

Managed retreat – difficult but necessary

Session Overview

Tim Sexton

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XVI WORLD WINTER SERVICE AND ROAD RESILIENCE CONGRESS XVI° CONGRÈS MONDIAL DE LA VIABILITÉ HIVERNALE ET DE LA RÉSILIENCE ROUTIÈRE XVI CONGRESO MUNDIAL DE VIALIDAD INVERNAL Y RESILIENCIA DE LA CARRETERA





Topic/Presentation title	Speaker (title, role/position, organisation, location, if applicable include PIARC Technical committee)
Welcome – session overview	Tim Sexton , Assistant Commissioner, Minnesota Department of Transportation, PIARC TC 1.4 (US)
Welcome - TC 1.4	Caroline Evans , Principal Policy Advisor, National Transport Commission, Chair – TC 1.4 (Australia)
Overview of Managed Retreat	Katie Spidalieri, Senior Associate, Georgetown Climate Center (US)
Managed Retreat Case Study: California, USA	Fraser Shilling, Road Ecology Center, University of California at Davis (US)
Managed Retreat: Stories from Uganda	Dr. Mark Henry Rubarenzya , Head of Research and Development, Uganda National Roads Authority, PIARC TC 1.4 (Uganda)
Managed Retreat Case Study: Minnesota, USA	Jeffrey Meek , Sustainability Coordinator, Minnesota Department of Transportation (US)
Managed Retreat Case Study: Mexico	Carlos Alfonso Lara Esparza , Director General, Mexican Institute of Transportation, PIARC First Delegate from Mexico (Mexico)
Panel session: presenters and audience Q&A	Moderator: Tim Sexton , Assistant Commissioner, Minnesota Department of Transportation, PIARC TC 1.4 (US)
Conclusions of the session	Tim Sexton , Assistant Commissioner, Minnesota Department of Transportation, PIARC TC 1.4 (US)



Managed Retreat Overview of TC1.4

Caroline Evans

Chair PIARC TC1.4 & Principal Policy Advisor, National Transport Commission

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Resilience defined

- The ability to survive in the face of complex, uncertain and changing circumstances, and is a way of thinking about both short-term cycles and long-term trends
- Ability of a system and its component parts to anticipate, absorb, accommodate, or recover from the effects of a potentially hazardous event in a timely and efficient manner, including through ensuring the preservation, restoration, or improvement of its essential basic structures and functions
- Source: Realising European RESILiencE for Critical INfraStructure, EU-Research Project
- Lavell, A., M. Oppenheimer, C. Diop, J. Hess, R. Lempert, J. Li, R. Muir-Wood, and S. Myeong, 2012: Climate change: new dimensions in disaster risk, exposure, vulnerability, and resilience. In: Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation [Field, C.B., V. Barros, T.F. Stocker, D. Qin, D.J. Dokken, K.L. Ebi, M.D. Mastrandrea, K.J. Mach, G.-K.



Sources: K. Thoma, "Resilience-by-Design": Strategie für die technologischen Zukunftsthemen (strategy for technical issues of the future), acatech STUDY, 2014.



Background on PIARC Products: International Climate Change Adaptation Framework

Stage 1	l	Sta	age 2		
Preparatio defining pu scope. Assessing	n stage: urpose, aim and vulnerability	Asse Priori	essing and scoring itising risk	risk	
Stage	e 3		Stage 4		INTERNATIONAL CLIMATE CHANGE ADAPTATION FRAMEWORK FOR ROAD INFRASTRUCTURE
	Assessing adapta responses and strategies	tion	Integrating the into decision processes	he finding making	



Background on PIARC Products

- 2015: PIARC Int. Climate Change Adaptation Framework for Road Infrastructure
- 2019: Case studies (WG1) + Refinement of PIARC's CC Framework (WG2)





ADAPTATION METHODOLOGIES AND STRATEGIES TO INCREASE THE RESILIENCE OF ROADS TO CLIMATE CHANGE – CASE STUDY APPROACH TECHNICAL COMMITTEE E 1 ADAPTATION STRATEGIES AND DESIGNATION







PIARC TC 1.4: Who we are....

- + 50 members
- + 35 countries globally







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Work Program of TC 1.4 (2020-2023)

Work Program and Organization of the Work





Permafrost degradation, Dempster Highway, NWT – Canada

Water-related damage, E6 Birri-Otta – Norway



Landslide, RN85 - France



Forest fire, A7/A51 - France



Development of Reports



Graph: Lennart Meine, BASt & TC 1.4



~70+ Case studies collected from 25 countries

Vulnérabilités et risqu infrastructures de transport face au clim

Different kind of case studies, from strategies to implementations

Best practices in different fields of climate change and resilience

Detailed presentations during WG meetings



Coordination Activities Across PIARC – Resilience and Climate Change

- PIARC TC 1.4 involvement in PIARC COVID-19 Response Team
- Achieve "horizontal coordination" with related TC's in the context of crosscutting issues for the topic of resilience
 - TC 1.5: Disaster Management, TC 2.4: Road Network Operations/ITS, TC 3.2: Winter Service, TC 3.3: Asset Management, TC 3.4 Environmental Sustainability in Road Infrastructure and Transport, T.F: Road Infrastructure and Transport Security, T.C 4.1: Pavements, TC 4.2: Bridges, TC 4.3: Earthworks, TC 4.4: Tunnels, T.F. 4.1: Road Design Standards, TF 3.1: Security
- Coordination of activities for the PIARC Calgary Congress
- Linkages to TRB, AASHTO, BMVI-NoE, REAAA, EU FORESEE Project, IRF, UNECE on resilience



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Sources: K. Thoma, "Resilience-by-Design": Strategie für die technologischen Zukunftsthemen (strategy for technical issues of the future), acatech STUDY, 2014.



Background on PIARC Products (2016-2019)

- 2015: PIARC Int. Climate Change Adaptation Framework for Road Infrastructure
- 2019: Case studies (WG1) + Refinement of PIARC's CC Framework (WG2)



PIARC TC 1.4: Who we are....

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Development of Reports



Number of CSs



~70+ Case studies collected from 25 countries

CONSTRUCTORS OF TRANSPORT Face are closed of

Different kind of case studies, from strategies to implementations

Best practices in different fields of climate change and resilience Detailed presentations during WG meetings



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Coordination Activities Across PIARC - Resilience

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Managed retreat Overview

Katie Spidalieri Senior Associate, Georgetown Climate Center

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GEORGETOWN CLIMATE CENTER An Introduction to Managed Retreat in the U.S.

PIARC XVI Congress February 8, 2022

Coastal Adaptation Strategies

Accommodate



Infrastructure Decisions in a Managed Retreat Context



- Flooding, erosion, saltwater intrusion, coastal storms
- Increasing maintenance needs and costs
- Transportation and land use
- Multiple agencies/authorities
- Long-range planning; asset management
- Community engagement

GEORGETOWN CLIMATE CENTER

Thank you!

Explore the Managed Retreat Toolkit online: bit.ly/GCCMRT

Connect with us on social media: @Climate_Center @GeorgetownClimate #GCCMRT

Contact us: Katie.Spidalieri@georgetown.edu



GEORGETOWN CLIMATE CENTER



Strategic Vertical and Horizontal Adaptation to Sea Level Rise Case study: California, USA

Fraser Shilling

Road Ecology Center University of California at Davis

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Proposed Horizontal and Vertical Adaptation of SR 37



koadecology.ucdavis.edu



Economic impacts in the trillions (Dietz et al., 2016; CBO, 2019)

State Route 37	Meetings	Resources	Images	Maps	About				Contact Us	Logi
Integrated Trat Highway	11ic, Infras	atructure and an	nd Sea I Maps	Level R S	lise Analy:	sis				
Map Tips										
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Please contact us if y	ou see any iss	ues or have sp	ecific questi	ens about	this map.					
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Additional Information about the Maps Overlay Layers



NOAA Global Mean Sea Level (GMSL) Scenarios for 2100



Traffic Impacts: San Rafael (Marin Co)

From Chen and Shilling in prep.

- 0.75 m SLR US101 and local roads flooded
- Scenario 1 101 closed, local roads open
- Scenario 2 5% 101 traffic
- Scenario 3 101 raised in place

Conclusion – local roads inadequate for total demand without raising 101

os://roadecology.ucdavis.edu





Managed retreat Stories from Uganda

Mark Henry Rubarenzya Uganda National Roads Authority

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Hanna. C., et al, 2021. 'Managed retreats by whom and how? Identifying and delineating governance modalities'. Climate Risk Management.

















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Managed retreat Case study: Minnesota, USA

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The Need for Retreat in Minnesota

- Minnesota is a central state in the USA
- The main climate impact is increased extreme precipitation
- Between 2000-2020 there were 2x as many mega-rains as the 27 years spanning 1973-99.







The following evaluation criteria were considered:

- Highway user impacts
- Landowner impacts
- Community impacts
- Cultural resource impacts
- Environmental impacts
- Constructability / Cost
- Maintenance
- Schedule



Resilience Strategies

Approach	Adaptation Options
Defend	Provide major structural protection
	Provide protection at existing elevation/locations
Accommodate	Elevate the infrastructure above the impact zone
	Enhance drainage to minimize closure time and/or deterioration levels
Retreat	Abandon infrastructure
	Relocate infrastructure (horizontally)
	Temporarily restricts use of infrastructure
Change policy or practice	Increase the infrastructure's maintenance and inspection interval and continue to
	monitor/evaluate
	Modify land use and development policies to account for future impacts





Managed retreat Case study: Mexico

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Route 14: Morelia-Patzcuaro







Original route after administrative retreat Class "C", 2 lanes (7m traveled way)



New route

Class "A4S", 4 lanes (7m traveled way + 1.8m right shoulder + 0.5m left shouler by section) AADT 19,866 veh

Route 1: Tijuana-Ensenada









In 1967 the Scenic Toll Highway Tijuana-Ensenada began operations (Class "A4S", 4 lanes, AADT 10,850-28,486 veh.).

Soil instability zone between kilometers 92 + 460 and 93 + 480

The highway has had very significant impacts, such as those of 1976, 1995 and 2014.

There is a new project, with a new route, but it is not possible to abandon the existing one due to all the existing housing areas.



¡Muchas gracias!



FEBRUARY 7-11 | 7-11 FÉVRIER | 7-11 DE FEBRERO

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Presenters and Audience Q&A

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Questions for the panel

- What climate risks are impacting transportation and road agencies?
- Where is MR being considered as a climate adaptation strategy around the world?
- What factors contribute to consideration of managed retreat?
- What lessons were learned by transport agencies who tried or considered MR?
- How do your agencies consider equity around MR as it relates to individual transportation assets, systems, or communities (e.g., neighborhoods subject to frequent flooding)?
- Thoughts about how MR will impact your agencies and communities in the future (or other examples like agricultural centers or businesses)?





Closing Thank you and next steps

Tim Sexton Minnesota Department of Transportation

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