

MEMORANDUM FOR NSDPI RESEARCHERS
ON NATURAL OBJECTS AND PROCESSES AS DEFENSE INFRASTRUCTURE**1. Executive Summary**

The Department of War (DoW) estimates that extreme weather has cost the department at least \$15 billion in damage to critical defense infrastructure in the last decade.ⁱ While the DoW has institutionalized infrastructure resilience planning and efforts, critical defense infrastructure across the nation remains at high risk from extreme weather, particularly in the Hampton Roads region of Virginia, which is vital to naval operations and national defense at large.ⁱⁱ The United States faces competition from the People's Republic of China (PRC), which has integrated infrastructure reliance into its national security strategy through its ecological civilization doctrine, emphasizing the protection and adaptation of vital assets to withstand environmental threats.ⁱⁱⁱ While both governments have taken initiative to prepare their defense infrastructure for increasingly volatile weather, there are key differences in their respective approaches.

2. Background – United States

The Department of War is responsible for over 5,000 military installations worldwide, with an estimated replacement value of \$1.2 trillion.^{iv v} U.S. security and military objectives rely on this infrastructure, but environmental threats such as climate change and extreme weather events increasingly create maintenance and operational costs.

- a. The Department of War first acknowledged the importance of defense infrastructure resilience in DoDD 4715.21, issued in 2016, where it defines climate adaptation for the first time.^{vi} The DoW views recurrent flooding, drought, desertification, wildfires, and thawing permafrost as the most pressing vulnerabilities to infrastructure.^{vii} Of 79 mission-critical installations, 73 are experiencing the environmental threats listed previously.^{viii}
- b. A critical turning point for the Department of War's infrastructure resilience efforts was the destruction of Florida's Tyndall Air Force Base by Hurricane Michael in 2018. The storm produced the strongest sustained winds in the continental United States in over 25 years, destroying 12 F-22 fighter aircraft and causing over \$4.7 billion in damage.^{ix} The DoW has begun rebuilding it using natural infrastructure solutions in an effort to set a precedent for future defense infrastructure.^x

3. Background – China

The People's Republic of China holds a unique position within the Asian continent, sharing direct borders with 14 countries while actively maintaining economic dominance and possessing strong regional influence.^{xi} China is also among the most vulnerable nations to climate change. Sea levels are rising faster in coastal areas than the global average, and annual flood/drought cycles are intensifying.^{xii} It is important for policymakers and officials within the United States to understand how environmental vulnerabilities and ecological concerns have historically swayed China's actions and how the PRC's current conservation efforts impact the broader geopolitical landscape.

- a. China's topography can be broken down into a three-step "staircase," cascading from the western mountains into the eastern coast.^{xiii} Mountainous regions cover two-thirds of all the nation, making much of the land inhabitable and pushes 94% of the population towards the East.^{xiv} ^{xv} Coastal areas frequently experience typhoons and floods that destroy the general Chinese economy, agriculture, and livelihood, while the rest of Eastern China faces serious droughts.^{xvi}
- b. In March 2021, the China's National People's Congress passed the 14th Five-Year Plan for National Economic and Social Development of the People's Republic of China and the Long-Range Objectives for 2035.^{xvii} The plans outline a goal of restoring 400 km of coastline and 200 km² of coastal wetlands in addition to planting and restoring 1100 km² of shelter forests.^{xviii}
- c. Canal systems have been used to manage Chinese rivers for 5,000 years.^{xix} Xi Jinping has framed modern flood defenses as a continuation of this history, incorporating climate measures into the cultural framework. By 2030, the goal is for 70 percent of cities to be "sponge cities" that recycle their own rainwater to address shrinking freshwater supplies.^{xx} Large forests have been planted as defensive barriers, such as the 200,000 acre Saihanba, which protects Beijing from desertification.^{xxi} Interventions are framed as "ecology" or "beautification", and officials largely avoid reference to climate challenges.

4. Current Initiatives – United States

The United States is currently taking steps to properly protect its land from ecological threats through projects such as the Sentinel Landscape Partnership and DOW's Readiness and Environmental Protection Integration (REPI). These programs work with states, nonprofits, and private landowners to conserve land around military installations. The goal is to prevent urban development from interfering with military training while also

UNCLASSIFIED

protecting ecosystems and biodiversity. Furthermore, the U.S. has taken measures abroad by strengthening its East Asian alliances to take advantage of their proximity to China. Between the risks of rising sea levels, flooding, excessive heat, drought, wildfire, and coastal erosion, climate change and ecological damage pose a serious threat to the United States' assets and national security if not properly addressed.

- a. Sentinel Landscape Partners has protected 240,000 acres within seven Sentinel Landscapes and has regulated management practices to promote sustainability in 1.6 million acres of land surrounding high-value military spaces.^{xxii}
- b. The DoW has put forth \$1.7 billion for the REPI program, along with \$1.5 billion from partner contributions, protecting over 1.4 million acres of land for 141 project locations, including key operational assets, infrastructure, and military capabilities.^{xxiii}
- c. The Bashi Channel is a vital access point from the SCS into the Pacific Ocean. The U.S. deployed troops and anti-ship missiles to the northern Philippines to conduct U.S.-Philippine war drills to deter China from the channel.^{xxiv} Chinese control of the Bashi Channel would allow for China to be able to better strategically dominate a conflict situation involving Taiwan.
- d. Furthermore, the U.S. and Japan have collaborated in HIMARS drills at Camp Fuji to test missiles and response plans.^{xxv} Japan and the United States are strengthening military cooperation along the "First Island Chain," the chain of islands stretching from Japan through Taiwan and the Philippines that could limit Chinese naval access to the Pacific.^{xxvi}

5. Hampton Roads

Hampton Roads is home to the world's largest naval base, with over 100,000 active-duty military personnel and 19 military installations.^{xxvii} As a region, it is the second-most vulnerable to sea level rise in the country, making it especially prone to storm surges every four to five years.^{xxviii}

- a. Joint Base Langley-Eustis, located within the Hampton Roads region, is a serious concern for the DoW as flooding has become more frequent and severe. Since 1930, the base has observed a 14-inch rise in sea level, driven by land subsidence and sea level rise.^{xxix}

UNCLASSIFIED

- b. Navy Region Mid-Atlantic currently leads efforts to increase understanding of the growing risks of extreme weather on defense infrastructure in the Hampton Roads region through collaborations with academia, localities, non-profit organizations, and state and federal agencies.^{xxx} An especially effective product of these relationships has been Joint Land Use Studies, which have been adopted by the cities of Norfolk, Virginia Beach, and Hampton to better identify resilience strategies.

6. Current Initiatives – China

China has largely avoided labeling climate crises as a security risk. The 2022 Global Security Initiative described climate change as a “non-traditional security factor;” however, China has also stated a desire to avoid “pan-securitization” of climate change. Chinese Defense White Papers have not referenced climate challenges since 2010.^{xxxii} Military leaders have expressed concerns about climate responsibilities distracting from their core objectives. Despite this non-security framing, rising waters threaten key military assets and equipment.

- a. The “Great Green Wall,” also known as the Three-North Shelterbelt Forest Program, is a 4,500 km long belt that is comprised of over 66 billion trees aimed at halting the expansion of the Gobi and Taklamakan deserts while simultaneously forming a carbon sink.^{xxxii xxxiii} The initiative began in 1978 and is expected to be fully complete by 2050, reducing desertification by slowing soil erosion and sand deposition.^{xxxiv} The belt runs along China’s borders with Mongolia, Kazakhstan, and Kyrgyzstan and has effectively encircled the Taklamakan desert.^{xxxv}
- b. As of 2022, there are reported to be more than 98,000 dams and reservoirs in China.^{xxxvi} The nation is looking to make a shift away from fossil fuels towards natural resources, especially hydropower, to reliably supply clean energy and stimulate the economy, generating billions in economic value.^{xxxvii} Current flashpoints surround China’s dams in both the Brahmaputra and Mekong rivers, respectively known as the Yarlung Tsangpo and Lancang River in China.^{xxxviii}
- c. The PRC has announced plans to transform Scarborough Shoal into a marine nature reserve to restore the depleting reefs and oceanic wellbeing.^{xxxix} Additionally, the nation has implemented bans aimed at combating overfishing while effectively restoring 112 km of coastline and increasing vital mangrove forest area by more than 7,000 hectares since 2020 due to programs like the National Mangrove Forest Conservation Program and the National Plan for Construction of Coastal Shelterbelt System.^{xl xli}

UNCLASSIFIED

Research and Writing: Brooke Livergood, Jane McGuiggin, Maeve Myers, Peter Sullivan
Compilation and Editing: Trevor Hamilton

ⁱ U.S. Government Accountability Office. “Military Installations: DOD Should Improve Natural Disaster Cost Tracking and Planning for Resilience Improvements.” GAO-26-107786, February 23, 2026. <https://files.gao.gov/reports/GAO-26-107786/index.html>.

ⁱⁱ Sayler, Kelley M. “Climate Change and Adaptation: Department of Defense.” Congressional Research Service, IF12161, updated April 6, 2023. https://www.congress.gov/crs_external_products/IF/PDF/IF12161/IF12161.3.pdf.

ⁱⁱⁱ Sikorsky, Erin. 2022. “CHINA’S CLIMATE SECURITY VULNERABILITIES.” *Center for Climate and Security*. <https://councilonstrategicrisks.org/wp-content/uploads/2022/11/China-Climate-Security-Vulnerabilities-2022.pdf>.

^{iv} Bridges, Todd, Jeff King, and Courtney Chambers. “Supporting Mission Resilience through Natural Infrastructure.” *The Military Engineer*, January–February 2022. https://ewn.ercd.dren.mil/wp-content/uploads/2022/03/TME_Jan-Feb2022-EWN.pdf.

^v U.S. Government Accountability Office. “Climate Resilience: DOD Needs to Assess Risk and Provide Guidance on Use of Climate Projections in Installation Master Plans and Facilities Designs.” GAO-19-453, June 12, 2019. https://www.gao.gov/products/gao-19-453?mobile_opt_out=1.

^{vi} Sayler, Kelley M. “Climate Change and Adaptation: Department of Defense.” Congressional Research Service, IF12161, updated April 6, 2023. https://www.congress.gov/crs_external_products/IF/PDF/IF12161/IF12161.3.pdf.

^{vii} Office of the Under Secretary of Defense for Acquisition and Sustainment. “Report on Effects of a Changing Climate to the Department of Defense.” U.S. Department of Defense, January 2019. <https://media.defense.gov/2019/Jan/29/2002084200/-1/-1/1/CLIMATE-CHANGEREPORT-2019.PDF>.

^{viii} “DOD Already Sees Adverse Effects from Climate Change at Priority Installations.” State Science & Technology Institute, February 14, 2019. <https://ssti.org/blog/dod-already-seesadverse-effects-climate-change-priority>.

^{ix} “Five Years After Cat-5 Hurricane Hit, Florida AFB’s \$5B Rebuild Focuses on Resilience.” *Engineering News-Record*, October 3, 2023. <https://www.enr.com/articles/57199-five-years-after-cat-5-hurricane-hit-florida-afbs-5b-rebuild-focuses-on-resilience>.

^x Bridges, Todd, Jeff King, and Courtney Chambers. “Supporting Mission Resilience through Natural Infrastructure.” *The Military Engineer*, January–February 2022. https://ewn.ercd.dren.mil/wp-content/uploads/2022/03/TME_Jan-Feb2022-EWN.pdf.

^{xi} Yu, Miles. “China’s Border Strategies and Its Security Paranoia.” Hudson Institute, March 19, 2024. <https://www.hudson.org/immigration/chinas-border-strategies-its-security-paranoia-miles-yu>.

^{xii} You, Li. 2020. “Rising Seas Threaten China’s Long, Low, and Crowded Coast.” *Sixth Tone*. 2020. <https://www.sixthtone.com/news/1006652>.

^{xiii} Wang, Jing’ai, Honglin Xiao, Rudi Hartmann, and Yaojie Yue. “Physical Geography of China and the U.S.” In *A Comparative Geography of China and the U.S.*, 109:23–81. Springer, Dordrecht, 2014. https://doi.org/10.1007/978-94-017-8792-5_2.

UNCLASSIFIED

-
- xiv Embassy of the People's Republic of China in Nepal. "Geographical Features," October 27, 2004. https://np.china-embassy.gov.cn/eng/ChinaABC/dl/200410/t20041027_1998300.htm.
- xv Environmental Systems Research Institute. "An Introduction to Population Densities in China." ArcGIS StoryMaps, December 11, 2022. <https://storymaps.arcgis.com/stories/cedc545739af42b2a175cd2ba168e83d>.
- xvi Environmental Systems Research Institute. "An Introduction to Population Densities in China." ArcGIS StoryMaps, December 11, 2022. <https://storymaps.arcgis.com/stories/cedc545739af42b2a175cd2ba168e83d>.
- xvii Center for Security and Emerging Technology, "Outline of the People's Republic of China 14th Five-Year Plan for National Economic and Social Development and Long-Range Objectives for 2035," May 13, 2021, <https://cset.georgetown.edu/publication/china-14th-five-year-plan/>. (cset.georgetown.edu).
- xviii Jinhai Zheng, Wei Xu, Aifeng Tao, Jun Fan, Jinyang Xing, and Gang Wang, "Synergy between Coastal Ecology and Disaster Mitigation in China: Policies, Practices, and Prospects," *Ocean & Coastal Management* 245 (2023): 106866, <https://doi.org/10.1016/j.ocecoaman.2023.106866>.
- xix Colville, Alex. 2020. "Yu the Great, Tamer of China's Greatest Floods." The China Project. August 24, 2020. <https://thechinaproject.com/2020/08/24/yu-the-great-tamer-of-chinas-greatest-floods/>.
- xx Sikorsky, Erin. 2022. "CHINA'S CLIMATE SECURITY VULNERABILITIES." *Center for Climate and Security*. <https://councilonstrategicrisks.org/wp-content/uploads/2022/11/China-Climate-Security-Vulnerabilities-2022.pdf>.
- xxi Sikorsky, Erin. 2022. "CHINA'S CLIMATE SECURITY VULNERABILITIES." *Center for Climate and Security*. <https://councilonstrategicrisks.org/wp-content/uploads/2022/11/China-Climate-Security-Vulnerabilities-2022.pdf>.
- xxii Network for Landscape Conservation, "Sentinel Landscapes: Uniting People, Securing the Future," *Landscape Conservation Cooperative Knowledge Center*, accessed May 28, 2026, <https://landscapeconservation.org/knowledge-center/stories/sentinel-landscapes-uniting-people-securing-the-future/>.
- xxiii U.S. Department of Defense, "Readiness and Environmental Protection Integration (REPI) Program," *repi.mil*, accessed May 28, 2026, <https://www.repi.mil/>.
- xxiv Karen Lema, David Lague, and Lisa Marie David, "A Narrow Pacific Waterway Is at the Heart of U.S. Plans to Choke China's Vast Navy," *Reuters*, October 31, 2025, <https://www.reuters.com/investigations/narrow-pacific-waterway-is-at-the-heart-of-u-s-plans-to-choke-chinas-vast-navy-2025-10-31/>.
- xxv Kyodo News, "U.S. to Send Typhon, HIMARS Missile Systems to Japan for Drills Amid China Tensions," *South China Morning Post*, May 21, 2026, <https://www.scmp.com/news/asia/east-asia/article/3354294/us-send-typhon-himars-missile-systems-japan-drills-amid-china-tensions>.
- xxvi Ibid.
- xxvii i "Defense." Hampton Roads Alliance. Accessed May 20, 2026. <https://hamptonroadsalliance.com/defense/>.
- xxviii "Coastal Resiliency & Sea Level Rise." Hampton Roads Planning District Commission. Accessed May 20, 2026. <https://www.hrpdcva.gov/381/Coastal-Resiliency-Sea-Level-Rise>.

xxix “DOD Already Sees Adverse Effects from Climate Change at Priority Installations.” State Science & Technology Institute, February 14, 2019. <https://ssti.org/blog/dod-already-sees-adverse-effects-climate-change-priority-installations>.

xxx Office of the Under Secretary of Defense for Acquisition and Sustainment. “Report on Effects of a Changing Climate to the Department of Defense.” U.S. Department of Defense, January 2019. <https://media.defense.gov/2019/Jan/29/2002084200/-1/-1/1/CLIMATE-CHANGEREPORT-2019.PDF>.

xxxi Sikorsky, Erin. 2022. “CHINA’S CLIMATE SECURITY VULNERABILITIES.” *Center for Climate and Security*. <https://councilonstrategicrisks.org/wp-content/uploads/2022/11/China-Climate-Security-Vulnerabilities-2022.pdf>.

xxxii Pare, Sascha. “China’s Great Green Wall: The Giant Artificial Forest Designed to Slow the Expansion of 2 Deserts.” Live Science, December 12, 2025. <https://www.livescience.com/planet-earth/plants/chinas-great-green-wall-the-giant-artificial-forest-designed-to-slow-the-expansion-of-2-deserts>.

xxxiii Noor, Salma, Xun Jiang, Xinyue Wang, Jiani Yang, Sally Newman, King-Fai Li, Liming Li, Le Yu, Xiyu Li, and Yuk L. Yung. “Human-Induced Biospheric Carbon Sink: Impact from the Taklamakan Afforestation Project.” *Proceedings of the National Academy of Sciences* 123, no. 4 (January 20, 2026). <https://doi.org/10.1073/pnas.2523388123>.

xxxiv Pare. “China’s Great Green Wall”.

xxxv English.gov.cn. “China’s Largest Desert Fully Encircled with Green Belt,” November 28, 2024. https://english.www.gov.cn/news/202411/28/content_WS6748240fc6d0868f4e8ed7ed.html.

xxxvi Song, Chunqiao, Chenyu Fan, Jingying Zhu, Jida Wang, Yongwei Sheng, Kai Liu, Tan Chen, et al. “A Comprehensive Geospatial Database of Nearly 100 000 Reservoirs in China.” *Earth System Science Data* 14, no. 9 (September 6, 2022): 4017–34. <https://doi.org/10.5194/essd-14-4017-2022>.

xxxvii Weijun, Shi. “China’s Energy Ambition: Inside the Yarlung Tsangpo Dam Project - CKGSB Knowledge.” CKGSB Knowledge, October 28, 2025. <https://english.ckgsb.edu.cn/knowledge/article/china-energy-ambition-inside-the-yarlung-tsangpo-dam-project/>.

xxxviii Yang, Jianli. “India and China in Deep Water over Himalayan Hydropower.” East Asia Forum, December 15, 2025. <https://eastasiaforum.org/2025/12/15/india-and-china-in-deep-water-over-himalayan-hydropower/>.

xxxix Borton, James. “China Says It Wants to Protect Coral Reefs in the South China Sea. Experts Are Doubtful.” SAIS Foreign Policy Institute, September 21, 2025. <https://www.fpi.sais.jhu.edu/articles/bo4cr6fvjvdy7g9uwsn0r2qtp9lu5>.

xl Nuo, Xu. “China Enhances Coastal Ecosystem Protection and Restoration.” Chinadaily.com.cn, June 13, 2025. <https://www.chinadaily.com.cn/a/202506/13/WS684c3154a310a04af22c62f9.html>.

xli Shi, Jianbin, and Wang Wenqing. “Turning a Harmful Tide.” Paulson Institute, August 5, 2020. <https://www.paulsoninstitute.org/conservation/conservation-blog/turning-a-harmful-tide/>.