부문별 기후변화 리스크 평가 및 적응

2022. 02. 22.

홍제우 부연구위원
한국환경연구원　국가기후변화적응센터

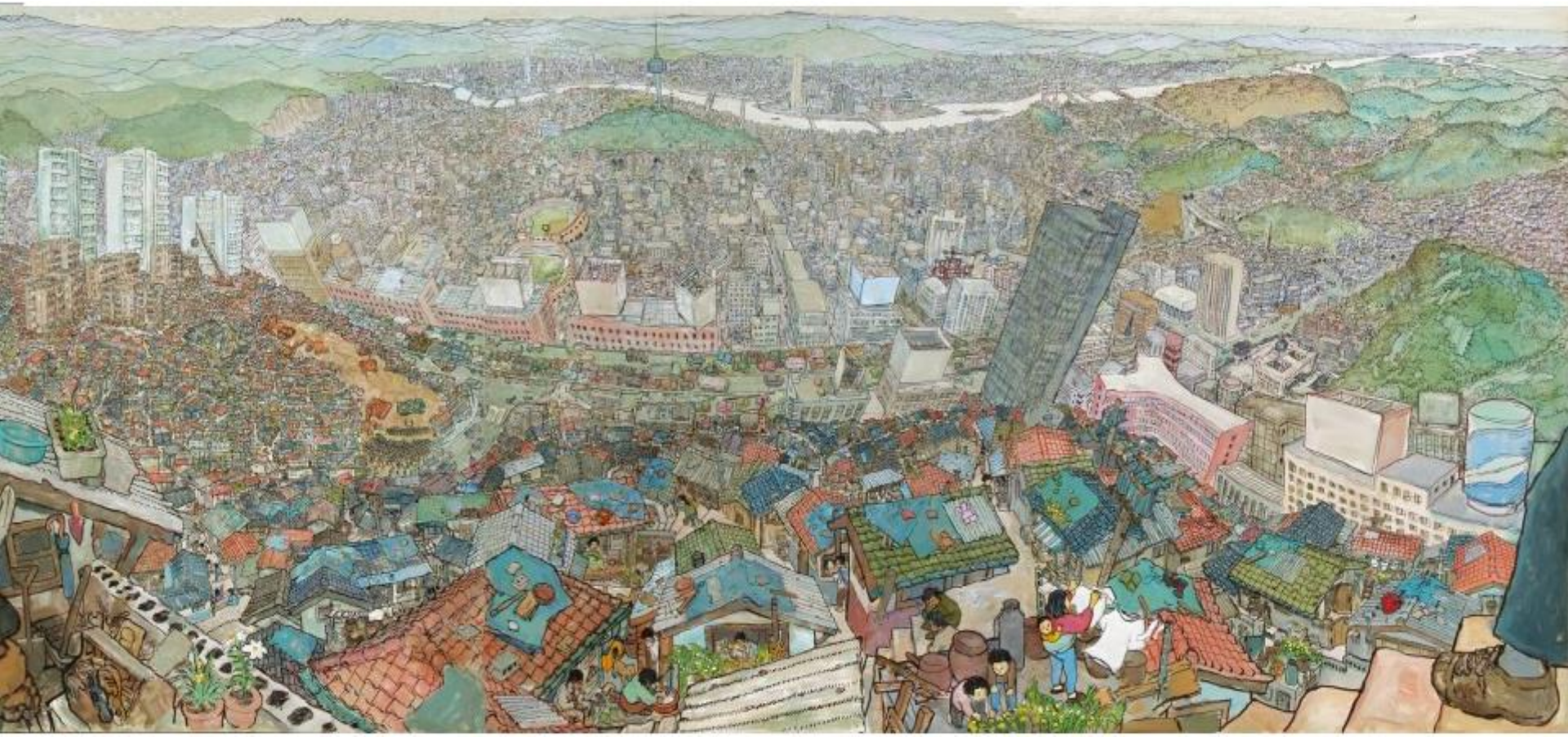
KEI
Korea Environment Institute

KACCC
Korea Adaptation Center for Climate Change

(CV) Hong Je-Woo

- 부연구위원, 한국환경연구원(KEI) 국가기후변화적응센터('20.1.~)
  - 국가 기후변화 적응대책 이행 지원 (2022)
    - 탄소중립·녹색성장 기후위기대응 기본계획
    - 제3차 국가 기후변화 적응대책 세부시행계획수립 & 이행점검
    - 중점관리지역(hotspot) 선정 및 모니터링
    - IPCC WGII 발간 대응
  - IPCC WGII 국내대응 주관기관 담당
  - MOTIVE(영향예측) & VESTAP(취약성평가), 한국기후변화평가보고서2020 (2020)
  - 한국일보 수요컬럼(기후변화 설명서, '21.02.~'22.02.), 과학소년('22.01.~)

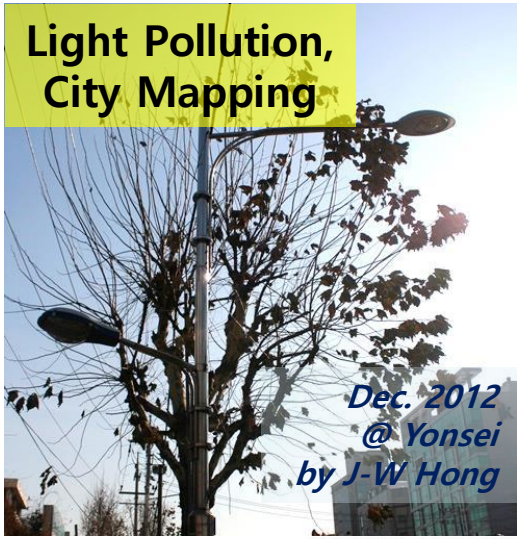
- 이학박사, 연세대학교 대기과학과('14.3.~'19.2.)
  - 우수학위논문상, 한국기상학회('19.10.)
  - 글로벌박사양성과정, 한국연구재단('15.3.~'18.2.)
- 공학석사, 서울대학교 생태조경·지역시스템공학부('11.3.~'14.2.)
- 공군학사장교, 교육특기, 강릉18전투비행단('07.3.~'10.6.)
- 이학사, 연세대학교 대기과학과('03.3.~'07.2.)
  - 기상기사('06.)



“우리 사는 땅” 1993, 최호철 작가

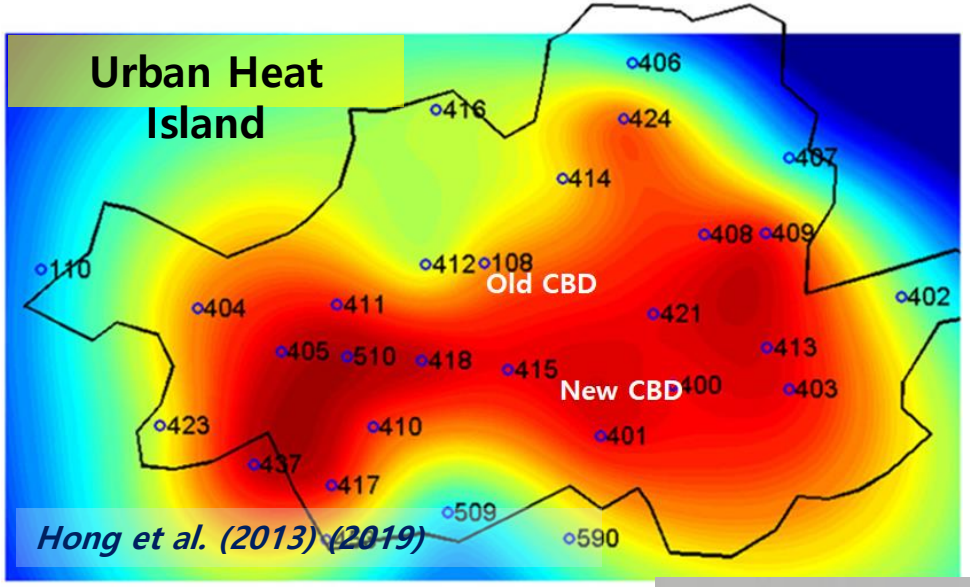
Research Topics

Light Pollution, City Mapping



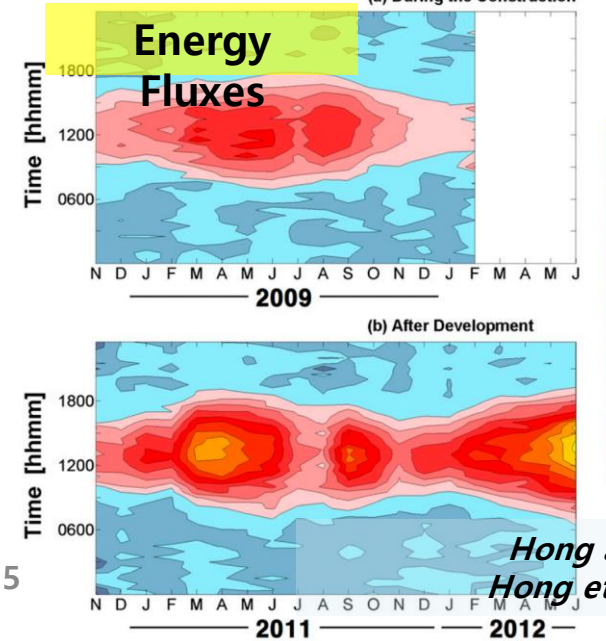
Dec. 2012 @ Yonsei by J-W Hong

Urban Heat Island

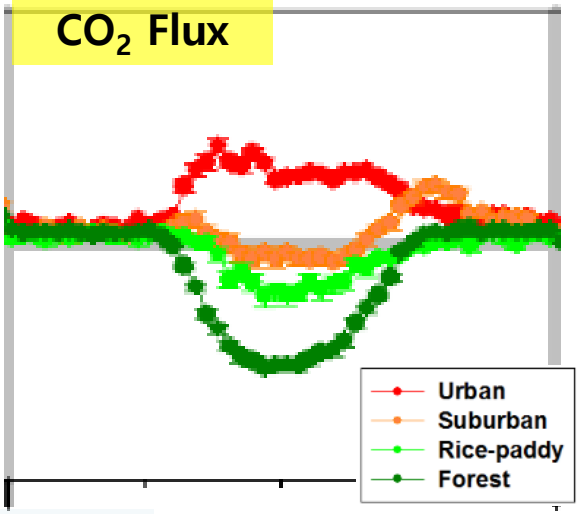


Hong et al. (2013) (2019)

Energy Fluxes



CO_2 Flux



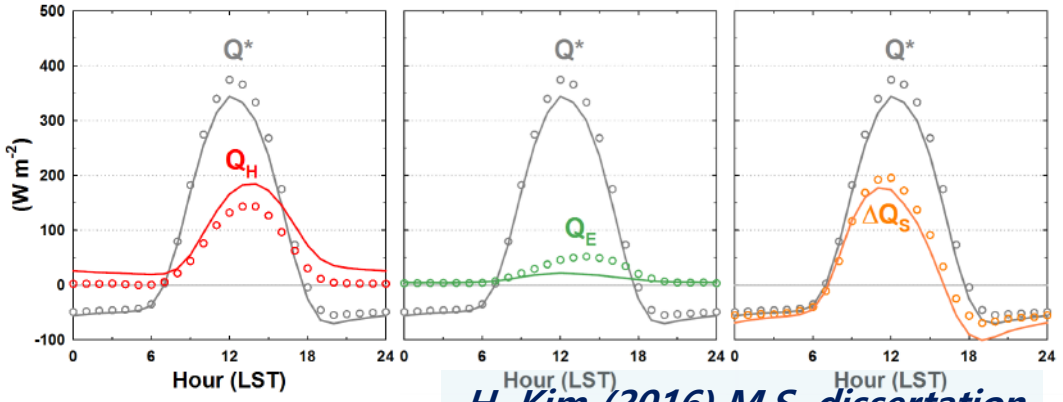
Hong and Hong (2016)
Hong et al. (2019)(2020)

Air-Quality

Lee et al. (2019)
Tang et al. (2018)

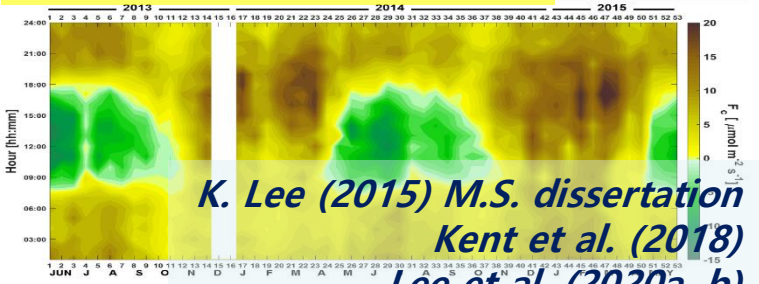
Research Topics : *Collaborations*

Land Surface Model (JULES)



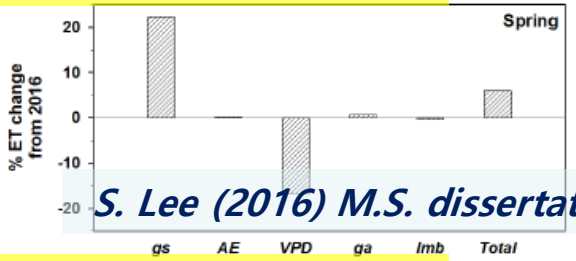
H. Kim (2016) M.S. dissertation
Kim et al. (2019)

Seoul Forest Park



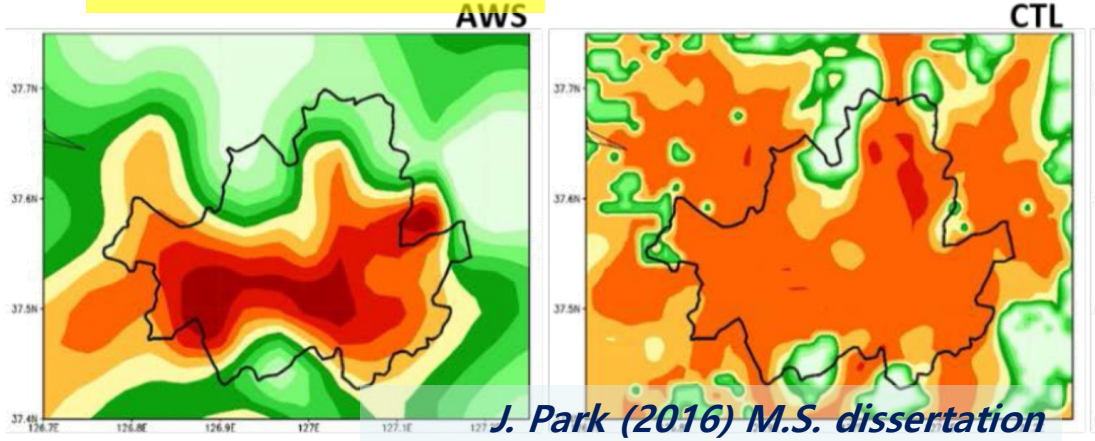
K. Lee (2015) M.S. dissertation
Kent et al. (2018)
Lee et al. (2020a, b)

ET analysis (Jeju forest)



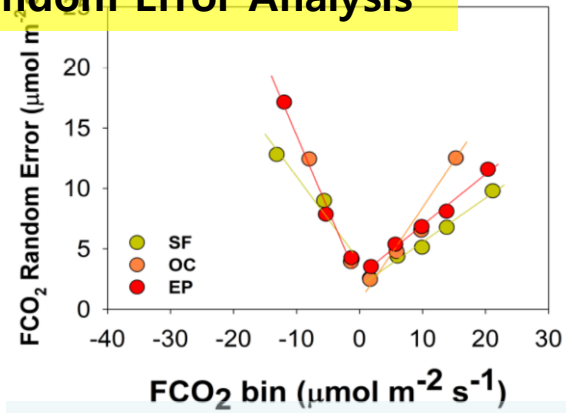
S. Lee (2016) M.S. dissertation

(Polar) WRF Model

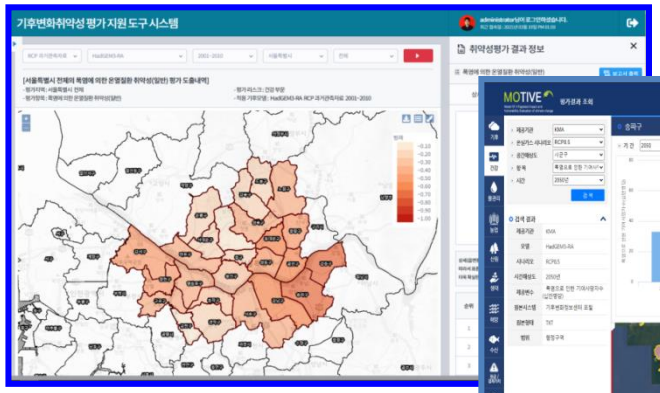


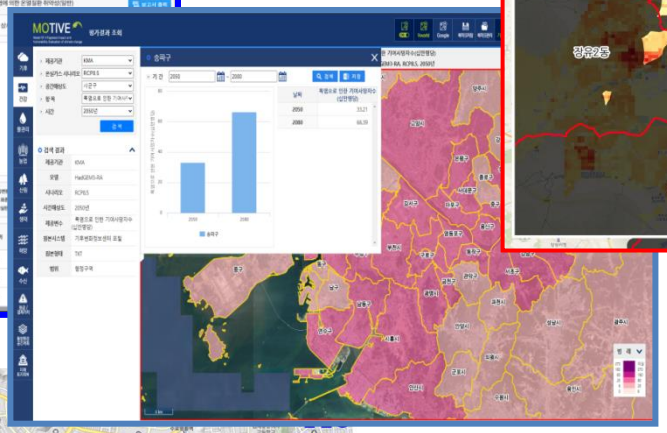
J. Park (2016) M.S. dissertation
U.-Y. Byun (2017) Ph.D. dissertation
Kim et al. (2020)

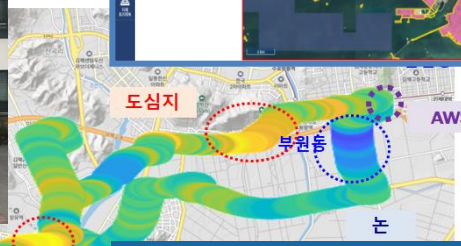
Random Error Analysis

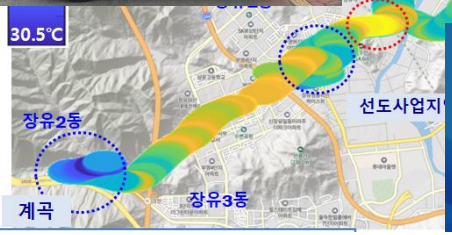


S.-D. Lee (2017) M.S. dissertation





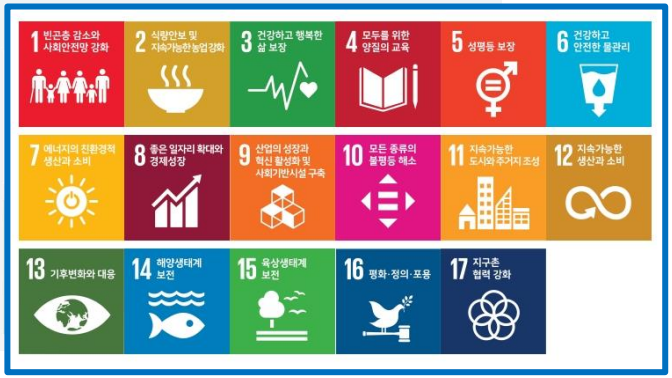




한국일보 칼럼니스트

2021.09.07
경제위기가 오면 도시열섬이 약해진다?
홍제우 한국환경연구원 부연구위원

2021.09.06
대선이 끝나도 네거티브의 얼룩은 남는다
이상돈 중앙대 명예교수·전 국회의원



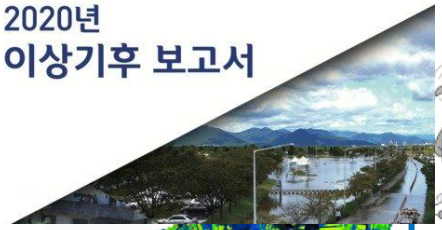
메가트렌드 대응
『국토정보 TF』 회의 안

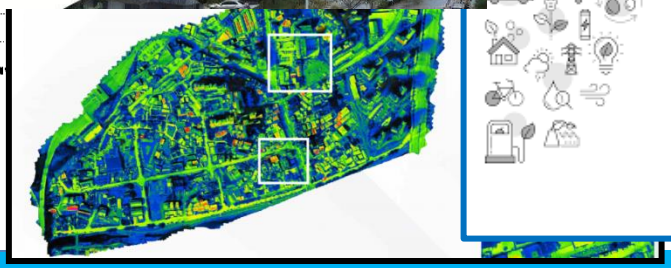
2021. 9. 3.

Ⅰ. 메가트렌드 대응 국토정보 TF 추진계획
Ⅱ. 메가트렌드 대응 국토교통 정책 혁신 추진방향
Ⅲ. 메가트렌드에 따른 공간정보의 미래 변화상

국 토 교 통 부
국토정보정책관

2020년
이상기후 보고서





제3차
국가 기후변화
적응대책
| 2021 - 2025 |

IPCC 6차 보고서 심포지엄
정책결정자를 위한 기후과학
전망과 위기 대응 방안
2021년 8월 31일(화) 13:00~18:00
전경련회관 컨퍼런스센터 에메랄드홀 (유튜브 YouTube 생중계 진행)

오피니언 포커스 취재 지면보기 The Korea Times

한국일보

오피니언 | 칼럼

- ('21.2)기후변화 적응
- ('21.3) 2050탄소중립
- ('21.4) 기후변화 대응법
- ('21.5) 탄소중립
- ('21.6) 기후변화 회의론 – 가짜뉴스
- ('21.7) 폭염
- ('21.8) 탄소중립 생활실천서
- ('21.9) 도시 열섬
- ('21.10) IPCC AR6 WG1
- ('21.11) 기후변화 대응은 손해가 아니다
- ('21.12) 탄소중립 1주년
- ('22.1) 메탄
- ('22.2) 기후변화 불확실성

기후변화 설명서

홍제우 한국환경연구원 부연구위원

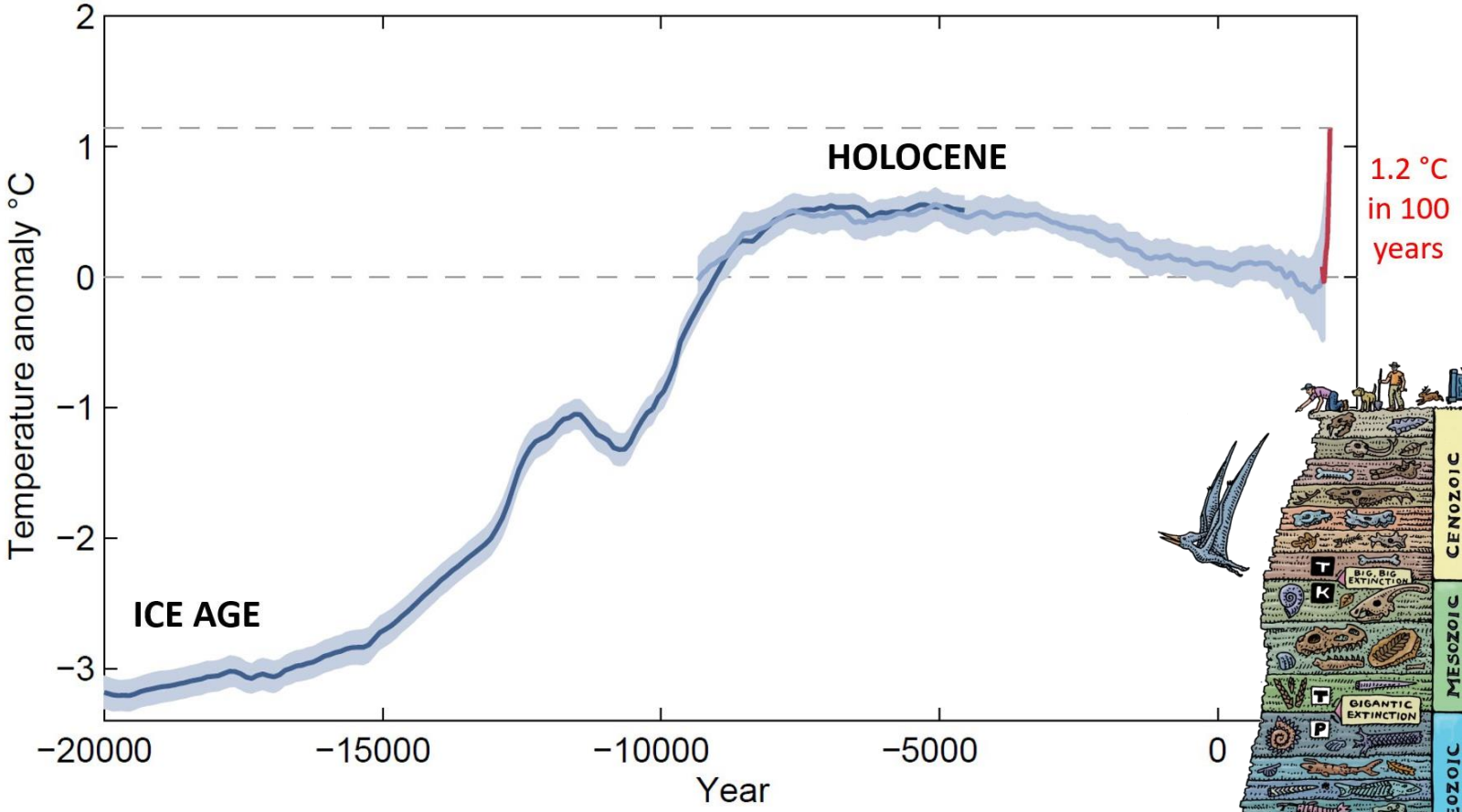
구독 +

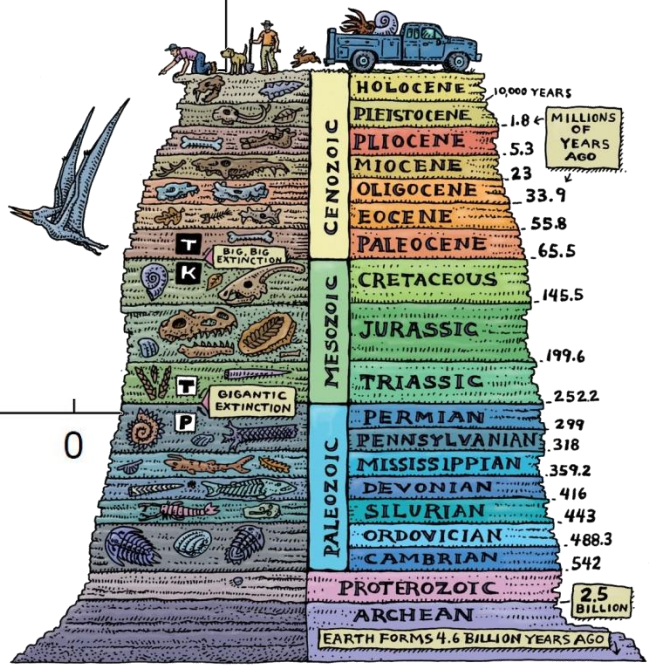
Contents

1. Overview of Climate Change

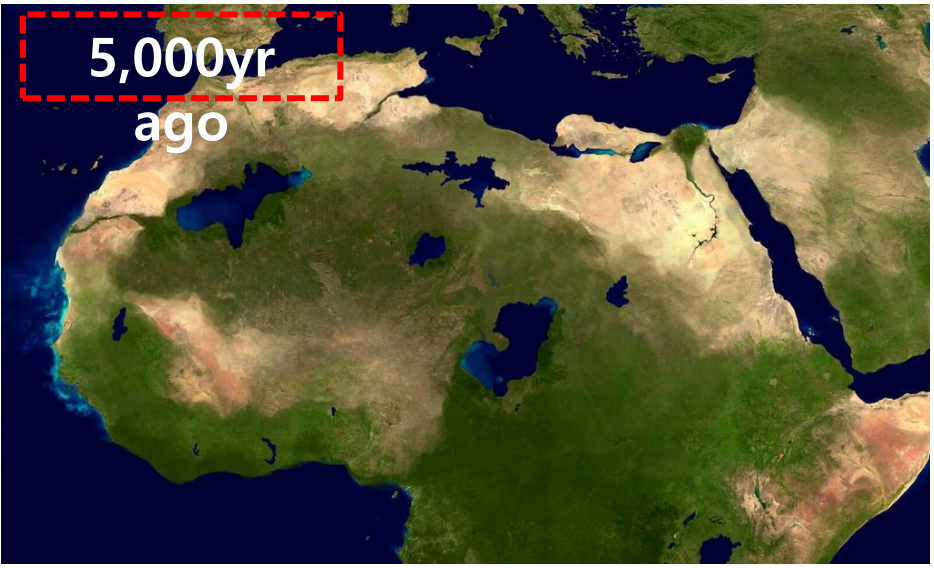
(ⓒpixabay)

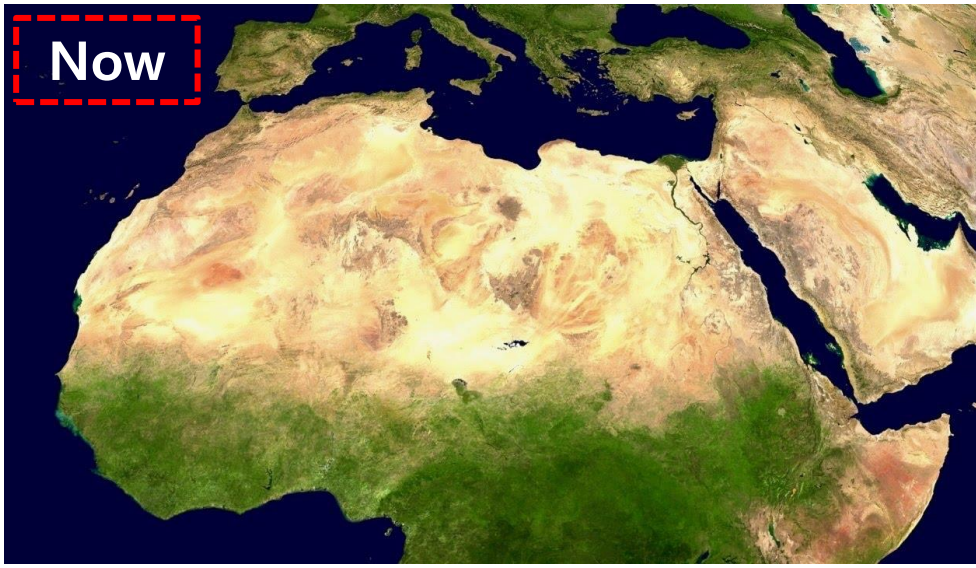
Anthropocene through the Adaptation

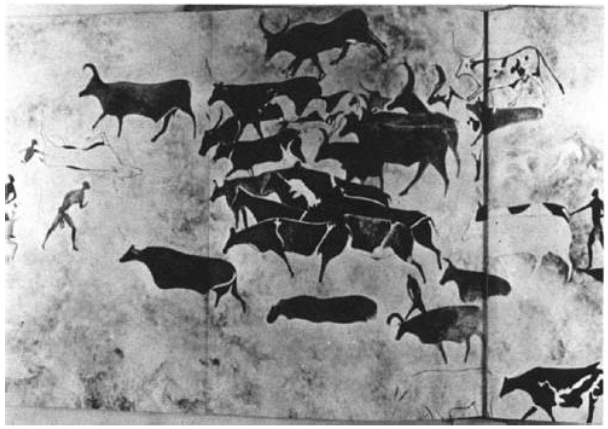


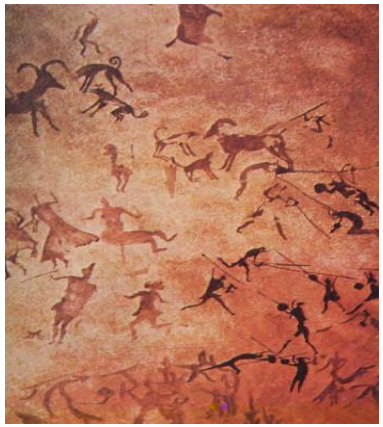


Green Sahara



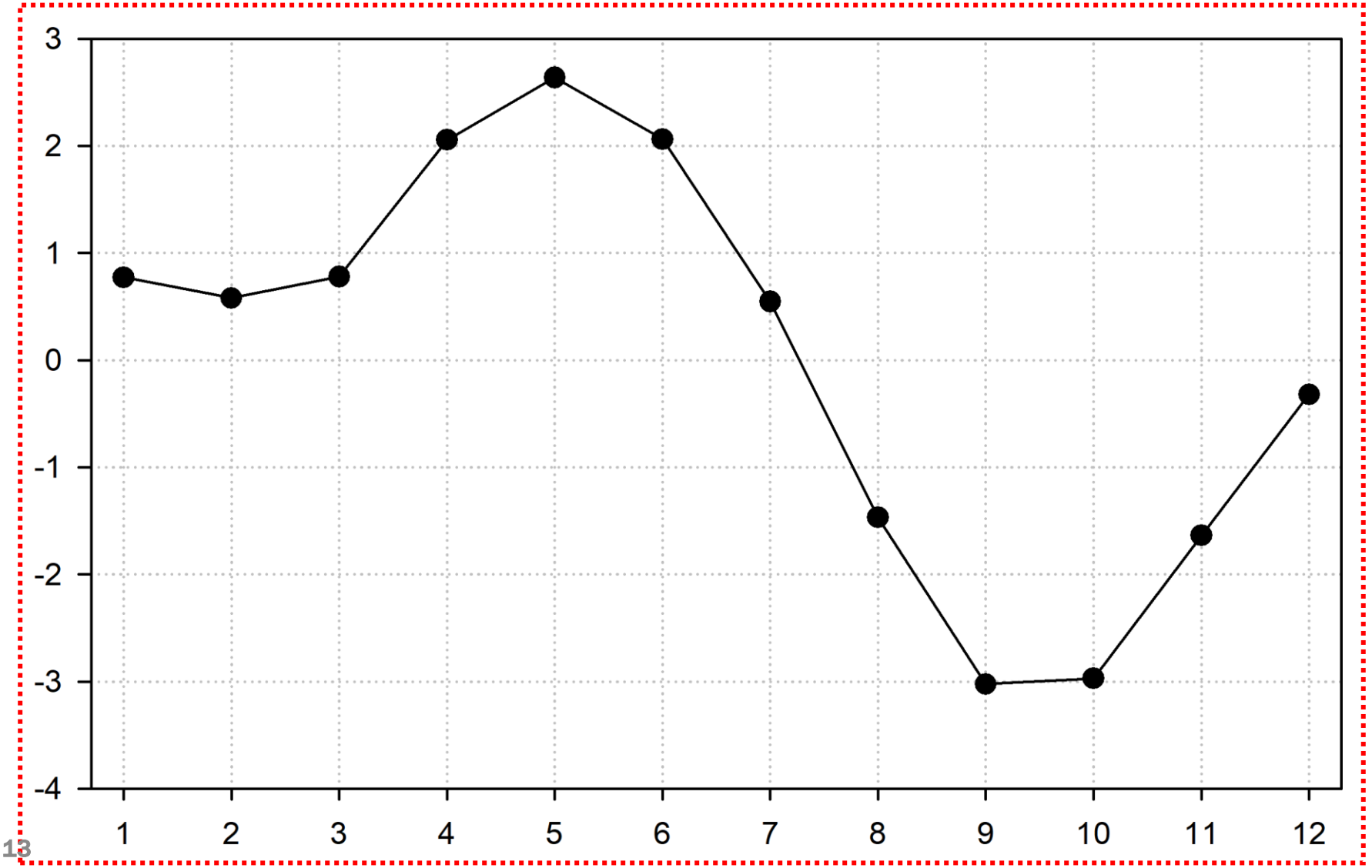




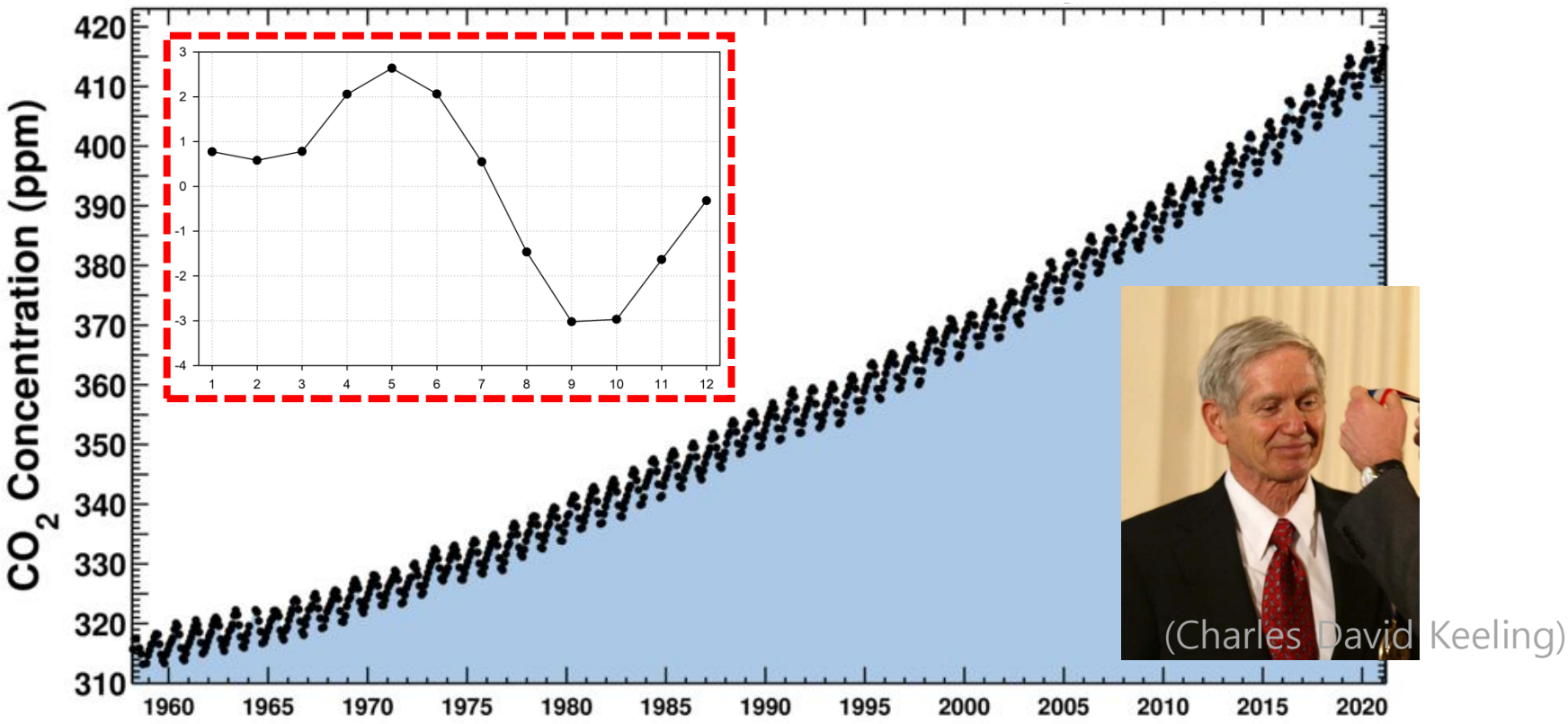


Henri Lhote
(1959, Tassili frescoes)

What it looks like?



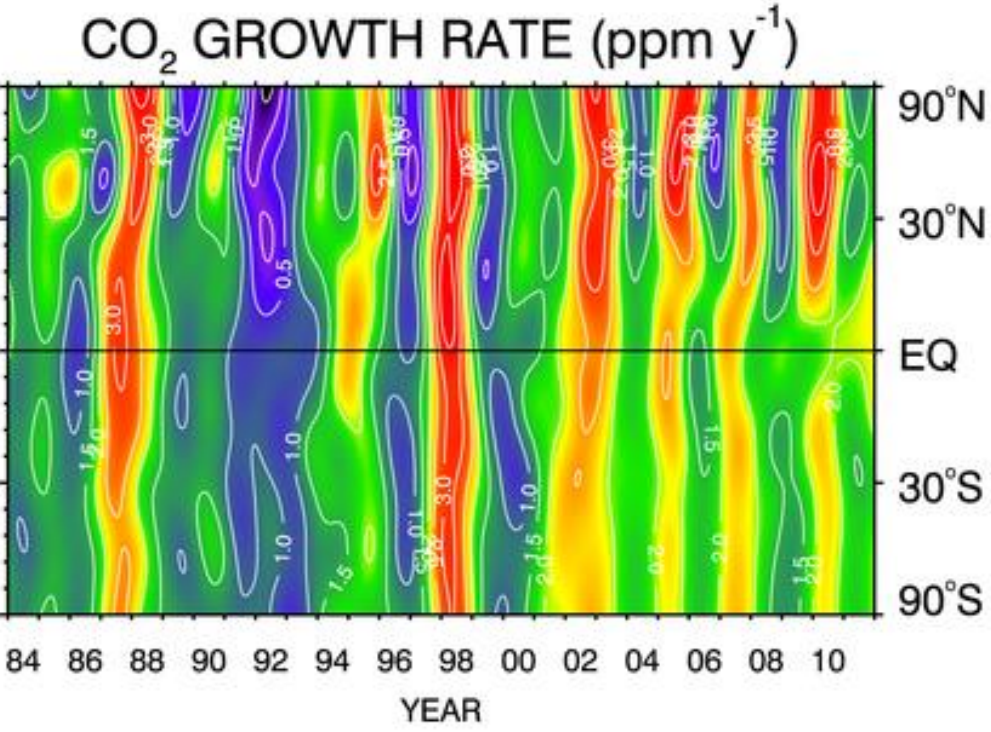
Keeling Curve

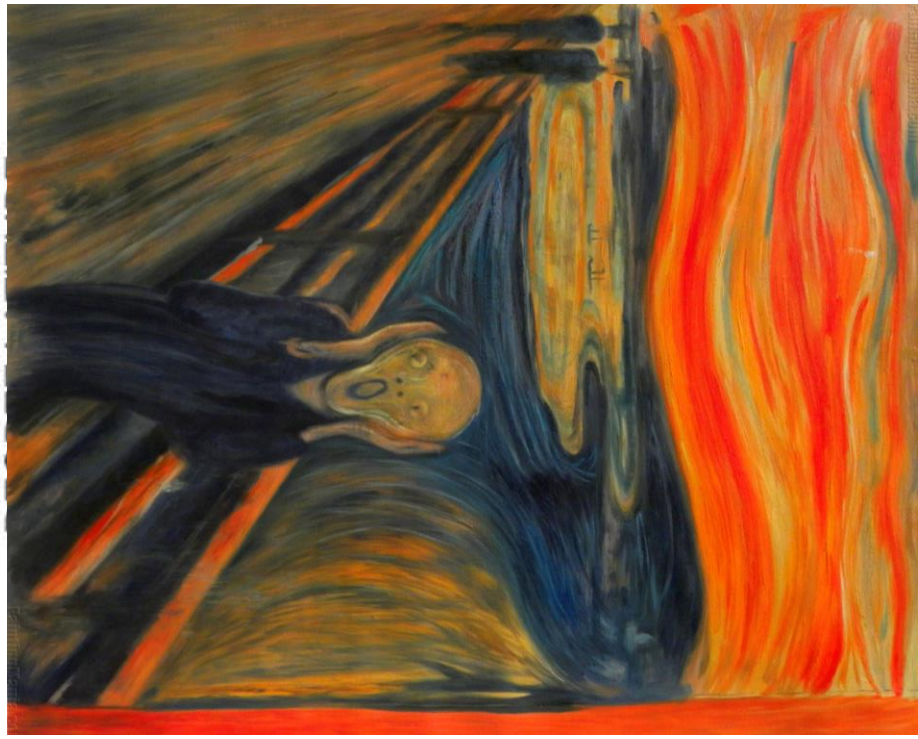


(Charles David Keeling)

Why his CO_2 represents global trends?

the Scream …



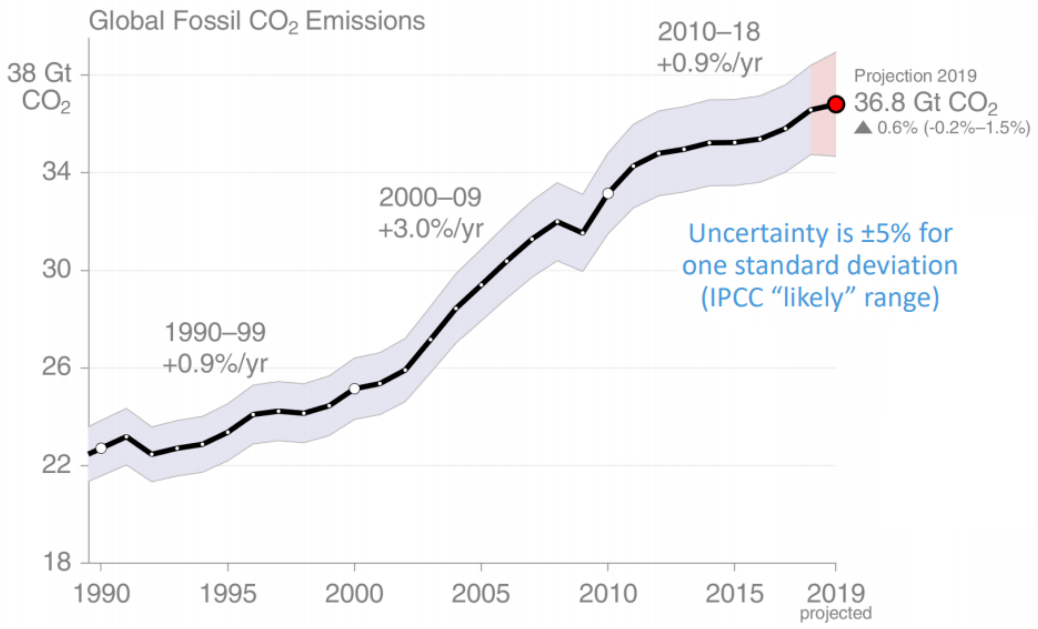


(Edvard Munch)

조천호 교수님 발표 중

Human-induced Climate Change

- By the people…

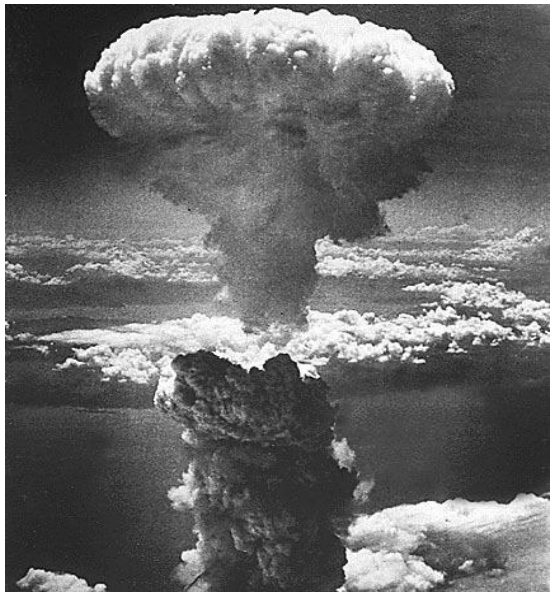


(Global Carbon Project)

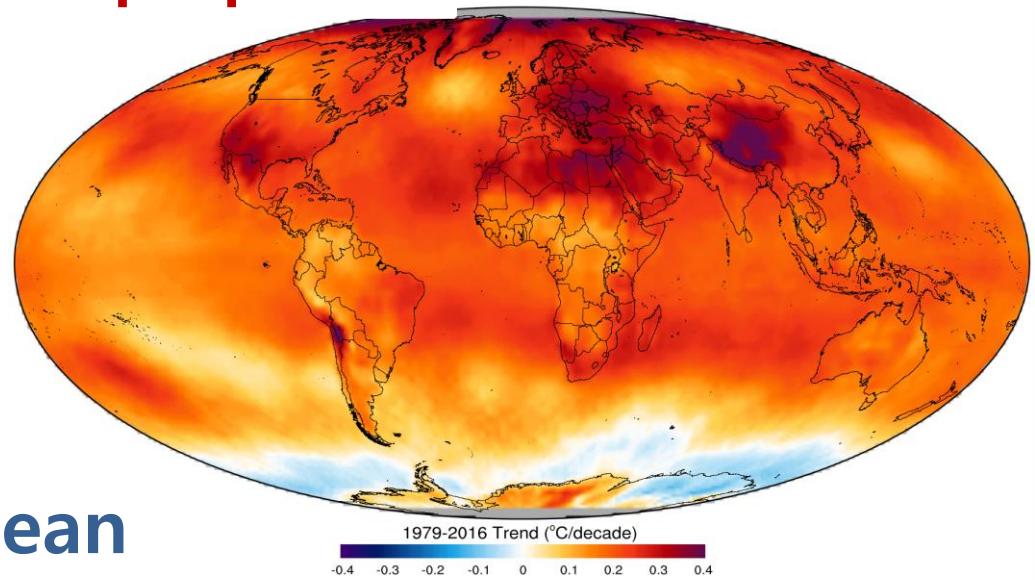
Greenhouse Effect

= 4 atom-bombs a second

= 345,500 atom-bombs a day

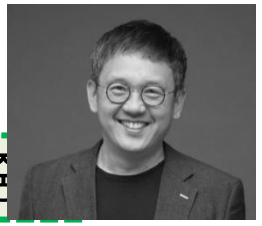


troposphere



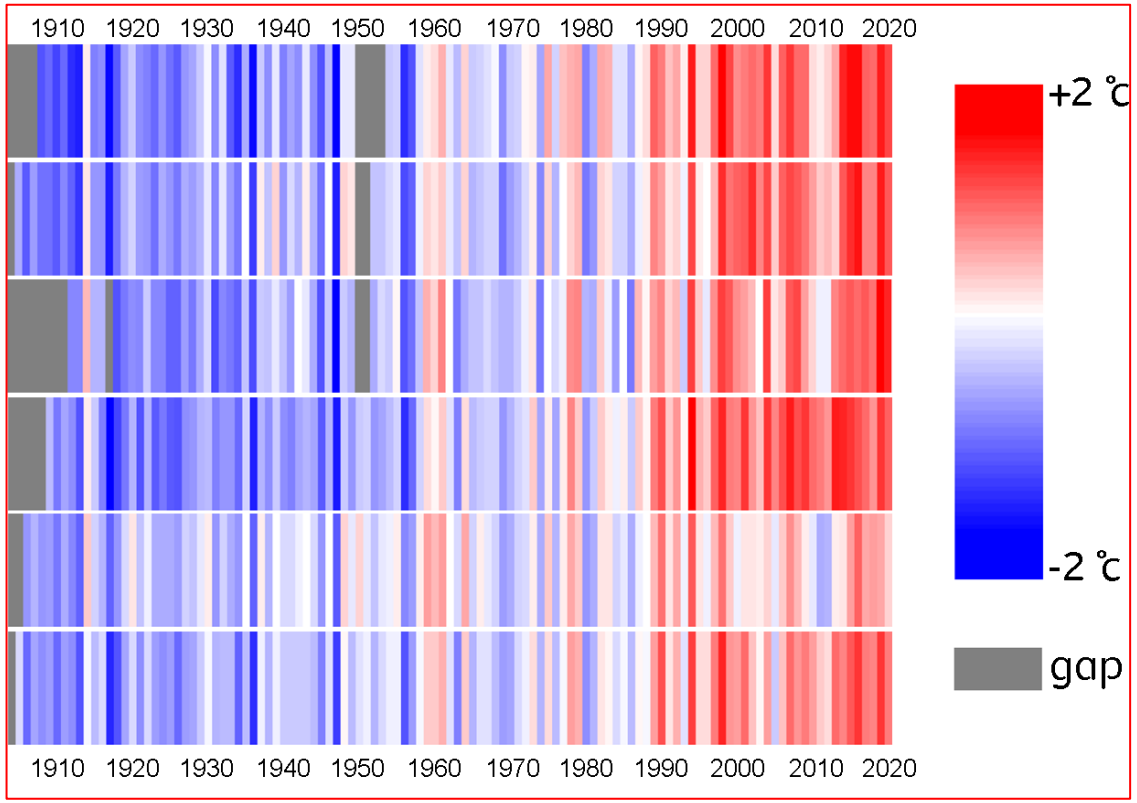
90% of heat to the Ocean

Only ~2% to the Atmosphere



조천호 교수님 발표 중

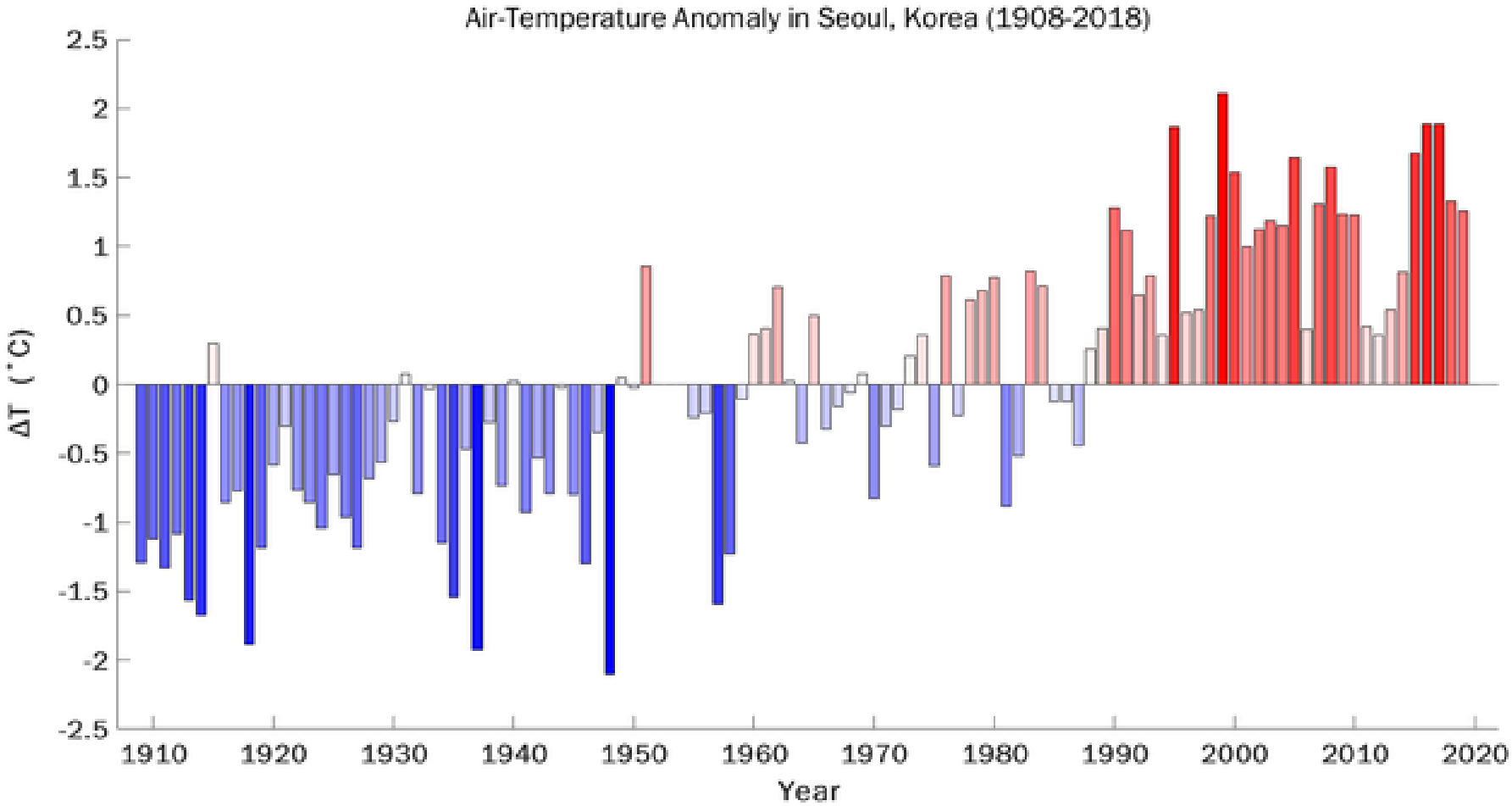
Slow-onset Process



by J-W Hong

Long-term trends in Korea

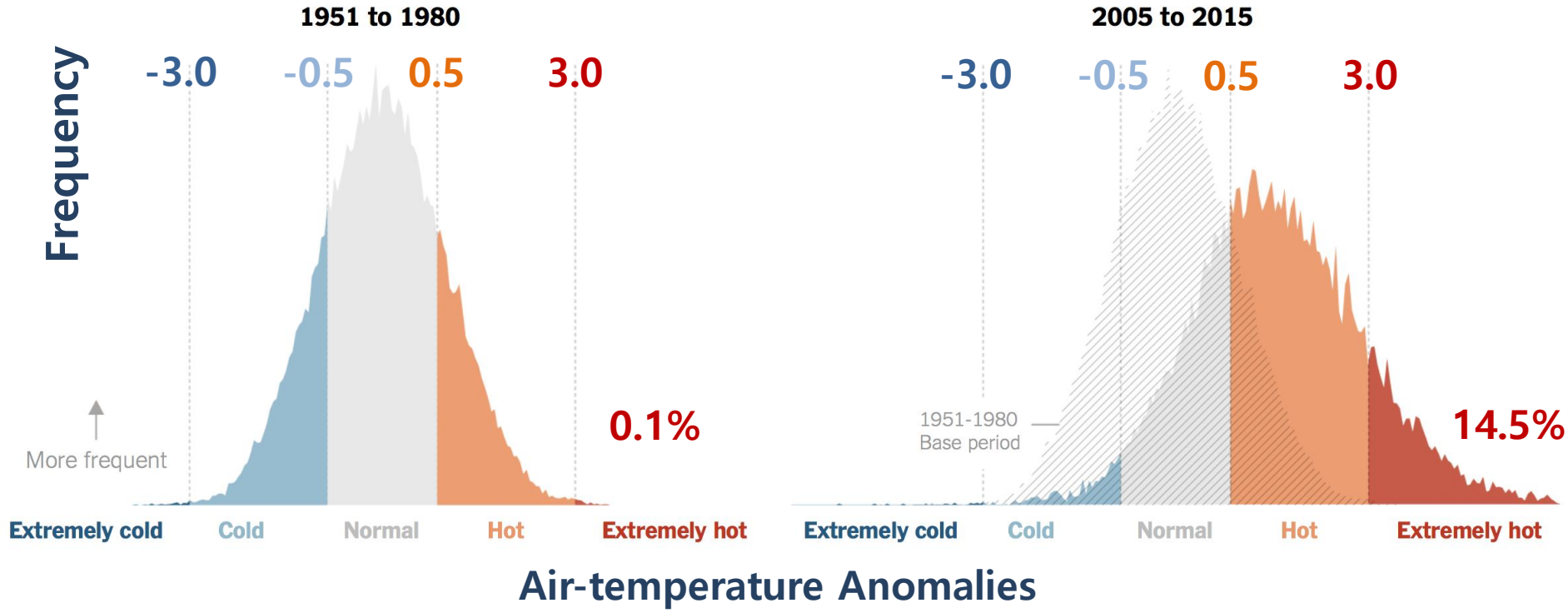
Seoul, Korea



by J-W Hong

Low-likelihood, High-impact Outcomes

NH in summer (JJA)

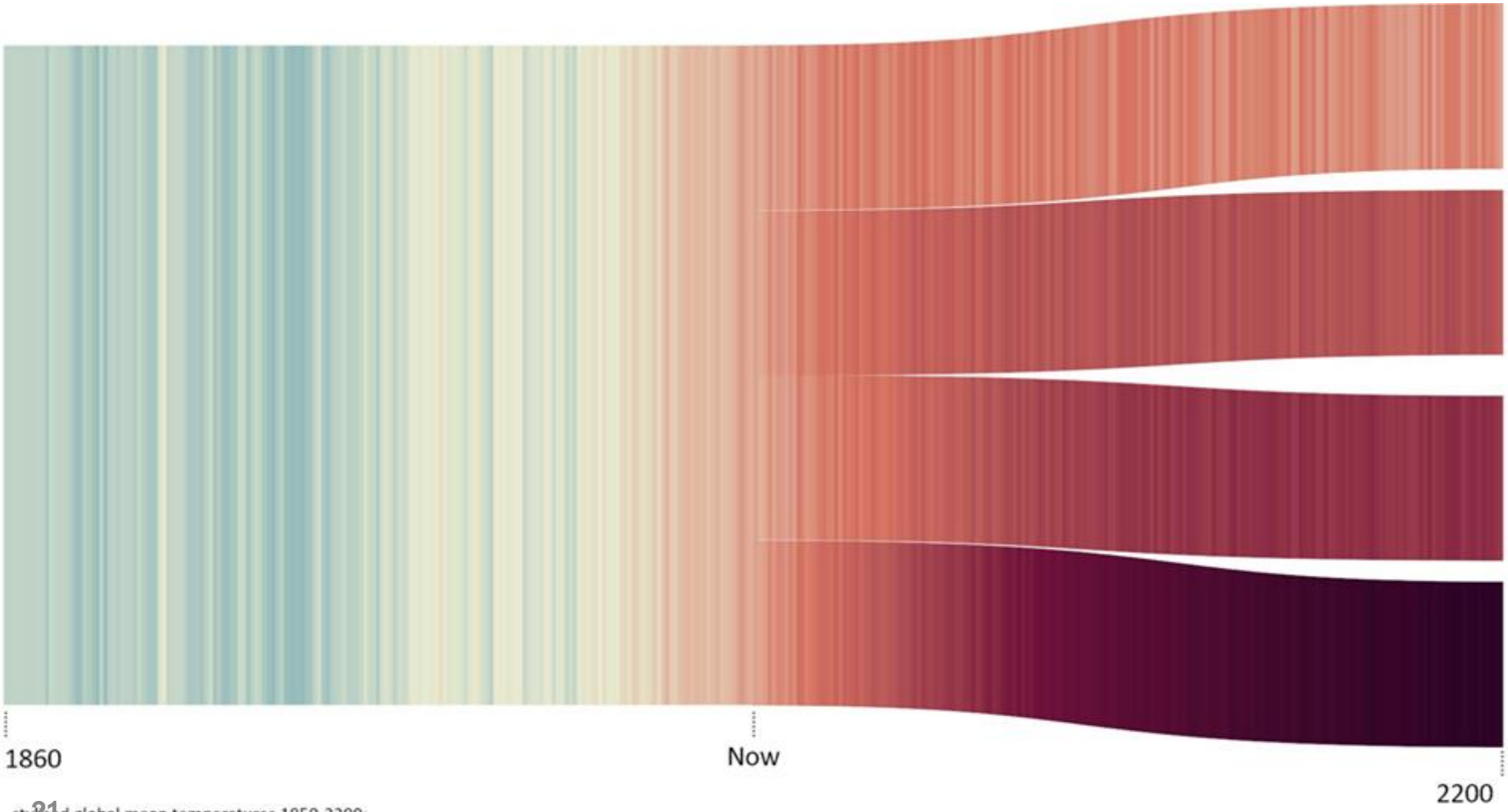


(Columbia University Earth Institute)

조천호 교수님 발표 중

Our Future ?

조천호 교수님 발표 중

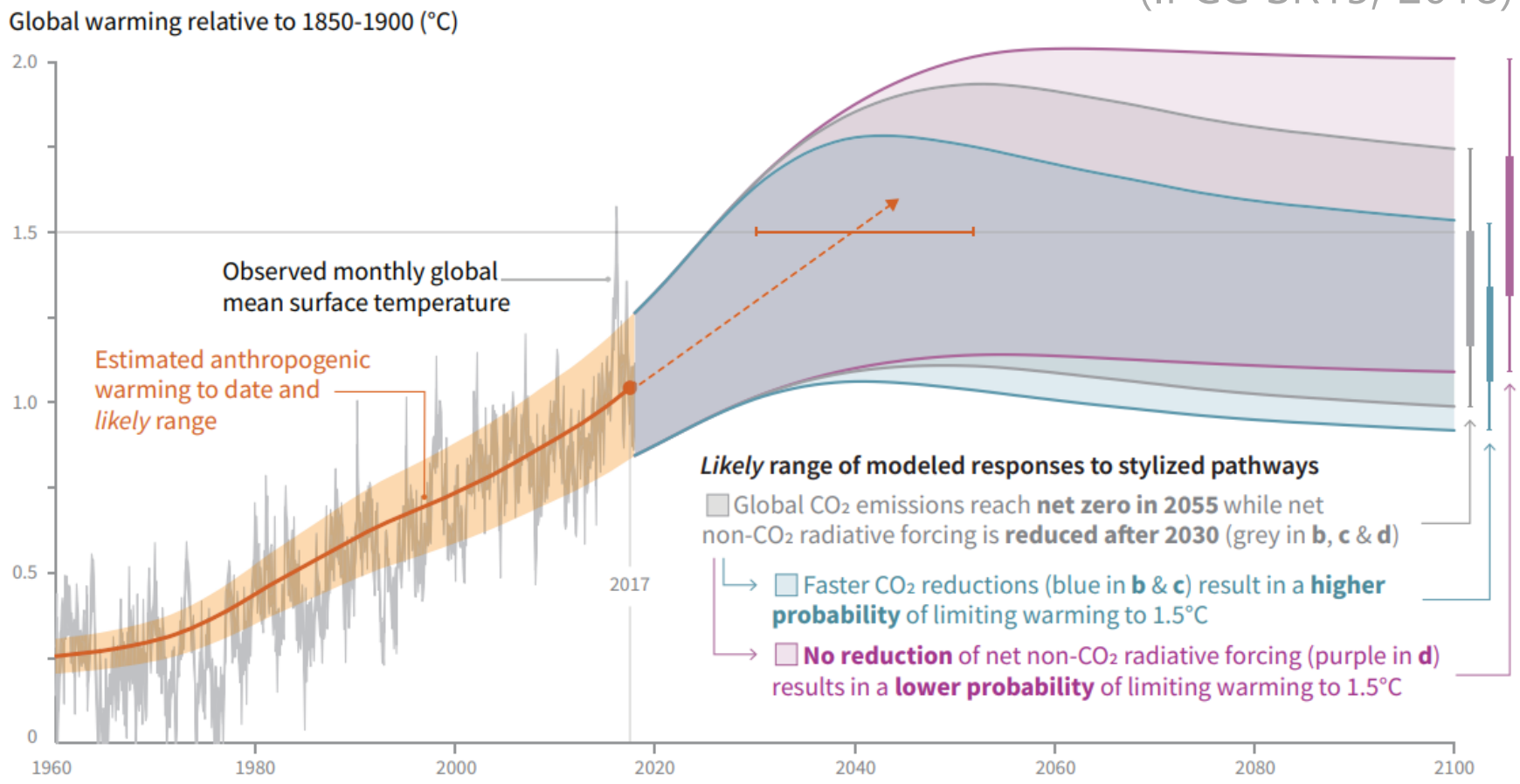


stylised global mean temperatures 1850-2200;
design by @alxrdk based on warming stripes from @ed_hawkins

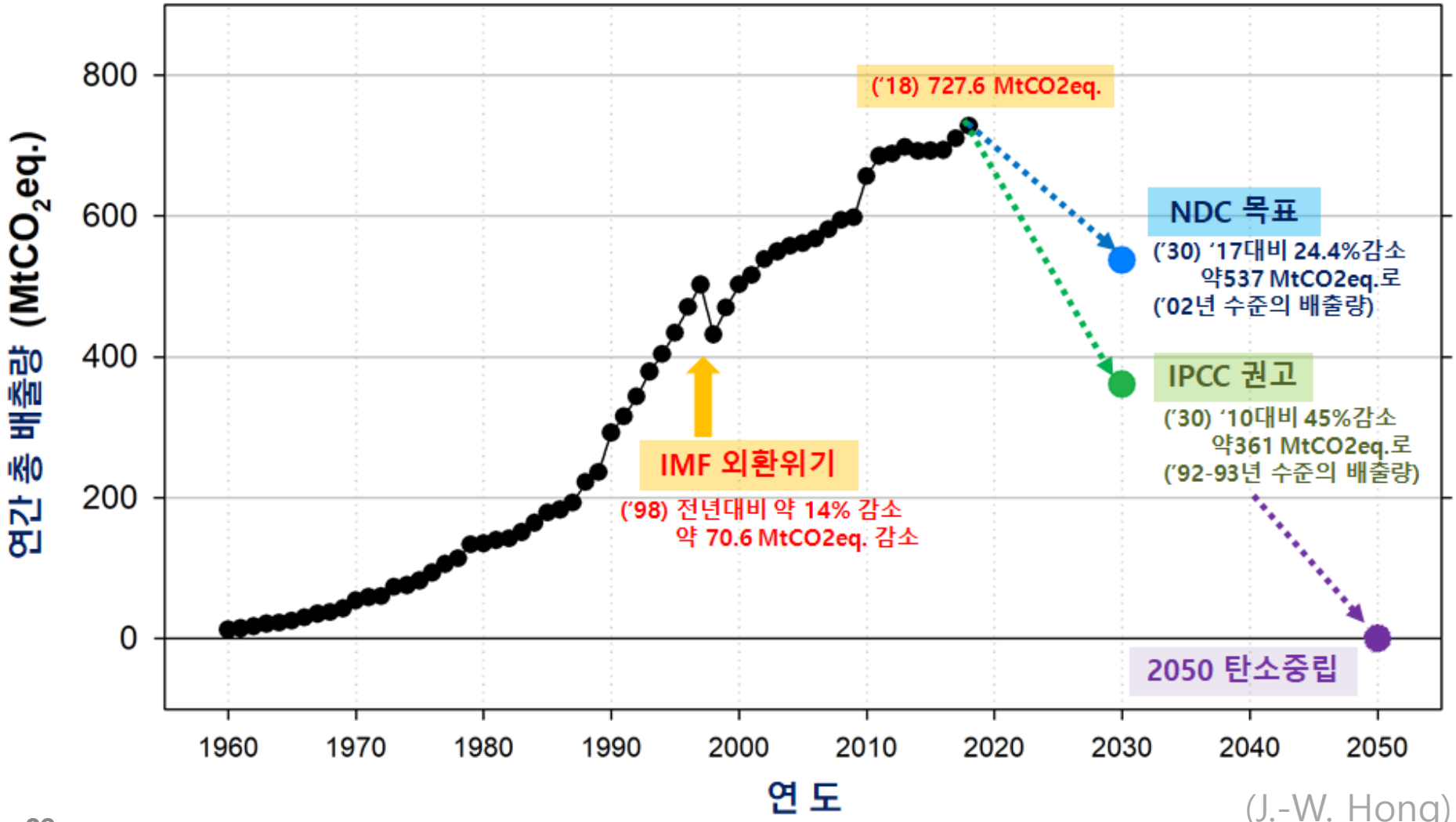
2050 Carbon Neutral

- **We should include non-CO_2.**

(IPCC SR15, 2018)



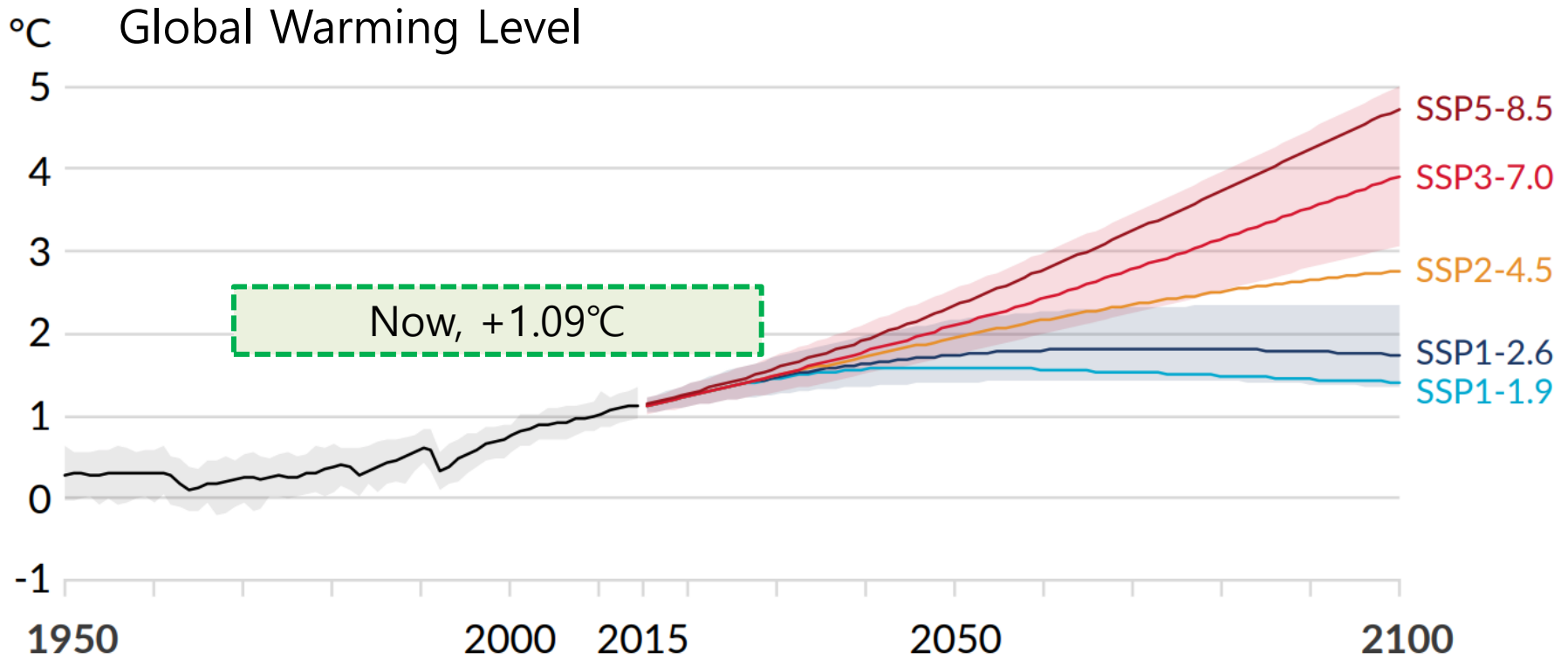
Mitigation …



(J.-W. Hong)

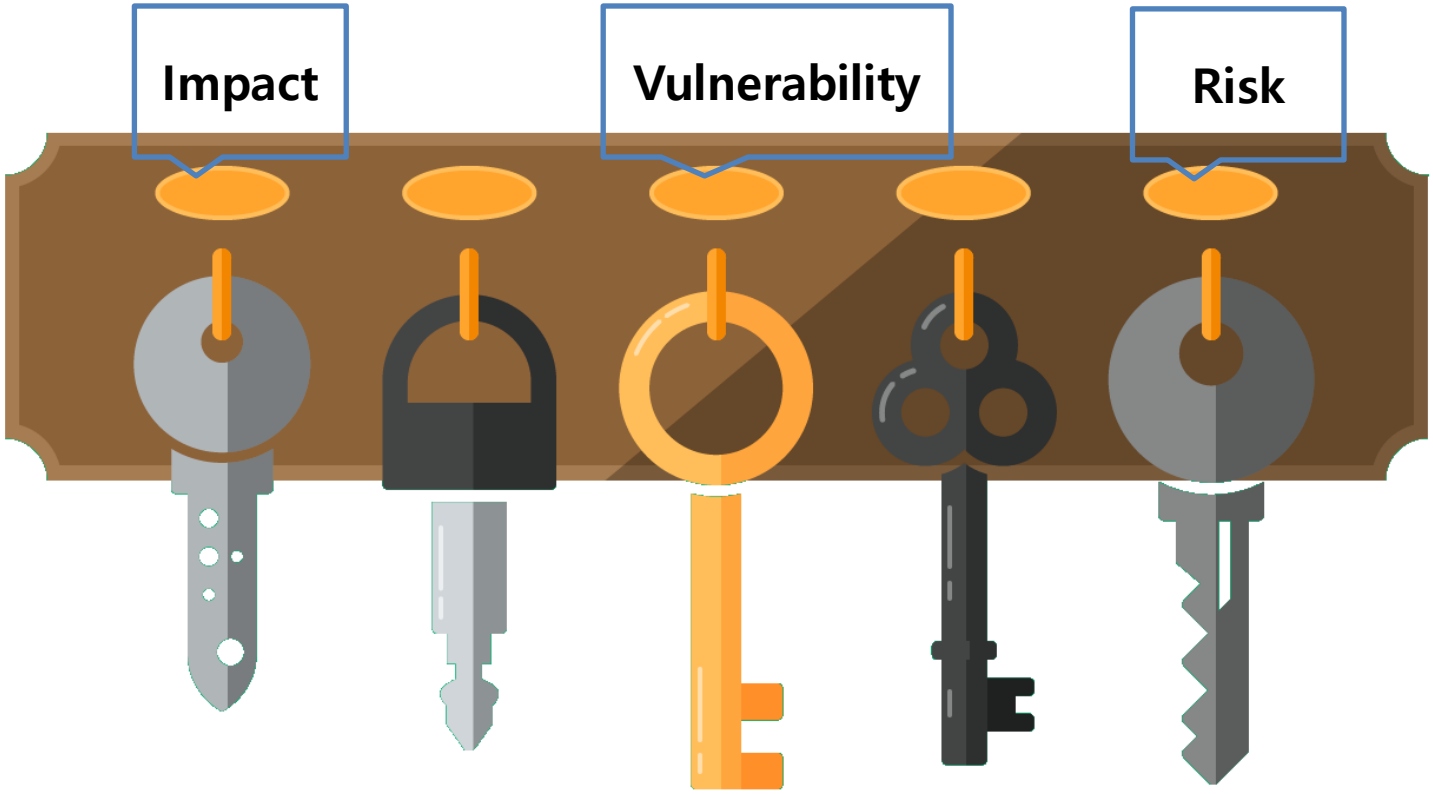
We need Adaptation !

- We will touch 1.5℃ soon (2021-2040).



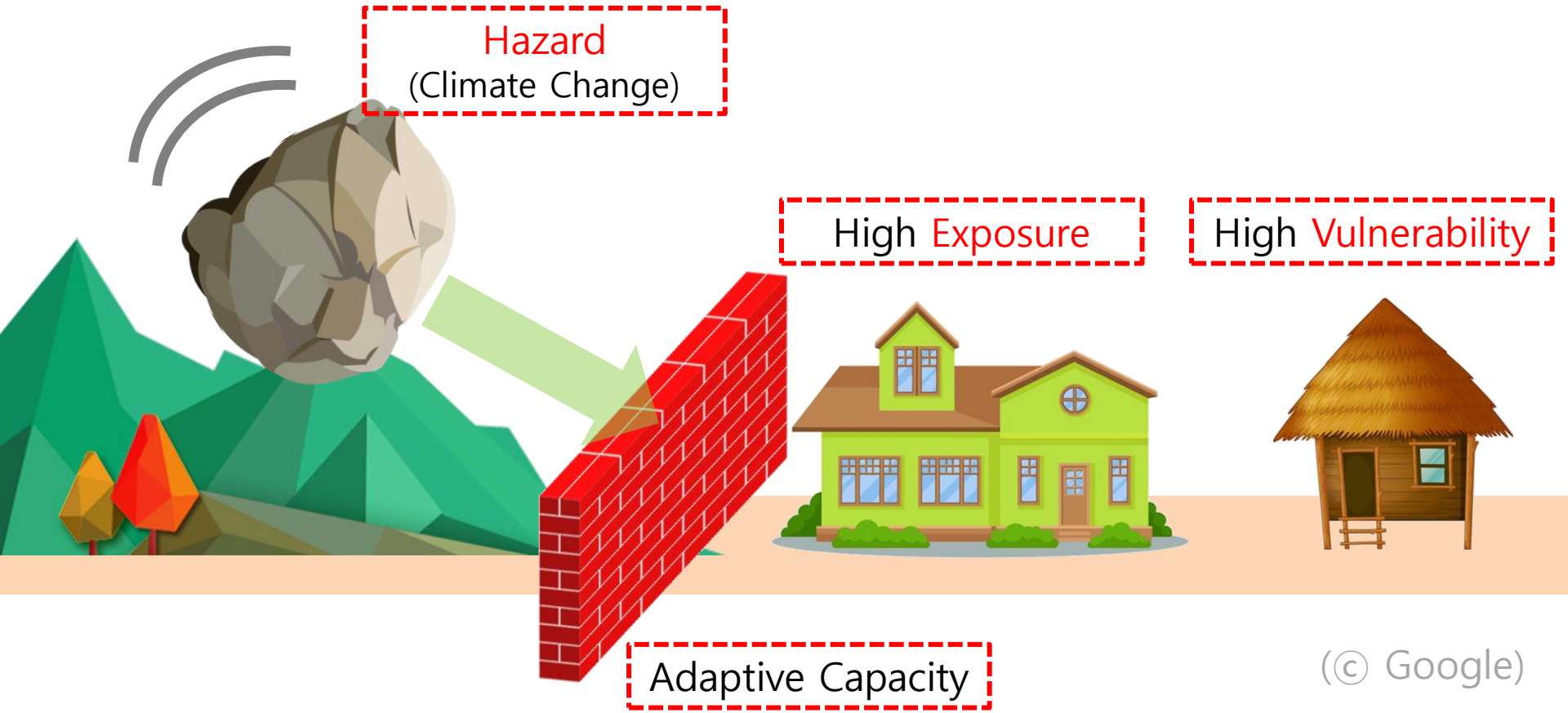
(IPCC AR6 WG1, 2021)

2. Key Concepts for Adaptation

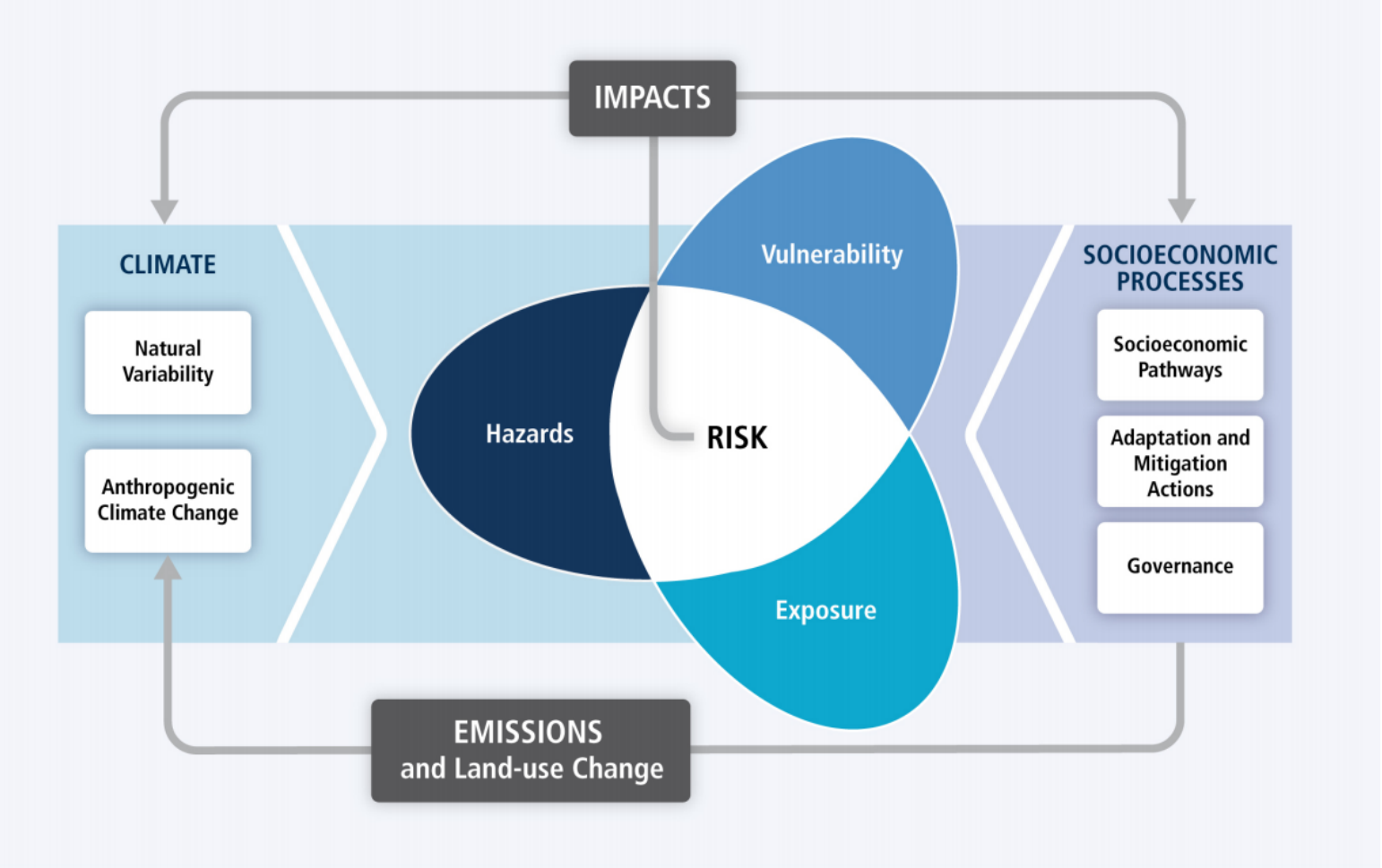


(ⓒ Google)

Build Adaptation Capacity



Climate Risk



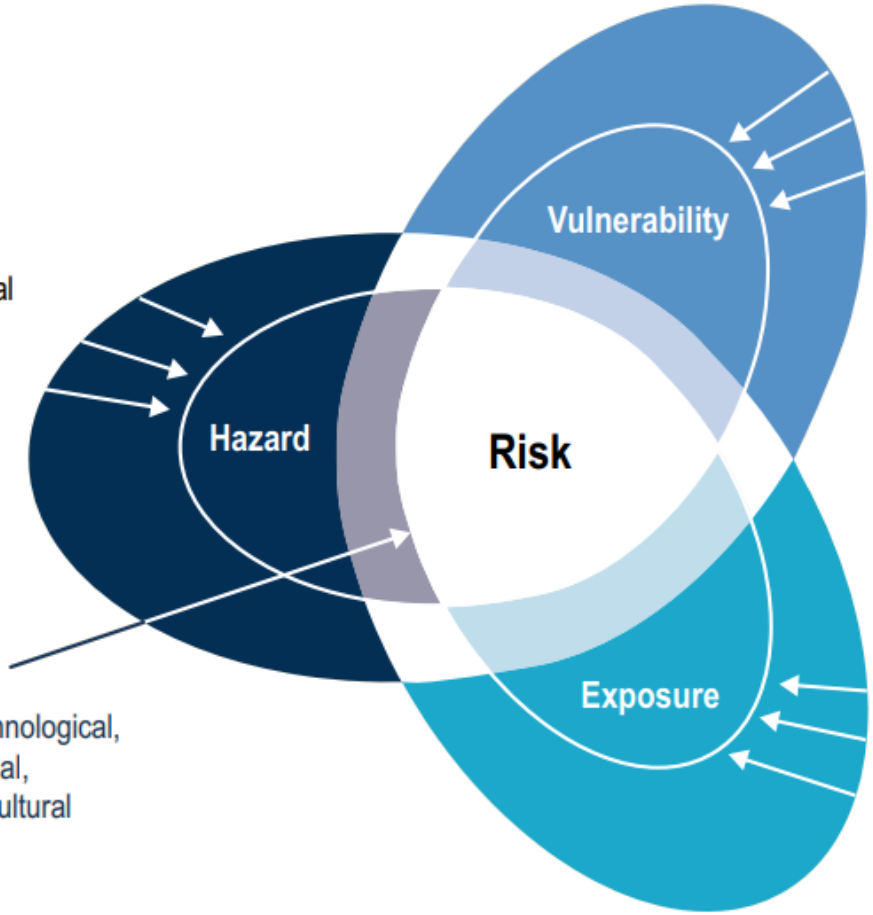
(IPCC AR5 WG2, 2014)

Gap makes Adverse Impacts

Actions to reduce Hazards

Examples include:

- Ecosystem-based measures to reduce coastal flooding
- Mangroves to alleviate coastal storm energy
- Water reservoirs to buffer low-flows and water scarcity



Actions to reduce Vulnerability

Examples include:

- Social protection
- Livelihood diversification
- Insurance solutions
- Hazard-proof housing and infrastructure

Limits to Adaptation

- E.g. physical, ecological, technological, economic, political, institutional, psychological, and/or socio-cultural

Actions to reduce Exposure

Examples include:

- Coastal retreat and resettlement
- Risk sensitive land use planning
- Early warning systems and evacuations

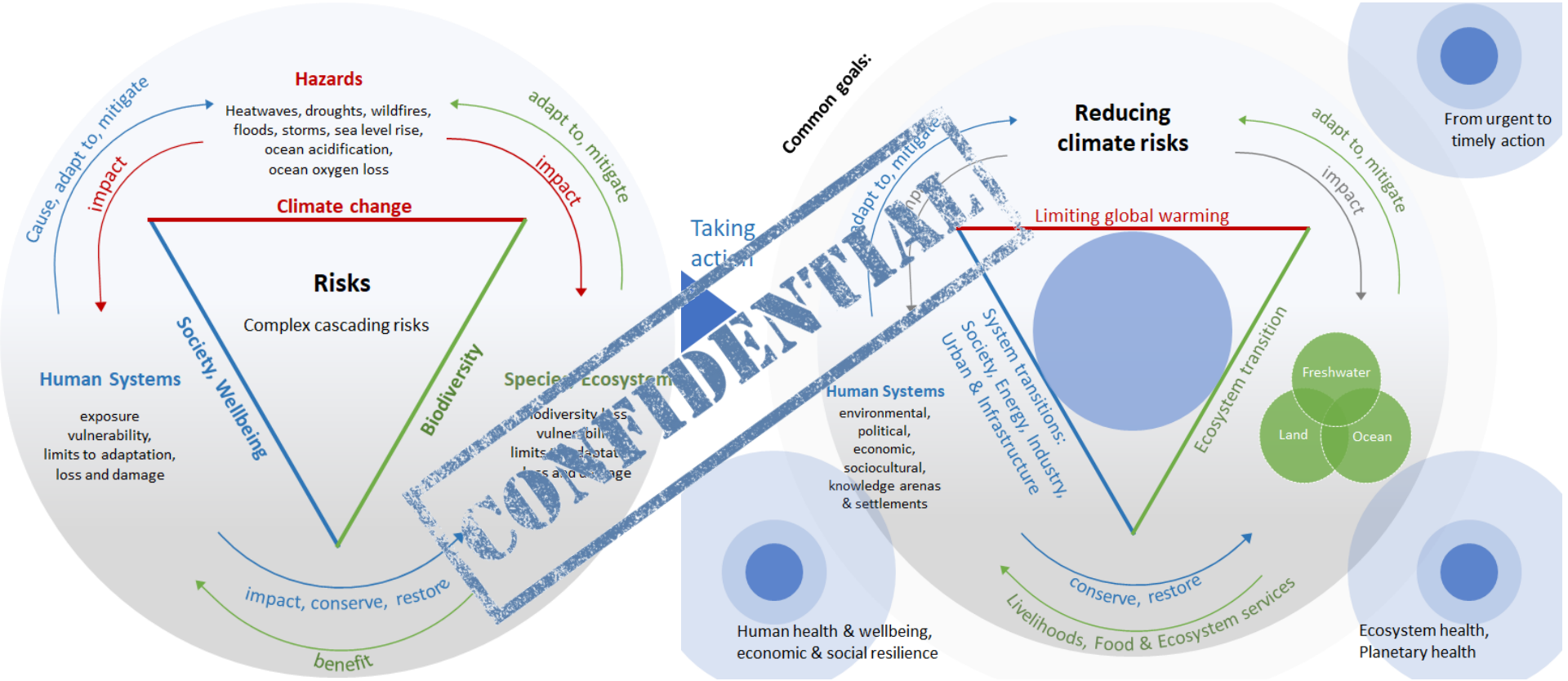
(IPCC AR6 SROCC, 2019)

Pathways to Climate Resilient Development

(IPCC AR6 WG2, 2022)

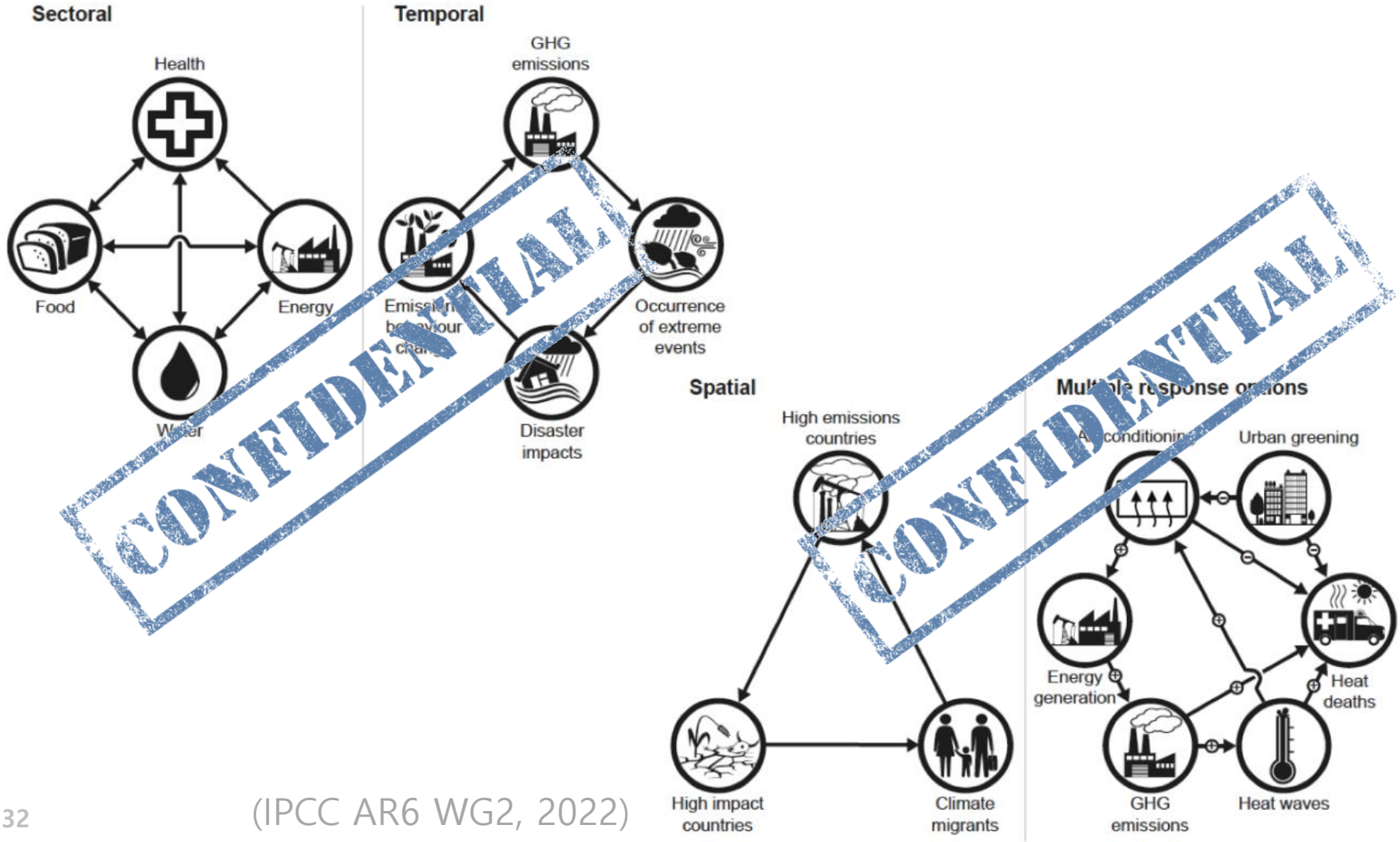
Mind the Gap !

Climate Risks



(IPCC AR6 WG2, 2022)

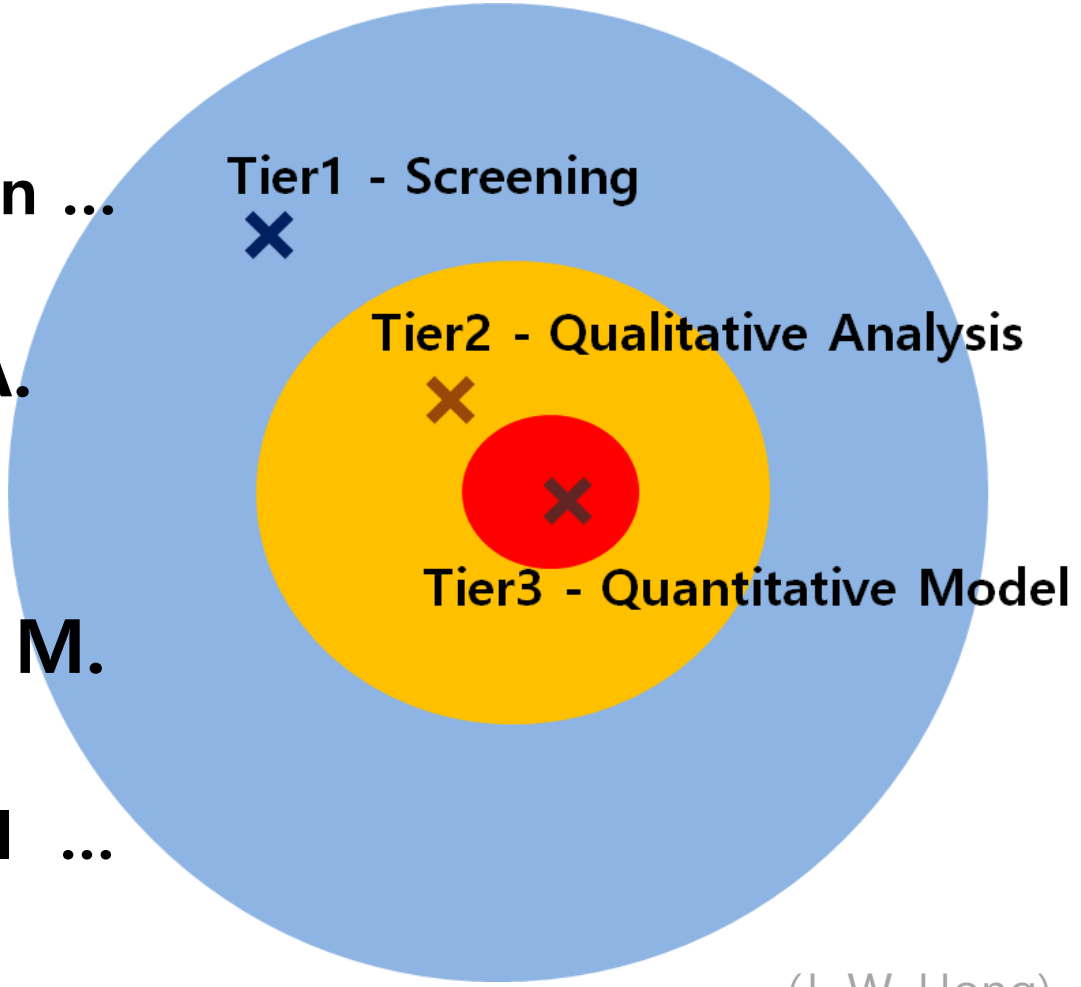
Complex, Compound, Cascading



(IPCC AR6 WG2, 2022)

Risk Assessment

- **Tier1 – Screening**
  - **records, data, opinion …**
- **Tier2 – Qualitative A.**
  - **index-based analysis**
- **Tier3 – Quantitative M.**
  - **empirical model**
  - **process based model …**



(J.-W. Hong)

Risk Management Framework

- **① Identification**
  - **list-up**
- **② Selection**
  - **choice and concentration**
- **③ Planning**
  - **NAP, LGAP …**
- **④ MRE (M&E)**
  - **perform, monitoring, evaluation, reporting**

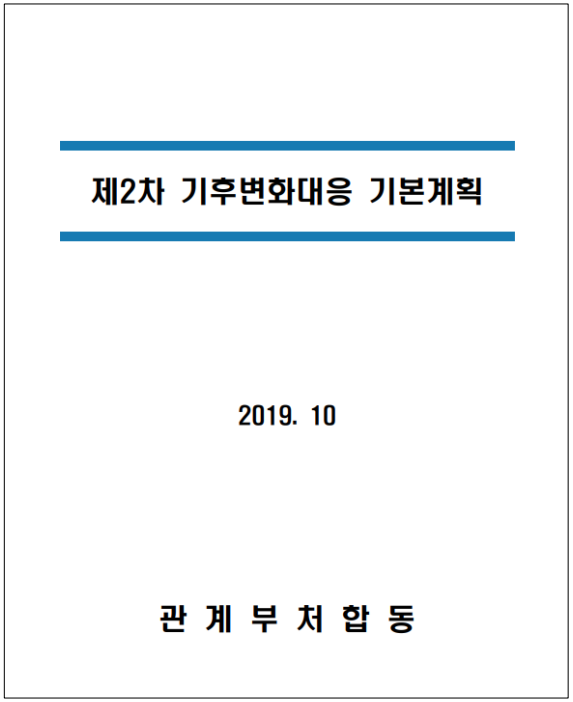
3. Adaptation Policy in Korea

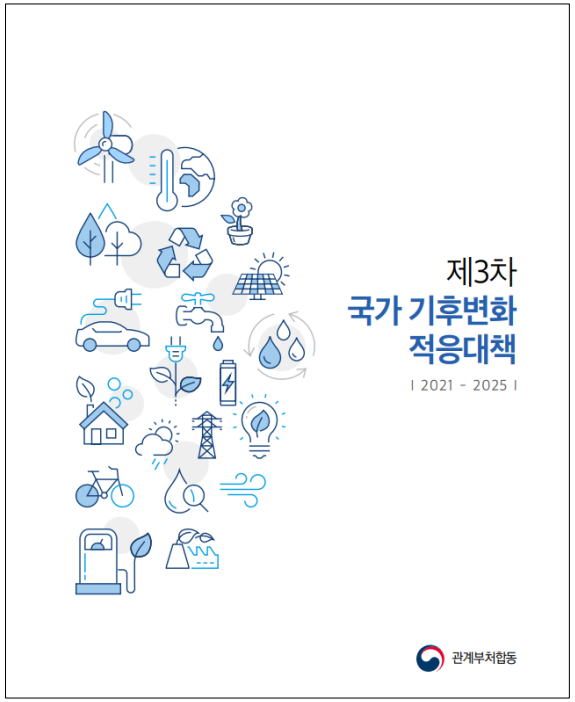
Institution

- **Carbon Neutral Green Growth Basic Law**
  - **enact: 2021.09.**
  - **enforce: 2022.03.**

Institution (2)

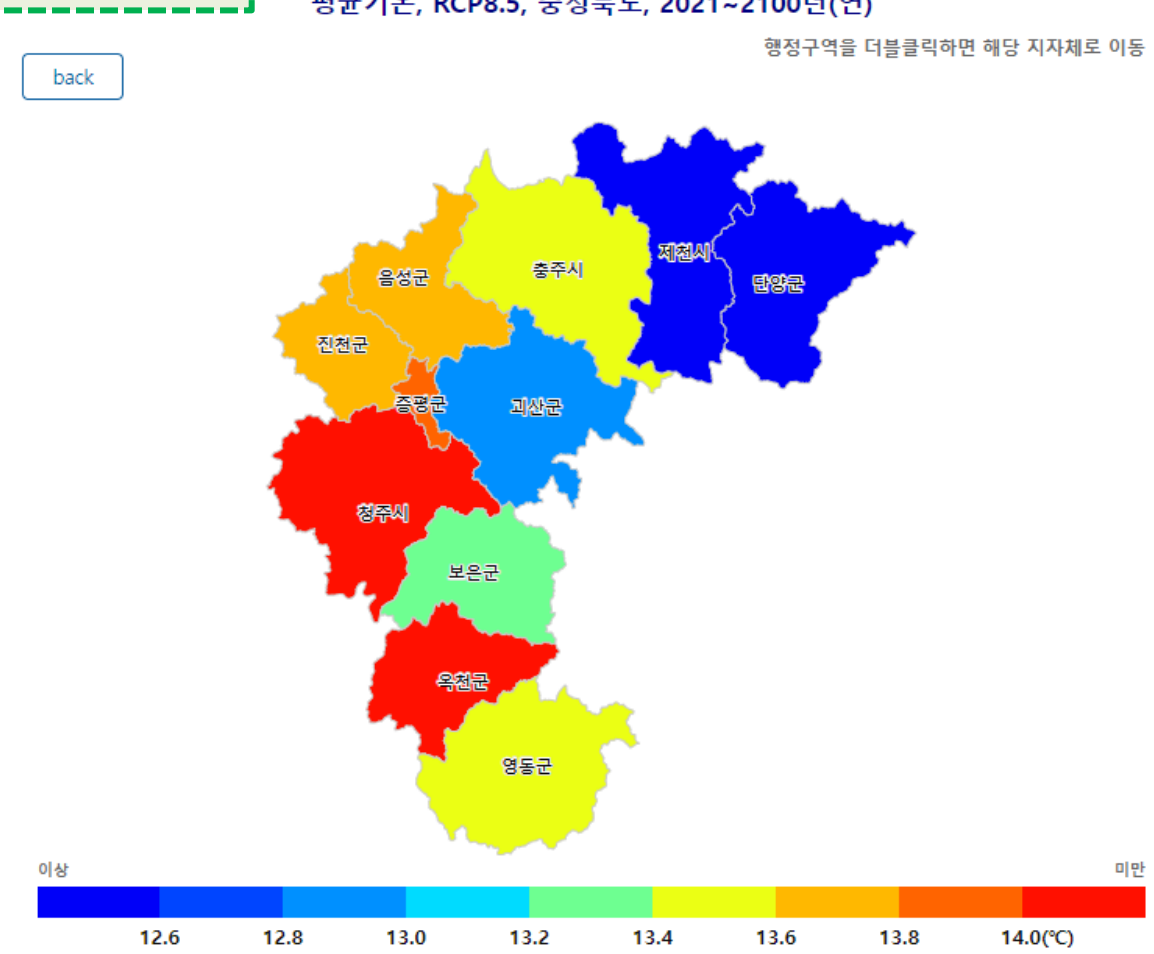
- **Master Plan for Climate Action (20-yr)**
- **NAP, LGAP (5-yr)**
- **Climate Change Impact Assessment**





Climate Scenarios

Starting Point !!



(KMA, https://climate.go.kr/)

Assessment Report

Assessment Report

Perspective Report

(National Institute of Meteorological Sciences)

Assessment Report(2)

- 120 authors, ~1,900 papers

WG Ⅰ

WG Ⅱ

(MoE and KMA)

Tools for Risk Assessment

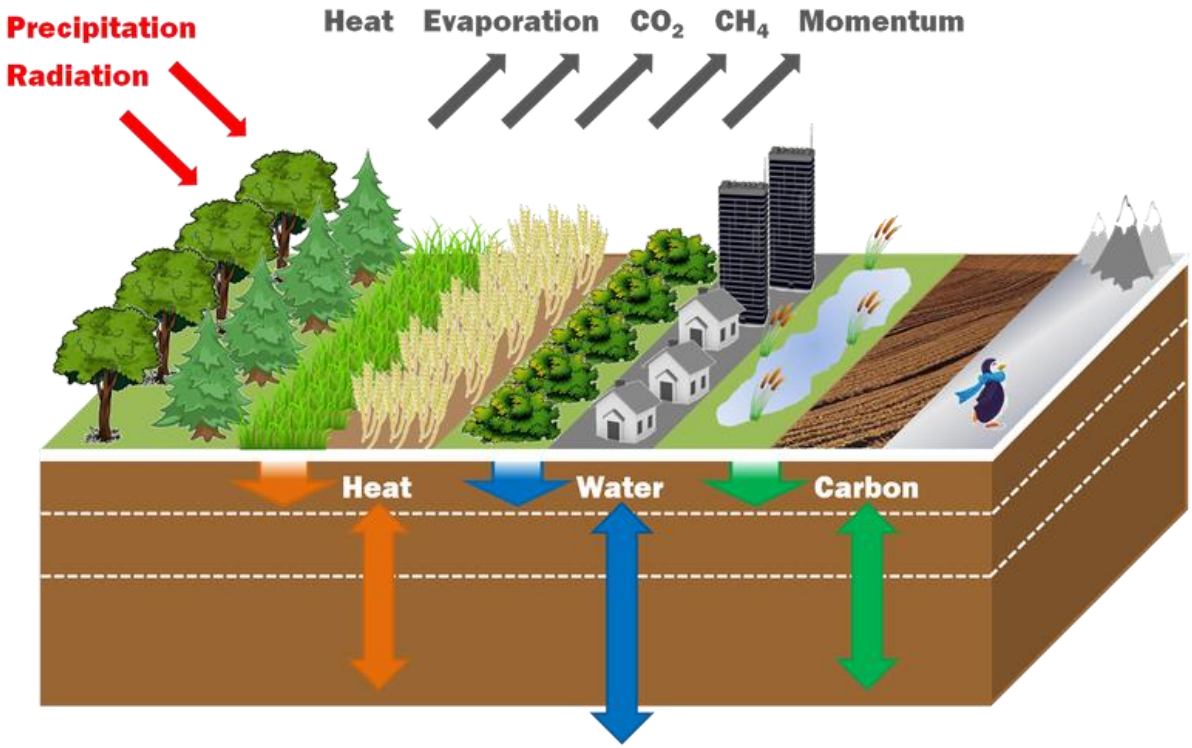
Give me a place(Model) to stand on, and I can move(Save) the Earth.
- Archimedes?? (Scientist)

(ⓒ Google)

"No one but **the modeler believes in his results**; everyone **except the observer believes in his data!**"
– So&So after Albert Einstein

Land Surface Model (LSM)

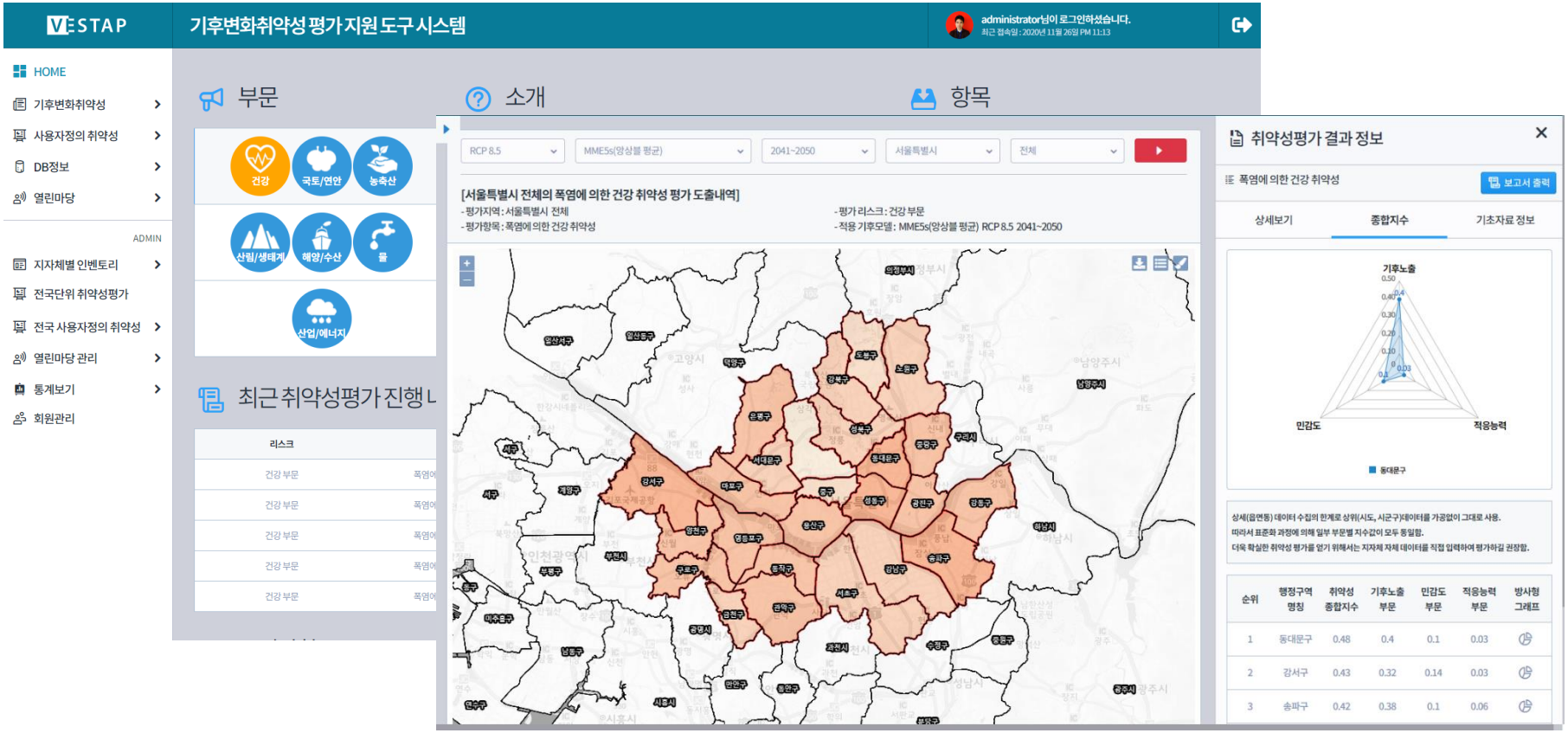
- to simulate the exchange of water, energy, carbon over the surface-atmosphere interface
- light (<100 Mb) & simple (low computing source)



(JULES model, UK MetOffice)

VESTAP

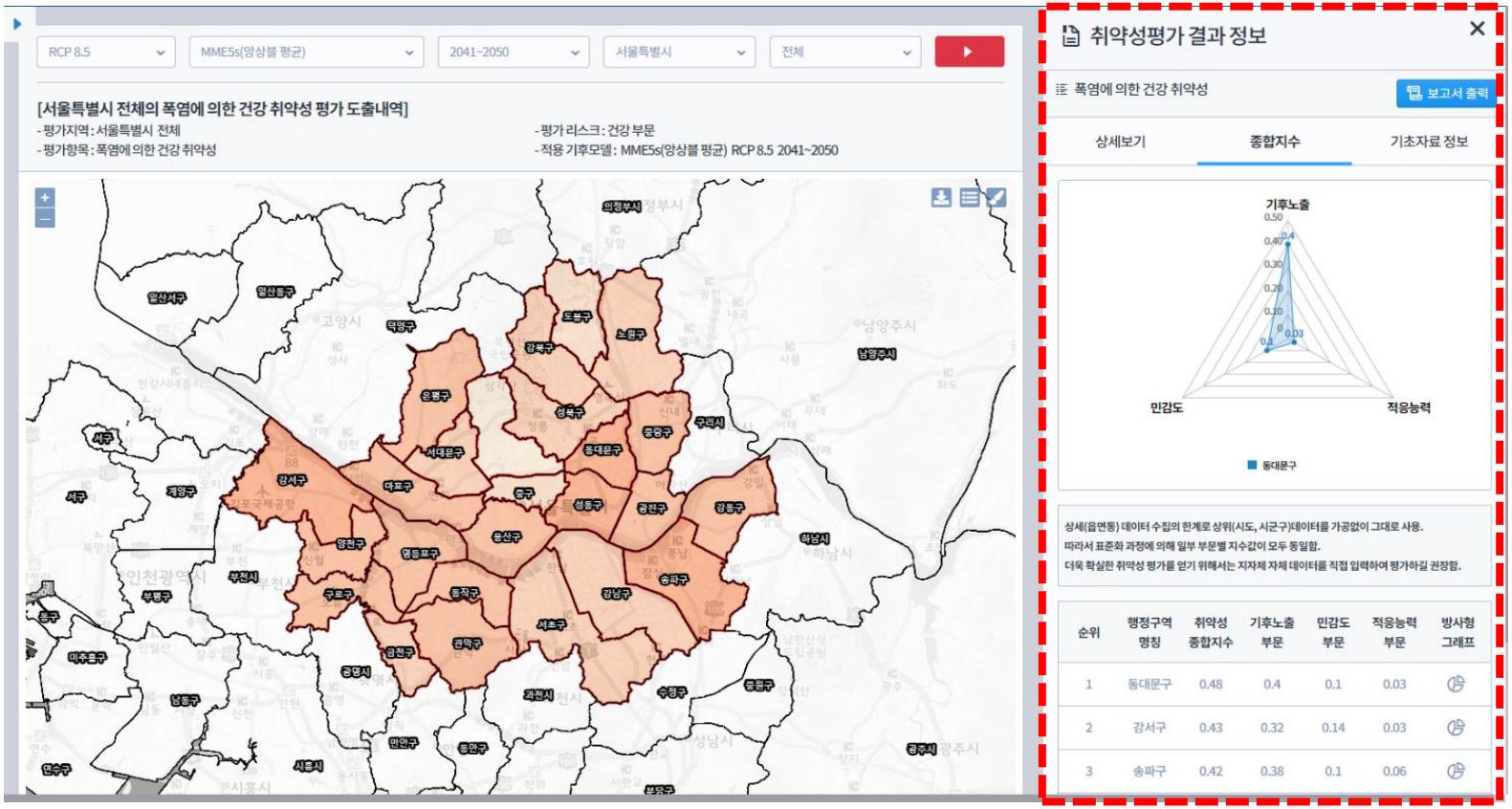
- Vulnerability Assessment Tool to Build Climate Change Adaptation Plan
- 6 sectors(e.g., health), 57 climate risks (e.g., health V due to heatwaves)



(VESTAP, KEI KACCC)

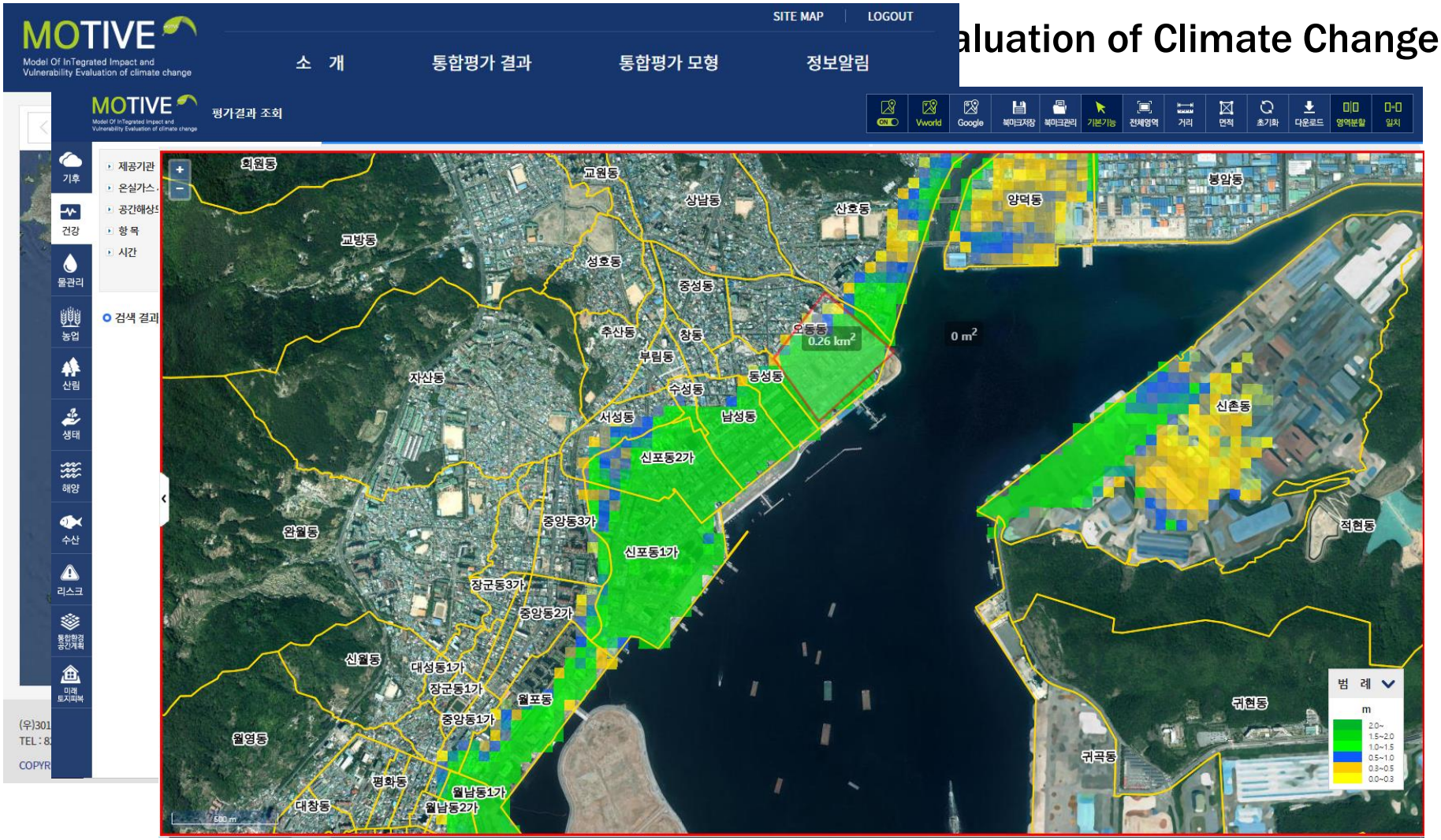
VESTAP

- Vulnerability = α×Exposure + β×Sensitivity – γ×AdaptiveCapacity
- V is calculated based on the concepts in「IPCC AR4 」.
- E, S, AC are averaged value of normalized(0~1) 4~10 indices.



MOTIVE

aluation of Climate Change

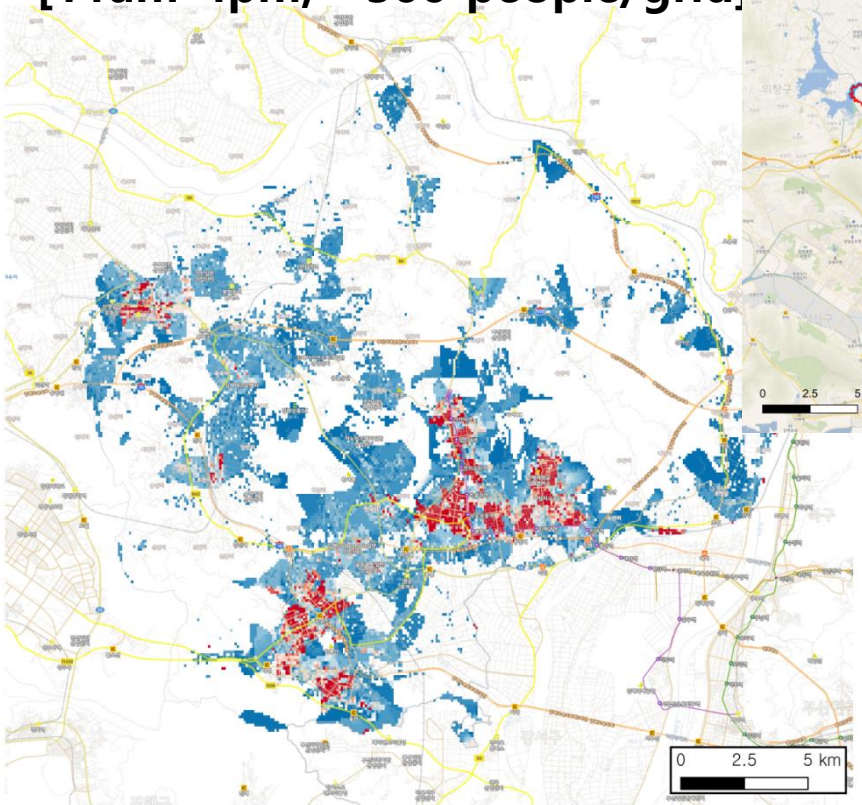


(MOTIVE, KEI KACCC)

Hotspot Research

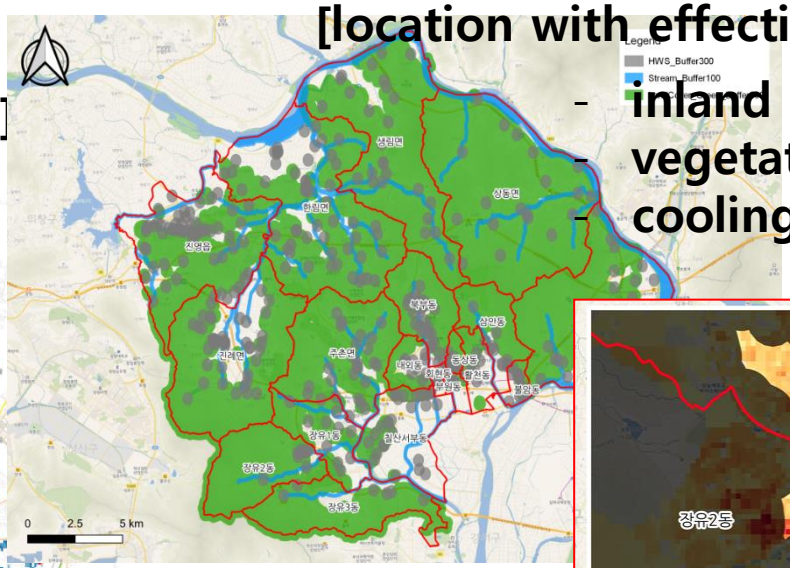
- **floating population (50m, 1hr)**

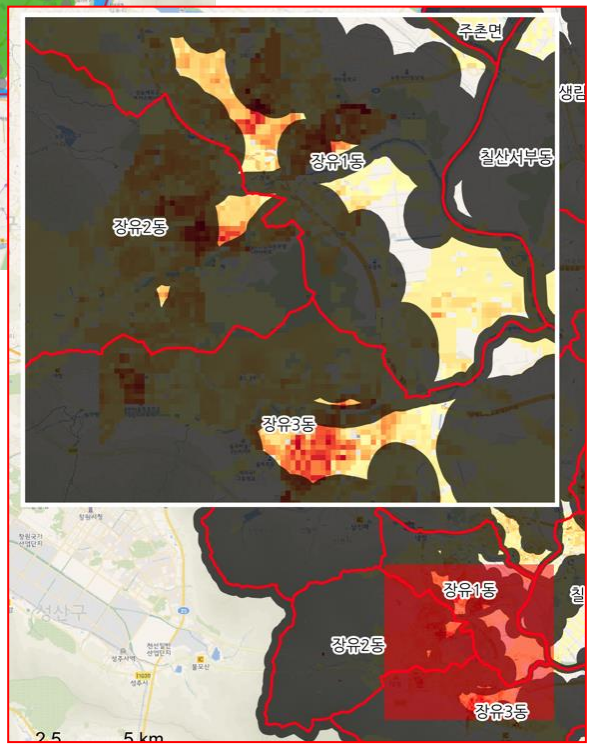
for JJA 2020,
[11am-4pm; ~300 people/grid]



[location with effective range]

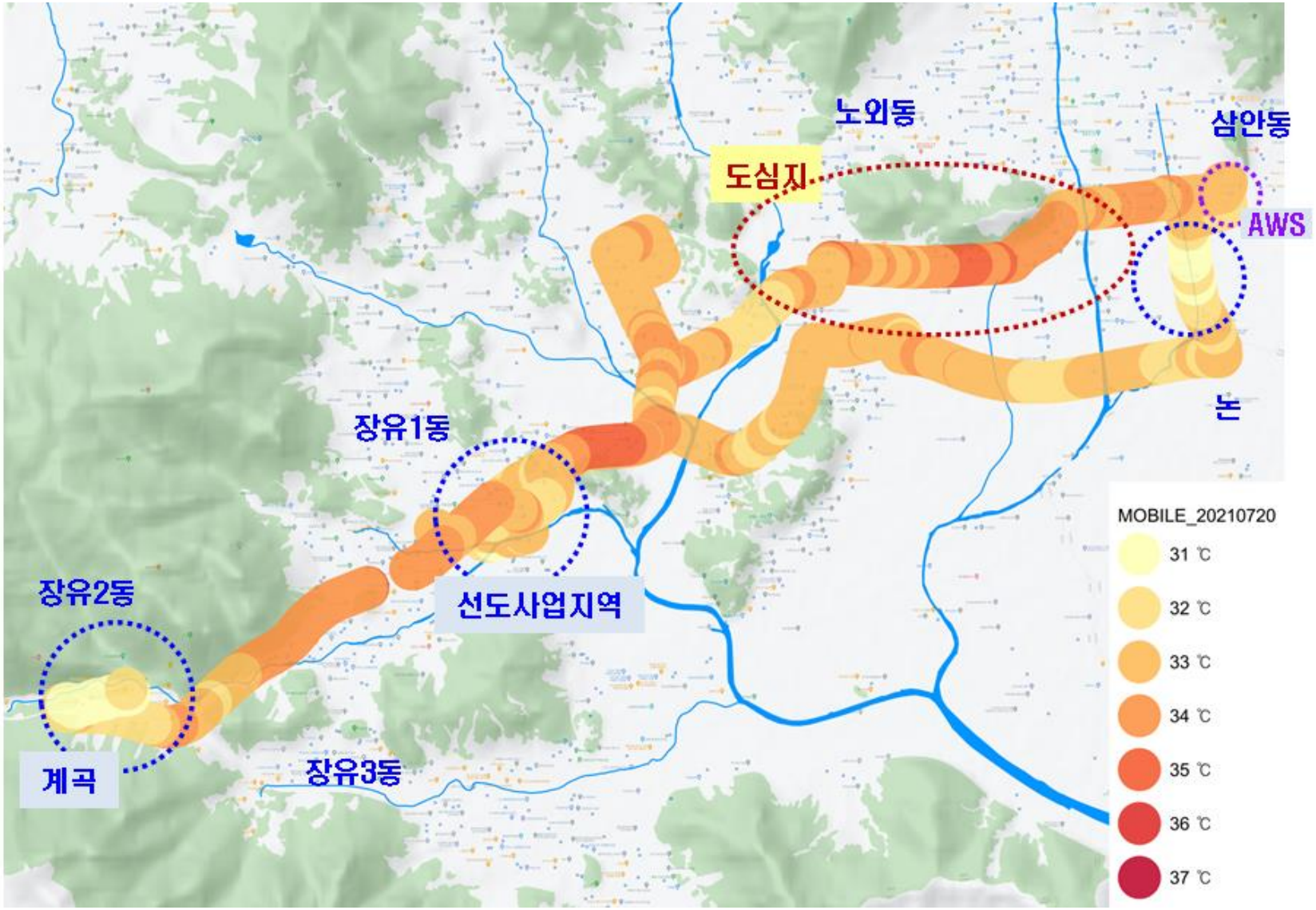
- **inland water**
- **vegetated area**
- **cooling center**



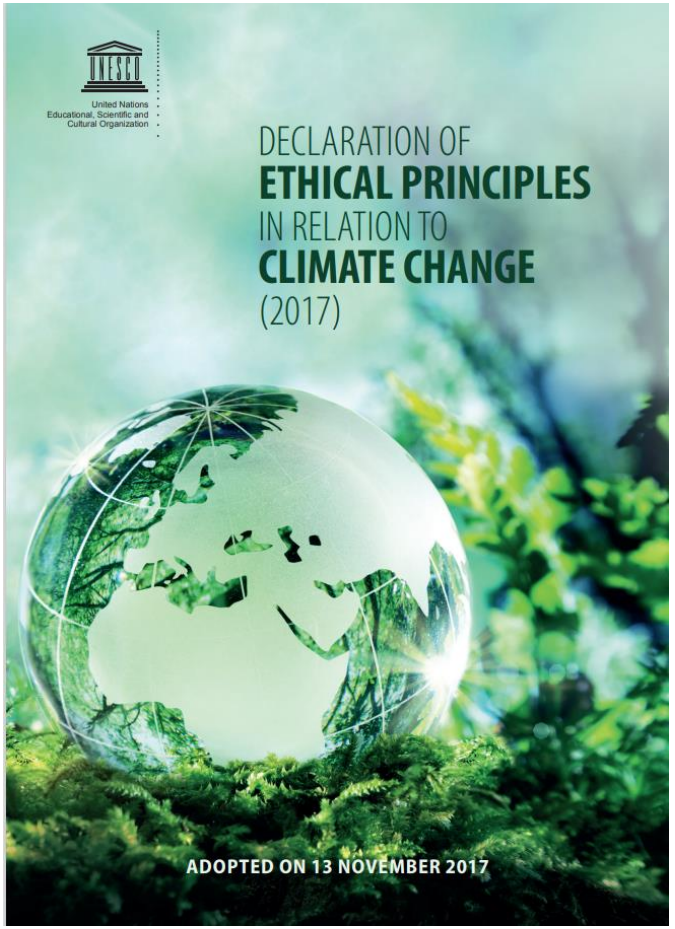


Mobile monitoring

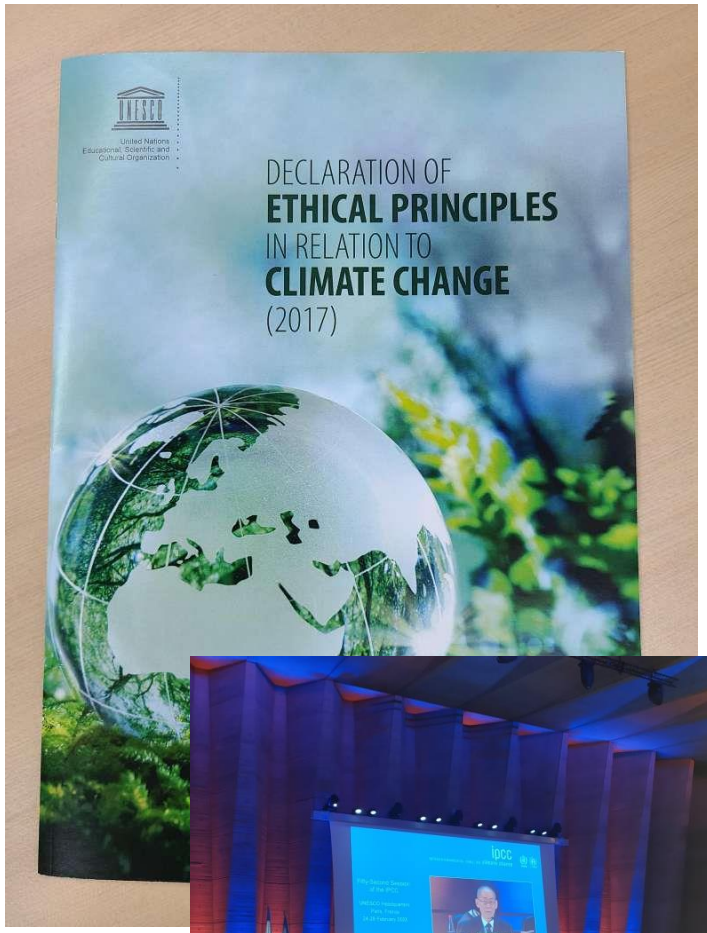
Mobile monitoring



4. Declaration of Ethical Principles in Relation to Climate Change



Declaration of Ethic Principles



- Prevention of harm
  : 위해금지
- Precautionary approach
  : 사전주의 원칙
- Equity and justice
  : 형평성과 정의
- Sustainable development
  : 지속가능발전
- Solidarity
  : 연대
- Scientific knowledge and integrity in decision-making
  : 과학지식과 의사결정의 진실성

Precautionary Approach

- Assumed the risk of climate-change…
- Based on risk management process

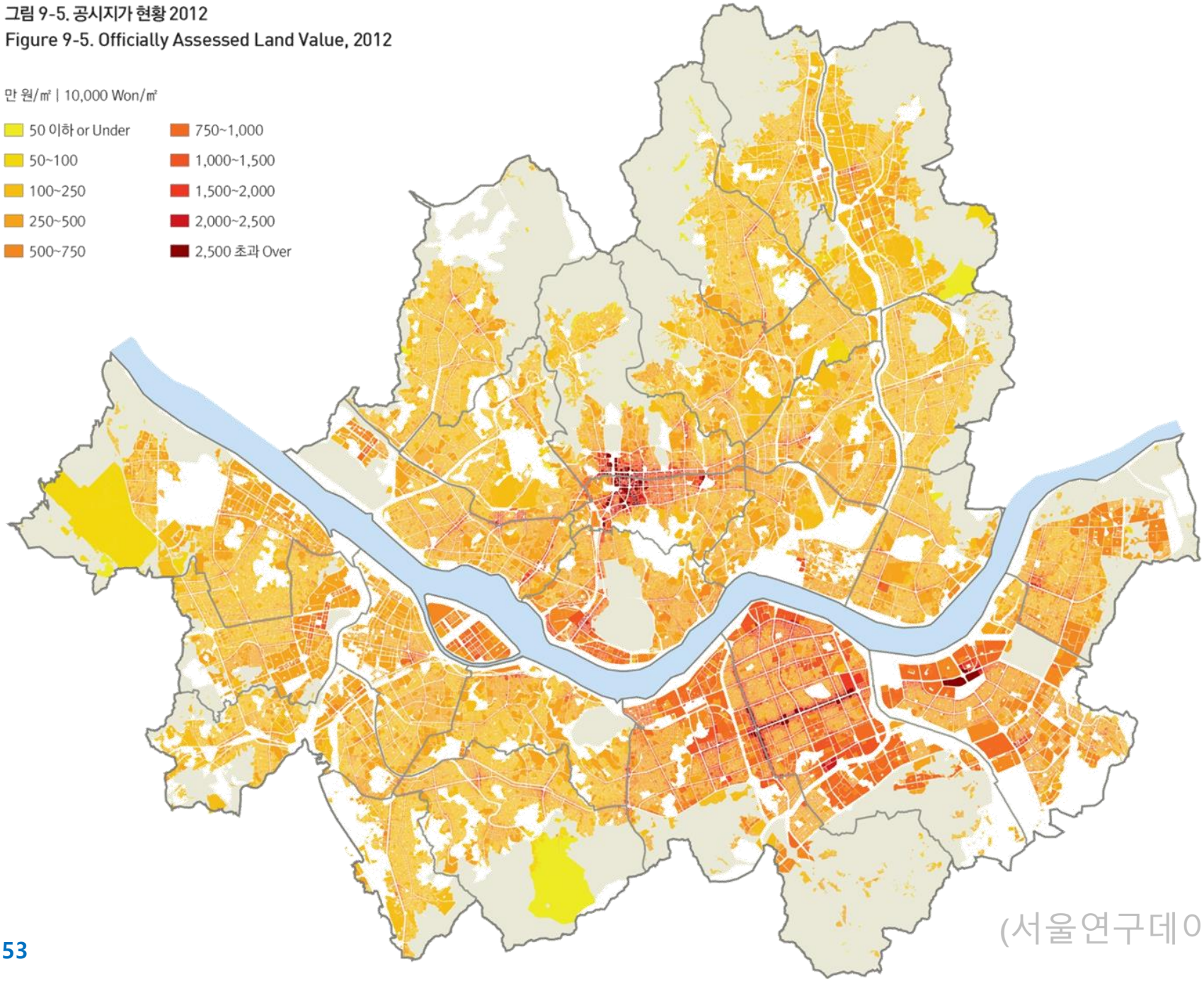
(Rumsfeld)

KNOWN KNOWNS	KNOWN UNKNOWNS
I know…	I know I don't know…
UNKNOWN KNOWNS	**UNKNOWN UNKNOWNS**
I don't know, but somebody does… and they ain't tellin'	Who would have thunk?

Equity and Justice

- Poor and rich,
- Large- and mid- companies, Stranded assets,
- Seoul and the provinces, Metropolitan- and Local,
- Maternal-child health,
- Younger- and Older- generation,

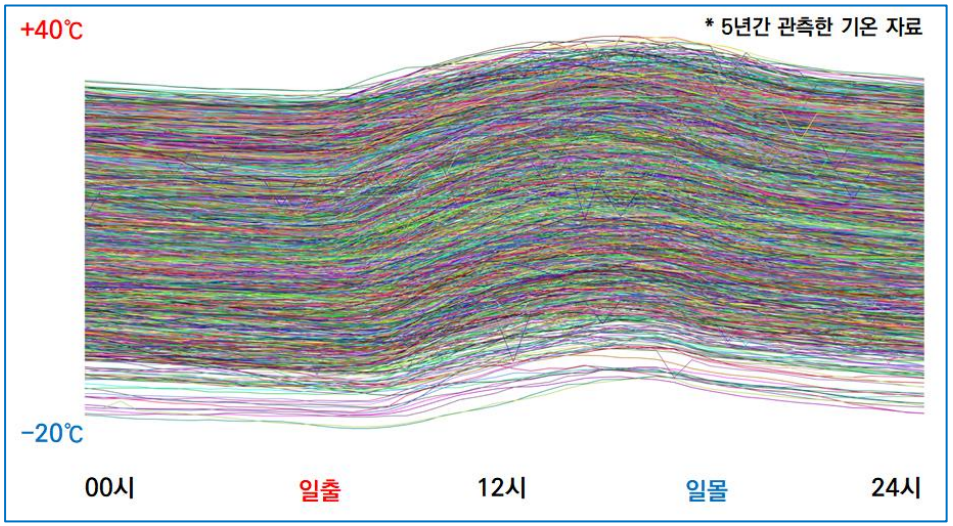
그림 9-5. 공시지가 현황 2012
Figure 9-5. Officially Assessed Land Value, 2012

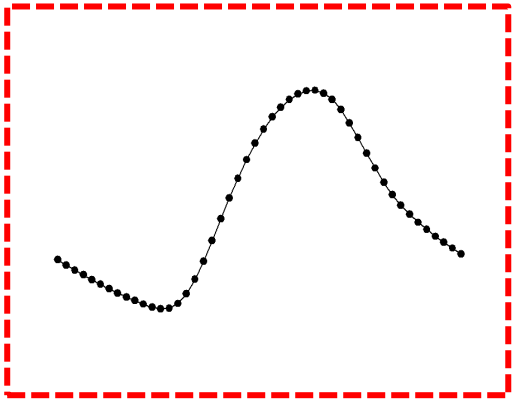


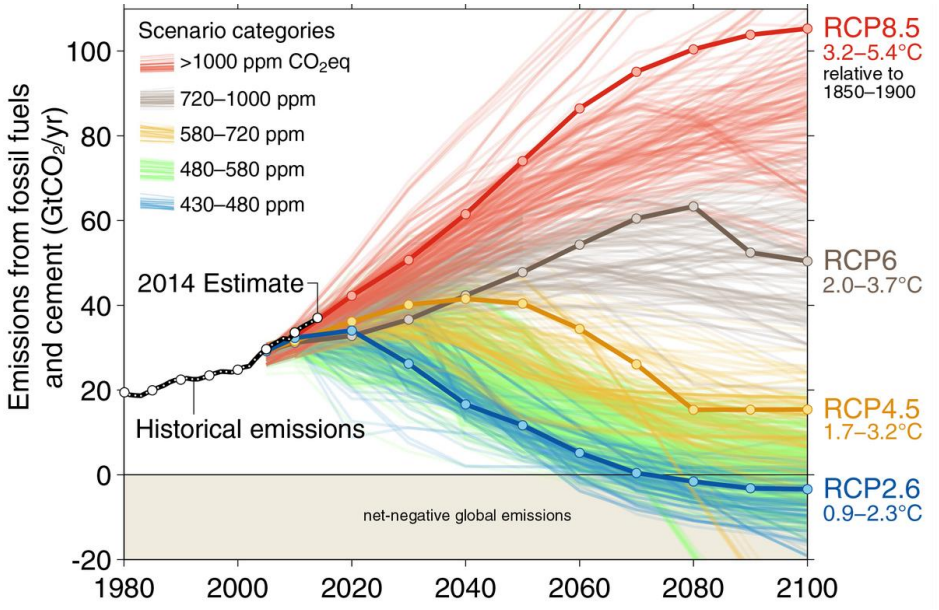
(서울연구데이터)

Scientific Knowledge and Integrity in Decision-Making

- **Scientism,**
- **Uncertainty,**
  : mean, median, error bar,







(Fuss et al., 2014)

5. Discussion

Discussion

- Overview of Climate Change
- Key Concepts for Adaptation
- Adaptation Policy in Korea
- Declaration Ethical Principles in Climate Change

Thank you for your attention!!

Think Globally, Act Locally !
Think Locally, Act Globally !

HONG Je-Woo,
Research Fellow | Ph.D in Atmospheric Science
jwhong@kei.re.kr
+82-10-3123-6183

KEI
Korea Environment Institute

KACCC
Korea Adaptation Center for Climate Change