Pilot Training on Climate Finance Tracking

Transport Sector

Brief Description

I. The sectoral needs in the region and ADB's strategy.

II. Explain the MDB climate finance tracking approach (for transport)

III. ADB's internal approach and resources, providing practical and illustrative examples.

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28 June 2017

I. The sectoral needs in the region and ADB's strategy.

Overview of transport issues in Asia and Pacific

- Population increase
- Mobility need increase
- Increasing Megacities
- High motorization

Traffic Congestion
Air Pollution aggravate
GHG emission increase
Road Safety degraded

Asia's motorized transport emissions have become a significant contributor to the global problem of greenhouse gas (GHG) emissions

In 2009, transport was responsible for 23% of global GHG emissions compared with 41% for energy.

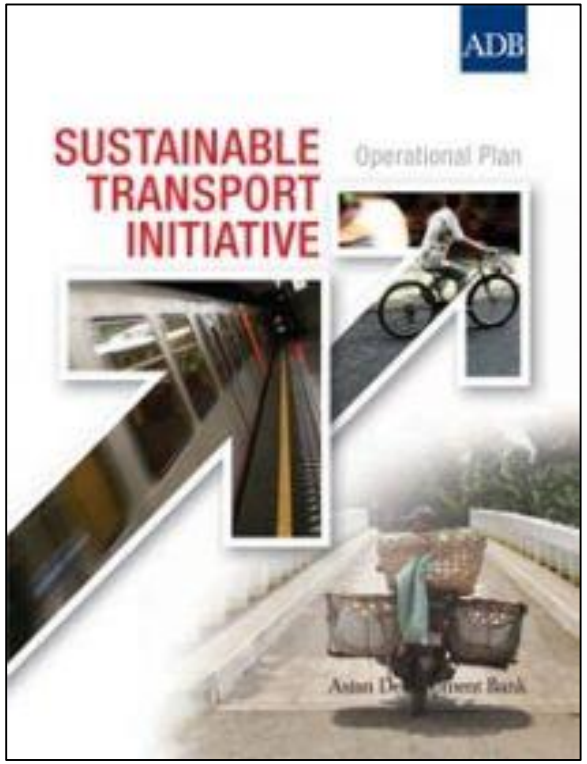
In 2006, Asia accounted for 19% of total worldwide transport–sector related CO2 emissions. By 2030, the share of Asia will increase to 31%.

by 2035 transport is expected to become the single largest GHG emitter accounting for 46% of global emissions, and by 2050 it is set to reach 80%.

I. The sectoral needs in the region and ADB's strategy.

STI-OP (Sustainable Transport Initiative Operation Plan, 2010)

Provides details of how ADB will update its operations in the transport sector in line with Strategy 2020.



Strategy 2020 (2008)
- inclusive economic growth,
- environmentally sustainable growth,
- regional integration

STI-OP (2010)
creating transport systems that are
- accessible,
- safe,
- affordable, and
- environment-friendly

STI lending directions

Mainstream sustainability in roads

Scale up 4 areas

- Urban transport
- Addressing climate change
- Cross-border transport & logistics
- Road safety & social sustainability

I. The sectoral needs in the region and ADB's strategy.

STI-OP (2010): Climate Change and Energy Efficiency

transport investments are vulnerable to the effects of climate change

Avoid means reducing the need to travel, for example by integrating land use and transport planning to create local clusters of economic activity that require less mobility; by changing how production is organized (e.g., doing more online); and by developing multimodal logistics chains to cut unnecessary trips.

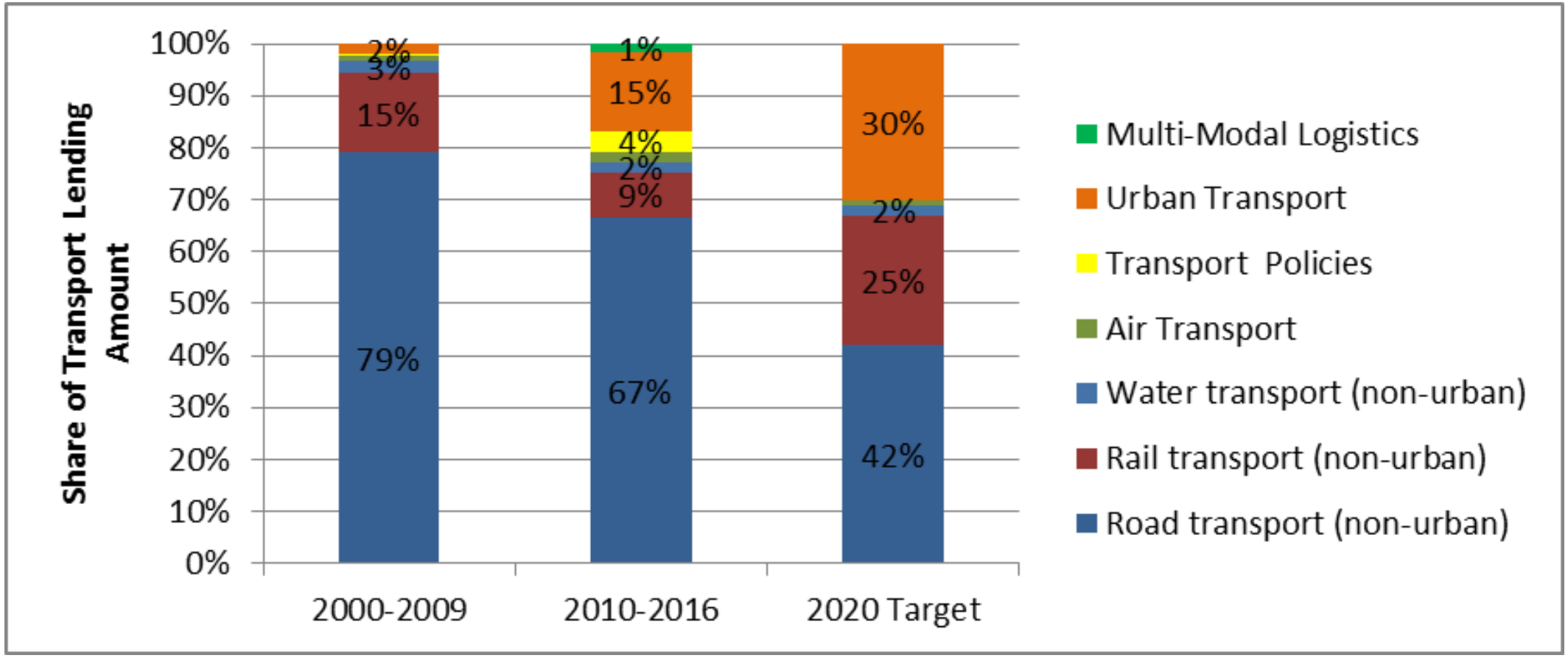
Shift means changing to more energy efficient modes or routes, such as shifting from road to rail or waterways, or onto well-defined trucking routes, or shifting passengers from private vehicles to public transport and nonmotorized modes.

Improve means using technologies that are more energy efficient, including through improving vehicle standards, inspection, and enforcement; developing improved vehicle technologies and fuels; and improving transport efficiency using information technology.

I. The sectoral needs in the region and ADB's strategy.

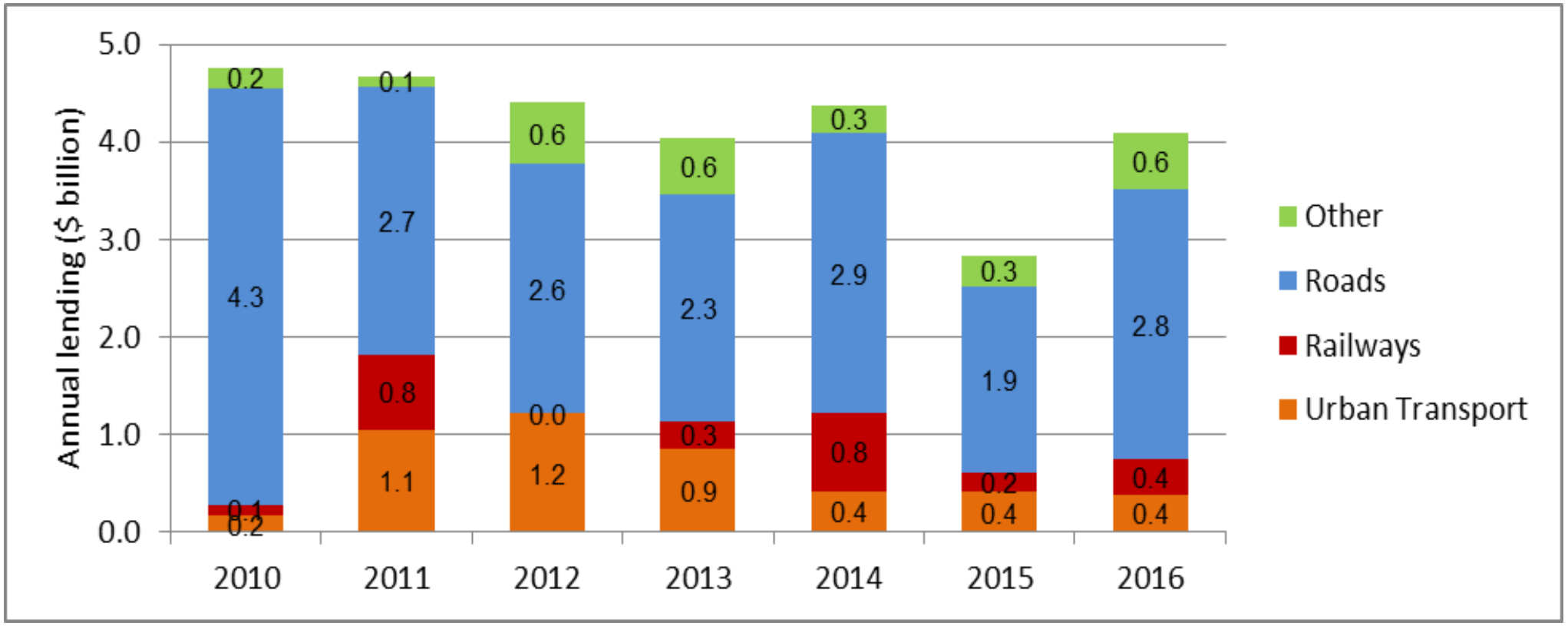
STI –OP MTR (2017) : Progress Vs Targets

Subsector lending Vs STI-OP directional targets, 2010–16: generally good overall progress but more to do



I. The sectoral needs in the region and ADB's strategy.

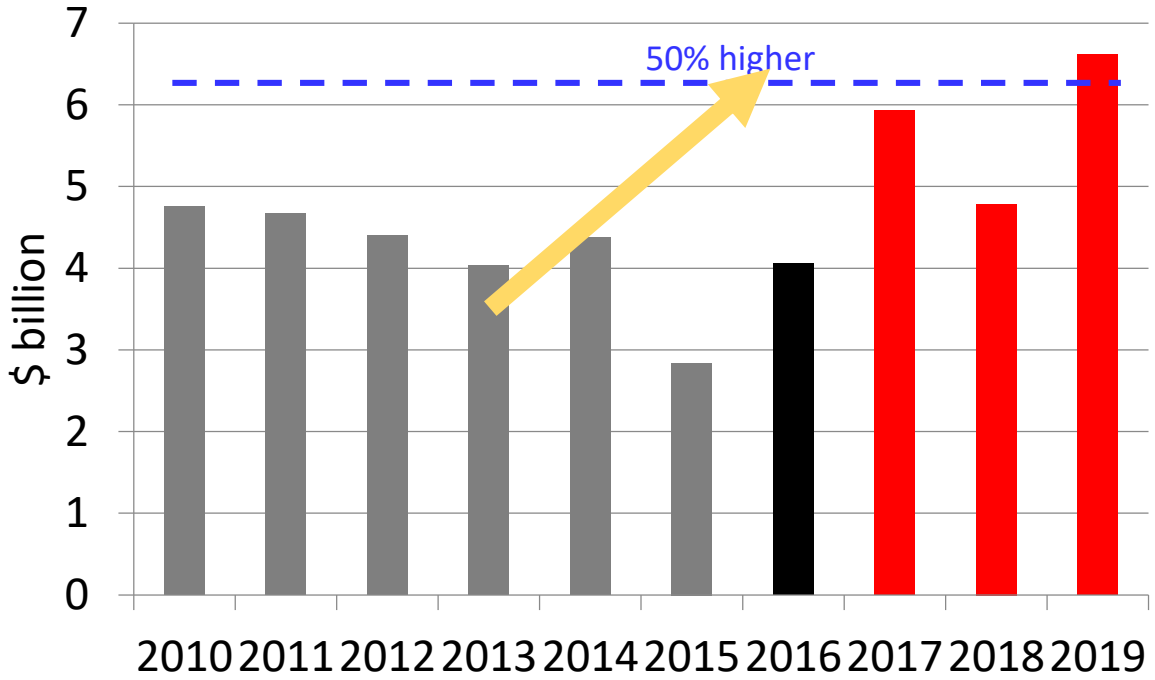
Annual lending, 2010–16: overall lending steady except in 2015, roads steady, urban transport & railways fluctuating



I. The sectoral needs in the region and ADB's strategy.

2017-19 firm pipeline

Lending volume: 2019 pipeline >50% above 2012-14 average



Source: SPD database, 9 Aug 16

Lending composition: further growth in STI-OP priority subsectors

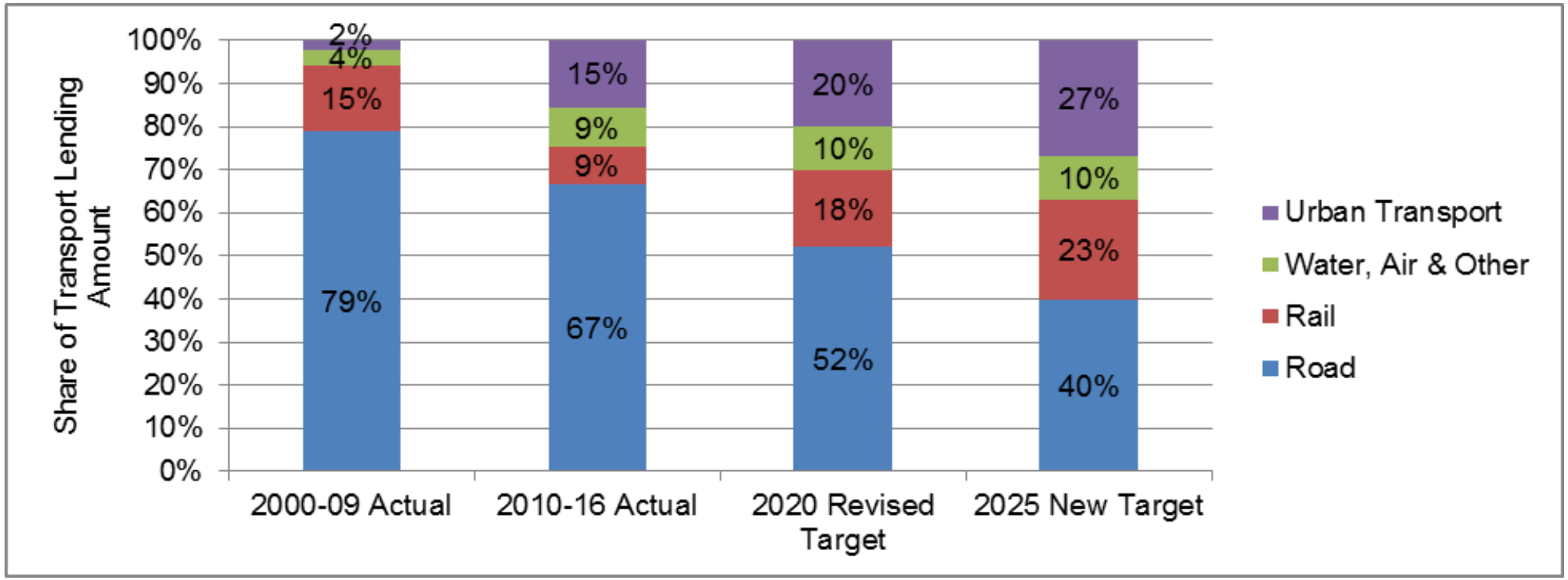
Lending share (%)	Actual 2010-16	Pipeline 2017-19	2020 Target
Roads	67	57	42
Urban transport	15	18	30
Railway	9	16	25
Other	9	9	3

- **Climate finance**. For mitigation target of $1B in 2020, the pipeline has $1.7–1.8B each year. Expect $200-400M annually for climate adaptation.

I. The sectoral needs in the region and ADB's strategy.

MTR recommendations

1. **STI-OP remains valid but needs some adjustment of resources in order to meet targets**
2. **Revise the STI-OP lending targets: they should be ambitious but achievable**



Note: Targets for 2025 to be taken into account when formulating next operational plan to align transport with Strategy 2030

I. The sectoral needs in the region and ADB's strategy.

MTR recommendations

Address critical internal resource limitations

- **Pool of experts** – recruit fixed-term ST experts based in SDSC to be shared across OD project teams
- **Limitations in number/mix of staff** – TSG, BPMSD to examine effect on loan processing, identify solutions
- **TA levels** – TSG and SPD to examine need to provide additional TA for projects in complex ST subsectors
- **FPF support for ST** – expand use of energy and urban FPFs for supporting ST, and establish FPF for ST covering such fields as low carbon transport, railways, green logistics, advanced transport technology etc
- **Knowledge partnerships** – review existing KPs, establish new ones if needed

I. The sectoral needs in the region and ADB's strategy.

MTR recommendations

Build up ST operations in DMCs

- **Track and report OD progress on ST** – lending composition and level, climate financing, cofinancing
- **Sector dialogue on ST** – RDs to conduct annual ST dialogue with DMCs, and TSG to consolidate bankwide
- **Build more ST into project scope** – improve the feedback mechanism at pre-concept stage
- **ST project support to ODs** – for project preparation, implementation and capacity development
- **Sustainability in road operations** – mainstream road safety and road asset management
- **Scale up** – increase size of projects ADB prepares
- **Major new financiers of transport** – engage in high-level dialogue on ST project development

2017 work plan :SDCC-TRA

1. Strategic operational support

- Implement MTR recommendations
- Upstream sector dialogue - in 3+ DMCs,
- Project support – including project development support for 5+ projects, ICT/ITS support for 2+ projects, Innovation TA support for 5+ urban transport and 5+ road safety projects
- Quality assurance – 30-40 peer reviews, support for project preconcept review (dept meetings, division brainstormings)
- FPF for ST – donor dialogue to establish FPF

2. Knowledge mgt and sharing, including training

- Led by advisory teams supported by secretariat

3. HR mgt, talent mgt, staff sharing

- Work with BPMSD on solutions to staffing level/mix and attracting leading recruitment candidates inc. females

2017 work plan – specific activities

Policy dialogue support: initial list from ODs

- PAK: Pakistan Railways strategic plan
- CAM: urban transport operations
- TIM: urban transport operations in Dili
- FIJ: urban transport operations in Suva
- PRC: Xinjiang cross-border logistics support

Strategic support for projects: initial list from ODs

- UZB: Railway Electrification
- PHI: Metro Manila BRT, including collaboration with USG on CDIA support
- PRC: Shandong Spring City Green Modern Trolley Bus Demonstration Project
- PRC: Guizhou Gui'an New District New Urbanization Smart Transport System Development Project.
- CAREC: low carbon cities RETA

2017 work plan – specific activities

Strategic support for projects: initial list (continued)

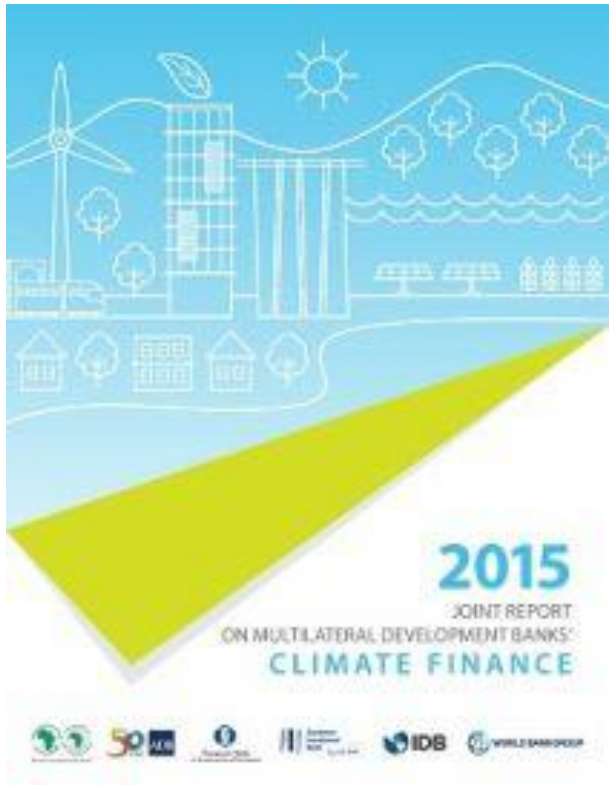
- CAREC: Regional Railway Strategy - implementation
- CAREC: Reg. Road Safety Strategy - implementation
- Innovation TA: so far 13 candidate projects for urban transport support, 4 for road safety support
- RETA on ST for trade competitiveness – prepare with RCI TG
- Future Cities RETA – collaboration with USG
- IND: railway energy efficiency project – collaboration with ESG on implementing Clean Energy FPF support

ICT/ITS support: initial list from ODs

- LAO: Vientiane BRT Project (pilot project of ADB's advanced technology initiative)
- PHI: Davao Public Transport Modernization Project
- KAZ: National ITS Implementation Project
- BAN: Dhaka BRT – ICT support for ongoing project

II. MDB climate finance tracking approach (for transport)

Memorandum : Guidance Note on Counting Climate Finance at ADB, 13 Oct 2016



2015 JOINT REPORT
ON MULTILATERAL DEVELOPMENT BANKS'

CLIMATE FINANCE

AUGUST 2016

Climate finance totaling $81 billion was mobilized for projects funded by the world's six largest multilateral development banks (MDBs) in 2015.

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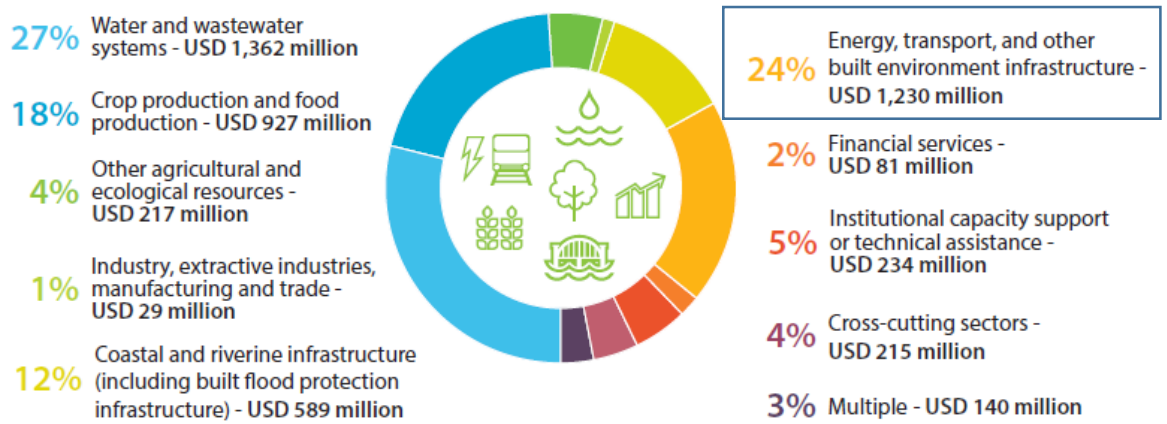
Figure 12: MDB Adaptation Finance by Sector Grouping, 2015



Note: Adaptation finance reported for some projects /project components for which there was not enough data granularity to allow apportioning of the adaptation finance among the sector groups are included in "Multiple".

Figure 18: MDB Mitigation Finance by Sector Type, 2015

Note: "Other sectors" include the following: non-energy GHG reductions; low-carbon technologies; miscellaneous; and multiple. Miscellaneous is defined in Annex Table 3 in Annex C. Mitigation finance reported for some projects/project components for which there was not enough data granularity to allow apportioning of the mitigation finance among the sectors are included in "Multiple".

II. MDB climate finance tracking approach (for transport)

Table 1: Targets Announced by MDBs to Support Climate Action

MDB	Targets Announced
ADB	Doubling climate finance to USD 6 billion annually by 2020 (own resources only), of which USD 4 billion is for mitigation and USD 2 billion is for adaptation
AfDB	Triple climate financing to reach 40 percent of investments by 2020
EBRD	40 percent of EBRD annual business investment by 2020 in green finance[a]
EIB	Global target of greater than 25 percent of all lending. Increased target of 35 percent of lending in developing countries by 2020
IDBG	Goal to double climate finance to 30 percent of operational approvals by 2020 to an average USD 4 billion per annum, and to improve evaluation of climate risks and identify opportunities for resilience and adaptation measures
WBG	A one-third increase in climate financing, from 21 percent to 28 percent of annual commitments by 2020. If current financing levels are maintained, this would mean an increase to USD 16 billion in 2020. The WBG intends to continue current levels of leveraging co-financing for climate-related projects, that could mean up to an another USD 13 billion a year in 2020. The direct financing and leveraged co-financing together represent potentially an estimated USD 29 billion in 2020.

II. MDB climate finance tracking approach

Methodology

2 OVERVIEW OF MDB CLIMATE FINANCE TRACKING METHODOLOGIES

- 2.1 Climate Adaptation Finance
- 2.2 Climate Mitigation Finance
- 2.3 Dual Benefit Climate Finance
- 2.4 Climate Co-Financing

Calculating Climate Adaptation, Mitigation and Dual Benefit Finance

	Climate Adaptation Finance	Climate Mitigation Finance	Dual Benefit Climate Finance
Project Description	The project is a built environment improvement program and falls under the "Energy, Transport, and other Built Environment and Infrastructure" sector grouping. The project aims to strengthen climate resilience and disaster preparedness in vulnerable coastal towns. The total project budget is USD 300 million and it has two components: 1. Providing more climate-resilient municipal infrastructure; and 2. Training and capacity building for local technical personnel for improved infrastructure operations and service delivery under a changing climate An analysis of the impacts of climate change on the project was carried out to inform the design of the project. The project document explicitly set out the climate vulnerabilities within project components 1 and 2, with specific adaptation measures incorporated into the project components, as follows: Component 1: Climate-resilient construction materials (e.g. more heat-resistant) were procured to replace conventional construction materials, with an additional cost of USD 50 million (which is part of the Component 1 budget); Component 2: The scope of training and capacity building was adjusted to include climate risk management performance monitoring as part of the ongoing operational and maintenance tasks of the local technical personnel, but there is no separate costing.	The project is a 320 megawatt wind farm which will be built along a coastal line. The electricity produced will be sold to the local distribution utility that services 10 towns. The facility is estimated to produce about 800 gigawatt-hours of electricity per year and will avoid 400,000 tons of carbon dioxide annually. The project supports the national renewable energy policy and will increase the share of renewable energy in the country's energy mix. The whole project qualifies as a mitigation project, and is classified as a "Renewable Energy/electricity generation activity" based on the MDB methodology for mitigation. Total project cost is USD 900 million. An MDB committed a non-concessional loan of USD 200 million to the private sector developer.	The project is an afforestation project and is classified as an "Agriculture, Forestry, and Land Use" mitigation activity. The project is also intended to provide erosion control and slope stability in response to increased climate risk, and falls under the "Other Agricultural and Ecological Resources" sector group based on the MDB methodology for adaptation. Therefore, the project is to deliver the dual benefit of both climate mitigation and adaptation. Investments in erosion control and slope stability are considered as adaptation finance; the mitigation value comes from rebuilding forests which function as carbon sinks. The project was considered 100 percent climate finance. An MDB provided a loan USD 150 million.
Calculation of MDB Climate Finance	The entire project has significant development and climate resilience benefits. However, based on the MDB adaptation finance tracking methodology, only USD 50 million—the additional expenditure incurred in procuring heat resistant construction materials in comparison with traditional construction materials—is tracked as adaptation finance.	The total project cost of USD 900 million, covering the installation of wind turbine generators and ancillary plant equipment is considered as mitigation finance, i.e. 100 percent of the total MDB financing committed is reported as climate finance. In this case, 100 percent of the total MDB finance committed, or USD 200 million, is reported as mitigation finance.	The dual benefit climate finance can be computed in two ways: Accounting Method 1: Split loan equally between adaptation (USD 75 million) and mitigation (USD 75 million). Dual benefit finance reporting would be zero. Accounting Method 2: The entire loan amount is reported as dual benefit finance.

II. MDB climate finance tracking approach (adaptation for transport)

0.5% and 8.7% of capital cost

Sectoral grouping	Examples of Sectors	Potential impacts	Potential Adaptation Activities in Response
Coastal and Riverine Infrastructure (including built flood protection infrastructure)[b]	Sea defenses/flood protection barriers	Increased storm damage along coastline due to sea level rise and increased storm surges	Physical/natural reinforcement of coastline and/or additional coastal structures/ vegetation
	River flood protection measures	Increased risk of riverine flooding due to heavier and/or more frequent rainfall events	Increased river dredging programs, reinforcement of levees, reestablishment of natural flood plains and vegetation in upstream areas/river banks
Energy, Transport, and other Built Environment and Infrastructure	Construction	Shift in zones affected by typhoons/hurricanes/storm surges	More robust building regulations and improved enforcement
	Transport	More extreme river flows cause erosion of embankments and loss of bridges	Use of revised codes for infrastructure design that consider increased frequency/severity of extreme events
	Urban development	Increased risk of floods	Improved solid waste management and collection, increased capacity and other changes in drainage systems
	Tourism[c]	Storms disrupt tourist season	Diversification of tourist attractions to encompass inland or low-risk areas
	Solid waste management	Increased risk of pollution of areas below landfill sites due to risk of flood	Completion of a climate risk assessment prior to location of landfill sites
	Thermal energy generation	Increased seasonality of rainfall, creating periods of low river flows	Investment in thermal power generators with minimal cooling water requirements
	Energy generation (including renewables)	Reduction in river flows lead to loss of generation from hydroelectric plant	Optimization of hydro-infrastructure design subject to due diligence based on climate and hydrological models
	Energy transmission and distribution	Higher temperatures reduce distribution efficiency	Investment in embedded renewable generation to reduce distribution requirements

Project Focus	Roads Rehabilitation
Sector	Energy, Transport, and Other Built Environment and Infrastructure
Brief Description of Project	The project aims to enhance the connectivity of selected national and regional roads and to improve the government's capacity for road safety and climate resilience.
Climate Vulnerability Context	The project aims to address vulnerability to climate change and incorporate climate resilience measures into the technical design to help reduce risks of erosion and landslides due to sudden short heavy rainfalls. Assessment of vulnerability was done through available literature reviews and country documents.
Statement of Purpose or Intent	The project includes consideration of climate adaptation in the design of road works to ensure the construction of proper drainage systems on the roads, therefore increasing their resistance to flooding. Climate resilience is also included at various points throughout the project's results indicators.
Link to Project Activities	One portion (sub-component A3) of the project involves civil works specifically identified as necessary to build climate resilience as a result of erosion and landslides on selected locations of the road network. Another portion (sub-component B4) involves institutional and technical assistance to evaluate additional resilience enhancing measures and to prepare guidelines for the road agency to consider resilience in design of road works.
Calculation of Adaptation Finance	Sub-components A3 and B4 are combined to total the incremental cost of adaptation for this project, or USD 3.07 million, or less than 1% of total project commitment. Note that while the project document lists the exact cost of the sub-component A3 portion of the project, this number is used directly. However, because the project document does not identify the cost of each sub-component within component B, the proportional approach was used to assign 25 percent co-benefits from the overall funding allocated for sub-component B4.
Type of Adaptation Finance	Loan, MDB own resource

II. MDB climate finance tracking approach (Mitigation for transport)

Table 1 - List of activities eligible for classification as climate mitigation finance

7. Transport	**7.1 Urban transport modal change**	Urban mass transit
		Non-motorized transport (bicycles and pedestrian mobility)
	7.2 Transport oriented urban development	Integration of transport and urban development planning (dense development, multiple land-use, walking communities, transit connectivity, etc.), leading to a reduction in the use of passenger cars
		Transport demand management measures dedicated to reduce GHG emissions (e.g., speed limits, high-occupancy vehicle lanes, congestion charging/road pricing, parking management, restriction or auctioning of license plates, car-free city areas, low-emission zones)
	7.3 Inter-urban transport	Railway transport ensuring a modal shift of freight and/or passenger transport from road to rail (improvement of existing lines or construction of new lines)
		Waterways transport ensuring a modal shift of freight and/or passenger transport from road to waterways (improvement of existing infrastructure or construction of new infrastructure)

II. MDB climate finance tracking approach (Mitigation for transport)

Table 1 - List of activities eligible for classification as climate mitigation finance

3. Energy efficiency	**3.4 Vehicle energy efficiency fleet retrofit**	Existing vehicles, rail or boat fleet retrofit or replacement (including the use of lower-carbon fuels, electric or hydrogen technologies, etc.)
	3.5 Energy efficiency in new commercial, public and residential buildings	Use of highly efficient architectural designs, energy efficiency appliances and equipment, and building techniques that reduce building energy consumption, exceeding available standards and complying with high energy efficiency certification or rating schemes
	3.6 Energy audits	Energy audits to energy end-users, including industries, buildings, and transport systems

III. ADB's internal approach and resources

2016 Approved Projects : Tracking (Investment and TA)

2016 TOTAL CLIMATE FINANCE (INVESTMENTS AND TECHNICAL ASSISTANCE) ($ million)									
Sector	Mitigation			Adaptation			Climate Finance		
	ADB funds	External funds	Subtotal	ADB funds	External funds	Subtotal	ADB funds	External Funds	Total
Energy	2,121.30	446.90	2,568.19	49.27	9.19	58.46	2,170.57	456.08	2,626.65
Transport	**397.80**	**2.00**	**399.80**	**368.10**	**18.49**	**386.59**	**765.90**	**20.49**	**786.39**
Agriculture	32.39	36.56	68.94	338.91	18.93	357.84	371.29	55.49	426.78
Urban, Water	3.31	1.48	4.79	251.16	56.12	307.28	254.47	57.60	312.07
Others	100.26	107.75	208.01	73.03	3.23	76.26	173.29	110.98	284.26
TOTAL	2,655.05	594.68	3,249.73	1,080.47	105.96	1,186.42	3,735.51	700.64	4,436.15

48373-007 Bihar New Ganga Bridge Project IND SARD SATC Sovereign 715.00 Project loan Loan 3396 ADB funds OCR 500.00 Transport Adaptation 200.00

III. ADB's internal approach and resources

TRA CF Draft Estimation from Pipeline 2018-2020

TRA CF in draft 2018-2020 pipeline-1.xlsx

RDs	Adaptation	Mitigation	Sub Total
SERD	121.20	229.00	350.20
SARD	282.50	1,636.00	1,918.50
PARD	131.40	-	131.40
EARD	-	1,770.00	1,770.00
CWRD	36.00	1,522.09	1,558.09
Total	449.90	4,928.09	5,377.99
Per Year	149.97	1,642.70	1,792.66

Note : Tentative figure, more likely to be reduced due to project delay

III. ADB's internal approach and resources

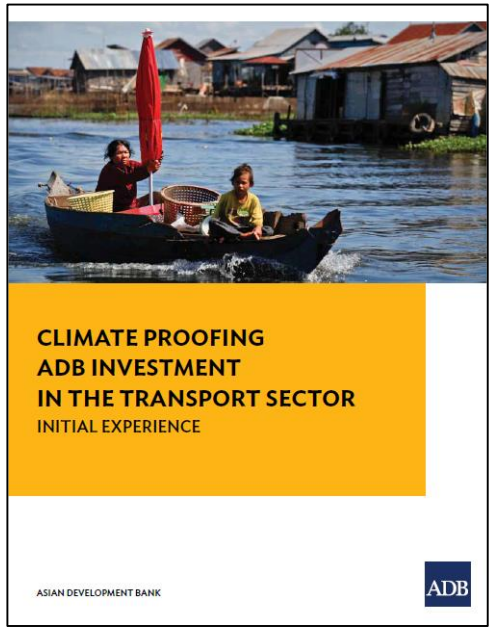
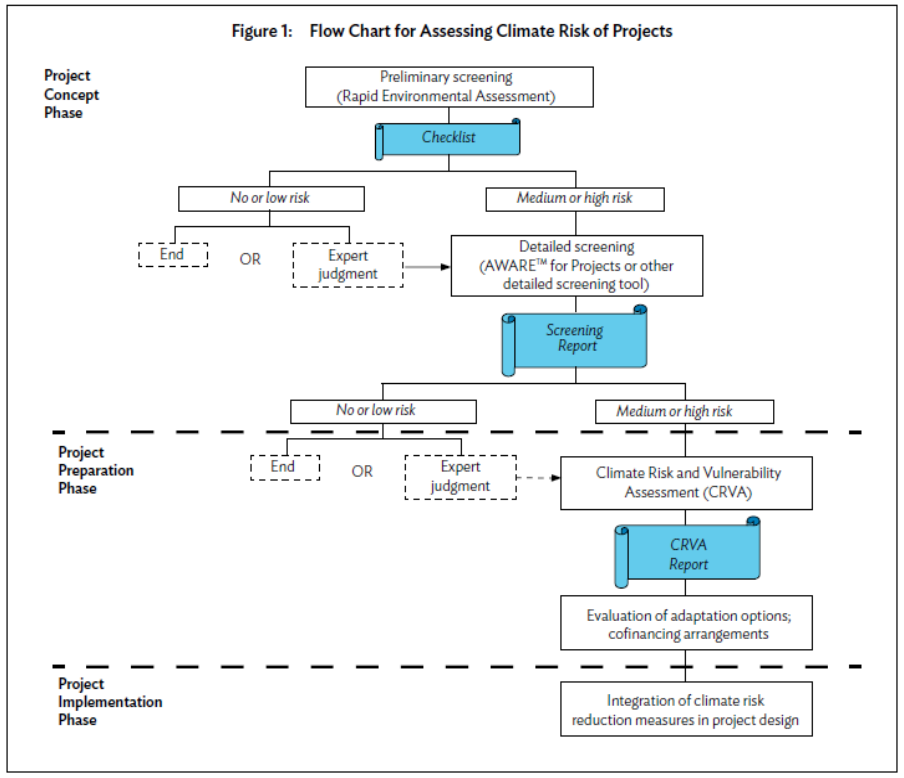


Figure 1: Flow Chart for Assessing Climate Risk of Projects



[8] Appendix 1: Climate Change and Adaptation Screening Methods and Tools lists examples of tools that are available to screen climate change risks and vulnerabilities.

Box 2: Activities and Steps Guiding the Conduct of Climate Risk and Vulnerability Assessments

The process begins with scoping the project and defining the assessment and its objectives. The core activities related to project design fall under impact assessment, vulnerability assessment, and adaptation assessment. Finally, the process ends with defining implementation arrangements and monitoring frameworks.

Set of Activities	Steps
1. Project screening and scoping	Step 1: Screen the project for exposure to climate change Step 2: Establish the adaptation objective Step 3: Survey existing information and knowledge Step 4: Identify and engage stakeholders Step 5: Identify methodology and data needs Step 6: Identify the required expertise
2. Impact assessment	Step 7: Construct climate change scenarios Step 8: Estimate future biophysical impacts Step 9: Assign probabilities to identified impacts
3. Vulnerability assessment	Step 10: Identify vulnerabilities Step 11: Identify biophysical drivers of vulnerabilities Step 12: Identify socioeconomic drivers of vulnerabilities
4. Adaptation assessment	Step 13: Identify all potential adaptation options Step 14: Conduct consultations Step 15: Conduct economic analysis Step 16: Prioritize and select adaptation option(s)
5. Implementation arrangements	Step 17: Establish arrangements for implementation Step 18: Identify needs for technical support and capacity building
6. Monitoring and evaluation	Step 19: Design monitoring and evaluation plan including suitable performance indicators Step 20: Feedback into policymaking and knowledge management processes

Source: ADB. 2011. *Guidelines for Climate Proofing Investment in the Transport Sector*. Manila.

Experience with Climate Risk and Vulnerability Assessment in Transport Projects

Table 18: Climate Risks and Vulnerabilities

Project Name	Identified Exposure and Vulnerability
Main Roads and Bridges	
Bhutan: South Asia Subregional Economic Cooperation Road Connectivity Project	Key climate risks for the project have been identified as projected increases in temperature and precipitation. As a result of temperature increase, the asphalt pavement is likely to bleed. Regular thermal expansion and contraction will have significant impact on bridge structures. Rainfall increase may lead to blockage of surface drains, damage to pavement surfaces, increase in slope failure and landslides, and damage to smaller bridges from flash floods.
Viet Nam: Central Mekong Delta Region Connectivity Project	The project was deemed vulnerable to projected increases in precipitation (with the ensuing increase in peak flood events) and sea level rise, which could limit navigation clearance under smaller bridges. A hydrological model was used to estimate changes
Papua New Guinea Bridge Replacement for Improved Rural Access Project	A number of climate risks and sensitivity factors were identified. It was found that those bridges located on high-dependency highways, particularly those with current susceptibility to flooding, landslides, and damage, were more vulnerable to climate change. In particular it was found that the bridges located on the New Britain Highway were more vulnerable, and many sites in New Britain that were identified as critical routes for socioeconomic purposes were found to be more sensitive to climate-related impacts.
Uzbekistan: Central Asia Regional Economic Cooperation Corridor 2 Road Investment Program	Changes in temperature may cause the failure of traditional expansion joints.
Remote Rural Roads	
People's Republic of China: Inner Mongolia Road Development Project	The analysis indicated that permafrost in the project area will probably remain discontinuous. Permafrost in the southern part of the project area will likely be under considerable threat of degradation by the end of the century, hence creating a high risk of thaw during summer.
Cambodia Rural Roads Improvement Project	The main vulnerabilities identified included damage to the road infrastructure due to increased flooding.
Solomon Islands Second Road Improvement Project	Due to rising sea levels, the risks for road infrastructure are flooding due to overtopping of rivers over river crossings, permanent subsurface flooding due to saltwater intrusion into groundwater, higher erosion rates of construction materials subject to higher salinity, and increased siltation of river beds. These risks can in turn result in weaker slopes, river beds, and coastal zones. The increased sedimentation can suffocate corals and mangroves, which act as natural protection for the coastline against storms.
Timor-Leste Road Network Development Sector Project	Key risks identified for transport infrastructure were drought and flooding. Drought could cause shrinkage of the expansive embankment materials. Flooding can cause prolonged presence of water on the road surface, saturation of the ground, nonpassable submerged roadway, scouring of embankment slope, and damaged sub-base (wet subgrade level).
Urban Transport	
Viet Nam: Ho Chi Minh City Rapid Transit Line 2 Investment Program	With the threat of projected extreme rainfall and sea level rise in Ho Chi Minh City, the Rapid Transit Line 2 will be vulnerable to normal and extreme floods during construction and operation.
Waterways and Ports	
People's Republic of China: Anhui Intermodal Sustainable Transport Project	Specific risks associated with estimated increases in flooding for the inland waterway include the erosion of embankments and the possibility of navigation channels becoming non-navigable. Asphalt pavement may be subject to surface cracking due to extreme hot or cold weather and risk of landslide and flooding may increase due to extreme precipitation events.
Cook Islands Avatiu Port Development Project	The analysis of the information generated from the climate modeling indicated that the project may be adversely affected by climate. During cyclone events, there is a high risk that the wharf face will be overtopped.

Table 19: Analysis and Selection of Adaptation Options

Project Name	Analysis and Selection of Adaptation Options
Main Roads and Bridges	
Bhutan: South Asia Subregional Economic Cooperation Road Connectivity Project	A number of adaptation options were identified for various components of the road project including improvements in the concrete mix for drainage structures and walls, in the design of masonry wall, the frequency of cross drainage structures, the size of Hume pipes, and the design of drains and bridge protection walls.
Viet Nam: Central Mekong Delta Region Connectivity Project	For road embankments, the height was increased by 0.3 meters (m) for roads located in low-lying areas. For the long term (beyond 30 years), a recommendation was made for a second phase of adaptation as required as part of further maintenance and road upgrade. For minor bridges, an increase of 0.3 m was made to mitigate risks of submergence of the bridge bearings. For the other components, including the two major bridges, the existing designed structures were found to be resilient to climate change.
Papua New Guinea Bridge Replacement for Improved Rural Access Project	A number of adaptation measures were identified to address the risk of scouring, impacts from debris and logs, and flooding. However the measures were at a general level and further confirmation and identification of specific measures during the project concept and design stages were recommended.
Uzbekistan: Central Asia Regional Economic Cooperation Corridor 2 Road Investment Program	Plastic joint profiles made of ethylene-propylene-diene monomer (EPDM) rubber replaced traditional cement-concrete pavement joints
Remote Rural Roads	
People's Republic of China: Inner Mongolia Road Development Project	The road upgrades that are proposed through this project have a design life of 25 years. Projections indicate that climate change impacts on permafrost are unlikely to be observed until the end of the century. It was recommended that the actual regional effects of climate change be monitored and taken into account in future planned major maintenance. If it becomes evident that projections do not reflect the actual situation then it be may be necessary to consider improving stability and drainage of road infrastructure during major maintenance. There may also be a need for an increased frequency of routine maintenance.
Cambodia Rural Roads Improvement Project	The engineering measures taken were elevation of the road in flood-prone areas and changing the selection of subgrade materials to withstand higher moisture content. Nonengineering measures include increasing the resilience of the road infrastructure through green planning and implementation of ecosystem-based adaptation strategies.
Solomon Islands Second Road Improvement Project	Specific climate adaptation measures included in the project are watercourse crossings designed to accept higher flood levels and debris loads, bridge abutments anchored to piled foundations to minimize collapse of abutments and approach roads, river training works to minimize the deviation of watercourses from their original paths, and strengthened protection of approach roads with additional protection and river training works.
Timor-Leste Road Network Development Sector Project	Potential climate adaptation measures identified to mitigate the risks were replacement of embankment with suitable nonexpansive materials, use of flexible surface on pavement and shoulder, and removal of unsuitable ground materials.
Urban Transport	
Viet Nam: Ho Chi Minh City Rapid Transit Line 2 Investment Program	Identified adaptation measures included the design of a functioning warning system to initiate flood mitigation procedures, ensuring that the critical electrical and mechanical operating systems can be isolated from water. The revised design of the project also provides capacity for the tunnel entrances to be quickly and easily closed by means of waterproof flood gates in the event of rising floodwaters so as to prevent the flooding of underground stations.
Waterways and Ports	
People's Republic of China: Anhui Intermodal Sustainable Transport Project	Several adaptation options were identified including embankment protection, navigation stoppage due to adverse weather events, and development of new port and storage facilities. Ecosystem restoration was also recommended as a long-term adaptation option to reduce flooding risks and enhance resilience of the project. The environmental impact assessment recommended that the detailed project design be reviewed to ensure that scour protection on bridge piers and re-formed channel banks was appropriate for more frequent and higher magnitude flows. For the road infrastructure, it was recommended that detailed design take account of increased frequency of extreme weather events and adopt appropriate protective measures such as vegetation cover, geotextiles, settling basins, permeable paving, infiltration ditches, stepped slopes, riprap, crib walls, retaining walls, and ditches to manage and reduce the speed of surface runoff.
Cook Islands Avatiu Port Development Project	The wharf wall face was designed with additional steel and increased capacity of anchors to allow the wharf face and adjacent pavement to be raised by 0.5 m in the future if and when required.

Table 20: Types of Climate Proofing Decision

	Climate Proof Now	Make Project Climate Ready	Do Nothing
Main Roads and Bridges			
Bhutan: South Asia Subregional Economic Cooperation Road Connectivity Project	√		
Viet Nam: Central Mekong Delta Region Connectivity Project	√[a]		√[b]
Papua New Guinea Bridge Replacement for Improved Rural Access Project			√
Uzbekistan: Central Asia Regional Economic Cooperation Corridor 2 Road Investment Program	√		
Remote Rural Roads			
Inner Mongolia Road Development Project			√
Cambodia Rural Roads Improvement Project	√		
Solomon Islands Second Road Improvement Project	√		
Timor-Leste Road Network Development Sector Project	√		
Urban Transport			
Viet Nam: Ho Chi Minh City Rapid Transit Line 2 Investment Program	√		
Waterways and Ports			
Anhui Intermodal Sustainable Transport Project			√
Cook Islands Avatiu Port Development Project		√	

[a] connecting road; [b] major bridges

Table 21: Estimated Costs of Climate Proofing

Project Name	Cost of Adaptation
Main Roads and Bridges	
Bhutan: South Asia Subregional Economic Cooperation Road Connectivity Project	$1.6 million, or 5.2% of total project cost
Viet Nam: Central Mekong Delta Region Connectivity Project	$4.5 million, or 0.5% of total project cost
Papua New Guinea Bridge Replacement for Improved Rural Access Project	No estimate
Uzbekistan: Central Asia Regional Economic Cooperation Corridor 2 Road Investment Program	The adaptation measure costs $65,000 less than traditional approach.
Remote Rural Roads	
Inner Mongolia Road Development Project	No estimate
Cambodia Rural Roads Improvement Project	$5.4 million, or 8.3% of total project cost
Solomon Islands Second Road Improvement Project	$2.1 million, or 8.7% of total project cost
Timor-Leste Road Network Development Sector Project	No estimate
Urban Transport	
Viet Nam: Ho Chi Minh City Rapid Transit Line 2 Investment Program	$8 million, or 0.5% of total project cost
Waterways and Ports	
Anhui Intermodal Sustainable Transport Project	No estimate
Cook Islands Avatiu Port Development Project	$0.8 million, or 4.4% of total project cost

Conclusion

The experiences presented in this report, while covering only a subset of all CRVAs conducted in ADB across all sectors over recent years, clearly highlight that CRVAs

- can be undertaken within a reasonable time frame and with limited resources;
- provide a more comprehensive understanding of how an investment project may be affected by projected changes in key climate parameters;
- can offer, in most cases, a large menu of climate proofing measures, both engineering and nonengineering;
- can increase the climate resilience of an investment project without requiring significant changes to project design; and
- do not necessarily require large incremental costs to project investment.

Challenges due to inadequate information, capacity, and resources have certainly been encountered. The financing of CRVAs has often been challenging, and capacity and resource constraints have often been encountered when recommending climate proofing measures to DMCs. While some of these challenges are currently being addressed, others will best be addressed in close collaboration with other development partners. ADB remains committed to ensuring that CRVAs inform the design of investment projects at risk for the greater benefit of its DMCs. The key challenges and opportunities identified through this review provide direction for future efforts to mainstream climate adaptation for the transport and environment communities.

IV. Final Remarks :

CC Finance Tracking

- Mitigation is rather clear, but adaptation is less receptive
- CC tracking still not been fully practiced : matter of awareness
- Good practice is available and can be routinized
- Need transport sector dedicated training on adaptation
- Keep consciousness on adaptation and timing of tracking is important
- Sector division + Front Office + SDCC can work together

Meeting STI-OP Target

- STI-OP is more receptive than before
- SDCC-TRA provide support for project development, STI priority area support for projects (processing + implementation)
- SDCC-TRA staff will be expanded to support RDs (Rail, Asset management
- RETA is in preparation for funding

Thank You

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