Rapti
Impact Story

A New Capital Designed for Resilience and Inclusion

Tomorrow's CITIES
Urban Risk in Transition

Table of Contents

01 Summary

03 Introduction

07 Challenges

09 Opportunities

11 TCDSE Implementation

13 Impact

19 In Short

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Thank you for your continued commitment to our shared mission.

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Tomorrow's CITIES
Urban Risk in Transition

Summary

By empowering local communities and training professionals, Tomorrow's Cities has laid the groundwork for a sustainable and resilient future.

The Tomorrow's Cities project has profoundly transformed Rapti City, the newly designated capital of Lumbini Province, by embedding inclusive risk-informed urban planning into its development strategy.

A central achievement was its emphasis on community engagement and inclusivity through participatory workshops that not only engaged the indigenous Tharu community but also perspectives from other groups, including Dalits and Madhesi communities, Muslim, and migrant populations.

The project trained 165 local professionals in risk-informed urban planning and disaster resilience. These professionals, drawn from various disciplines, now have the skills and knowledge to apply the methodologies introduced by the project, ensuring that its outcomes remain sustainable.

Another major success was the institutionalisation of the Tomorrow's Cities Decision Support Environment (TCDSE) with key stakeholders signing a declaration committing to the creation of a disaster-resilient and inclusive city.

Signatories included the Office of the Chief Minister, the Ministry of Home Affairs, the Ministry of Urban Development, and the three municipalities of the capital.

The Provincial Infrastructure Development Authority (PIDA) and the Lumbini Province Planning Commission also supported the initiative. Furthermore, the TCDSE was integrated into national training courses for newly elected mayors and local officials across all 753 local governments in Nepal.

The project also attracted considerable media attention through a series of events, including media interaction with journalists, a student art competition involving students from nine schools, and the participation in Nepal's 26th Earthquake Safety Day.

Additionally, the project directly influenced critical infrastructure planning in Rapti. Enhanced hazard and risk modelling helped identify vulnerable areas, guiding the placement of flood embankments and informing seismic building codes to protect critical infrastructure. These flood mitigation measures, designed with future climate scenarios in mind, will safeguard vulnerable areas from increased rainfall and future flooding.

PIDA is now actively exploring further collaboration to apply these approaches throughout the wider Rapti Valley.

Signing of the Memorandum of Understanding

Introduction

Rapti City, rapidly evolving as Lumbini Province's capital, faces the dual challenge of urban growth and significant environmental risks. Balancing development with disaster resilience is key to its future.

Rapti City, the newly appointed capital of Nepal's Lumbini Province is nestled at the foothills of the Chure mountains. The region is traversed by the Rapti River, flowing centrally through the Deukhuri. This strategic position offers a blend of agricultural landscapes and areas slated for urban development. However, the city's location also exposes it to significant environmental risks. Frequent floods, triggered by the Rapti River and intensified by unpredictable rainfall patterns, pose a constant threat. Earthquake risk is substantial, given the region's seismic activity, and landslides are a recurring concern, particularly during heavy monsoon seasons.

As Rapti City transitions into its role as the provincial capital, its population is growing rapidly. From approximately 76,000 residents in 2021, the population is projected to reach around 140,000 by 2051. This influx is fuelled by migration from rural areas and increased economic opportunities linked to the city's administrative and commercial significance. Urban expansion, while necessary, is in its infancy. The city's boundaries were formed through the consolidation of three municipalities, and much of the land remains agricultural.

There is resistance from local communities to land pooling efforts, highlighting the challenges of balancing development with the preservation of local livelihoods and culture.

Urban planning in Rapti is primarily governed by the Provincial Infrastructure Development Authority (PIDA), which has been tasked with developing the city's master plan. Local governance is shared between PIDA, municipal authorities, and national bodies such as the National Disaster Risk Reduction & Management Authority (NDRRMA). While the political structures are in place, coordination among these institutions is critical, especially as the city grapples with issues of disaster resilience and rapid development.

Rapti was selected as a pilot city for the Tomorrow's Cities initiative due to its unique combination of rapid urbanisation, specially after the declaration of capital city, multihazard environment, and the opportunity to influence development from the ground up. As a city still forming its identity, Rapti offers a valuable opportunity to integrate risk-informed planning into its foundation, particularly in addressing the threats posed by floods, earthquakes, and landslides. Its inclusion in the program allows for the testing of participatory planning methods and the engagement of marginalised communities in shaping the city's future.

Next page: Tomorrow's Cities workshop ▶


INK REFILLABLE
BOARD MARKER

Rapti

489 sq. km
urban area in 2022

50% live
in flood prone areas

17.4%
below poverty line

68 615
population in 2022

Rapti offers a valuable opportunity to integrate risk-informed planning into its foundation, particularly in addressing the risks posed by floods, earthquakes, and landslides, as the city transitions into its role as the provincial capital.

Dilli P. Poudel
Southasia Institute of Advanced Studies

◀ Meeting with local authorities

Next page: Tomorrow's Cities Future Visioning Activity ▶


Micro Infrastructure
घर तथा आवास
Macro Infrastructure
ठूला पूर्वाधारहरु
Institution and Rule of Law
सुशासन (नीतिगत, संस्थागत)
Social Assets
सामाजिक अवस्था
Environment Assets
वातावरणीय पक्ष
Knowledge and
Cultural Assets
ज्ञान र सांस्कृतिक
सम्पदा
Jobs and Livelihoods
रोजगार तथा
जीवनयापनका
साधनहरु
Tomorrow's CITIES
Urban Risk in Transition
Tomorrow's Cities
Decision Support
Environment (TCDSE)
Paperline

Challenges

1

Multi-hazard context

Rapti is highly exposed to natural hazards, including floods, inundations, earthquakes, and landslides. Its proximity to the Rapti River and tributaries, exposes large sections of the city to flooding, particularly during the monsoon season. The city is also located in a seismically active region, making it vulnerable to earthquakes that could severely impact infrastructure. Landslides, especially in the hilly areas surrounding the city, pose additional risks.

2

Rapid Population Growth and Urban Expansion

The city's population is projected to nearly double by 2051, driven by rural-to-urban migration and economic opportunities in the new provincial capital. However, this rapid growth presents challenges in managing urban expansion, particularly in balancing development with the protection of agricultural land, local livelihoods, and culture. Informal settlements are likely to increase, heightening vulnerability to environmental hazards.

3

Resistance to Land Pooling and Urbanisation

Land pooling is a technique where small, fragmented plots owned by individuals or families are combined, re-planned, and redeveloped, with a portion of the serviced land returned to the original owners and a portion repurposed for collective infrastructure. This tool has been widely used in Nepal for urban development. In Rapti, however, the approach has faced resistance. Many local communities, especially those reliant on agriculture, are concerned about the risk of losing their land and the potential cultural and livelihood disruptions that urbanisation may bring. This opposition creates challenges in building trust towards the implementation of large-scale development projects.

4

Coordination Among Governance Bodies

Rapti’s urban planning is overseen by multiple institutions, including PIDA, local municipalities, and national bodies like the NDRRMA. While these institutions have clear roles, effective coordination remains a challenge.

5

Inclusion of Marginalised Communities

The region is home to diverse and often marginalised groups, including the Tharu, Pahadi, Ethnic and Madhesi Muslim communities, as well as Dalits and landless populations. These groups are often excluded from formal planning processes, which leads to inequitable development outcomes.

6

Long-Term Resilience in Urban Planning

Rapti's current urban planning does not fully account for multi-hazard interactions associated with changes in land use, which differ greatly from existing patterns, nor does it address the evolving risks posed by climate change and future population growth. Tomorrow's Cities facilitates the consideration of new cycles of risk accumulation, which could arise from various spatial and policy interventions on the land.

> ***Balancing development with the preservation of local livelihoods and culture presents a significant challenge, especially as urban expansion faces resistance from local communities and the city grapples with disaster resilience amidst environmental hazards.***

Ramesh Guragain
Deputy Executive Director
National Society for Earthquake Technology

Tomorrow's Cities art competition in Rapti.

Opportunities

Rapti City has the chance to pioneer disaster resilience by embedding risk reduction into its early urban planning. Through inclusive participation, coordinated governance, and advanced technology, it can become a model for sustainable, hazard-adaptive growth.

1

Building a Disaster-Resilient City

Rapti City's early stage of urban development presents a unique opportunity to embed disaster risk reduction directly into the city's master plan. Unlike older, more established cities, Rapti can integrate risk assessments, hazard mitigation, and climate change adaptation strategies into its infrastructure and urban planning from the beginning. By doing so, it can avoid many of the vulnerabilities faced by cities that expand without considering these risks. Rapti can become a model for how cities can adapt to hazard exposure and climate change while maintaining sustainable growth. This future-oriented planning can prevent costly retrofits and disaster recovery efforts in the future, as the city will be designed to cope with its hazard context.

2

Participatory and Inclusive Urban Planning

Rapti offers an opportunity to showcase a truly participatory urban development model. The inclusion of marginalised and diverse community groups—such as the Tharu, Pahadi, Ethnic and Madhesi Muslim communities—has the potential to create an equitable city. The engagement of these communities in decision-making can result in a city that reflects the needs and aspirations of all its residents, ensuring that development is inclusive and fair. This participatory approach can also reduce resistance to urbanisation projects, such as land pooling, by building trust and ownership among local stakeholders.

> ***Rapti's status as a pilot city in Tomorrow's Cities provides a unique opportunity to shape its development from the ground up, using participatory planning methods.***

Dilli P. Poudel
Southasia Institute of Advanced Studies

3

Coordinated Governance for Effective Urban Management

While the governance structure in Rapti involves multiple institutions (PIDA, local municipalities, and national disaster authorities), this also presents an opportunity for creating a model of coordinated or multi-level urban governance. Better coordination will allow for more efficient decision-making and implementation of urban development projects. This model of multi-level governance could serve as a blueprint for other regions of Nepal.

4

Harnessing Technological Tools for Urban Planning

Tomorrow's Cities introduced advanced technological tools, such as hazard models, GIS-based land use planning, and scenario development, which provide a data-driven basis for urban planning. This is an opportunity to modernise urban planning in Rapti, moving beyond traditional, reactive approaches to a proactive, evidence-based system. These tools allow planners to simulate future urban growth and disaster impacts, ensuring that infrastructure and housing are built in safer locations with disaster mitigation strategies in place.

▼ Tomorrow's Cities workshop

TCDSE Implementation

The deployment of the Tomorrow's Cities Decision Support Environment (TCDSE) in Rapti stood out for its strong integration with PIDA's planning processes, demonstrating a model of co-production for urban resilience planning.

This co-production approach fostered a close and equitable relationship between the Tomorrow's Cities team, PIDA, and local authorities. It allowed these stakeholders not only to align with the government's vision of creating an inclusive and resilient capital city, but also to provide opportunities for implementing Tomorrow's Cities findings directly into PIDA's and the local authorities' urban development initiatives.

This partnership ensured that the TCDSE methodology was not just a theoretical framework, but a practical tool integrated into ongoing planning efforts. By working closely with the local government and planning bodies, the project facilitated a seamless transition from research findings to real-world application, ensuring that the inclusive and resilient urban strategies were embedded in the city's future development.

165
participants in capacity strengthening activities.

753
representatives from all local governments in Nepal participated in a national training course.

37
students participated in the Tomorrow's Cities Art Competition.

9
local schools involved throughout the project.

1500
people visited the Tomorrow's Cities booth at the 2024 Earthquake Safety Day.

108
participants in the Action Planning Workshop.

Stakeholders

Provincial Infrastructure Development Authority (PIDA)
PIDA oversees and facilitates the development of infrastructure at the provincial level. In Lumbini, PIDA plays a key role in urban planning, infrastructure projects, and managing the development of new cities such as Rapti.

Lumbini Province Ministries
Various departments at the provincial level, including the Chief Minister, Chief Secretary, and relevant ministers, were involved in supporting and integrating the TCDSE into local governance and planning.

National Government Bodies
This included the NDRRMA and the Ministry of Federal Affairs and General Administration (MOFAGA), which expressed interest in institutionalising the TCDSE approach.

Kathmandu Knowledge Leads
Our partners based in Kathmandu, the National Society for Earthquake Technology (NSET) and the Southasia Institute of Advanced Studies (SIAS), were critical in rapidly and successfully deploying the TCDSE in Rapti.

NSET
Earthquake Safe Communities in Nepal

SIAS

Impact

The Tomorrow's Cities project reshaped Rapti City's urban planning, introducing risk-informed strategies into the Lumbini Province Capital City Master Plan. By incorporating multi-hazard assessments and community input, the project ensured that infrastructure and urban development address seismic, flood, and landslide risks while prioritising inclusivity for marginalised groups.

1

Influencing the Regional Master Plan.

The Tomorrow's Cities project played a pivotal role in transforming and improving the Lumbini Province Capital City (LPCC) Master Plan by introducing data-driven, risk-informed strategies. Through the course of the project, newly produced data—particularly multi-hazard assessments of earthquakes, floods, and landslides—directly informed the design of new risk-reduction strategies for infrastructure and urban development. This allowed the Master Plan to integrate more accurate projections of future hazards, ensuring that flood mitigation structures and seismic building codes reflect the latest scientific models and long-term climate change adaptation. Furthermore, the Tomorrow's Cities framework prioritised the involvement of local communities, especially indigenous and marginalised groups like the Tharu, ethnic Dalits, and migrants.

Their inputs, gathered through participatory workshops, ensured that the Master Plan reflects their socio-economic needs and aspirations, fostering a more equitable and inclusive approach to urban planning that accounts for the vulnerabilities of all community segments.

▲ Tomorrow's Cities workshop

Next page: Tomorrow's Cities workshop ▶


लुम्बिनी प्रदेशको राजधानी

2

Official Endorsement of the TCDSE

During the Lumbini Province Symposium held in early 2024, a formal declaration was endorsed by key stakeholders, including PIDA and local municipalities, as an outcome of the Tomorrow's Cities activities. The declaration outlined 8 commitments aimed at fostering disaster resilience in Rapti Valley. 2 of the key commitments rooted in the TCDSE include:

- **Development of a well-managed, disaster-resilient, and inclusive city**. This involves incorporating the development scenarios, co-created by local communities through the TCDSE process, into the Master Plan of Rapti City.

- **Formulation and implementation of Risk-Sensitive Land Use and Development Planning Guidelines**. These guidelines for emerging cities are informed by the TCDSE's principles and methodologies.

The Ministry of Federal Affairs and General Administration included the TCDSE framework in a national training course aimed at newly elected mayors and people's representatives from all 753 local governments in Nepal. This training was designed to promote the localisation of Disaster Risk Reduction and Management practices and support the development of Risk-Sensitive Land Use Plans. The TCDSE principles were also incorporated into the National Framework for Risk-Sensitive Land Use Planning, further extending influence across urban planning and policy development.

Action Planning Workshop

We are fully committed to incorporating the findings and aspirations of all our people, including indigenous, marginalised, ethnic groups, migrants, and low-income communities, into the city's planning. Tomorrow's Cities experts have provided invaluable insights, and I'm pleased to see that our elected officials have embraced this knowledge. Together, we are working towards making Rapti safer and more resilient for the future.

Mr. Chhabi Raj Pokhrel,
Chief Executive Officer
Provincial Infrastructure Development Authority,
Lumbini Province.

We are committed to planning Rapti City not only for today but for the next 50 years. The Master Plan includes wards from Rapti, Shitaganga, and Gadhawa, and we have worked hard to incorporate the aspirations of local communities into this vision. Every aspect of their livelihood needs has been studied and carefully integrated. Moving forward, we are committed to a phase-wise implementation of the plan, but I also call on our partner organisations to assist in providing the resources necessary to bring this vision to life

Ms. Radhika Aryal
Principal Secretary of Lumbini Province

3

Enhanced Hazard and Risk Modelling

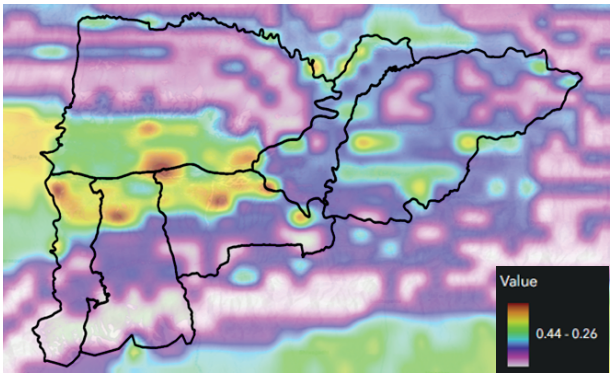
Multi-hazard Assessement

Work done through the Hazard & Impact Modelling stage of the TCDSE provided Rapti with a detailed, multi-dimensional understanding of its exposure to multiple hazards. The data and insights generated through this work will play a crucial role in guiding the city's urban development towards a safer, more resilient future.

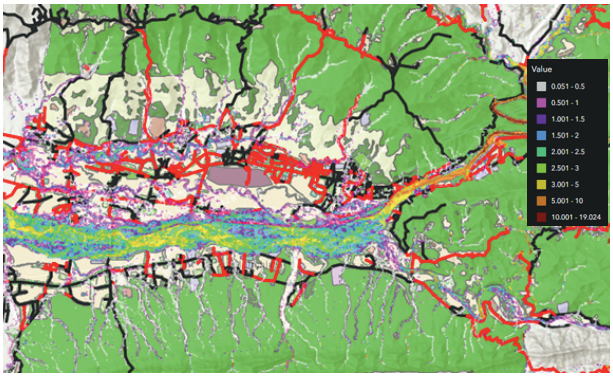
- Earthquake: Ground shaking simulations were conducted using the OpenQuake engine, integrating geological, geomorphological, and seismological data to model the city's exposure.

- Flood: Flood risk was modelled using HAIL-CAESAR and Caesar-Lis models, with future climate scenarios included to predict rainfall impacts. These models produced flood hazard maps that will guide infrastructure development in flood-prone areas.

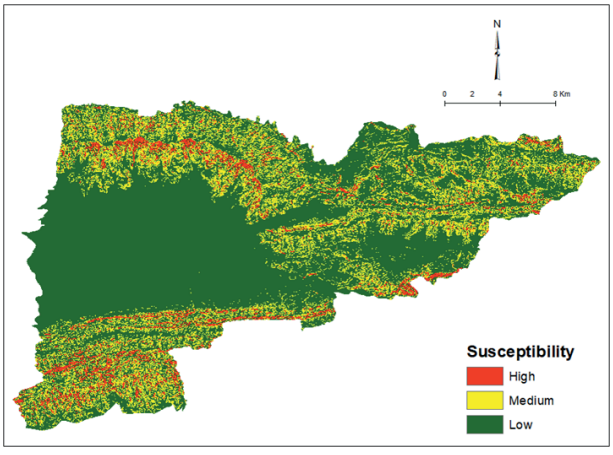
- Landslide Susceptibility was assessed using Logistic Regression models, categorising areas into low, medium, and high susceptibility zones. This analysis identified critical areas where landslide risk could pose significant threats to communities and infrastructure.



Earthquake shake map (peak ground acceleration) for an 8.2 magnitude earthquake (equivalent to 1890 Nepal-Bihar Earthquake)



Flood hazard map (depth in m) for a 70 years return period



Landslide susceptibility map

Impact Assessment on Critical Infrastructure

The resilience of critical infrastructure, including transportation networks and power systems, was evaluated across various hazard scenarios. Connectivity analyses were used to determine the impact of disasters on access to essential services, such as hospitals and schools. The project also developed vulnerability indices for buildings, categorised by construction type (e.g., Adobe, Cement Masonry, Reinforced Cement Concrete), to help planners identify which structures are most at risk from earthquakes, floods, and landslides.

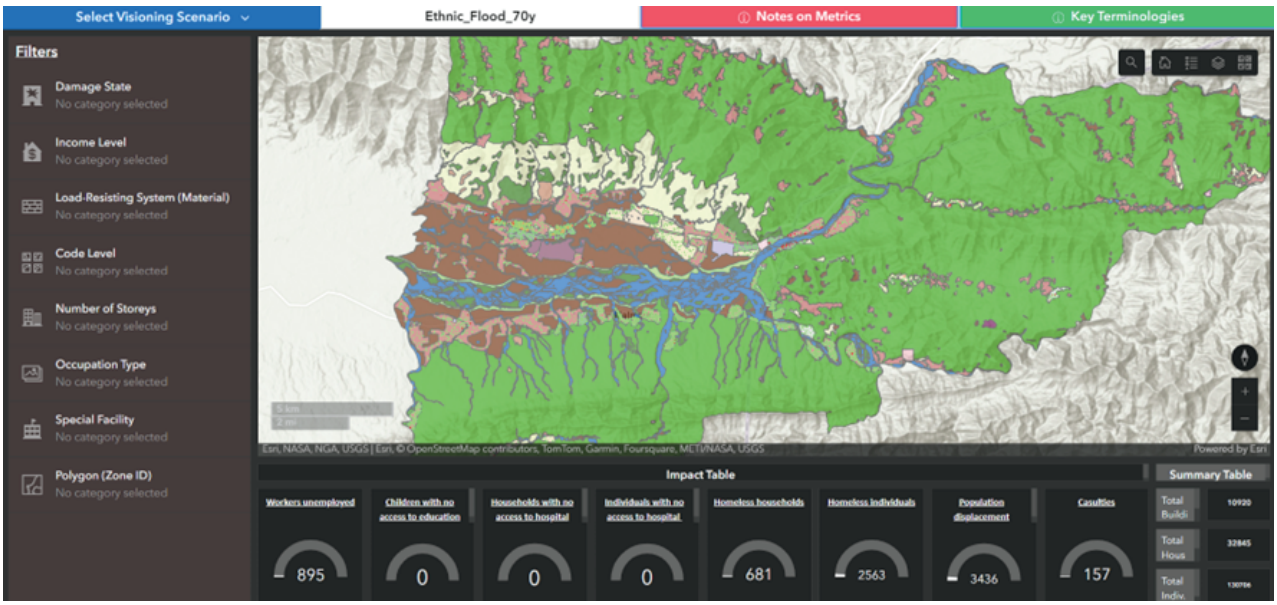
Casualty and Displacement Estimates

The project estimated potential casualties and displacements resulting from earthquakes and floods. By employing specific methodologies tailored to each hazard, it assessed the likely number of affected individuals based on factors such as building damage and population density. This data provides a clearer understanding of how different communities might be impacted, helping to inform disaster preparedness and response strategies.

Integrating Community Perspectives in Technical Assessments

The work in Rapti went beyond technical hazard modelling to include community inputs in assessing the social impacts of disasters. Workshops were conducted with diverse groups to understand local perceptions of risks, ensuring that the vulnerability assessments reflected the realities faced by different socio-economic groups, especially marginalised communities.

The Tomorrow's Cities Risk Dashboard showcases the impacts of a 70-year return flood on both the physical and social environments. This includes visualising how such a flood event would affect infrastructure, such as roads and buildings, as well as its broader implications on the community, including access to essential services and the potential displacement of residents.



Flood Mitigation

One of the key outcomes of hazard modelling in the Tomorrow's Cities project in Rapti was the enhancement of flood mitigation structures in the region. The project's advanced modelling informed the design and strategic placement of embankments to protect exposed areas from future floods. These embankments were specifically designed to account for the impacts of climate change, ensuring they can withstand increased rainfall and severe flooding events.

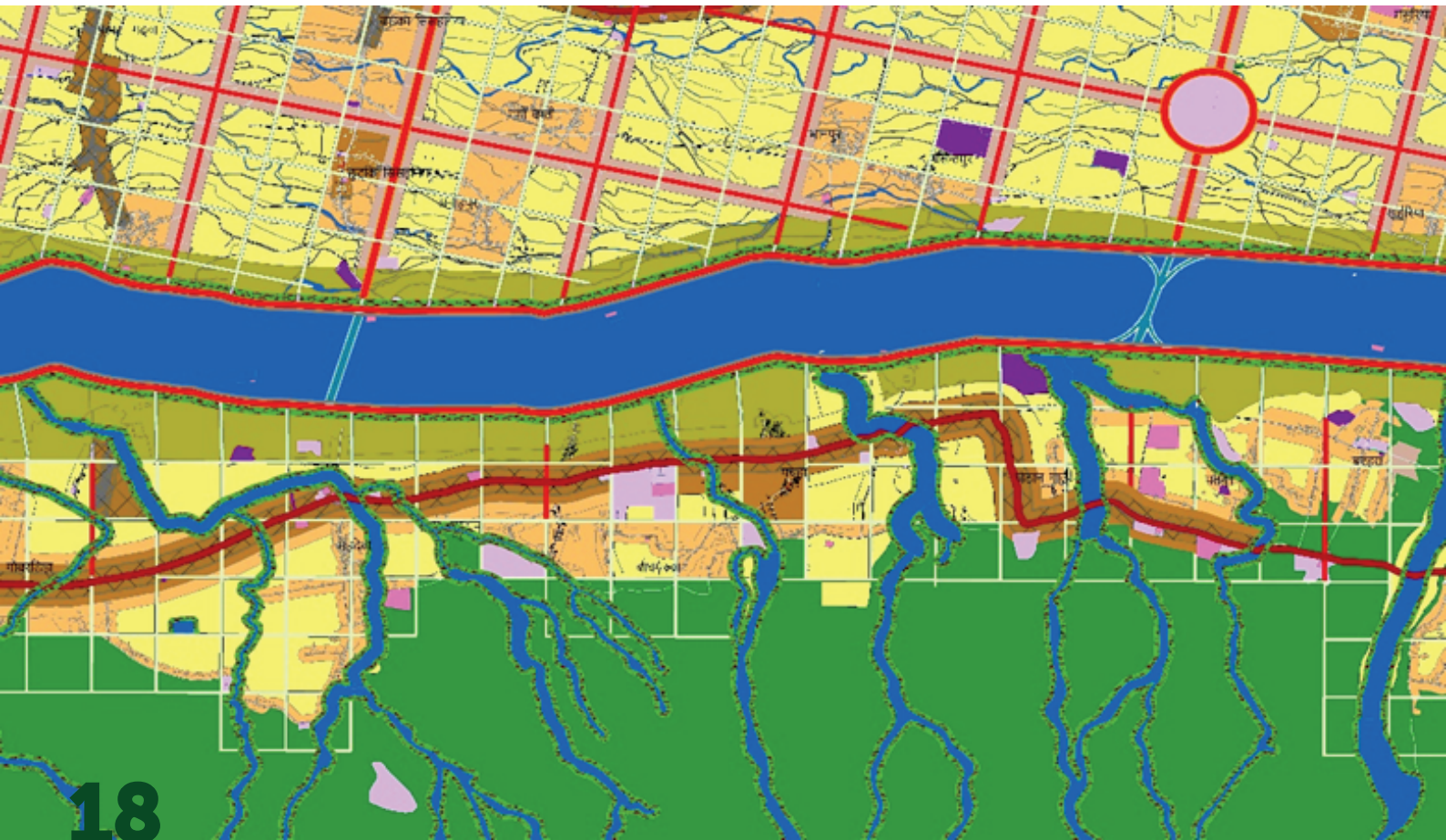
3

Expansion to new cities

High-level meetings and discussions with PIDA and the Lumbini Province ministry are ongoing to implement the TCDSE in new cities across Lumbini Province. Additionally, components of the TCDSE are being considered for inclusion in the Risk-Sensitive Land Use and Development Planning Guidelines for these new cities.

There are also plans to share the approach and its outcomes at the national level with the National Disaster Risk Reduction and Management Authority and other relevant ministries. This is intended to extend the application of the TCDSE to more cities in other provinces of Nepal.

▼ Embankment in the updated LPCC (Lumbini Province Capital City) Master Plan



In Short

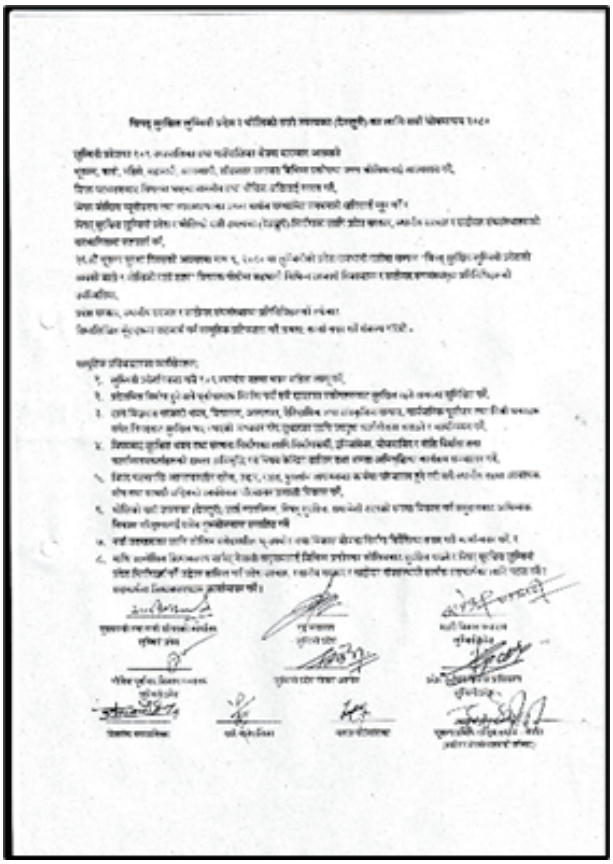
Rapti City stands as a beacon of innovative urban resilience, with Tomorrow's Cities embedding disaster risk-informed practices into its very foundation, setting the stage for a more inclusive, sustainable future across Nepal.

Tomorrow's Cities has established a strong foundation for a safer and more inclusive Rapti City, shaping its transformation into a model for disaster risk-informed urban development. By integrating multi-hazard assessments into the city's Master Plan, ensuring marginalised voices are included in decision-making, and providing training for local professionals, Rapti is now better equipped to address future environmental challenges.

The institutionalisation of the TCDSE framework at both provincial and national levels guarantees that the project's influence will extend well beyond its initial outcomes, shaping urban planning practices across Nepal. As Rapti continues to grow, the insights gained from Tomorrow's Cities will remain at the core of its development, promoting resilience, sustainability, and inclusivity.

The materials published by Tomorrow's Cities consistently emphasise a commitment to advancing the capital city. With ongoing efforts to replicate these approaches in other cities within Lumbini Province and across Nepal, Rapti is poised not only as the provincial capital but as a symbol of innovative urban resilience. The journey to build on this progress has only just begun, and the collaborative ethos of the project will continue to inspire future growth toward a more disaster-resilient Nepal.

Signatures of the several local and national authorities committing to the implementation of the TCDSE



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Tomorrow's Cities
2024
https://tomorrowscities.org

To apply the Tomorrow's Cities approach in your city or to learn more about our work worldwide:

https://tomorrowscities.org/

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Urban Risk in Transition

UKRI UK Research and Innovation

GCRF Global Challenges Research Fund

Up to September 2024, Tomorrow's Cities was an interdisciplinary Urban Risk Hub funded by the UK Research and Innovation (UKRI) Global Challenges Research Fund (GCRF). From 2024 onwards, Tomorrow's Cities functions as a Global Community of Practice for equitable disaster risk reduction.