

Green Roads

Developing a Green Roads Toolkit for ADB Projects

September 5-7, 2023, ADB HQ, Manila, Philippines



Dr. Frank van Steenbergen - Director MetaMeta

fvansteenbergen@metameta.nl

- Between 2010 and 2050, 25 million km new roads to be built (Laurence et al., 2014)
- Transport sector currently responsible for 24% of global CO2 emissions (IEA, 2021)

Asian Transport Outlook 2030

- Transport infrastructure, passenger and freight activity continue to grow between 2020 and 2030:
 - Infrastructure +40%
 - Passenger activity +30%
 - Freight activity +60%

- To meet increasing demand and support achieving the SDGs, ADB estimates the costs of transport infrastructure requirements in Asia and the Pacific region to be more than \$500 billion a year.
- In developing Asia and the Pacific many countries still do not have an adequate road network – many communities lack all-weather access to health, education, government services and economic opportunities.
- Expansion of road networks has been a central part of ADB's assistance → but future road system investments must consider and reduce the environmental and social burden of road transport.

- ADB has committed to align any new projects with the Paris Agreement → Decarbonization of the sector.
- Much more factors to consider in reducing social and environmental burden of roads
- Roads will remain essential → Need for Green Roads

1. Develop a Green Roads Vision for Asia

2. Take stock of most promising Green Roads practices and approaches

3. Assess the relevance and applicability of Green Roads solutions for

4. Develop the Green Roads Guidance Note and Toolkit

5. Pilot test the Toolkit and Guidance Note in two countries

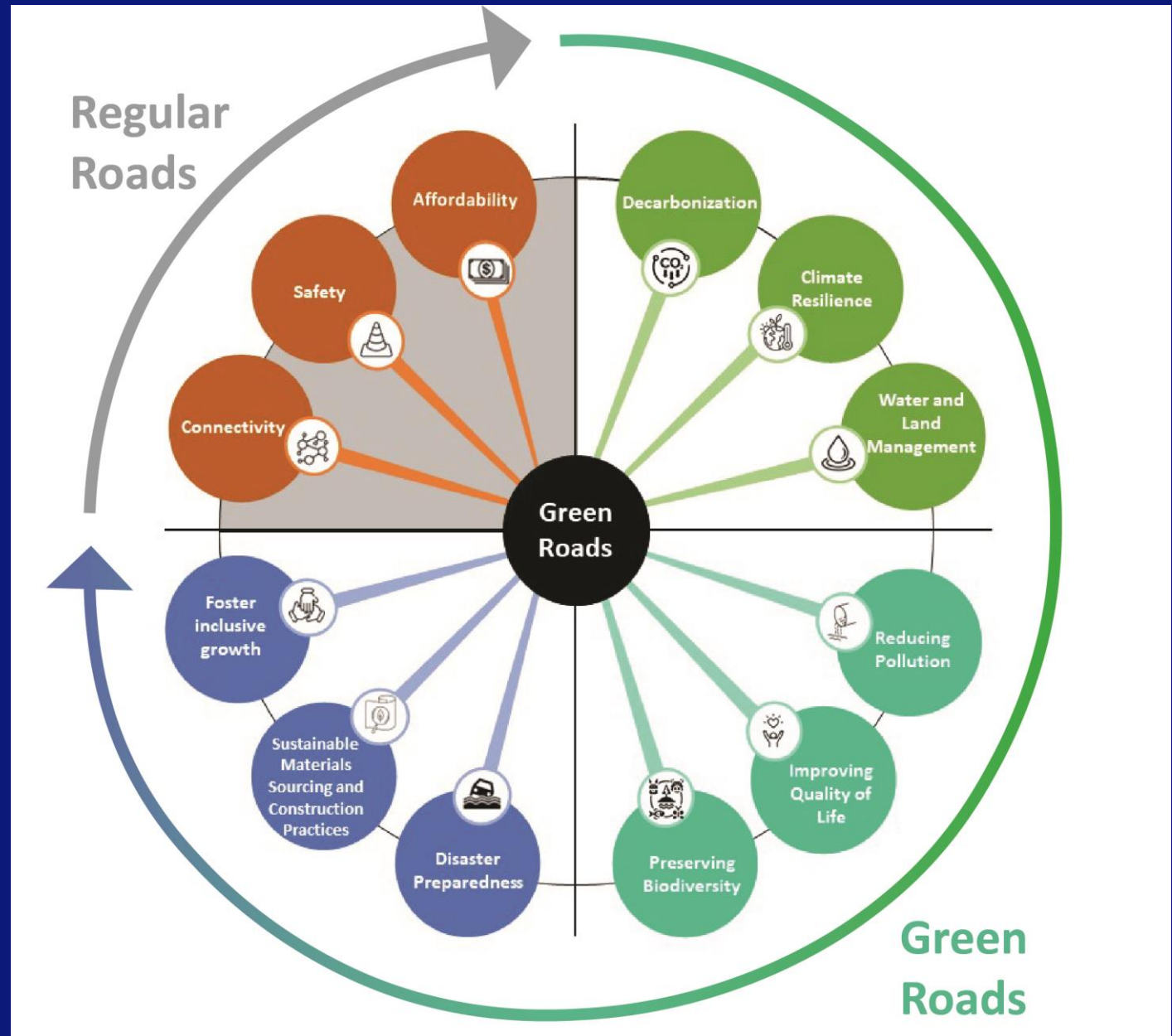
6. Organize the Launch of the Toolkit and Guidance Note

Green Roads Vision



12 Themes

- 3 for Regular Roads
- 9 for Green Roads
- Synergies between the themes

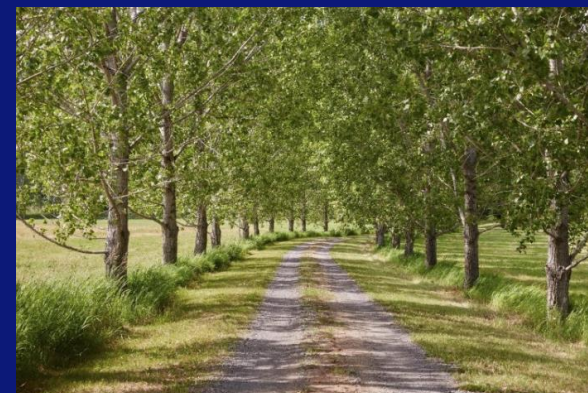




1. Decarbonization



- Transport sector responsible for **24% of global CO₂ emissions** (IEA, 2021).
- Decarbonization pivotal to align with Paris Agenda.
- Emissions in each phase of road cycle (material production and transport, construction, use, maintenance and end-of-life)
- Road transport is the dominant part, accounting for **74%**



Roadside tree planting



Smoother asphalt

Key interventions areas:

- Material production and transportation
- Design of roads and road appliances
- Road construction
- Road transport management
- **Vegetative measures along roads (e.g., roadside tree planting)**



Energy generation with roads



Energy-efficient LED



Using lignin as alternative bio-based binder



2. Climate Resilience



- Climate-related damage to road infrastructure costs countries between **1-3% of their GDP annually** (World Bank)
- Making infrastructure more climate-resilient can add about 3 percent to the upfront costs but has **benefit-cost ratios of about 4:1** (Global Commission on Adaptation)

Key interventions areas:

- **Climate resilient road drainage**
- **Increased stabilization of roadsides**
- **Resilient routing/avoiding vulnerable areas**
- **Resilient road maintenance**
- **Landscape management**



Using appropriate size culverts



Deep rooted vegetation for slope stabilization



Stabilization of slopes



Streambank protection



3. Water and Land Management



- Water is responsible for **80% of road damage to unpaved roads and 30% of damage to paved roads**
- It is estimated that **20% of the global land surface is within one kilometer of road**, which is where most of the people live and where economic activities are concentrated.

Key interventions areas:

- Water harvesting and run-off storage
- Agricultural water management
- Groundwater management
- Reduced waterlogging and water congestion
- Preventing landslides
- Erosion and gully control
- Reducing sedimentation from road surfaces
- Avoiding sand dune movement



Field trench from road



Road made from excavation of drainage canal



Gully rehabilitation



Road drift cum sand dam



Overflow road



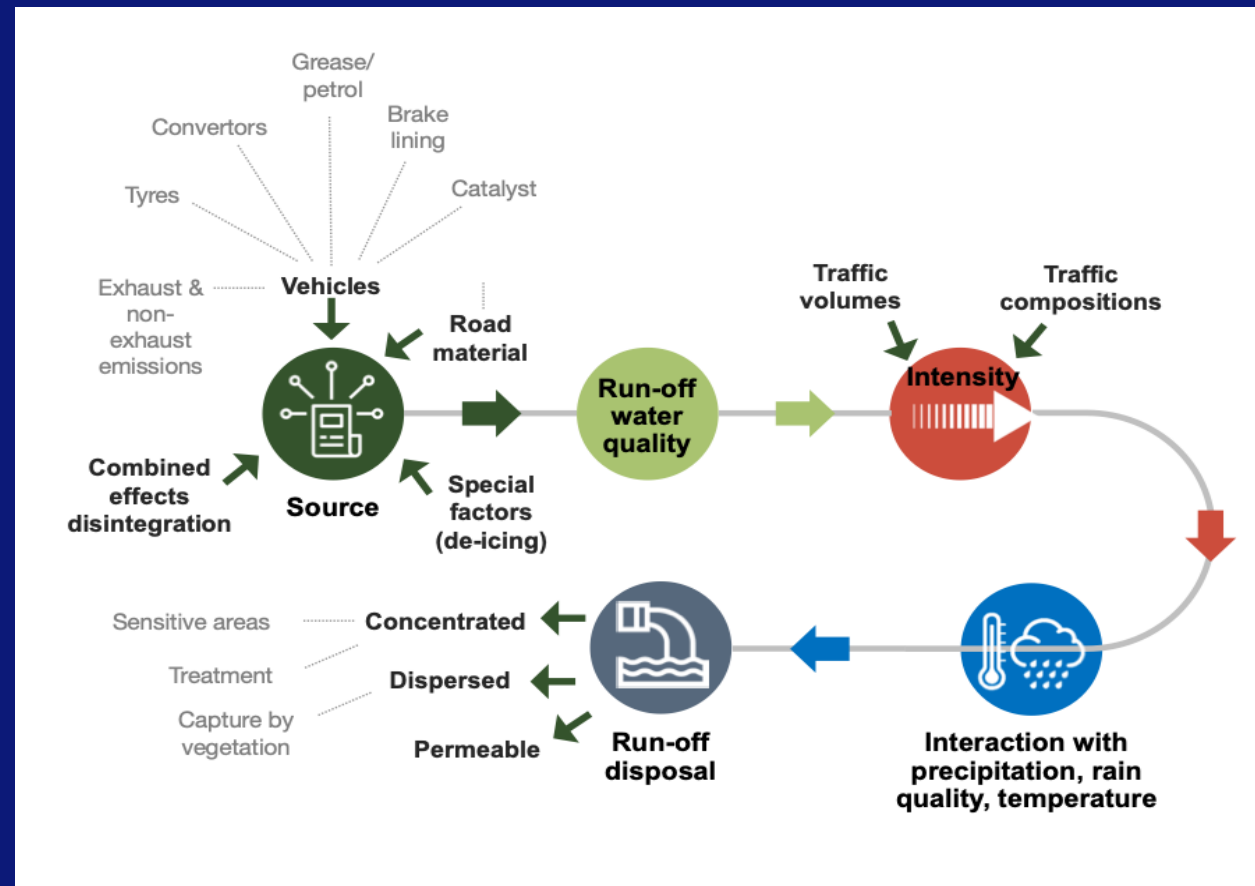
4. Reducing Pollution



- Usually, a land strip of up to **60-100 meters from the road is significantly affected** by the pollution from the road, either from run-off or the deposited road dust

Key interventions areas:

- Consider road construction materials
- Source control: Minimize pollutants from vehicles
- Road maintenance
- Prioritize road drainage
- Proper use of de-icing/traction agents
- Capture and remove pollutants





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Retention pond



Sand filter



Proper use of de-icing agents



Accumulator plants



Porous pavement (right)



5. Quality of Life



- Large **negative impacts from roads to people's quality of life**, via dust, noise, temperature and aesthetics. This can be reduced and turned around.
- Tree planting is found to be associated with significant reductions in non-accidental and cardiovascular mortality (Donovan et al., 2022)
- Closely aligned to all other Green Roads themes.

Key interventions areas:

- Dust control
- Beautification
- Noise control
- Temperature control



Application of dust palliatives



Pavers on streets through an urban area



Noise barriers



Beautification of roads



6. Preserving Biodiversity



- To **address the biodiversity crisis**, it is critical to ensure roads do not longer harm biodiversity, but instead preserve it.

Key interventions areas:

- Protect and harness invertebrate biodiversity
- Protect and harness vertebrate biodiversity
- Protect aquatic systems
- Improve roadside flora



Overpass



Underpass



Typical jump out



Canopy bridge



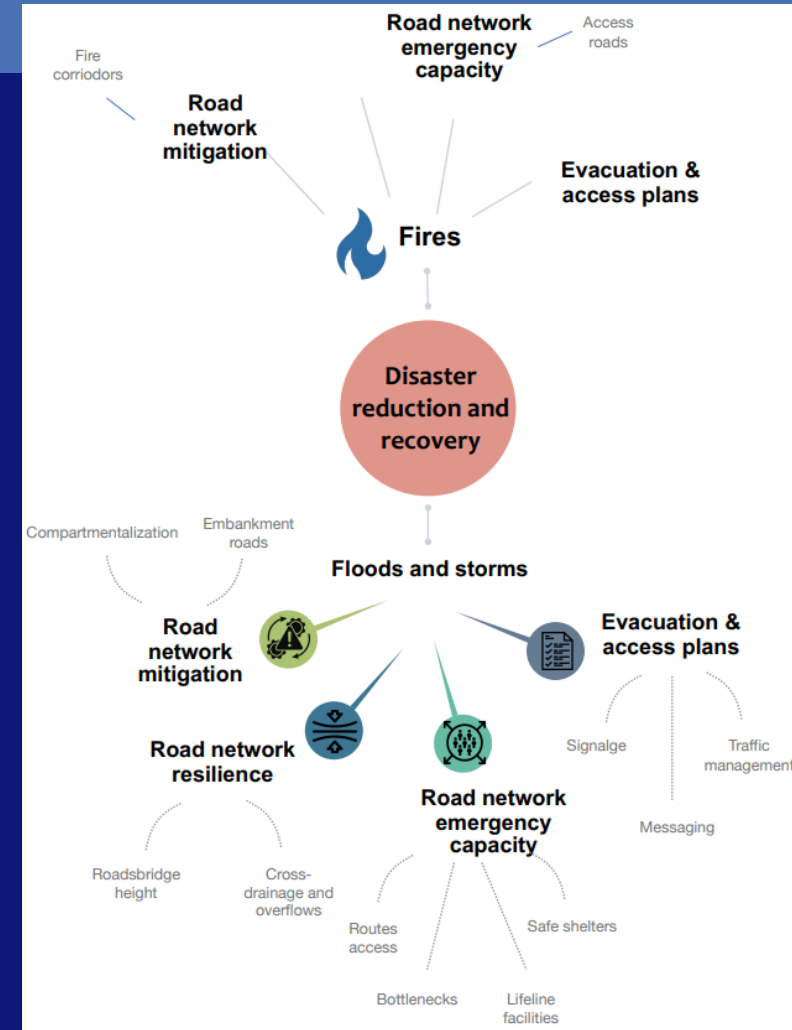
7. Disaster Preparedness



- Disasters triggered by natural hazards and escalating climate change impacts pose a worldwide **huge threat to economic and social development** in Asia and the Pacific.
- Roads play an important role in **disaster risk reduction** as well as in **disaster response** (such as flood and fire management).

Key interventions areas:

- Flood mitigation by road network
- Flood resilience by road network
- Road network capacity to deal with emergencies
- Evacuation and access plans
- Fire prevention





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Roads used as shelter



Upland water retention



Fire-resistant materials



Adequate drainage



Road crossing doubling up as sand dam



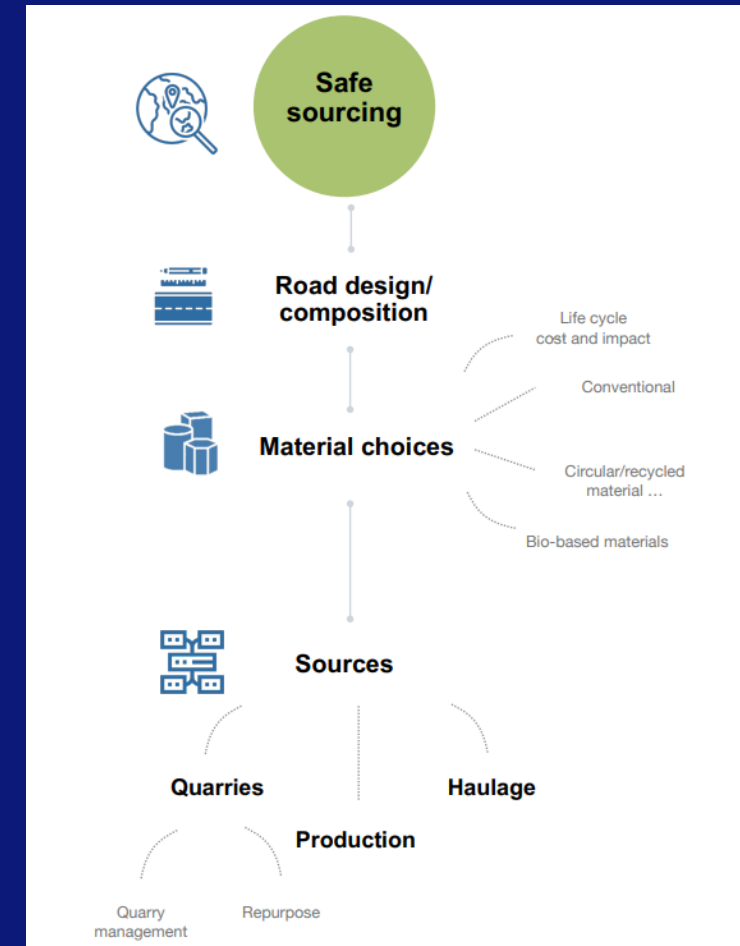
8. Sustainable Materials Sourcing and Construction Practices



- **30-40% of construction material** globally is used in linear infrastructure.
- ... impacting **60% of their costs**
- ... and **85% of their carbon emissions**
- Some of the raw material is becoming in short supply (tarmac, sand, gravel) either locally or globally
- In many cases, the production process is demanding in terms of (environmental) costs, or haulage is demanding in terms of carbon emissions. This is an area where balanced trade-offs are required

Key interventions areas:

- Design
- Materials
- Sourcing
- Operation and maintenance – tailored to small island material options





9. Fostering Inclusive Growth



- Road construction and maintenance is a **large public expenditure ticket – high scope for inclusive growth**
- Road construction – as with other infrastructure – is often used in a Keynesian way to **jump-start fledgling economies**
- In many countries, road construction is also included in **social safety net programs**
- Road construction can be used to build **entrepreneurial capacity** and – through **local sourcing** - to enlarge the money circulating in **local economies**



Fostering inclusive growth and local entrepreneurship

Key interventions areas:

- Local sourcing
- Employment generation and local capacity building
- Promoting roadside businesses
- Ensuring last mile access
- Safe management of construction sites
- Gender and indigenous population considerations



Local material processing



Trail bridge to ensure last mile access

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