

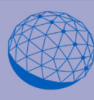
CLIMATE VULNERABILITY OF EAST ASIA

A Regional Derivative Analysis from Climate Vulnerability Monitor 3

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Presented at Regional Workshop on Climate Vulnerability Monitor: Focus on East Asia. 16th Dec 2022. Online. CVF/V20 and IGES.



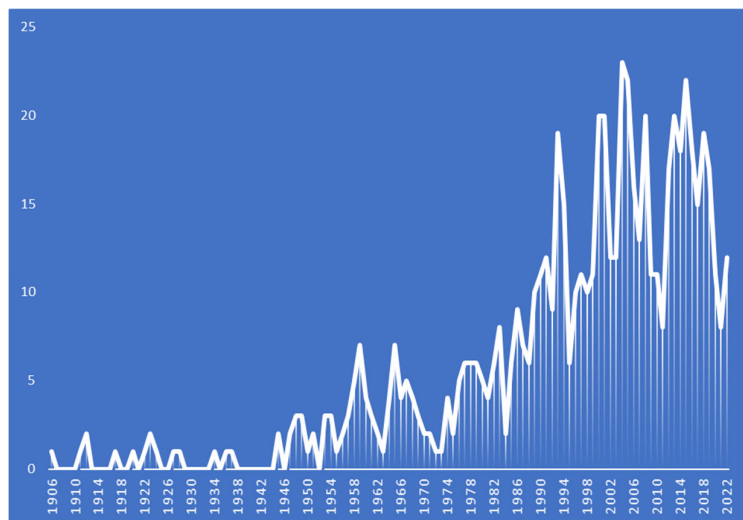
The Unique Context of the East Asia Region

- Seven countries and SARs of East Asia region is comprised of **20.8%** of the world population.
- **Highly urbanized:** **81%** of this population lives in urban areas in the region, it constitutes the **24%** of the urban population of the world. In China, the urbanization grew at a rate of **2.7%** in the past decade.
- AFF contributes to only **4.5%** of the regional GDP while employing **14.8%** of the population signifying the livelihood dependency on this sector.
- **A net food importer:** In terms of weight, the region **imports 10 times** the food that it exports.



The East Asia region has one of the highest population densities in the world, **4015/sq km** against 60/sq km world average)

Disproportionate Losses from Natural Hazards in the Region



The annual number of hydrometeorological and climatic events are on the rise in the region (EM-DAT, 2022).

- The annual number of hydrometeorological and climatic events are on the rise in the region.
- **Disproportionate losses:**
- Since 1900, the region experienced 1319 (**11%** of world events) hydroclimatic and meteorological events.
- Killing **10.4 million** people (**51.6%** of world deaths), and
- Affecting nearly **3.2 billion** population (**40%** of world affected).

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A Globally Connected Region

1. **An economic superpower:** 7 countries contributing to a little above quarter of the (**25.9%**) of the global GDP.
 2. **A crucible of innovation:** **62%** of the total global patents.
 3. **A global manufacturing hub:** **18.2%** of global exports in goods and services (a net exporter).
 4. **A socio-cultural epicentre:** A growing tourist destination with **13%** of global tourist arrivals.
 5. **A benefactor:** **12.4%** of global aid.
- Any climate change impacts in the region will have **transboundary** implications.
 - Adaptation in the region should be treated as a global concern, a **real global public good**.

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Indicator Framework of Climate Vulnerability Monitor 3

Biophysical Indicators	Health Indicators
<u>Temperature</u>	<u>Heat and Health</u>
Daily maximum near-surface air temperature	Exposure of vulnerable populations to heatwaves
Daily minimum near-surface air temperature	Heat and physical activity
Daily mean near-surface air temperature	Loss of labor productivity
<u>Water</u>	Heat-related mortality
Precipitation (rainfall+snowfall)	<u>Wildfires</u>
Snowfall	Exposure to very high or extremely high wildfire risk
Surface runoff	<u>Infectious Diseases</u>
Discharge	Dengue
Maximum daily discharge	Vibrio
Minimum daily discharge	Malaria
Drought Index	<u>Heat and Food Security</u>
Extreme precipitation	Crop yield potential
<u>Wind</u>	Heat and food insecurity
Horizontal wind speed	<u>Economic Indicators</u>
<u>Agriculture</u>	GDP Per Capita Growth
Total soil moisture content	Inflation
Maize yields	Interest Rate
Rice yields (first growing period)	
Rice yields (second growing period)	GDL Vulnerability Index
Soy yields	Economic growth, poverty, education, health
Winter wheat yields	gender inequality, governance, demography and
Spring wheat yields (summer wheat)	access to basic infrastructure

- 32 Indicators
- 1995–2014 as base year.
- Two future scenarios:
 - SSP1-2.6: 1.8°C by 2100, climate action.
 - SSP3-7.0: 3.6°C by 2100, no climate action.
- **GDL Vulnerability Index:** uses 8 socio-economic indicators including economic growth, poverty, education, health, gender inequality, governance, demography and access to basic infrastructure.

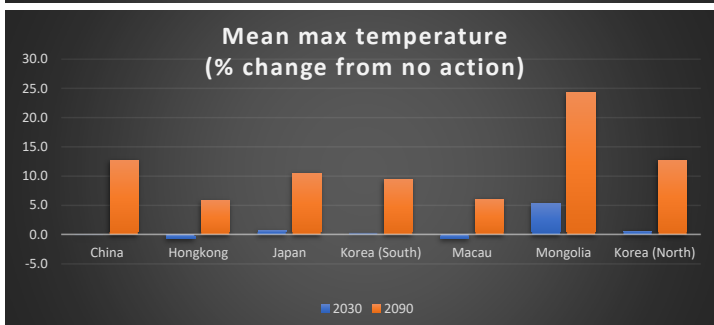
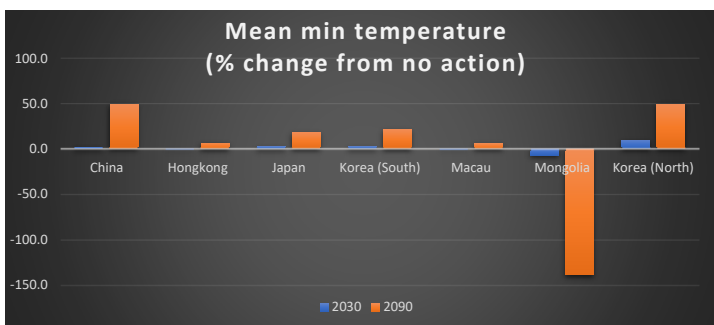
Scenarios Explainer

- **SSP1-2.6:** In the next-best scenario, global CO2 emissions are cut severely, but not as fast, reaching net-zero after 2050. It imagines the same socioeconomic shifts towards sustainability as SSP1-1.9. But temperatures stabilize around 1.8C higher by the end of the century.
- **SSP3-7.0:** On this path, emissions and temperatures rise steadily and CO2 emissions roughly double from current levels by 2100. Countries become more competitive with one another, shifting toward national security and ensuring their own food supplies. By the end of the century, average temperatures have risen by 3.6C.
- [SSP1-1.9: The IPCC's most optimistic scenario, this describes a world where global CO2 emissions are cut to net zero around 2050. Societies switch to more sustainable practices, with focus shifting from economic growth to overall well-being. Investments in education and health go up. Inequality falls. Extreme weather is more common, but the world has dodged the worst impacts of climate change. This first scenario is the only one that meets the Paris Agreement's goal of keeping global warming to around 1.5 degrees Celsius above preindustrial temperatures, with warming hitting 1.5C but then dipping back down and stabilizing around 1.4C by the end of the century.

East Asia Regional Results

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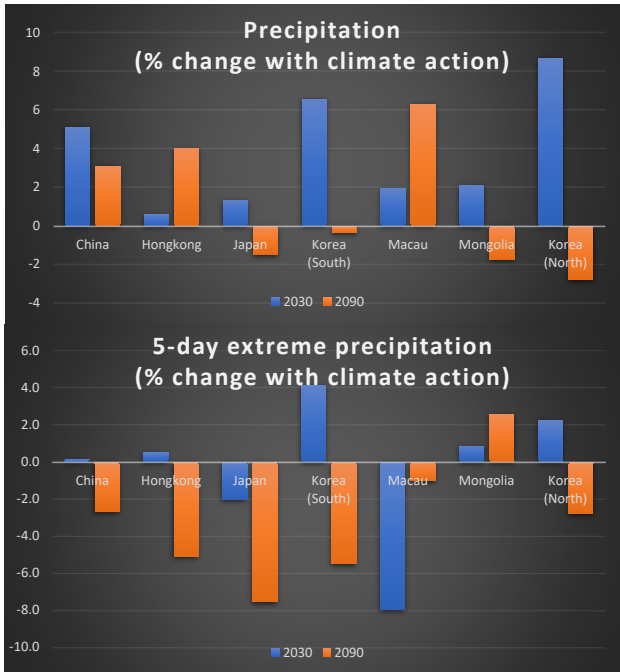
Temperature changes in the region



- The region will experience an increase in mean minimum (**3.35°C** by 2090) and maximum temperatures (**3.43°C** by 2090) (marginally warmer than the rest of the world).
- The increase in max temperatures is more pronounced than min temperatures.
- The increase in max temperatures will be higher in PRK, South Korea & Japan. High min temp in PRK & Japan.
- Climate action will not have significant impact on the maximum temperatures as most countries will show a warmer temperatures.

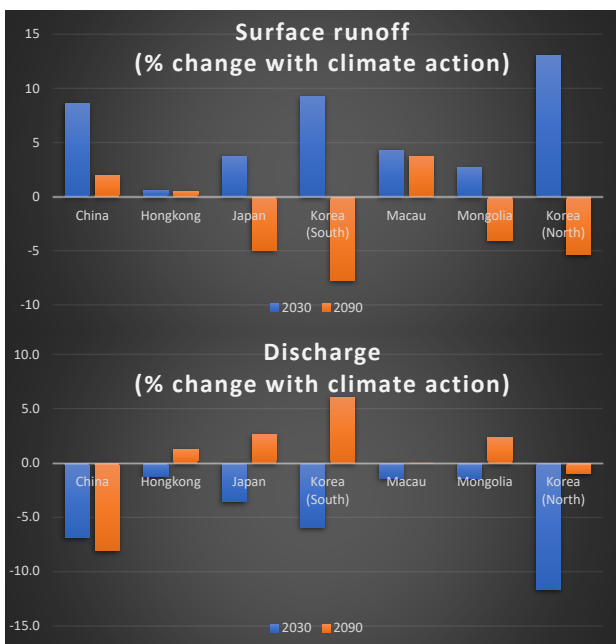
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Precipitation trends in the region



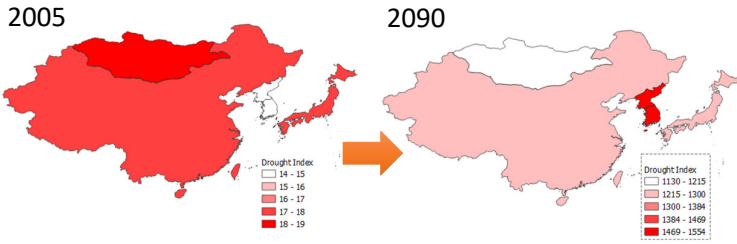
- The region will experience an increase in precipitation.
- The precipitation will increase by **3.6%** and **10.6%** by 2050 and 2090, with the most increase in PRK, China, South Korea, and Mongolia.
- 5-day extreme precipitation will increase in the region by **2.1%** by 2050 and **8.7%** by 2090.
- The climate action will have significant reduction in the extreme precipitation events.

Surface runoff and discharge

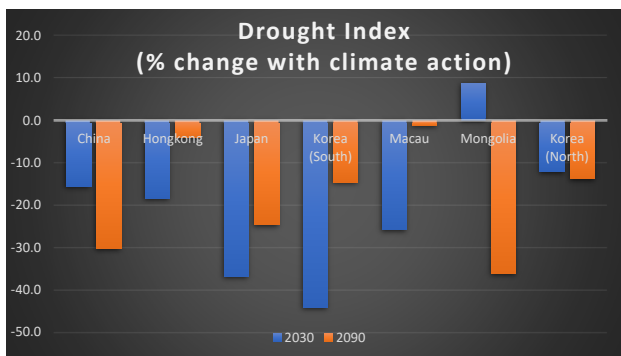


- Consequently, we have seen a net increase in the surface runoff and discharge.
- **Surface runoff:** By 2050 and 2090, the surface runoff in the region will increase by **5%** and **17%** respectively, with the most increase in PRK, Korea and China.
- **Discharge:** This will have a significant effect on the discharge of rivers with most rivers recording an increase in discharge by **2%** by 2050 and **11%** by 2090.
- Climate action will have significant affect on discharge.

East Asia region will become more drier



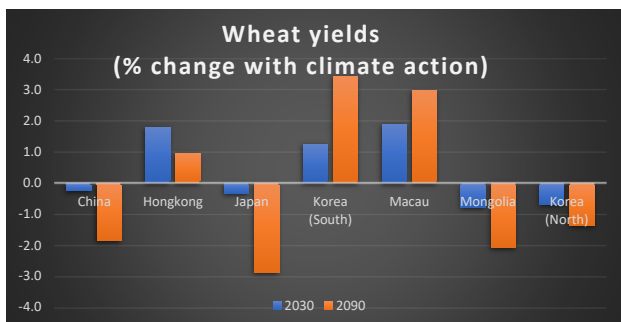
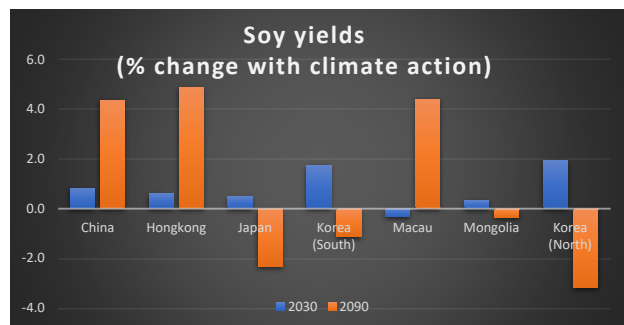
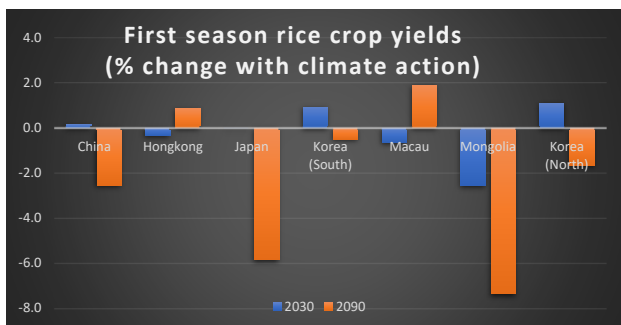
Change in relative drought conditions



- Drought conditions, assessed through Drought Index (SPEI) showed, will increase **15 times** by 2090 without climate action.
- However, the relative drought conditions of countries will also change in the region.
- Even with climate action, the drought index is projected to increase by **8 times** and **10 times** by 2050 and 2090 respectively.
- Climate action will only ameliorate drought conditions by **18%** by 2090.

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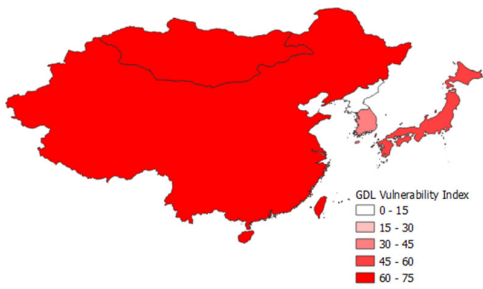
Climate Change Impact on Crop Production



- Compared to 2005, maize yields will decline by **9.4%** in the region by 2090, with the most reduction in China.
- On an average, rice yields in the region will increase under both the scenarios of with (**2.2%**) and without climate action (**4.5%**). A similar increase in soy and wheat yields were also observed.
- Interestingly, rice yields respond poorly with climate action.
- However, wheat and soy yields will show relative improvement with climate action.

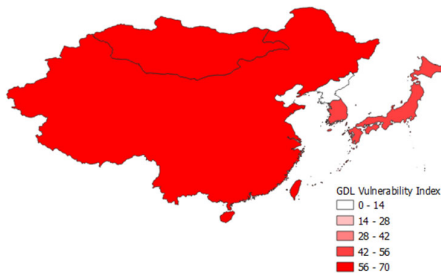
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GDL Vulnerability Index



GDL Vulnerability Index for SSP3-7.0 Scenario, 2030

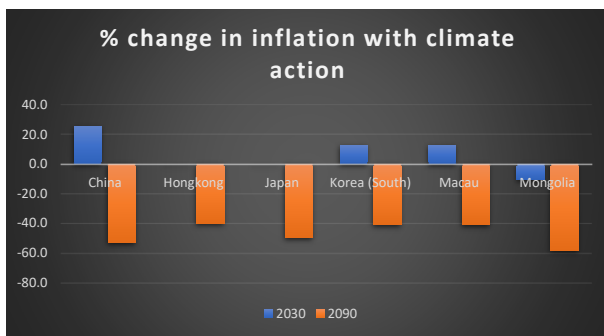
17% benefit of climate action



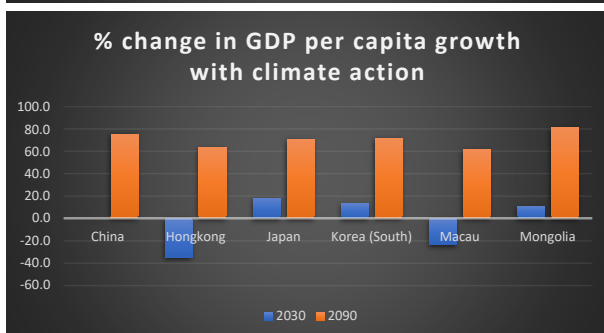
GDL Vulnerability Index for SSP1-2.6 Scenario, 2030

- GDL Vulnerability Index represents the socio-economic vulnerability to climate change.
- The GDL VI showed a **126%** increase by 2090, an increase from 2020 without climate action.
- With Climate action, the VI will increase by **109%**, showing a **17%** benefit of climate action.

Projected Macro Economic Conditions

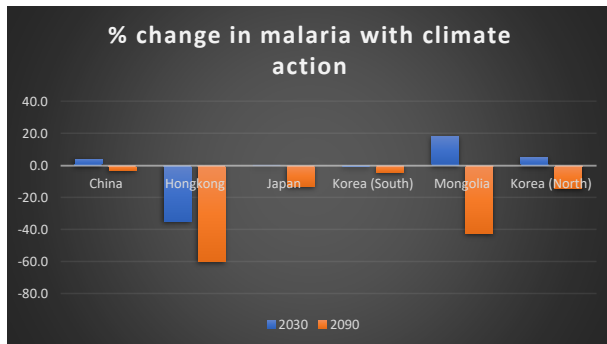
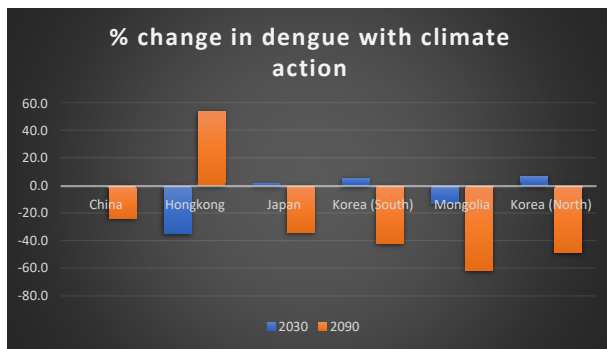


47% reduction with climate action
 71% increase with climate action



- The economic vulnerability of the region was assessed by using three indicators of inflation (consumer price index), GDP per capita growth, and interest rates.
- **Inflation: 4.6 times increase** in the region by 2090 without climate action, with the most increase in China, Mongolia, and Japan.
- **Interest rates: 3 times increase** by 2090 without climate action, most increase in Mongolia, China and Japan.
- **GDP per capita:** Can shrink by **1.9%** by 2030 and as much as **10%** by 2090 without climate action.

Health Impacts of Climate Change



26% reduction with climate action
23% reduction with climate action

- **Heatwave exposure: 9-fold** increase in by 2090 without climate action.
- **Physical activity: 58% reduction** in physical activity by 2030 without climate action, with a similar reduction in labour productivity (**62%**).
- **Heat related mortality: will increase by 5.5 times** in the region without any climate action by 2090 .
- **Infectious diseases: dengue (49%) and malaria (30%)** incidence will increase compared to 2005 without climate action by 2090.
- Climate actions will have significant impact on dengue and malaria infection rates.

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Implications for the Region

- **Increase in surface runoff** can impact the region in the form of reduced soil moisture, increased soil erosion and increased drought and flood incidences. Siltation of reservoirs and reduced hydroelectricity production and reduced flood mitigation effectiveness.
- **Increase in the night temperatures** can have implications for the quality of crop produce due to increased respiration.
- Increased night temperatures with greater heat island effect in urban areas, causing increased demand for power consumption in the region.
- Reduced human performance due to high temperatures can affect the outdoor occupations such as agricultural labour.

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Adaptation Planning Implications for the Region

1. Investing in nature-based solutions must be a high priority
 - Reducing the surface runoff and increasing the infiltration opportunity time, urban resilience, coastal resilience
2. Water resources management is the key
 - Droughts and floods
3. Food security policies need to be strengthened
 - The region is a net importer of food.
4. Engagement with the private sector is the strength
 - Thriving private sector can leapfrog the adaptation technology innovation
5. Adaptation beyond boundaries is a reality
 - Globally connected region, impacts will have rippling effect beyond the region. Trilateral Cooperation (TC), TEMM
6. Influence the adaptation beyond the region to scale up with feedback loops/win-win benefits for the region
 - 24 billion USD towards development assistance a major portion of which goes to the vulnerable countries

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Conclusions

- The findings affect the region by bringing trends that the region has not witnessed so far and the preparedness is needed.
- The findings mean immediate action for the policymakers and/or financial and economic planners in the region.
- The region can best apply the findings from the CVM3 for strengthening the adaptation planning.
- Future iterations of the monitor could be improved by bringing coastal vulnerability, and with sectoral focus.

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Thank You!



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