Comparative Analysis of South Korean and Japanese Climate Adaptation Policies

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Abstract

The past decade of climate policymaking has seen a rise in multi-sectoral 'climate adaptation' policy, with disaster risk assessment becoming critical to policy formation. Despite this global increase in adaptation policies, little scholarship has analyzed adaptation strategies in a comparative fashion, especially in Asia. By comparing policies across three representative risk categories—heatwaves, flooding, and food losses—this paper demonstrates how Korea emphasizes technical, specific tasks, while Japan focuses on generalized ministerial and prefectural delegation to realize adaptation targets. Considering the strengths of opposing adaptation strategies may aid Korea and Japan in tackling climate adaptation in more comprehensive, effective ways.

I. Climate Adaptation, Disaster Risks, and Strategy

What is Climate Adaptation?

The climate crisis has been at the forefront of world politics for the last decade, and for good reason. Warming oceans have bleached coral reefs across the world, small island nations are soon to be swallowed by sea-level rise,[1] and over 1.2 billion people may be displaced by natural disasters and climate change in the next three decades.[2] In order to halt climate change in its tracks, the international community has various bodies and treaties under the United Nations (UN) dedicated to the support of climate research and the lowering of carbon emissions across the world economy. Climate change mitigation refers to the efforts and actions taken to either 1) decrease the

[1] Mathew E. Hauer et al., "Sea-Level Rise and Human Migration," *Nature Reviews Earth & Environment* 1, no. 1 (January 2020), 35, https://doi.org/10.1038/s43017-019-0002-9, 35; Thomas J. F. Goreau and Raymond L. Hayes, "Global Warming Triggers Coral Reef Bleaching Tipping Point," *Ambio* 50, no. 6 (June 1, 2021), 1137–40, https://doi.org/10.1007/s13280-021-01512-2.

[2] "Over One Billion People at Threat of Being Displaced by 2050 Due to Environmental Change, Conflict and Civil Unrest" (Institute for Economics & Peace, 2020), https://www.economicsandpeace.org/wp-content/uploads/2020/09/Ecological-Threat-Register-Press-Release-27.08-FINAL.pdf.

amount of greenhouse gas emissions released into the atmosphere, or 2) enhance (natural) carbon sinks, like forests.[3] However, mitigation alone is not enough. The effects of climate change are already present worldwide, shifting the weather patterns and the ecosystems of places that have been stable for centuries into new, uncharted waters. Communities around the world have begun to face – among many drastic changes – new, high temperatures, shifting agricultural seasons, and differing trends in precipitation. The people of the world cannot utilize the same practices of decades and centuries past to survive with these already-changed patterns. Thus, the concept of 'climate adaptation' was created as the UNFCCC's response.

> Adaptation refers to adjustments in ecological, social or economic systems in response to actual or expected climatic stimuli and their effects. It refers to changes in processes, practices and structures to moderate potential damages or to benefit from opportunities associated with climate change.[4]

Climate adaptation entered the political vernacular in 2011 with the establishment of the Cancun Adaptation Framework. The Framework was intended to strengthen adaptation ventures first in developing countries, which lacked the capital and often infrastructure to respond to a changing climate in the same way that richer countries could.[5] This was to be done through international cooperation, including increased financial and technical support through a Green Climate Fund and Technology Mechanism, the establishment and strengthening of regional networks, and creation of a process for least developed countries and developing countries to develop national adaptation plans. The 2011 Agreements mandated the creation of the Adaptation Committee under the UNFCCC in order to promote implementation of adaptation policies under both the Cancun Framework and the greater UNFCCC.

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[3]"Introduction to Mitigation | UNFCCC," United Nations Framework Convention on Climate Change, accessed November 30, 2023, https://unfccc.int/topics/introduction-to-mitigation.
[4]"Adaptation and Resilience," United Nations Framework Convention on Climate Change, accessed November 21, 2023, https://unfccc.int/topics/adaptation-and-resilience/the-big-picture/introduction.
[5]Lucas Di Pietro Paolo, "From the Cancun Adaptation Framework to the Paris Agreement," in *Negotiating Climate Change Adaptation: The Common Position of the Group of 77 and China*, ed. María del Pilar Bueno Rubial and Linda Siegele, Springer Climate (Cham: Springer International Publishing, 2020), 89, https://doi.org/10.1007/978-3-030-41021-6_8.

Climate adaptation in the early years was primarily concerned with Least Developed Countries (LDCs) and developing nations which were assumed to require UN assistance in combatting the effects of climate change. Although wealthy, "developed" nations have been responsible for the large majority of historical carbon emissions,[6] LDCs and developing countries have suffered disproportionately more from heatwaves, pollution, and other crises due to the lack of infrastructure, capital, and government support available to combat such ills.[7] An iterative adaptation process for climate was then defined for said nations in four steps by the UNFCCC Adaptation Committee. The steps were: 1) assessing impacts, vulnerability, risks, and resilience; 2) planning for adaptation; 3) implementing adaptation measures; and 4) monitoring and evaluating adaptation. Although this is the "ideal" process to establish adaptation policies, insufficient data, funding woes, power politics, and past disaster experiences can make the creation of effective, robust, and just climate adaptation policy much more difficult than the iterative process suggests.[8]

Governments worldwide have come to understand that climate adaptation will be a necessary part of domestic policy no matter the country's geographic location. Although Global North countries are not included on the UN Environment Programme list of countries with National Adaptation Plans, many states have created domestic plans just the same. The US mandated all federal agencies to produce Climate Adaptation Plans under its Executive Order (EO) 14008: Tackling the Climate Crisis at Home and Abroad. France recently reached the terminus of its second French National Adaptation Plan for Climate Change in 2022, having focused on its main economic sectors—agriculture, industry, and tourism—as well as its territories. Switzerland's Adaptation Action Plan (2020-2025) mandates seventy-five measures at the federal level across issues from biodiversity management to spatial development.

Disaster Risks for Adaptation

There is no cut-and-dry method for adaptation action plans, especially considering the extreme variability in domestic needs across the world. However, the

[6]Simon Evans, "Analysis: Which Countries Are Historically Responsible for Climate Change? - Carbon Brief," May 10, 2021, https://www.carbonbrief.org/analysis-which-countries-are-historically-responsible-for-climate-change/.

[7] "Adaptation and Resilience."

[8]Laura Kuhl, "Policy Making under Scarcity: Reflections for Designing Socially Just Climate Adaptation Policy," *One Earth* 4, no. 2 (2021), 202–12.

IPCC produced a 2012 special report—*Managing the Risks of Extreme Eventsand Disasters to Advance Climate Change Adaptation* – to synthesize the literature on how disaster risks manifest in order to aid policymakers in forming their adaptation frameworks. Disaster risks are defined as the following by the IPCC:

> "...the likelihood over a specified time period of severe alterations in the normal functioning of a community or a society due to hazardous physical events interacting with vulnerable social conditions, leading to widespread adverse human, material, economic, or environmental effects that require immediate emergency response to satisfy critical human needs and that may require external support for recovery."[9]

Disaster risks are informed by three key characteristics: 1) weather and climate events (and their extremes), 2), vulnerabilities—the propensity or predisposition to be

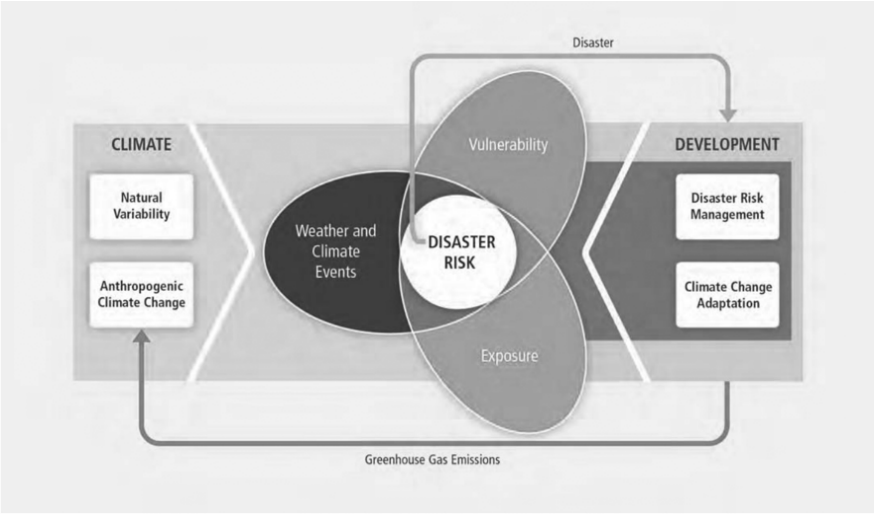

Figure 1: Illustration of how weather and climate events, exposure, and vulnerability interact to create disaster risk (SREX 2012)

adversely affected—and 3) exposure—the presence of people; livelihoods; environmental services and resources; infrastructure; or economic, social, or cultural

[9]Christopher B Field et al., *Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation: Special Report of the Intergovernmental Panel on Climate Change* (Cambridge University Press, 2012), 31.

assets in places that could be adversely affected.[10] As demonstrated in Figure 1, the magnitude of these three variables in tandem creates disaster risk.

Adaptation Strategies

When governments have a high level of understanding for disaster risks, they can proceed to create country-tailored disaster risk management and climate change adaptation policies. Climate adaptation strategies often reflect much more than just basic protection of civil societies' health and safety—they are determined by culture, history, governmental structure, funding mechanisms, and international cooperation. Adaptation strategies can vary by sector inclusivity; some countries publish and promote multi-sectoral adaptation strategies—like much of the European Union, for example—while other countries produce sectorally focused approaches. The Netherlands approaches adaptation through its Dutch Delta Programme, a sectoral programme that focuses primarily on water management.[11] Other national strategies approach climate adaptation through a particular lens or set of lenses—Brazil, for example, focuses on ecological restoration and nature-based solutions (NBSs) as a product of their environment and land-use history.[12] Although national adaptation strategies have been of interest in scholarly analysis, many papers published in the past fifteen years that focus on country-specific adaptation policies leave out East Asia, focusing instead on the Global North or South. Furthermore, few comparative studies have focused on East Asia—and none compare South Korea and Japan.[13][14]

II. The Comparison

[10] IPCC, 2012.

[11] Anja Bauer and Reinhard Steurer, "National Adaptation Strategies, What Else? Comparing Adaptation Mainstreaming in German and Dutch Water Management," *Regional Environmental Change* 15, no. 2 (February 1, 2015), 341–52, https://doi.org/10.1007/s10113-014-0655-3.

[12] Mercedes M. C. Bustamante et al., "Ecological Restoration as a Strategy for Mitigating and Adapting to Climate Change: Lessons and Challenges from Brazil," *Mitigation and Adaptation Strategies for Global Change* 24, no. 7 (October 1, 2019), 1249–70, https://doi.org/10.1007/s11027-018-9837-5.

[13] Seunghan Lee, "Towards a Thick Understanding of the Barriers to National Climate Adaptation Policy Process: The Cases of South Korea and the United Kingdom" (University of Leeds, 2022).

[14] Rasoul Yousefpour, N. Nakamura, and N. Matsumura, "Forest Management Approaches for Climate Change Mitigation and Adaptation: A Comparison between Germany and Japan," *Journal of Sustainable Forestry* 39, no. 6 (2020), 635–53.

First, this section will provide a rationale for comparing Japan and Korea. Next, it will evaluate three key disaster risks shared by the two countries, following each risk with the adaptation policies undertaken by each government. After developing an understanding of Japan and Korea's overarching approach to adaptation policy, this section will discuss the key similarities and differences between the two countries' strategies in adaptation policy.

Basis for Comparison: Why Compare the Two Countries?

Despite fraught bilateral ties due to long-lasting historical tensions, Japan and South Korea (hereafter referred to as both South Korea and Korea) have long been contrasted in socio-political studies[15] for a variety of reasons. First, the two countries both have powerful economies and similar GDPs per capita. Japan is currently the third largest economy, with a GDP per capita of $33,815, and Korea, the world's thirteenth largest economy with a GDP per capita of $32,254.[16] As developed, dynamic economies, both countries share the financial capabilities to pursue adaptation policy. Japan and Korea are also well known for their shared demographic concerns. South Korea holds claim to the lowest total fertility rate in the world and is an aged society. Aged societies occur when the share of elderly people (65 years and older) is more than 15% of the population – Korea hit the 15% mark in 2019. Japan is already a "super-aged" society,[17] with a share of 28.4% – and both countries are predicted to gain even higher shares of elderly by 2050.[18] Huge populations of the elderly in both South Korea

[15] Eun Woo Nam et al., "Health Promotion Policies in the Republic of Korea and Japan: A Comparative Study," *Promotion & Education* 13, no. 1 (2006), 20–28; KG Krechetnikov and NM Pestereva, "A Comparative Analysis of the Education Systems in Korea and Japan from the Perspective of Internationalization.," *European Journal of Contemporary Education* 6, no. 1 (2017), 77–88; Wei-Ming Chen, Hana Kim, and Hideka Yamaguchi, "Renewable Energy in Eastern Asia: Renewable Energy Policy Review and Comparative SWOT Analysis for Promoting Renewable Energy in Japan, South Korea, and Taiwan," *Energy Policy* 74 (2014), 319–29; Se Jung Park and Yon Soo Lim, "Information Networks and Social Media Use in Public Diplomacy: A Comparative Analysis of South Korea and Japan," *Asian Journal of Communication* 24, no. 1 (January 2, 2014), 79–98, https://doi.org/10.1080/01292986.2013.851724; Yuliya Dronina et al., "Health System Development and Performance in Korea and Japan: A Comparative Study of 2000–2013," *Journal of Lifestyle Medicine* 6, no. 1 (March 2016), 16–26, https://doi.org/10.15280/jlm.2016.6.1.16.

[16] "World Bank Open Data," World Bank Open Data, 2022, https://data.worldbank.org.

[17] Super-aged societies occur when the share of elderly is over 20% of a country's population.

[18] Axel Klein and Hannes Mosler, "The Oldest Societies in Asia: The Politics of Ageing in South Korea and Japan," in *Global Political Demography: The Politics of Population Change*, ed. Achim Goerres and Pieter Vanhuysse (Cham: Springer International Publishing, 2021), 195–217, https://doi.org/10.1007/978-3-030-73065-9_8.

and Japan invite demographic concerns about maintaining a healthy, sizable workforce and overloading state capacity to care for the elderly.[19] This is especially vital to consider for adaptation policies as the elderly are often the most vulnerable; high health risks, lack of mobility, and low amounts of disposable income predispose them to higher levels of injury and disease in the face of climate change.[20] Japan and Korea also maintain kindred statutes on the security front. Both are considered strong allies of the US in the Indo-Pacific and are often courted by the US as such. Although both countries usually enjoy strong economic ties to China, security issues regarding maritime disputes in the South China Sea as well as military disagreements, such as Chinese anger over Korea's THAAD deployment, complicate both Korea and Japan's relationship with the country.[21] As climate change becomes a part of security agendas, regional alliances and partners may become key to adaptation policy in technology transfers, joint projects, and information sharing.[22] The above similarities all play into Korea and Japan's ability to pursue climate adaptation policies. This is the new front of similarities for the countries—disaster risks from climate change.

Korea is currently on the third iteration of its National Climate Adaptation Plan, which has been updated every five years since 2010. Alongside the Ministry of Environment published document, risk assessments and "crisis plans" have been pushed forward in tandem with the five-year plans. In Japan, a legal requirement for adaptation measures was passed in 2018 with the Climate Change Adaptation Law, which also mandated international cooperation and national plans every five years. Korea's key goals in their latest iteration are to 1) enhance adaptive capacity to climate risks; 2) to strengthen monitoring, forecasting and evaluation systems; and 3) mainstream climate change adaptation. Japan's key goals are 1) the stabilization of people's life, 2) the sound development of society and economy, and 3) the preservation of the natural environment. Korea's key adaptation goals are heavily focused on specific

[19]Kee Whan Kim and Oh Seok Kim, "Super Aging in South Korea Unstoppable but Mitigatable: A Sub-National Scale Population Projection for Best Policy Planning," *Spatial Demography* 8, no. 2 (July 1, 2020), 155–73, https://doi.org/10.1007/s40980-020-00061-8.

[20]Jason L Rhoades, James S Gruber, and Bill Horton, "Developing an In-Depth Understanding of Elderly Adult's Vulnerability to Climate Change," *The Gerontologist* 58, no. 3 (May 8, 2018), 567–77, https://doi.org/10.1093/geront/gnw167.

[21]Steven Borowiec, "THAAD Missile System Agitates South Korea-China Ties," Nikkei Asia, June 22, 2023, https://asia.nikkei.com/Politics/International-relations/THAAD-missile-system-agitates-South-Korea-China-ties.

[22]Hannah M. Teicher, "Climate Allies : How Urban/Military Interdependence Enables Adaptation" (Thesis, Massachusetts Institute of Technology, 2019), https://dspace.mit.edu/handle/1721.1/122193.

infrastructural and technical changes, while Japan's stated goals are focused on more broad strokes of civilian health, sustainable development, and NBS. These broad adaptation policies are also intended to address cross-sectoral vulnerabilities that come with said risks.

Disaster Risks

Disaster risks, as explained in the previous section, occur when a hazardous climate event interacts with a society and its vulnerable conditions, leading to adverse effects on humans, materials, economies, or ecosystems that require emergency response. The three disaster risks of heatwaves, flooding, and food losses represent some of the most frequent natural hazards in Korea and Japan between 1980 and 2020.[23] The policy responses to these three disaster risks will serve as representative case studies to determine Japanese and Korean climate adaptation frameworks.

Disaster Risk 1: Heatwaves and Human Health

The first key disaster risk Korea and Japan share is susceptibility to heat-related illnesses from increasing extreme heat events. Climate change is set to exacerbate extreme heat events, or heatwaves, worldwide.[24] Characterized by consecutive nights—usually three or more—of high minimum temperatures caused by stagnant, warm air masses, heatwaves can cause both heat-related illnesses—such as heat cramps, heat syncope, heat exhaustion, and heat stroke—as well as death.[25] Vulnerable populations have been proven to experience increased mortality and heat-related illnesses: such groups include socio-demographic categories like the elderly, children, females, low socioeconomic status, low education levels, and rural populations, and those with medical conditions like cardiopulmonary diseases, diabetes, or mental diseases. [26]

[23]"Korea, Rep.," World Bank Climate Change Knowledge Portal, accessed December 16, 2023, https://climateknowledgeportal.worldbank.org/; Japan," World Bank Climate Change Knowledge Portal, accessed December 16, 2023, https://climateknowledgeportal.worldbank.org/.

[24]S. E. Perkins-Kirkpatrick and P. B. Gibson, "Changes in Regional Heatwave Characteristics as a Function of Increasing Global Temperature," *Scientific Reports* 7, no. 1 (September 25, 2017), 12256, https://doi.org/10.1038/s41598-017-12520-2.

[25]George Luber and Michael McGeehin, "Climate Change and Extreme Heat Events," *American Journal of Preventive Medicine*, Theme Issue: Climate Change and the Health of the Public, 35, no. 5 (November 1, 2008), 429–35, https://doi.org/10.1016/j.amepre.2008.08.021.

[26]Fadly Syah Arsad et al., "The Impact of Heatwaves on Mortality and Morbidity and the Associated Vulnerability Factors: A Systematic Review," *International Journal of Environmental Research and Public Health* 19, no. 23 (December 6, 2022), 16356, https://doi.org/10.3390/ijerph192316356.

Heatwaves have caused: up to 70,000 excess deaths in the 2003 European heatwave;[27] heat-related deaths for American adults aged 65 and older increasing by 88% in 2018-2022 compared to 2000-2004 numbers;[28] and have been associated with wildfire increases from the Pantanal[29] to Portugal.[30]

Japan and Korea are experiencing some of these same trends. Heat-related deaths are on the rise in both South Korea and Japan, with 2023's summer death toll more than triple that of the same period last year in South Korea.[31] World Scout Jamboree—an international youth event hosted in Korea's Buan—saw hundreds of heatstroke cases, with the event ending in the evacuation of tens of thousands of teenagers.[3233] Son et al. find that total mortality in seven major cities in Korea from 2000 to 2007 increased 4.1% during heatwaves compared with non-heat-wave days, with an 8.4% increase estimated for Seoul.[34] Estimated mortality was higher for heatwaves that were more intense, longer, or earlier in summer, and estimated risks were higher for women versus men, older versus younger residents, and those with no education versus some education. Over one week in the summer of 2019, over 18,000 Japanese citizens

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[27]Daniel Mitchell et al., "Attributing Human Mortality during Extreme Heat Waves to Anthropogenic Climate Change," *Environmental Research Letters* 11, no. 7 (July 2016), 074006, https://doi.org/10.1088/1748-9326/11/7/074006.

[28]Marina Romanello et al., "The 2023 Report of the Lancet Countdown on Health and Climate Change: The Imperative for a Health-Centred Response in a World Facing Irreversible Harms," *The Lancet* 402, no. 10419 (December 16, 2023), 2346–94, https://doi.org/10.1016/S0140-6736(23)01859-7.

[29]Renata Libonati et al., "Assessing the Role of Compound Drought and Heatwave Events on Unprecedented 2020 Wildfires in the Pantanal," *Environmental Research Letters* 17, no. 1 (January 2022), 015005, https://doi.org/10.1088/1748-9326/ac462e.

[30]J. Parente et al., "Heat Waves in Portugal: Current Regime, Changes in Future Climate and Impacts on Extreme Wildfires," *Science of The Total Environment* 631–632 (August 1, 2018), 534–49, https://doi.org/10.1016/j.scitotenv.2018.03.044.

[31]Min Joo Kim and Julia Mio Inuma, "As Extreme Heat Hits South Korea and Japan, Death Toll Rises Sharply," *Washington Post*, August 2, 2023, https://www.washingtonpost.com/world/2023/08/02/south-korea-japan-heat-wave-extreme-weather/.

[32]"Hundreds Suffer Heat Exhaustion at World Scout Jamboree in South Korea - August 4, 2023 | Reuters," accessed November 29, 2023, https://www.reuters.com/pictures/hundreds-suffer-heat-exhaustion-world-scout-jamboree-south-korea-2023-08-04/5NN73VCQDBLJZC5GX2GMFLSWWU/.

[33]Jae-Seung Lee and Jeong Won Kim, "Assessing Strategies for Urban Climate Change Adaptation: The Case of Six Metropolitan Cities in South Korea," *Sustainability* 10, no. 6 (June 2018), 2065, https://doi.org/10.3390/su10062065.

[34]Ji-Young Son et al., "The Impact of Heat Waves on Mortality in Seven Major Cities in Korea," *Environmental Health Perspectives* 120, no. 4 (April 2012), 566–71, https://doi.org/10.1289/ehp.1103759.

were hospitalized due to heat-related illnesses, while fifty-seven lost their lives,[35] and in late June of 2022, Japan experienced its worst heatwave ever recorded—fifty-eight days long.[36] In a nationwide assessment from 1973 to 2015, Kim et al. determined that mortality increased 9-10% during hot nights in comparison with non-hot nights across all forty-seven prefectures of Japan.[37] Furthermore, the study found an exceptionally strong association between elderly people's deaths and hot nights.

Heatwaves are predicted to increase in intensity and duration moving forward, with varying rises in frequency determined by region.[38] The dangers of increasing heatwaves due to climate change have been quantified through and predicted with many tools, including the World Bank's Climate Change Knowledge Portal. Heat risk is the potential for adverse consequences on lives, livelihoods, health, and other aspects of society[39] due to heatwaves.[40] Heat risks in Korea and Japan are set to rise higher and higher across multiple provinces and prefectures over the next sixty-plus years—with some regions already reaching the highest risk factors, as demonstrated in the figure below. The World Bank delineates the maximum risk factor per province and prefecture with a compound risk factor scale from zero to four based on temperature-based heat and population. Regions with no risk factor receive a zero, while highest risk regions receive a four out of four. Some prefectures in Japan have already crossed the threshold to a risk factor of four—Aichi and Osaka.

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[35]"57 Dead and 18,000 Taken to Hospitals in One Week amid Japan Heat Wave," *The Japan Times*, August 6, 2019, https://www.japantimes.co.jp/news/2019/08/06/national/57-dead-18000-taken-hospitals-one-week-amid-japan-heat-wave/.

[36]"Japan Swelters in Its Worst Heatwave Ever Recorded," June 29, 2022, https://www.bbc.com/news/world-asia-61976937; "熱中症情報 | 総務省消防庁," accessed December 16, 2023, https://www.fdma.go.jp/disaster/heatstroke/.

[37]Satbyul Estella Kim et al., "Mortality Risk of Hot Nights: A Nationwide Population-Based Retrospective Study in Japan," *Environmental Health Perspectives* 131, no. 5 (May 2023), 057005, https://doi.org/10.1289/EHP11444.

[38]S. E. Perkins-Kirkpatrick and P. B. Gibson, "Changes in Regional Heatwave Characteristics as a Function of Increasing Global Temperature," *Scientific Reports* 7, no. 1 (September 25, 2017), 12256, https://doi.org/10.1038/s41598-017-12520-2.

[39] Ecosystems and species, economic, social and cultural assets, services (including environmental services) and infrastructure.

[40]"Korea, Rep."

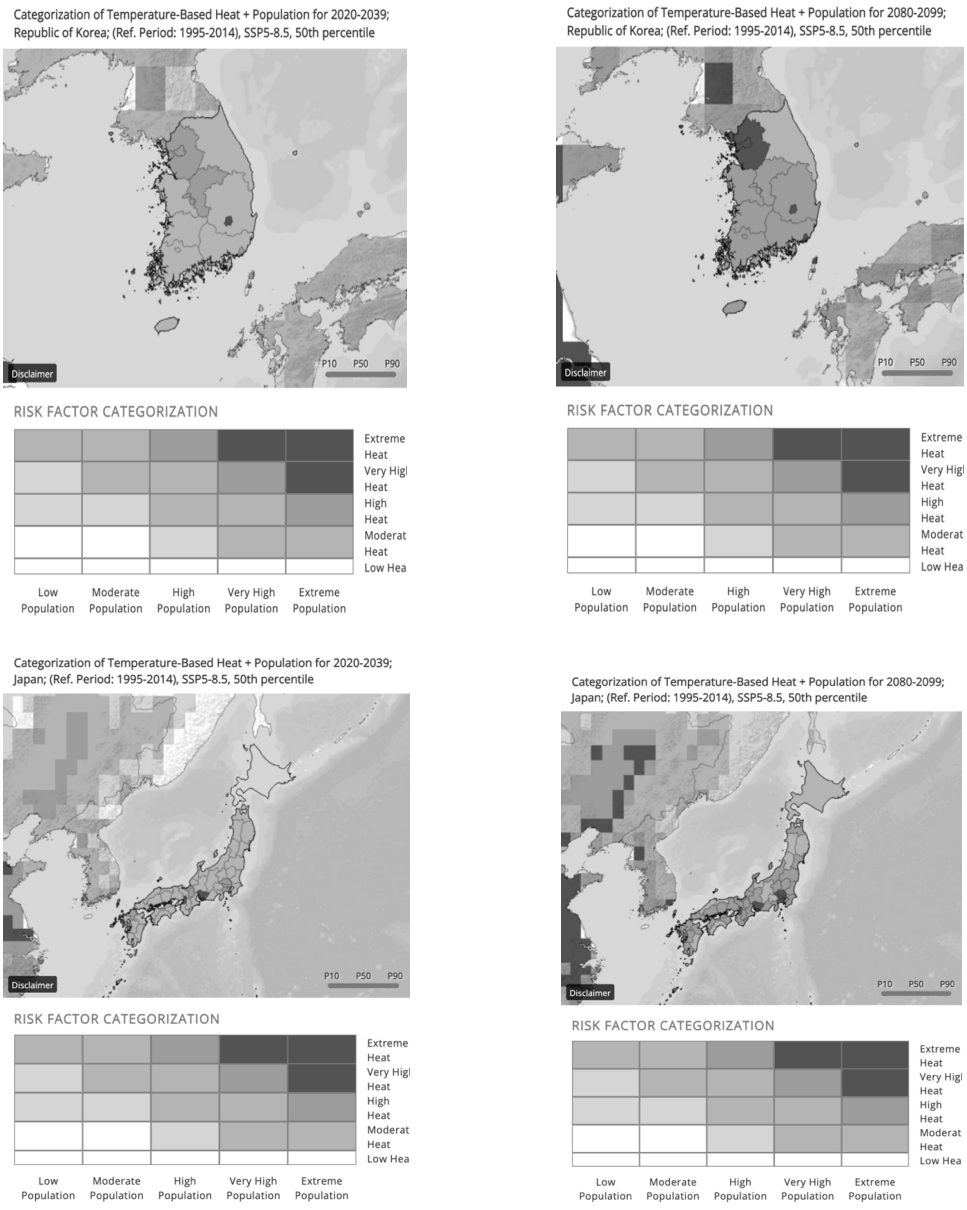

Figure 2: Comparison of Korean and Japanese heat risk factors by province and prefecture respectively, from 2020-2039 to 2080-2099

Adaptation policies are thus crucial for governments to protect their populations from the risks of heat. First, each country's policies for adaptation to heatwaves are categorized under three representative policy types, followed by a

sampling of policies from nationally and internationally published documents on climate adaptation policies, including but not limited to: South Korea's *Third National Climate Change Adaptation Plan*; [41] and Japan's *Eighth National Communication under the United Nations Framework Convention on Climate Change*.[42]

Korea

Korea's approach to heatwaves and illnesses focuses on specific, numerical measures for adapting to heatwaves, with policies that fall under one of the following three categories: 1) digital and technical support tools, 2) deployment of physical items and new infrastructure, and 3) preparation for guidelines and projects. These categories were determined after careful review and consideration of the published policies (as delineated in Figure 3) across different sectoral plans in Korea's Third National Climate Adaptation Plan.

[41] Government of Korea. "The 3rd National Climate Change Adaptation Plan (2021–2025)." Government of Korea, 2020, 13-19, http://www.climate.go.kr/home/cc_data/policy/3_nation_climate_change_adaptation_step_summary.pdf.

[42] Government of Japan. "Japan's Eighth National Communication under the UNFCCC: Vulnerability Assessment, Climate Change Impacts, and Adaptation Measures." United Nations, 2023, 237-8, 259-260. https://unfccc.int/sites/default/files/ACR/2023-04/2nd%20Adaptation%20Communication%20Pursuant%20to%20Article%207%2C%20Paragraph%2010%20of%20the%20Paris%20Agreement%20V2.pdf.

Figure 3: Korean Policy Approaches to Heatwaves

Type	Policies
Digital and Technical Support Tools	• Development of climate risk map VESTAP to visualize heatwave risks and send out quick alerts and targeting tools for vulnerable groups. • Transmission of information on heatwaves and cold spells through community broadcasts and mobile text messages.
Physical Item Deployment and Infrastructural Development	• Support for heatwave response equipment (window air conditioners, portable shelters) for vulnerable groups (children, the elderly, outdoor workers). • Expansion of support for heatwave response items (cool mats, parasols, fans, etc.) and specific provision of response items for vulnerable households. • Support for the installation of heatwave response facilities (cool roofs, cool pavements, etc.) on an annual basis.
Guideline and Project Preparation	• Production and distribution of guidelines for heatwaves • Organizing and operating a heatwave response task force every year. • Diagnosis and consulting to improve residential environments' ability to respond to heatwaves at 2,000 locations per year. • Promotion of a heatwave adaptation support project for vulnerable groups on an annual basis.

Japan

Japan's approach to heatwaves and illnesses considers the increasing morbidity and mortality associated with heatwaves over the past few decades, and provides 1) adaptation guidelines for ministries, alongside 2) a short list of specific national mechanisms for adaptation, and 3) requests for future monitoring, as demonstrated in the table below. These categories (as delineated in Figure 4) were determined after careful review and consideration of the published policies across different sectoral plans in Japan's adaptation communications and published policies.

Figure 4: Japanese Policy Approaches to Heatwaves

Type	Policies
Adaptation Guidelines (for Ministries)	● Provision of weather information and reminders to raise awareness of prevention and handling methods of heat illness ● Operation of the nationwide "Heat Stroke Alert" from April 2021 to encourage preventive action against heat illness ● Recommendation of measures to reduce the intensity of physical labor by mechanization, shorten continuous working hours, change working hours, and implement other preventive measures against heat illness. ● Determination that the national government, local governments, industry, various organizations, and people should implement heat illness measures together.
Specific National Mechanisms for Adaptation	● Revision and upgrade of the Liaison Conference of Ministries and Agencies Concerned with Heat Illness to the Heat Illness Prevention Conference in March 2021. ● Establishment of a Heat Illness Action Plan through the Heat Illness Prevention Conference.
Requests for Future Monitoring	● Emphasis to continually monitor and assess information related to the results of adaptation measures. ● Call for the collection and assessment of information regarding adaptation measures for working under severe conditions, such as replacement by mechanization. ● Stressing the need to monitor the status of heat island effects and engage in technical investigation and research of heat island measures.

Discussion

In adapting to heatwaves, both Korea and Japan show strong focus on the provision of adaptation guidelines—but Japan retains its emphasis on prefectural delegation while Korea mandates digital and technical support tool production and dissemination. Korea also makes clear a goal to identify and protect vulnerable groups—Japan, in contrast, has no specific language on vulnerable groups. Instead, one key recommendation focuses on decreasing heat illness risks for workers, albeit without any specific goals cited. Finally, while Korean monitoring is intended to send event-specific alerts and determine local needs, Japan's monitoring recommendations are intended to assess the results of adaptation measures**.**

Disaster Risk 2: Flooding

The second key disaster risk Korea and Japan share is flooding. There are three different types of floods—coastal floods, river floods, and storm surge—that are functions of rainfall amount and duration, tides, soil types and slopes, impermeable surfaces (like roads), and sea-level rise.[43][44] Flooding can cause innumerable property and infrastructure damages,[45] disruptions in transportation,[46] energy cut-offs,[47] and even increase the spread of waterborne diseases.[48] This is in addition to the thousands dead and millions displaced worldwide due to flooding each year.[49] South Korea and Japan

[43]"Flood Types," NOAA National Severe Storms Laboratory, accessed December 16, 2023, https://www.nssl.noaa.gov/education/svrwx101/floods/types/.

[44]Margaret A. Walls, Sophie Pesek, and Donnie Peterson, "Flooding in the United States 101: Causes, Trends, and Impacts," Resources for the Future, 2023, https://www.rff.org/publications/explainers/flooding-in-the-united-states-101-causes-trends-and-impacts/.

[45]Jing Liu et al., "Future Property Damage from Flooding: Sensitivities to Economy and Climate Change," *Climatic Change* 132, no. 4 (October 1, 2015), 741–49, https://doi.org/10.1007/s10584-015-1478-z.

[46]Qing-Chang Lu, Zhong-Ren Peng, and Junyi Zhang, "Identification and Prioritization of Critical Transportation Infrastructure: Case Study of Coastal Flooding," *Journal of Transportation Engineering* 141, no. 3 (March 1, 2015), 04014082, https://doi.org/10.1061/(ASCE)TE.1943-5436.0000743.

[47]Cleo Varianou Mikellidou et al., "Energy Critical Infrastructures at Risk from Climate Change: A State of the Art Review," *Safety Science*, Special Issue on societal safety, critical infrastructure reliability and related intersectoral governance., 110 (December 1, 2018), 110–20, https://doi.org/10.1016/j.ssci.2017.12.022.

[48]Maryam Baqir et al., "Infectious Diseases in the Aftermath of Monsoon Flooding in Pakistan," *Asian Pacific Journal of Tropical Biomedicine* 2, no. 1 (January 1, 2012), 76–79, https://doi.org/10.1016/S2221-1691(11)60194-9.

[49]Hannah Ritchie, Pablo Rosado, and Max Roser, "Natural Disasters," *Our World in Data*, December 17, 2023, https://ourworldindata.org/natural-disasters.

experience summer (June and July) monsoon seasons in addition to the Pacific typhoon season, which occurs approximately from May to October each year.[50] This combination can be lethal for extreme precipitation leading to flooding in the two countries.

About half of Japan's population live on the 10% of land that would sink below river level in the event of extreme flooding, and approximately 75% of Japan's assets are concentrated in these same areas.[51] More than $1.4 billion worth of damages occur each year, and climate change is predicted to increase flood-related economic losses in Japan in the future.[52] In 2018, the combination of typhoon "Prapiroon" with a seasonal rain front resulted in torrential rains that claimed over 200 lives and forced millions to evacuate from Southwestern Japan.[53] The heavily mountainous regions of Japan further exacerbate risk due to the danger of mudslides and landslides, where more than twenty people are killed annually from such disasters.[54] Although Korea has less land area to be impacted by flooding events, the risks are similarly high. Property damage and casualties tripled in 2020 compared to the average annual damage in the past decade,[55] and flooding events, both inland and along coasts, are predicted to increase

[50]"Asia - Monsoons, Typhoons, Climate | Britannica," accessed December 17, 2023, https://www.britannica.com/place/Asia/Monsoons-and-typhoons; Dong-Hwan Ko, "Korea's Monsoon Season to Begin next Week," Korea Times, June 22, 2022, https://www.koreatimes.co.kr/www/nation/2023/12/371_353481.html.

[51]Hanawa Kazunari, "Japan Battles Flooding amid Deepening Climate Crisis," Nikkei Asia, accessed December 17, 2023, https://asia.nikkei.com/Spotlight/The-Big-Story/Japan-battles-flooding-amid-deepening-climate-crisis.

[52]Tao Yamamoto et al., "Evaluation of Flood Damage Reduction throughout Japan from Adaptation Measures Taken under a Range of Emissions Mitigation Scenarios," *Climatic Change* 165, no. 3 (April 23, 2021), 60, https://doi.org/10.1007/s10584-021-03081-5; S. Tezuka et al., "Estimation of the Effects of Climate Change on Flood-Triggered Economic Losses in Japan," *International Journal of Disaster Risk Reduction* 9 (September 1, 2014), 58–67, https://doi.org/10.1016/j.ijdrr.2014.03.004.

[53]Srinivas Bandaru et al., "Impact of Heavy Rains of 2018 in Western Japan: Disaster-Induced Health Outcomes among the Population of Innoshima Island," *Heliyon* 6, no. 5 (May 1, 2020), e03942, https://doi.org/10.1016/j.heliyon.2020.e03942.

[54]R.J.T. Klein et al., "Inter-relationships between adaptation and mitigation," in *Climate Change 2007: Impacts, Adaptation and Vulnerability*, ed. M.L. Parry, O.F. Canziani, J.P. Palutikof, P.J. van der Linden, and C.E. Hanson (Cambridge: Cambridge University Press, 2007), 745-777.

[55]Ju-min Park and Hyun Young Yi, "South Korea Flood Deaths Cast Doubt on Work to Prepare for Extreme Weather," *Reuters*, July 18, 2023, sec. Asia Pacific, https://www.reuters.com/world/asia-pacific/south-korea-flood-deaths-cast-doubt-work-prepare-extreme-weather-2023-07-17/.

throughout the country.[56] The 2023 monsoon season saw the heaviest rainfall in Korea in 115 years and resulted in forty-seven deaths from dam overflows, landslides, and the flooding of an underpass that trapped fourteen people in their vehicles.[57] Additional vulnerabilities stem from population and infrastructure congestion—like in the Han River Basin, which hosts the city of Seoul and its nearly ten million people—and the topography of rural areas, where mudslide-prone mountain features in combination with a lack of resources hinder search and rescue efforts during flooding events.[58]

Although precipitation and storm occurrences are predicted to vary with climate change, the IPCC Sixth Assessment Report ascertained the following trends and predictions for the region of East Asia:

- Daily precipitation extremes have increased over parts of the region (high confidence).
- Heavy precipitation will increase in frequency and intensity (high confidence), leading to more frequent landslides in some mountain areas.
- The rate of intensification and number of strong tropical cyclones have increased (medium confidence), and tropical cyclone tracks likely migrated poleward.
- Relative sea level around Asia has increased faster than the global average, with coastal area loss and shoreline retreat. Regional-mean sea level will continue to rise (high confidence).

In Korea and Japan, increases in the 1) the duration of monsoon seasons, 2) extreme storms, and 3) impacts from sea-level rise, threaten to further exacerbate exposure to the disaster risk of flooding. Adaptation policies are thus crucial for governments to protect their countries against flooding events, especially as higher frequencies of events can be expected moving forward. As opposed to policies on heat illness that often span

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[56] Sang-Jin Park and Dong-Kun Lee, "Prediction of Coastal Flooding Risk under Climate Change Impacts in South Korea Using Machine Learning Algorithms," *Environmental Research Letters* 15, no. 9 (August 2020), 094052, https://doi.org/10.1088/1748-9326/aba5b3, 5.

[57] John Yoon and Jin Yu Young, "South Korea's Monsoon Rains Set Off Deadly Landslides and Flooding," *The New York Times*, July 15, 2023, sec. World, https://www.nytimes.com/2023/07/14/world/asia/south-korea-floods-rain.html; Cheong-mo Yoo, "This Year's Monsoon Season Ends after 3rd-Heaviest Rainfall on Record," Yonhap News Agency, July 26, 2023, https://en.yna.co.kr/view/AEN20230726007000315.

[58] Heejae Shin, Youngje Choi, and Jaeeung Yi, "Analysis of the Local Characteristics of Flood Damage Vulnerability in an Urban Area: The Han River Basin," *Journal of the Korean Society of Hazard Mitigation* 19, no. 5 (2019), 293–303.

only a page or two of official documentation among adaptation plans, flooding receives, overall, easily quadruples heat risks in terms of pages, policies, and finances. This is due to the all-encompassing nature of damages that flooding can cause and has caused in both countries. As such, each country's policies for adaptation to flooding are summarized below from a careful review of nationally and internationally published documents on climate adaptation policies.

Korea

Korea's Third National Climate Adaptation Plan puts a heavy emphasis on sustainable flood management, with main goals to 1) establish an early warning system to improve flood response capacity; 2) strengthen regionally tailored flood response; 3) strengthen the flood response capacity of national water management facilities; 4) strengthen the provision of information to prevent flood damage, and to 5) establish a rapid processing system for disaster waste due to torrential rain.[59] These goals are accompanied by specific, numerical, targets in the implementation of physical facilities or data provision methods, including goals to: expand storage and pumping facilities by thirty to forty locations each year; triple flood forecasting centers from sixty-five to 218 by 2025; and up the number of hot spots for drainage maintenance from 114 to 180. The policies are seldom, however, accompanied by the designation of national ministries suited for the task or financial allotments, save for one goal of establishing deep rainwater retention tunnels and expanding existing facilities for a total of thirty-one locations – which receives 69.5 billion Korean won ($53.5 million). The Third National Plan is also a strong upgrade in goals from previous adaptation policies. The two most notable adaptations occurring before 2020 were 1) the establishment of a rainfall radar system for flood forecasting in nine locations in 2018 and 2) the production of a national river flood risk map (cumulatively 2,332 km) and coastal flooding forecast map in 2017. However, despite strong rhetoric on adaptation policies, the 2023 rainy season flooding deaths on the peninsula have galvanized criticism on lack of government action, with experts stating that pledges for better preparation had not been followed by setting aside the necessary finances needed, and instead using national spending to focus on recovery and not enough on prevention.[60]

[59]Government of Korea, "The 3rd National Climate Change Adaptation Plan (2021–2025)," 54-57.
[60]Park and Yi, "South Korea Flood Deaths Cast Doubt on Work to Prepare for Extreme Weather."

Japan

Japan has deep expertise in Disaster Risk Reduction (DRR), utilizing domestic flood technology for international projects such as a flood-resilient subway system in Bangkok and erosion-control dams in Indonesia. Such expertise has been reflected domestically in the 2006 construction of the Metropolitan Area Outer Underground Discharge Channel, one of the world's largest underground discharge channels. It has long protected the city of Kasukabe in Saitama prefecture—but concerns are growing that old adaptation plans may not be enough against increasingly heavy rains.[61] Accordingly, Japan's 2020 adaptation communications to the United Nations contains the following set of goals for inland water flooding:

- Establish changes of plans in consideration of climate change projections
- Implement "River Basin Disaster Resilience and Sustainability by All" efforts
- Implement structural/nonstructural measures in cooperation with stakeholders
- Promote the use of green infrastructure
- Start the manufacturing of successor satellites in fiscal year 2023 to be operated by fiscal year 2029, for better monitoring and prediction of typhoons and rainfall
- Adopt concepts of ecosystem-based disaster risk reduction (Eco-DRR)

Separate goals are also noted to combat high waves and storm surges for harbors and fishing ports, coastlines, fishing ports and villages, coastal disaster-prevention forests, airports, and sediment disasters. This second set of goals comes with little to no specifics on targeted measures on a regional or national level; instead, focus is centered on 1) the recognition of the potential for damages nationwide, 2) the necessity of the participation by "all people in the river basin," and 3) calling for non-specific "measures" to combat different types of risks. Although Japanese national adaptation policies lack specificity, they call for ministries, prefectural governments, private business sectors, and individuals to cooperate for adaptation to combat flooding. Although this overarching framework reflects the diversity of flooding adaptation needs necessitated by Japan's diverse geography, there is a lack of quantified policy goals that can be monitored and measured.

[61]Linda Poon and Shoko Oda, "Climate Change Will Test Tokyo's World-Class Flood Defenses," *Bloomberg.Com*, November 13, 2023, https://www.bloomberg.com/news/features/2023-11-13/ambitious-tokyo-flood-tunnels-tested-by-worsening-natural-disasters.

Discussion

Korea maintains its commitment to technical targets, but supplements numbers with sweeping directives on improving information flow, locally effective flood response strategies, and overall response capacity. Despite this, calls for better implementation due to increasing disaster frequencies and financing questions call into question the effectiveness of policies thus far. Japan maintains its tendency to delegate tasks to stakeholders outside the national government. Their already strong adaptive capacities for flooding are bolstered with the recognition that current infrastructures may not be enough – adaptation plans will have to shift with climate change predictions.

Disaster Risk 3: Food and Agricultural Losses

The final key disaster risk that Japan and Korea share is potential losses in food and agriculture, including livestock, fisheries, and aquaculture, hereafter referred to as "food losses." Climate change is predicted to affect the agricultural sector in a variety of ways, including changes in agricultural yield, food quality, prices, safety, and food security overall.[62] Food losses in occur in acute disasters like heatwaves[63] and flooding[64] – as such, a focus on this third disaster risk provides an example of how a sector is moderated by the previous two risks – and how Japan and Korea approach multi-faceted sectoral adaptation.

Already, South Korea is experiencing losses in food sectors due to extreme weather events and changing patterns of precipitation and temperature exacerbated by climate change. Coastal fishing production has decreased from 1.13 million tons in 2010 to just over 900,000 tons in 2019, and over the past forty years, the volatility of fishing grounds for mackerel, yellowtail, and cod has increased due to rising water

[62]Sonja J. Vermeulen, Bruce M. Campbell, and John S.I. Ingram, "Climate Change and Food Systems," *Annual Review of Environment and Resources* 37, no. 1 (2012), 195–222, https://doi.org/10.1146/annurev-environ-020411-130608.
[63]David D. Breshears et al., "Underappreciated Plant Vulnerabilities to Heat Waves," *New Phytologist* 231, no. 1 (2021), 32–39, https://doi.org/10.1111/nph.17348.
[64]Felipe-Omar Tapia-Silva et al., "Estimation of Flood Losses to Agricultural Crops Using Remote Sensing," *Physics and Chemistry of the Earth, Parts A/B/C*, Recent Advances in Mapping and Modelling Flood Processes in Lowland Areas, 36, no. 7 (January 1, 2011), 253–65, https://doi.org/10.1016/j.pce.2011.03.005.

temperatures.[65] During the 2023 monsoon season, nearly 30,000 hectares of farmland were damaged, and over 500,000 livestock were killed over a one-week period of rain: price hikes over 150% for multiple products, as well as devastating financial damages to rural farmers were also recorded.[66] Losses are predicted to continue in the future as well; based on emissions scenario RCP 8.5, rice yield will decrease by more than 25% in most regions by the end of the 21st century. Japan has long sustained its national rice programs with billions of dollars in support and even banned all rice imports until the mid-1990s to ensure domestic food security.[67] Yet, nationwide production of rice is predicted to experience declines up to 28% by 2100 at the highest emission scenarios,[68] and crop-damaging pests are also forecasted to increase in their regional distribution.[69] Ocean acidification and warming seas were determined to be leading causes of Japanese reductions in fish catch, which saw a record low down 7.5% in 2022 – the third year of decreases in a row.[70] Record-breaking heat in the summer of 2023 resulted in 1) the share of high-quality rice produced dropping over 16% compared to 2022, 2) tomato yields down 10 to 20%, and 3) high rates of rotting, making much crop unmarketable.[71] Acute, extreme weather events are devastating farmers and consumers and disrupting the planting of following seasons' crops – possibly forcing a near self-sufficient country for vegetable consumption to look outwards for imports.[72] Both South Korea and Japan are facing damages to their food production sectors that destroy livelihoods,

[65]Suam Kim et al., "Climate Variability and Its Effects on Major Fisheries in Korea," *Ocean Science Journal* 42, no. 3 (September 1, 2007), 179–92, https://doi.org/10.1007/BF03020922.
[66]Yoon-seo Lee, "Monsoon Rain Ravages Farms, Kills Livestock," *The Korea Herald*, July 17, 2023, https://www.koreaherald.com/view.php?ud=20230717000573.
[67]Eric J. Wailes, Kenneth B. Young, and Gail L. Cramer, "Rice and Food Security in Japan: An American Perspective," in *Japanese And American Agriculture* (Routledge, 1993); David Holley and Donald Woutat, "Japan Agrees to End Ban on Imported Rice," *Los Angeles Times*, December 14, 1993, https://www.latimes.com/archives/la-xpm-1993-12-14-mn-1850-story.html.
[68]Yasushi Ishigooka et al., "Revision of Estimates of Climate Change Impacts on Rice Yield and Quality in Japan by Considering the Combined Effects of Temperature and CO2 Concentration," 農業気象 77, no. 2 (2021), 139–49, https://doi.org/10.2480/agrmet.D-20-00038.
[69]Takeshi Osawa et al., "Climate-Mediated Population Dynamics Enhance Distribution Range Expansion in a Rice Pest Insect," *Basic and Applied Ecology* 30 (August 1, 2018), 41–51, https://doi.org/10.1016/j.baae.2018.05.006.
[70]"White Paper on Fisheries: FY2022 Trends in Fisheries and FY2023 Fisheries Policy" (Ministry of Agriculture, Forestry and Fisheries, 2022), https://www.maff.go.jp/e/data/publish/attach/pdf/index-224.pdf.
[71]"Torrid Summer Heat Hits Crop Production in Japan," *The Japan Times*, November 15, 2023, https://www.japantimes.co.jp/business/2023/11/15/heat-hits-japan-vegetables/.
[72]"Japan: Record Heat Stifles Japanese Vegetable Production," USDA Foreign Agricultural Service, September 22, 2023, https://fas.usda.gov/data/japan-record-heat-stifles-japanese-vegetable-production.

change production economies, and reduce domestic food security. Each country's policies for adaptation to climate change to combat said issues are summarized below from a careful literature review of nationally and internationally provided policy documents.

Korea

Korea's National Climate Change Adaptation Plan provides a series of key tasks focused on creating a sustainable environment for agricultural and fisheries production, while also maintaining the trend of setting a series of stringent goals based on technological and numerical checkpoints.[73] The three main tasks pinpointed are to:

1. Provide climate change impact information to improve climate resilience
2. Adapt to climate change and strengthen agricultural and fisheries production
3. Preserve a safe environment for agricultural and fisheries

Each task comes with a subseries of requests for the appropriate subnational bodies, including but not limited to the Rural Development Administration, the Ministry of Agriculture, and the Ministry of Oceans and Fisheries. Key tasks include performing impact and vulnerability assessments and surveys, developing new prediction and forecasting tools, and creating distribution and data-driven maps for agriculture, livestock, and fishery sectors. Specific, technological goals are sampled below:

- Increase the number of climate-resistant crop species from 288 in 2020 to 363 in 2025
- Expand farms with tailored early warning systems from twenty-nine to 110 by 2025.
- Distribute seventy-five disaster-resistant facility standards by 2025, up from sixty-eight in 2020
- Identify eight crop species to shift cultivation areas due to climate change by 2025

The National Adaptation Plan contains sixty-four unique provisions, actions, and targets across its three main goals. Much ground is covered with such comprehensive goal-setting – but financing for said targets is not mentioned, nor covered by the plan specifically.

Japan

[73]Government of Korea, "The 3rd National Climate Change Adaptation Plan (2021–2025)," 178, 184-5.

Japan's official adaptation policy documents have few strategies outlined for adaptation to food losses due to climate change. Instead, sectoral policy is delegated to the appropriate ministry – in this case, the Ministry of Agriculture, Forestry, and Fisheries (MAFF). Adaptation policy is couched in the MAFF *Summary of the Annual Report on Food, Agriculture, and Rural Areas in Japan*,[74] not a separate document focused on climate change adaptation. MAFF has four key goals for food production: 1) securing stable food supplies, 2) sustainable agricultural development, 3) promotion of rural areas, and 4) restoration/reconstruction from natural disasters, disaster prevention/reduction, and strengthening national resilience. Policies that fit under the idea of adaptation are siloed under the fourth goal in a section titled "promoting the development and introduction of new adaptation technologies to address the impacts of climate change." Specific policies can be partitioned into two categories, as delineated in Figure 5: general guidelines and specific actions. The policies displayed below make up nearly all of the available documentation of adaptation-coded policy.

[74]"Annual Report on Food, Agriculture and Rural Areas in Japan FY 2022" (Ministry of Agriculture, Forestry and Fisheries, 2022), https://www.maff.go.jp/e/data/publish/attach/pdf/index-224.pdf.

Figure 5: Japanese Policies Towards Food Loss Adaptation

Type	Policies
General Guidelines	● Promote local efforts to address impacts that are not currently apparent: Provide scientific impact assessment and adaptation technologies. ● Promote impact assessment research and technology development: Promote research and technological development in areas where there is little knowledge about future impacts. ● Promote conversion to subtropical and tropical fruit trees.
Specific Tasks	● Development of heat tolerant rice varieties and breeding materials with heat tolerant sterility ● Promotion of timely pest control based on the forecast of pest outbreaks, etc. ● Development of mountain control facilities and forests, development of coastal disaster prevention forests, and conservation facilities, etc.

Discussion

The prospect of food losses looms for both countries across multiple sectors. Both Korea and Japan do well in recognizing rural communities as being more vulnerable and reserve policy for rural sectors accordingly. While Korea is very concerned about adapting its agricultural and fisheries sectors to climate adaptation, it has over 60 unique goals for adaptation to be completed by 2025. Japan's adaptation policy sees the opposite extreme: food is only briefly included under adaptation communications, and only in one page of the MAFF yearly summary.

III. Moving Forward

Korea and Japan take different approaches to climate adaptation; whilst Korea focuses on the technical, specific tasks needed to meet sectoral adaptation goals, Japan focuses on generalized ministerial and prefectural delegation to realize adaptation targets. The question then becomes the following: what can each country learn from the other's strategy for a more comprehensive adaptation policy? Korean and Japanese adaptation policy could benefit by moving away from the extremes they inhabit –

Korea from its uber-technical, numerical, and often over-promising extreme of specificity, and Japan from its extreme of almost too general guidelines and delegation to subnational bodies. While these extremes in strategy could be defended by size differences in population and geography, finding a middle ground of realistic, measurable, and achievable goals across disaster risks can serve as a method to serve society in both a detail-oriented and realistic way. Korea, for example, could focus on establishing priorities and ensuring bandwidth for its numerous goals to ensure food security, perhaps by cooperation with and financial support to appropriate agencies to determine efficient, implementable courses of action. Including more targeted evaluation, ministry-specific implementation, and financing measures in accordance with regional-scale flooding dangers may also be useful for the Korean government. Japan, on the other hand, could stand to establish more measurable, national goals; while general guidelines and recommendations for heat illnesses are important, measurable interventions such as establishing a specific number of cooling facilities or surveying vulnerable groups can enhance measures to protect citizens from feeling the worst effects of heatwaves. As both countries encounter the same disaster risks of heatwaves, flooding, food loss, and more, their adaptation policies can learn from each other—and find a middle ground away from extremes.

Most research to date on national adaptation policy has focused on Western countries. Therefore, an examination of Korea and Japan can contribute to a better understanding of adaptation policy frameworks among other nations—especially as adaptation policies are implemented at higher and higher rates across the world. Comparison reveals both gaps and opportunities for Korean and Japanese adaptation policies, and while comparing adaptation strategies can provide a lens into governmental priorities, policy implementation must also be carefully analyzed. Future studies must carefully appraise the successes—and failures—of adaptation policy in order to ensure that they are not done in vain.