

# Transportation system adaptation and finance

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# Agenda of presentation

- ▶ Pacific context - e mobility
- ▶ Definitions - Financials
  - ▶ Adaptation finance
  - ▶ Mitigation finance
  - ▶ Loss & damage
  - ▶ Conservation finance
  - ▶ Infrastructure finance
- ▶ 3 Challenges to e-mobility adaptation in the PICs
- ▶ Some investments by GEF, GCF, Bilateral Partners
- ▶ Ways forward
- ▶ Conclusion

# A. Future of Transportation is in -e mobility

- ▶ It's a sustainable way to reduce carbon emissions and air pollution. E-mobility is the use of electric vehicles (EVs) and the infrastructure that supports them.
- ▶ Why e-mobility is the future?
  - **Reduces emissions:** EVs produce zero tailpipe emissions, which helps fight air pollution and global warming.
  - **Decreases reliance on fossil fuels:** EVs use electric motors instead of internal combustion engines (ICE).
  - **Improves air quality:** EVs can improve air quality in urban areas.
  - **Government support:** Governments are offering incentives and regulations to encourage EV adoption.

# Future of Transportation is in -e mobility

## ▶ What's happening now?

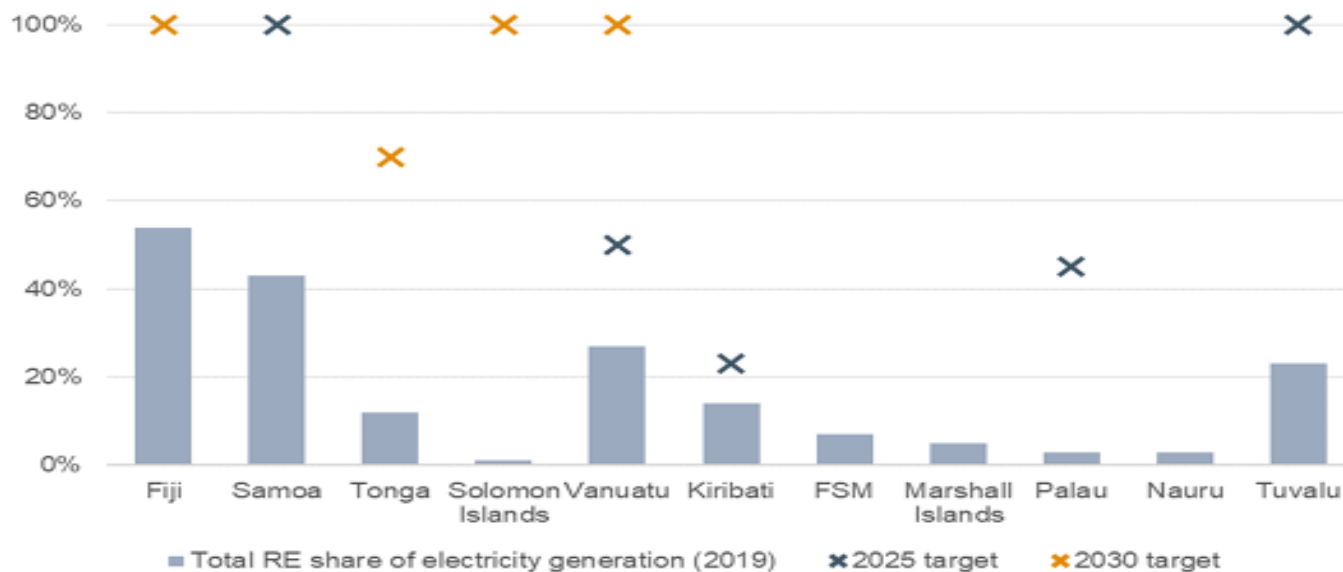
- The number of EVs on the road is growing rapidly.
- The number of publicly accessible EV chargers is increasing.
- Governments are planning to phase out ICE vehicles.
- Cities are embracing electric buses to reduce their environmental impact.

## ▶ What's next?

- More EVs will be integrated into ride-sharing services and public transportation.
- Charging infrastructure will expand.
- Battery technology will improve.
- The cost of EVs will decrease.

# Pacific Context : E mobility Framework & Road map

RE targets in Pacific Island Countries



Pacific Island Countries – E-Mobility Policy Framework and Roadmap

## ► **PACIFIC VULNERABILITY ( Main reasons for E- Mobility)**

The Pacific Islands are highly vulnerable to natural disasters and climate change, and are among the most disaster-prone regions in the world:

- 1. Natural disasters** - The Pacific Islands are prone to many natural disasters, including cyclones, floods, earthquakes, tsunamis, and volcanic eruptions. These disasters can have devastating impacts on livelihoods, especially for the poorest and most vulnerable people.
- 2. Climate change** -Climate change is posing increasingly severe threats to the Pacific Islands, including more frequent and longer droughts, increased severity of tropical cyclones and typhoons, flooding, coastal erosion, and salinization of arable land and safe drinking water sources.
- 3. Limited means to prepare and respond** - The Pacific Islands have limited means to prepare and respond to natural disasters and climate change.
- 4. Social sectors** -Disasters impact the social sectors, such as education, health, housing, and culture, which can exacerbate inequalities of income and opportunity.
- 5. Ocean resources** -Pacific islanders have a high dependence on their ocean resources for food security, livelihoods, and economic revenue.

## **B. Some definitions**

### **Adaptation Finance: Definition**

**Climate adaptation finance is the cost of activities undertaken to lower the current and expected risks to or vulnerabilities of the project, or community, economy or the environment, posed by climate change.**

# Mitigation Finance : Definition

- ▶ **Mitigation finance** seeks to significantly reduce and/or avoid greenhouse gas and other climate-warming emissions while improving livelihoods.



# Loss & Damage

- ▶ Loss and damage is a concept that describes the negative effects of climate change that occur despite efforts to mitigate and adapt:

## Definition

- Loss and damage refers to the unavoidable and irreversible impacts of climate change.

## Types

Loss and damage can be categorized into economic and non-economic types:

1. **Economic loss and damage:** Quantifiable impacts, such as damage to infrastructure or reduced crop yields
2. **Non-economic loss and damage:** Impacts that are not easily traded in markets, and typically harder to measure in monetary terms, such as loss of culture, displacement and way of life.

# Conservation Finance

- ▶ **Conservation finance** is a broad term that encompasses the many tools and strategies for securing the funds needed to implement and sustain a given conservation initiative or project.
- ▶ **Carbon credits from forestry** or other land-use projects are among the most widely used for mobilizing conservation finance. Investments in environmental commodities, such as carbon credits, ecosystem services such as wetland restoration credits, or more conventional food and fiber commodities are gaining traction.

# Infrastructure Finance

- ▶ **Infrastructure finance** frequently involves **Public-Private Partnerships**, or PPPs, where government entities call upon private lenders to help finance the construction of essential national infrastructure such as fiber-optic networks, water treatment plants, or high-speed rail lines.



## Climate Change Impacts and Adaptation for Transport Networks and Nodes

Transport infrastructure and systems are at the forefront the extreme climate change events - which are projected to increase in frequency and intensity as the years go by.



# Transportation at the fore front of climate change





# Vulnerability to climate change



Not only impacted but they contributed- Climate change



# Transportation system adaptation and finance

- ▶ **Refers to the actions and funding required to make transportation systems more resilient and reduce their environmental impact**
- ▶ **[ Normal funding + extra....]**



# COP28 “Dubai”- Just transition

- ▶ The just transition at COP28 was a focus on transitioning to a low-carbon economy while creating decent jobs and protecting workers. The goal was to ensure that the transition was equitable and inclusive, leaving no one behind.
- ▶ **What was discussed at COP28?**
  1. **Energy:** The transition to clean energy sources, including renewable energy
  2. **Workforce:** The creation of good jobs and the development of skills
  3. **Social protection:** The use of social protection to mitigate the impacts of the transition
  4. **International cooperation:** The need for international cooperation to achieve the goals of the Paris Agreement
  5. **Innovation:** The need for innovation to drive economic benefits through green investments
  6. **Finance:** The need to transform financial systems and integrate just transition into policies

# Cop29 - Climate Finance COP

- ▶ The UN Climate Change Conference (COP29) in Baku, Azerbaijan agreed to a new climate finance goal of raising at least \$1.3 trillion per year by 2035. This goal is part of the Baku Climate Unity Pact, the main outcome of COP29.

- ▶ **Goal details**

- The goal includes a "core" financing of at least \$300 billion annually by 2035
- The goal also includes an "additional layer" of up to \$1.3 trillion, which will primarily come from private financing
- The goal is to triple the amount of finance provided to developing countries, from \$100 billion annually to \$300 billion annually by 2035

- ▶ **Purpose**

- ▶ The goal aims to help countries adapt to and respond to the impacts of climate change. It also aims to help countries protect their people and economies from climate disasters.
- ▶ Received a lot of critics from developing countries

## Adaptation Finance: Recap of Key Elements

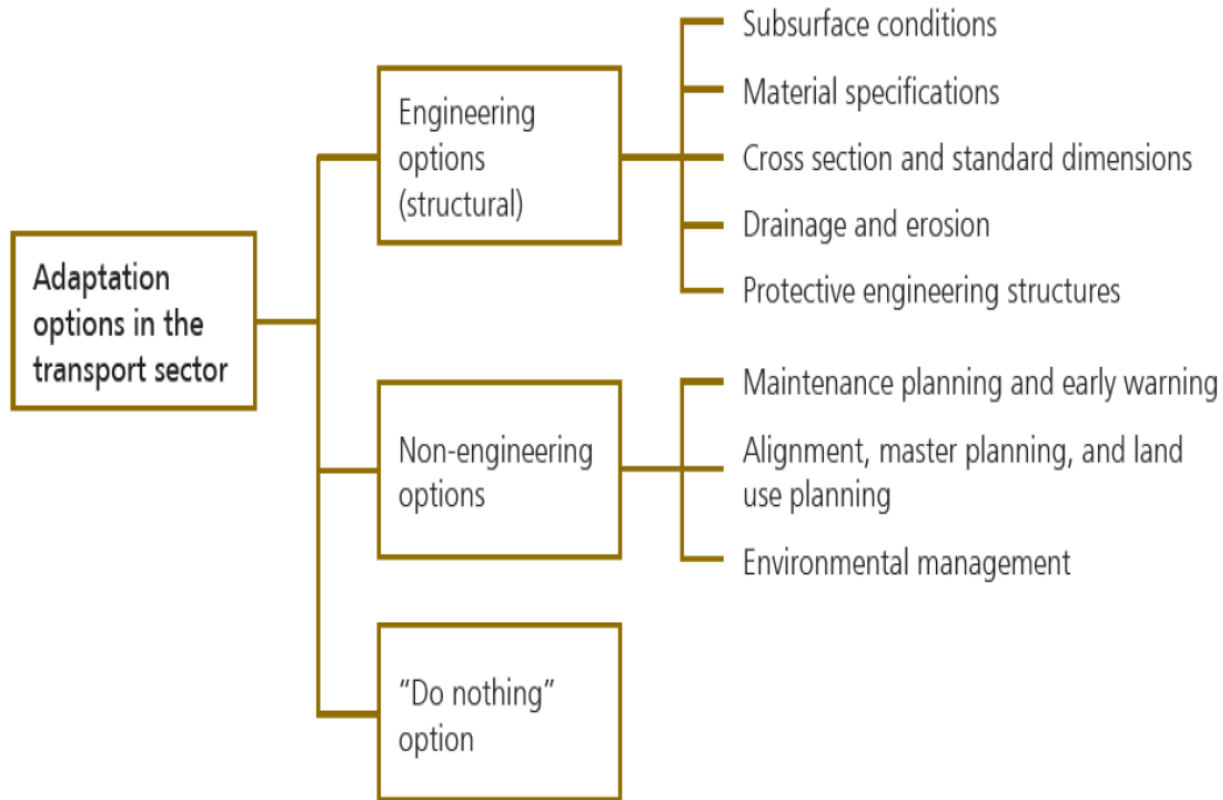
A transport sector project activity is eligible for inclusion in project adaptation finance if we can answer YES to the following questions:

1. Is the project at demonstrated risk from the impact(s) of climate change? (establishing the climate vulnerability context of the project);
2. Is there an explicit statement of intent to address climate vulnerability through project design and/or activities?
3. Is there a clear and direct link between the climate vulnerability context and specific project activities? (Are they logical responses to the climate risks identified?)

## **Examples of Potentially Eligible Adaptation Activities in the Transport Sector**

- Modifications in project location and/or scale (e.g., changes in road alignment to avoid flooding, SLR)
- Modifications in engineering materials and designs (e.g., pavement stiffness; drainage capacity)
- Alternative technology choices
- Biophysical- and Ecosystem-based measures (e.g., bio-engineering for slope stabilization)
- Revised National, sectoral design standards and protocols (including re-estimation of design event magnitudes)
- Training and Capacity Development

Figure 1 Nature of Adaptation Options in the Transport Sector



Source: ADB.

## Road Infrastructure Impacts, Design Parameters I/II

Climate Event	Potential Impacts	Vulnerable Infrastructure Design Parameters
<b>Temperature</b>	<p><b>Extended hot weather can cause:</b></p> <ul style="list-style-type: none"> <li>• Pavement deterioration due to liquification of bitumen</li> <li>• Heating, thermal expansion of bridges</li> <li>• Bucking of joints in steel structures</li> </ul>	<p><b>Pavement:</b></p> <ul style="list-style-type: none"> <li>• use of stiff bitumen to withstand heat</li> <li>• control of soil moisture</li> <li>• maintenance planning</li> </ul> <p><b>Bridges:</b></p> <ul style="list-style-type: none"> <li>• selection of material</li> <li>• provision of expansion joints</li> <li>• corrosion protection</li> </ul>
<b>Rainfall</b>	<p><b>Increased intensity of precipitation:</b></p> <ul style="list-style-type: none"> <li>• Increased flood magnitude</li> <li>• Affect drainage, pavement &amp; driving conditions, visibility</li> <li>• Affect bridge, culvert clearances,</li> <li>• Scouring of foundations</li> <li>• Trigger landslides, road blockages</li> </ul>	<p><b>Bridges and culverts:</b></p> <ul style="list-style-type: none"> <li>• Revise estimated design flood magnitude</li> <li>• Improve foundation and bank protection</li> </ul> <p><b>Drains:</b></p> <ul style="list-style-type: none"> <li>• Revise design discharge</li> <li>• Size, shape, slope of drain</li> </ul> <p><b>Mountain roads:</b></p> <ul style="list-style-type: none"> <li>• Slope protection</li> <li>• Subsurface, catch drains</li> </ul> <p><b>Pavement:</b></p> <ul style="list-style-type: none"> <li>• Increase road surface camber</li> <li>• Increase frequency of maintenance</li> </ul>

## Road Infrastructure Impacts, Design Parameters II/II

Climate Event	Potential Impacts	Vulnerable Infrastructure Design Parameters
<b>Storm, Storm Surge</b>	<ul style="list-style-type: none"> <li>• Rainfall and wind create flooding, inundation of embankments</li> <li>• Disrupt traffic safety, emergency evacuation operations</li> <li>• Affect traffic boards, information signs</li> </ul>	Drains and cross-drains: capacity enhancement, slope Road embankment: increase height Road signs: wind load, structural design, foundation, corrosion protection
<b>Sea Level Rise (SLR)</b>	<ul style="list-style-type: none"> <li>• Rise in sea level (in combination with storm surge, large waves) will affect coastal roads</li> <li>• Potential need to re-align or abandon roads in affected areas</li> </ul>	<b>Coastal roads:</b> <ul style="list-style-type: none"> <li>• Protection walls</li> <li>• Additional warning signs</li> <li>• Re-alignment of road sections to higher areas</li> <li>• Edge strengthening</li> </ul>

Source: Regmi and Hanaoka (2011) Survey on Impacts of Climate Change on Road Transport Infrastructure and Adaptation Strategies in Asia. Environ Econ Policy Studies 13: 21-41.

# What are Typical Costs of Climate-Proofing Transport Sector Infrastructure?

- ADB (2016) in *Meeting Asia's Infrastructure Needs*, estimates that climate change adaptation adds **7%** to the costs of transportation infrastructure (based on 7.8% for road transport, 0.6% for other transport (rail, airport and seaport)).
- Climate adaptation as a percent of ADB's total internal finance for the period of reporting (2011 – 2017) has been around **5%** (4.85%), inclusive of all sectors.
- For the Transport sector, climate adaptation finance has averaged **5.2%** of total ADB Transport finance for the period 2015-2017.
- In the IDA16 Special Themes report (2013), World Bank staff estimated climate proofing costs of around **6%** of the total value of IDA investment projects per year on the basis of the findings of the EACC study (2010).
- While reasonably consistent, these are portfolio percentages and do not necessarily provide guidance on individual projects.



# Calculation of Climate Adaptation Finance

Total ADB Financing:	\$149.0 million
Total financing:	\$203.5 million
Assessed climate risks to the project:	Medium
Climate change adaptation finance:	\$27.0 million (18%)

Basis for calculation: difference in costs between baseline (no climate change) and climate change-adjusted design requirements.

**Statement of Intent (RRP):** “The climate change scenarios indicate a high risk to the project outcome but subproject design will incorporate adaptations to mitigate the risk level to medium. Additional climate change costs will be quantified within the subproject detailed designs. The climate adaptation measures follow the government’s project construction and implementation procedures. Climate mitigation is estimated to cost \$3 million and climate adaptation is estimated to cost \$27 million, both 100% financed by ADB.”

## 3 Primary Challenges

1. **Climate Change** - The transport sector is vulnerable to climate change, which can cause physical damage to infrastructure.
  - ▶ Some general examples of Climate Change impacts across the Pacific islands regions:

## Some common Impacts of CC on Infrastructure

- **Roads and bridges** - Higher temperatures and extreme weather events are causing roads and bridges to deteriorate faster.
- **Coastal infrastructure** - Sea-level rise and increased **storm** activity are putting coastal infrastructure at risk of flooding and erosion.
- **Energy infrastructure** - Climate change can damage energy infrastructure, especially in extraction, generation, and transmission.
- **Buildings** - Extreme weather events like floods, storms, and heatwaves can cause substantial structural damage to buildings.
- **Construction** - Unpredictable weather affects construction timelines and budgets.
- **Airport infrastructure** - Climate change can cause disruptions to airport operations, such as increased flight delays and infrastructure damage.

# How to address CC impact on Infrastructure

1. **Adaptation** - Incorporate adaptation into development activities to reduce the consequences of climate change. This can include building the resilience of transport networks, such as roads, ports, and airports.
2. **Mitigation** - Reduce the rate of climate change through renewable energy, energy efficiency, and reducing emissions from deforestation and land use.
3. **Infrastructure planning** - Support national infrastructure planning programs to ensure investments are efficient and effective.
4. **Infrastructure maintenance** - Support efforts to improve infrastructure asset maintenance and rehabilitation.

## How to address CC impact on Infrastructure

5. **Commercialization of utilities** - Support efforts to commercialize utilities to improve their self-funding.
6. **Local skills and technology** - Support efforts to harness diverse local skills and technology.
7. **Disaster risk financing** - Use parametric triggers to determine insurance payouts for disasters such as cyclones and earthquakes.
8. **Disaster preparedness** - Support programs like the Pacific Humanitarian Warehousing Program (PHWP) to develop disaster preparedness and resilience.

# Challenges

**2. Financing** - There is a gap between the need for financing and the availability of funds to support the transition to sustainable transportation,

- ▶ Some examples of Financing Gap

# “The transport sector faces a significant financing gap, with estimates ranging from \$10 trillion to trillions per year”

- ▶ **1. Global Investment Gap** - The [Global Infrastructure Outlook - A G20 INITIATIVE](#) estimates that the transport sector will need \$50 trillion in investment by 2040, but the investment gap is estimated at \$10 trillion.
- ▶ **2. Annual Financing Gap** - The ITF estimates that governments face an annual transport infrastructure financing gap of US\$244 to US\$944.
- ▶ **Asian Financing Gap** - The Asian Development Bank (ADB) estimates that Asia will need to invest approximately US\$1.7 trillion annually in infrastructure through 2030.

► **Some ways to finance the transport sector include:**

1. **Public financing:** Fuel and road taxes can provide finance for public transport infrastructure.
2. **Cross financing:** The cross financing of public services can subsidize public transport.
3. **Campaigns:** Coalitions of workers and civil society organizations can campaign for remunicipalisation.
4. **Direct democracy:** Electorates can vote for the funding of public transport.



- **Climate financing**

In 2021-2022, the transport sector received \$336 billion of the total global climate financing flows of \$1.27 trillion each year. Most of this investment occurred in developed countries, with less than 3% going to least developed countries.

Pacific Islands	Source of Finances
1. Fiji	GEF
2. Vanuatu	GEF
3. Solomon Islands	GEF
4. Nauru	PRC
5. Tuvalu	UNDP/GEF/ADB
6. Marshal Islands	DP/USAID
7. Kiribati	DP
<b>8. Cook Islands</b>	<b>DP</b>
9. Palau	DP
10. Niue, FSM etc	DP

# GEF 8 investment in e-mobility

GEF has provided funding to the countries enlisted below to pilot or upscale e-mobility in respective countries: [ **Child Project**]

1. Fiji Islands
2. Vanuatu
3. Solomon Islands
4. Azerbaijan
5. Zimbabwe
6. Senegal
7. Zambia

# Green Climate Fund

GCF has provided funding to the countries enlisted below to pilot or upscale e-mobility in respective countries:

1. Armenia
2. Georgia
3. Indonesia
4. Kazakhstan
5. Kyrgyz Republic
6. Nepal
7. Uzbekistan

# Challenges

- ▶ **Project delivery** - Traditional project delivery methods can be slow and reactive, and may not consider climate adaptation needs

## Project delivery challenges

1. **Scope creep** - When the requirements of a project change after they've been agreed upon. This can be caused by poor communication, inaccurate scheduling, or changes in client priorities.
2. **Risk management** - Projects can encounter risks like client dependencies, regulatory changes, and scope creep. To manage these risks, you can establish a risk management framework to identify, analyze, and respond to them.
3. **Communication** - Poor communication can cause confusion and misalignment among team members.
4. **Lack of accountability** - Accountability prevents procrastination and ensures work gets done.
5. **Budget constraints** - Budget constraints are a common challenge in modern business.
6. **Unrealistic deadlines** - Setting unrealistic deadlines can lead to stress, burnout, and compromised project quality.

# Adaptation and finance strategies

1. **Research** - Research can help identify vulnerabilities and inform the development of adaptation strategies
2. **Stakeholder engagement** - Engaging stakeholders can help build consensus and ensure that adaptation strategies are relevant and practical.
3. **Financial institutions** -Collaborating with financial institutions can help increase the availability of climate finance.
4. **Infrastructure investments** -Investing in infrastructure can help build resilience and reduce emissions
5. **Information systems**- Providing early warning systems and other information systems can help communities prepare for and respond to extreme events

# Ways to support e-mobility promotion in the PICs

1. **Government incentives** -Governments can offer tax breaks, subsidies, and reduced registration fees for EVs.
2. **Grid expansion** - Expanding the grid to support EVs can also expand the use of renewable energy, which can help decarbonize the electricity sector.
3. **Charging infrastructure** - Companies like Leaf Capital Pte Ltd are working to establish charging networks in the Pacific.
4. **Standards and regulations** -The Pacific Centre for Renewable Energy and Energy Efficiency (PCREEE) is working to identify relevant international standards and regulations for EVs.
5. **Workshops** -The PCREEE has hosted workshops to share experiences and identify areas for cooperation on e-mobility.
6. **Collaboration** - The National Renewable Energy Laboratory (NREL) is collaborating with island nations to support their e-mobility goals.

# Benefits

- **Reduced emissions** - Adaptation and finance strategies can help reduce greenhouse gas emissions.
- **Improved services** - Adaptation and finance strategies can help improve the quality of services, especially in areas that are growing rapidly or are vulnerable to climate change.
- **Increased resilience** - Adaptation and finance strategies can help transportation systems withstand disruptions and recover more quickly.



# Conclusion

1. E- mobility well fitting to the Pacific Islands context (Solar Energy]
2. Shorter distances to office, market and home
3. The Pacific region has the potential to produce more solar energy
4. Core problem - Could contribute towards GHG emission
5. Address - Environmental benefits- This can improve air quality and reduce the risk of respiratory, visual, and cardiovascular diseases.
6. Job Creation - Job opportunity for local/regional population
7. Ease the government constraint budget to other priorities of the government.
8. Build resilient to climate change

# References

- ▶ ADB Adaptation Finance Report
- ▶ GEF Announcements
- ▶ GCF News letters
- ▶ PCREEE Reports
- ▶ Solomon Islands e-mobility road map policy draft

Source: Regmi and Hanaoka (2011) Survey on Impacts of Climate Change on Road Transport Infrastructure and Adaptation Strategies in Asia. Environ Econ Policy Studies 13: 21-41.