This Technical Knowledge Exchange (TKX) was organized by the World Bank Disaster Risk Management Hub, Tokyo, in collaboration with the World Bank’s Resilient Transport Community of Practice (CoP) in partnership with the government of Japan (Ministry of Finance (MoF); Ministry of Land, Infrastructure, Transport and Tourism (MLIT)). The TKX also benefited greatly from contributions by the following: the Global Facility for Disaster Reduction and Recovery (GFDRR), Japan International Cooperation Agency (JICA), Iwate Reconstruction Bureau, Hyogo Prefecture, Kyoto University, Nippon Expressway Company (NEXCO), Japan Bosai Platform, and World Road Association (PIARC).
CONCEPT: The Technical Knowledge Exchange (TKX)

Technical Knowledge Exchange (TKX) integrates workshops, site visits, peer-to-peer knowledge sharing, and action planning to support World Bank clients on specific topics. TKX both facilitates knowledge sharing and provides ongoing support to connect clients with technical experts and best practices in close collaboration with the World Bank’s Communities of Practice (CoPs).

The TKXs have four core elements:
1. Objective-focused structure: Demand-driven and problem-solving orientation, with possible technical assistance, including consultation and expert visits to client nations through the World Bank’s City Resilience Program and other programs.
2. Knowledge exchange to foster operations: Knowledge exchange, just-in-time assistance, and potential technical assistance for clients and World Bank task teams.
3. Structured learning: Delivery of structured learning for clients and partners such as e-learning courses and a package of selected knowledge exchange instruments before, during, and after the Technical Knowledge Exchange in Japan.
4. Application to knowledge networks: Contribution of relevant inputs to CoPs to support development of their knowledge assets (such as case studies and best-practice lessons) and to disseminate them to the broader community.

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**ACKNOWLEDGMENTS**

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Transportation infrastructure represents a significant public and private investment that is fundamental to the functioning and development of economies and societies. As such, transport investments have been integral to the World Bank’s partnerships with client countries. Since 2002, more than 260,000 kilometers of road were constructed or rehabilitated through World Bank-supported projects. However, these investments are increasingly exposed to disaster and climate hazards, including landslides, flooding, and earthquakes. To manage and reduce the risks these hazards may pose, low- and middle-income countries are seeking new approaches to plan, design, construct, operate, and maintain their transportation systems.

On May 8–12, 2017, the World Bank Disaster Risk Management (DRM) Hub in Tokyo and the Resilient Transport Community of Practice (CoP) hosted a week-long Technical Knowledge Exchange (TKX) in Tokyo that convened clients and World Bank task team leaders (TTLs) from 16 countries to share concepts and practices on resilient transport, including systems planning, engineering and design, asset management, and contingency programming. The exchange drew upon Japanese and international experts to showcase innovative approaches and practical advice for facing the challenges when addressing risk management planning for the transport sector. Country representatives and World Bank teams learned from one another and from Japan’s challenges and successes with large-scale disasters. One key lesson was that continuously reviewing and enhancing domestic practices and regulations will ultimately increase the resilience of transport networks.

The Resilient Transport TKX also served as a platform for the launch of the new Road Geohazard Risk Management Handbook developed under the Hub’s Knowledge Program. The tool was presented alongside case studies of its application across federal, state, and municipal levels in Brazil and Serbia. The Handbook itself urges a shift away from traditional and reactive approaches towards a multidimensional geohazard risk management approach that incorporates people, the environment, hydrology, and geology as well as transportation infrastructure so that such proactive methodology can result in 60–70 percent life-cycle cost savings. Going forward, the Resilient Transport CoP will continue to connect current and future World Bank transport investments with the information, tools, and technical expertise that exist in Japan and in many countries in the area of resilient transport.

**ABBREVIATIONS**

<table>
<thead>
<tr>
<th>DRM</th>
<th>Disaster Risk Management</th>
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<tbody>
<tr>
<td>GRM</td>
<td>Geohazard Risk Management (Handbook)</td>
</tr>
<tr>
<td>IT</td>
<td>Information Technology</td>
</tr>
<tr>
<td>JICA</td>
<td>Japan International Cooperation Agency</td>
</tr>
<tr>
<td>LMICs</td>
<td>low- and middle-income countries</td>
</tr>
<tr>
<td>NGO</td>
<td>nongovernmental organization</td>
</tr>
<tr>
<td>TEC-FORCE</td>
<td>Technical Emergency Control Force (Japan)</td>
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<tr>
<td>TKX</td>
<td>Technical Knowledge Exchange</td>
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</table>
Participant Profile and Challenges Faced

The TKX brought together World Bank staff working in five regions; experts from Japan and New Zealand; and client delegations from Afghanistan, Argentina, Brazil, Cambodia, Colombia, Georgia, India, the Kyrgyz Republic, the Lao People’s Democratic Republic, Mozambique, Myanmar, the Philippines, Serbia, Sri Lanka, Tajikistan, and Vietnam. FIGURE 1 60 percent of the attendees represented the transport sector, while the other 40 percent comprised individuals working in the infrastructure and public works and disaster risk management (DRM) fields. Country representatives shared their unique challenges, practices, and lessons learned with over 70 people who participated in the exchange. Each country presented a lightning talk on the disaster risks affecting their own transport sectors. FIGURE 2 and the methods they employ to make them more resilient. This ultimately informed each country as they developed action plans.

| AFGHANISTAN | • AF: Afghanistan Rural Access Project (P125961) • Trans-Hindukush Road Connectivity Project (P165347) |
| ARGENTINA | • Northwestern Road Corridor (P163175) |
| BRAZIL | • São Paulo Sustainable Transport Project (P127723) |
| CAMBODIA | • KH: Road Asset Management Project II (P150572) |
| COLOMBIA | • CO Support Natl Urban Transit Program (P179747) |
| GEORGIA | • GE: Climate Resilience of Road Network (P161222) |
| INDIA | • IN: PMGSY Rural Roads Project (P124639) • BBRRP (P155522) |
| KYRGYZ REPUBLIC | • Central Asia Regional Links - Phase 3 (P157220) |
| LAO PDR | • Lao Road Sector Project 2 (P158504) • Lao PDR Southeast Asia DRM Project (P160930) |
| MOZAMBIQUE | • MZ-APL2 Roads & Bridges (P083325) • Feeder Road Project (P158231) |
| MYANMAR | • Flood and Landslide Emergency Recovery C (P158194) |
| PHILIPPINES | • Technical assistance on Local Roads Management (P162622) |
| SERBIA | • Corridor X Highway AF (P158413) • Implementing Open Data Plan for Serbia (P162777) |
| SOUTH ASIA | • Nepal-India Reg Trade & Transport Prj (P164355) |
| SRI LANKA | • Transport Sector Project (P132833) |
| TAJIKISTAN | • RSIP (P158707) |
| VIETNAM | • Vietnam Road Asset Management Project (P123961) • Local Road Asset Management Program (P155086) |

Together, these projects represent more than US$5 billion in government-led investment, supported by the World Bank.
1. Understanding disaster (that is, geohazard) risks faced by the transport sector and system planning-based approaches to manage these risks

2. Showcasing Japan and global good practices on asset management technologies and institutional and financial mechanisms

3. Exploring innovative materials and structures to reduce vulnerability

4. Learning from Japan’s emergency management response and contingency planning efforts

5. Examining how transport infrastructure can be used as protection against hydrometeorological events

The TKX included six main sessions (including 14 lectures) on the principles of resilient transport, about which the experts from Japan offered relevant experience; two keynote addresses; two field visits, and two workshops.

Key Takeaways

- Investments in accurate data collection, archiving, analyzing, and sharing systems are crucial. A comprehensive system should be developed that focuses on the entire value chain, from data collection and analysis to efficient service delivery. Long-term planning, institutional aspects, and data systems are key for sustainability of investments.

- Capacity building of the stakeholders, through training and site visits, promotes well-coordinated, long-lasting, and effective resilient transport planning. Participants were specifically interested in developing asset management tools; implementing comprehensive geohazard management systems; and sharing technical guidance notes, case studies, and terms of reference.

- Incorporating climate and DRM in the transport sector life cycle is essential, and effective resilient transport management systems are built on legal and regulatory frameworks that define clear responsibilities and roles of different stakeholders, such as governments, municipalities, media, and the private sector.

- Upstream planning of transport systems can reduce the hazard exposure of the infrastructure that results in greater disaster risk. To utilize the life-cycle approach effectively, institutional and regulatory challenges, which are cross-cutting in nature, need to be mitigated. The life-cycle approach applied to highlight how climate and disaster risk management can be integrated in the different phases of infrastructure life-span:

  - Systems planning: Shifting deployment of long-lived infrastructure away from disaster-prone areas to avoid development lock-in; consideration of integration and redundancy on critical infrastructure to offer alternatives.

  - Engineering and design: Using transport infrastructure both for connectivity and for DRM purposes, particularly from hydrometeorological-related hazards; use of innovative materials and design specifications that enhance robustness and flexibility of infrastructure.

  - Asset management: Inventory and mapping of transport infrastructure using open and interoperable technologies and improving institutional and financial arrangements for infrastructure maintenance; integration of climate and disaster risk considerations in the prioritization of investments in new infrastructure, rehabilitation, and restoration.

  - Contingency programming: Developing policy and institutional frameworks, communication protocols, and investments in emergency preparedness and response; alignment of transport systems and flows with local and regional evacuation, response, and recovery needs.

FIGURE 3  Key Themes of the TKX  Source: Resilient Transport CoP
TRANSPORT damages and losses often make up a significant proportion of the economic impacts of disasters, frequently surpassing destruction to housing and agriculture in value terms. Damage is sustained not only by road surfaces or structures, but also by bridges, culverts, and other drainage works, while losses occur when breaks in transport links lead to reduced economic activity. Transport systems that are built well the first time—upholding structural and schematic standards and planning for safe failure—and that are well maintained are less likely to collapse when under pressure. With networks incurring damage less often, costs of rebuilding the same structures are reduced, and time and funding are made available for investment in more capable, adapted systems. If disaster strikes, a still-functioning transport system can also enhance the protection and revitalization of other sectors. Finally, planning and programming for contingencies ensures that when failures do occur, they can be addressed in a way that limits negative impacts.

With a growing transport and DRM agenda across the WB, the Resilient Transport CoP brings together members of the Climate Change Cross-Cutting Solutions Area (CCSA), GFDRR, Social Urban Rural & Resilience Global Practice (GPSURR), and Transport and ICT GP (T&I GP), with the objective of creating a knowledge-sharing environment for DRM and transport sector specialists. This CoP has principally developed since September 2016, with the aim at establishing professional sharing practices among multidisciplinary staff that provides Task Teams with a suite of cross regional best practices and grant funding for technical assistance. By tackling DRM and transport in tandem—integrating the priorities and needs of both sectors—robust resilient transport systems can be established to reduce the risk of lost returns on investments and make strides toward long-term poverty reduction.

Japan’s Experience in Transport DRM

The government of Japan has a wealth of knowledge and experience in identifying and managing hazards that may adversely affect transport. In Japan, the challenges and lessons learned from large-scale disasters have been the driving force for continuously reviewing and enhancing the regulations, institutional frameworks, financing, staff capacity, and technology to advance resilience in transport. The TKX tapped into this experience by inviting speakers from Japan’s public sector, private sector, academia, and civil society to share their lessons learned in relation to each of the life-cycle phases.

Specifically, the Ministry of Land, Infrastructure, Transport and Tourism (MLIT) provided the overall institutional DRM framework for roads in Japan and introduced the Technical Emergency Control Force (TEC-FORCE) mechanism whereby the national government coordinates across regions to quickly deploy technical capacity for post-disaster recovery. In addition, Nippon Expressway Company Limited (NEXCO) presented an advanced and unique model for how private highway companies can manage and operate resilient roads, as well as the technology and capacities put in place to respond to disasters.
From the World Bank welcomed the participants on behalf of the Bank’s Resilient Transport Community of Practice. The interest received for this event and the coming together of global practice units and client countries from around the world was a testament to the importance of and need to enhance the resilience of transport systems to the impacts of natural disasters and climate change.

Incorporating climate and disaster risk management into infrastructure investments is an important part of meeting the World Bank Group’s commitments to address climate change. Given this context, the Technical Knowledge Exchange (TKX) set the following key objectives:

- Raise awareness of the importance of climate and natural disaster resilient transport systems by exposing World Bank clients and teams to resilient transport concepts and best practices.
- Foster learning, knowledge sharing, and collaboration among client countries on the topic of resilient transport.
- Start documenting best practices being deployed by client countries, with the support of the World Bank, to facilitate replication and scaling-up of solutions.
- Improve understanding of challenges faced by client countries to inform World Bank products and services in order to best serve and support client countries.

Japan has developed its institutional and regulatory framework to define roles and responsibilities of governmental organizations for disaster risk management (DRM) as one of the world’s most disaster-prone countries. Figure 5 Fukumoto provided a comprehensive explanation of how Japan has established a centralized DRM system by having strong coordination and communication at the national, prefectural, and municipal levels to ensure the consistency of DRM plans and its implementation approach. As a result, Japan has been able to mobilize people and resources effectively during any phase of the disaster management cycle (mitigation, preparedness, response, and recovery). His presentation emphasized the importance of continuously improving the technical capacity of those who engage in disaster response and recovery work through practical trainings. For example, Japan’s Technical Emergency Control Force (TEC-FORCE) is a group of trained experts who provide immediate support when local municipalities cannot manage the situation in the event of disaster.

### FIGURE 5
Japan’s Institutional Framework for Disaster Management System. Source: Adapted from Hitoshi Fukumoto’s presentation.
SESSION 1: Introduction to Road Geohazard Risk Management

YUKA MAKINO, senior natural resources management and disaster risk management specialist, World Bank

THE World Bank’s Road Geohazard Risk Management (GRM) Handbook urges traditional reactive approaches to improving transport network resilience to move toward a multidimensional geohazard risk management approach. FIGURE 6, which incorporates people, the environment, hydrology, and geology as well as transportation infrastructure, this proactive methodology is threefold—working through the steps of evaluating hazards, monitoring networks, and managing infrastructure accordingly—and can result in 60–70 percent life-cycle cost savings.

Effective transport asset management must include the following elements: (a) geohazard risk evaluation from a landscape perspective; (b) hazard monitoring, early warning systems, structural measures, and emergency preparedness and response planning; and (c) institutional coordination and management.

FIGURE 6 Holistic Approach for Geohazard Management

Source: Road Geohazard Risk Management Handbook.

[It is] easy to get money when disaster happens but difficult to get funding for preventive actions. —Yuka Makino

Currently the GRM Handbook is being tested through technical assistance programs and the first release of the executive summary was distributed to Technical Knowledge Exchange (TXK) participants. The unabridged version of the document contains sample terms of reference, operations manuals, and guidance for cost-benefit analysis.
ALTHOUGH Brazil faces significantly fewer natural hazards than many of the countries represented at the TKX, its transport infrastructure is extremely critical and highly vulnerable to disaster shocks. Approximately 25 percent of the Brazilian economy relies on the functioning of a pair of highways between the São Paulo metropolitan area and the Port of Santos, the busiest container port in the Latin American region. Therefore, any obstruction on that road can have a sizable impact on the entire country’s economy.

Unfortunately, the country faces significant institutional challenges in mobilizing disaster resilience. The GRM Handbook encourages countries to establish standard operating procedures and recognize that DRM is not only the responsibility of federal or central governments, but also of state, local, and all other administrative bodies. The World Bank team is working in Brazil across federal, state, and municipal levels and is currently focused on addressing issues of poor communication to promote better sharing of data across government sectors.

IN MAY 2014, an unprecedented rainfall resulted in massive flash flooding and landslides in Serbia. The transport sector took an enormous hit as bridges failed, roads were eroded, and thoroughways were flooded by river water. The government realizes that it needs to streamline DRM but doesn’t know where to start. Therefore, the World Bank team is applying the GRM Handbook to address the government’s unanswered questions. This effort includes making the case for increasing capacity, upgrading maintenance plans, and filling the data gap to improve the country’s 5- and 10-year DRM implementation plans.

Risks are defined and evaluated quantitatively and qualitatively. Based on the shared understanding of risks, Tamura suggested evaluating road geohazard risks more systematically by using a standardized risk index and rating. By using the example of risk assessment on the national highway (a 170-kilometer section) running through the Pacific coast area of Japan, Tamura emphasized the importance of quantifying road geohazard risks by using a risk index to identify treatment areas and specify risk mitigation methods. The proposed method of road DRM is to evaluate the risk of road facilities systematically and demonstrate the efficiency of the proposed method through a case study. The process involves the identification of natural disasters (hazards), damage assessment of road facilities, evaluation of direct and indirect damages, evaluation of consequences, evaluation of risks, and examination of the disaster prevention measures. FIGURE 7

FIGURE 7 Proposed Risk Management Process Source: Adapted from Keiichi Tamura’s presentation.
**JULIE ROZENBERG, economist, World Bank**

**DECISION MAKERS** often have to make decisions that will have an impact for many years to come, without having access to full information or certainty. Rozenberg presented a road network model designed to help decision makers overcome this burden in two ways:

- Identify critical links in a transport network by using a new technology (available as a free phone app) called RoadLabPro to collect up-to-date data about the network and then systematically simulate disruptions to highlight the road disruptions that will lead to the highest increase in costs and time.

- Prioritize robust interventions to improve the resilience of the transport network given that risks and their consequences are uncertain.

Experience shows that relying too much on the past can be sometimes dangerous for future plans. —Julie Rozenberg

The tool urges decision makers to move from a "predict, then act" system to one that allows for iteration—that is, moving through phases of learning, acting, learning, revising, and then acting again based on new information. **FIGURE 8** This model was applied to Mozambique and Peru, and findings from a series of scenario studies show that increasing maintenance always yields higher economic benefits, though they do not protect against the worst-case scenarios. The World Bank team recommends that the best option is to build redundancy only in the routes that draw the highest traffic and that it is always beneficial to invest in resilience.

**MONIQUE CORNISH, New Zealand Climate Adaptation Platform, University of Auckland, and Tonkin & Taylor**

**RECENT RESEARCH** commissioned by the New Zealand Transport Agency (NZTA) defines resilience as “the ability of systems (including infrastructure, government, business, and communities) to proactively resist, absorb, recover from, or adapt to disruption within a timeframe which is tolerable from a social, economic, cultural, and environmental perspective.” This definition is not restricted to natural hazards but takes a wide view of challenges to the system.

The tool developed for NZTA supports decision makers in the consideration of the consequences of unavailability of an asset in the context of social, cultural, environment, and economic impacts, as well as community tolerance to outage and willingness to pay. **FIGURE 9** Monique emphasized the importance of taking a wide view of resilience as it relates to a variety of stresses and shocks; of focusing on social, cultural, and environmental as well as economic value at stake; of allowing for a range of stakeholder perspectives in decision making, and of prioritizing outcomes and systems rather than assets.

It’s very important to place communities and their tolerance of risk at the heart of our decision making. —Monique Cornish

**THE TRADITIONAL WAY OF MAKING DECISIONS**

<table>
<thead>
<tr>
<th>Predict</th>
<th>Act</th>
</tr>
</thead>
<tbody>
<tr>
<td>Learn</td>
<td>Act</td>
</tr>
</tbody>
</table>

**FIGURE 8** Proposed Decision Making Process Source: Adapted from Julie Rozenberg’s presentation.

**FIGURE 9** Suggested New Approach to Consequence Source: Adapted from Monique Cornish’s presentation.
Keynote 2: Road Asset Management for Disaster Resilience
KIYOSHI KOBAYASHI, professor, Graduate School of Management, Kyoto University

INFRASTRUCTURE is a driving force for development and is an invaluable asset in megacities, especially in low- and middle-income countries (LMICs). Kobayashi first defined the objective of road asset management as “to enhance the optimal allocation of the limited budget between the new arrangement of infrastructure and rehabilitation/maintenance of the existing infrastructure to maximize the value of the stock of infrastructure and to realize the maximum outcomes for the citizens.” Considering the challenges of asset management in LMICs—due to their poor quality of infrastructure, growing and diverse needs for infrastructure services, and vulnerabilities to disasters—Kobayashi reiterated the need for proper road inspections and asset data collection and management to prioritize road investment in a strategic manner.

His presentation focused on the collaboration of Kyoto University with Vietnam to improve the road asset management system over the past 12 years. By conducting a training course with Vietnamese universities and others to enhance the skills of the civil engineers, Kyoto University and the Japan International Cooperation Agency (JICA) helped Vietnam build its technical capacity to apply the “Kyoto Model” invented by Kyoto University. The Kyoto Model is a performance-based road asset management system that supports the decision making of PMS (pavement management systems) based on an actual investigation inspection, repair data, and performance to reduce the life-cycle cost of road pavement at the project level or network levels. Unlike previous models—including the Highway Design and Maintenance Standards Model (HDM) developed by the World Bank—the Kyoto Model requires minimal data and provides a standard platform corresponding to an international standard as well as a PMS that supports overall pavement asset management. FIGURES 10 A–B

Finally, Kobayashi again emphasized the importance of maximizing the value of infrastructure for citizens by having optimal allocation of resources between investment for new construction and spending for the maintenance costs of existing facilities through a step-by-step evolution of the asset management system.

**FIGURE 10A** The Kyoto Model of Road Asset Management vs. Previous Models
Source: Adapted from Kiyoshi Kobayashi’s presentation

**FIGURE 10B** The Kyoto Model of Road Asset Management vs. Previous Models
Source: Adapted from Kiyoshi Kobayashi’s presentation

Infrastructure is a driving force for development and is an invaluable asset in megacities.
—Kiyoshi Kobayashi
SESSION 3: Road Asset Management and Mapping for Resilience

TAKEAKI SHONO, civil engineer, Land Development Department, Land Planning Division, Hyogo Prefecture

Most of Hyogo Prefecture’s infrastructure was built after the 1960s, and thus maintenance and renewal costs are expected to increase in coming years. To repair and renew aging infrastructure efficiently, maintenance plans based on a wide range of data and information are necessary. Hyogo Prefecture is using infrastructure data management systems to maintain infrastructure efficiently. Hyogo Prefecture manages a comprehensive infrastructure data platform by centralizing six key information systems: a facility ledger system, an asset management system, a geographic information management system, a requests-and-complaints management system, a photograph storage system, and a mobile system. **FIGURE 11** This infrastructure data platform allows users to access data from anywhere (such as office and construction or inspection sites) remotely via internet. The photograph storage system, which enables users to share geographical location and photographs of disasters, can enhance the quick recovery of affected sites.

**FIGURE 11** Hyogo Prefecture’s Infrastructure Data Management Systems Source: Adapted from Takeaki Shono’s presentation.

THE NEW Zealand government has a policy, upheld across all sectors, that urges a focus on resilience planning, emergency response, and integration with business continuity planning. Resilience planning involves the mapping of hazard exposure—understanding road networks not only as linear systems of state highways and local roads but also about what they connect and enable.

Fairclough shared the Modeling the Economics of Resilient Infrastructure Tool (MERIT) that the New Zealand government is developing to understand the types of businesses that can be affected by different hazards and how those impacts can take shape. **FIGURE 12**

**FIGURE 12** Modeling the Economics of Resilient Infrastructure Tool (MERIT) Source: Adapted from Roger Fairclough’s presentation.

MERIT is an economic evaluation tool and may be used to assess the economic impacts associated with major infrastructure outages such as the GDP impacts. MERIT is a dynamic, multi-regional and multi-sectoral economic model that contains all of the core features of a computable general equilibrium (CGE) model. Finally, he recalled that adaptability is key; plans need to be easy to understand and easily readjusted.

We are guilty of plans that run into hundreds of pages. We need realistic implementation. —Roger Fairclough

**FIGURE 12** Modeling the Economics of Resilient Infrastructure Tool (MERIT) Source: Adapted from Roger Fairclough’s presentation.
SESSION 4: Innovative Materials and Structures for Vulnerability Reduction

KENSOKE ICHIKAWA, manager, Disaster and Water Resources Management Division, Kokusai Kogyo Co. Ltd.

ETHIOPIA’s National Road Route 3 crosses through the Abay Gorge to connect the district towns of Dejen and Gohatsion. The winding 42-kilometer stretch of road drops and then climbs 1.2 kilometers along cliffs and steep slopes, presenting difficult geohazard conditions and demanding engineering challenges for road construction and maintenance. In fact, engineers found four critical landslides in the project area from 2010 to 2012. JICA-supported work identified options to address these issues. Focusing on surface drainage, earth removal, soil nailing, erosion prevention, and anchoring, the project showed the value of sharing and adapting techniques with local engineers and the need to continue to innovate and adapt economic selection of materials and more labor-intensive—rather than capital-intensive—approaches. FIGURE 13


HUSZAK SHARED the research conducted at the University of Auckland concerning the better understanding of the role that water ingress has to play on road asset failures. Water related failures is an issue that is being exacerbated through climate change, population increase, and urbanization. Conducted research includes deepening the understanding of water related failures, as well as exploring options to increase road asset resilience. In many cases, water is needed to build roads, but as soon as building is completed, water is seen as the enemy. Water can enter the system through infiltration through the surface (including being forced through by traffic), capillary rise (water rising from water table), and from the shoulder. Research aimed at understanding waterproofness of thin chipseals (sprayed seals), and moisture susceptibility of pavement materials. This research will provide better information from which to improve and optimize design processes of road assets. Options to increase resilience of roads include the use of positive drainage techniques, permeable pavements, Epoxy modified open graded porous asphalt (EMOGPA), and waterproof solutions for thin chipseals (sprayed seals). The challenge still exists of integrating this knowledge into widely used decision making processes to select options that increase resilience and reduce risk. FIGURE 14

**WITHOUT WATERPROOFING**

- Repeated traffic loading (~750kPa, ~0.002sec)
- Water entering seal defect

**WATERPROOF ROAD SOLUTIONS**

- Repeated traffic loading (~750kPa, ~0.002sec)
- Water entering seal defect but prevent from entering basecourse
- Waterproofing membrane Top 10-15mm of basecourse impregnated
- Basecourse layer intact

**WITHOUT WATERPROOFING**

- Water entering seal defect
- Flushing
- Weakened, saturated basecourse
- Basecourse layer intact

**WATERPROOF ROAD SOLUTIONS**

- Water entering seal defect but prevent from entering basecourse
- Waterproofing membrane Top 10-15mm of basecourse impregnated
- Basecourse layer intact
SESSION 5: Emergency Management Response and Contingency Planning

KATSUNAO TANAKA, director, Disaster Risk Management Division, Water and Disaster Management Bureau, Ministry of Land, Infrastructure, Transportation and Tourism

According to MLIT’s DRM protocol, when large-scale natural disasters occur, MLIT’s senior officials gather immediately at the Disaster Control Center to:

- Collect disaster-related data and information;
- Assess damage situations;
- Share critical disaster-related information with the prime minister’s office and other ministries (such as the Cabinet Office, which plays a general coordination role and provides disaster information to the public and mass media); and
- Determine contingency plans.

MLIT’s Technical Emergency Control Force (TEC-FORCE) is a group of trained technical experts dedicated to providing special support in case of emergency. Since its establishment in April 2008, more than 8,000 people from each organization of MLIT have been assigned to TEC-FORCE and have supported 69 disaster-affected areas. TEC-FORCE’s activity location and investigation results are shared through the Integrated Disaster Mapping System (DiMAPS), which integrates damage information such as roads, rivers, seismic intensity, and emergency routes.

Finally, Tanaka shared MLIT’s efforts to prepare for a future Nankai Trough megathrust earthquake, which is expected to occur around the time of the 2020 Tokyo Olympics, and emphasized the importance of investing in preparedness.

UEMURA gave an overview of the duties of Japan’s Nippon Expressway Company (NEXCO), which include toll management, road maintenance and repairs, and inspection. The regional head office and traffic control center collect private data from weather forecasting information services, meteorological agencies, and traffic patrol monitors to assess road and weather conditions. For NEXCO, information and institutional arrangements are the essential foundation of a well-operated expressway.

In our roles, who and when needs to do what is very well prescribed.—Osamu Uemura

In the event of a disaster, NEXCO prioritizes road clearance to restore the network within 20 hours for emergency vehicle passage. General use is permitted within 13 days after temporary restorations have been made, while full restorations are expected to take up to two years after an event. To conclude, Uemura shared strategies, such as NEXCO’s comb-like road-opening process and eight-directions strategy, which aims to reestablish the accessibility to Tokyo from eight directions within 48 hours after the earthquake by maintaining at least one route in each direction.

These strategies facilitate the rapid response and recovery of transport systems and enable NEXCO to fulfill its mission of protecting society and responding to disaster-hit areas.
SESSION 6: Transport Infrastructure as Protection against Hydromet Events

STEFAN HUSZAK, geotechnical engineer, New Zealand Climate Adaptation Platform, University of Auckland

Urbanization removes a number of natural means to reduce flooding, and paved surfaces also cover significant urban areas that could be used to recharge the groundwater and reduce pressure on storm water. Although pavements traditionally are designed to keep water out, permeable pavements do the opposite and, as a result, they can effectively disseminate water to ground and avoid flooding. A trial of permeable pavement technology was constructed on Auckland’s North Shore (New Zealand); which was a success in its function, but a more expensive option when not including the value of other benefits such as environmental and flood risk reduction benefits. These benefits of DRM intervention need to be properly quantified and considered for a true value of the technology. Huszak highlighted that although various pavement and surface design options exist around the world, it is critical to consider the hydro-related hazards holistically as well as long-term infrastructure performance for the needs in specific locations. Figure 17 In addition, he reiterated that the benefits of resilience measures should not only be quantified in economic terms but should also include their environmental, social, and cultural aspects. The Mauri model was presented as a tool to quantify and account these benefits, and successfully shown to be of use on a case study of a road project in Samoa (funded by the World Bank).

KAZUSHIGE ENDO, deputy director general, Iwate Reconstruction Bureau, Reconstruction Agency

After the Great East Japan earthquake in 2011, the government established a Reconstruction Agency in 2012 to coordinate reconstruction policies and implement government assistance by promoting clear communication between the central government and local governments and other line ministries and agencies. Under Japan’s Cabinet Office, the Reconstruction Agency was positioned and ranked higher than other ministries and agencies. Figure 18 Within this institutional framework, the minister of the Reconstruction Agency is authorized to provide any support across different ministries and agencies and thus can comprehensively manage and expedite the reconstruction process. The budget for reconstruction measures and activities for the planned 10-year period (FY 2011 to FY 2020) was set at approximately US $320 billion, and the progress of recovery of key infrastructure such as transportation, schools, and hospitals was almost complete (as of November 2016).

Endo shared examples of the seawalls constructed in Rikuzentakata city in Iwate Prefecture and how the design of the seawalls is harmonized with the natural environment and recreational space such as parks and provides not only safety for the residents but also beautiful scenery. He also noted that roads can serve as seawalls in case of emergency by explaining how the East Sendai Expressway in Miyagi protected 230 people who evacuated to the roadway (height of embankment is 7–10 meters) during the 2011 Tohoku earthquakes by blocking the tsunami and debris from the Pacific Ocean.
The Watarase Retarding Basin (WRB) is a flood control basin that stores water for daily use and retains the river overflow temporarily to prevent flooding. The objective of the visit was to allow participants to understand both normal and extraordinary operations at river management offices, particularly before, during, and after expected major flood events. The site visit included a tour of the facilities and levee, which serve key functions in mitigating flood impacts to downstream metropolitan Tokyo. Participants also visited the roadside station, which was constructed on the super levee to provide amenities for road users and to serve as an evacuation center with storage for emergency goods.

The WRB was constructed as a flood control measure after the flood caused by Typhoon Catherine in 1947, which inflicted large damages to many areas of the flood-prone Kantō Plain. The Fujihatake area super levee was constructed from 1998 to 2000 on the western bank of the Yata River (a tributary of the largest tributary of the Tone River, called Watarase), where the vulnerability to extreme hydromet events is relatively high. In addition to its functions as a WRB levee, the Fujihatake area super levee also forms part of the levee road of Prefectural Road Nº 9. Participants drew key lessons on the integration of disaster risk management (DRM) into road transport infrastructure from the observation of super levees (much wider than ordinary levees and designed against floods and seismic events); roads in retarding basins, levee roads; and overflow levees, which are applicable for river crossing (as a road river-crossing structure) as a non-all weather service concept for low-volume roads.
NEXCO Traffic Control Center,
Saitama City

East Nippon Expressway Company Limited (NEXCO East) is one of the three Nippon Expressway Companies owned by the government of Japan. NEXCO East is responsible for the construction and operation and maintenance of 3,870 kilometers of expressways with a daily traffic volume of 2.8 million vehicles; operation of terminals for trucks; and roadside business including parking lots and rest areas. The main disaster types on the expressway are mountainside slope failures, embankment collapses, flooding, and damage to bridges. The objective of the visit was to allow participants to understand the advanced intelligent traffic control (ITC) technology used for traffic control, including road disaster emergency management.

To prepare and respond to disasters, NEXCO’s Iwatsuki Traffic Control Center integrates observed hydrometeorological and seismic data and information as well as early warnings from the Japan Meteorological Agency. This information helps NEXCO organize an emergency task force and response measures at the affected segments of highways that it manages. The Control Center was upgraded in February 2016 with backup arrangements from other control centers to avoid disruption of services in the event of natural disasters.

The participants learned about the Control Center’s disaster identification and response procedures, as follows:

- **Monitoring and emergency response:** The traffic control room monitors and integrates information about abnormal events (including natural disasters, objects on the road, disabled cars, and accidents); road conditions (such as traffic jams and road closures); and weather conditions to provide emergency information to traffic users in coordination with the Regional Police Bureau’s Expressway Management Office, fire departments, Ministry of Land, Infrastructure, Transport and Tourism (MLIT), and local governments. At the time of an abnormal event, the traffic control room provides instructions to the NEXCO’s Traffic Management Patrol Squad on-site to implement appropriate emergency response measures. The patrol squad sends video feeds to the traffic control room for further instructions.

- **Asset management:** The facility control room collects and analyzes the data and information about tunnels and bridges to develop and implement a maintenance and rehabilitation plan. It also monitors and controls the operations of various facilities on roads and tunnels using remote supervision control facilities that are available 24 hours a day. In case of fire in the long tunnels, control room personnel swiftly guide the road users for evacuation and operate emergency facilities in the tunnels.
Afghanistan

Overall transport and disaster risk management (DRM) institutional mapping: The Ministry of Transportation designs, constructs, maintains, and prepares geohazard mapping. The Ministry of Economy acts as a DRM coordinator through the working committee.

Client-identified challenges: Key challenges include the move toward preparedness from the current status of focusing mainly on post disaster response, lack of financial resources, technical capacity, and effective institutional arrangement.

Implementation plan: (1) Conduct capacity building exercise; (2) conduct comprehensive functional analysis of existing systems; and (3) map geohazard risks of a network of selected routes.

Argentina

Overall transport and DRM institutional mapping: The Ministry of Transport is a specialized agency on national roads and national railways. The Ministry of Security provides post disaster response.

Client-identified challenges: Geohazard risks and their impacts are not analyzed on a systematic basis. Owing to the lack of institutional and functional links between transport and DRM, Argentina has no institutionalized risk assessment process.

Implementation plan: (1) Review locally applicable design and construction standards; (2) develop vulnerability assessment guide and database; (3) draft a prioritized plan of locations to be measured on the sample network and a quantified assessment of net benefits; and (4) draft recommendations on design and maintenance protocols with additional climactic data.

Brazil

Overall transport and DRM institutional mapping: Civil defense under the Ministry of Integration has the mandate to provide emergency assistances to people and assets affected by natural disasters. However, it is not linked to the Ministry of Transport and National Road Department for risk identification and assessment.

Client-identified challenges: In the past five years, four major disaster events cost a total of US$7.5 billion, US$5.5 billion of which were direct damages while the other US$2 billion were related losses. In addition to the lack of clarity in responsibility of each institution related to DRM, there is need to enhance DRM data integration and establish risk evaluation methodology.

Implementation plan: (1) Establish the missions, targets, and responsibilities of all related institutions on all phases of DRM in the short and long term; (2) define the approach for the assessment of vulnerability and risk; and
Cambodia

Overall transport and DRM institutional mapping: The National Committee for Disaster Management, the country’s lead government authority for disaster management and response, has been established. Responsible institutions are designated for transport and DRM at the national and rural levels.

Client-identified challenges: Flooding has been the biggest problem with over the past 50 years, with destructive flooding occurring approximately every five years. There are also flash floods. Most roads are unpaved and vulnerable to disaster risks, particularly with limited maintenance. While hazard maps have been created based on simple and limited hydrometeorological data, upgrading disaster risk identification and assessment is needed.

Implementation plan: (1) Learn more about the matrix system risk identification and measurement; (2) initiate dialogue with the competent bodies around DRM, including community participation; and (3) increase human capabilities and financial resources to implement road asset management with proper design for disaster risks.

Georgia

Overall transport and DRM institutional mapping: Transport and DRM are under different agencies and ministries.

Client-identified challenges: Landslides and rockfalls are the most common and frequent threats. While Georgia implements an identification and assessment process applying multicriteria analysis for vulnerability determination, preparation of strategic action plans and inclusion of geohazard intervention in current asset management systems is required.

Implementation plan: (1) Finalize geohazard vulnerability assessment; (2) prepare a prioritized work program; (3) update the road asset management process and design standards; and (4) prepare clear guidelines for emergency response.

India

Overall transport and DRM institutional mapping: A National Disaster Management Act and Policy, as well as national, state, and district disaster management plans are prepared. State governments lead the process of risk identification by developing satellite imagery and advanced forecasting systems.

Client-identified challenges: India has been focusing on how to integrate disaster and climate resilience through the life cycle of infrastructure by improving knowledge and awareness through modern information technology (IT)-based tools, optimizing network designs and increasing green cover, and improving asset management programs.

Implementation plan: (1) Prepare climate resilience strategy for rural roads; (2) conduct vulnerability mapping of core transport networks; and (3) seek climatically optimized roads and bridges.

Kyrgyz Republic

Overall transport and DRM institutional mapping: The Ministry of Transportation designs, constructs, maintains, and prepares geohazard mapping. The Ministry of Economy acts as a DRM coordinator through the working committee.

Client-identified challenges: Although avalanches occur yearly and the Ministry of Transportation allocates a budget for repairs and response every year, the funds are not sufficient. It is necessary to strengthen preparedness by setting up financial resources, develop technical capacity with dedicated technical units based on effective institutional arrangement, and create sustainable early warning systems.

Implementation plan: (1) Conduct functional analysis of existing systems; (2) map geohazard risk of a selected network of routes; and (3) prepare clear guidelines for emergency response.

Lao People’s Democratic Republic

Overall transport and DRM institutional mapping: Transport and DRM management activities are under the responsibility of different agencies at both central and provincial levels. Sector strategy, design standards, specification and budget allocation, risk identification, and implementation of national road are under responsibility of Ministry of Public Works, while provincial level is responsible for risk identification, planning, and implementation of local roads.

Client-identified challenges: Key challenges include the need for a long-term strategic plan integrating land use planning, coordination between sectors to implement a National Green Growth Strategy, and incorporation of the road disaster management into sector development plans and operationalization of resilient road asset management.

Implementation plan: (1) Improve climate resilient road asset management, road design standards and specifications, and technical guidelines to enhance the road network; (2) improve quality of and access to hazard inventory and hydrometeorology data for road design, planning and monitoring; and (3) mainstream National Green Growth Strategy into five-year sector plan and sector strategy.

Mozambique

Overall transport and DRM institutional mapping: Institutions responsible for both transport and DRM are the Ministry of Public Works, Housing and Water Resources; the Ministry of Transport and Communications; the Ministry of Local Government; and the Ministry of Economy and Finance. Engineering and design for the road are managed by the National Road Administration (ANE) and Road Fund (RF). Asset management or risk management are conducted by the ANE, RF, local governments, and municipalities.

Client-identified challenges: Although the Ministry of Transport developed climate risk screening with efforts to revise design standards through a consultative process with industries, academics, and the public sector, successful implementation will require strong institutional and sectorial coordination.

Implementation plan: (1) Implement pilot projects throughout the country; (2) mainstream climate resilience issues into the country strategies; (3) set up a tool for country processing.
Philippines

SUMMARY

of Public Works and Highways provides design for local government units (LGUs). The Department of the Interior and Local Government (DILG) and the Department of Public Works and Highways (DPWH) are responsible for the maintenance of road networks in the Philippines. The Department of Environment and Natural Resources (DENR) is responsible for the preparation of land-use plans and the development of natural resources. The Department of Transportation (DOT) is responsible for the development of transport infrastructure. The Department of Finance (DOF) is responsible for the allocation of funds for transport projects.

Client-identified challenges: The Philippines faces several challenges in transport and disaster risk management. The road network is outdated and vulnerable to extreme weather events. The Department of Environment and Natural Resources (DENR) and the Department of Transportation (DOT) are responsible for the development of transport infrastructure. The Department of Finance (DOF) is responsible for the allocation of funds for transport projects.

Implementation plan:

1) Establish a national vulnerability assessment and emergency response system;
2) Formulate a flood risk assessment methodology for vulnerability assessment of roads;
3) Establish a data exchange platform and a construction code considering climate change effects.

Sri Lanka

Overall transport and DRM institutional mapping:
The Ministry of Transportation and the Ministry of Defence are responsible for transport and disaster risk management. The Ministry of Defence is responsible for disaster risk management and the Ministry of Transportation is responsible for transport infrastructure. The Ministry of Finance is responsible for the allocation of funds for transport projects.

Client-identified challenges: Sri Lanka faces several challenges in transport and disaster risk management. The road network is outdated and vulnerable to extreme weather events. The Ministry of Defence is responsible for disaster risk management and the Ministry of Transportation is responsible for transport infrastructure. The Ministry of Finance is responsible for the allocation of funds for transport projects.

Implementation plan:

1) Enhance geospatial road asset management, landslide mapping, and monitoring system for the road network;
2) Establish natural hazard monitoring, (3) create forecasting and early warning systems;
3) Establish task forces and management systems to respond to disasters.

Vietnam

Overall transport and DRM institutional mapping:
The Ministry of Transport and the Ministry of Planning and Investment are responsible for transport and disaster risk management. The Ministry of Transport is responsible for transport infrastructure. The Ministry of Planning and Investment is responsible for the allocation of funds for transport projects.

Client-identified challenges: Vietnam faces several challenges in transport and disaster risk management. The road network is outdated and vulnerable to extreme weather events. The Ministry of Transport is responsible for transport infrastructure. The Ministry of Planning and Investment is responsible for the allocation of funds for transport projects.

Implementation plan:

1) Conduct knowledge workshop and capacity building exercise;
2) Assess functional analysis of existing systems in relation to DRM and resilience of transport infrastructure;
3) Conduct geohazard risk mapping for a network of selected routes for shorter term and climate change vulnerability assessment for longer term.
Summary of Community of Practice (CoP) Work Plan Development

The TKX showed how the Resilient Transport CoP encouraged the creation of partnerships at the country level and emphasized that people are at the center of the World Bank Group’s Resilient Transport efforts moving forward. One of tangible engagements emerged through this TKX is the launch of a regional approach, “high mountainous countries initiative,” proposed by three countries in Central Asia – Afghanistan, Kyrgyzstan, and Tajikistan –aiming at the creation of a resilient transport system based on their numerous similarities in the geography, topography, type and occurrence of disasters, and economic situation. This initiative was agreed upon among three delegations during the TKX and then idea was presented by the Minister of Transport and Roads of the Kyrgyz Republic, Mr. Kalilov. While countries have diverse starting points, values, and approaches, the CoP reiterated the importance of developing a flexible suite of engagements that can be applied in a modular way.

This Resilient Transport CoP continues to consolidate and scale-up efforts to build climate and disaster resilient transport systems. The program grounds future, relevant World Bank Group projects to the appropriate sectors by establishing a base set of tools, solutions, and priorities on which to build. The CoP will host follow-up events, publish blog posts, create knowledge products, and hold meetings. Ultimately the CoP’s goal is to help task team leaders support country officials who make key decisions on transport and encourage them to build more resilient countries.

CONCLUSION

The World Bank recognizes infrastructure as a driving force for development and an invaluable asset for cities. Incorporating elements of resilience into infrastructure investments in an informed way is an important part of meeting the World Bank Group’s commitments to climate action. Moving forward, the Resilient Transport CoP will continue to leverage the information, tools, and technical expertise that exist in Japan and in many other countries to inform current and future World Bank transport investments by ensuring that the wealth of knowledge and experience within each country or institution can be shared widely to benefit as many countries and people as possible.
# DAY 1. MONDAY, MAY 8

## OBJECTIVES OF DAY 1
Set out the objectives, concept, definition, and framework of resilient transportation
Introduce client profiles and development challenges and set out what we are trying to achieve
Launch the Road Geohazard Risk Management Handbook
Deepen understanding of risk and system planning
Introduce and explore road asset management and resilience mapping

<table>
<thead>
<tr>
<th>Time</th>
<th>Activity</th>
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<tbody>
<tr>
<td>8:30 am – 9 am</td>
<td>Registration and Breakfast</td>
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<tr>
<td>9 am</td>
<td>Welcome and Opening Remarks (10 minutes)</td>
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<tr>
<td></td>
<td>Mr. Marc Forni, lead DRM specialist, World Bank</td>
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<td>Ms. Maria Cordeiro, senior transport specialist, World Bank</td>
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<tr>
<td>9 am</td>
<td>Learning Objectives and Client Profiles (10 minutes)</td>
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<tr>
<td></td>
<td>Mr. James (Jay) Newman, DRM specialist, DRM Hub, Tokyo (GFDRR)</td>
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<td>Ms. Naho Shibuya, DRM specialist, DRM Hub, Tokyo (GFDRR)</td>
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<td>Ms. Shoko Takemoto, DRM specialist, DRM Hub, Tokyo (GFDRR)</td>
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<tr>
<td>9:45 am</td>
<td>Keynote Presentation: Disaster Risk Management of Roads in Japan (15 minutes)</td>
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<td></td>
<td>Mr. Hitoshi Fukumoto, senior deputy director, Road Bureau, Ministry of Land, Infrastructure, Transport and Tourism</td>
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<tr>
<td>9:45 am</td>
<td>Q&amp;A (10 minutes)</td>
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<td>10:30 am</td>
<td>Coffee Break</td>
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<tr>
<td>10:45 am</td>
<td>Session 1: Opening and Launch of Road Geohazard Risk Management Handbook</td>
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<tr>
<td></td>
<td>Introduction of Road Geohazard Risk Management Handbook (45 minutes)</td>
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<td></td>
<td>Introduction to Road Geohazard Risk Management (10 minutes)</td>
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<td></td>
<td>Dr. Yuka Makino, senior natural resources management and DRM specialist</td>
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<td>Case Study: Brazil (7 minutes)</td>
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<td></td>
<td>Mr. Frederico Ferreira Fonseca Pedroso, DRM specialist, and</td>
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<td>Fernando De Melo E Silva, transport consultant (via VC)</td>
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<td>Case Study: Serbia (7 minutes)</td>
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<td>Dr. Yoganath ADIKARI, DRM consultant, World Bank</td>
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<td>Q&amp;A (15 minutes)</td>
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<td>Panel, including Mr. Mikihiro Mori, chief specialist, Geosphere</td>
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<td>Engineering &amp; Disaster Management Office, Nippon Koei</td>
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<td>10:45 am</td>
<td>Session 2: Understanding Risk and System Planning</td>
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<td>Understanding Risk and System Planning</td>
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<td>Lightning Talks from international experts (45 minutes)</td>
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<td></td>
<td>Dr. Keiichi Tamura, chair, Technical Committee on Disaster Management, World Road Association (PIARC): “Quantitative Evaluation of Road Disaster Risks”</td>
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<td>Ms. Monique Cornish, NZ Climate Adaptation Platform and Tonkin &amp; Taylor: “Building the Business Case for Resilience”</td>
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<td>Ms. Julie Rozenberg, economist, World Bank</td>
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<td>Q&amp;A (15 minutes)</td>
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<tr>
<td>11:45 am</td>
<td>Client Country Presentations (20 minutes)</td>
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<td>Q&amp;A, exchange of views in small group discussions (10 minutes)</td>
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<tr>
<td>12:15 pm</td>
<td>Lunch</td>
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<td>1:00 pm</td>
<td>Session 3: Road Asset Management and Mapping for Resilience</td>
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<td>Introduction to Road Asset Management for Disaster Resilience</td>
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<td>Keynote presentation (20 minutes)</td>
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<td>Q&amp;A (10 minutes)</td>
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<tr>
<td>1:30 pm</td>
<td>Case Studies on Technology and Institutional / Financing</td>
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<td>Lightning Talks from international experts (30 minutes)</td>
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<td>Q&amp;A (10 minutes)</td>
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<td>2:10 pm</td>
<td>Client Country Presentations (30 minutes)</td>
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<td>2:40 pm</td>
<td>Feedback and Comments from Expert Panel</td>
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<td>Prof. Kobayashi, Mr. Fairclough, and World Bank team (10 minutes)</td>
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<td>2:50 pm</td>
<td>Coffee Break</td>
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<td>3:10 pm</td>
<td>Action Planning (small groups)</td>
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<td></td>
<td>Mr. James (Jay) Newman, DRM specialist, DRM Hub, Tokyo (GFDRR)</td>
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<td>Challenge Questions and Action Planning (WB and client teams) (60 minutes)</td>
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<td>4:30 pm</td>
<td>Report Back</td>
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<td>Small group reporting: representative from each group presents key points</td>
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<td>Feedback and Comments from Expert Panel (15 minutes)</td>
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<td>Prof. Kobayashi, Mr. Fairclough, and World Bank team</td>
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<td>5:25 pm</td>
<td>Wrap-up</td>
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<td>Wrap-up of Day 1 and Overview of Day 2 (5 minutes)</td>
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<tr>
<td>5:30 pm</td>
<td>Welcome Reception with Japan Bosai Platform</td>
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**DAY 2: TUESDAY, MAY 9th**

**OBJECTIVES OF DAY 2**

Explore innovative materials and structures for vulnerability reduction
Explore approaches to emergency management response and contingency planning

<table>
<thead>
<tr>
<th>Time</th>
<th>Session 4: Innovative Materials and Structures for Vulnerability Reduction</th>
<th>Details</th>
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<tbody>
<tr>
<td>9:00 am</td>
<td>Recap of Day 1 and Overview of Day 2 (5 minutes)</td>
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<tr>
<td>9:05 am</td>
<td>Session 4: Innovative Materials and Structures for Vulnerability Reduction</td>
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<td>Innovative Materials and Structures for Vulnerability Reduction</td>
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<td></td>
<td>Lightning Talks from international experts (45 minutes)</td>
<td>Mr. Kensuke Ichikawa, manager, Disaster and Water Resources Management</td>
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<td>Division, Kokusai Kogyo Co., Ltd.</td>
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<td>Mr. Stefan Huszak, NZ Climate Adaptation Platform and University of</td>
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<td>Auckland: “Understanding Resilience of Natural Aggregate Properties;</td>
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<td>Epoxy Porous Asphalt; Coastal Roads and Rising Seawater Levels”</td>
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<td>Q&amp;A (15 minutes)</td>
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<td>10:00 am</td>
<td>Client Country Presentations (30 minutes)</td>
<td>Columbia, Sri Lanka, India, Vietnam</td>
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<td>Q&amp;A, exchange of views in small group discussions (15 minutes)</td>
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<td>11:00 am</td>
<td>Coffee Break</td>
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<td>11:30 am</td>
<td>Session 5: Emergency Management Response and Contingency Planning</td>
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<td>Emergency Management Response and Contingency Planning</td>
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<td>Lightning Talks from international experts (30 minutes)</td>
<td>Mr. Katsunao Tanaka, Disaster Risk Management Division, Water and</td>
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<td>Disaster Management Bureau, Ministry of Land, Infrastructure,</td>
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<td>Transportation and Tourism (MLIT), Japan: Presentation on TEC-FORCE</td>
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<td>Mr. Osamu Uemura, Nippon Expressway Company (NEXCO): Presentation on</td>
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<td>Disaster Management</td>
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<td>Q&amp;A (15 minutes)</td>
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<td>12:30 pm</td>
<td>Client Country Presentations (20 minutes)</td>
<td>Afghanistan, Argentina, Tajikistan</td>
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<td>Q&amp;A, exchange of views in small group discussions (10 minutes)</td>
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<td>1:00 pm</td>
<td>Lunch</td>
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<td>2:00 pm</td>
<td>Client Country Presentations (20 minutes)</td>
<td>Philippines, Myanmar, Serbia</td>
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<td>Q&amp;A, exchange of views in small group discussions (10 minutes)</td>
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<td>2:30 pm</td>
<td>Session 6: Transport Infrastructure as Protection against Hydromet Events</td>
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<td>Transport Infrastructure as Protection against Hydromet Events</td>
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<td>Lightning Talks from international experts (15 minutes)</td>
<td>Mr. Stefan Huszak, NZ Climate Adaptation Platform and University of</td>
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<td>Auckland: “Vulnerability Aspects of Coastal Infrastructure (Erosion and</td>
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<td>Storm Events), Resilience Options, Coastal Protection, Protection against</td>
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<td>Storm Events, Infrastructure that Has to Come with Sea Level Rise”</td>
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<td>Q&amp;A (10 minutes)</td>
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<td>3:00 pm</td>
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3:30 pm Engagement and Action Planning
Small group discussion and action planning (30 minutes)
Small group reporting: representative from each group presents key points (15 minutes)
Interactive session and feedback on learning needs from each country (15 minutes)

5:00 pm Wrap-up
Wrap-up of Day 2 and overview of Day 3 (5 minutes)

**DAY 3: WEDNESDAY, MAY 10**

**OBJECTIVES OF DAY 3**
Learn about how to utilize transport infrastructure for DRM measures against hydromet events Expand network of transport sector DRM stakeholders in Japan

9:00 am Recap of Day 2 and Overview of Day 3 (5 minutes)

9:05 am Session 6: Transport Infrastructure as Protection against Hydromet Events (contd)
Transport Infrastructure as Protection against Hydromet Events
Lightning Talks from international experts (15 minutes)
Mr. Kazushige Endo, Iwate Reconstruction Bureau, Reconstruction Agency
Q&A (10 minutes)
Depart from Tokyo to Kako City, Saitama Prefecture (bus)
Lunch in the bus and one break at highway service area

12:30 pm Field Visit 1: Watarase Retarding Basin and Levee Roads
Wetland Information Center
The Watarase Retarding Basin (WRB) is located in the center of Kanto plains and constructed to store water for daily consumption and to temporarily retain the river overflow to prevent flooding in the river basin. The area is highly prone to floods and the facility serves as a key function for mitigating impacts of floods to the downstream metropolitan Tokyo. The levee road (Prefectural Road No.9) surrounds the WRB, and the stability of the road embankment has been enhanced as Super Levee against floods and seismic risk. At the WRB Wetland Information Center, an overview of WRB and the role of Super Levee / Prefecture Road during the past typhoon events will be explained.

1:15 pm Depart from WRB Wetland Information Center to Fujihatake Area Super Levee

1:35 pm Fujihatake Area Super Levee
The Fujihatake Area Super Levee is located on the western bank of Watarase River, the largest tributary of Tone River. The Super Levee is much wider than ordinary levees and designed against floods and seismic events. The Super Levee was constructed from 1998 to 2000, including the Prefectural Road No.9 that runs on top of the Super Levee. In 2004, a Roadside Station and a Sports Leisure Education Center were also opened as part of the Super Levee. These facilities have multiple functions including commercial, leisure, as well as emergency response by serving as storage facilities for emergency goods.

2:20 pm Depart from Kitakawabe Roadside station to NEXCO’s East Kanto Traffic Control Center

**DAY 4: THURSDAY, MAY 11**

**OBJECTIVES OF DAY 4**
Review and reflect on key lessons learned and explore how to operationalize them into country-specific actions

9:00 am Recap of Day 3 and Overview of Day 4 (5 minutes)

9:05 am Stocktaking and Multistakeholder Dialogue (30 minutes)
Bringing it Home
How to Operationalize Key Takeaways (30 minutes)

10:00 am Country-Specific Action Plan Development (60 minutes)
Small group discussions by clients and task team leaders

11:00 am Coffee Break

11:30 am Action Plan Pitch Session 1 (90 minutes)
5 minute presentation + 5 minute Q&A per client
Panelists:
Dr. Mikio Ishiwatari, senior adviser, Japan International Cooperation Agency (JICA)
Mr. Marc Forni, lead DRM specialist, World Bank
Ms. Maria Cordeiro, senior transport specialist, World Bank
Mr. Juan Gaviria, practice manager, Transport for Europe and Central Asia, World Bank
Moderated by DRM Hub

1:00 pm Lunch

2:00 pm Action Plan Pitch Session 2 (90 minutes)
5 minute presentation + 5 minute Q&A per client
Panelists:
Dr. Mikio Ishiwatari, senior adviser, Japan International Cooperation Agency (JICA)
Dr. Yuka Makino, senior natural resources management and DRM specialist, World Bank
Ms. Julie Rozenberg, economist, Sustainable Development Group, World Bank
Ms. Fiona Collin, lead transport specialist, World Bank
Moderated by DRM Hub

3:30 pm Coffee Break
ANNEX 1: AGENDA OF TKX

ALL DAY WORLD BANK TEAMS

1:00 pm

Welcome and Opening Remarks (10 min)

2:00 pm

Session 1: Resilient Transport Community of Practice (CoP)

3:00 pm

Session 2: Climate Change and Transport

4:00 pm

Session 3: Disaster Risk Management

5:00 pm

Farewell Dinner

DAY 5: FRIDAY, MAY 12

OBJECTIVES OF DAY 5

Develop strategy for Resilient Transport Community of Practice (CoP)

All Day  World Bank teams

3:45 pm

Conclusion and Wrap-up (20 min)

3:55 pm

Closing Remarks (10 min)

ANNEX 2: EXPERT PROFILES

Information is as of the time of the TKX

Marc S. Forni

Lead DRM Specialist | GSURR, World Bank

Marc Forni joined the World Bank in 2003, working for four years in the Latin America and the Caribbean region to help build the disaster risk management practice. He returned to the World Bank in 2011, after a period as an investment banker, to support the expansion of the disaster risk management practice in South Asia, where he leads the World Bank’s investments in resilience in Bangladesh and Sri Lanka, as well as housing reconstruction in Nepal following the 2015 earthquake.

Maria Cordeiro

Senior Transport Specialist | Transport and ICT, World Bank

Maria Cordeiro contributes to the Green Transport Community of Practice as a focal point on greenhouse gas accounting and climate risk screening for the transport sector, supporting agencies to climate finance, and in the preparation of knowledge products on resilient and low-carbon transport.

Maria has 20 years of international work experience in the fields of climate change, air quality, environment management, and sustainable mobility. Prior to joining the World Bank, Maria was a section manager at the Environment Agency, Abu Dhabi, United Arab Emirates. As part of the Policy and Planning team, Maria supported the development of Abu Dhabi’s air quality and climate change strategies, Surface Transportation Master Plan, Low Emission Vehicle Strategy, and vehicle fuel economy standards, among other policies. Maria also worked at the Inter-American Development Bank, the World Resources Institute, and other international institutions where she helped shape low-carbon investment portfolios in the transportation sector and contributed to flagship events and publications like Transforming Transportation and United Nations Environment Programme’s (UNEP) Global Environment Outlook – West Asia Regional Report. A Portuguese national, Maria holds a Global MBA from IE Business School, a master’s degree in integrated environment control from Nottingham Trent University, and a bachelor’s degree in energy and environmental technology from the University of Glamorgan, U.K.

James P. Newman (Jay)

DRM Specialist | DRM Hub, Tokyo, GFDRR, World Bank

Jay Newman is a DRM specialist at the World Bank DRM Hub, Tokyo, where he leads the Hub’s Knowledge Program, as well as its engagements on resilience. Since joining the World Bank in 2013, Jay has worked at the Global Facility for Disaster Reduction and Recovery (GFDRR), serving as a focal point for urban resilience and regional portfolios in South Asia and East Asia Pacific. He contributed to the development of the CityStrength Diagnostic, and has supported World Bank projects and technical assistance in India, Nepal, South Africa, and Vietnam. Prior to joining the GFDRR, he worked for the City of Baltimore, contributing to the city’s 10-Year Financial Plan and CitiStat performance management program, also serving as acting deputy procurement agent. As an adjunct professor at University of Baltimore’s Master’s in Public Administration, he has taught courses on statistics, urban management, and public policy. Jay holds a master’s degree in applied economics and public policy jointly from Georgetown University and Universidad Alberto Hurtado in Santiago, Chile, as well as a bachelor’s degree in economics and Spanish from Washington University in St. Louis.

Naho Shibuya

DRM Specialist | DRM Hub, Tokyo, GFDRR, World Bank

Naho Shibuya works on bridging global and Japanese knowledge and expertise with the World Bank’s operations to help mainstream DRM in low- and middle-income countries. She currently implements a knowledge program on resilient infrastructure by leveraging her experience in infrastructure development including public-private partnerships (PPPs) in water supply and sanitation, transport, energy, and urban planning. As a Chartered Water and Environmental Manager and a Chartered Environmentalist, Naho provided advisory service to multilateral and bilateral development banks, commercial lenders, investors, civil contractors, and manufacturers in the Asia Pacific region prior to joining the World Bank. She holds a graduate degree from Arizona State University and a master’s degree in sustainability science from the University of Tokyo.

Shoko Takemoto

DRM Specialist | DRM Hub, Tokyo, GFDRR, World Bank

Shoko Takemoto is a DRM specialist based in the DRM Hub, Tokyo. Prior to joining the DRM Hub, she spent more than five years working alongside national governments, communities, and donors in the Pacific and West Africa on climate- and disaster-resilient development through her appointment with the United Nations Development Programme. Her areas of specialization include environmental policy and planning, climate change adaptation, disaster resilient design, and integrated water resource management. She holds a master’s degree in city planning from the Massachusetts Institute of Technology.
Yuka Makino has more than 23 years of operational experience in management and delivery of programs in geohazard risk management, natural resources management, land management, and climate change adaptation. She has extensive experience in East Asia, South Asia, and Africa and has held field positions at the World Bank in China, Indonesia, and Nepal. Prior to joining the World Bank, she worked for the United Nations Development Programme (UNDP) program office in the Secretariat of the Japan International Cooperation Agency (JICA) in Sri Lanka, Ethiopia, and Jordan. She was a member of the technical assistance project staff in Cambodia, China, the Philippines, and Vietnam. In 2001, she was appointed as an expert in the field of construction and infrastructure management in Nepal, and she has held various positions over the past year, including research and development in the field of infrastructure management.

Yukan Adhikari is a Japanese national who has worked for the World Bank as an international consultant since 2016. He has more than 17 years of experience in the field of disaster risk reduction and recovery in low-income countries, and he has helped to improve the effectiveness of disaster risk management in the Asia-Pacific region. In recent years, he has focused on disaster risk management and recovery in the areas of infrastructure and urban development.

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Keiichi Tamura is a professor of infrastructure engineering at Disaster Management Office, Nippon Koei Co., Ltd. His research interests include resilience and sustainability in the field of infrastructure management. He has more than 30 years of experience in the field of infrastructure management.

Hitoshi Fukumoto, Keiichi Tamura, and Monique Cornish are experts in the field of infrastructure management. They have worked on various projects related to disaster risk management, infrastructure development, and sustainable urban planning. They have contributed to the development of guidelines and best practices in the field of infrastructure management. Their work has been recognized by various international organizations, including the United Nations, the World Bank, and the Asia-Pacific Economic Cooperation (APEC).

Keiichi Tamura is a professor of infrastructure engineering at Disaster Management Office, Nippon Koei Co., Ltd. His research interests include resilience and sustainability in the field of infrastructure management. He has more than 30 years of experience in the field of infrastructure management.

Hitoshi Fukumoto is a professor of infrastructure economics at Keio University in Japan. He has contributed to the development of guidelines and best practices in the field of infrastructure management. His work has been recognized by various international organizations, including the United Nations, the World Bank, and the Asia-Pacific Economic Cooperation (APEC).
Takeaki Shono
Civil Engineer | Hyogo Prefectural Government, Japan

Shono Takeaki specializes on risk management and since he joined Civil Engineering Office, Hyogo Prefecture in 2006. He is currently in charge of the development and operation of an integrated management system of social infrastructure assets and facilities for Hyogo Prefecture.

Roger Fairclough
Managing Director | Neo Leaf Global

Roger Fairclough is a civil engineer and member of the Institute of Professional Engineers New Zealand. His career spans government, state-owned enterprises, and the private sector. This includes national 30-year energy outlooks, managing national petroleum and biofuels policies, and “The Thirty Year New Zealand Infrastructure Plan 2015” with the vision that “New Zealand's Infrastructure will be resilient and coordinated, and contributes to a strong economy and high living standards.” The earthquakes in Canterbury, New Zealand, in 2010 and 2011 and the recovery phase have been an ongoing area of involvement. Roger is currently chair of the New Zealand Lifelines (Utilities) Council and chair of the Built Environment Leadership Steering Committee. His areas of interest include asset investment, national resilience, global resources, and infrastructure, emergency management, advanced technologies, and natural hazards.

Kensuke Ichikawa
Manager | International Consulting Department, Kokske Kagyou Co. Ltd.

Kensuke Ichikawa is a senior geotechnical engineer. He has worked in several low- and middle-income countries as a project manager for international projects funded by the Japan International Cooperation Agency, the World Bank, and the United Nations. He has a master's degree in engineering.

Stefan Huszak
Geotechnical Engineer | Opus International Consultants

Huszak Stefan is currently a doctoral candidate studying at the University of Auckland and working at Opus International Consultants as a geotechnology engineer. Stefan has been working at Opus International Consultants since he began his working career as a civil engineering cadet. Stefan has experience in civil engineering, surveying, and groundwater design, however, the main basis of Stefan's background is material testing. Stefan has been involved with both laboratory and field testing for several major projects, both within New Zealand and internationally. Since completing his bachelor's degree in engineering in 2015, Stefan has been working as a geotechnical engineer, widening his capabilities in that area developing as well as beginning research toward his doctorate. Stefan's research topic is “Optimising the Waterresistance of Chisel Surfacing,” which predominantly has applications within New Zealand, and other areas that use this type of road seal. The research is part of a larger project, called “Waterproof Roads.” The overall aim of the research is to better design chip-seal roads to increase resilience against water infiltration and moisture-related failures. The research project predominantly consists of civil engineering material researches, using laboratory testing that is validated in the field.

Katsuno Tanaka
Director, Disaster Management | Water, ICT, and Disaster Management Bureau, MLIT

Katsuno Tanaka has specialized in water and disaster management since he joined the Ministry of Land, Infrastructure, Transport and Tourism (MLIT) in 1997. After 14 years of experience there, he taught at the Interfaculty Initiative in Information Studies, Graduate School of Interdisciplinary Information Studies, University of Tokyo, as an assistant professor for three years. He was appointed as a director of the Kofu River and National Highway Office in Kano Regional Development Bureau from 2014 to 2016. Since 2016, he has been a director for disaster management, Disaster Prevention Office, Water and Disaster Management Bureau.

Kazushi Endo
Deputy Director General | Institute of Information Policy, Research Agency of Cabinet Secretariat

Kazushi Endo is the Director of the Great East Japan Earthquake (March 11, 2011) reconstruction projects in the Japan Institute of Civil Engineering, who has published a lot of books and papers related to the Great East Japan Earthquake and tsunami. He has been involved in the development of several projects related to disaster risk management and infrastructure development in Japan. Endo has been involved in several international projects and has worked in various international organizations such as the United Nations and the World Bank.

Juan Gaviria
Practice Manager | Transport and ICT, World Bank

Juan Gaviria is a practice manager of transport for Europe at the World Bank and responsible for managing the transport infrastructure project portfolio, with a focus on improving road and transport networks in Europe. He has a strong background in transport policy and infrastructure development and has worked on projects in various countries around the world. Gaviria leads a team of experts and works closely with government officials, industry leaders, and civil society organizations to promote sustainable and inclusive transport solutions.

Shanika Perera
Deputy Director General | Open Data Research Division, Ministry of Development

Shanika Perera is a Deputy Director General at the Open Data Research Division of the Ministry of Development in Sri Lanka. She is responsible for leading the Open Data Program, which aims to improve access to high-quality, open data for citizens and businesses. Perera has a degree in computer science and has worked in various capacities in the field of information technology and management. She has experience in community mapping and participatory planning, impact modeling, risk communication, and nature-based risk reduction. Perera has a commitment to the protection of lives, livelihoods, and infrastructure in the face of disaster and climate risks and the development and implementation of improved and soft resilience measures. She is involved in the development and resilience from the Harvard Global Shocks design, which builds on her prior focus on urban planning at Cornell University.

Jack Campbell
DRM Specialist | GSDRR, World Bank

Jack Campbell was a founding team member in the DRM Hub, The World Bank’s unit established in 2014–15 to set up the program. His operational focus has been on urban and climate resilience projects in South Asia, where he is a task team member of projects in Dhaka and Colombo and manages a regional technical assistance program on hydro-meteorological services. For the Global Facility for Disaster Reduction and Recovery (GFDRR), he also focuses on new program development with donors and client countries. Prior to working at the World Bank, Jack was an advisor to the United Kingdom’s Department for International Development (DFID) on disaster risk management. He is a British national and holds a degree in geography and Hispanic studies from the London School of Economics and a master’s degree in public administration from the London School of Economics.
Annex 2: Expert Profiles

Yohannes Yemane Kesete
Disaster Risk Management Specialist | GSER, World Bank

Yohannes Yemane Kesete is a civil engineer, with specialization in infrastructure and transport systems engineering. He has more than 10 years of both professional and research experience. He currently works in the Latin America and the Caribbean region on infrastructure improvement projects. He also leads several technical assistance projects that aim to integrate natural disaster risk into infrastructure investment decision making. In the past, he has worked as a risk modeller with AIR-Worldwide and as a structural engineer with the Ministry of Public Works of Eritrea. He holds a doctorate in civil infrastructure systems from Cornell University. He has spent a semester abroad at La Universidad San Francisco de Quito in Ecuador.

Luquan Tian
Senior Transport Specialist | Transport and ICT, World Bank

Luquan Tian specializes in transport infrastructure and policy. Prior to joining the World Bank in 2009, he worked at the Department of Transport in a province in China, as well as at two engineering consulting firms in the United Kingdom. He has also worked as a project manager at several key national trunk motorway networks in China. Other areas of expertise include road maintenance, traffic engineering, and transport planning in the United Kingdom and the United Arab Emirates. At the World Bank, he works on transport infrastructure and transport planning and policy in Afghanistan and Nepal. Additionally, he works with the DRM team to advise on transportation and infrastructure development projects across the World Bank's portfolio. He is a charterered engineer in the United Kingdom and Europe, as well as holds two degrees in civil engineering.

Akiko Toya
Junior Professional Officer | GFDRR, World Bank

Akiko Toya is a junior professional officer who works on GFDRR's technical assistance grant portfolio. She connects leading stakeholders in Japan with global and Japanese DRM knowledge and expertise with the World Bank's operational teams, focusing on resilient infrastructure and transport projects. Previously, she worked with the South Asia and Caucaus team in America and the Caribbean teams on disaster risk assessment and risk reduction strategies for the transport sector. Prior to joining the World Bank, she worked in enterprise risk management and political risk advisory at private insurance and consulting firms. A Japanese national, Akiko holds a master's degree in public affairs and risk management from Cornell University and a bachelor's degree in environmental economics and sustainable development from the Soka University of America. She has spent a semester abroad at the Universidad San Francisco de Quito in Ecuador.

Hamidi Sayed Abdul Manan
Senior Contract Engineer | HRAP, MPW, Kabul, Afghanistan

Hamidi Sayed Abdul Manan joined the Ministry of Public Works' (MPW) Trans-Hindukush Road Connectivity Project (THRCP). Before joining the MPW, he worked as a road design engineer with the United Afghan Construction and Transport Infrastructure Company (UAATIC) in Kabul and has worked with several international organizations in Afghanistan and abroad, such as the National Rural Access Program (NRAP), the United Nations Procurement Division (UNOPS), and the Danish Authority for Foreign Aid (DAAD). He has more than 35 years of experience in the field of engineering and has worked with several international and local organizations in Afghanistan and abroad, such as the United Nations Children's Fund (UNICEF), the Afghan Construction and Logistics Unit (ACLU), the Construction Control Services Corporation (CCSC), the United Nations Drug Control Program (UNDCP) (UNODC), the International Rescue Committee (IRC), and the International Relief and Development (IRD).

Noori Mohammad Salam
Senior Road Design Engineer | THRCP, MPW, Kabul, Afghanistan

Noori Mohammad Salam works as a road design engineer with the Ministry of Public Works’ (MPW) Trans-Hindukush Road Connectivity Project (THRCP). Before joining the MPW, he worked as an international road design engineer with the United Nations Building Office for Project Services (UNOPS). He has also worked for the Afghan government, where he worked in Khost, and on a United States Agency for International Development (USAID)-funded project located at the Blue Nile State and in Gulli. He studied engineering at Kabul University in Afghanistan. He has several degrees in civil engineering and has worked with several international organizations in Afghanistan and abroad, such as the National Rural Access Program (NRAP), the United Nations Procurement Division (UNOPS), and the Danish Authority for Foreign Aid (DAAD). He has more than 35 years of experience in the field of engineering and has worked with several international and local organizations in Afghanistan and abroad, such as the United Nations Children’s Fund (UNICEF), the Afghan Construction and Logistics Unit (ACLU), the Construction Control Services Corporation (CCSC), the United Nations Drug Control Program (UNDCP) (UNODC), the International Rescue Committee (IRC), and the International Relief and Development (IRD).

Veronica Raffo
Senior Infrastructure Specialist | Transport and ICT, World Bank

Veronica Raffo is a senior infrastructure specialist at the World Bank's Information and Communication Technologies (ICT) global practice. She joined the World Bank in 2006 as a young professional and has worked for the public sector and transport units. She has helped develop strategies in sustainable transportation and mobility through her management of lending and advisory operations in urban mobility, road safety, rural connectivity, road asset management, logistics, and transport planning in Latin America, Eastern Europe, and Africa. Before joining the World Bank, she worked as a researcher at the Social Science Research Council, a program coordinator at the Program on Global Security and Cooperation, and as an associate attorney in the European Parliament and project finance practice at Macwil, D'Farrell & Mairal. She has also worked at the European Commission as an international road engineer in Afghanistan. She holds a law degree from the University of Buenos Aires in Argentina and a master’s in science degree as a Chevening Scholar at the University of Oxford School of Economics in the United Kingdom.

Andres Gartner
Chief Advisor | Ministry of Transport

Andres Gartner is a chief advisor at the Ministry of Transport in Argentina. Previously, he worked at the World Bank’s Latin America Transport Cluster and in the City of Buenos Aires’ Transport Subsecretary’s Sustainable Mobility Unit. He has also worked at the World Bank in transport projects, think tanks, universities, and other organizations. He holds a bachelor’s degree in economics from the University of Buenos Aires in
Argentina, a master’s in science degree in urban economics from the Torcuato di Tella University in Argentina, and a master’s in science degree in transport from the Imperial College London in the United Kingdom.

Emma Alibrieu
General Manager | Validid Nacional
Emma Alibrieu is a general manager of projects at Validid Nacional, the National Roads Council, which is a part of Argentina’s Transportation Ministry. She has also been an executive director at the Highway Concession Control Body (El Organismo de Concesionamiento Viárias, OCOV), an infrastructure coordinator for the Argentina Operations Center (AROC), and at the United Nations Office for Project Services (UNOPS). She holds a degree in civil engineering from the Universidad Católica de Córdoba in Argentina and a master’s in science degree in international business from École Nationale des Ponts et Chaussées in France.

BRAZIL
Satoshi Ogita
Senior Transport Specialist | Transport and ICT, World Bank
Satoshi Ogita is a transport specialist with more than 18 years of professional experience. He joined the World Bank in 2011 and works on inter-urban transport projects, mainly in Brazil and Mozambique. Previously, he worked as an international development consultant analyzing more than 25 transport projects in Asia, Eastern Europe, and the Middle East for eight years. He holds a master’s degree in civil engineering and a degree in international studies from the University of Tokyo in Japan.

Livia Maria Tiemi Fuji
Coordinator | Road Transport Programs, Ministry of Transport, Ports, and Civil Aviation
Livia Maria Tiemi Fuji works as a coordinator at the Brazilian Ministry of Transport, Ports, and Civil Aviation (MTPCA). She joined the MTPCA in 2012. She is a civil engineer and holds a master’s degree in geotechnics and a master’s in business administration degree in public management.

Fabio Pessoa da Silva Nunes
General Coordinator | Maintenance and Road Restoration, National Department of Transport Infrastructure (DNIT), Brazil
Fabio Pessoa da Silva Nunes is a general coordinator of road maintenance and restoration at the Brazilian Department of Transport Infrastructure (DNIT). Previously, he worked in the construction division of DNIT. He holds a master’s degree in engineering and administration from the University of Brasilia in Brazil.

COSTA RICA
Pom Chrey
Director | Department of Rural Health Care, Min. of Rural Development
Pom Chrey is a project director at the Ministry of Rural Development, Department of Rural Health Care and is also a director of the World Bank-funded Cambodia Southeast Asia Disaster Risk Management Project. He has been working at the Ministry since 1998. He holds a degree in public administration from the University of Canberra in Australia and a degree in rural development management from the University of Khon Kaen in Thailand.

PHILIPPINES
Phirth Kang
Deputy Director | Equipment and Road Construction Department, Min. of Public Works and Transport
Phirth Kang is a deputy director at the Ministry of Public Works and Transport. In 2011, he worked on the World Bank-funded Road Asset Management Project (RAMP), which was co-financed by the World Bank, the Asian Development Bank, and Canadian Aid. He has also worked as a deputy project director on the World Bank-funded Road Rehabilitation Project.

NORMA CASTELLANOS
Norma Castellanos is an advisor at the National Planning Department’s Infrastructure and Sustainable Energy Unit. She works on developing infrastructure strategy, renewable energy and energy efficiency, public-private partnership, urban transport policy, road safety, public finance & decentralization, and rapid assessment of damages and losses occurred from natural disasters.

Roberto Mutyaba
Transport Specialist | Transport and ICT, World Bank
Robert Mutyaba is a transport specialist at the World Bank, working on road and logistics projects in Georgia, Armenia, Azerbaijan, and Kazakhstan. Prior to joining the World Bank, he worked in various positions at the Uganda Road Authority and as a consultant at Morton McDonald and Ernst & Young in the United Kingdom. He holds a bachelor’s degree in civil engineering from Makerere University in Uganda and a master’s degree in road management and engineering from the University of Birmingham in the U.K.

INDIA
Rajesh Bhushan
Joint Secretary | Ministry of Rural Development, Government of India
Rajesh Bhushan is joint secretary and director general at the central government’s National Rural Roads Development Agency. He manages the rural connectivity sector for the Pradhan Mantri Gram Sadak Yojana (PMGSY), a flagship government program which aims to improve livelihoods and connectivity. Between 1996 and 2009, he was an advisor to the President of Georgia on environmental issues. In 2011, he established ECOVISION, a union of nongovernmental organizations involved in sustainable development projects in Georgia. He has also authored about 25 scientific and educational publications. He holds a doctorate in geographical sciences from Tribhu University in Georgia.

Ashok Kumar
Senior Highway Engineer | Transport and ICT, World Bank
Ashok Kumar works as a senior highway engineer at the World Bank with the Regional Office for South Asia (RAS), where he focuses on integrating and adapting climate change to rural projects. He has 35 years of experience working on rural roads and highway projects. Prior to joining the World Bank, he worked with government and international organizations, road sector policies and reforms, modernization of road agencies, capacity building, knowledge sharing, contract management, and working on challenging assignments in low capacity regions. Previously, he worked at the Central Road Research Institute in India for 22 years, where he conducted research on rural roads.

Vinay Kumar Kumar
Secretary | Rural Works Department, State Government of Bihar
Vinay Kumar Kumar is a secretary at the State Government of Bihar’s Rural Works Department. Previously, he has served as a director at the Bihar State Beverages Corporation, a chairman at the Bihar Rural Livelihoods Project, and as CEO of the Animal Husbandry & Fish Resources. He holds a master’s degree in physics.
Cordula Rastogi authored publications on logistics connectivity challenges. She has a connectivity program addressing Uzbekistan and Turkmenistan. Most recently in the Central Asia region, she has been involved in transport and logistics projects in a number of countries.

Rajeev Nayan Prasad Singh has 30 years of experience in planning, executing, and monitoring Rural Roads Projects. Previously, he worked in the Advance Planning section at the Road Development Department. He has participated in numerous training programs at the IIF Khagpur (innovative technology), ASCI Hyderabad (project management & procurement), Asian Institute of Transport & Development, New Delhi, NITHE (Noida), and AIMA (Ahmedabad).

Rajeev Nayan Prasad Singh is a project director on the Bihar Rural Roads Project at the Bihar Rural Roads Development Agency. He has 30 years of experience in planning, executing, and monitoring Rural Roads Projects. Previously, he worked in the Advance Planning section at the Road Development Department. He has participated in numerous training programs at the IIF Khagpur (innovative technology), ASCI Hyderabad (project management & procurement), Asian Institute of Transport & Development, New Delhi, NITHE (Noida), and AIMA (Ahmedabad).

Litta Khattiya is a deputy director general at the Ministry of Public Works and Trade. She holds a master's degree in transport engineering. She is a member of the International Association of Public Roads and Transport, and the International Federation of Highway Engineers. She has more than 30 years of professional experience in the field of road and transport development.

Francisco Álvaro works as a technical officer at the Directorate of External Relations. He is responsible for liaising with development partners such as the World Bank, as well as monitoring and evaluating the Integrated Road Sector Program. He holds a degree in international relations and diplomacy.

MNs Mehtabul Hossain

Francisco Manuel Jose Danca is a civil engineer specializing in roads and bridges. He is currently acting as a provincial delegate for the Roads Fund in the Cebu Province. He has worked for several years as a road construction and maintenance supervisor in the Manica and Nampula provinces.

Emilia Tembe Boene is the head of the National Roads Administration’s Monitoring Department. She has 17 years of experience in coordinating environment and resettlement issues. She is responsible for coordinating road monitoring and cross-cutting issues, as well as mainstreaming environmental and social considerations into all stages of a road project’s life cycle.

Philippines

Victor Dato is a senior infrastructure specialist at the World Bank country office in the Philippines. He specializes in roads and transport, with a focus on transport projects in the region.

Kulwinder Rao
Senior Highway Engineer Transport and ICT, World Bank

Francisco Álvaro
Senior Infrastructure Specialist | Global Practice, World Bank

Nongrat Maelane
Senior Highway Engineer Transport and ICT, World Bank

Victor Dato
Senior Infrastructure Specialist | Transport and ICT, World Bank

Henrike Brecht
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Victor Dato is a senior infrastructure specialist at the World Bank country office in the Philippines. He specializes in roads and transport projects in the region.
transport projects for the Philippine government’s transport department. Recently, the transport team has started to work on local provincial road development programs. He was part of the World Bank-led Disaster Needs Assessment team in the aftermath of Typhoon Ketsana and Parma in 2009.

Maria Teresa H. Concepcion
Local Government Operations Officer V | Department of the Interior

Maria Teresa H. Concepcion focuses on the project development and management of local roads and bridges information systems. She is also involved in disaster risk reduction and management, specifically disaster risk financing, local risk assessments, and vulnerability assessment of local infrastructures. In her 10 years with the Philippine Republic’s Department of the Interior and Local Government (DILG) as a local government operations officer, her work has mostly revolved around the various phases of project development and management to facilitate effective and reliable decision making and to enhance the capacity of local government operations.

Paul Irineo P. Montano
Local Government Operations Officer V | Department of the Interior

Paul Irineo P. Montano works on program development, policy research and formulation, with a special focus on strengthening disaster risk governance at the sub-national levels. This includes risk information management and analysis, vulnerability assessment of local communities especially in the areas of disaster risk management and financing windows.
The World Bank Disaster Risk Management Hub, Tokyo supports developing countries to mainstream DRM in national development planning and investment programs. As part of the Global Facility for Disaster Reduction and Recovery and in coordination with the World Bank Tokyo Office, the DRM Hub provides technical assistance grants and connects Japanese and global DRM expertise and solutions with World Bank teams and government officials. Over 47 countries have benefited from the Hub's technical assistance, knowledge, and capacity building activities. The DRM Hub was established in 2014 through the Japan-World Bank Program for Mainstreaming DRM in Developing Countries – a partnership between Japan's Ministry of Finance and the World Bank.