# SECOND TECHNICAL KNOWLEDGE EXCHANGE ON

# RESILIENT TRANSPORT

## SUMMARY REPORT

THE WORLD BANK
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GFDRR
Global Facility for Disaster Reduction and Recovery

Resilient Transport
Community of practice

This Technical Knowledge Exchange (TKX) was organized by the Global Facility for Disaster Reduction and Recovery (GFDRR) and the World Bank's Resilient Transport Community of Practice (CoP) and Green Transport CoP, in partnership with the government of Serbia. The TKX also benefited greatly from contributions by the following: World Bank Serbia Country Office, Faculty of Mining and Geology at University of Belgrade, Arup, and IMC Worldwide.

# SECOND TECHNICAL KNOWLEDGE EXCHANGE (TKX)

# ON RESILIENT TRANSPORT

## January 22–26, 2018

**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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The report greatly benefited from the information and support provided by the GFDRR, the government of Serbia, World Bank Serbia Country Office, Faculty of Mining and Geology at University of Belgrade, Arup, and IMC Worldwide.

We thank the participating officials and project task teams for their presentations, active involvement, and knowledge sharing.

# ABBREVIATIONS

| | |
|---|---|
| CAT DDO | Catastrophe Deferred Drawdown Option |
| CoP | Community of Practice |
| DFID | Department for International Development |
| DRM | Disaster Risk Management |
| GCM | Global Climate Model |
| GFDRR | Global Facility for Disaster Reduction and Recovery |
| GIS | Geographic Information Systems |
| GSURR | Social, Urban, Rural, and Resilience Global Practice |
| ICED | Infrastructure and Cities for Economic Development |
| KM | Knowledge Management |
| KPI | Key Performance Indicators |
| M&E | Monitoring and Evaluation |
| MCA | Multi-Criteria Analysis |
| NDRMP | National Disaster Risk Management Program |
| O&M | Operation and Maintenance |
| PBC | Performance-Based Contracting |
| PERS | Public Enterprise Roads of Serbia |
| RAM | Road Asset Management |
| RAMS | Road Asset Management Systems |
| SEETO | South East Europe Transport Observatory |
| SIDS | Small Island Developing States |
| T&DD GP | Transport & Digital Development Global Practice |
| TAs | Technical Assistances |
| TKX | Technical Knowledge Exchange |
| ToR | Terms of Reference |
| TTL | Task Team Leader |



# EXECUTIVE SUMMARY

## Technical Knowledge Exchange on Resilient Transport

OVER THE next 20 years, humans will build more infrastructure than has been built over the last 2,000 years. While transportation infrastructure represents a significant public and private investment that is fundamental to the functioning and development of our economies and societies, these investments are increasingly exposed to disaster and climate hazards, including landslides, flooding, and earthquakes.

Our ever-changing world urges a shift away from traditional reactive approaches since we are living through a rare opportunity to lock in either resilience or risk in many fast-growing parts of the globe. Proactive methodologies, based on a multidimensional disaster risk management approach that incorporates people, the environment, hydrology, and geology need to be nurtured, in order to provide for resilient transport infrastructure. It is estimated that such an approach can result in 60–70 percent life cycle cost savings, reductions in economic losses and improvements to the resilience of people and assets.

On January 22–26, 2018, building on the first Resilient Transport Technical Knowledge Exchange (TKX) that took place in Tokyo in May 2017, the second Resilient Transport TKX was organized in Belgrade, Serbia, in partnership with the Belgrade country office, World Bank's Resilient Transport Community of Practice (CoP) and Green Transport CoP, and GFDRR. With the objective of further building the resilient transport community to influence Bank Technical Assistance (TA) and operations, 11 country delegations and a total of 65 participants attended the workshop. The exchange drew upon Serbia's experience 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 Serbia's challenges and successes with large-scale disasters. The Task teams and clients conducting climate vulnerability analysis for the transport sector funded by GFDRR showcased the outcomes of their work and lessons learned at this event. One key lesson was that institutional and regulatory support through strong leadership in implementing resilience measures is critical to approach resilient transport in a holistic way.

## Structure of the TKX

THE week-long innovative learning exchange was structured around key practical themes:

1. Climate Science
2. Resilient Transport Design
3. Geohazards and Landslides
4. Co-Benefits and Adaptation Strategies for Roads
5. Resilience Financing Mechanisms
6. Economic Appraisal of Resilience Interventions
7. Road Maintenance as an Adaptive Response

The event aimed to empower clients and World Bank Task Teams to promote mitigatory and adaptive solutions to improve transport resilience through considering the hazards confronting the transport sector more broadly and eliminating avoidable consequences through vulnerability and risk assessment; good planning and design; timely maintenance; emergency response capability; clear policy; and legislative frameworks.

## Key Takeaways

WHILE the concept of resilience is increasingly being embraced in the transport sector, resilience is not only about an extra cost and effort added at the engineering and design phase, but rather an important consideration at the systems and planning, O&M, and contingency and response phases. As the life cycle approach (Figure 1) shows, a holistic approach covering all aspects of transport asset management is essential for integrating climate and disaster resilient transport interventions into decision making and implementation. Actions, for example, could involve mapping hazards, identifying highly vulnerable assets, understanding the magnitude of the consequences of asset failure, planning to prevent disruptions rather than only reacting after disasters, and building back better after events.

COMPARED with traditional reactive approaches, proactive and adaptive investments in collecting accurate risk data, including hazards, and economic and social vulnerability, identifying priority interventions and implementing disaster mitigation measures can result in 60–70 percent life cycle cost savings and increase the resilience of people and assets. 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.

PARTICIPANTS emphasized the importance of cross-sector and cross-line ministries' collaboration through further enhancing capacity building of stakeholders, training and site visits, and promoting well-coordinated, long-lasting, and effective resilient transport planning. Legal and regulatory frameworks that define clear responsibilities and roles of different stakeholders, such as governments, municipalities, media, and the private sector, are required to effectively centralize available risk data, implement effective decision-making processes, and achieve a comprehensive disaster risk management (DRM) approach for resilient transport.

THE Resilient Transport CoP identified the urgent need to invest more in knowledge management given the increasing demand from the World Bank teams and clients to mainstream resilience in the transport sector. The CoP will establish a technical expert team to further advance this agenda and convene knowledge exchange events to share the best practices globally.

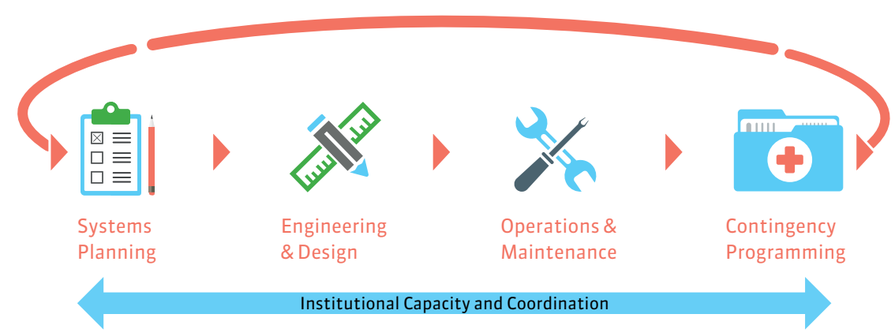



**FIGURE 1**
Disaster-Resilient Infrastructure Life Cycle Approach
*Source:* Resilient Transport CoP.

## Background on the Resilient Transport CoP

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 (GFDRR), Social, Urban, Rural, and Resilience Global Practice (GPSURR), and Transport and Digital Development GP (T&DD 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 of 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.

## ACTIVE ENGAGEMENTS

Belgrade Resilient Transport TKX in January 2018

Tokyo Resilient Transport TKX in May 2017

# OPENING AND WELCOME

BUILDING on the first Resilient Transport Technical Knowledge Exchange (TKX) in Tokyo where the Resilient Transport CoP was officially launched, the World Bank's Resilient Transport CoP reiterated the need of further building the resilient transport community to influence the Bank's technical assistances and operations because more resilient transport infrastructure helps avert asset and well-being losses from natural disasters and climate change impacts. In addition, such efforts can reduce required investments in reconstruction and rehabilitation funds, and saved resources can be invested back into transport asset management systems for further improving maintenance and minimizing impacts from future events.

Given this context, the Resilient Transport CoP will seek to accomplish the following objectives that should enable scaling up and systematization of global engagements:

1. Define key areas where technical assistance interventions can mainstream resilience across the life cycle of infrastructure from systems and planning to engineering and design, then to asset management and finally to contingency and response.

2. Build an informal community of practice to deepen technical knowledge and establish the best practices based on inputs from transport and DRM experts.

3. Support an external effort to convene and engage donors, bilaterals, and other partners that could provide support to deliver technical assistance.

4. Define operational approaches to identify new projects and investments that have material impact beyond technical assistance for more transformative operations.



## Serbia's Experience in Transport DRM

DUE to extraordinary rains in May 2014, Serbia was affected by the most severe flooding in 120 years. The disaster affected more than 1.6 million people (22 percent of the total population) in 38 municipalities in central and western Serbia. This caused significant economic hardship and disproportionally affected the poor and vulnerable. Mr. Miodrag Poledica, State Secretary, Ministry of Construction, Transport and Infrastructure, and Mr. Marko Blagojevic, Acting Director, Public Investment Management Office, highlighted the government's strong efforts in improving and addressing disaster risk management (DRM) systematically for multiple hazards in Serbia after the floods when it developed and approved the National Disaster Risk Management Program (NDRMP) in December 2014.

The NDRMP helps mobilize international donor funding, facilitate coordination across donors and key stakeholders, and ensure that financing will be directed to prioritized investments by comprehensively covering various aspects of DRM. These aspects include: (i) institutional strengthening; (ii) risk identification and monitoring; (iii) structural and nonstructural risk reduction measures; (iv) preparedness and early warning; (v) disaster risk financing and insurance solutions; and (vi) recovery planning. Serbia's experience emphasized the urgent need for the following activities:

- Shifting focus over time from flood prevention and recovery to multi-hazard risk management at both the local and national levels.
- Expanding DRM approaches to selected sectors such as transport and urban planning for improved resilience.
- Strengthening financial protection mechanisms to protect against fiscal shocks of natural hazards. (CAT DDO)
- Mitigating the impact of climate change and making the economy more disaster resilient.
- Managing and implementing the NDRMP through supporting regional initiatives on risk assessment, resilient planning, preparedness, and response.

# SESSION SUMMARIES

## SESSION
## SERBIA RESILIENCE
### Overview of Serbia Resilience

**MS. SVETLANA** Vukanovic, Transport Specialist, World Bank

Connectivity is a critical driver of competitiveness, and the quality of infrastructure networks is a crucial factor for Serbia to shift the economy toward export orientation. However, Serbia's transport infrastructure is exposed to various natural hazards, and the two most extreme climate and weather episodes were the drought in 2012 and the floods in 2014. Total damage caused by extreme climate and weather conditions, since 2000, exceeds 5 billion EUR. Ms. Vukanovic shared the World Bank Transport team's work on mainstreaming climate resilience in the road sector through interventions and policy support by providing diagnostics of the current framework and identifying the areas of improvements with pilot testing of the Geohazard Risk Management Handbook and Toolkit. The preliminary analysis from the Handbook testing suggests that there is no established methodology for systematic management of the network vulnerability in Serbia. In particular:

- Climate resilience is considered only on an ad-hoc basis and is usually driven by the expert knowledge of a few employees from operators of infrastructure.
- There is no clear regulation governing how the investments in potentially critical locations should be planned or financed.
- While design legislation and guidelines for geohazards in the road network have been defined as sufficient and recently strengthened to comply with the European standards, insufficient funding limits their application considerably and results in insufficient instrumentation and geotechnical designs.
- Cooperation between central and local relevant government agencies is insufficient. The authority dealing with emergency situations and Public Enterprise Roads of Serbia (PERS) should work more closely with each other, interact, and share data by utilizing available early warning systems and jointly responding to disasters in a timely and combined manner in emergency situations.
- There is a lack of unified and publicly available methodologies for elaboration of climate change–related assessments due to insufficient regional coordination mechanisms. Serbia's high exposure and vulnerability to climate change as well as environment degradation factors urge a shift from reactive approach to proactive investment in mainstreaming climate resilience in the road transport network.

With additional technical assistance funded by GFDRR, the team is assisting the government in establishing a foundation for mainstreaming climate resilience considerations in the road transport sector by assessing vulnerability of the road transport network to the climate-related risks, improving capacities of key stakeholders in road network climate resilience planning, and setting the path for development of structured and systematic response plans.

| | |
|---|---|
| **Task 1.** Methodology for Climate Change and Natural Hazard Road Network Vulnerability Assessment (and beyond) | ▪ Vulnerability assessment **methodology**<br>▪ **Framework** for prioritization of interventions based on vulnerability and criticality criteria<br>▪ **Guidelines** for climate change and natural hazard road network vulnerability assessment |
| **Task 2.** Recommendations for Inclusion of Climate Resilience in the Road Asset Management and Corresponding Action Plan | ▪ Develop recommendations for actions across the full scope of road asset management and action plan.<br>▪ Monitoring and observation * Financing<br>▪ Investment Decision Making Framework<br>* Institutional and legal reforms<br>▪ Asset Life Cycle Strategy Adjustments |
| **Task 3.** Pilot Testing of the Proposed Approach for the Valjevo Region and Development of corresponding GIS Maps | ▪ Vulnerability assessment and asset plans pilot testing with corresponding GIS maps |
| **Task 4.** Development of a ToR for Network Vulnerability Analysis and Emergency Response Plans for the Main Trade Routes | ▪ Policy frameworks, disaster response mechanisms<br>▪ Protocols for traffic queuing and coordination, evacuation routes, etc and disaster communication protocols and equipment<br>▪ Procurement, financial planning and protection<br>▪ Establishing sectoral disaster assessment teams and provision of risk understanding, awareness, and technical training |
| Task 5: Dissemination and Knowledge Sharing Workshops | |

**FIGURE 2**
The scope of planned technical assistance
*Source:* Adapted from Svetlana Vukanovic's presentation.

## Guidelines and Tool Development Landslide Assessment

**MS. BILJANA** Abolmasov, Associate Professor, University of Belgrade

The procedure for landslide hazard vulnerability assessment on the Valjevo road network test area and results of road vulnerability analysis from landslides were presented to explain phenomenology of landslide processes, their varieties (rock falls, debris flows, mud flows, and landslides) and risks on the transport network. To effectively conduct climate change and natural hazard road network vulnerability assessment, Ms. Abolmasov explained the following steps: (i) review the current state of affairs and data availability, (ii) review international methodologies, (iii) identify and rank geographical areas with high hazard and risk exposure, (iv) assess the likely risk impacts for all major road links and the effect of the loss of connectivity and access in priority areas, and (v) develop a list for priority interventions based on vulnerability and critical criteria **FIGURE 3**. She highlighted the importance of having guidelines for effective vulnerability assessment including key questions such as: What parts of the road network cross areas with high climate related hazard(s)?; What is the relative level of risk for the road network?; What kind of socioeconomic impacts could be generated in the case of hazardous events on particular road(s)?; How to prioritize critical road interventions for investment (both in the current climate conditions and related hazards and for future climate change projections); and How to develop estimated budgets prioritizing mitigation and adaptive measures with respect to climate and natural hazard events.

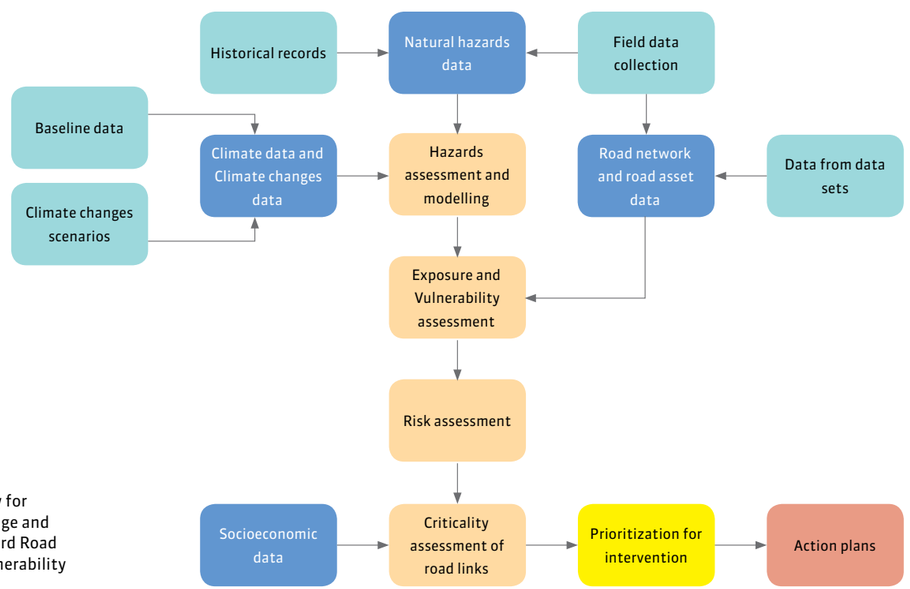



**FIGURE 3**
Methodology for Climate Change and Natural Hazard Road Network Vulnerability Assessment
*Source:* Adapted from Biljana Abolmasov's presentation.



## Prioritization Methodology

**MR. JAMES** Reeves, IMC Worldwide

As part of the ongoing project to define guidelines for mainstreaming climate change resilience into the management of Serbia's road network, a criticality analysis has been undertaken. The objective was to identify the most critical links within the Valjevo pilot area. Mr. Reeves presented the methodology that has been used to complete this criticality analysis, which incorporates a range of socioeconomic data related to population, the locations of key social infrastructure, and measures of criticality, including overall traffic intensity and the effects of dislocation in terms of extended journey distances that result from the need to use alternative routes **FIGURE 4**. The methodology a Multi-Criteria Analysis (MCA) to identify a criticality index for each road section in the pilot area network. Lastly, he discussed the requirements and limitations of the methodology in how to deal with situations where data availability is limited.

| ISSUE | ASPECT | SCORING |
|---|---|---|
| Population | ▪ Number of children<br>▪ Number of adults of working age<br>▪ Number of retired people | ▪ 1 point per 100 children<br>▪ 1 point per 100 adults<br>▪ 1 point per 100 retired people |
| Social Services | ▪ Number of schools in area served<br>▪ Number of hospitals in area served<br>▪ Number of ambulances in area served | ▪ 10 points per school within the affected area<br>▪ 20 points per hospital within the affected area<br>▪ 10 points per ambulance within the affected area |
| Traffic | ▪ Traffic using affected road link | ▪ 1 point per 1,000 vehicles using the road section |
| Impact of Dislocation | ▪ Additional distance required to be traveled | ▪ 1 point per 10% increase in distance |

**FIGURE 4**
Multi-Criteria Analysis (MCA) Scoring System, Assessing Criticality
*Source:* Adapted from James Reeves's presentation.

# SESSION

## CLIMATE SCIENCE AND RESILIENT DESIGN

### Climate Science

**MS. MARIA** Sunyer Pina, Climate Change Adaptation Consultant, Arup

While assessments of climate change impacts and resilience measures have been discussed and implemented by engineering and design teams, Ms. Pina highlighted the challenges of utilizing various data for a robust climate change vulnerability assessment of people, buildings, and infrastructure **FIGURE 5**. She also emphasized the need for developing adaptation and resilience measures to reduce risks through a strategic approach by informing and influencing government policies and practices, focusing on proper urban development. To deal with uncertainty and ensure resilience, she explained the following approaches: (i) no regret actions are cost effective under current climate conditions and under future climate projections, (ii) low regret actions are relatively low cost and provide relatively large benefits under a range of projected changes, (iii) win-win actions increase resilience while also having other social, economic, and environmental benefits, (iv) flexible actions that can deal with uncertainties in climate change projections, and (v) adaptive management structure and iterative approach to improve actions through monitoring, modelling, and assessing.

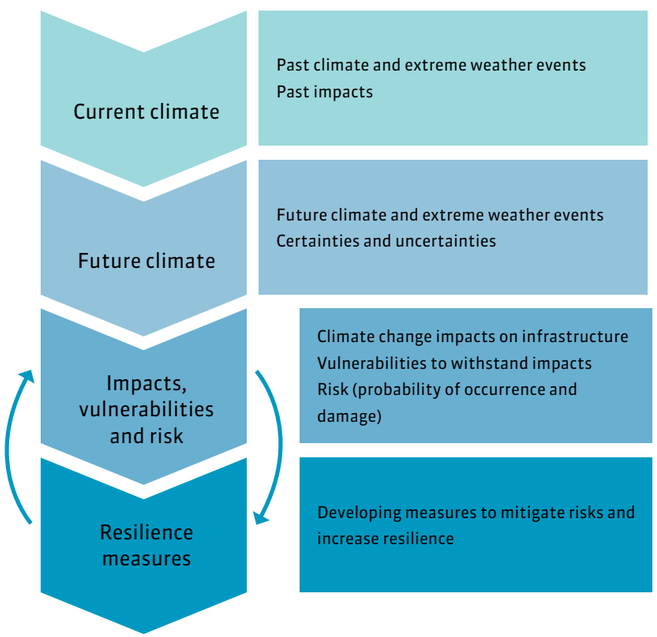



**FIGURE 5**
Climate Resilience Approach
*Source:* Adapted from Maria Pina's presentation.

### Climate and Natural Hazard Resilience of Rail Projects for the WB Urban Rail Design Guidebook

**MS. SAVINA** Carluccio, Chartered Civil Engineer, Arup

Resilient infrastructure is essential for the safety, well-being, sustainability, and economic prosperity of cities. The forthcoming World Bank's publication 'Urban Rail Design Guidebook' will provide high-level guidance to decision makers and practitioners throughout the urban rail project life cycle, to support decision making that will enhance resilience. Ms. Carluccio presented the principles and strategies for enhancing resilience of rail projects to climate and natural hazards by reiterating the need for cross-sector collaboration considering city's interconnected system-of-systems based infrastructure by enhancing institutional and stakeholder coordination **FIGURE 6**. One of the key takeaways was that resilience thinking should extend beyond specific climate-related and other natural hazards to encompass the ability of urban rail systems, and the cities within which they operate, to prepare and plan for, absorb, recover from, or adapt to any adverse events during the system's operational life. International experience suggests that investment in measures that enhance the resilience of urban rail systems pays off in the face of hazards and can enhance efficiency and safety of the rail system during normal operations.

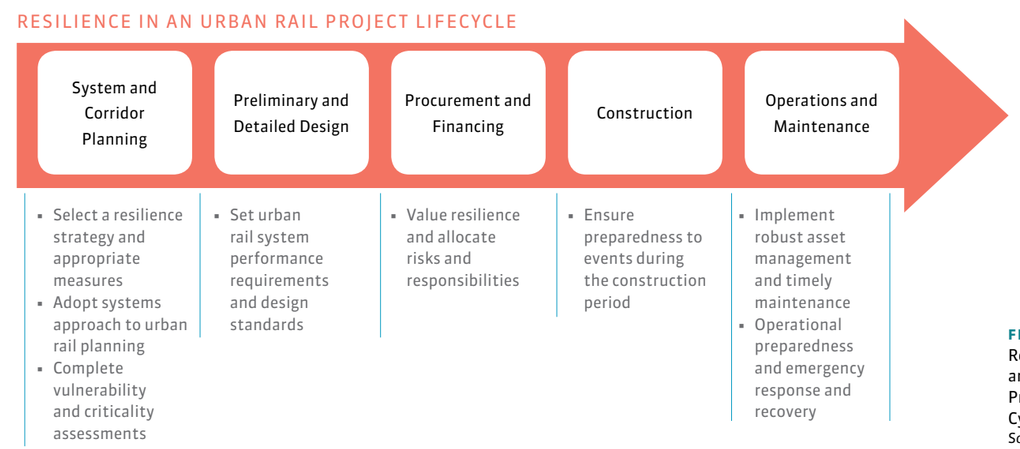



**FIGURE 6**
Resilience in an Urban Rail Project Life Cycle
*Source:* Adapted from Savina Carluccio's presentation.

## REDi™—Resilient Engineering Design Initiative—Floods and Earthquakes

**MS. YANA** Waldman, Senior Consultant, Arup

Modern building codes do not solely focus on earthquake resilience—the ability of an organization or community to quickly recover after a future earthquake. Resilience-based guidelines and criteria were created based on lessons learned from past earthquakes, by identifying limitations in the traditional code approach, by adopting some codified criteria for essential facilities, and by adopting non-codified best-practice approaches. This single integrated and actionable framework aims to help owners, engineers, and architects achieve 'beyond-code' resilience objectives. To qualify for a REDi™ rating, people have to satisfy the mandatory requirements for that rating in each of three Resilient Design and Planning categories, and select appropriate non-mandatory recommendations to help achieve the desired Resilience Objectives. **FIGURE 7** REDi™ outlines a resilience-based design approach which includes design and planning criteria in each of three categories:

- Building resilience can be achieved by reducing earthquake demands on the building and/or increasing the capacity of building components, including architectural components, to accommodate the demands with only minor damage—this is one of the key components of resilience-based earthquake design, and it encourages innovative design approaches and systems.
- Organizational resilience can be achieved by contingency planning for utility disruption and business continuity.
- Ambient resilience can be achieved by reducing the risk that threats outside the building envelope, such as adjacent collapse-prone buildings and high liquefaction risks, would restrict site access or otherwise hinder functionality.

The tool includes a detailed checklist to ensure proper organizational planning for resilient construction and operation of buildings and related assets, as well as a quantitative evaluation of the physical facility using fragility data and quantified hazard statistics based on location. The outputs are projected losses as a result of defined threat and calculated downtime to return the asset to a functional state based on repair requirements.

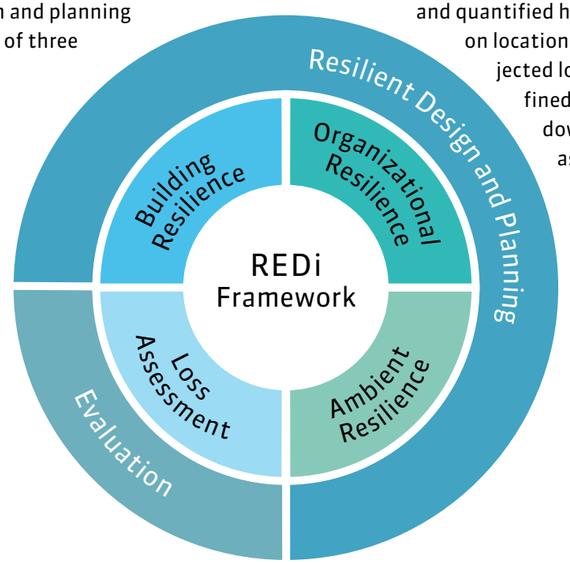



**FIGURE 7**
The REDi™ Framework
*Source:* Adapted from Yana Waldman's presentation.



# SESSION

## GEOHAZARDS AND LANDSLIDES

## Geohazard Handbook

**MS. YUKA** Makino, Senior Natural Resources Management Specialist and DRM Officer, World Bank

Geohazards do not need to become disasters, if: (a) hazards are understood and anticipated; (b) exposure and vulnerabilities are reduced; and (c) resilience capacities are enhanced. Road transport networks need to be proactively managed, monitored, and maintained to maximize their disaster resilience. Disaster risk management is about understanding how an extreme natural event affects people; how vulnerable people react to natural hazards; to what extent communities can cope with emergencies and disasters; and how the responsible organizations can take preventive, mitigation, and preparedness measures to face natural hazards now and in the future. Ms. Makino explained that the geohazard risk management process is an essential series of steps to guide the development of key management and technical processes.

1. Geohazard and disaster risk assessment, including hazard, exposure, and vulnerability assessment
2. Assessment, identification, and prioritization of geohazard risk reduction measures
3. Development of a geohazard risk management plan, factoring in sources of funding
4. Institutional collaboration and regulatory mechanism for the effective implementation of the plan
5. Regular and consistent monitoring, maintenance, and evaluation
6. Regular reporting and establishment of a feedback mechanism of the lessons learnt
7. Ensuring the availability of technical skills applicable to all the steps and components

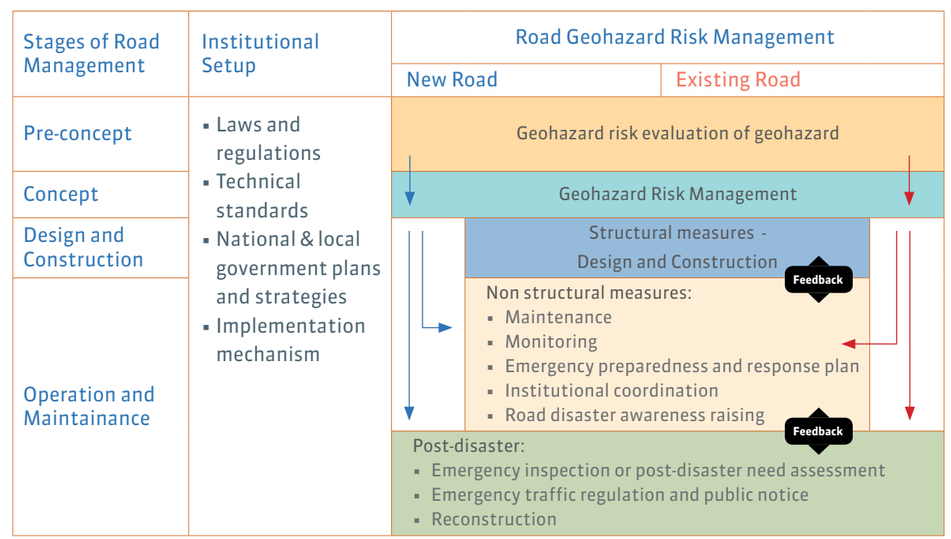



**FIGURE 8**
Framework for Road Geohazard Risk Management
*Source:* Adapted from Yuka Makino's presentation.

## Tajikistan WB Project Tool

**MR. YANNIS** Fourniadis, Chartered Geologist and Specialist, Arup

Tajikistan is located within a mountainous region with a large number of glaciers and mountain rivers. The country is prone to numerous natural hazards, including floods, earthquakes, and landslides. Tajikistan also has high vulnerability to climate change–related hazards. Mr. Fourniadis shared an approach for a World Bank-funded natural hazard assessment project implemented by the team comprised of University of Zurich and Tajik experts. Hazard assessments for flooding, landslides, and earthquakes were undertaken for 25 critical bridges and flood protection infrastructure sites that are proposed for rehabilitation and reconstruction. Historical data were collected for the entire region and Global Climate Model (GCM) data were obtained looking at the change in mean and variance of climate variables (namely temperature and precipitation). Then, a mathematical model was implemented to apply the GCM results to the observed weather data. This approach produced a time series of "future weather data". **FIGURE 9** This type of analysis helped the local stakeholders effectively conduct natural hazard assessment and manage reconstruction of transport Infrastructure by building back better.

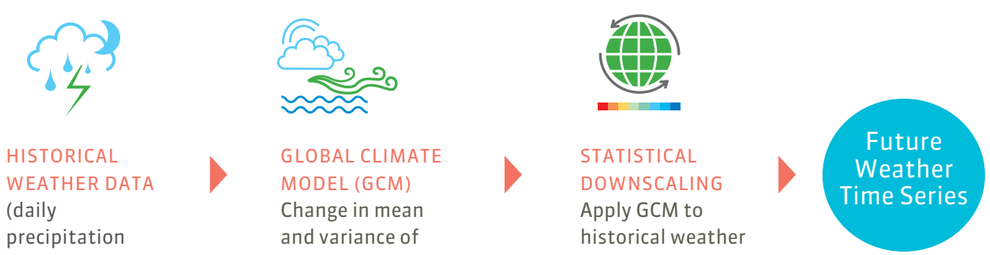



**FIGURE 9**
Approach for Climate Change Projections
*Source:* Adapted from Yannis Fourniadis's presentation.



## Resilience of Geotechnical Assets to Severe Weather—Vulnerability Framework to Categorize Assets and Prioritize Interventions Pre- and Post-Weather Events

**MS. SAVINA** Carluccio, Chartered Civil Engineer, Arup

A resilient transport system is essential to a functioning society as it supports economic growth by connecting people and goods. However, 100 percent physical resilience to all hazards would be impractical. Hence, there is a need for proactive resilience planning and management because such a proactive approach can achieve smarter use of asset information for decision making and resilience planning and efficiency savings on whole-life costs due to proportionate interventions (Figure10). Ms. Carluccio shared two case studies for the resilience of geotechnical assets: the main transport asset owners in the U.K., Highways England and Network Rail. The Highways England case study presented a high-level framework for resilience management with a focus on identification and management of ground-related hazards. The Network Rail case study showcased an example of how advanced data analytics can now support enhanced decision making through establishing operational warning thresholds in case of adverse and extreme weather. She concluded by emphasizing that resilience is managed through a combination of preventative design, proactive risk mitigation, event readiness, and operational preparedness.

**FIGURE 10**
Approach for Managing the Geohazard Threat
*Source:* Adapted from Savina Carluccio's presentation.

## SESSION

### PRACTICAL APPROACHES 1

### Optimizing Road Infrastructure for Beneficial Water Management and Resilience under Climate Change

**MR. FRANK** van Steenbergen, Consultant, World Bank

**USE OF GIS** and Remote Sensing Technologies, Geotechnical DataBase Management: Mr. Yannis Fourniadis, Chartered Geologist and Specialist, Arup

Roads and water are often seen as enemies: water is the major cause of damage to road infrastructure, but roads are also a major cause of local flooding, erosion, and sedimentation (typically 15–40 percent in a catchment) and as such a major contributor to watershed degradation. Roads have a major imprint on surface hydrology, and this can be used to manage water by making use of road infrastructure as protection (channeling road drainage to storage or recharge areas) or by adjusting the design of roads to better manage watersheds and to harvest water. Embanked roads used as flood and/or coastal protection measures, retention basins, and rainwater storage facilities stored alongside and under roads (i.e., green streets, linear rain gardens, permeable pavements, etc.) are examples of multipurpose infrastructure that serve both transport and disaster risk management needs. Combining efforts offers opportunities to reduce total costs, combine funds, and address issues across sectors in ways that are ultimately more effective and efficient. This approach will create a triple win: less road damage and downtime, less erosion and flooding, and the beneficial use of water. This 'roads for water' movement has already started in ten countries (www.roadsforwater.org).

Digital technologies can improve the accuracy and cost-effectiveness of geohazard assessment. For instance, remote sensing consisting of earth observations made from space and aircrafts can help monitor geohazards, and improve our understanding of geohazard mechanics and evolution. Also, geohazard database management comprises software systems that can let us gather, manage, and report geotechnical data efficiently and according to the needs of different users. Mr. Fourniadis highlighted that utilizing Geographic Information Systems (GIS), remote sensing, and geotechnical database management in a geohazard assessment and management project can lead to greater efficiency and cost savings, improved, more transparent decision making, and improved communication. However, there are some barriers to adoption of such digital technologies due to lack of trained experts and institutional inertia to commit to an open, transparent, and inclusive data management system because of ownership and data control issues.

## SESSION

### RESILIENCE FINANCING AND ECONOMIC APPRAISAL

### Resilience Financing Mechanisms

**MS. YANA** Waldman, Senior Consultant, Arup

Repair costs and the cost of lost business opportunities collectively increase as a result of compounding natural disasters and increased economic development. In 2017, the major credit rating agencies began dropping the credit scores of countries and municipalities with an elevated risk of climate impact, damaging their assets. Resilience financing includes funding resilience development, providing post-disaster financial relief, allocating ownership of risk, and creating incentives for resilience. While there are some barriers to financing resilient infrastructure due to difficulties in capturing and monetizing resilience value, Ms. Waldman emphasized that development of business case models identifying unique funding sources best suited for projects in each dimension of resilience and a value for money exercise are keys to determine what scale of revenue is possible for resilient funding and financing.

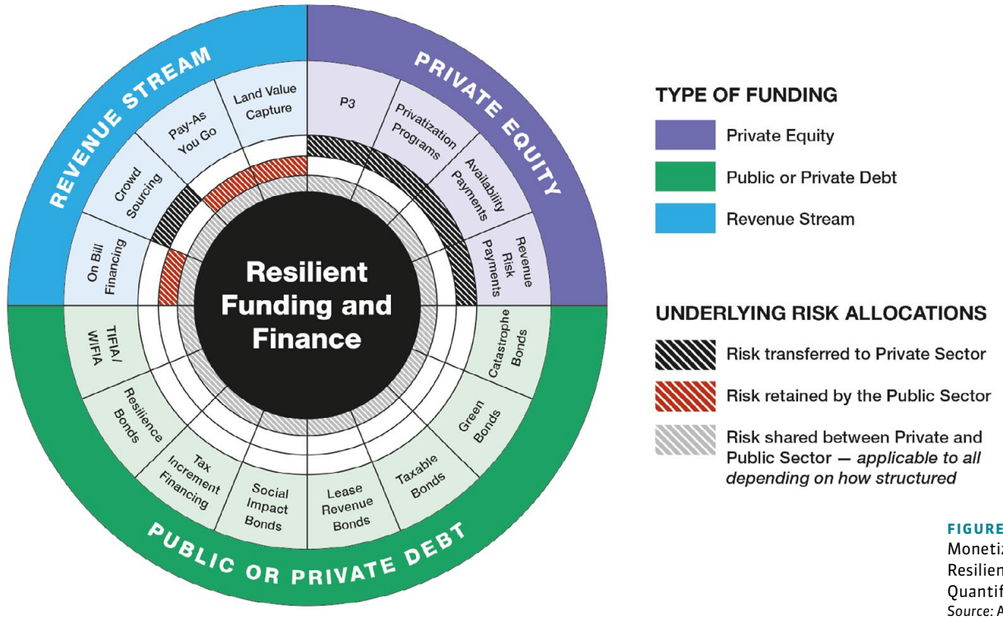



**FIGURE 11**
Monetizing Resilience by Quantifying Values
*Source:* Adapted from Yana Waldman's presentation.

## Economic Appraisal of Resilience Interventions—Serbia, Caribbean and Pacific

**MR. JAMES** Reeves, Senior Technical Director, IMC Worldwide

Mr. Reeves described the various difficulties of feasibility studies to assess interventions to strengthen resilience of transport infrastructure by assessing the costs of different events in terms of damage to infrastructure, socio-economic costs, and the costs of emergency response. He discussed the key issues including the need for risk-based appraisal techniques and how these can be incorporated into an overall appraisal, difficulties in assessing the probabilities of future events, and how to present the results of this kind of analysis to decision makers. The focus of this discussion was around data availability and how to deal with data gaps, and the difficulties in trying to mechanize these processes due to the fact that every country and every situation is unique. He concluded the session by raising a number of general issues around economic appraisal that still need to be resolved, including how to monetize the value attached to the maintenance of remote communities, how decision makers should balance infrequent long closures and frequent short closures, and how to appraise situations where no intervention is the most viable option or there is no political will to commit to the interventions.

## DFID Briefing Notes on Climate Resilient Infrastructure

**MS. MARIA** Sunyer Pina, Climate Change Adaptation Consultant, Arup

The Infrastructure and Cities for Economic Development (ICED) is looking to deepen the public understanding and knowledge on climate-smart infrastructure, with the aim to build understanding and enhance the practice of Department for International Development (DFID) advisers across all cadres and countries. Ms. Pina shared practical application of industry knowledge to programs based on the review of key questions and gaps in the methodology and in embedding climate resilience in program design. Three key drivers are: (i) "Must Do" through developing legislation, policy frameworks, and funding requirements, (ii) "Should Do" through promoting awareness of climate risks, 'peer pressure', and competitive advantages, and (iii) 'Could Do" through enhancing foresight and innovation, and enlightened self-interest. Examples for the "Must Do" driver includes making climate change adaptation and resilience assessments as part of the Environmental Impact Assessment for infrastructure projects.



# SESSION

# READINESS OF ROADS FOR FLOODS AND PBC

## Optimizing Road Infrastructure for Flood Preparedness and Emergency and Post-Emergency Response

**MR. FRANK** Steenbergen, Consultant, World Bank

Roads can contribute to flood resilience in a major way, and in flood prone areas roads should be planned as such. Roads often unwittingly cause flooding by causing waterlogging, by concentrating run-off in watersheds, or by obstructing flooding patterns in flood plains. This can however, be prevented by making roads help guide and compartmentalize floods through managing water levels in low-lying areas. Roads can also double up as evacuation routes and flood shelters. Mr. Steenbergen highlighted that roads can make a major positive contribution to flood resilience through preventing roads from creating floods, improving flood defenses with roads, and designing roads to be utilized as protection measures during and post a flood emergency.

## Role of Road Asset Management in Emergency Response

**MR. IAN** Greenwood, Consultant, World Bank

Mr. Greenwood presented the role of Road Asset Management (RAM) emergency response with a key focus on the operational and maintenance tasks, funding, and service delivery models. It was also noted that the presence of non-road assets within the carriageway (e.g., water, power, and other utilities—often privately owned) can dramatically increase the time needed to make permanent repairs to the road assets following an emergency. To make operations and maintenance more effective in times of emergencies, there must be a clearly understood priority of routes to get open based on criticality to society. **FIGURE 12** These critical 'lifelines' should be defined well ahead of the emergency event and incorporated into all other aspects of RAM. Based on previous emergency events (especially flooding), proactive routine maintenance of known trouble spots should be undertaken to lessen the impacts. Mr. Greenwood also showed while how parts of the Auckland (New Zealand) motorway network go under water in exceptionally high tides, the emergency was managed through soft measures such as media campaigns and operational activities—rather than through hard measures such as investing heavily in infrastructure. With regard to funding, it is imperative that there is an understanding of how emergency works will be funded—insurance, disaster funds, or others. While the private sector is just as capable as the public sector in responding to emergency events, contractual arrangements need to be in place ahead of the events to enable the private sector to be agile and responsive. While the major works might only impact on a small portion of roads in a region, it is important that the scope of the contract permits the contractor to be deployed to any road in the region during an emergency event because payment is typically on a provisional sum basis.

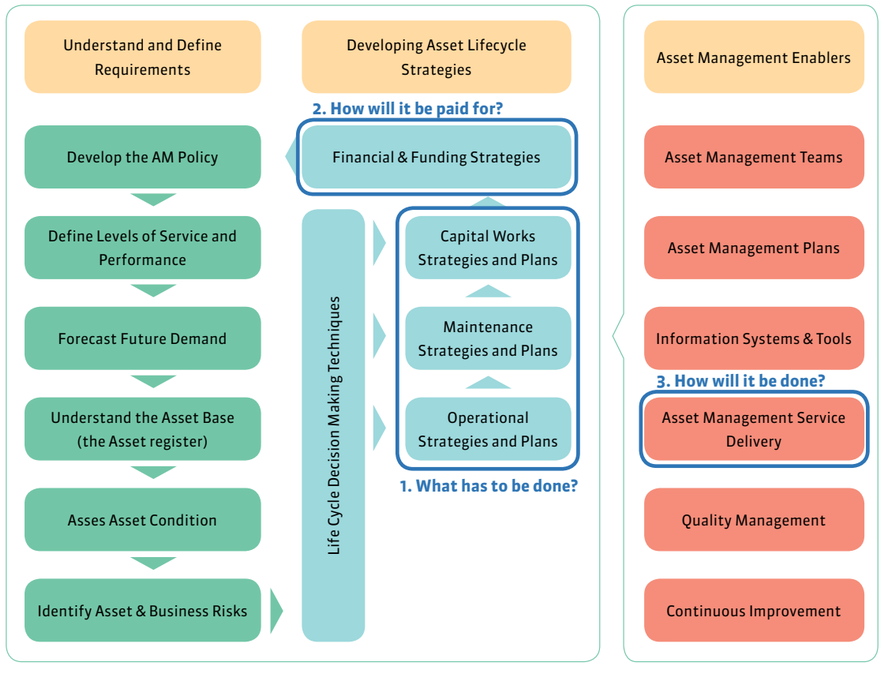


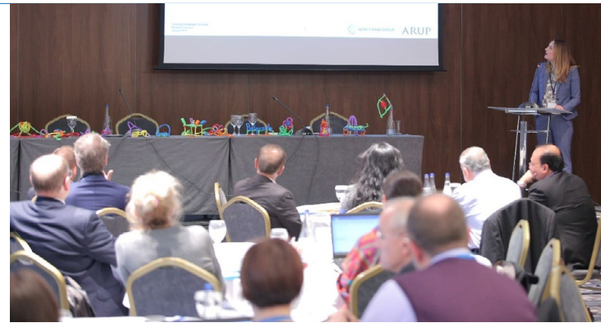

**FIGURE 12**
Road Asset Management Framework from the International Infrastructure Management Manual
*Source:* Adapted from Ian Greenwood's presentation.



## SESSION

## PRACTICAL APPROACHES 2
## Performance-Based Contracting (PBC) Responses to Climate Change

**MS. YANA** Waldman, Senior Consultant, Arup




Climate change presents serious challenges to maintenance and operations and long-term viability of roadway assets since historic data do not reliably represent future climate, which affects the economic and social benefits of a project. Therefore, integrating climate risk into Performance-Based Contracting (PBC) by defining and scoping risks from a contractual

| PARTY | TAKEAWAYS |
|---|---|
| Contractors/ developers | The costs associated with recovering from climate shocks and stressors will impact project profit |
| | Uncertainty around climate risk could dissuade contractors and/or lead to increases in price to buffer the climate risk contingency |
| | Responsibility for maintenance of the mitigation facilities provides one mechanism for control |
| | The definition of force majeure will likely need to evolve with respect to climate change |
| Owners/ client countries | When the contingency budgets for storm repairs, increased drainage maintenance, and unforeseen conditions have been exceeded, the regional government and asset owners are hit with additional service requests |
| | Threats posed by off-site causes such as poor land use planning, agriculture, and logging are hard to manage |
| Funders/ investors | Duration of investment terms need to be extended |
| | Contractual language should be augmented to incentivize resilience planning by developers |
| Communities | Local involvement in project development, execution, and transition of ownership is vital to ensuring the ongoing feasibility of investments |
| | Project evaluation should consider the economic impact of roadways on local communities from both the positive perspective of increased commerce and the negative perspective of business continuity downtime associated with reduced availability |
| Insurers | As providers increasingly experience claims as a result of intensifying climatic events, they will need to balance these with higher premiums |
| | Many countries without insurance markets lack coverage and are forced to self-insure with rainy day funds or turn to government bailout options |

**FIGURE 13**
Stakeholder Engagement and Challenges
*Source:* Adapted from Yana Waldman's presentation.

perspective helps define and clarify transparency of risk ownership throughout the life cycle of roadway assets to ensure proper protection of investment. This approach may also reduce the volume of transportation downtime which often results in financial losses associated with recovering from climate-related shocks and stresses. Based on some studies conducted by Arup, Ms. Waldman pointed out that the procurement process does not easily provide a vehicle for climate change adaption requirements due to challenges and lack of incentives and defined roles among stakeholders. **FIGURE 13** In addition, risk allocation within operations contracts is toggled from contractors to government parties solely through force majeure and unforeseen conditions terminology that defines these events, using generic language unspecific to an event scale. She suggested utilizing assessment tools in order to systematically identify Key Performance Indicators (KPI) as critical to assist government organizations and infrastructure investors with capitalizing on the value capture of avoided risk associated with resilience planning.

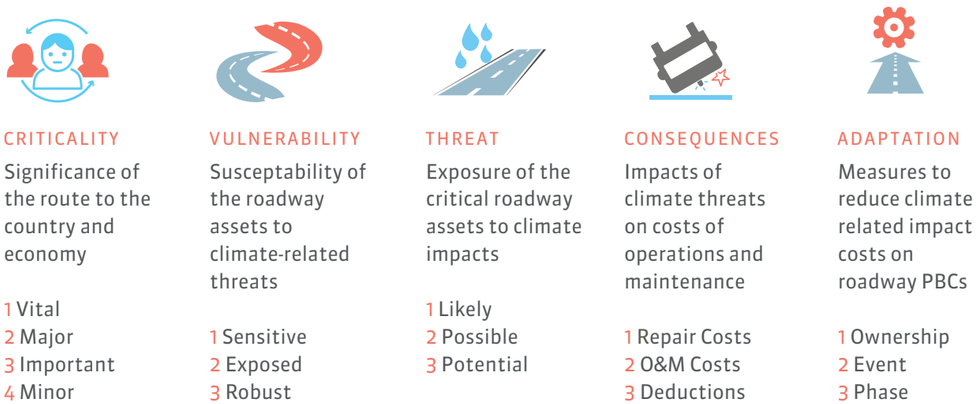



**FIGURE 14**
Assessment Tool and Steps
*Source:* Adapted from Yana Waldman's presentation



## Roadside Tree Planting—Experiences, Good Practices, and Potential to Contribute to Resilience

**MR. FRANK** van Steenbergen, Consultant, World Bank

While systematic knowledge on roadside planting is currently limited, Mr. Steenbergen emphasized potential contributions of roadside tree planting on the reduction of dust by removing dust and other pollutants from the air and protecting crops and roadside communities. In addition, roadside tree planting can sequester carbon, reduce soil erosion by holding soils together and creating productive assets, and act as flood control by slowing and absorbing road runoff. In order to effectively utilize roadside planting methods, the right selection of trees, the right porosity of the hedges, and observing road safety and visibility standards are required.

**FIGURE 15**
Planning Roadside Plantations Safety Considerations
*Source:* Adapted from Frank van Steenbergen's presentation.

| SPEED ZONE | ROAD SAFETY MITIGATION METHOD | |
|---|---|---|
| 40 km/h | The impact force is unlikely to exceed human tolerances, so no specific mitigation is needed | |
| 50 km/h | A minimum lateral distance from road edge of 1 m should be maintained | |
| 60 km/h | ▪ Intersections | at least 10 m beyond intersection on the approach and departure side |
| | ▪ Driveways | at least 3 m between driveway and tree |
| | ▪ Lane merge locations | 3.6 m lateral distance from road edge |
| | ▪ Curves | 3.6 m lateral distance from road edge for gentle curves; barrier for moderate/tight curves |
| 70–100 km/h | The impact force is highly likely to exceed human tolerances<br>Safety barriers are the most appropriate mitigation (wire rope safety barrier, guard rail, or other approved safety barrier that is suitable in high speed environments) | |

## Road Maintenance as an Adaptive Response

**MR. IAN** Greenwood, Consultant, World Bank

Based on the 2017 World Bank report 'Integrating Climate Change into Road Asset Management' coauthored by himself, Mr. Greenwood explained what additional activities are needed to be undertaken at each stage of the RAM cycle to ensure climate change is appropriately incorporated. He reiterated that climate change is not a separate task, but rather a task that should be fully integrated into everyday RAM activities—from a high-level policy, through to data collection, risk management, and life cycle decision making. A key focus of the presentation was on the need to have a clearly defined service level that defines the level of resilience that is to be provided on each road (or road class). Without these service levels, it is difficult to define and implement 'climate resilience.' While the RAM process might be consistent between developed and developing nations, the service levels might vary significantly due to the operational and maintenance cost and capacity of implementers. Data collection was emphasized as being essential to develop a full understanding of climate impacts—including simple records of the size, location, and duration of events (flooding, landslides, etc). The data are important for the development of risk registers and risk allocation within road maintenance contracts, along with calibrating predictive models. Finally, the presentation clarified what actions need to occur before, during, and after disasters, with the majority of actions needing to be undertaken prior to the event.

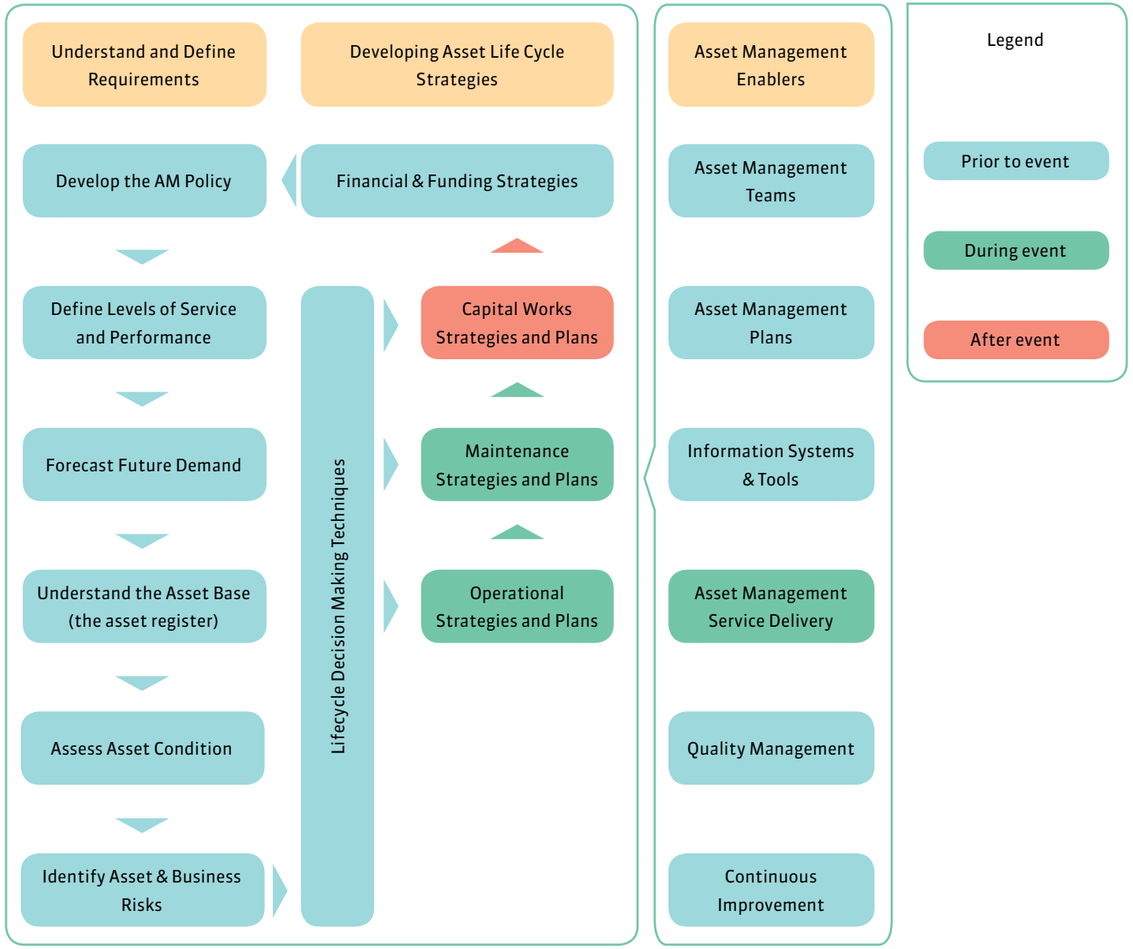



**FIGURE 16**
Effects of Climate Change and Road Asset Management Framework
*Source:* Adapted from Ian Greenwood's presentation.

# SITE VISITS

## Mainstreaming Climate Resilience in Road Transport Management: Valjevo Pilot Testing

In May 2014, the cyclone Tamara swept through the Western Balkans, resulting in extreme precipitation over a short period, which caused flash floods, flooding, and massive landslides in the western parts of Serbia. The highest 48 hour rainfall was registered at the Loznica and Valjevo cities, which corresponds to an extreme rainfall that statistically occurs once in 1,000 years. The following flood events and landslides were triggered instantly, and many of the locations in the Valjevo area were affected by flow-type landslides, which had never previously been reported.

Participants visited municipalities severely affected by the floods in 2014 to see rehabilitation work and various interventions implemented by the World Bank. Participants also learned the steps of the World Bank financed technical assistance which aims to mainstream a climate resilience-led approach in the national management of road transport by developing an effective vulnerability assessment methodology to analyze the risk of Serbia's road network assets to climatic events.

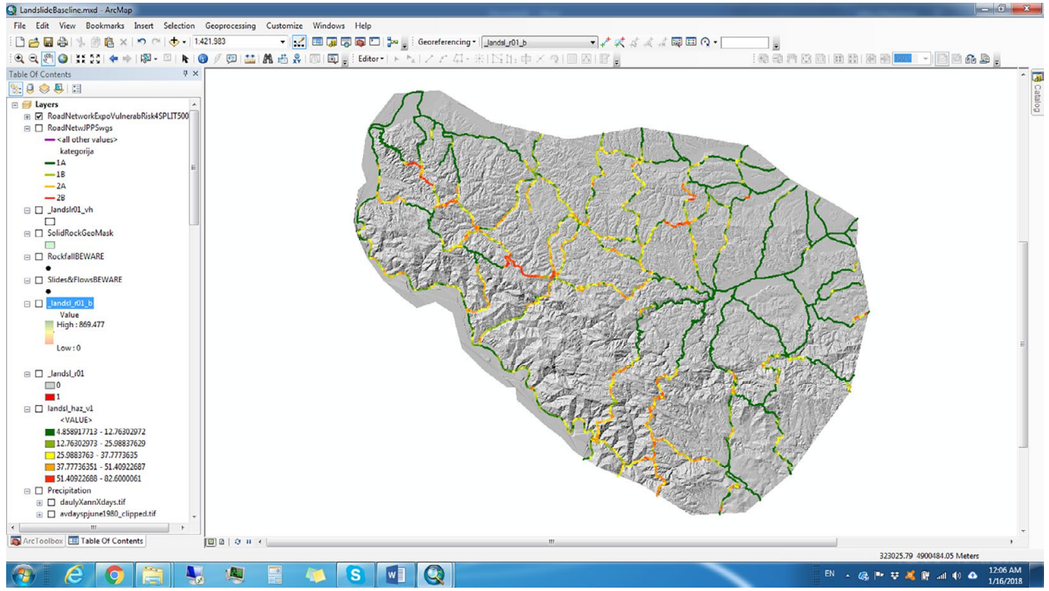



**FIGURE 17**
Valjevo Road Vulnerability Map
Source: Adapted from Biljana Abolmasov's presentation.



Valjevo Pilot Testing has been implemented through the following steps:

**1. Collect and review road network (200 km) data in the Valjevo pilot area**

**2. Collect and review climate related hazards data in the Valjevo pilot area (900 km2)**

**3. Collect and review social and economic data for the Valjevo pilot area**

**4. Collect and review climatological data for the Valjevo pilot area**

**5. Conduct risk assessment for the road network in the Valjevo pilot area**

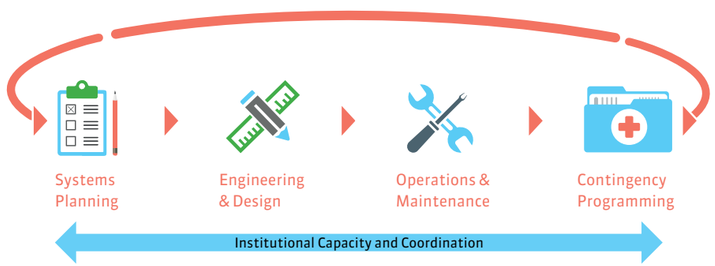
**6. Identify priority interventions**

A participatory approach was also used to consult regional and national key stakeholders to draw on local knowledge and identify priority areas of interventions.

# OUTCOMES AND CONCLUSIONS

## Summary of Action Planning Discussions

Participating countries engaged in peer-to-peer learning and formulated takeaways from the Technical Knowledge Exchange (TKX) for potential application to their country contexts. In the action planning discussions summarized below, by country, the participants discussed the range of challenges they face—institutional, legal, financial, technological, communication, structural, and nonstructural. Consisting of four components of the life cycle approach, participating countries reconfirmed the importance of addressing country-specific needs assessments and transition plans, implementation of resilience measures and transport asset management systems, avenues for local capacity building and knowledge exchange, and fundraising and reassessing capital needs for continued enhancement of transport systems resilience.




| INSTITUTIONAL CAPACITY AND COORDINATION CHALLENGES AND SOLUTIONS IDENTIFIED BY THE WORKSHOP PARTICIPANTS | |
|---|---|
| ▪▪ Policy and planning related to transport development don't address disaster and climate risks | ▪▪ Develop integrated government-wide objective setting and results monitoring for climate resilience to provide the required focus and incentives during implementation<br>▪▪ Implement alternative coordination mechanisms to facilitate cooperation across institutional mandates<br>▪▪ Balance capacity building with capacity supplementation to ensure long-term sustainability of management systems |



| SYSTEMS PLANNING CHALLENGES AND SOLUTIONS IDENTIFIED BY THE WORKSHOP PARTICIPANTS | |
|---|---|
| ▪▪ Infrastructure is built in highly hazard-prone areas<br>▪▪ Risk assessments are not properly used in the planning of infrastructure systems and networks. Infrastructure systems planning does not properly address connectivity (redundancy) and continuity options in case of disaster | ▪▪ Collect risk data including hazards, social, and economic vulnerability, and new or existing road networks<br>▪▪ Identify hot spots based on collected risk data, map hazards, and various risk data<br>▪▪ Establish prioritization criteria for priority interventions<br>▪▪ Define resilience targets to establish effective M&E (Monitoring and Evaluation) system and Implement value engineering<br>▪▪ Implement effective and inclusive land use planning<br>▪▪ Define critical infrastructure including routes, utilities, and social infrastructure such as hospitals, schools, shelters |

| ENGINEERING AND DESIGN CHALLENGES AND SOLUTIONS IDENTIFIED BY THE WORKSHOP PARTICIPANTS | |
|---|---|
| ▪▪ Geotechnical, hydrometeorological, and other studies carried out prior to design and construction often do not include climate change risks<br>▪▪ Design codes, data, and standards are not updated or recalibrated to reflect changing average and extreme conditions<br>▪▪ Infrastructure is not designed for safe failure<br>▪▪ Tools needed to address these vulnerabilities<br>▪▪ Limited industry capacity to recognize hazards and climate change risks, which in turn will exacerbate losses in the transport network, that would then negatively impact mobility, and economic activities<br>▪▪ Climate resilient infrastructure can have high upfront costs, especially in the case of retrofitting | ▪▪ Develop climate adaptive design standard by upgrading design standards and specifications.<br>▪▪ Combine cyclone shelter and net lowing multi-standard-stored warehousing/rigid pavement<br>▪▪ Expand use of bank protection and storm shelter with innovative bank protection, riverside measures<br>▪▪ Use innovative materials to strengthen the resilience of infrastructure systems<br>▪▪ Mandate the need of performing hazard and infrastructure-level vulnerability assessments.<br>▪▪ For areas affected by disasters, implement "Build Back Better" approach based on lessons learned<br>▪▪ Conduct technical audit with tools and guidance notes |

**OPERATIONS AND MAINTENANCE**
**CHALLENGES AND SOLUTIONS IDENTIFIED BY THE WORKSHOP PARTICIPANTS**

| | |
|---|---|
| ▪ Lack of updated and easily accessible asset management system in place<br>▪ Lack of funding and political will for maintenance of infrastructure and supporting its resilience<br>▪ Infrastructure is poorly maintained making it more likely to fail | ▪ Establish RAMS, procedure, and data collection<br>▪ Make annual plans and strategies based on needs identified through inspections<br>▪ Improve capacity of service providers and awareness of users on how to best manage transport interruptions by providing certification of maintenance to trained workers<br>▪ Encourage innovative use of equipment for monitoring automation, GIS based technology<br>▪ Redesign O&M concentrate by integrating performance parameters and risk elements related to climate adaptation<br>▪ Enforce implementation of early warning systems based on river information system<br>▪ Explore innovative contracting for disaster management<br>▪ Explore "commerce use alternatives" for disaster management shelter<br>▪ Create "disaster management fund" from river tourism/cruise levy<br>▪ Improve institutional, financial, and contractual arrangements for infrastructure maintenance<br>▪ Mobilize local communities in operations and maintenance of road assets using a gender inclusive approach |

**CONTINGENCY PROGRAMMING**
**CHALLENGES AND SOLUTIONS IDENTIFIED BY THE WORKSHOP PARTICIPANTS**

| | |
|---|---|
| ▪ Disaster recovery process and protocols are needed<br>▪ Poor financial planning to allow for rapid recovery/reconstruction post-disaster<br>▪ Poor understanding of systems functioning in the aftermath of a disaster or partial/total failure, and its socioeconomic consequences | ▪ Invest in safe hubs such as churches and schools so that these facilities can act as shelter in the case of emergency<br>▪ Establish emergency response stations and shelters which contain clinics including trained rescue teams, emergency vehicles, repair materials, and equipment<br>▪ Invest in emergency preparedness to meet local and regional evacuation, response, and recovery needs, and to prepare for relief distribution<br>▪ Perform pre-qualification of goods and service providers for faster procurement post-disaster<br>▪ Develop financial protection strategies, including disaster reserve funds, contingency budgets, and insurance programs to repair and replace public transport infrastructure components damaged by a climate-related disaster<br>▪ Prepare evacuation plans and trainings by establishing evacuation procedures, evacuation centers, communication pipelines, and supply of tools<br>▪ Train community volunteers for disaster management<br>▪ Increase awareness of various contingency financing mechanisms |

## Summary of Community of Practice (CoP) Work Plan Development

Considering the growing operational and corporate interest in a well-established and successful Resilient Transport Partnership Program, the Resilient Transport CoP will continue to strengthen its knowledge management activities, including establishing a technical expert team to further support and implement its ongoing technical assistance and systematically centralize its knowledge management efforts. In FY18, the Resilient Transport CoP core team successfully developed a knowledge management platform which contains Terms of Reference (ToR) and various tools/guidance notes collected from Task Teams, mainly from Transport GP and GSURR. As the CoP becomes more mature, the need for strong KM activities, including prioritizing the engagement area, disseminating existing knowledge products, convening knowledge exchange events, and creating another flagship report was highlighted by its key stakeholders.

Moving forward, the Resilient Transport CoP will continue to leverage information, tools, and technical expertise 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. Given the successful results of two major technical knowledge exchanges (TKXs) conducted in Tokyo, Japan, (May 2017) and Belgrade, Serbia, (January 2018) in partnership with country offices and GFDRR, the CoP will continue to host international workshops while systematically centralizing World Bank's existing efforts in resilient transport by strengthening its knowledge creation and management efforts.

## Scaling Up the CoP's Knowledge Management Efforts

| OBJECTIVES | ACTIVITY DESCRIPTION |
|---|---|
| Further enhancing of Resilient Transport CoP's knowledge management activities and products including guidance notes, reports, and ToR shared by CoP members | Since the official launch of the Resilient Transport CoP in September 2016, the core team has created several key knowledge management products such as flagship reports, conference summary reports, and tools. In addition, the CoP has collected various ToRs from relevant Task Team Leader (TTLs) (Transport and DRM Task teams) to provide technical support through its knowledge management platform. Going forward, the CoP will systematically extract lessons and guidance from the existing Knowledge Management (KM) system, and leverage this knowledge to inform operations. |
| Integration of climate and disaster risk considerations in the prioritization of investments in transport asset management | The World Bank has piloted and deployed climate and disaster risk modules in systems for prioritization of investments in transport asset management (maintenance, rehabilitation, expansion) by utilizing network models to quantify disaster risk in network models and prioritize interventions that increase the resilience of the network. Analyses were conducted in Peru, Mozambique, Tanzania, Bangladesh, and Fiji, and are currently starting in Vietnam, Argentina, and the Balkans. |
| Development of practical methodologies for integration of climate and disaster risk considerations along the transport infrastructure life cycle | The CoP will further support the broad Resilient Transport initiative at the World Bank with specific focus on developing practical methodologies for the integration of climate and disaster risks considerations along the transport infrastructure life cycle. |
| Knowledge exchange events | Since the official launch of the Resilient Transport CoP in September 2016, the core team has organized several key knowledge exchange events, including the technical knowledge exchange (TKX) in Tokyo, Japan, (May 2017) and Belgrade, Serbia, (January 2018) in partnership with country offices and GFDRR, and various workshops at the World Bank Washington DC office. The CoP will further create knowledge exchange opportunities to share results of this program and promote cross-sector partnerships. |
| Targeted support to enhance resilience of transport systems in Small Island Developing States (SIDS). | The Resilient Transport CoP launched a report at COP23 making the case for strengthening support to SIDS to enhance resilience of transport systems. Going forward, needs assessment plans will be conducted in interested client countries, and technical support provided to implement resilience measures. Capacity building activities include the creation of a designated knowledge platform accessible to client countries, and the organization of regional TKXs focused on SIDS. |

# ANNEX 1: AGENDA OF TKX

2nd Technical Knowledge Exchange on Resilient Transport:
Learning from the Serbian Experience in DRM for Resilient Transport

| MONDAY, JANUARY 22, 2018 | |
|---|---|
| 8:30 AM | *Registration—Nikola Tesla Ballroom* |
| 9:00 AM | **SESSION 1: OPENING**<br>Welcome and Opening Remarks (10 minutes)<br>Mr. Juan Gaviria, Practice Manager, World Bank<br>Mr. Marc Forni, Lead DRM Specialist, World Bank<br>Learning Objectives (10 minutes)<br>Ms. Fiona Collin, Lead Transport Specialist, World Bank<br>Keynote Presentation (15 minutes)<br>Mr. Miodrag Poledica, State Secretary, Ministry of Construction, Transport and Infrastructure<br>Mr. Marko Blagojevic, Acting Director, Public Investment Management Office<br>Q&A to Panel (10 minutes) |
| 9:45 AM | **SESSION 2: SERBIA RESILIENCE**<br>Overview of Serbia Resilience (5 minutes)<br>Ms. Svetlana Vukanovic, Transport Specialist, World Bank<br>Introduction to the Project Team (5 minutes)<br>Mr. James Reeves, IMC Worldwide<br>Guidelines and Tool Development (15 minutes)<br>Ms. Biljana Abolmasov, IMC Worldwide<br>Landslide Assessment (10 minutes)<br>Ms. Biljana Abolmasov, IMC Worldwide<br>Prioritization Methodology (15 minutes)<br>Mr. James Reeves, IMC Worldwide<br>Q&A to Panel (10 minutes) |
| 10:30 AM | *Coffee Break* |



| | |
|---|---|
| 11:00 AM | **SESSION 3: GEOHAZARDS AND LANDSLIDES**<br>Tajikistan WB Project Tool (20 minutes)<br>Mr. Yannis Fourniadis, Arup<br>Geohazard Handbook (20 minutes)<br>Ms. Yuka Makino, Senior Natural Resources Management Specialist and DRM Officer, World Bank<br>Use of GIS and Remote Sensing Technologies, Geotechnical DataBase Management (20 minutes)<br>Mr. Yannis Fourniadis, Arup<br>Q&A to Panel (15 minutes) |
| 12:15 PM | *Lunch (44 Paralel Restaurant)* |
| 1:00 PM | **SESSION 4: CLIENT COUNTY PRESENTATIONS**<br>3 Countries TBD (10 minutes each)<br>Exchange of Views, Small Group Discussions (15 minutes) |
| 1:45 PM | **SESSION 5: CLIMATE SCIENCE AND RESILIENT DESIGN**<br>Climate Science (20 minutes)<br>Ms. Maria Sunyer Pina, Arup<br>Climate and Natural Hazard Resilience of Rail Projects for the WB Urban Rail Design Guidebook (20 minutes)<br>Ms. Savina Carluccio, Arup<br>REDi™—Resilient Engineering Design Initiative—Floods and Earthquakes (20 minutes)<br>Ms. Yana Waldman, Arup<br>Q&A to Panel (15 minutes) |
| 3:00 PM | **SESSION 6: PRACTICAL APPROACHES 1**<br>Optimizing Road Infrastructure for Beneficial Water Management and Resilience under Climate Change (20 minutes)<br>Mr. Frank van Steenbergen, Consultant, World Bank<br>Resilience of Geotechnical Assets to Severe Weather—Vulnerability Framework to Categorize Assets and Prioritize Interventions Pre and Post-Weather Event (20 minutes)<br>Ms. Savina Carluccio, Arup<br>Q&A to Panel (15 minutes) |
| 3:55 PM | *Coffee Break* |
| 4:05 PM | **SESSION 7: CLIENT COUNTY PRESENTATIONS**<br>3 Countries TBD (10 minutes each)<br>Exchange of Views, Expert Panel (15 minutes) |
| 4:50 PM | **SESSION 8: ACTION PLANNING**<br>Introduction to Action Planning (10 minutes) |
| 6:00 PM | Wrap-Up<br>Wrap-up of Day 1 and Overview (10 minutes)<br>Logistics for Day 2 (5 minutes)<br>World Bank Team |
| 6:30 PM | *Welcome Reception* |

## TUESDAY, JANUARY 23, 2018

| | |
|---|---|
| 8:45 AM | *Coffee* |
| 9:00 AM | **SESSION 1: DAY 2 OPENING COMMENTS**<br>Recap of Day 1 and Overview of Day 2 (5 minutes)<br>**Mr. Marc Forni, Lead DRM Specialist, World Bank**<br>Logistics Issues for Day 2 (5 minutes)<br>**Ms. Nadia Islam, Program Analyst, World Bank** |
| 9:10 AM | **SESSION 2: RESILIENCE FINANCING AND ECONOMIC APPRAISAL**<br>Resilience Financing Mechanisms (20 minutes)<br>**Ms. Yana Waldman, Arup**<br>Economic Appraisal of Resilience Interventions—Serbia, Caribbean and Pacific (20 minutes)<br>**Mr. James Reeves, IMC Worldwide**<br>DFID Briefing Notes on Climate Resilient infrastructure (20 minutes)<br>**Ms. Maria Sunyer Pina, Arup**<br>Q&A to Panel (15 minutes) |
| 10:25 AM | *Coffee break* |
| 10:35 AM | **SESSION 3: CLIENT COUNTY PRESENTATIONS**<br>3 Countries TBD (10 minutes each)<br>Exchange of Views, Small Group Discussions (15 minutes)<br>3 Countries TBD (10 minutes each)<br>Exchange of Views, Small Group Discussions (15 minutes) |
| 12:05 PM | *Lunch (44 Paralel Restaurant)* |
| 12:50 PM | **SESSION 4: READINESS OF ROADS FOR FLOODS AND PBC**<br>Optimizing Road Infrastructure for Flood Preparedness and Emergency and Post-Emergency Response (20 minutes)<br>**Mr. Frank Steenbergen, Consultant, World Bank**<br>PBC Responses to Climate Change (20 minutes)<br>**Ms. Yana Waldman, Arup**<br>Q&A to Panel (20 minutes) |
| 1:50 PM | **SESSION 5: PRACTICAL APPROACHES 2**<br>Roadside Tree Planting—Experiences, Good Practices, and Potential to Contribute to Resilience (20 minutes)<br>**Mr. Frank van Steenbergen, Consultant, World Bank**<br>Road Maintenance as an Adaptive Response (20 minutes)<br>**Mr. Ian Greenwood, Consultant, World Bank**<br>Q&A to Panel (15 minutes) |
| 2:45 PM | *Coffee break* |



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| 2:55 PM | **SESSION 6: PRACTICAL APPROACHES 2**<br>Optimizing Road Infrastructure for Beneficial Water Management and Resilience under Climate Change (20 minutes)<br>**Mr. Frank van Steenbergen, Consultant, World Bank**<br>Role of Road Asset Management in Emergency Response (20 minutes)<br>**Mr. Ian Greenwood, Consultant, World Bank**<br>Q&A to Panel (15 minutes) |
| 3:50 PM | **SESSION 7: ENGAGEMENT AND ACTION PLANNING**<br>Small Group Discussion and Action Planning (60 minutes)<br>Small Group Reporting (30 minutes)<br>Interactive Session and Feedback on Learning Needs from Each Country (10 minutes) |
| 5:30 PM | **WRAP-UP**<br>Wrap-up of Day and Overview (10 minutes)<br>Logistics for Day 3 Field Visit (5 minutes)<br>**World Bank Team** |
| 6:30 PM | *Buffet Dinner (44 Paralel Restaurant)* |

## WEDNESDAY, JANUARY 24, 2018

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| 8:45 AM | *Coffee* |
| 9:00 AM | **SESSION 1: DAY 3 OPENING COMMENTS**<br>Recap of Day 2 and Overview of Day 3 (5 minutes)<br>**Mr. Marc Forni, Lead DRM Specialist, World Bank**<br>Logistics Issues for Day 3 (5 minutes)<br>**Darko/Svetlana** |
| 9:10 AM | **TRANSPORT TO FIELD TRIP**<br>· drive to Mali Zvornik (route: Belgrade–Šabac–Loznica–Mali Zvornik) (3 hours)<br>· break at Mali Zvornik and review of the rehabilitation works done after floods in 2014 (30 minutes)<br>· drive to Krst and review rehabilitation works (route: Mali Zvornik–Loznica–Krst) (30 minutes<br>· drive from Krst to Krupanj with review of the rehabilitation works/landslides, bridges, Stolice Dam, torrential floods, Korenita River regulations (60 minutes)<br>· coffee break in Krupanj and meeting with local authorities in the Krupanj Municipality building (60 minutes)<br>· drive to Krupanj–Zavlaka and review of partialy rehabilitated road and rehabilitation works on landslides and bridges (30 minutes)<br>· drive to Koceljeva (route: Zavlaka–Valjevo–Koceljeva) and review of rehabilitation works on bridges, different slope stability measures, regulation of Jadar River, regulation on Kolubara River, rehabilitation on Tamnava River and bridge (90 minutes)<br>· lunch at Koceljeva in Hotel Dvorac Ivanovi (2 hours)<br>· return to Belgrade through the Obrenovac and Ub that are the most affected municipality by the floods in 2014 (route: Koceljeva–Ub–Obrenovac–Beograd) (90 minutes) |
| 7:30 PM | *Arrival in Belgrade* |



## THURSDAY, JANUARY 25, 2018

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| 8:45 AM | *Coffee* |
| 9:00 AM | **SESSION 1: DAY 4 OPENING COMMENTS**<br>Recap of Day 3 and Overview of Day 4 (5 minutes)<br>**Mr. Marc Forni, Lead DRM Specialist, World Bank**<br>Logistics Issues for Day 4 (5 minutes)<br>**Ms. Nadia Islam, Program Analyst, World Bank** |
| 9:10 AM | **SESSION 2: BRINGING IT HOME**<br>Stock-Taking and Multi-Stakeholder Dialogue (30 minutes)<br>How to Operationalize Key Take-Aways (30 minutes) |
| 10:10 AM | *Coffee break* |
| 10:30 AM | **SESSION 3: COUNTRY-SPECIFIC ACTION PLAN DEVELOPMENT**<br>Small Group Discussion by Clients and TTLs (60 minutes)<br>Action Plan Pitch #1 (60 minutes)<br>**Country Presentations**<br>**Panel Discussion after Each Pitch** |
| 12:30 PM | *Lunch (44 Paralel Restaurant)* |
| 1:30 PM | **SESSION 4: COUNTRY-SPECIFIC ACTION PLAN DEVELOPMENT**<br>Action Plan Pitch #2 (120 minutes)<br>**Country Presentations**<br>**Panel Discussion after Each Pitch** |
| 3:00 PM | *Coffee break* |
| 3:45 PM | **SESSION 5: CONCLUSION AND WRAP-UP**<br>Conclusions and Take-Aways (20 minutes)<br>Closing Remarks (10 minutes)<br>Certificate Presentation (10 minutes) |
| 6:30 PM | *Buffet Dinner (44 Paralel Restaurant)* |

| FRIDAY, JANUARY 26, 2018 | |
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| | - World Bank Only. Objective: To develop a strategy for the Resilient Transport Community of Practice (COP) and Partnership Program |
| 9:00 AM | **INTRODUCTION TO THE SESSION**<br>**Ms. Akiko Toya, Junior Professional Officer, GFDRR, World Bank**<br>**INTRODUCTION OF RESILIENT TRANSPORT PARTNERSHIP PROGRAM**<br>**REVIEW OF THE WEEK**<br>- Reflections on the week and implications for Transport and DRM partnership value proposition<br>- Key takeaways on what worked well/not so well for planning future events<br><br>**COMMUNITY OF PRACTICE – REVIEW OF ONGOING ACTIVITIES**<br>- Tour de table to identify ongoing TA and lending operations in resilient transport<br>- Knowledge management dashboard<br>- What GFDRR can offer (ThinkHazard, Geonode, GeoSafe, various tools/ resources)<br>- Technical and peer review<br>- Update on SIDS flagship report and potential fundraising<br>- Communications and outreach – blogs, BBLs, materials<br><br>**COMMUNITY OF PRACTICE – WORK PLAN AND NEXT STEPS**<br>- Brainstorm and discussion session for ideas on next flagship<br>- Discussion on how CoP aims to secure sources of funding<br>- Systematizing JIT support |
| 12:00 PM | - Open discussion on expectations and mandate for CoP |



# ANNEX 2: EXPERT PROFILES

Information is as of the time of the TKX

## Organizers

### Marc S. Forni

**Lead DRM Specialist, GSURR, World Bank**

Marc Forni joined the World Bank in 2003, working for four years in 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.

### Shomik Mehendrinatta

**Practice Manager, TDD, World Bank**

Dr. Shomik Mehndiratta is the World Bank's Practice Manager for Transport in Latin American and the Caribbean. He has been at the World Bank since 2002 (except for a short break in 2015) working primarily in East Asia, Latin America, and Africa. He has served in the past as the Transport Sector's technical lead on urban mobility and climate-informed transport. In the period 2007–2010 he lived and worked in China and is the co-editor and author of an edited book on Low Carbon Urban Development in China. In 2015 he briefly worked with Uber as Director of Policy; and prior to the World Bank he worked at CRA International, a business and economics consulting firm, based out of Boston, MA. Shomik holds a PhD from the University of California at Berkeley and an executive MBA jointly from INSEAD and Tsinghua University.

### 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 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, Latin America, and 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 and has spent a semester abroad at La Universidad San Francisco de Quito in Ecuador.

### Darko Milutin

**DRM Specialist, GSURR, World Bank**

Darko Milutin worked as a Project Manager for the DRM Team in Serbia CMU, prior to joining the ECA Urban and DRM Unit (GSURR) as a DRM Specialist in 2016, where he was responsible for support to the implementation of the National Disaster Management Program of Serbia. Most of his career he spent working in development cooperation, combined with academic work in the Netherlands and Serbia. His international experience as a consultant stretches over more than 20 years, with the last eight years prior to joining the World Bank being a donor representative for Luxembourg bilateral development cooperation projects in Serbia and Montenegro. A Serbian and Dutch national, Darko holds a PhD degree in Environmental Sciences from Wageningen, the Netherlands, with a BsC degree in Hydrology and Water Resources Management Engineering from Belgrade, Serbia.

### Fiona Collin

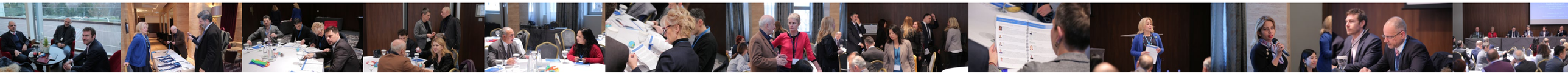
**Lead Transport Specialist, TDD, World Bank**

Fiona Collin joined the World Bank as a senior transport specialist in 2011, initially based in Addis Ababa for three years, and now a further three years in headquarters within the Europe and Central Asia region. Before joining the World Bank, Fiona worked as a civil engineer and project manager, specializing in transport and connectivity. Her 30 years of work experience span the World Bank and other development partners, road agencies, contractor work, and consultancies. Geographically, Fiona has worked in Europe, Central Asia, East Africa, East Asia, Australia, and the Pacific Islands. With a significant amount of time spent in tropical latitudes, Fiona has firsthand experience of extreme weather, particularly in relation to cyclones and flooding, and in post-disaster recovery and adaptation. This professional and personal exposure brings with it an interest in addressing the impacts of climate change and extreme weather and its effects on road infrastructure; and her professional background as a development practitioner and engineer who has designed, built, and maintained roads provides perspectives on how to deal with it.

### Nadia Islam

**Program Analyst, GFDRR, World Bank**

Nadia Islam started her career at the World Bank with the first VP for SAR working on annual and spring meetings. She has extensive experience in working in operations with the agriculture department and M&E. She has handled corporate events for the President and one of the largest Bank organized ministerial conferences in Egypt. She recently moved to GFDRR from Social Safeguards in SAR where she was the manager of the TSP database and monitored nearly 100 percent tracking of social performance rates in projects and monitoring the Unit's portfolio and budgets she has also been part of the core team of the GPSURR forum organizing team. Nadia worked in the Cairo country with the Country Director's office on portfolio monitoring. In GFDRR, she will contribute and support monitoring and management of the overall GFDRR programs with a focus on visibility events for the secretariat as well as post-disaster needs assessments. She will be providing cross support to the GPs and CRP given her extensive operational experience in the



Bank and ensuring accountability of GFDRR funding in many of these programs.

### Svetlana Vukanovic
**Transport Specialist, TDD, World Bank**

Svetlana Vukanovic is a Transport Specialist in the World Bank where, for the past nine years, she has been working on transport infrastructure investment and road and rail sector reform projects, ITS (intelligent transport systems), road safety, and resilience. Before joining the Bank, she worked on cutting edge innovative EU mobility projects and was technical department manager for ITS in Siemens. She has a PhD in ITS from the Technical University of Munich.
World Bank

## World Bank Teams

### Juan Gaviria
**Practice Manager, TDD, World Bank**

Juan Gaviria is a practice manager of transport for Europe at the World Bank and responsible for managing the transport infrastructure practice in 22 active programs in the European Union, Eastern Partnership, Western Balkans, Caucasus, Turkey, and the Russian Federation. He oversees a portfolio of investment projects totaling just under US$5 billion and annual advisory services of about US$5 million, including a diverse portfolio of motorways, railways, waterways, ports, and logistics projects, as well as infrastructure public-private partnerships (PPPs) in a variety of countries. Juan also has broad professional experience in private and public infrastructure development and management, public utility companies and concessions, climate change and infrastructure operations, management of complex assignments, project appraisal, finance, management, and marketing covering Europe, Latin America, Central Asia, South Asia, and Africa. He also has experience as chief operating officer of a medium-size global container shipping line, formulating and implementing new company strategy; carrying out organizational and cultural alignment; and developing regulatory strategy, value creation, integration management, and concluding transactions. He has a doctorate in transport economics from the University of California, Berkeley.

### Denis Jean-Jacques Jordy
**Lead DRM Specialist, GFDRR, World Bank**

Denis Jordy is Lead Disaster Risk Management Specialist and leads the GFDRR's Small Islands States Resilience Initiative. He has more than 20 years of experience in disaster and climate resilience, environment, and water management. From 2013 to 2017, he was based at the World Bank Office in Sydney and coordinated the Disaster Risk Management, Climate Change Adaptation, and Environment portfolio in the Pacific Region. He was previously based in Washington DC, USA, and Dakar, Senegal, and has a multi-region experience in Africa, Asia, Middle East and North Africa, Latin America, France and the USA. Denis joined the World Bank in 2004 and has been working on a wide range of projects and knowledge products related to urban flood risk reduction, coastal zone management, climate change adaptation, disaster risk management, post-disaster needs assessments, environmental management, and pollution control.

### Arnab Bandyopadhyay
**Lead Transport Specialist, TDD, World Bank**

Arnab Bandyopadhyay works as the Lead Transport Specialist with the Transport & ICT Global Practice in the World Bank and is based in the New Delhi office. A Civil Engineer by education with a specialization in Construction Management, Arnab has worked with consulting firms in wide-ranging highway design and construction projects in South Asia, East Asia, and East Africa before joining the Bank in 2001. Arnab has several publications on the Construction Industry, Water Transport, Institutional Development, and Road Safety to his credit and is a regular speaker in national and international forums.

### Diep Nguyen-van Houtte
**Lead Transport Specialist, TDD, World Bank**

Mrs. Diep Nguyen-van Houtte is a Lead Transport Specialist for the World Bank's Transport and ICT Global Practice. She has worked in more than 20 countries in Europe and Central Asia, East Asia, South Asia, Africa, the Middle East and North Africa, and North America. Her educational background is in economics, public policy, and organizational/business management. Her work at the World Bank has focused on multi-modal transport including road, railway, and inland waterway connectivity; national and regional integration; spatial development; and transport and trade facilitation. She is accompanying teams from Egypt, Bangladesh, India, and Nepal on this knowledge exchange.

### Dung Anh Hoang
**Senior Transport Specialist, TDD, World Bank**

Dung Anh Hoang is a Senior Transport Specialist based in Hanoi, Vietnam. He is an Engineer by training and has been with the Bank for 15 years. Previously he was an Associate Professor at the National University of Civil Engineering and worked extensively with the Ministry of Transport in Vietnam. He has been the Task Team Leader for a number of projects in multi-modal transport and logistics, expressway, pilot PPP for highways, and inland waterways. He is currently the technical lead working on climate-resilient solutions for rehabilitation of disaster-affected roads and bridges in Bank-financed projects in Myanmar, Bangladesh, India, and Vietnam.

### Deepak Man Singh Shrestha
**Senior Transport Specialist, TDD, World Bank**

Deepak Shrestha is a Sr. Transport Specialist in the Nepal Country Office, World Bank, and is working on Bank funded projects in Nepal, India, and Bangladesh. He has professionally worked in the road transport sector for more than 35 years as a Civil Engineer, Construction Management, and Public Procurement expert. While working on mountainous regions, he has had experiences in various aspects of road construction and maintenance, including implementation of slope stabilization and bioengineering works.

### Erik Nora
**Senior Operations Officer, Country and Operations Services, World Bank**

Erik Nora is a Sr. Operations Officer in the World Bank's Transport and ICT Global Practice (GP), South Asia. Erik, a Norwegian national, joined the World Bank in 2003 in the External Affairs Department. Prior to joining the Transport Practice, he worked for 5 years in the South Asia Regional Integration Unit, focusing on trade and transport connectivity. He is currently the task team leader (TTL) for the Bangladesh Regional Connectivity project, co-TTL for the Bangladesh Regional Waterways Project and Regional Road Safety study, and Program Manager for the South Asia Regional Integration Trust Fund.

### Yuka Makino
**Senior Natural Resource Management/ DRM Specialist, GSURR, World Bank**

Yuka Makino has more than 23 years of operational experience in managing and developing programs in geohazard risk management, natural resources management, land management, DRM, and climate change adaptation. She has extensive experience in East Asia, South Asia, and Africa and has held field postings in Bangladesh, Cambodia, Japan, and Nepal. Prior to joining the World Bank in 2001, Yuka was a United Nations Development Programme (UNDP) program officer in Cambodia, and a Japan International Cooperation Agency (JICA) expert on community-based disaster management in Nepal. Yuka has an undergraduate degree from International Christian University in Japan as well as master's and doctoral degrees in terrestrial ecosystem management from the University of Michigan, Ann Arbor. In addition to her professional experience in South Asia, she spent 14 years of her youth in the Garhwal Himalayas in India and is fluent in Hindi.

### Romain Pison
**Senior Transport Specialist, TDD, World Bank**

Romain Pison was born in France and grew up in both France and Italy. As a French-Italian, Romain was raised between competing cheeses, cars, and soccer teams. Romain studied Civil Engineering and Transport at the French Ecole Nationale des Travaux Publics de l'Etat, as well as Economics and International Management at New York University. Romain started his career at the United Nations where he worked on slum upgrading with the UN Habitat. He then moved to the French Ministry of Transport in 2006 where he worked on road maintenance, bridge engineering, and safety. He joined the international project development world in 2009, first with the Europe and Central Asia Department of the World Bank, where he was in charge of maritime transport and road safety projects, among other sectors, in more than 10 countries. He worked for the European Commission, based in Cameroon, working on transport infrastructure development, before moving back to Washington DC with the World Bank on the East Asia and Pacific Team. Romain moved over the summer of 2017 to the Vienna Office of the World Bank where he supervises project in trade, connectivity, road safety, resilience, and intelligent transport systems in the Western Balkans and Asia.

### Yang Chen
**Urban Transport Specialist, TDD, World Bank**

Ms. Yang Chen is an urban transport specialist in the Transport & ICT Global Practice of the World Bank. She has been working on various urban transport projects in China, Mongolia, Vietnam, and Latin America. Yang is interested in urban transport policies and planning, green transport, and smart cities. Before joining the World Bank, she worked for Precourt Energy Efficiency Center at Stanford University, the International Council on Clean Transportation, and Grütter Consulting, as well as Beijing Turenscape Design Institute. She holds a B.S. in Urban Planning from Peking University, Master in City Planning from University of Pennsylvania, and a Ph.D. in Urban Transportation from Massachusetts Institute of Technology.

### Ana Silvia Aguilera
**Senior Infrastructure Consultant, TDD, World Bank**

Ana Silvia Aguilera is a Senior Infrastructure Consultant with over 10 years of experience working with the World Bank in the preparation and support of the implementation of infrastructure projects, including transport and water and sanitation. In transport her focus has been on roads and rural roads projects with territorial development approaches in Latin America. Her experience extends geographically to Africa and East Asia where she worked for two years in the Global Partnership of Output-Based Aid (GPOBA), within the World Bank as an Infrastructure Specialist advising on the structuring and implementation on Output-Based Aid (OBA), and in Results-Based Financing (RBF) projects in infrastructure sectors, particularly in water and sanitation. Before her work in the World Bank she worked for over two years with the Inter-American Development Bank (IDB) in the preparation of the IDB country strategies for the Central American and Caribbean countries. Ana Silvia received a master's degree in Economics from the University of

Alabama in the United States, and two Bachelor's degrees from Universidad Francisco Marroquin in Guatemala, one in Economics, and the other one in Business Administration and Finance.

### Ana Simecki

**Transport Industry Consultant, TDD, World Bank**

Ana Simecki is a Transport Industry Specialist with 10 years of international experience. She is currently engaged as a Short-Term Consultant (STC) for the World Bank Group on the following projects: 'Trade and Transport facilitation in the Western Balkans'; 'Strengthening the Integration of Disaster Risk Management and Climate Resilience in Road Transport to Improve Trade and Competitiveness in the Western Balkans Region'; and 'Strengthening Sector Performance for Rail Transport Services in Vietnam'. Before joining the World Bank Group, she worked as a manager in the Italian PwC Capital Projects and Economics group; in the European Commission (DG NEAR) as a Transport Sector Expert; and in a SEETO Regional Organization where she led a team for strategic planning of transport infrastructure in the Western Balkans. She holds a Master's Degree in Transportation Engineering of the Faculty of Transport and Traffic Sciences, University of Zagreb, where she also obtained a PhD in technical science.

## External Speakers

### Biljana Abolmasov

**Associate Professor of Faculty of Mining and Geology, University of Belgrade**

Biljana Abolmasov is the Associate Professor of the Faculty of Mining and Geology, with more than 26 years lecturing experience at the Department of Geotechnics and lead at the Centre for Geological Hazards and Risk. She has wide international scientific research and experience in landslide hazard and risk assessment and management, engineering geological modelling, and geotechnical engineering. She has been part of several eminent international research projects across the Western Balkan Countries, as well as a visiting professor. As a UNDP expert, she participated in the RNA Team after the 2014 disaster in Serbia. Biljana is an expert in trial geotechnical slope stability assessment and new approaches to landslide hazard and risk assessment and management. She is currently the Deputy Team Leader on the WB-funded Mainstreaming Climate Resilience in the Road Transport Management in Serbia project, leading all local activities. Other recent assignments have included Landslide Risk Assessment and Management in Post-Disaster Risk Management in Serbia and in Bosnia and Herzegovina. The most recent assignments have included application on new Terrestrial Laser Scanner (TLS) and UAV technologies for slope stability assessment and analysis on Corridor X (E-75) in Serbia.

### Frank van Steenbergen

**Senior Infrastructure Consultant, World Bank**

Dr. Frank van Steenbergen is working with MetaMeta (www.metameta.nl), a social enterprise working on improved resource management. He is also the convenor of the Road for Water Alliance (www.roadsforwater.org), that aims at making roads instruments of water management and climate resilience and that is currently active in ten countries. Frank has thirty years of experience, primarily in Asia and Africa, working at a policy level as well as field operational level.

### Ian Greenwood

**Senior Infrastructure Consultant, World Bank**

Dr. Ian Greenwood, with over twenty-five years' experience, is an internationally recognized leader in the field of infrastructure asset management and performance-based contracting. Ian has worked in 23 countries—covering both developed and developing nations, with projects covering the full spectrum of public infrastructure. In 2016 the Institute of Asset Management (UK) presented Ian with the Individual Achievement Award for asset management for his contribution to the industry. Ian was the lead author of the World Bank guidance on implementing performance-based contracts in the road sector, and was coauthor of the 2017 World Bank publication "Integrating Climate Change into Road Asset Management." Ian has guided many AM implementations and was one of the two New Zealand industry representatives for the development of the ISO 55000 standard on asset management, along with coauthoring the 2011 International Infrastructure Management Manual. Ian was the Chairman of the Business New Zealand Transport Infrastructure Group from 2011–2013 and a member of the New Zealand government task force on road maintenance.

### James Reeves

**Senior Technical Director, IMC Worldwide**

James Reeves is IMC's Senior Technical Director responsible for the firm's Economics and Finance team. He is a transport economist with 28 years' experience, working in all regions of the world. He has wide experience in the planning and appraisal of investment schemes across all modes of transport. James has worked extensively in small and island states. He is an expert user of HDM4 and RED and has wide experience in the development of bespoke appraisal frameworks. Most recently, James has been involved in a number of climate change adaptation projects, including the development of transport plans for vulnerable countries, the appraisal of specific climate change–related interventions, and the development of processes and guidelines for the inclusion of resilience within asset management systems. James is the economist on ongoing World Bank-funded work to mainstream climate resilience within road network management in Serbia. He is also working on two projects in the Caribbean, development of guidelines for the inclusion of climate resilience in road asset management across the Caribbean, and the appraisal of climate change interventions on a major road in Dominica. James has been involved in the development of road sector financing mechanisms in a number of countries, as well as the development of road maintenance and asset management systems.

### Maria Sunyer Pina

**Climate Change Adaptation Consultant, Arup**

Dr. Maria Sunyer Pina is a climate change adaptation consultant based in Arup's Advanced Technology and Research (AT&R) team. Her area of expertise is the assessment of climate change impacts and the development of climate change adaptation measures. Maria has experience in climate change impact, risk, resilience, and adaptation work for infrastructure and building projects. Maria has strong analytical skills as well as experience in statistical analysis, uncertainty quantification, and handling of large amounts of data. She has published numerous journal articles on the impact of climate on infrastructure including the following: "Inter-comparison of statistical downscaling methods for projection of extreme precipitation in Europe," Hydrology and Earth System Sciences Discussion; "A Bayesian approach for uncertainty quantification of extreme precipitation projections including climate model interdependency and non-stationary bias," Journal of Climate; and "Comparison of different statistical downscaling methods to estimate changes in hourly extreme precipitation using RCM projections from ENSEMBLES," International Journal of Climatology.

### Savina Carluccio

**Senior Consultant, Arup**

Savina Carluccio has over 15 years of experience in infrastructure advisory roles for major highway projects. A Chartered Civil Engineer with a geotechnical engineering background, she specializes in providing technical advice on asset management, resilience to extreme weather and climate change, and transport innovation for highway owners. She is the author of the resilience of urban rail projects to climate change and natural hazards chapter of the forthcoming World Bank publication Urban Rail Design Guidebook. She is also working on assessing the resilience of the geotechnical assets on Highways England's Strategic Road Network to severe weather events. The task will deliver a vulnerability framework with the aim to categorize assets and recommend risk-based prioritization of interventions pre- and post-weather events. Her wide breadth of skills and experience also include design, technical management of multidisciplinary teams, and delivery of large infrastructure projects. These have included an 85-km long motorway widening scheme, part of which was procured using Early Contractor Involvement, a DFBO project in Northern Ireland, a fast-track PPP project for a new toll motorway in Canada, and Crossrail.

### Yana Waldman

**Senior Consultant, Arup**

Yana Waldman is a Senior Consultant in Arup's Transaction Advice team. She specializes in resilience strategies and financing for large-scale infrastructure projects, government organizations, and corporations. Her expertise spans multi-hazard threat and vulnerability assessment, resilience planning, risk mitigation engineering, business continuity management, and portfolio analysis. She is currently working to develop more interactive evaluation tooling in the resilience space. Yana is the project manager for development of a multi-hazard mitigation plan for the Bay Area Rapid Transit (BART) commuter rail system. BART's electrically powered rail system is comprised of 167 km of double track and 44 passenger stations throughout the San Francisco Bay Area. The project includes threat and vulnerability assessment of critical system assets to seismic, SLR, flood, and fire hazard for state level operational clearances. Yana led the development of applicable mitigation strategies to improve system wide sustainability, decrease critical vulnerability points, and reduce service downtime exposure.

### Yannis Fourniadis

**Senior Consultant, Arup**

Yannis Fourniadis is a Chartered Geologist and Specialist with the UK Register of Ground Engineering Professionals (RoGEP) with over ten years of experience in identifying and mitigating ground risks for major infrastructure and building projects worldwide. Yannis brings extensive experience in geohazard risk assessment, where he has been responsible for the delivery of complex multidisciplinary projects on the impact of climate change to natural hazards (flooding, landslides) in Tajikistan, and a countrywide seismic risk management study for the Kyrgyz Republic. He was project manager for a project to investigate the impact of climate change on the rate at which glaciers are melting in the Pamir Mountains of Tajikistan. Yannis coordinated a multidisciplinary team comprising Arup geologists and structural engineers, with experts in glaciology and mountain region hydrology from the University of Zurich, to undertake a state-of-the-art study of the rate at which the glaciers are changing, and the potential impact of climate change and associated flooding on buildings and infrastructure downstream. With a background in engineering geology and geotechnics, Yannis has also provided advice on every stage of the investigation, design, and construction supervision of geotechnical works (e.g., retaining walls, embankments, piled foundations, ground improvement). Yannis has worked in the UK, Europe, Central Asia, North Africa, and the Middle East.

**ALBANIA**

### Ervin Dervishi

**Road Safety Expert, Police Road Department, Ministry of Interior**

Mr. Ervin Dervishi holds an MPA degree from the University of Tirana University, Faculty of Economy.

He has a University degree on Law from the "Kristal" University as well as a University degree on Safety Engineer from the Police Academy University in Ankara, Turkey. He has a good experience working in organizing, directing, and controlling all departmental resources to ensure public order and security, enabling the physical security and inviolability of citizens' property, traffic management, administration of personnel, and prevention of accidents, etc. His professional carrier includes different positions as Chief of Police Traffic in different cities of Albania. Mr. Dervishi is fluent in English, Italian, and Turkish.

### Zana Joca (Guzja)

**Expert of IPA Projects Preparation and Feasibility, Ministry of Infrastructure and Energy of the Republic of Albania**

Mrs. Zana Joca (Guzja) is an Expert of IPA Projects Preparation and Feasibility, and Directorate of Concepction and Feasibility of Infrastructure and Territorial Projects at the Ministry of Infrastructure and Energy of the Republic of Albania. She holds a bachelor degree from the University of Tirana and a Master's degree in Business Administration. Mrs. Joca has previously served as Expert of European Integration and Approximation of Legislation, European Integration Directory, and General Directorate of Integration in the former Ministry of Transport and Infrastructure. In this function, she has dealt with issues related to the "acquis communautaire" and the implementation of the Stabilization and Association Agreement. In addition, from 2007 she serves as SEETO National Coordinator for Albania and has coordinated the transport issues under the Connectivity Agenda, in the framework of the Berlin Process. From 2007, she is a Certified Trainer of the Albanian School of Public Administration (ASPA) for the issues of European Integration, Regional Cooperation, and the management of IPA Funds.

**BANGLADESH**

### Md. Hasan Ali

**Superintending Engineer, Bangladesh Land Port Authority, Ministry of Shipping**

Mr. Md. Hasan Ali is serving in the Bangladesh Land Port Authority (BLPA) under the Ministry of Shipping (MoS), Bangladesh, as Superintending Engineer. He joined this organization on 22 November 2004. Mr Ali is a graduate in Civil Engineering from Khulna University of Engineering and Technology (KUET), Bangladesh. He has recently been deputed in the project titled "Bangladesh Regional Connectivity Project 1" funded by World Bank and executed by BLPA as Deputy Project Director. His main responsibility is to look after the engineering and managerial works in the project. Before this, he worked in World Bank, Asian Development Bank, and government funded projects in the Bangladesh Land Port Authority under Ministry of Shipping.

### Shamsul Alam Mazumder

**Executive Engineer, Bangladesh Inland Water Transport Authority (BIWTA)**

Mr. Shamsul Alam Mazumder is serving in the Bangladesh Inland Water Transport Authority (BIWTA) under Ministry of Shipping (MoS), Bangladesh as Executive Engineer. He joined this organization on 12 July 2010. Mr Mazumder is a graduate Civil Engineer of Shahjalal University of Science and Technology, Bangladesh. He has recently been deputed in the Project titled "Bangladesh Regional Waterway Transport Project 1" funded by World Bank and executed by BIWTA as Executive Engineer. The main responsibility in this project is to coordinate with the Consultants and other Stakeholders to prepare the River Port, Terminal, Landing Station, and other related civil engineering drawing and design. Before this, he worked in the Planning and Design Division of Bangladesh Inland Water Transport Authority.

**EGYPT**

### Abdelazim Mohamed Ali Mohamed

**Chairman, River Transport Authority, Ministry of Transport**

Dr. Abdelazim Mohamed Ali Mohamed was appointed as Chairman of the River Transport Authority in October 2017. Dr. Abdelazim has broad experience, covering different aspects of hydraulic engineering, gained during his 27 years of practice. His main experience has been achieved in the fields of irrigation and hydraulic structures, designing canals and physical modeling. He also attained vast experience in the field of Coastal Engineering in both physical and mathematical modeling. This experience was gained through his involvement in studies conducted about the stability of breakwaters, wave agitation inside harbors, shoreline changes, field measurements, power plant cooling systems, and different coastal problems along the Egyptian coast.

**INDIA**

### Vanlalsiama Vansangpuii

**Sr. Assistant Engineer, Public Works Department, Government of Mizoram**

Vanlalsiama Vansangpuii is Sr. Assistant Engineer in the Government of Mizoram, Public Works Department and has worked in PWD for the last 21 years in the Design and Research Cell, Quality Monitoring Division, Building Projects Division, and Project Implementation Unit of EAP. During this service, she has worked as one of the three State Quality Monitors of all the 1st phase of PMGSY road works implemented by Mizoram PWD. She was one of the team, Geotechnical investigation in-charge, to successfully stabilize the slope on the main road entering Aizawl, Mizoram's capital in India.

### Shri Akhtarul Hanif

**Deputy Secretary and Deputy Financial Adviser, Ministry of Road Transport and Highways**

Shri Akhtarul Hanif, M.Sc & LLM, is currently working as Deputy Secretary and Deputy Financial Adviser, Ministry of Road Transport and Highways and is associated with World Bank Program of the ministry and has also worked as undersecretary in the office of Finance Minister, Director (Vigilance, Personnel, and Transport) New Delhi Municipal Council (NDMC), undersecretary of the Department of Revenue, Deputy Director (Finance and Confidential) Doordarshan, Assistant Registrar Debt Recovery Tribunal (DRT) Delhi, Assistant Assessor and Collector Municipal Corporation Delhi (MCD), and Assistant Haj Officer Makka and Madina. He is also Guest Faculty on Vigilance/Finance matters to various institutes/organizations. He has visited countries like Saudi Arabia, Thailand, Malaysia, Singapore, Slovenia, Italy, Austria, Germany, Belgium, France, and Switzerland. He has written a short stories book in Hindi "Smritian." He has also attended various national/International training programs.

**MONGOLIA**

### Davaasuren Janchivdorj

**Head of Policy Regulation Division, Capital City Road Development Department (CCRDA)**

Davaasuren Janchivdorj leads the Policy Regulation Division of the Capital City Road Development Department (CCRDA), an implementing agency under the Governor of Ulaanbaatar. He is managing road design and development, including annual road construction and maintenance planning for Ulaanbaatar. Before joining the CCRDA, he worked as a road and transportation officer at the Urban Development Division at the Office of the Capital City Governor of Ulaanbaatar. He has also worked for Chinggis Land Development Co., Ltd where he managed the planning and design of 1,000 km of highway from Altanbulag port to Zamiin-Uud port in Mongolia. He holds a Master's Degree in Civil Engineering from Harkov Highway University of Harkov, Ukraine.

### Gerelnyam Daramragchaa

**Senior Officer, Policy and Planning Department of Ministry of Roads and Transport Development**

Ms. Gerelnyam Daramragchaa is a Senior Officer of Policy and Planning Department of Ministry of Roads and Transport Development of Mongolia. She is responsible for strategic policy and investment in the road sector in Mongolia. Before joining the ministry, she worked as researcher in the Fourth Asphalt Plant project "Kapotnya–4" in Moscow, and taught at Mongolian Technical University. She holds an M.S. degree in engineering from Kharkov Automobile and Highways Construction Institute, Ukrain, and a Ph.D. from Moscow State Automobile and Road Construction Institute.

**MONTENEGRO**

### Angelina Zivkovic

**State Secretary, Ministry of Transport and Maritime Affairs**

Angelina Zivkovic, since April 2017, was appointed by the Government of Montenegro at the position of the State Secretary in the Ministry of Transport and Maritime Affairs. She graduated by the Faculty of Civil Engineering—University of Montenegro with the thesis, "Comparative Analyses of the Effective Yugoslav and European Seismic Codes on the Example of Design of the Tire Building Dual System" (2001). Angelina holds Master of Arts degree from the Faculty of Economy—University of Montenegro, with the thesis, "The Role of South East Europe Transport Observatory (SEETO) in the Process of Transport Integration of the Western Balkans Countries" (2009). She also attended the executive education program "Infrastructure in a Market Economy: Public-Private Partnerships" at the Harvard University, Boston, Massachusetts, USA, developing expertise in four key areas—choosing the appropriate public-private partnership model, building and maintaining political support, navigating private finance and capital markets, and regulating to protect consumers' interests (2009). In the course of her professional engagement at the Ministry of Transport and Maritime Affairs, Ms. Zivkovic participated in the preparation of various analyses, strategies, terms of references, studies, design-planning documents, and other documents related to the scope of competence of the ministry.

**NEPAL**

### Rohit Kumar Bisural

**Senior Divisional Engineer, Foreign Cooperation Branch, Department of Roads, Ministry of Physical Infrastructure and Transport**

Rohit Bisural is presently working as Senior Divisional Engineer in Foreign Cooperation Branch, Department of Roads, Ministry of Physical Infrastructure and Transport, Nepal. He has also professionally worked in the road transport sector for more than 26 years as a Civil Engineer, Highway Engineer, Construction Management team leader, Supervisor of Road and Bridge construction works, Project Manager, Procurement manager, Coordinator of development project, and Public Procurement In-charge. Rohit has worked on plain, hilly and mountainous regions all over Nepal with experiences in various aspects of road/bridge construction and maintenance problems. He has also worked as Deputy Project Director, Project In-charge in ADB-funded projects in Nepal.

**PERU**

### Jorge Luis Maguiña Villón

**Executive Director, Provias Descentralizado**

Jorge Maguiña Villón currently holds the position of Executive Director of Provias Descentralizado, the entity in charge of strengthening road management in regional and local governments in Perú. He has held various positions in the public sector in Peru in the Minis-

tries of: Transports and Communications; Production; Housing, Construction and Sanitation; and Agricultures and Irrigation. Outside the public sector, he worked as project official in Development Organizations, such as in Fondo Contravalor Perú-Canadá and in the Spanish Organization Ayuda en Acción. His professional field is linked to the development of rural areas and decentralized public management. He is a Peruvian national and civil engineer.

**SERBIA**

## Iva Jelic

**Associate for Coordination of Supervision, Corridors of Serbia**

Iva Jelic has been Associate for Coordination of Supervision, Corridors of Serbia since March 2017. Prior to that, she was Associate at a patent "Rubber panel systems for level crossings" (Patent no. 50379), from 2007 to 2012, and held an internship in 2008 at the Transport Company "LASTA." Iva received her education at the Faculty of Transport and Traffic Engineering, University of Belgrade, Department: Road and Urban Traffic and Transport.

## Marko Blagojevic

**Director of the Serbian Government's Public Investment Management Office**

Marko Blagojevic is the Director of the Serbian Government's Public Investment Management Office. He joined the Government of Serbia in 2014 after the catastrophic floods to become the Director of the newly established Office for Flood Affected Areas Relief and Reconstruction. His task at the time was to set up the office and enable smooth operation of the post-flood reconstruction process. During 2014–2015 he had overseen the transition of the mandate of this office from the post-flood recovery and reconstruction to disaster risk management and is now involved in the setup of the disaster risk management system in Serbia. In December 2015, the Government of Serbia appointed him the Director of the newly established Public Investment Management Office, a successor to the Office for Flood Affected Areas Relief and Reconstruction. In this new capacity, while maintaining responsibility over the management of post-disaster reconstruction and the setup of the disaster risk management system in Serbia, his tasks included the implementation, or the oversight, of a variety of infrastructure projects in health, education, agriculture, energy, and local infrastructure sectors. In 1997, Marko founded the Center for Free Elections and Democracy, the first Serbian watchdog organization specializing in issues of transparency, responsiveness, and accountability. In 2005, he founded CeSID, now one of the leading polling agencies in the CEE region, specializing in public affairs research and analysis. In the capacity of CeSID's Director, he has cooperated closely with international clients such as the Council of Europe, GIZ, OSCE, USAID, UN agencies, and the World Bank. Also, during 2003–2008, he was a Member of the Board of Directors of the Soros Foundation in Serbia.

## Miloš Marjanovi, PhD

**Assistant Professor, Faculty of Mining and Geology, University of Belgrade**

Miloš Marjanovi started his career at the Faculty of Mining and Geology, University of Belgrade, as a research staffer, cooperating on various projects dealing with the assessment of landslide hazard and risk. He graduated in Geotechnics and a PhD in Geoinformatics. His primary field of interest is applied GIS, especially in the domain of landslide assessment, for which he perfected his knowledge and skill set for implementing various methodological approaches (especially Machine Learning techniques) and data acquisition approaches (Remote Sensing, instrumental monitoring, statistical processing). He did his postdoctoral at TUM to finalize his specialization in landslide hazard mapping. Miloš currently works at the Department of Geotechnics at the Faculty of Mining and Geology, University of Belgrade as an Assistant Professor. Miloš published more than 60 articles, chapters, and abstracts, some of which are in prestigious journals in his field and highly cited. His operative practice is also sizable, as he took part in several UNDP, WB, national, and other independent projects concerning landslide monitoring, predicting, and hazard and risk assessment, as well as purely geotechnical projects.

## Miodrag Poledica

**State Secretary, Ministry of Construction, Transport, and Infrastructure**

Miodrag Poledica finished elementary and secondary school in Belgrade and graduated at the Faculty of Transport and Traffic Engineering at the University of Belgrade in 1995. He completed specialist studies in "Management of Public Administration" at the Faculty of Organizational Sciences in Belgrade. He was appointed as a State Secretary in the Ministry of Construction, Transport, and Infrastructure in April 2014, and previously, he was at the same position at the Ministry of Transport from 2012. From 2003 to 2012, he was the Head of the Rail and Intermodal Transport Department at the same Ministry. He was also Chairperson for EU negotiating chapters: 14-Transport Policy and 21-Trans-European Networks.

## Petar Krasic

**Department for Road Transport, Roads and Road Safety, Ministry of Construction, Transport, and Infrastructure**

Petar Krasic has been working in the Ministry for more than four years on various fields of road safety, roads, and Intelligent Transport Systems, particularly on the development of strategic frameworks, studies, legislation, and other technical documents; international cooperation in the scope of the European Union integration process in the transport field; and others. He holds Master's and Bachelor's degree in Traffic Engineering, both obtained at the University of Novi Sad in Serbia. In 2009, he was awarded with the third best place for project in road safety by the European Transport Safety Council. He is member of the European Fund for the Balkans Alumni network. Petar lives in Belgrade, Serbia.

## Predrag Mari

**Assistant Minister of Interior and Head of Sector for Emergency Management**

Predrag Mari graduated in 1990 at Faculty of Law, University of Belgrade, where he also completed Advanced Expert Studies in the field of Terrorism, Organized Crime, and Corruption. He completed his Master's Degree in "Terrorism, organized crime and security" on the University of Belgrade "Specifics of managing emergency situations arising as a consequence of acts of terrorism." Since 17 May 2007, he is Assistant Minister of Interior and Head of Sector for Emergency Management.

## Ranka Stankovic

**Associate Professor, Faculty of Mining and Geology, University of Belgrade**

Ranka Stankovic is associate professor at the University of Belgrade, Faculty of Mining and Geology, where she is teaching several courses related to informatics and geoinformatics. Her field of research is interested in semantic web, information systems, geodatabase modelling, geoinformation management, e-learning, open education, and artificial intelligence. She is head of the Computer Centre for the Mining department, Chairman of Technical comity A037 Terminology in the Institute for Standardisation of Serbia, and vice president of Language Resources and Technologies Society (JERTEH). She published more than 100 papers in journals and proceedings of scientific conferences, and participated in several international and national projects.

## Slavko Mladenovic

**Inspector, Ministry of Interior**

Slavko Mladenovic was born in Kraljevo, Republic of Serbia, 1970. Since 2010, Slavko is employed in the Ministry of Interior as an Inspector for coordination of risk management of accidents and other crashes in the Risk Assessment Department in the Sector for Emergency Management MoI. Before being employed in the ministry Slavko was responsible for environmental protection as an inspector. Giving education and seminars in the area of emergency situations management and being a member of many expert working groups and special commissions are also part of Slavko's accomplishments.

## Slobodan Basuric

**Engineer, Public Enterprise "Roads of Serbia," Belgrade Department for Road Maintenance and Preservation**

Slobodan Basuric comes from the Republic of Serbia, from Public Enterprise "Roads of Serbia"—Sector for maintenance and preservation for national road network. For the last five years he has been working as Head of the Belgrade Department for road maintenance and preservation on these jobs: maintenance of 4,000 km of national road network in Belgrade Department 50 mil euros per year, participated in the Resilient Transport Technical Knowledge Exchange (TKX), worked on the draft of the new Law on Public Roads, Economic Plan; maintenance of 4,000 km in Belgrade Department, Project Manager for performance-based maintenance of category I and II state roads in the Republic of Serbia on 3,000 km on south of Serbia, Disaster Risk Management: Assessment of damages and economic losses in the roads sector [Serbia Floods 2014]; IPA 2012—48 landslides and 15 bridges 10 mil euros; IPA 2014—Procurement of 18 road weather stations 600,000 euros; and The Office for Reconstruction and Flood Relief—12 landslide and 6 km of road, 5.8 mil euros. The floods of 2014 affected most of the territory of the Belgrade department so that he was in charge of the repair of damages. Before 2013 he was working in the Highway Institute of Belgrade as Project Manager for a Pilot Project on Macva and Kolubara districts for maintenance of 1,350 km of national road networks. He was supervisor on several repair landslides, and rehabilitation and reconstruction of roads, etc. He was also an environmental expert. He holds an Engineer for civil works degree obtained at the Civil University of Belgrade in Serbia.

## Svetozar Milenkovic

**Geotechnical Engineer, Geotechnical Department at the Highway Institute**

Svetozar Milenkovic is a Chartered Geotechnical Engineer currently heading the Geotechnical Department at the Highway Institute with nearly twenty years specialized experience in landslide-related phenomena on motorways, major highways, bridge, tunnel, and other infrastructure projects in Western Balkan countries. He started his career as a teaching assistant at Belgrade University before joining the Highway Institute. From 2013–2014 he was involved in the WB and EBRD financed project of Corridor 10 in Serbia as a Geotechnical Consultant. He was also a team leader in the preparation of a landslide database on Serbian road network with an emphasis on hazard and risk assessment. Besides his activities as practitioner, he did not neglect his passion for scientific work. He is author or coauthor of more than 50 professional and scientific papers published in the country and abroad within the fields of geotechnics and engineering geology, with the accent on planning, design, construction, and repair of all types of road structures. He has an MSc in Geotechnical Engineering, Belgrade University (1998) and is a Member of the Serbian Chamber of Engineers, Member of the International Society for Rock Mechanics (ISRM), Member of International association of Engineering Geology (IAEG).

## Nerejda Hoxha

**Transport Planning Manager, South East Europe Transport Observatory (SEETO)**

Nerejda Hoxha joined SEETO Secretariat based in Belgrade in 2015 in the position of Transport Planning Manager. She oversees the development of TEN-T Networks in the Western Balkans, in terms of implementation of transport policies, connectivity reform measures, and

transport investments programs by fostering a regional approach to transport systems in the region. She started her professional carrier as Project Manager for EU-funded projects at Albanian General Road Authority to progress further in several positions as part of the EU Technical Assistances team to Ministry of Transport in Albania and for four years as Transport Director at Municipality of Tirana. She has more than 20 years' experience in the field of transport and transport planning. She is equipped with deep and up-to-date knowledge on transport policies, institutional development and project management, transport resilience, and intelligence transport both on the national and regional level. After her graduation from the University of Tirana, Faculty of Civil Engineering, she had pursued her academic qualification further by obtaining a Master in Engineering (MEng) degree from IHE/TU Delft, The Netherlands, in Roads and Transport Planning, and a Master in Science (MSc) degree from Oxford Brookes University, United Kingdom, in Transport Planning Management.

## Contact

**The Global Facility for Disaster Reduction and Recovery (GFDRR)**
Email: gfdrr@worldbank.org
Website: https://www.gfdrr.org/

GFDRR is a global partnership that helps developing countries better understand and reduce their vulnerabilities to natural hazards and adapt to climate change. Working with over 400 sub-national, national, regional, and international partners, GFDRR provides grant financing, technical assistance, training, and knowledge sharing activities to mainstream disaster and climate risk management in policies and strategies. Managed by the World Bank, GFDRR is supported by 37 countries and 11 international organizations.

**World Bank Disaster Risk Management Hub, Tokyo**
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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.