

Graduation Plan

Master of Science Architecture, Urbanism & Building Sciences



Graduation Plan: All tracks

Submit your Graduation Plan to the Board of Examiners (Examencommissie-BK@tudelft.nl), Mentors and Delegate of the Board of Examiners one week before P2 at the latest.

The graduation plan consists of at least the following data/segments:

Personal information	
Name	Yuzhou Jin
Student number	5683289

Studio		
Name / Theme	Transitional Territories / Altered Nature – Poetics of Change	
Main mentor	Diego Andres Sepulveda Carmona	Spatial Planning and Strategy
Second mentor	Daniele Cannatella	Urban Data Science
Argumentation of choice of the studio	The sudden heavy rainfall in the Beijing-Tianjin-Hebei Metropolitan Region this July took me by surprise, highlighting the lack of preparedness in Chinese metropolitan areas for such unpredictable extreme weather events. We are living in an era where these unexpected occurrences are becoming increasingly frequent, yet our cities and society remain unprepared to handle them. Through the Transitional Territories studio, I am eager to gain a deeper understanding of the risks posed by these extreme weather events and how we can become more prepared facing the impermanent nature of our living environment.	

Graduation project	
Title of the graduation project	Water resilient mosaic: Envisioning a co-evolutionary transformation of territories-in-between in the BTH metropolitan region
Goal	
Location:	Beijing-Tianjin-Hebei (BTH) Metropolitan Region
The posed problem,	The BTH Metropolitan Region is known for its historical patterns of droughts, alongside an increase in severe precipitation and flood events. Additionally, the region faces persistent challenges including subsidence, societal disparities related to development, air pollution, and an aging population. The inherent social-environmental fragmentation present within the region renders it incapable of effectively addressing these emerging socio-environmental challenges, which leads to biophysical and social vulnerabilities in the foreseeable future.

	<p>Landscape fragmentation ecosystem degradation The permeable surfaces, including forests, grasslands, and croplands, have undergone a reduction in size and increased fragmentation as a consequence of swift urbanization since the 1980s. The degradation of these vital ecosystems has negatively impacted water-related ecosystem services, such as water purification and regulation, flood and erosion control, and groundwater recharge. The heightened landscape fragmentation, particularly evident in the Huabei Plain, characterized by significant urban centers and extensive agricultural practices, heightens the region's susceptibility to extreme weather events.</p> <p>Hydrological fragmentation water hazard exposure The hydrological system in the BTH metropolitan region has undergone substantial modifications as a result of engineered water management initiatives and transportation infrastructure. Reservoirs, while effective in mitigating flood events by retaining water, can contribute to increased flow rates in channelized waterways, thereby heightening the risk of downstream flooding, particularly during instances of extreme precipitation that surpass the system's capacity. In economically disadvantaged areas, particularly villages in Hebei province, elevated water hazard exposure is experienced by residents due to inadequate investment in water management systems. This heightened risk is in contrast to residents residing in major cities such as Beijing and Tianjin. Moreover, in times of drought, a significant proportion of the population in these areas is engaged in agricultural activities, thereby intensifying the challenge.</p> <p>Morphological fragmentation social polarization The process of rapid urbanization since the 1980s has not only led to landscape but also morphological fragmentation with disorderly and homogeneous development. Numerous villages have emerged and grew between cities and towns, but a significant portion of them lack proper transportation infrastructure, thereby intensifying developmental imbalances within the metropolitan region. The development paradigm influenced by land finance contributes to heightened segregation between these distant villages and large cities, consequently giving rise to notable economic disparities, educational gaps, and unequal access to essential resources such as healthcare, education, and job opportunities.</p>
<p>research questions and</p>	<p>Overall Research Question:</p> <p>How can a paradigm shift towards water resilience in the development of territories-in-between help alleviate the spatial and temporal disequilibrium of water resources in the Beijing-Tianjin-Hebei (BTH) region, while simultaneously sustaining environmental justice for its inhabitants?</p>

	<p>Sub Analytical research questions:</p> <p>AQ.1 How do the current and historical policies shape the landscape and urban morphology in the BTH region?</p> <p>AQ.2 Who are the major stakeholders involved in the urbanization process, and what is their relationship?</p> <p>AQ.3 What is the seasonal hydrological pattern in the BTH region? Which areas are most vulnerable when facing flood and drought events?</p> <p>AQ.4 Where lie the opportunities to re-balance the spatial and temporal disequilibrium of water resources in the BTH region?</p> <p>Sub Design and planning research questions:</p> <p>DQ.1 What are the principles that assist in reorganizing the territories-in-between as a network, integrating local economic productivity with ecological sensitivity?</p> <p>DQ.2 What potential design approaches can help these principles, and in which scale and domain?</p> <p>DQ.3 What are the positive and negative impacts of these design approaches, and how do they correlate with each other?</p> <p>DQ.4 What are the possible scenarios that the region may face regarding fluctuations in water yield and demand over the next fifty years?</p> <p>DQ.5 How to establish a framework to guide future design implementations, taking into account such uncertainties?</p> <p>DQ.6 How will the implementations unfold over time to alter the territory at various scales under different scenarios?</p> <p>DQ.7 How will the implementations change the daily activities of the inhabitants and their actions during extreme weather events?</p> <p>Sub Assessment research questions:</p> <p>SQ.1 What are the relevant categories in ecosystem services (ES) assessment for water resilience and environmental justice?</p> <p>SQ.2 How does the territorial alteration through the project impact the performance of relevant ES compared to the current status?</p> <p>SQ.3 If the results of the assessment do not meet expectations, how can the implementation plan be revised for better performance?</p>
<p>design assignment in which these result.</p>	<p>To answer AQ.1,2,3,4: Maps and diagrams with comprehensive understanding of the factors that have influenced the urbanization of the BTH region, the vulnerabilities of this region to water-related hazards, and the potential for resilient water management practices.</p> <p>To answer DQ.1,2,3: A set of pattern language that form a cluster of potential interventions to help reorganize the territories-in-between as a cohesive and resilient mosaic, integrating local economic productivity with ecological sensitivity.</p>

To answer DQ.4,5: A series of adaptation pathways roadmap under different water scenarios to guide the implementation of design interventions that can navigate uncertainties and changes over the next fifty years.

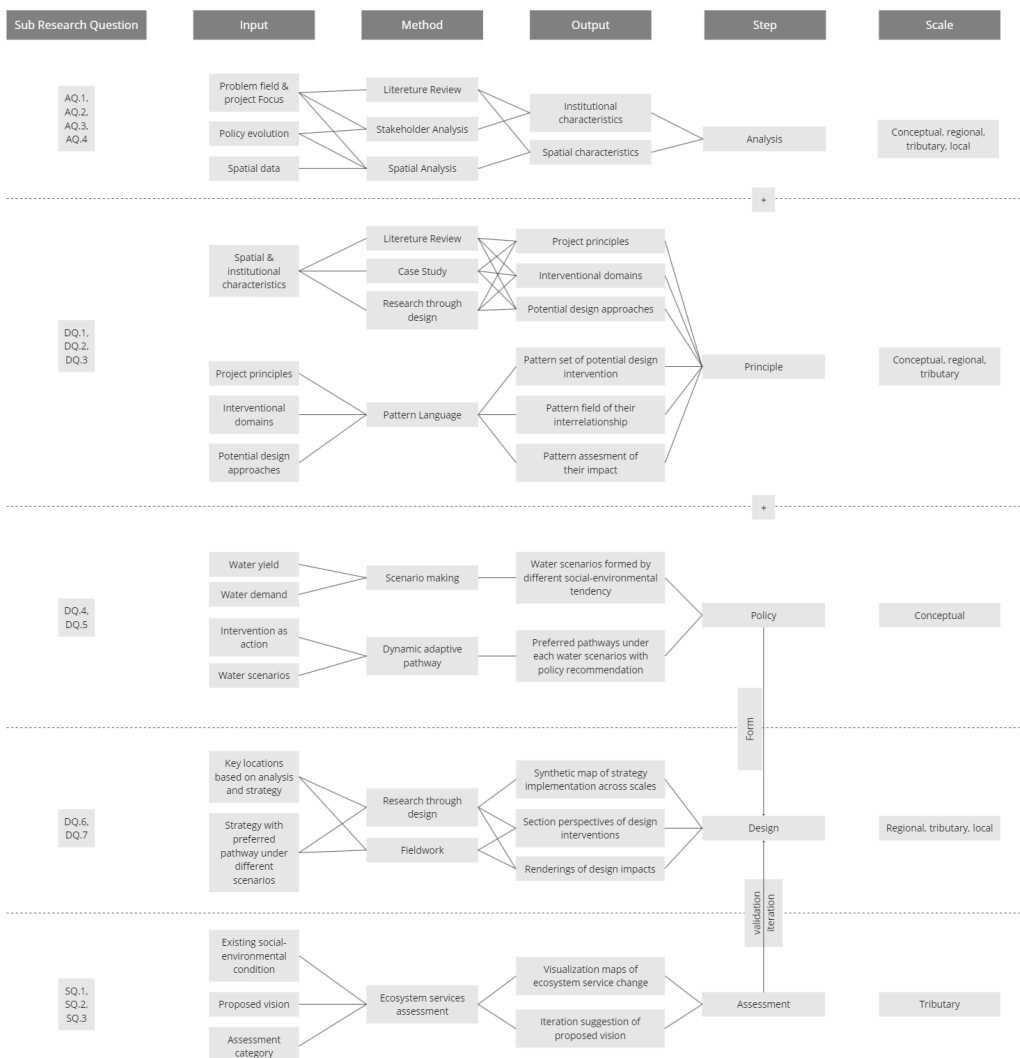
To answer DQ.6,7: A series of plans, sections, and perspectives visioning the potential environmental, socioeconomic, and long-term impacts of proposed implementations from local scale to the metropolitan scale.

To answer SQ.1,2,3: Assessment maps visualizing the environmental and social implications of projects and ensure that they are implemented in a way that promotes both water resilience and environmental justice.

Process

Method description

Methodological framework:



Literature Review

An essential and methodical examination of the prevailing academic literature related to a particular subject or research query. This analysis serves to establish a theoretical framework that situates and rationalizes the argument and proposal in the research, while also pinpointing areas requiring further development. The primary areas of concentration encompass ecosystem-based adaptation, integrated water resources management, village morphology and revitalization, and ecosystem services assessment.

Stakeholder Analysis

An analytical instrument employed to discern and comprehend the interests, requirements, and impact of diverse individuals or groups participating in the development of the territories-in-between. The onion diagram methodology devised by Alexander and Robertson (2004) unveils insights into the sector, level of engagement, and relationship of stakeholders.

Spatial Analysis

A Geographic Information System (GIS) approach to analyze spatial patterns, relationships, and trends resulting from policy evolution in the BTH region. The objective is to ascertain the vulnerabilities of the region to water-related hazards and to identify potential strategies for resilient water management practices.

Case Study

A qualitative research method concentrates on project scopes, seeking to comprehensively understand ongoing hypotheses and practices. The objective is to gain insights into potential design approaches that facilitate the reorganization of the territories-in-between into a cohesive and resilient mosaic.

Research through design

A methodology that employs design processes and outcomes to evaluate different combinations and resultant spatial configurations put forth by the project's guiding principles, anticipated future scenarios, and adaptive pathways.

Pattern Language

An approach for systematically categorizing prospective spatial tools, establishing a toolkit with well-defined solution hypotheses, theoretical foundations, and the anticipated outcomes of implementing such solutions (Salingaros, 2000). The pattern language will additionally serve as a shared communication medium for designers and researchers, fostering collaboration among individuals with diverse academic backgrounds.

Scenario making

A strategic planning and foresight method to construct narratives outlining potential alternative futures. This approach aids in the identification of potential disruptions and challenges, facilitating the development of strategies to address the uncertainties and complexities associated with water availability and demand in the region.

Dynamic adaptive pathway

A planning framework designed to facilitate flexible adjustments over time in response to evolving circumstances (Haasnoot et al., 2013). This is achieved through the integration of design actions, consideration of future scenarios, and the formulation of adaptive plans for implementation. Additionally, the framework offers decision-makers the capability to systematically monitor progress and make adjustments in accordance with altering conditions or newly acquired information.

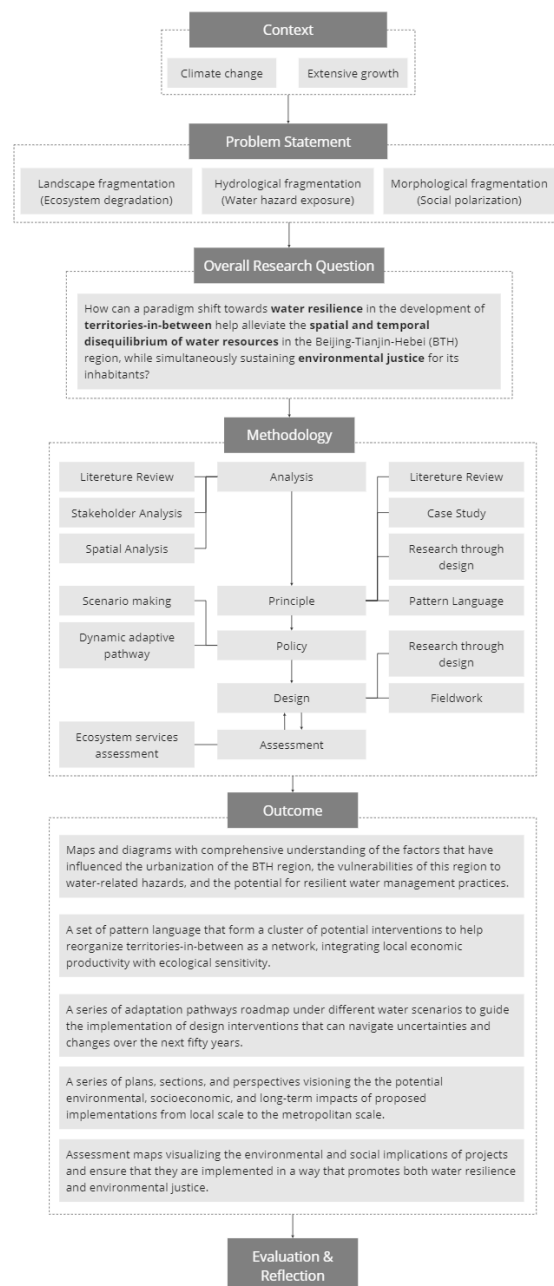
Fieldwork

A process of capturing tangible sensory experiences through photography at the designated site of the proposed design, aiming to enhance comprehension of the actual conditions and validate the design proposition.

Ecosystem services assessment

A process aimed at discerning, quantifying, and appraising the advantages offered by ecosystems upon human society. Specifically, the investigation centers on evaluating the water resilience and environmental justice aspects pertaining to the pre- and post-design implementation conditions at the designated site. Utilizing assessment tools like InVEST constitutes an integral component of this analytical approach.

(Research framework)



Literature and general practical references

Bibliography (on-going):

- Alexander, I., & Robertson, S. (2004). Understanding project sociology by modeling stakeholders. *IEEE Software*, 21(1), 23–27.
<https://doi.org/10.1109/MS.2004.1259199>
- Alexander Wandl, D. I., Nadin, V., Zonneveld, W., & Rooij, R. (2014). Beyond urban-rural classifications: Characterising and mapping territories-in-between across Europe. *Landscape and Urban Planning*, 130, 50–63.
<https://doi.org/10.1016/j.landurbplan.2014.06.010>
- Cheptou, P.-O., Hargreaves, A. L., Bonte, D., & Jacquemyn, H. (2017). Adaptation to fragmentation: Evolutionary dynamics driven by human influences. *Philosophical Transactions of the Royal Society B: Biological Sciences*, 372(1712), 20160037.
<https://doi.org/10.1098/rstb.2016.0037>
- Cui, Y. (2022). The coordinated relationship among industrialization, environmental carrying capacity and green infrastructure: A comparative research of Beijing-Tianjin-Hebei region, China. *Environmental Development*, 44, 100775.
<https://doi.org/10.1016/j.envdev.2022.100775>
- Daniele, C., LI, J., & CAI, J. (2023). Mapping Land Cover Change Through the Implementation of a Spatio-Temporal Matrix: The Case of the Pearl River Delta (China). *Landscape Architecture*, 30(11), 70–86.
<https://doi.org/10.12409/j.fjyl.202208170491>
- Dovey, K. (1990). The pattern language and its enemies. *Design Studies*, 11(1), 3–9.
[https://doi.org/10.1016/0142-694X\(90\)90009-2](https://doi.org/10.1016/0142-694X(90)90009-2)
- Eraydın, A., & Taşan-Kok, T. (2013). Resilience thinking in urban planning. Springer.
- Falkenmark, M., Wang-Erlandsson, L., & Rockström, J. (2019). Understanding of water resilience in the Anthropocene. *Journal of Hydrology X*, 2, 100009.
<https://doi.org/10.1016/j.hydroa.2018.100009>
- Folke, C., Carpenter, S. R., Walker, B., Scheffer, M., Chapin, T., & Rockström, J. (2010). Resilience Thinking: Integrating Resilience, Adaptability and Transformability. *Ecology and Society*, 15(4), art20. <https://doi.org/10.5751/ES-03610-150420>
- Ghofrani, Z., Sposito, V., & Faggian, R. (2017). A Comprehensive Review of Blue-Green Infrastructure Concepts. *International Journal of Environment and Sustainability*, 6(1). <https://doi.org/10.24102/ijes.v6i1.728>
- Guo, J., Mao, K., Zhao, Y., Lu, Z., & Xiaoping, L. (2019). Impact of Climate on Food Security in Mainland China: A New Perspective Based on Characteristics of Major Agricultural Natural Disasters and Grain Loss. *Sustainability*, 11(3), 869.
<https://doi.org/10.3390/su11030869>
- Gyourko, J., Shen, Y., Wu, J., & Zhang, R. (2022). Land finance in China: Analysis and review. *China Economic Review*, 76, 101868.
<https://doi.org/10.1016/j.chieco.2022.101868>
- Haasnoot, M., Kwakkel, J. H., Walker, W. E., & Ter Maat, J. (2013). Dynamic adaptive policy pathways: A method for crafting robust decisions for a deeply uncertain world. *Global Environmental Change*, 23(2), 485–498.
<https://doi.org/10.1016/j.gloenvcha.2012.12.006>

- Hidding, M. C., & Teunissen, A. T. J. (2002). Beyond fragmentation: New concepts for urban-rural development. *Landscape and Urban Planning*, 58(2-4), 297-308. [https://doi.org/10.1016/S0169-2046\(01\)00228-6](https://doi.org/10.1016/S0169-2046(01)00228-6)
- Kallis, G. (2007). Socio-environmental co-evolution: Some ideas for an analytical approach. *International Journal of Sustainable Development & World Ecology*, 14(1), 4-13. <https://doi.org/10.1080/13504500709469703>
- Levintal, E., Kniffin, M. L., Ganot, Y., Marwaha, N., Murphy, N. P., & Dahlke, H. E. (2023). Agricultural managed aquifer recharge (Ag-MAR)—a method for sustainable groundwater management: A review. *Critical Reviews in Environmental Science and Technology*, 53(3), 291-314. <https://doi.org/10.1080/10643389.2022.2050160>
- Li, Q., Chen, L., & Xu, Y. (2022). Drought risk and water resources assessment in the Beijing-Tianjin-Hebei region, China. *Science of The Total Environment*, 832, 154915. <https://doi.org/10.1016/j.scitotenv.2022.154915>
- Li, S., Yang, H., Lacayo, M., Liu, J., & Lei, G. (2018). Impacts of Land-Use and Land-Cover Changes on Water Yield: A Case Study in Jing-Jin-Ji, China. *Sustainability*, 10(4), 960. <https://doi.org/10.3390/su10040960>
- Li, Zhang, & Shi. (2019). Restrictive Effects of Water Scarcity on Urban Economic Development in the Beijing-Tianjin-Hebei City Region. *Sustainability*, 11(8), 2452. <https://doi.org/10.3390/su11082452>
- Martin, L. J. (2022). *Wild by design: The rise of ecological restoration*. Harvard University Press.
- Nesshöver, C., Assmuth, T., Irvine, K. N., Rusch, G. M., Waylen, K. A., Delbaere, B., Haase, D., Jones-Walters, L., Keune, H., Kovacs, E., Krauze, K., Kùlvik, M., Rey, F., Van Dijk, J., Vistad, O. I., Wilkinson, M. E., & Wittmer, H. (2017). The science, policy and practice of nature-based solutions: An interdisciplinary perspective. *Science of The Total Environment*, 579, 1215-1227. <https://doi.org/10.1016/j.scitotenv.2016.11.106>
- Qu, Y., Jiang, G., Li, Z., Tian, Y., & Wei, S. (2019). Understanding rural land use transition and regional consolidation implications in China. *Land Use Policy*, 82, 742-753. <https://doi.org/10.1016/j.landusepol.2018.11.014>
- Runhaar, H. (2016). Towards "nature-inclusive" agriculture [Other]. <https://doi.org/10.18174/389369>
- Salingaros, N. A. (2000). The structure of pattern languages. *Architectural Research Quarterly*, 4(2), 149-162. <https://doi.org/10.1017/S1359135500002591>
- Savenije, H. H. G., & Van Der Zaag, P. (2008). Integrated water resources management: Concepts and issues. *Physics and Chemistry of the Earth, Parts A/B/C*, 33(5), 290-297. <https://doi.org/10.1016/j.pce.2008.02.003>
- Schlosberg, D. (2007). *Defining Environmental Justice: Theories, Movements, and Nature* (1st ed.). Oxford University Press/Oxford. <https://doi.org/10.1093/acprof:oso/9780199286294.001.0001>
- Seddon, N., Chausson, A., Berry, P., Girardin, C. A. J., Smith, A., & Turner, B. (2020). Understanding the value and limits of nature-based solutions to climate change and other global challenges. *Philosophical Transactions of the Royal Society B: Biological Sciences*, 375(1794), 20190120. <https://doi.org/10.1098/rstb.2019.0120>

Tyler, S., & Moench, M. (2012). A framework for urban climate resilience. *Climate and Development*, 4(4), 311–326.

<https://doi.org/10.1080/17565529.2012.745389>

Walker, G. P. (2012). *Environmental justice: Concepts, evidence and politics*. Routledge.

Werners, S. E., Wise, R. M., Butler, J. R. A., Totin, E., & Vincent, K. (2021). Adaptation pathways: A review of approaches and a learning framework. *Environmental Science & Policy*, 116, 266–275.

<https://doi.org/10.1016/j.envsci.2020.11.003>

Wright, D., Stahl, B., & Hatzakis, T. (2020). Policy scenarios as an instrument for policymakers. *Technological Forecasting and Social Change*, 154, 119972.

<https://doi.org/10.1016/j.techfore.2020.119972>

Zhu, J., & Guo, Y. (2022). Social justice in spatial change: transition from autonomous rural development to integrated urbanization in China. *Cities*, 122, 103539.

<https://doi.org/10.1016/j.cities.2021.103539>

Reflection

1. What is the relation between your graduation (project) topic, the studio topic (if applicable), your master track (A,U,BT,LA,MBE), and your master programme (MSc AUBS)?

We live within altered nature. All human activities and their impacts, including humanity itself, are unquestionably integral components of altered nature. In the current era of the Anthropocene, it can be asserted that there exists no nature untouched by alteration, which some refer to as pristine nature.

In the context of my research, altered nature is evident in the ascendancy of gray infrastructure progressively supplanting the extant green infrastructure in the Beijing-Tianjin-Hebei Metropolitan Region. Historically, the study area constituted a coherent hydrological system comprising mountains, rivers, floodplains, and estuaries. However, with the development of water infrastructure in China, an increasing number of dams, rigid river channels, urban development zones, and land reclamation projects have gradually encroached upon the original green infrastructure. In such a context, the altered hydrological system has progressively lost its inherent self-regulatory capacity, becoming more like a controlled machine without resilience in the face of extreme climate events, unable to cope with unexpected flash flood events.

2. What is the relevance of your graduation work in the larger social, professional, and scientific framework.

Many proposals related to resilience and environmental justice in China encounter challenges in implementation. Through assessing the potential impact of the intervention proposed, I aim to enhance the persuasiveness of this plan by providing concrete assessment results.

The research area confronts several societal challenges, namely aging population, polarized development, and air pollution. Additionally, due to insufficient preparedness of society and cities for extreme weather events, there have been reports of serious environmental justice violations. My research and proposal aim to address these societal issues.

The research focuses on the development of territories-in-between, as these areas often lack essential resources for development and are more vulnerable to extreme climate events. Meanwhile, the experiences of residents in these regions often go unnoticed and unacknowledged, despite frequently shouldering the risks of extreme events for economically significant areas. As a Chinese individual, I am deeply concerned about this situation. I recognize the necessity to conduct an in-depth study of the phenomenon and exert my utmost effort to formulate improvement proposals. This endeavor aims to facilitate more informed decision-making among the stakeholders involved.