Adapting road infrastructure to climate change: overview of IRF members’ practice around the world

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Deputy Director General & Environment Expert
What is the IRF?

- Global organisation supporting the road sector
- Not-for-profit non-governmental organisation
- Established in 1948
- Consultative status with the UN, BSEC, EU, CEN

Mission: be the voice of road infrastructure sector
Vision: improve road networks worldwide
Values: commitment to safe, smart & sustainable roads
IRF Programme Centers and Chapters

- Geneva & Washington
- India Chapter- Delhi
- Russia Chapter – soon
- China Chapter
Members worldwide

More than 490 members in 115 countries
Who are our Members?

- Governments
- Contractors
- Consultants
- Materials suppliers
- Equipment manufacturers
- Research institutions and universities
- Associations
What do we do?

- Networking and contacts building
- Conferences, seminars, workshops
- Lobbying & Advocacy
- Dissemination of knowledge
- Education and training
- World Road Statistics
Focus Areas
- Environment
- Road Finance & Economics
- Road Safety
- Intelligent Transport Systems

Projects
- CHANGER: Greenhouse Gas Calculator
- gTKP: global Transport Knowledge Practice
- inaroad: Innovation Award for Road Transport in Developing Countries
- IRF World Road Statistics

Advocacy
- Various logos and partnerships

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Focus Areas

Projects

Advocacy

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• A tool to assess GHG emissions
• Green Public Procurement
• Sustainability rating systems
IRF Environment Committee

- Platform to share knowledge
- A forum for case-studies
- Identify and test best practices
- Clearing house for R&E
- Provide hands-on expert advice
Launch events:

- Geneva
- Washington
- New Delhi
International Road Federation
Innovative Practices for Greener Roads

Moving Towards Green Road Infrastructure
CASE STUDIES AND LESSONS LEARNED

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Questions to ask in developing an adaptation strategy

- Which changes are most relevant?
- What are the hazards (e.g., flooding, storm surge coupled with sea level rise)?
- Which assets may be affected?
- How severe must a hazard be before action is required? Can thresholds be identified?
- How likely is it that a hazard will exceed the threshold, when, and where?
- What level of risk is acceptable?
- What level of investment (capital and operating) is needed to maintain different levels of service?
- Are there critical levels of service needed to protect health and safety?
- Who is empowered to make these judgments and decisions?
- What are the risks in case of no action?
- If action is necessary, how will investment priorities be determined?
- Who will make the necessary investments, and how will they be funded?
Vulnerability

Risks

Resilience

Uncertainty
Framework for adaptive decision policy making

I. Stage Setting

- Objectives
- Constraints
- Options set
- Definition of success

II. Assembling a basic policy

- Necessary conditions for success
- Policy Actions

III. Specifying rest of policy and monitoring

- Vulnerabilities
  - Certain
  - Uncertain
- Signposts
- Triggers
- Mitigating actions
- Hedging actions

IV. Adapting the policy

- Others' actions
- Unforeseen events
- Changing preferences

- Reassessment
- Corrective actions
- Defensive actions

Dr A. Rahman

Cambridge Systematics

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Examples of IRF Members’ work

- Improving the resilience of transport Networks (New Zealand Transport Agency)
- Climate Change Framework (ARRB – Australia)
The Adapting to Climate Change Tool (AtCCT)

- Understand the likely risks posed by climate change
- Develop adaptation responses to reduce the impact of these risks.
- For network owners, designers and decision-makers
- Applicable across regions & sectors
Methodology

1. Identifying projected *climate changes* for the region;
2. Developing a local risk-based assessment of the network’s *vulnerabilities*;
3. Identifying potential *adaptation responses*;
4. Identifying the *most effective* adaptation responses based on a ‘multi-criteria analysis’;
5. Developing and implementing an *Adaptation Action Plan*.

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### Risk and probability assessment

- **Risk impact**
- **Probability**
- **Influence**

#### Table 1: Climate Change Risk Register

<table>
<thead>
<tr>
<th>Impact</th>
<th>Risk Score (RxPxI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pavement failure</td>
<td>18</td>
</tr>
<tr>
<td>Prolonged and/or more rapid growth of the soft estate</td>
<td>18</td>
</tr>
<tr>
<td>Lack of capacity in the drainage system and flooding</td>
<td>18</td>
</tr>
<tr>
<td>Heat damage to structures</td>
<td>12</td>
</tr>
<tr>
<td>Water scour to structures</td>
<td>12</td>
</tr>
<tr>
<td>Heat damage to pavement surface layers</td>
<td>12</td>
</tr>
<tr>
<td>Subsidence and heave</td>
<td>12</td>
</tr>
<tr>
<td>Less disruption by snow and ice</td>
<td>12</td>
</tr>
<tr>
<td>Landslips</td>
<td>8</td>
</tr>
<tr>
<td>Embankment erosion</td>
<td>8</td>
</tr>
<tr>
<td>Tree damage</td>
<td>8</td>
</tr>
<tr>
<td>Increased network use by cars and bikes as people avoid public transport during hot weather</td>
<td>4</td>
</tr>
<tr>
<td>Fire</td>
<td>3</td>
</tr>
<tr>
<td>Increased recreation and leisure-based travel</td>
<td>2</td>
</tr>
<tr>
<td>Plant and animal species changing. Shifting patterns of migration</td>
<td>2</td>
</tr>
</tbody>
</table>

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### Table 2: Adaptation Action Plan

<table>
<thead>
<tr>
<th>Adaptation Response</th>
<th>Score (Out of 3)</th>
<th>Timescale for implementation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carry out a risk assessment to identify which structures are most at risk from climate change and recommend to inspection/maintenance regimes.</td>
<td>2.75</td>
<td>Immediate</td>
</tr>
<tr>
<td>Undertake a risk assessment to determine vulnerable drainage assets and establish a prioritised scheme for maintenance.</td>
<td>2.75</td>
<td>Immediate</td>
</tr>
<tr>
<td>Carry out inspections to assess which parts of the network are most at risk from excessive heat.</td>
<td>2.6</td>
<td>By 2012</td>
</tr>
<tr>
<td>Carry out flood studies to identify the most vulnerable areas of the network and establish actions to reduce the level of risk.</td>
<td>2.55</td>
<td>By 2014</td>
</tr>
<tr>
<td>Invest in asset management reviews and carry out drainage surveys to improve the knowledge of drainage assets, hydraulic capacity and asset ownership.</td>
<td>2.25</td>
<td>Immediate</td>
</tr>
</tbody>
</table>

### Multi-criteria analysis (MCA)

- **Review current material specifications to assess their resilience to climate change**
  - Score: 2.15
  - Timescale: Immediate
- **Consider changing material choices.**
- **Increase verge maintenance frequencies to reduce the risk of ‘root invasion’ and vegetation ingress.**
  - Score: 1.95
  - Timescale: By 2015
- **Use polymer-modified and ‘stiffer’ binders that are less prone to binder stripping.**
  - Score: 1.85
  - Timescale: By 2020
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Climate Change and Adaptation

Definition

Adapting to climate change is about taking deliberate and considered actions to avoid, manage or reduce the consequences of a more extreme climate (warming of temperatures, more frequent flooding, rising of sea levels, increases in tropical storms and in hurricane intensities, migratory behaviour of wildlife species, etc...) and to take advantage of the opportunities that such changes may generate. The Intergovernmental Panel on Climate Change (IPCC) defines adaptation as the "adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects, which moderates harm or exploits beneficial opportunities" (IPCC, 2007).

Adaptation can take many different forms. It includes education and training about climate change; revising emergency planning responses for more severe extreme weather events; revised planning standards for more vulnerable areas and managing and assisting our natural assets to improve their resilience to climate change impacts. It may also require more technical and scientific solutions.

Adaptation to environmental change is not a new concept. Human societies have shown throughout history a strong capacity for adapting to different climates and environmental changes. For example, farmers, foresters, civil engineers and their supporting institutions have been forced to adapt to numerous challenges to overcome adversity or to remove important impediments to sustained productivity.

Adaptation is a necessary complement to mitigation in addressing climate change. Mitigation is necessary to reduce the rate and magnitude of climate change, while adaptation is essential to reduce the damages from climate change that cannot be avoided.

Research

Despite considerable work examining climate change impacts and adaptation over the past two decades, relatively little attention has been given to built infrastructure and engineered systems, including transportation. Rather, much of the work on transportation and climate change has been directed toward mitigation issues. This is not surprising, considering that transportation accounts for a
Links
- Beyond borders: the need for strategic global adaptation. Dec, 2008
- Enabling Adaptation: Priorities for Supporting the Rural Poor in a Changing Climate (June, 2009)
- Financing Adaptation Action, publication by the Global Environment Facility (GEF), 2007

Documents
- Adaptation Guidance Manual
- Adapting Transport to Climate Change (Sustainable Transport: A Sourcebook for Policy-makers in Developing Cities)
- Assessing the Costs of Adaptation to Climate Change
- Potential Impacts of Climate Change on US Transportation
- Reducing the Vulnerability of the Poor through Adaptation
- The Effect of Climate Change on 3CAP’s Highway Network Policies and Standards
- Transportation Adaptation to Global Climate Change

Recommended Links:
- Adaptation Fund Board
- Climate Proofing
- Global Environment Facility (GEF)
- The World Bank
- UNEP
- UNFCCC - Funding for Adaptation
- United Nations Framework Convention on Climate Change (UNFCCC)
- WeADAPT (Assessment & Design for Adaptation to Climate Change: A Prototype Tool)

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The Role of Coastal Zone Management Programs in Adaptation to Climate Change

This report is the second annual report on this topic to further explore the current and future roles of state coastal zone management programs in addressing climate change. The 2007 report, which remains the most comprehensive assessment of the various states' coastal program's climate change initiatives. Read More...

Type: Case Studies, Organization: Coastal States Organization, Published in 2008
Related theme(s): Environment & Climate Change

Adaptation of the Transportation System to the Impacts of Climate Change: Results of a Peer Exchange

This presentation on adaptation of the transport system explains how to respond to the impacts of climate change, both proactively and reactively. Link: Adaptation of the Transportation System to the Impacts of Climate Change: Results of a Peer Exchange Read More...

Type: Case Studies, Organization: United States Department of Transportation, Federal Highway Administration, Published in 2009
Related theme(s): Environment & Climate Change

Reducing the Vulnerability of the Poor through Adaptation

A paper called Reducing the Vulnerability of the Poor through Adaptation explores and summarises the current state of knowledge on adaptation to climate change and the need for its integration into poverty eradication and sustainable development efforts. Ten agencies (UNDP, UNEP, World Bank, ADB, Af Read More...

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Input to UNECE Expert Group on Adaptation

• Distribution of questionnaire
• Share knowledge (gTKP as hub? fingerprinting?)
• Solicit IRF members to provide case studies for the final report (projects, policy, strategy, ...)
Thank you

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