 - Residing in climate disaster-prone areas, etc.

Categories for Identifying Vulnerable People

Age

- Old people have less immune capacity to cope with extreme weathers
- Infants and young children do not have enough accessibility and applicability to climate change related information.

Energy

- Energy demand increases due to heat waves in summer and cold waves in winter.
- Many low income groups have low energy efficiency and the burden of energy cost is very high.

Residency

- People living in fragile housing are more exposed to climate change and their damage can be very severe.

Social Status

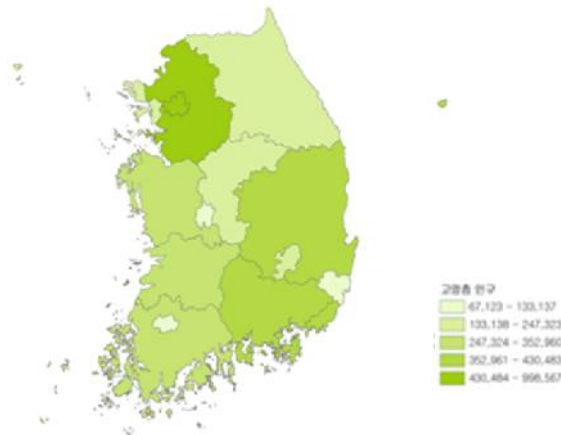
- Generally socially isolated groups lack financial capacity and adaptive capacity

Categories for Identifying Vulnerable People

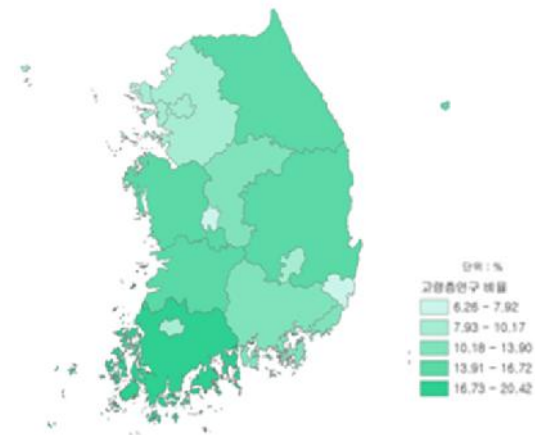
Categories	Subcategories
Age	Old people
	Infants & children
Energy	People Subsidized by the Government for Improving Energy Efficiency
	People Subsidized by the Government for Heating
Job	People Working in Agriculture
Residency	People Living in Shanties and Vinyl Shacks
Social Isolation	Health: Handicapped People
	Income: People Receiving Minimum Living Expenses from the Government
	House: Homeless People
	Family Style: Old People Living Alone

Distribution of Vulnerable People

Age



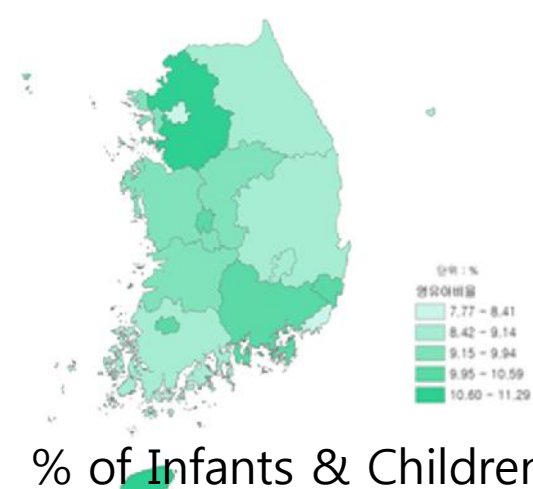
Old People



% of Old People



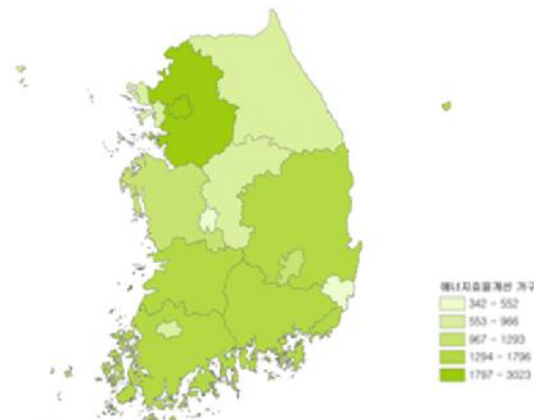
Infants & children



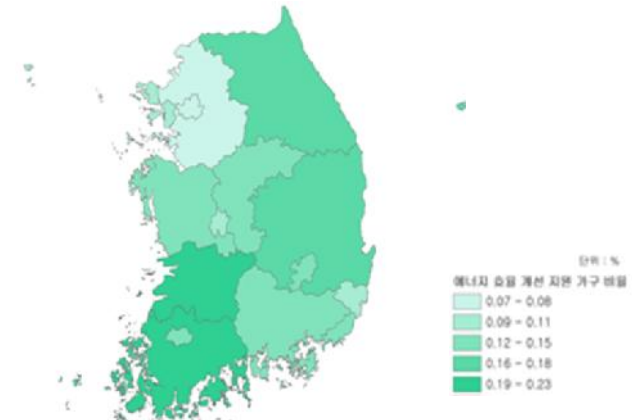
% of Infants & Children

Distribution of Vulnerable People

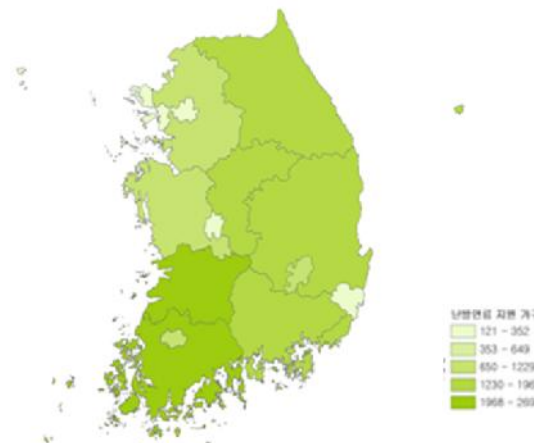
Energy



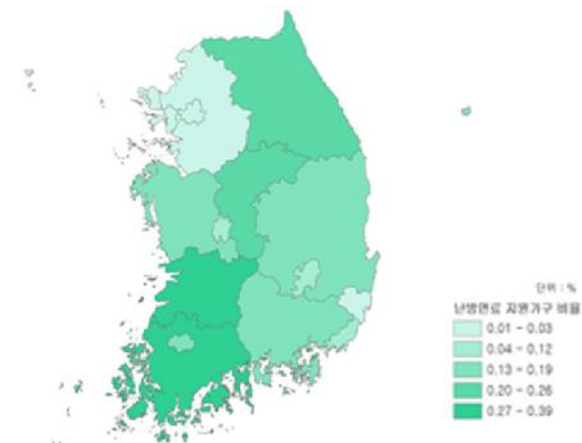
Households Subsidized by the Government for Improving Energy Efficiency



% of Households Subsidized by the Government for Energy Efficiency



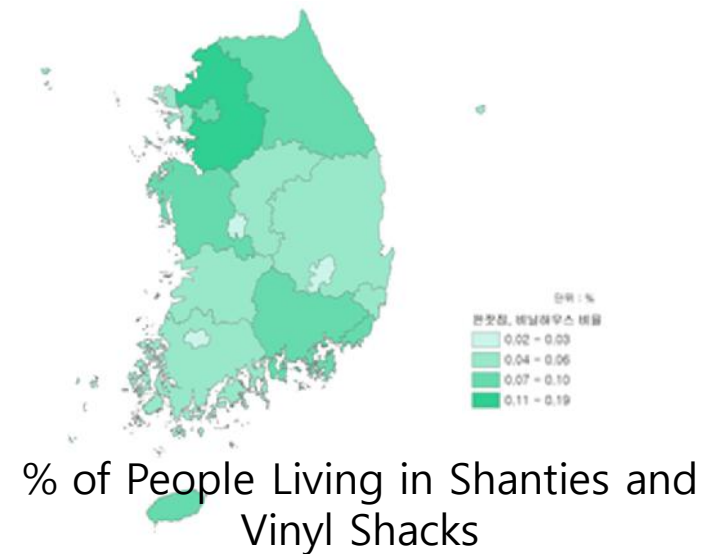
Households Subsidized by the Government for Heating



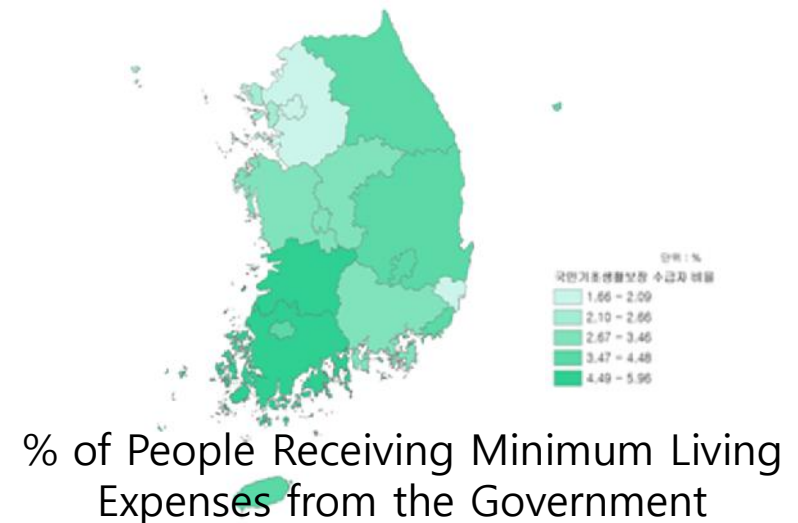
% of Households Subsidized by the Government for Heating

Distribution of Vulnerable People

Residency

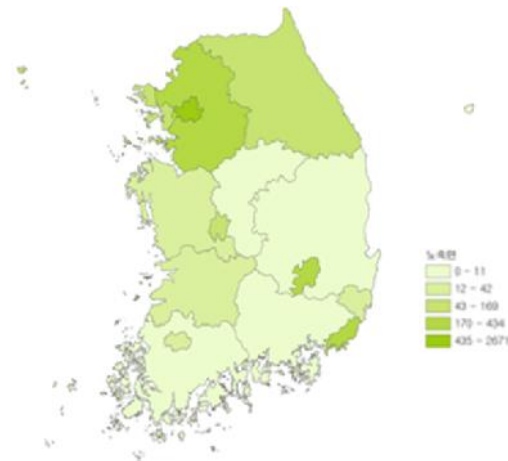


Isolation (Low Income)

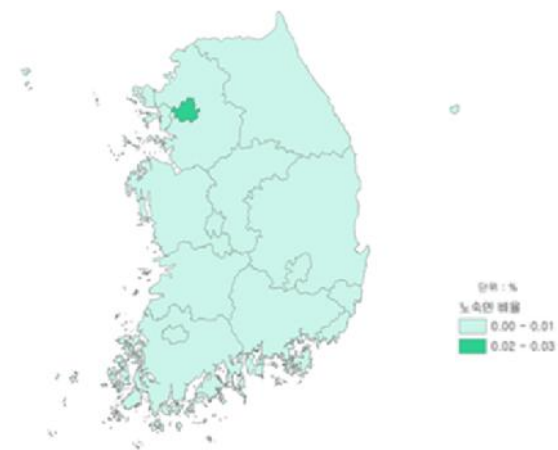


Distribution of Vulnerable People

Social
Isolation
(Homeless
People)

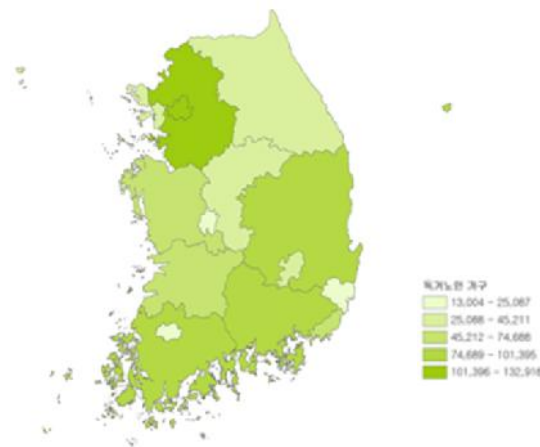


Homeless People

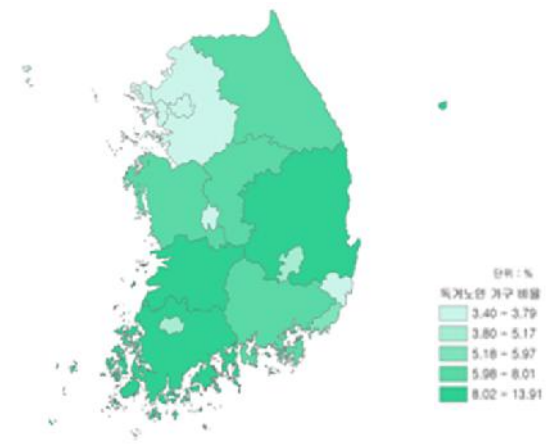


% of Homeless People

Social
Isolation
(Family Style)



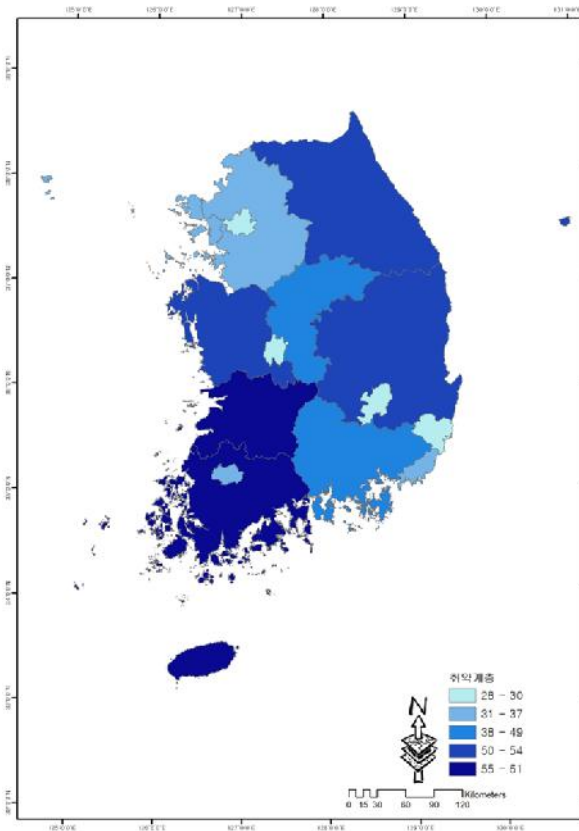
Old People Living Alone



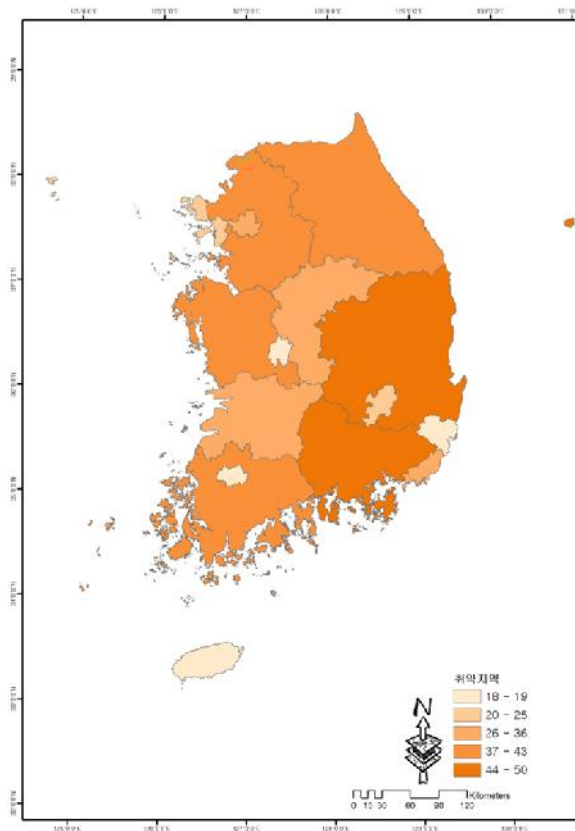
% of Old People Living Alone

People and Areas Vulnerable to Climate Change

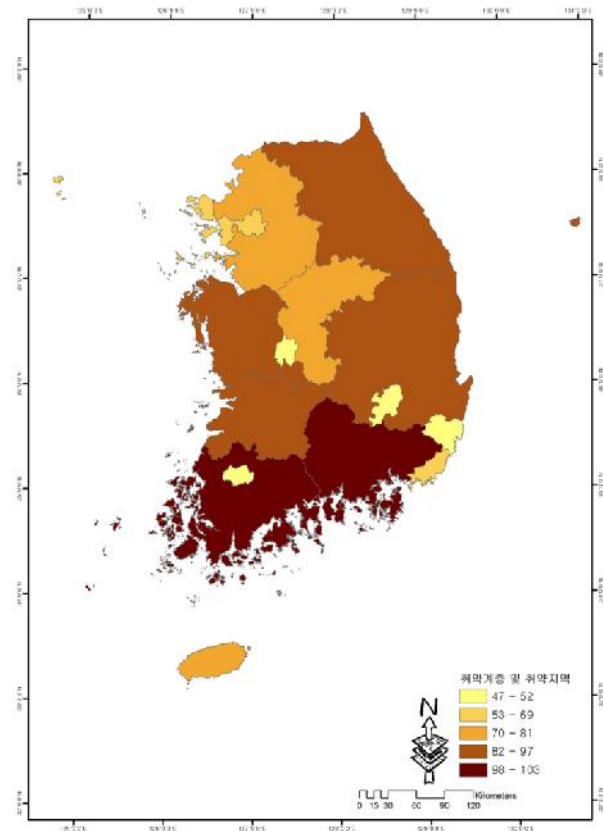
Maps of Vulnerable Areas and People



Map of **People** Vulnerable to Climate Change



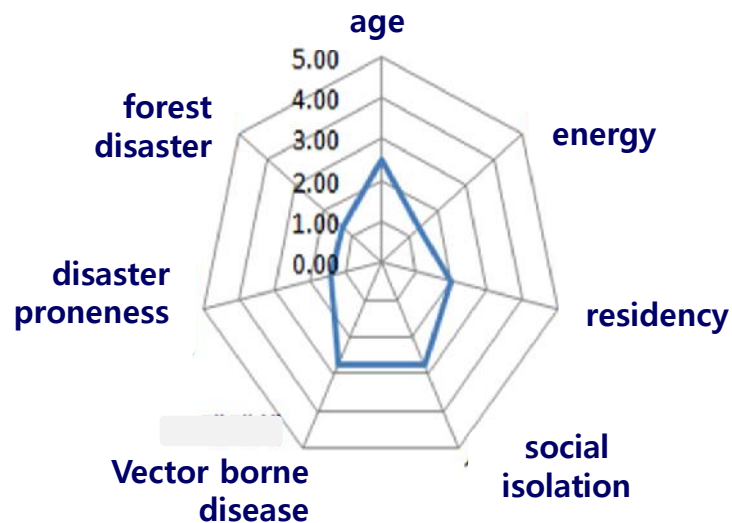
Map of **Areas** Vulnerable to Climate Change



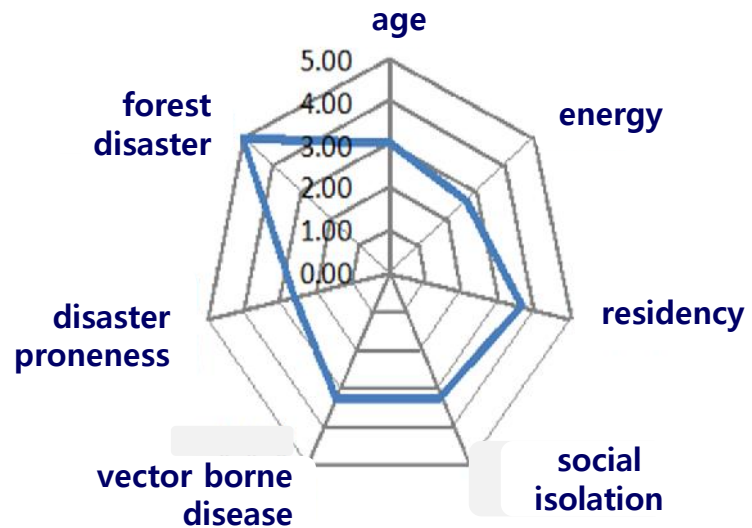
Map of **Areas and People** Vulnerable to Climate Change

People and Areas Vulnerable to Climate Change

Spider Web Chart



Incheon



Kyungbuk

- An overall picture is important to figure out the priority of adaptation sector in a certain region

Summary & Discussion

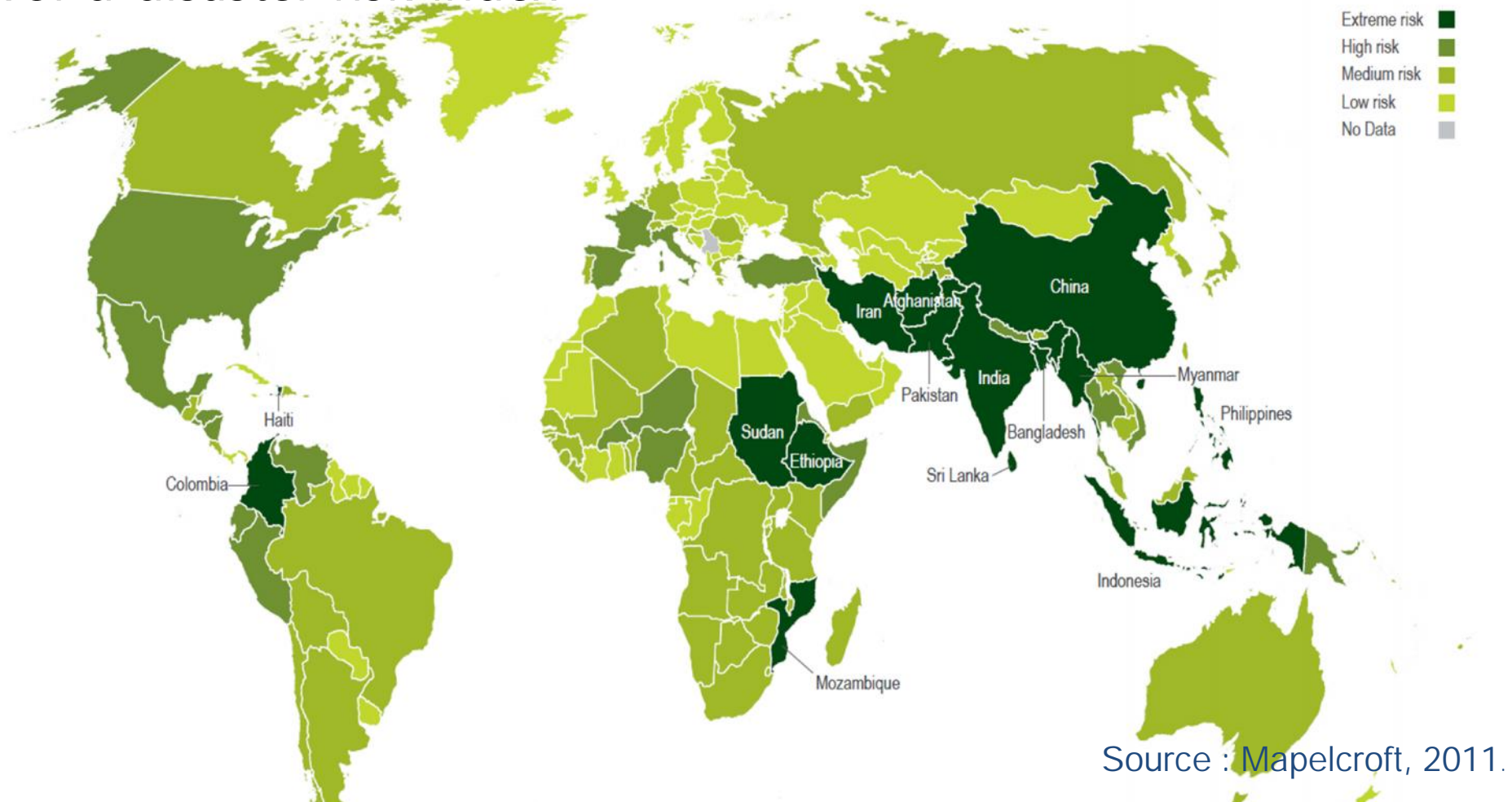
- The results are from a preliminary analysis; further investigation should be conducted in more detailed scales.
 - Systematically collected data are needed.
- Certain areas have more vulnerable people in certain categories.
 - Adaptation measures can be developed based on this kind of analysis.
- Sharing the analysis results with stakeholders and decision makers is important.
 - Identify adaptation measures
 - Design monitoring systems to cover an adequate time period
- Identifying vulnerable areas and people should be the first step in coping with climate change.

Summary & Discussion: Key Challenges

- How to define groups and areas vulnerable to climate change
- How to determine the exposure, sensitivity, adaptive capacities of vulnerable groups and areas
- How to obtain related information in appropriate spatial and temporal scales
- How to monitor those continuously
- What institutions and policies, at which scales, to address vulnerable people and areas in adaptation process
- How to expand this kind approach to global scale

World Disaster Risk Distribution

World disaster risk index



Source : Mapelcroft, 2011.

Concluding Remarks

- Climate change adaptation is very complicated and it is still in its early stages.

Social and geographical aspects should be analyzed and addressed in an integrated manner when developing adaptation plans and strategies

- International efforts should be made in a global scale to minimize the adverse effects of climate change on vulnerable people and areas.

Thanks!

When coping with climate change, vulnerable people
and areas should be considered first.