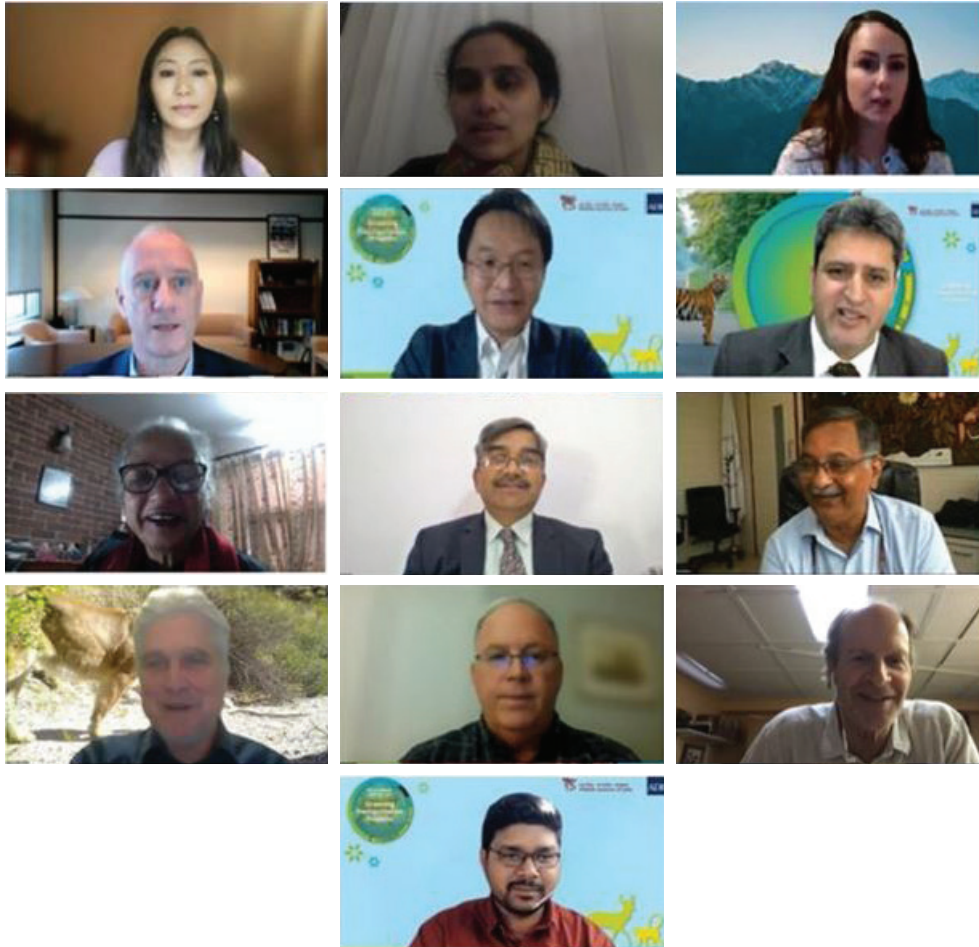




GREENING TRANSPORTATION PROJECTS

ADB-WII WEBINAR SERIES 2021-2022 PROCEEDINGS

JUNE 2022



For more information, and access to the events materials, please visit [Development Asia \(DevAsia\)](#) ADB Knowledge Events page: [Greening Transportation Projects](#).

DevAsia is ADB's knowledge collaboration platform for sharing development experience and expertise, best practice, and technology relevant to the Sustainable Development Goals. DevAsia also provide opportunities to interact with experts, policy makers, and other practitioners in related fields. It aims to share development knowledge generated from ADB events with the international development community and the public.

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Greening Transportation Projects Webinar Series Partnership

Asian Development Bank. The Asian Development Bank (ADB) was conceived in the early 1960s as a financial institution that would be Asian in character and foster economic growth and cooperation in one of the poorest regions in the world. ADB assists its members and partners by providing loans, technical assistance, grants, and equity investments to promote social and economic development. ADB is composed of 68 members, 49 of which are from the Asia and Pacific region. ADB is committed to achieving a prosperous, inclusive, resilient, and sustainable Asia and the Pacific, while sustaining its efforts to eradicate extreme poverty.

Wildlife Institute of India. Established in Dehradun, India in 1982, the Wildlife Institute of India (WII), an autonomous organization of the Ministry of Environment, Forest and Climate Change of the Government of India, is an internationally acclaimed Institution that offers training programmes, academic courses, and advisory in wildlife research and management, with footprints beyond India in the larger South and Southeast Asian region. Its mission is to nurture the development of wildlife science and promote its application in conservation, in consonance with our cultural and socioeconomic milieu. Its mandate is to build capacity through training, education, and research in the field of wildlife conservation. WII's programmes are field-based and seek an integration of biological, socioeconomic, and human aspects of large regional landscapes. It is actively engaged in research, which is the primary source of scientific information to help conservation across the country on biodiversity-related issues.

ADB's Environment Thematic Group and Transport Sector Group, in partnership with WII, organized the four-webinar series on "Greening Transportation Projects" from November 2021 to February 2022. The following provided professional support in organizing the webinar series:

ADB

Jamie Leather, *Chief of Transport Sector Group*
Karma Yangzom, *Principal Environment Specialist*
Isao Endo, *Environment Specialist*
Noel M. Chavez, *Operations Assistant*
Victor Tumilba, *Consultant*
Cecille P. Villena, *Consultant*
Marianne Villanueva, *Consultant*
Lucy Ignacio, *Consultant*

WII

Dhananjai Mohan, *Director*
Bilal Habib, *Scientist E and Head of Animal Ecology
and Conservation Biology*
Malvika Onial, *Scientist D and Associate Nodal Officer,
Environmental Impact Assessment Cell*
Sharmistha Singh, *Communication Manager,
ADB-WII Project*

1 Introduction



Linear infrastructure projects for developing roads, highways, and railways that boost economic growth depend on the considerable use of natural capital and invariably involve a significant number of long-term investments. These projects also have the potential to cause severe impacts to the natural capital that sustains economic development.

Habitat loss, fragmentation, and ecosystem degradation not only cause declines in biodiversity but also result in increased contact and conflict between wildlife and people, with far-reaching consequences including possible proliferation of zoonotic diseases. The urgency of this danger is driven home in light of the current global coronavirus disease (COVID-19) pandemic and its devastating impacts on human health and economies. However, the capacity to address challenges in harmonizing conservation with development goals remains limited, particularly in the context of greening linear infrastructure projects in the fast-developing countries in Asia, which also harbor valued ecosystems and rich biodiversity.

In this context, the Greening Transportation Projects webinar series was initiated from November 2021 to February 2022 to address capacity needs for conserving and managing natural capital during planning and implementation of transportation projects in Asia. Under the [Protecting and Investing in Natural Capital in Asia and the Pacific](#) Asian Development Bank (ADB) technical assistance, the Wildlife Institute of India (WII) and ADB's Transport Sector Group and Environment Thematic Group formed a partnership to conduct the webinar series for promoting and building capacity on developing ecologically friendly and sustainable road and rail projects in Asia.



Rural road in India. A motorbike is passing through the Sehore Shyampur Road, Muhali, Sehore District, Madhya Pradesh, India (photo by ADB).



2 Objectives and Scope of the Webinar Series

The webinar series aims to broaden and deepen the understanding of issues related to protecting natural capital and investing in green linear infrastructure. It fosters a global dialogue with leading experts from the field of green linear infrastructure for integrating principles of green growth, and concepts of smart planning, into designing and planning linear infrastructure developments. The main objectives of the webinar series are the following:

- (i) Broaden and deepen understanding of principles of green growth and concepts of smart planning into transport infrastructure development.
- (ii) Promote ecologically friendly and sustainable road and rail development projects in Asia.
- (iii) Build capacity for conserving and managing natural capital during planning and implementation of transportation projects.
- (iv) Promote sensitive planning and designing of development corridors for biodiversity conservation.

To achieve the objectives, the scope of the webinar series followed these thematic sessions:

- (i) Why Connectivity Matters and How to Develop Models of Connectivity for Different Species?
- (ii) Ecological Considerations in Planning and Mitigation Measures and Capacity Building Needs for Effective Conservation Alongside Linear Infrastructure
- (iii) Natural Capital Conservation Amidst Development and the Role of Governance in Planning Conservation Friendly and Sustainable Transportation Projects
- (iv) Lessons from the Field: Success Stories of Mitigation Measures in Maintaining and Enhancing Connectivity and Concluding Session: Summing up of the Webinar Series with Key Takeaways

The webinar series brought together representatives from sectoral development agencies for roads and highways, railways, as well as from development banks and environmental organizations from around the world including ADB's developing member countries (DMCs) such as Bangladesh, Bhutan, Cambodia, India, Indonesia, the Lao People's Democratic Republic, Nepal, the Philippines, Tajikistan, and Thailand. The well-attended series provided an opportunity to build and enhance capacities of individuals and organizations implementing green linear infrastructure projects in the transport sector.

3 Main Thematic Sessions and Related Emerging Issues



INAUGURAL SESSION 1:

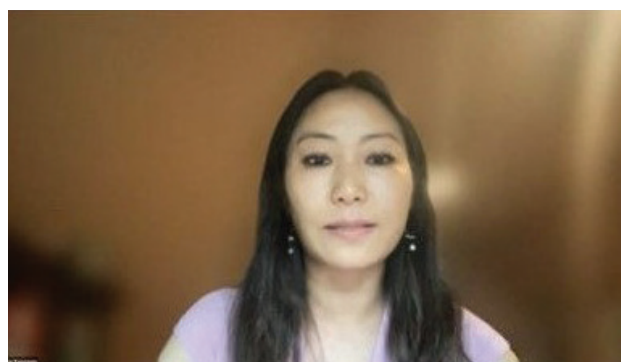
Why Connectivity Matters and How to Develop Models of Connectivity for Different Species?

25 November 2021

INAUGURAL SESSION

[Isao Endo](#), environment specialist, Sustainable Development and Climate Change Department of ADB moderated the Inaugural session of the Greening Transportation Projects webinar series.

[Karma Yangzom](#), principal environment specialist of ADB welcomed the participants and delivered the opening address. Emphasis was given on the importance of the Greening Transportation Projects knowledge event series in changing the narrative around the negative impacts of linear infrastructure projects into one opportunity in investing in nature. The first critical point presented is "avoidance," as by the time the appropriate expertise arrives, decisions had already been made on the location, construction, and design of linear infrastructure projects. For example, it would be better to avoid construction in ecologically sensitive areas in the first place as mitigating the negative effects can be more challenging, complicated, and expensive. It is also imperative to proactively engage government professionals working in these related sectors as they are the ones making the ultimate decisions regarding such linear infrastructure projects. ADB's commitment to invest in greening linear infrastructure projects was highlighted with the creation of the Natural Capital Lab, which will serve to demonstrate the benefits of nature-positive investments by piloting projects and knowledge exchanges.



Bilal Habib, scientist E and head of Animal Ecology and Conservation Biology of WII provided an introduction to the webinar series training course. The objectives and scope of the series were presented as well as the webinar schedule, session approaches, and anticipated learning outcomes. The importance of context-specific mitigation measures and green infrastructure principles for combining conservation and smart development goals was highlighted. Appreciation was expressed on the cooperation between WII and ADB in organizing the webinar series specifically designed to help and sensitize all individuals and institutions involved in planning and implementing transportation projects. He said that “such a series would enable mainstreaming of conservation issues and biodiversity concerns into the decision-making process of transportation projects.”



Indranil Mondal, project scientist, WII delivered his presentation on [Why Connectivity Matters and How to Develop Models of Connectivity for Different Species?](#) He discussed the background, objectives, concepts, and analytical methods of landscape connectivity and why it matters to greening transportation projects. The presentation covered the importance of understanding habitat fragmentation and how landscape fragmentation affects habitat quality for over 80% of all birds and over 80% of all bird and mammal species, which leads to extinction and loss of native species. The presentation focused on the importance of understanding induced impacts, landscape connectivity, and mitigation hierarchy in the planning of linear development projects. Case studies of wildlife-friendly transportation projects in the state of Maharashtra, Central India was highlighted.



V. B. Mathur, chairperson, National Biodiversity Authority (NBA), India gave the closing remarks covering a 2-decade journey encompassing linear infrastructure development, integration of principles of green growth, and the merging of the concepts of smart design and planning into linear developments. He also flagged three important thematic areas for developing this field further and called them the three C’s—capacity building, communication and convergence—of efforts of various departments and stakeholders.

The key messages and learnings from the inaugural session include the following:

- It is important to recognize that nature is a cornerstone for development.
- As part of a key conservation strategy to protect biodiversity, we should find ways to locate infrastructure projects in less ecologically sensitive areas and keep habitats connected.
- Natural capital system services, balancing conservation and development, and the role of science are vital aspects to consider in building a system and guiding infrastructure agencies in mitigation measures.
- Smart integration of principles of green growth and wildlife conservation concerns, SMART planning and designing, and intelligent formulation of policies are keys to striking a balance between environmental conservation and linear infrastructure development.
- Promoting sustainable infrastructure is necessary to raise awareness among infrastructure agencies.

The first webinar and inauguration is available to watch in full on the ADB website: [Webinar 1 Video Recording | ADB Knowledge Event Repository \(development.asia\)](#).

SESSION 2:

Planning and Mitigation Measures and Capacity Building Needs for Effective Conservation Alongside Linear Infrastructure

16 December 2021

[Fraser Shilling](#), director, Road Ecology Center Institute of Transportation Studies, University of California, Davis delivered the first presentation on [Decision-Support for Improving Wildlife Connectivity and Transportation](#). He reviewed the importance of studying wildlife mortality along with fragmentation from most recent linear infrastructure developments. To effectively support wildlife conservation with transportation development, there is a need for detailed information—traffic and vehicular types, road and rail geometry, land morphology (e.g., whether the road is in a valley or on high ground), vegetation and wildlife, ecological connectivity, among other important data. A simple decision analytical workflow diagram for collating information while working on such projects was provided. This includes the types of decision to be made on details of mitigation measures, construction, maintenance, and monitoring.



[V. B. Mathur](#), chairperson, NBA, India provided the second presentation on [Ecological Considerations and Mitigation Measures to Build Capacity for Smart Green Infrastructure: Some Perspectives](#), which included an overview of the different types of linear infrastructure developments and their linkages to economic growth and human well-being. The importance of integrating economic and ecological approaches for development projects with the help of “mainstreaming” was highlighted. This entails development without destruction and development by design such as incorporating the goals of both linear infrastructure projects and ecological conservation. Linear infrastructure developments need to be made animal-friendly to provide pathways for movement of wildlife and be specific, measurable, achievable, relevant, and time-bound (SMART) and “green” to effectively mitigate the ecological impacts of roads, railway lines, and power lines (e.g., when routed through sensitive ecosystems and habitats). Green infrastructure must promote both SMART growth and SMART conservation. Furthermore, attention is drawn toward various impacts of linear infrastructure and readily available guidance to overcome these impacts. Important mitigation principles include pre-identifying ecologically significant lands and suitable development areas and planning and protecting before development.

Some key messages and learnings from the second webinar session include the following:

- Think both science and engineering together, and work at the strategy of convergence, coherence, and complementary.
- Mainstreaming is best understood as an attempt to modify larger development strategies by incorporating biodiversity goals for both development and conservation.
- Linear infrastructure developments need to be made animal-friendly to provide pathways for the movement of species and be SMART and “green” to effectively mitigate the ecological impacts of roads, railway lines, and power lines when routed through sensitive ecosystems and habitats.
- Use the best available science for planning and implementing species-specific and site-specific mitigation options.
- Collaborate and coordinate with road and highway development agencies in all stages of planning and implementing to avoid retrofitting and *fait accompli* situations.

The second webinar is available to watch in full on ADB website:

[Webinar 2 Video Recording | ADB Knowledge Event Repository \(development.asia\)](#).

SESSION 3:

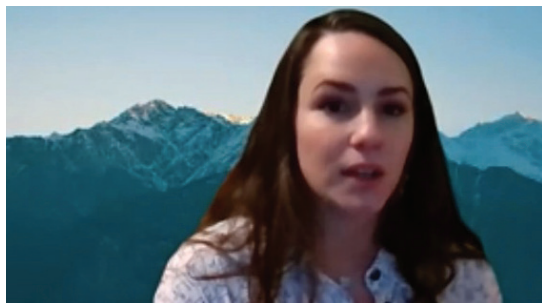
Natural Capital Conservation amid Development and the Role of Governance in Planning Conservation-Friendly and Sustainable Transportation Projects

13 January 2022



[Asha Rajvanshi](#), environmental expert and a former head, Environmental Impact Assessment (EIA) Cell of WII enlightened the audience about natural capital as a notion of economics that includes goods and services related to nature. In her presentation on [Natural Capital Conservation amidst Development and the Role of Governance in Planning Conservation-Friendly and Sustainable Transportation Projects](#) she discussed various academic undertakings that point to an increased recognition of natural capital in development policies and

decisions in all key sectors. A detailed overview of how roads both depend on, and impact ecosystem services was provided. One of the most important concepts that came forth during this session was that of road verges and their unrealized and unrecognized role in planning transportation projects. There was an illustration on the importance of road verges in connecting fragmented habitats and how they function as dispersal corridors for wildlife moving through modified landscape. The example of the National Highway-7 along Pench Tiger Reserve in India was highlighted. The presentation was concluded by stressing on the importance of mainstreaming Natural Capital for promoting sustainable transport and the various ways in which the Government should lead the development and coordination of a long-term investment programme.



The [Green Linear Infrastructure: Science, Policy, and Practice in the United States](#) was presented by [Elizabeth Fairbank](#), road ecologist, Center for Large Landscape Conservation. The presentation covered the intersection of science, policy, and practice with regards to green linear infrastructure. It is important to consider collaborative and interdisciplinary approaches for overcoming complex challenges through partnerships among ecologists, planners, engineers, economists, policy makers, and communities.

It was also highlighted that the Wildlife Crossing Pilot

Program under the Bipartisan Infrastructure Law of the United States Department of Transportation allows for dedicated funding for wildlife crossings. The purpose is to encourage states to adopt measures to reduce wildlife vehicle collisions and improve terrestrial and aquatic connectivity.

Some key messages and learnings from this webinar session include the following:

- Infrastructure development can deliver major socioeconomic benefits, but can also result in serious negative impacts on nature and, in turn, people. With careful planning, design, implementation, and policies, some negative impacts can be avoided, minimized, or mitigated.
- Collaboration and an interdisciplinary approach are necessary to overcome complex challenges in greening transportation projects.
- Natural capital thinking is a priority in the transportation sector in addressing the issues on the decline of ecosystem benefits from nature.
- There is a need to enable policies to promote sustainability-oriented planning approaches such as strategic planning to avoid unintended consequences before they occur.
- Understand and appreciate the role of habitat services and address all impacts that affect habitat services.
- Recognize the importance of using verges in helping mitigate impacts of roads and the value of undertaking maintenance on road verges in road development projects.

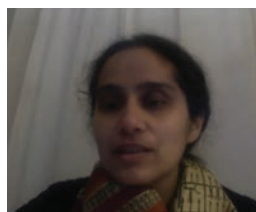
The webinar is available to watch in full on ADB website:

[Webinar 3 Video Recording | ADB Knowledge Event Repository \(development.asia\)](#)

SESSION 4:

Lessons from the Field: Success Stories of Mitigation Measures in Maintaining and Enhancing Connectivity and Concluding Session—Summing up of the Webinar Series with Key Takeaways

13 March 2022

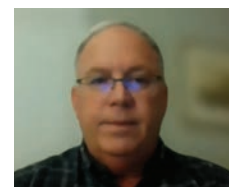


[Malvika Onial](#), scientist D and associate nodal officer, EIA Cell of WII moderated the session. [Jamie Leather](#), chief of Transport Sector Group, Sustainable Development and Climate Change Department, ADB delivered the opening remarks. He said that holistic solutions must be considered to mainstream sustainable transport. To mitigate and minimize road impacts on the remaining biodiversity, infrastructure demands and ecosystem conservation must be balanced by integrating ecological protection, policies, and design in transport projects. The success of mitigation measures in maintaining habitat connectivity requires early planning, management, and collaboration to implement conservation strategies and design that promote ecologically friendly and sustainable linear transport infrastructure. Transport data and information are key in developing strategies, system development, as well as the monitoring of progress. On this front, ADB has developed the Asian Transport Outlook Database to help in understanding the status of transport across Asia and the Pacific and this includes historical trends, the current situation, and future developments.



I. Status of Linear Infrastructure Safeguard Capacity in Asia

[Rob Ament](#), senior conservationist, Center for Large Landscape Conservation, United States, presented on the [Linear Infrastructure Safeguards in Asia \(LISA\) Project](#) for assessing the capacity of Asian countries to develop wildlife-friendly linear infrastructure (LI). This 14-month project sought to understand the challenges and barriers that slow the adoption and implementation of safeguards that protect Asia's diverse wildlife species and their critical habitats from the region's rapidly expanding LI. The project conducted spatial analyses of LI projects most likely to impact biodiversity and critical habitats. It compiled case studies of exemplary wildlife-friendly LI projects and provide cautionary examples. The project also examined capacities regarding policies, regulations, and resources for adopting LI safeguards. In addition, the project identified opportunities and barriers for implementing biodiversity safeguards in key countries and developed training materials for capacity building programs.



Some key messages and learnings from this webinar session include the following:

- Post-construction monitoring and evaluation are essential to determine the effectiveness of the mitigation measures and their design.
- Cost-benefit analyses can demonstrate that biodiversity safeguards not only protect environmental and biodiversity values, but can add to an infrastructure project's overall present net value.
- Increased training and capacity building is urgently needed in Asia to have ecologically sustainable LI projects in the future.
- Context-sensitive mitigation measures in planning and before construction are critical for safeguards design.

More information on: [The LISA Project](#)

II. Case Studies and Key Learning: Canada and Nepal Projects

[Tony Clevenger](#), senior research scientist, Western Transportation Institute, Montana State University provided a presentation titled [Case Study Toolbox: Canada and Nepal](#). The case study of Banff National Park, Alberta, Canada and how its 17 years' worth of data proves the efficacy of wildlife crossings. His presentation covered key questions for the management of highway including—Do existing drainage culverts act as habitat linkages? Does wildlife adapt to passages over time? Is there a “prey trap” effect at passages? The case study on an ADB-funded project with the Department of Roads in Nepal was also presented. An overview was provided on the key points of the methodology and approaches that were used to identify critical areas for mitigating measures on a stretch of the Mahendra highway running close to protected areas. The project covers smart infrastructure planning and design to protect natural habitats and biodiversity ecological assessment of the Narayanghat–Hetauda–Pathlaiya road upgrading, which is being expanded from a two-lane to a four-lane highway. Time is also critical for mitigations with the rapid infrastructure development and biodiversity loss in the area. A 30-kilometer buffer was used around the highway to study the wide-ranging species and became the basis of the study's design. Roadkill data were collected using a roadkill application which, in addition to camera trap data, are collated on a website called the Nepal Road Ecology Project and displayed in real time. The interface produces geographic information system maps that are shared with stakeholders in the project.



Key Lessons and Learning from Banff Project:

- Research and data collections are essential in biodiversity assessments, where information is critical in the early phase and beneficial for future projects.
- Adequate sampling periods are important both pre- and post-mitigation. Sufficient periods to study wildlife populations to recommend mitigation measures is critical for project success.
- Model projects like Banff are extremely important with its long-term funding and data as they inform many jurisdictions about the value of these structures. The learnings from these projects can transfer to other future projects. Short-term studies will give a very different result compared to long-term monitoring.
- Partnerships and coordination among stakeholders are extremely important not only for funding research and monitoring but also to gain consensus with regards to the project's success.

III. World's Largest Mitigation Measures in India

Dr. Bilal Habib, scientist E and head of Animal Ecology and Conservation Biology, WII gave an overview of 4 years of Monitoring of Animal Underpass on NH-44, Pench Tiger Reserve, Maharashtra (2019 to 2022). NH-44 used to be called National Highway 7 (NH-7). This study is the first in the country that provides relevant insights for combining ecology and structural designs for planning animal-friendly transport infrastructures. These series of nine underpasses of different sizes were constructed in 2018 and are the first animal underpasses to be constructed in the country to mitigate the impacts of roads. As these underpasses were in the same landscape, they also gave an opportunity to compare the structures with one another and see their impact on different species crossing. The camera traps for monitoring were placed every 15-30 meters, which is the distance between adjacent pillars of the structures.



Cameras were also placed within the forested areas and the edge of the forests to get adequate data on animals using the crossing structures. The study saw an increase of 193% in the usage of the underpasses from 2019 to 2020. A total of 21 wild mammal species used the underpasses, including 16 tigers. There were also animals that started using the underpasses for movement along the structure or for resting and feeding. The length of time it took for animals to get used to and begin to utilize the crossing structures varied across different species. It is expected that along with naturalization of the structures through the growth of plants and shrubs over time, more animals will be attracted to the area and it will eventually become part of their natural environment. Larger structures attracted different kinds of species compared to the smaller crossing structures. There was also no evidence of underpasses acting as prey-traps.

IV. Implementation Challenges: Learnings and Experiences

Dhananjai Mohan, Director, WII pointed out that in a fast-developing country like India, there are numerous issues involved while implementing green LI projects as it involves a balancing act between speed of development and conservation. The last 10 years have been very critical for green LI projects in India as developmental agencies and the Government of India are far more open and accepting of mitigation measures than before. Today, the country can claim to have the largest mitigation measures in the world. However, there are still issues as greening of LI can bring in substantial additional costs that can affect the viability of certain projects. India is on a very high-speed economic growth path. This means that any developmental activity that will affect the economy positively will have to be done quickly, and any mitigation that negatively influences this timeline will be resisted. Developmental agencies want mitigation plans to be done very fast. However, understanding of mitigation measures is still in the nascent stage, and there is a need to collect detailed data to study and produce mitigation plans that are based on science. This delay does bring in conflicts between developmental agencies and scientists. India has about 24% of its land under forest cover and much of this is very rich in biodiversity. However it is also building 20- to 50-kilometer highways daily. Many of these infrastructure cut through forests. There is more pressure to formulate mitigation plans in very short time spans. WII has been part of these mitigation plans for years and in 2016 developed a very important manual on mitigation measures and greening LI. This manual needs to be updated and made more objective to make it current and match the country's present scenario. Also, a manual cannot be site-specific and large projects require site-specific mitigation plans. WII is in the process of updating the manual to make it more India-specific with more case studies from the country.



V. Miles to Go: Key Takeaways from Green Linear Infrastructure Development Initiatives—The Asian Experience

The final speaker [V.B. Mathur](#), chairperson, NBA, India, very concisely brought his points to the table by focusing on the following key issues:

- Mainstreaming road ecology and rail ecology is critically needed for conservation of natural capital.
- Science-based and evidence-based planning lead to positive outcomes. Regular dialogue between wildlife biologists and transportation planners is important.
- Embedding wildlife mitigation costs in project costs should be the goal.
- Efficient design, development, and delivery (3Ds) combined with competence, convergence, and coordination (3Cs) comprise the recipe for green infrastructure development.
- Mitigation measures that are retrofitting in nature i.e., on already built linear structures, can have cost recovery models like road and green taxes from users to bring down the high cost of mitigation. New projects should have the mitigation cost built-in during the planning stage.
- Capacity building, partnership among stakeholders, and sponsorships from funding agencies like ADB and World Bank are crucial.



VI. Concluding Session: Summing up of the Webinar Series with Key Takeaways

The workshop concluded with a short summary of the webinar series and closing remarks from Bilal Habib, WII. He acknowledged the support of all the resource persons and ADB project counterparts. He expressed the hope that the webinar series is able to build an adequate level of capacity to promote ecologically friendly and sustainable road and rail development projects in Asia. He is also forward looking that participants were able to gain an understanding of the principles of green growth, and the concepts of smart planning needed for sustainable transport infrastructure development. He summarized the series into the following key points:

- Direct involvement and partnership of all stakeholders of green transportation projects is crucial for effective mitigation measures to balance development with conservation of natural capital.
- It is important to have close collaboration between scientists, engineers, and policy makers even before the planning stage of transportation projects. Research must be linked to end users by bridging the roles of academe, policymakers, and society.
- Infrastructure development can deliver major socioeconomic benefits, but it can also result in serious negative impacts on nature and, in turn, people.
- With careful planning, design, implementation, and policies, these negative impacts can be avoided, minimized, or even mitigated.

The 4th webinar and closing of the series is available to watch in full on ADB website:
[Webinar 4 Video Recording | ADB Knowledge Event Repository \(development.asia\)](#)



4 Greening Transportation Projects Webinar Series Salient Outcomes

Green infrastructure have conclusively shown to reduce wildlife-vehicle collisions, improve highway permeability, promote landscape connectivity, and reduce genetic isolation. There are many cost-effective designs available especially for retrofitting of existing highways. What came through from the various examples and case studies was that monitoring is critical for successful application of these projects. On LI projects, the key findings and recommendations are (i) properly designed biodiversity assessment before construction are critical for informing safeguards design; (ii) importance of more subject matter experts for LI projects; (iii) post-construction monitoring and evaluation can determine the effectiveness of the mitigation measures and design; (iv) cost-benefit analyses can demonstrate that biodiversity safeguards not only protect environmental and biodiversity values but can add to infrastructure overall present net value; and (v) more training, and capacity building is needed in Asia for ecologically sustainable LI projects in the future.

Long-term monitoring and research are essential in biodiversity assessments; where such studies are beneficial for future projects, information and integration are critical in the early phases. Partnerships and coordination are substantial in funding, research, and monitoring, as well as in gaining consensus on project success. Prioritization of key sites is necessary on landscape corridors and crossing structures. Maintaining and enhancing connectivity, minimizing human disturbance, and vegetation cover are vital and critical on wildlife underpasses. Some challenges in green LI projects implementations are cost, timeline, pressures, and overruns. With respect to the regulatory aspect, it takes time to get clearances on wildlife angle, environmental angle, forest angle, and the government. The government is instrumental in simplifying and efficiently making the system user-friendly to reduce the complexities of clearances and elaborated processes. Developing a mitigation plan must be based on science. It involves collecting primary data, analyzing results, and objectivity, and thus, takes time.

5 Participant's Feedback and Evaluation



Participants were encouraged to actively participate and share their questions and comments using the chat box during the live webinar. Additionally, at the end of each session, a comprehensive semi-structured feedback form was emailed to all participants to obtain their views on the content, and overall scope of the webinar sessions.

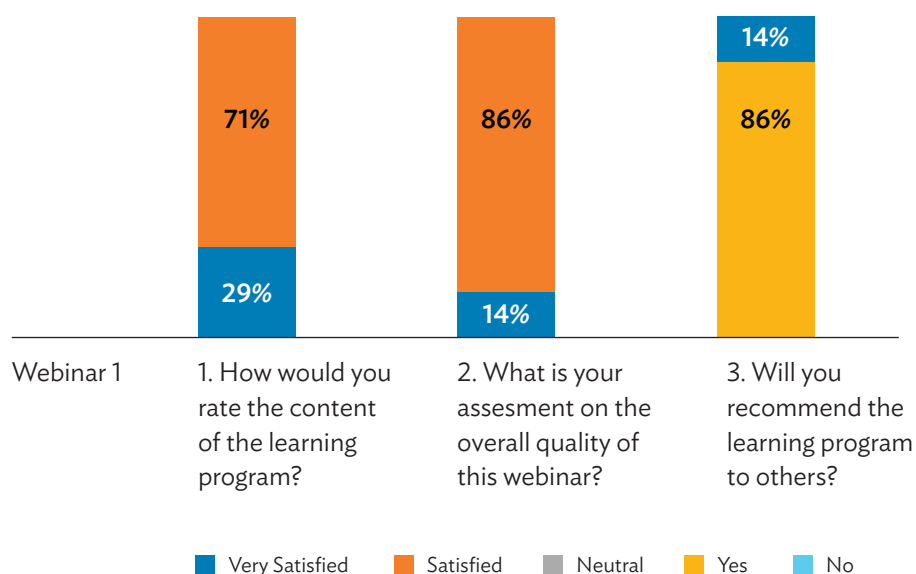
The webinar series was attended by more than 200 participants, from 33 countries, including ADB, nongovernment organizations, government, academe, media, and private institutions. Participants also included officials from DMCs responsible for managing EIAs and ecological concepts related to biodiversity conservation, natural capital, and the valuation of the ecosystem, from the public works, transport, highways, railways, environment, roads, and wildlife conservation departments and ministries; secretaries of state; other agencies; and experts. The summary list of participants is in Appendix 3.

Webinar I: Why Connectivity Matters and How to Develop Models of Connectivity for Different Species

Overall, the respondents considered the first webinar as very good, and a very relevant and important topic. Respondents suggested the provision of successful practices as well as connectivity recommendations for different sets of habitats. Some of the positive responses to the evaluation are summarized as follows:

- 71% are satisfied, and 29% are very satisfied with the content of the learning program;
- 86% are satisfied, and 14% are very satisfied with the overall quality of the webinar; and
- 86% will recommend the learning program to others.

Figure 1: Webinar 1 Evaluation Results

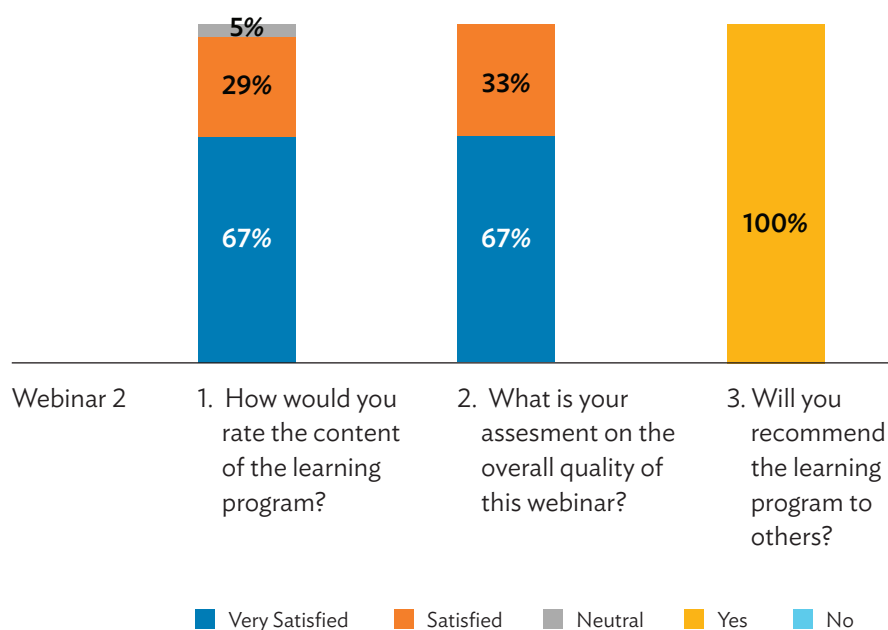


Webinar II: Ecological Considerations in Planning and Mitigation Measures and Capacity Building Needs for Effective Conservation Alongside Linear Infrastructure

The respondents perceived that the second webinar is very important, informative, and insightful, and are looking forward to working on this domain. There were also requests to share the presentation slides with the participants and the summary of the question and answer (Q&As) segments to help everybody learn from the discussion. Some participants also suggested a longer session for discussions to entertain even more questions from participants. The summarized responses from the poll questions are as follows:

- 67% are very satisfied, and 29% are satisfied with the content of the learning program;
- 67% are very satisfied, and 33% are satisfied with the overall quality of the webinar; and
- 100% of the respondents will recommend the learning programs to others.

Figure 2: Webinar 2 Evaluation Results

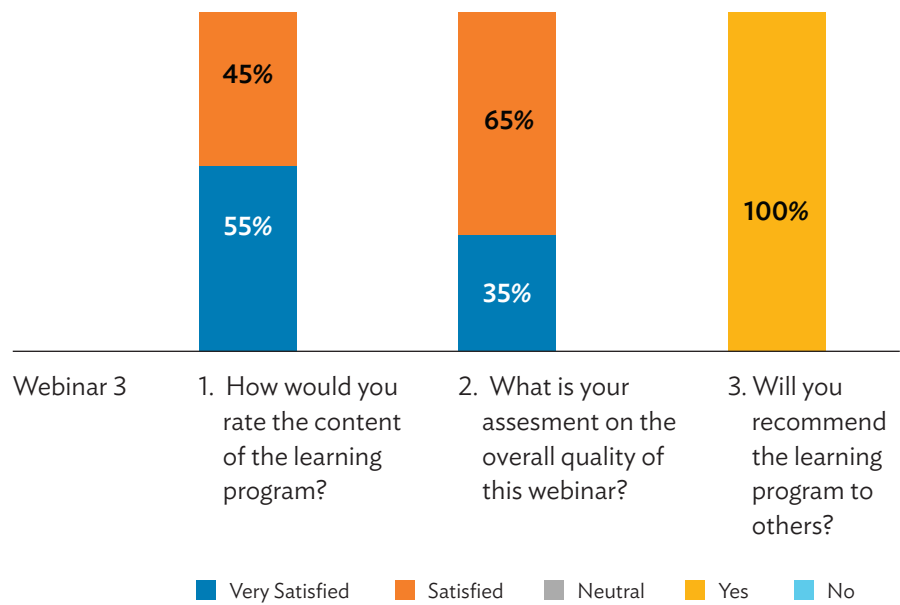


Webinar III: Natural Capital Conservation amid Development and the Role of Governance in Planning Conservation-Friendly and Sustainable Transportation Projects

The respondents appreciated the learnings and commented that they substantially benefited from the shared knowledge on LI sustainability and mitigating measures from the webinar. Some participants suggested to add a discussion on road safety with regards to the greening of transport projects, and further discuss the topics on road verges. The summarized responses are as follows:

- 55% are very satisfied, and 45% are satisfied with the content of the learning program;
- 65% are satisfied, and 35% are very satisfied with the overall quality of the webinar; and
- 100% of the respondents will recommend the learning programs to others.

Figure 3: Webinar 3 Evaluation Results

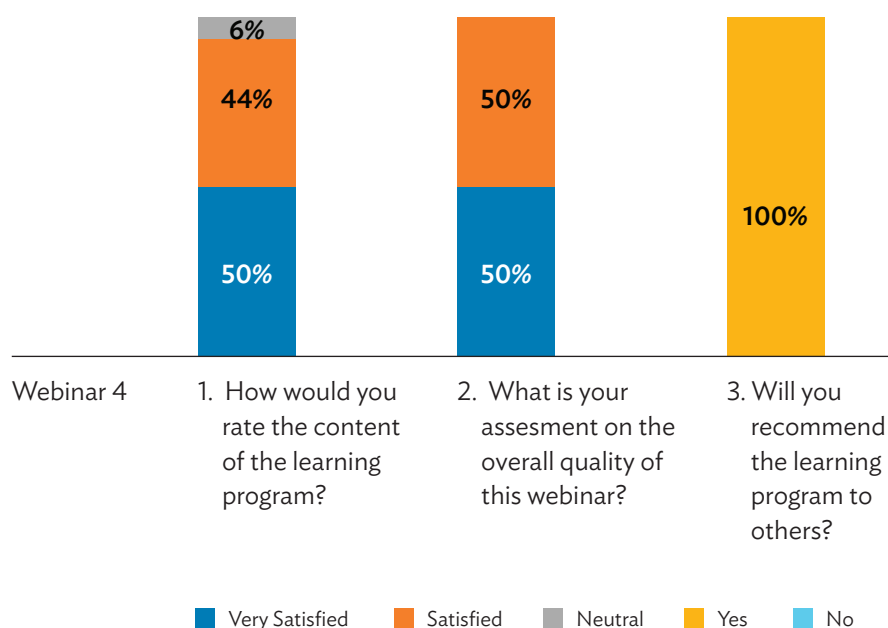


Webinar IV: Lessons from the Field: Success Stories of Mitigation Measures in Maintaining and Enhancing Connectivity, and Concluding Session: Summing Up of the Webinar Series with Key Takeaways

The respondents indicated that the fourth webinar was a good initiative and planned and conducted excellently. Some participants would like to hear topics on planning assessment while preparing project proposals. One area of improvement is to increase the duration of the webinar, including a more detailed Q&A session. Some of the respondents' positive feedback are summarized as follows:

- 50% are very satisfied, and 44% are satisfied with the content of the learning program;
- 50% are very satisfied, and 50% are satisfied with the overall quality of the webinar; and
- 100% of the respondents will recommend the learning programs to others.

Figure 4: Webinar 4 Evaluation Results



6 Conclusion and Recommendations



Overall, the respondents were very satisfied with the content and quality of the learning program while the majority of the respondents will recommend the learning program to others. There is a great interest in having more time to accommodate questions and discussions, which should be considered in future programs. There are also recommended topics such as consideration of road safety in linear transport infrastructure, planning assessment while preparing the project proposal, plant species and green industries, and further detailed developments on the use of verges, to name a few.

The capacity building on the Greening Transportation Project is an awareness campaign to promote sustainable transport infrastructure and address environmental challenges by integrating the principles of green growth and concepts of smart design and planning into linear development projects.

According to the participant feedback and evaluation of the webinar series, there remains great interest to cover more topics and in more detail greening transportation projects. The partnership between ADB and WII, forged stronger by this webinar series, should also be prepared to meet the increasing demand for more knowledge sharing on greening transportation projects from DMCs as well as non-member countries.



APPENDIXES

1 Webinar Series Agenda

ADB-WII WEBINAR SERIES 2021-2022

ADB

GREENING TRANSPORTATION PROJECTS

Organized by the
Environment Thematic Group,
Transport Sector Group, and
the Wildlife Institute of India

Join us in a global dialogue with
leading experts from the field of
green linear infrastructure for
integrating principles of green
growth, and concepts of smart
planning into designing and
planning of linear developments.



BACKGROUND

Transportation infrastructure projects invariably involve considerable land diversion and long-term investments. These projects also have the potential to cause severe impacts to the environment and wildlife. To counter these adverse effects of development, it is imperative to have capacity to address the negative impacts of linear infrastructure projects and also to harmonize conservation with development goals for sustainable development.

WHAT IS THE GOAL?

- To broaden and deepen understanding of principles of green growth, and concepts of smart planning into transport infrastructure development.
- Build capacity to promote ecologically friendly and sustainable road and rail development projects.
- This training programme also aims to build capacity for conserving and managing natural capital during planning and implementation of transportation projects.

WHO IS IT FOR?

This training is oriented towards building capacity of individuals and organizations working in the implementation of Green Linear Infrastructure projects in the transportation sector.

Attendees of the training will leave with an understanding of:

1. Impact of linear infrastructure on animals and context specific mitigation measures.
2. Importance of natural capital and ecosystem services in the planning and implementation of transportation projects.
3. Promoting sustainable development and conservation in connected habitats.
4. Green infrastructure principles for combining conservation and smart development goals.

Tiger Photo: Sandesh Guru



ADB-WII WEBINAR SERIES 2021-2022



Photo: Sandesh Gera

ASIAN DEVELOPMENT BANK
in partnership with the
WILDLIFE INSTITUTE OF INDIA
presents a Webinar Series to foster
a global dialogue in the field of green
linear infrastructure for integrating
principles of green growth, and
concepts of smart design and
planning, into linear developments.

Why Connectivity Matters? and How to Develop Models of Connectivity for Different Species?



INDRANIL MONDAL
Project Scientist,
Wildlife Institute of India

Ecological Considerations in Planning and Mitigation Measures and Capacity Building Needs for Effective Conservation Alongside Linear Infrastructure



FRASER SHILLING
Director,
Road Ecology Center
Institute of Transportation Studies,
University of California, Davis



V.B. MATHUR
Chairperson,
National Biodiversity Authority,
India

Natural Capital Conservation Amidst Development and the Role of Governance in Planning Conservation Friendly and Sustainable Transportation Projects



ELIZABETH FAIRBANK
Corridors & Crossings Program Officer,
Center for Large Landscape Conservation,
Bozeman, MT, USA



ASHA RAJVANSHI
Former Head,
Environmental Impact Assessment Cell,
Wildlife Institute of India,
Dehradun – Uttarakhand, India

Lessons from the Field: Success Stories of Mitigation Measures in Maintaining and Enhancing Connectivity and Concluding Session: Summing up of the Webinar Series with Key Takeaways



ROB AMENT
Senior Conservationist,
Center for Large
Landscape Conservation,
Bozeman, MT, USA



TONY CLEVENGER
Senior Research Scientist,
Western Transportation
Institute, Montana State
University, Bozeman, MT, USA



BILAL HABIB
Scientist-E & Head of Animal
Ecology & Conservation Biology,
Wildlife Institute of India



V.B. MATHUR
Chairperson,
National Biodiversity
Authority, India



DHANANJAI MOHAN
Director,
Wildlife Institute of India



**Why Connectivity Matters?
and How to Develop
Models of Connectivity
for Different Species?**

This webinar explores the concept of landscape connectivity and answers the following -

- How fragmentation caused by human activities disrupts animal movements and habitats, threatens biodiversity and climate change adaptation.
- How infrastructure development is in direct conflict with conservation and that the need of the hour is to create a balance - for conservation and development to go hand in hand, complementing—rather than conflicting with—each other.
- Implications of maintaining connectivity in developing nations.
- Science behind connectivity modeling and identifying important areas of animal movement across landscapes.
- Developing different models of connectivity specific to species (e.g., width of a corridor).



**Ecological Considerations in
Planning and Mitigation Measures
and Capacity Building Needs
for Effective Conservation
Alongside Linear Infrastructure**

It is more important than ever to balance environmental conservation with the rapid development of linear infrastructure. This resultant 'Green linear infrastructure' can be understood simply as a 'design and develop with nature' concept (Examples from India and other countries).

A wide network of individuals and organisations, from the government to the civil sector, play a significant role in collaborating, planning and constructing linear infrastructures. These roads, railways, transmission lines and canals, and such, are a significant cause of fragmentation and biodiversity loss around the world.

It makes the Capacity Building efforts of these key stakeholders absolutely crucial- to develop strategies that can help reverse this trend of biodiversity loss, in a coordinated manner.



**Natural Capital Conservation
Amidst Development and
The Role of Governance
in Planning Conservation
Friendly and Sustainable
Transportation Projects**

Nature is our life-support system and connectivity is essential for the preservation of biological diversity. Healthy habitats are crucial to the health and well-being of all species on Earth, and we must ensure to build green linear infrastructure while simultaneously protecting, improving, and restoring habitats - To make sure that people and animals continue to benefit from the products and services that nature provides.

The aim of this session is to showcase the importance of linking research to end users by bridging the roles of academics, policymakers, and society. To demonstrate that to develop successful, sustainable green infrastructure, it is imperative to have partnerships that protect ecological connectivity, meet the needs of local communities, and conserve vital environmental resources, natural capital, and wildlife populations. All of which can only be achieved by the direct involvement and partnership with stakeholders from the policy and government sector.



**Lessons from the Field: Success
Stories of Mitigation Measures
in Maintaining and Enhancing
Connectivity and Concluding Session:
Summing up of the Webinar Series
with Key Takeaways**

Lessons from the field: Success stories of mitigation measures in maintaining and enhancing connectivity.

Established best practices, recommendations, and principles with real life successful examples of mitigation measures by wildlife biologists.

Concluding Session:

Summing up of the Webinar Series - Expert comments with key takeaways at this concluding session by a panel of speakers.

ADB-WII WEBINAR SERIES 2021-2022

Greening Transportation Projects



भारतीय वन्यजीव संस्थान
Wildlife Institute of India



WEBINAR SERIES 1

Why Connectivity Matters *and* How to Develop Models of Connectivity for Different Species?

25 Nov 2021

4:00–5:00 pm Philippines (GMT+8)
1:30–2:30 pm India (GMT+5:30)

This webinar explores the concept of landscape connectivity and how fragmentation caused by human activities disrupts animal movements and habitats, and threatens biodiversity and climate change adaptation.

MODERATOR



ISAO ENDO
Environment Specialist,
Environment Thematic Group, Sustainable
Development and Climate Change Department,
Asian Development Bank

4–4:05 p.m.

Opening Remarks and Inauguration



KARMA YANGZOM
Principal Environment Specialist,
Safeguards Division,
Sustainable Development and
Climate Change Department,
Asian Development Bank

4:30–4:35 p.m.

Questions and Answers

4:35–4:55 p.m.

Open Discussion with Participants

- Challenges and opportunities in implementing Green Linear Infrastructure projects
- Identifying capacity building needs

4:05–4:10 p.m.

Background and Objectives



BILAL HABIB
Scientist-E & Head of Animal
Ecology & Conservation Biology,
Wildlife Institute of India

4:55–5 p.m.

Closing Remarks



V.B. MATHUR
Chairperson,
National Biodiversity Authority,
India

4:10–4:30 p.m.

Why Connectivity Matters
and Developing Models



INDRANIL MONDAL
Project Scientist,
Wildlife Institute of India



ADB-WII WEBINAR SERIES 2021-2022

Greening Transportation Projects



भारतीय वन्यजीव संस्थान
Wildlife Institute of India

ADB

WEBINAR SERIES 2

Ecological Considerations in Planning and Mitigation Measures *and* Capacity Building Needs for Effective Conservation Alongside Linear Infrastructure

16 Dec 2021

11 a.m.-12 p.m. Philippines (GMT+8)
8:30-9:30 a.m. India (GMT+5:30)

Roads, railways, transmission lines and canals can cause significant habitat fragmentation and biodiversity loss. It is more important than ever to balance environmental conservation by designing and developing with nature. This webinar tackle issues on capacity building and needs of key stakeholders towards green linear infrastructure developments.

Registration **HERE**

11-11:05 a.m. Introduction to Webinar II

MODERATOR



KARMA YANGZOM
Principal Environment Specialist,
Safeguards Division,
Sustainable Development and
Climate Change Department,
Asian Development Bank

11:05-11:45 a.m. Planning Mitigation Measures and
Capacity Building Needs for Green
Linear Infrastructure



V.B. MATHUR
Chairperson,
National Biodiversity Authority,
India



FRASER SHILLING
Director,
Road Ecology Center
Institute of Transportation Studies,
University of California, Davis

11:45 a.m.-12 p.m. Q&A and Open Discussion



ADB-WII WEBINAR SERIES 2021-2022

Greening Transportation Projects



भारतीय वन्यजीव संस्थान
Wildlife Institute of India



WEBINAR SERIES 3

Natural Capital
Conservation Amidst
Development *and*
the Role of Governance
in Planning Conservation
Friendly and Sustainable
Transportation Projects

13 Jan 2022

11 a.m.-12 p.m. Philippines (GMT+8)
8:30-9:30 a.m. India (GMT+5:30)

Nature is our life-support system and connectivity is essential in preserving biodiversity. This webinar showcases importance of linking research to end users by bridging the roles of academics, policymakers, and society in green linear infrastructure developments.

11-11:05 a.m. Introduction to Webinar III

MODERATOR



KARMA YANGZOM
Principal Environment Specialist,
Safeguards Division,
Sustainable Development and
Climate Change Department,
Asian Development Bank

11:05-11:45 a.m. Natural Capital Conservation and Governance in Planning Sustainable Transportation Projects



ELIZABETH FAIRBANK
Corridors & Crossings Program Officer,
Center for Large Landscape Conservation,
Bozeman, MT, USA



ASHA RAJVANSHI
Former Head,
Environmental Impact Assessment Cell,
Wildlife Institute of India,
Dehradun - Uttarakhand, India

11:45 am-12:00 pm Q&A and Open Discussion

Registration **HERE**



WEBINAR SERIES 4

Lessons from the Field -
Success Stories of Mitigation
Measures in Maintaining and
Enhancing Connectivity and
Concluding Session - Summing
up of the Webinar Series with
Key Takeaways

10 Feb 2022

11 a.m.-12:30 p.m. Philippines (GMT+8)
8:30-10 a.m. India (GMT+5:30)

This webinar shares established best practices, recommendations, and principles with real life successful examples of mitigation measures by wildlife biologists. The series concludes with key takeaways from panel of experts on the field of green linear infrastructure.

An enriching dialogue among stakeholders on how to build capacity for conserving and managing natural capital during planning and implementation of transportation projects. We learn about the real-life examples and case studies that showcase the positive effects of green linear infrastructure on biodiversity. We also get a glimpse into the science and work that goes behind building the world's largest mitigation measures in India. Our experts bring forth the administrative capacity constraints in planning green transportation project as it remains one of the biggest challenges for avoiding and mitigating potential impacts of road, rail and other transport infrastructure. Finally, the way forward - to enable mainstreaming of conservation issues and biodiversity concerns into the decision-making process of transportation projects. The objective is to build capacity for a range of stakeholders in harmonizing conservation and development, and retrofitting and investing in nature-based infrastructure development.

MODERATOR



MALVIKA ONIAL
Scientist D, Animal Ecology
& Conservation Biology and
Associate Nodal Officer,
Environmental Impact
Assessment Cell, Wildlife
Institute of India

11-11:05 a.m. Opening Remarks



JAMIE LEATHER
Chief of Transport Sector Group,
Sustainable Development and
Climate Change Department,
Asian Development Bank

11:05 a.m.-12:05 p.m.

Success Stories of Mitigation Measures
in Greening Transportations Projects

Status of Linear Infrastructure
Safeguard Capacity in Asia (15 mins)



ROB AMENT
Senior Conservationist,
Center for Large
Landscape Conservation,
Bozeman, MT, USA

Implementation Challenges:
Learnings and Experiences (10 mins)



**DHANANJAI
MOHAN**
Director,
Wildlife Institute of India

Case Studies and Key Learning:
Canada and Nepal Projects (15 mins)



TONY CLEVENGER
Senior Research Scientist,
Western Transportation
Institute, Montana State
University, Bozeman, MT,
USA

Miles to go: Key Take-aways
from Green Linear Infrastructure
Development Initiatives:
The Asian Experience (10 mins)



V.B. MATHUR
Chairperson,
National Biodiversity
Authority, India

World's Largest Mitigation Measures in India (10 mins)



BILAL HABIB
Scientist-E & Head of Animal Ecology
and Conservation Biology,
Wildlife Institute of India

12:05-12:25 p.m.

Interactive Session: Ask the Panel of Experts

12:25-12:30 p.m.

Summary of the Series and Closing Remarks



BILAL HABIB
Scientist-E & Head of Animal Ecology
and Conservation Biology,
Wildlife Institute of India

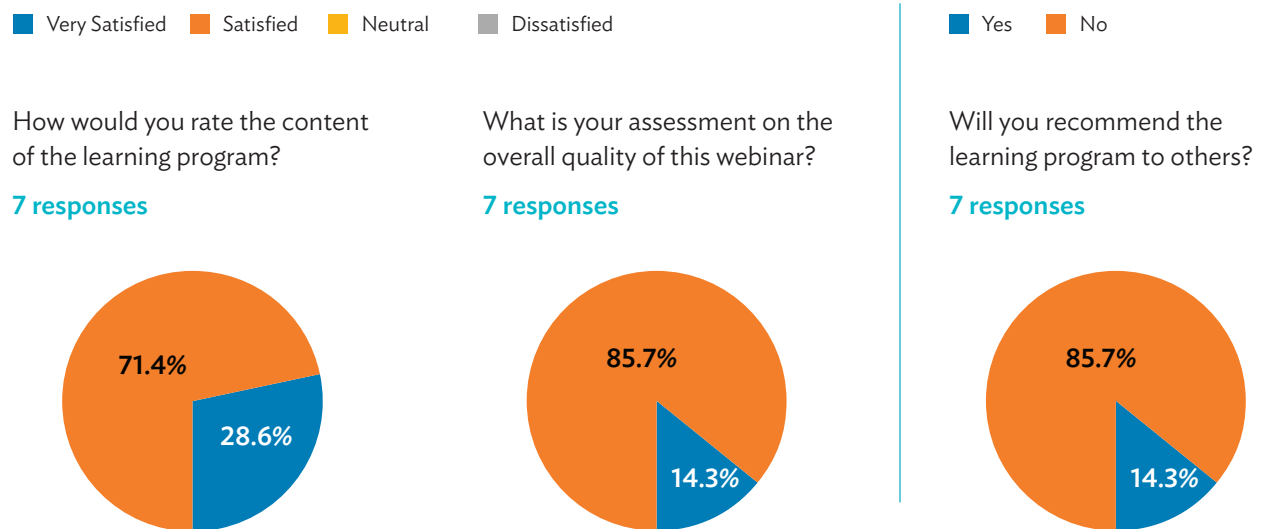
Registration **HERE**

2 Participant's Feedback Summary



WEBINAR 1: Why Connectivity Matters and How to Develop Models of Connectivity for Different Species

Figure A2.1: Feedback on Webinar 1

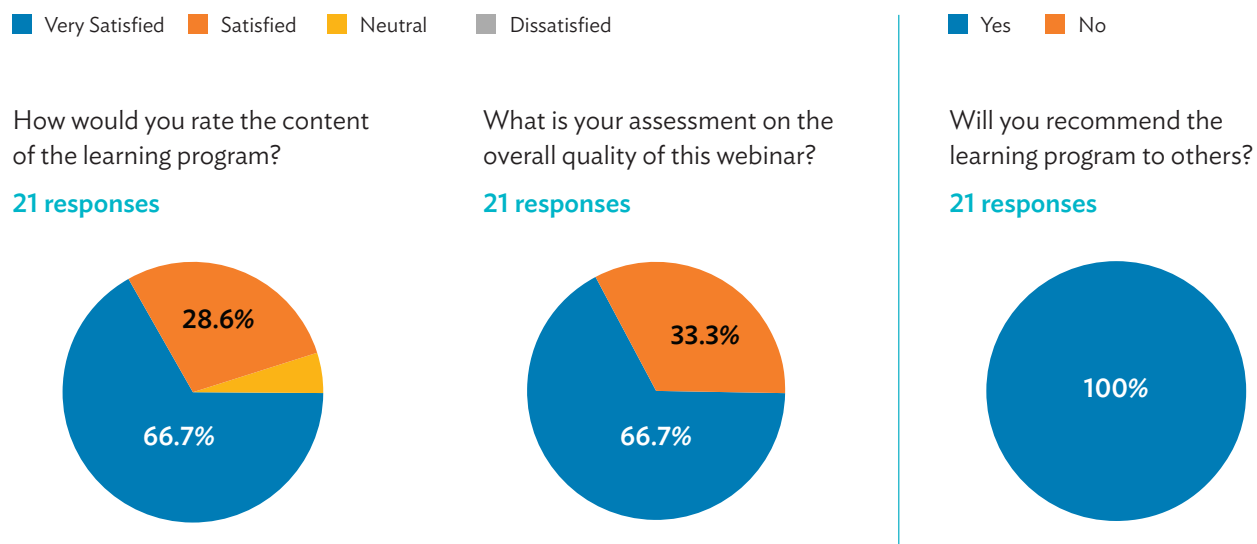


Webinar 1 Comments:

- Very important topic at present.
- Very good.
- It would have been nice if some of the successful practices in Asia were shared and provided concrete connectivity recommendations for different sets of habitats stretched in different altitudinal gradients. We mostly consider only few big animals from the low-lying areas, but animals inhabiting the mid-hills and high mountains of Asia are often not brought into discussion. This is primarily because of huge information gaps from these areas.

WEBINAR 2: Ecological Considerations in Planning and Mitigation Measures and Capacity Building Needs for Effective Conservation Alongside Linear Infrastructure

Figure A2.2: Feedback on Webinar 2

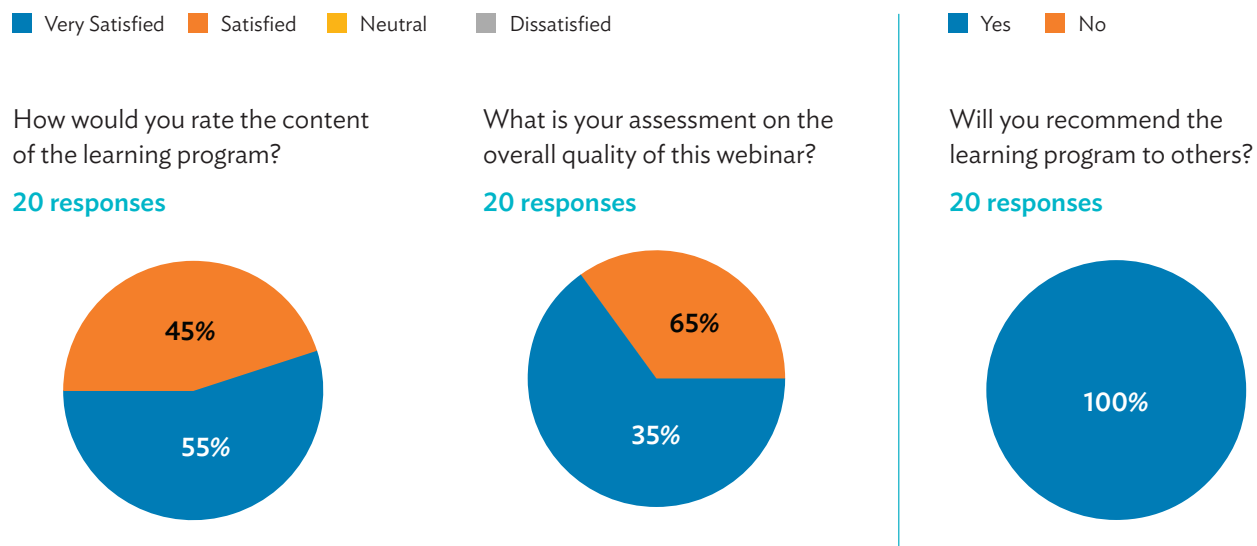


Webinar 2 Comments:

- Request to share the presentation slides with the participants. Several questions were asked, and many could not be asked (lack of time). Request the summary of the question and answer session to be shared as well; this helps everybody to learn from the discussion.
- Road specific mitigation measures should be shown only for roads where biodiversity action plans have been prepared.
- Very important topic.
- NA
- There were more general questions.
- It was an informative and insightful webinar. Looking forward to work in this domain.

WEBINAR 3: Natural Capital Conservation amid Development and the Role of Governance in Planning Conservation-Friendly and Sustainable Transportation Projects

Figure A2.3: Feedback on Webinar 3

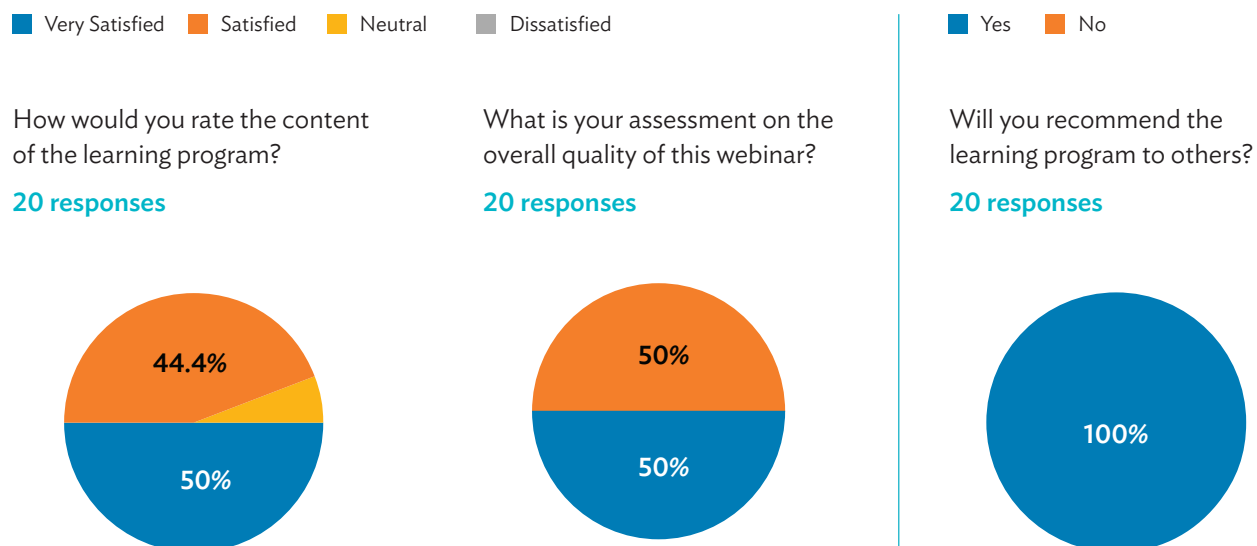


Webinar 3 Comments:

- Add the discussion on road safety with regards to the greening of transport projects.
- The two topics: (i) road verges; and (ii) animal overpass or human tunnel, which is more feasible, need to be further discussed.
- Thanks.
- I learned lots of knowledge about building infrastructure sustainably and its mitigating measures from that course.

WEBINAR 4: Lessons from the Field: Success Stories of Mitigation Measures in Maintaining and Enhancing Connectivity, and Concluding Session: Summing Up of the Webinar Series with Key Takeaways

Figure A2.4: Feedback on Webinar 4



Webinar 5 Comments:

- Excellent planning and conduct of the webinars. I wish we had a 120-minute session instead of 90 minutes.
- NA
- How about making a webinar on plants and promotions of the green growth industry in the world?
- Good initiative.
- Thanks.
- I gained several new perspectives and ideas on environmental and social impact assessment for infrastructure projects, particularly on biodiversity conservation and sustainable management of living natural resources. My thanks to ADB and all those who made the webinar a success as well as for the opportunity and learnings. Looking forward to other interesting and informative webinars.
- I would like to hear more on planning such assessment while preparing the project proposal.

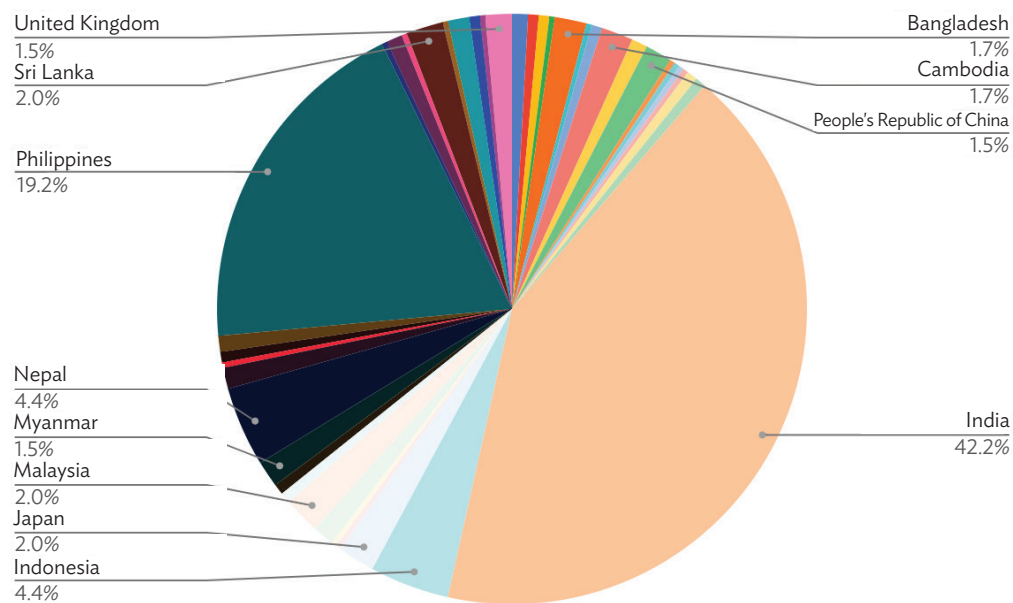
3 Overview of Participants



Greening Transportation Projects Webinar Series

TOTAL REGISTRANTS

364 from **41** countries



Affiliation		Number of actual attendees
1	Government	28
2	ADB	72
3	Academe	18
4	WWF	28
5	WII	21
6	NGO and others	42

ADB = Asian Development Bank, NGO = nongovernment organization, WII = Wildlife Institute of India.

Greening Transportation Projects

ADB-WII Webinar Series 2021-2022 Proceedings

The Asian Development Bank (ADB) and the Wildlife Institute of India conducted a three-part webinar series geared toward greening transport projects. This report captures the highlights of the series on integrating principles of green growth, smart design, and planning to promote ecologically friendly and sustainable transport projects in Asia. The sessions brought together government officials, transport and biodiversity practitioners, ADB staff, consultants, and representatives from the academe to broaden and deepen the understanding of issues related to protecting natural capital and investing in green linear infrastructure. The webinar series also provided an opportunity to build and enhance capacities of people and organizations implementing green linear infrastructure projects in the transport sector.