

*Transportation: Adapting to a Changing Climate Webinar Series*

# What the ISO14090 standard means for building climate resilience in Canada's transportation sector

Monday, February 13, 2023, 1:00 pm to 2:30 pm ET

## Presenter:



### **Professor John Dora**

*Royal Academy of Engineering Visiting Professor at the University of Birmingham and a Visiting Professor at the University of Surrey, and a Fellow of the ICE*



**Strengthening climate resilience using  
ISO 14090:2019 *Adaptation to climate  
change – Principles, requirements and  
guidelines***

***A webinar with case studies***

**John Dora**

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# **THE IMPORTANCE AND IMPACT OF ISO 14090 *ADAPTATION TO CLIMATE CHANGE* ON YOUR ORGANISATION**

# What's the case for Adaptation?



- Strong business case – continually getting stronger  
Example: World Bank \$1 invested = \$4 benefit (June 2019)
- Supply / value chain resilience
- Accountability
- Liability
- Reputation
- Risk management
- Improved business resilience in longer term
- Supports ISO 14001 Environmental Management
- Supports ISO 55000 Asset Management

***Wouldn't it be good to have a Framework to help?***

# What's the case for Adaptation?

## International Initiatives

- Paris Agreement
  - Article 7 - Adaptation
  - Capacity Building
- UN Sustainable Development Goals
- TCFD

## National Initiatives

- Nationally Determined Contributions
- Adaptation Reporting
- Policy changes

## Business Drivers

- Risk management
  - Flooding, drainage, earthworks' stability
  - Tracks, roads, workforce, passengers and heat
  - Wind, overhead line
  - Sea-level rise
  - Etc...

## Multiple stakeholders' interests

### BUT Consider:

*Infrastructure life cycles*

*Systems thinking / Interdependencies*

*Strong business case - continually getting stronger!*

*As world climate changes*

*Economics*

*Example: World Bank \$1 invested = \$4 benefit (June 2019)*

### Also think about:

- Reputation
- Improved service resilience
- Supply / value chain resilience
- Accountability
- Liability
- **INFRASTRUCTURE INTERDEPENDENCIES**

**Rapidly changing climate**

# Adaptation and resilience – an urgent need

Climate changing more rapidly than recently thought

Systemic adaptation seen as 'best practice' internationally –

ISO 14090, Governments, Engineering Institutions, RAEng

- Systems thinking considers *entire system*
- External influences, interdependencies and interconnections
- Other elements of value/ supply chain

ALSO Governance, Leadership, Financing, and

- 'Soft' concepts like policies, strategies and plans
- Links to Paris 2016 and UN SDGs
- Forecasting, contingency planning, maintenance



**Future-looking technical standards for infrastructure are crucial**

# Think about benefits and value, not 'cost'!

World Bank 2019 - "Invest in regulations and planning, in the early stages of project design, and in maintenance. Doing so can significantly outweigh the costs of repairs or reconstruction after a disaster strikes"

*\$1 invested in resilience brings \$4 return*

*..also...*

*2/3 of the infrastructure needed for 2050 has yet to be built*

*(World Bank, COP 22) = Opportunity!*

*Invest in Adaptation – up to £10 for every £1 spent (CCRA 2021)*

**Change the Mindset..**

**Whole life not lowest first cost..**

***Challenge Economics Theories..!!***

# What's the case for using a standard?



- Set out an ordered, 'agreed' way of doing things
- Trust - it's written by adaptation professionals
- Can demonstrate international Best Practice to others – clients, investors, legislators
- Provides a recognised benchmark
- Use across sites nationally and internationally to provide consistent results
- Can form basis of an accreditation process

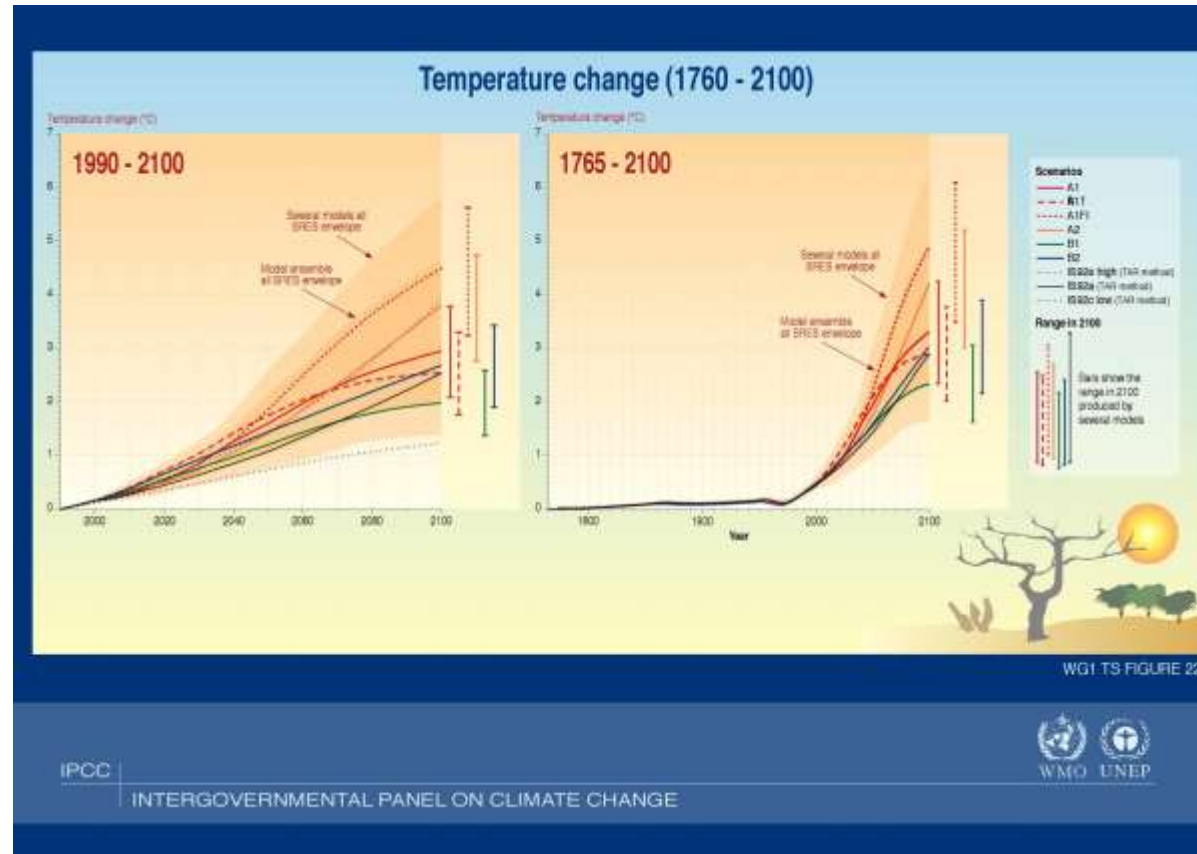


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# **UNDERSTANDING THE CLIMATE RISKS IN YOUR OWN FIELD**

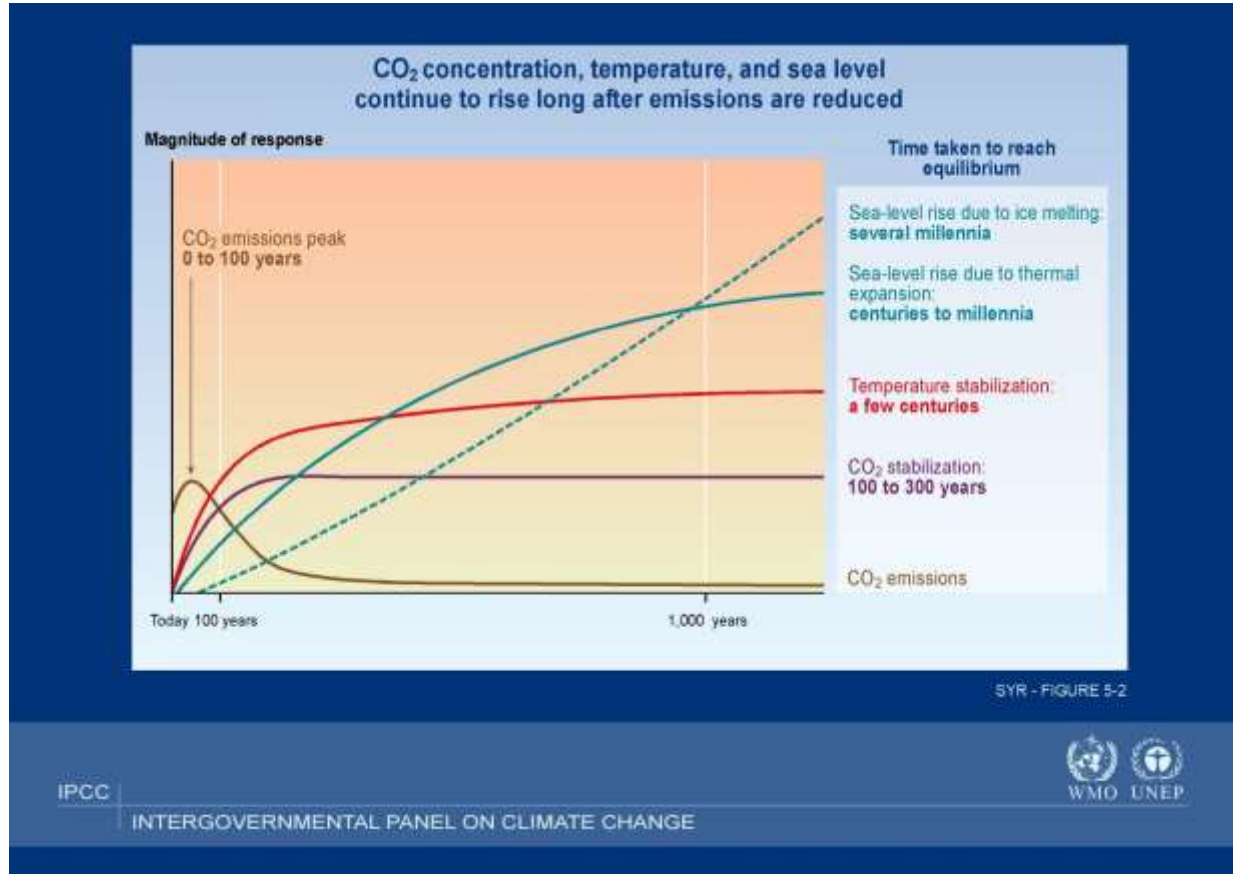


# Climate Impacts - Risks – Vulnerabilities



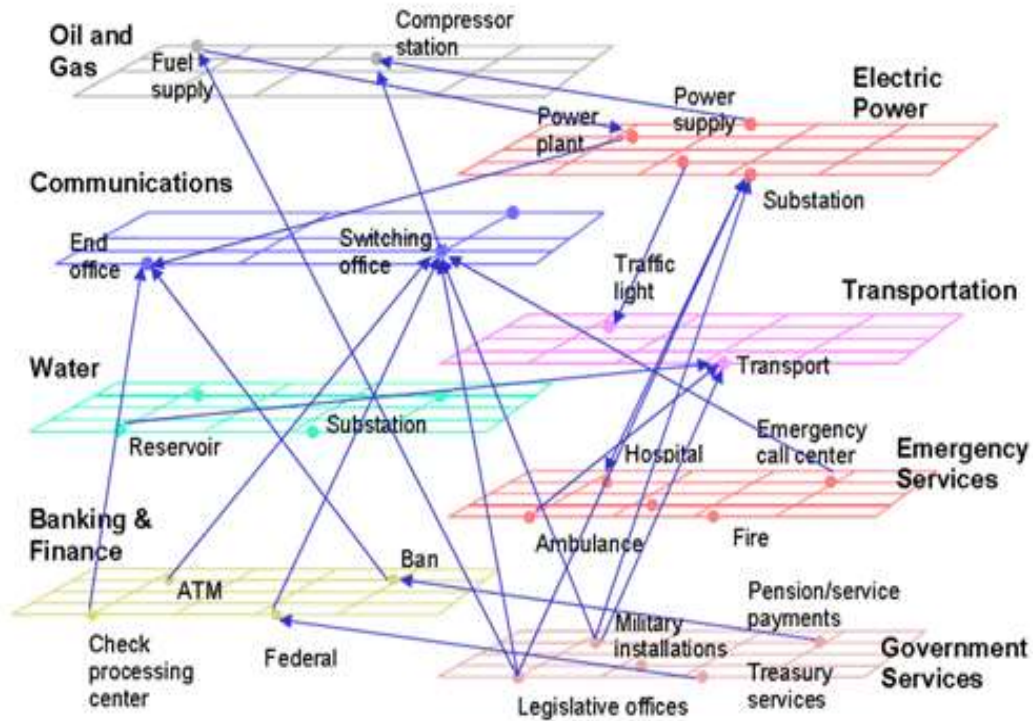
- We know the climate is changing
- IPCC Studies
- UN Paris Agreement
- Evidence
  - Wetter winters, hotter, drier summers
- Think asset and component lifecycle

# Climate Impacts - Risks – Vulnerabilities



- We know the climate will keep changing
- Think Impacts
  - Risk
  - Vulnerability
- Recognise vulnerability and risk is influenced by capacity and understanding
  - e.g. of asset behaviour and of decision makers

# Vulnerable infrastructure



From US, post Katrina, Federal Communications Commission

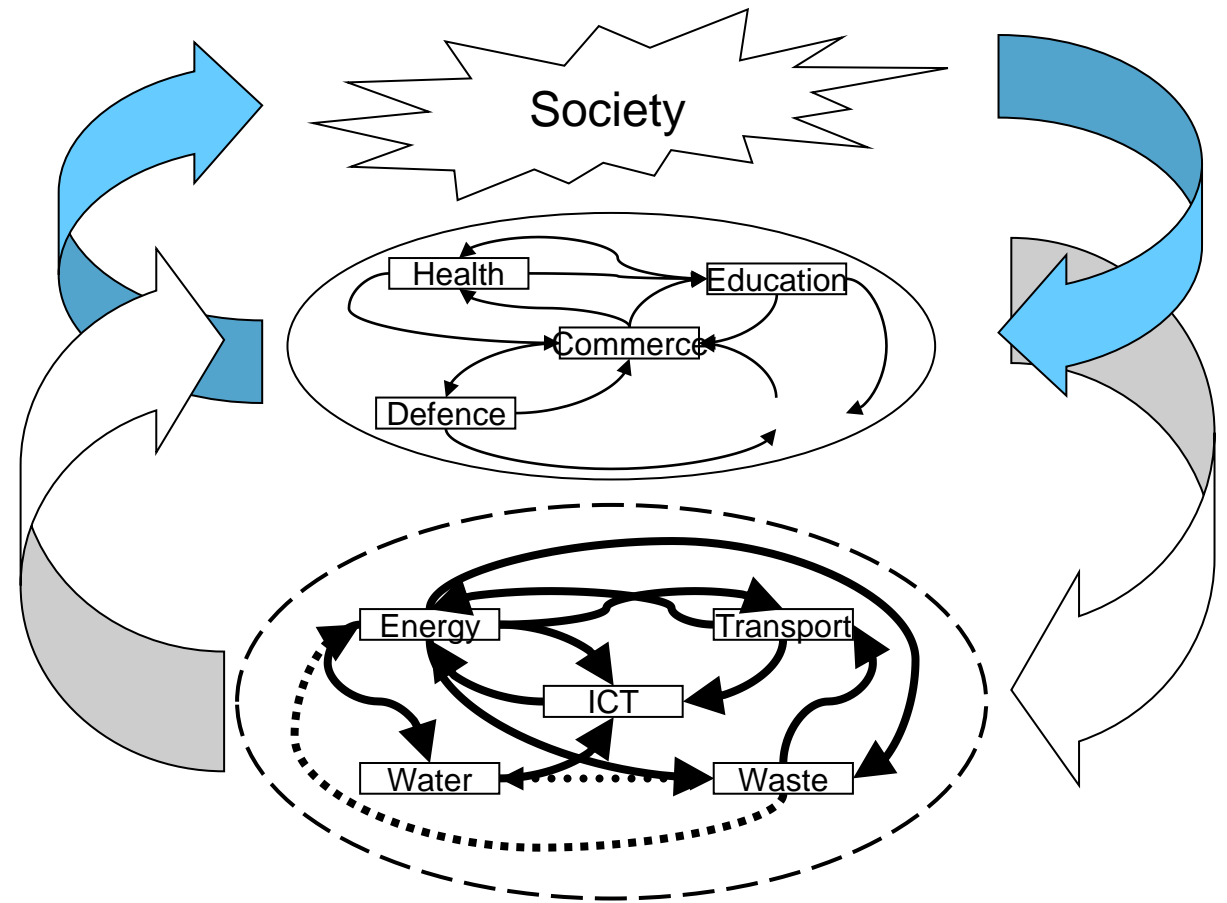
## Think Transport Infrastructure

- Terminals – freight, passengers
- Hubs - interchange
- Corridors – roads, railroads
- System needs
  - Staff – operations, maintenance, response
  - Energy
  - ICT
  - Vehicles etc.

**ALL Connected as Systems!**

# Vulnerable infrastructure

- Interconnected, interdependent Infrastructure systems
- Transport
- Energy
- Water
- Waste
- Information Communications Technology



**Transport systems underpin Civil Society**

© Beckford Consulting

# ISO 14090 AND ADAPTATION PLANS

# ISO 14090 covers all you thought about and more...

- Applicable to All organisations, Any sector
- Takes a flexible approach to suit YOUR business
- Applicable at any stage of adaptation
- Allows Risk, Vulnerability assessments  
Enables tailored solutions, not 'one size fits all'
- Iterative – not linear
- Embeds as 'business as usual'
- Links to Paris 2016 and UN SDGs



# ISO 14090 Key elements

- Questions asked at outset on:
  - Governance arrangements
  - Leadership and awareness
  - Life-cycle of products, activities, services
  - Organisational capability – knowledge, resources
  - Ability to assessing impacts – risks/ vulnerability/ thresholds
  - Cross-cutting (systemic) matters





# ISO 14090 Main sections

- Introduction
- Principles
- Pre-planning (Clause 5)
- Assessing climate change impacts (Clause 6)
- Adaptation planning (Clause 7)
- Implementation (Clause 8)
- Monitoring and Evaluation (Clause 9)
- Reporting and Communications (Clause 10)



# ISO 14090 covers all you thought about and more...



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# Setting up and Adaptation Plan 1

## Introduction, Principles

## Pre-planning (Clause 5)

- *Prepares the organisation for adaptation planning and includes gathering information and resources...*
- **Requires an understanding of the capability of the organisation to form an adaptation plan**
- **Requires a Plan to fill gaps**
- **Refers to Clauses 6 to 10**
- **BUT 6 and 7 are key**



# Setting up and Adaptation Plan 2



## Introduction, Principles, Pre-planning (Clause 5)

## Assessing climate change impacts (Clause 6)

- *Outlines range of methods that can be used to identify and assess impacts, vulnerability and risks (including identifying opportunities)...*

## Adaptation planning (Clause 7)

- *Assembling a plan from the varied sources of knowledge, data and information in the context of existing policies, strategies, planning and decision-making.*

# Setting up and Adaptation Plan 3



## Implementation (Clause 8)

- *Developing a plan to ensure the actions identified in the adaptation plan are delivered*
- *Indicators linked to Trajectories*

## Monitoring and Evaluation (Clause 9)

- *Assesses progress against the implementation plan*

## Reporting and Communications (Clause 10)

- *What to communicate, and the best way to do so...*

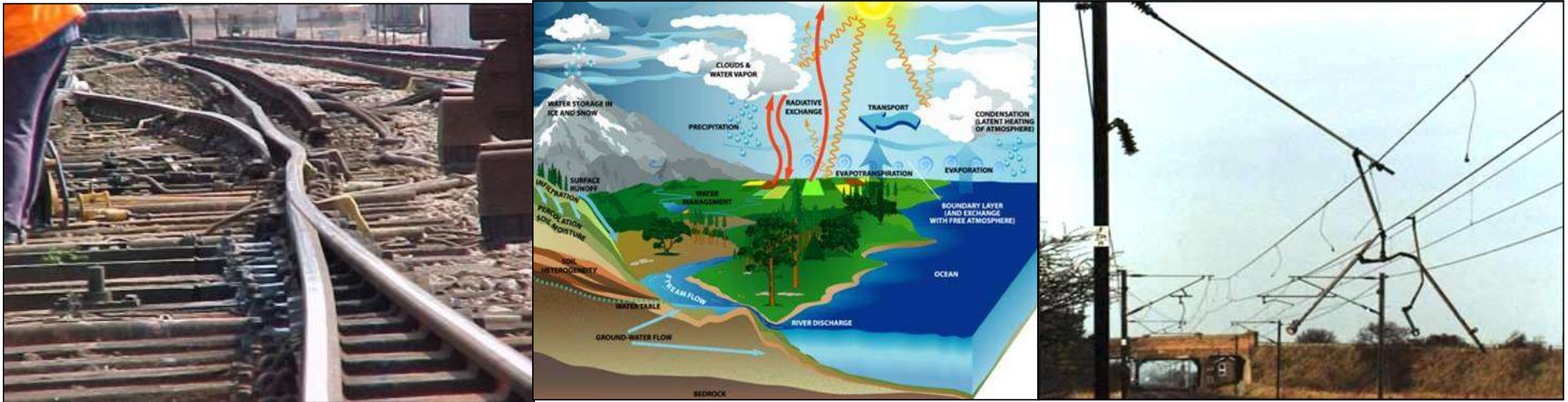
# ISO 14090 Thoughts

- How well are future climate impacts understood?
  - What impacts will extreme weather or slow-onset climate change have on your activities or services?
- Do you know your exposure to weather hazards?
  - Directly or indirectly; e.g. at your depots? Or via your Suppliers?
  - Are long supply chains resilient to weather patterns in e.g. the Pacific?
- Have your assets been designed for the future climate?
  - Are the existing design, operation, maintenance standards fit for the next 30 years? 5 years? 50+ years?

# ISO 14090 Thoughts

What Governance arrangements need to change?

- Does your Leadership understand the issues?
- How do the Paris Agreement and UN Sustainable Development Goals feature?



# Standards and challenges

- Organizations might use standards *only if they have to*
  - Does the system framework require it?
  - Legislation, regulation, planning?
  - Loan conditions and covenants?
- Structural specifications based on historic climate, generally
  - BUT see CEN 'Tailored guidance' and ISO Guide 84
- 'Design life' concept brings uncertainty issues and so a reluctance to invest
  - Other approaches are being recognised



Trainspotted.com



Pinterest.com



# Opportunities

- Early stage thinking
  - Link planning policy with avoiding development in exposed areas
  - Review long-term infrastructure policies and strategies
- Systems thinking
  - Interdependent infrastructure
  - Consider issues across all infrastructure interdependencies
  - Design, operation, maintenance
  - Governance
- Managed adaptive approach (TE2100 example, see BS 8631:2021 ([link](#)))
- Build back better after destruction



# Final thoughts on adaptation...

- Think 'systems' and 'criticality'
  - Populations depend upon infrastructure systems that are interlinked
  - ISO 14090 recommends using systems thinking to scope the coverage of an adaptation plan so all areas are addressed
- Good practice in Planning
  - Evaluate existing planning laws and guidelines
  - Modify them to reduce exposure to hazards
- Capacity-building
  - The Paris 2016 agreement mentions 'adaptive capacity', use tools like CaDD to help
- Monitoring, evaluating and making the right changes
- Make the best of existing design codes
  - Adapt them to suit local and future conditions

# Well, ...and a few more...

Next steps for mainstreaming climate adaptation and natural-hazard resilience in infrastructure projects include:

- Building infrastructure that can be adapted at a future date – ‘managed adaptive approach’ - *adaptive pathways*
- Adopt a ‘line of sight’ concept throughout workflows, from the heads of agreement to the delivery – construction, operation and maintenance – of a project
- Think ‘systems’ and ‘criticality’. ISO 14090 recommends using systems thinking to scope the coverage of an adaptation plan
- Adopt good practice in spatial planning – evaluate existing planning laws and guidelines and modify them to reduce *exposure* to hazards
- Capacity-building. ISO 14090 makes organizational capability a fundamental part of adaptation
- Monitoring, evaluating and making the right changes. An approach set out in ISO 14001 and ISO 9001,
- Make the best of existing design codes. The Structural Eurocodes are used widely outside Europe. Drafting ‘national annexes’ offers an opportunity to insert national *future* climate parameters suited to any country

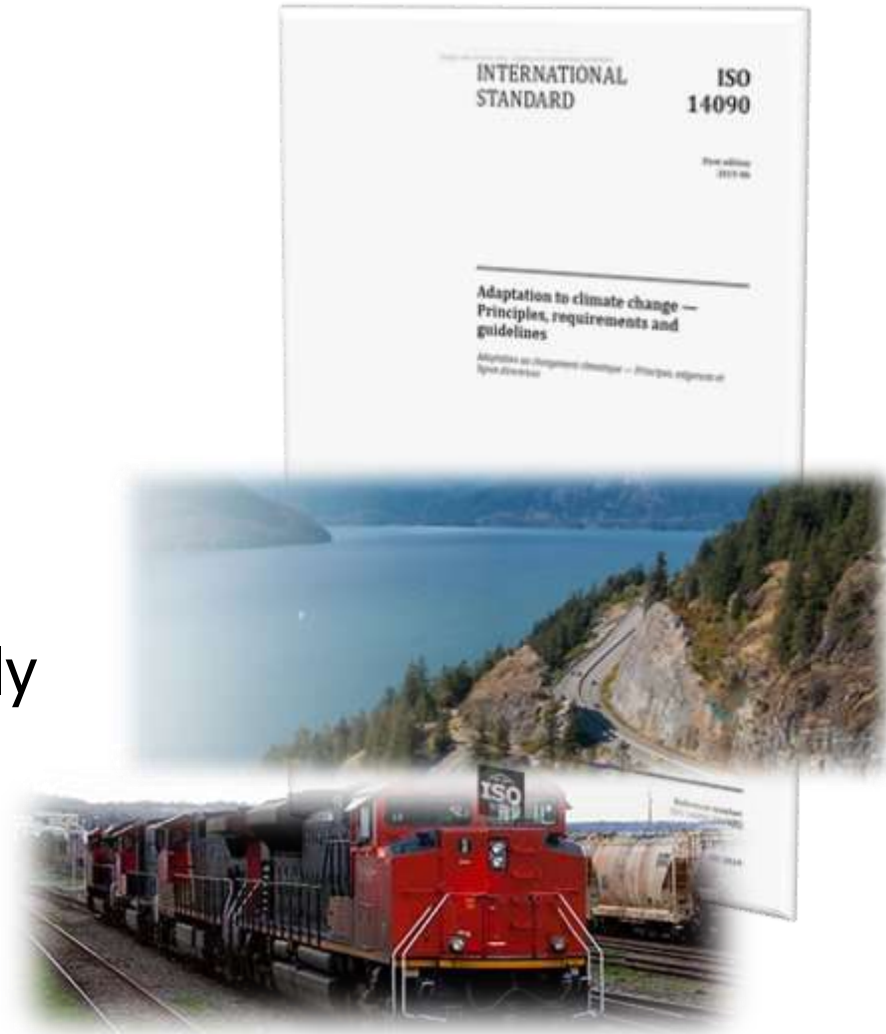
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# **CASE STUDIES ON USE OF ISO 14090**

# Case studies

## Transport Canada

- A federal institution, leading the Transport Canada portfolio
- Transport Canada is responsible for transportation policies and programs
- Promotes safe, secure, efficient and environmentally responsible transportation.
- Incorporating elements of ISO14090 as part of ongoing adaptation activities
- Key staff undertaken ISO 14090 training



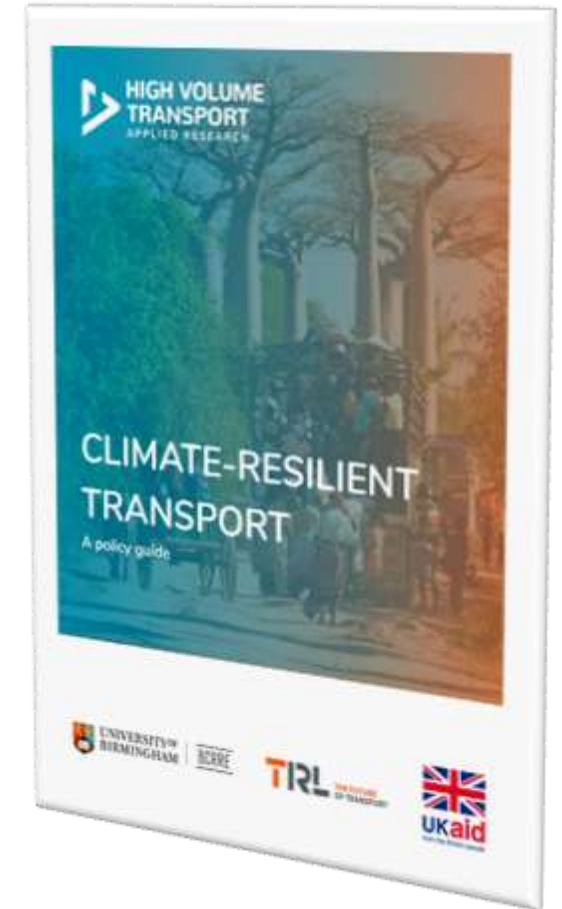
Training courses – see [link](#)

# Case studies

## International transport policy guidance

### Adaptation for Transport Resilience to Climate Change: A policy guide for low income countries

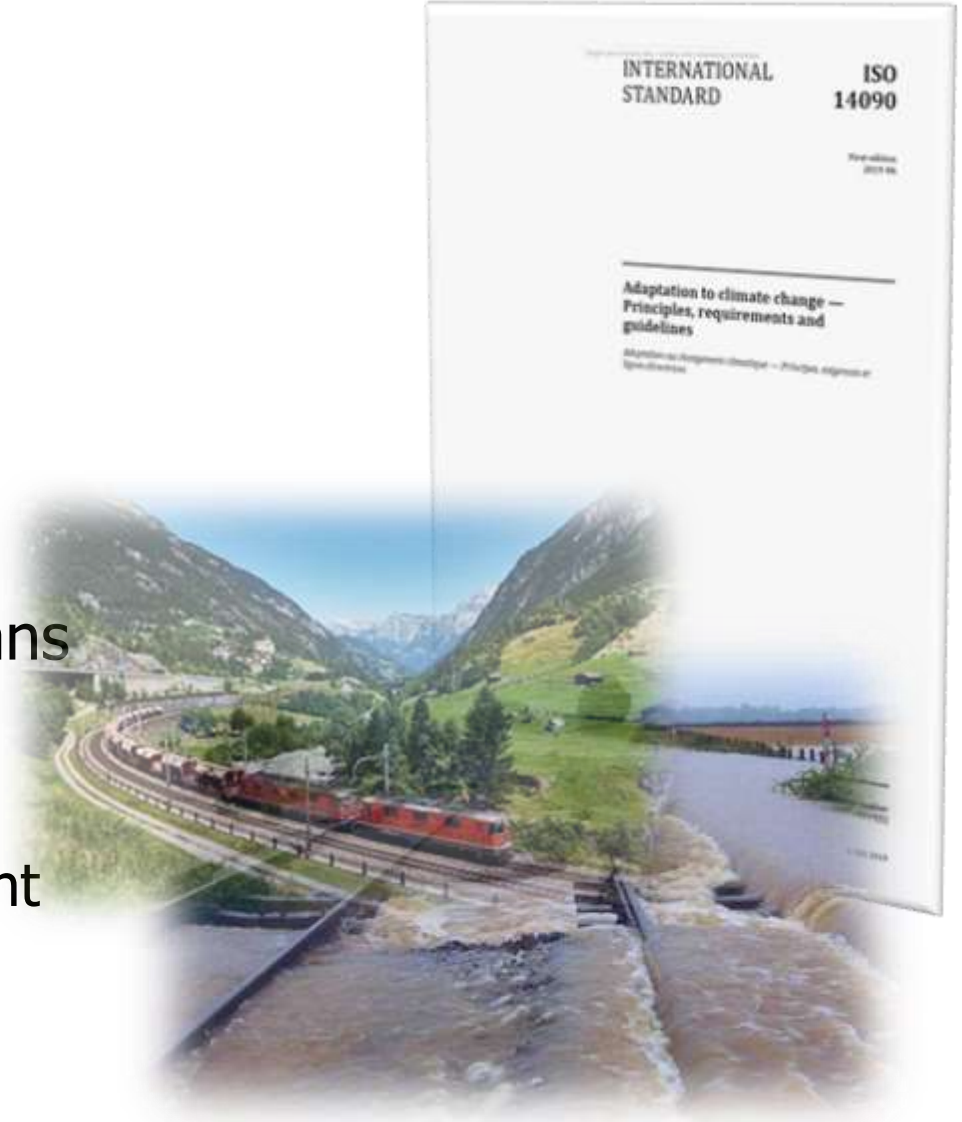
- To assist public and private providers of transport in African and South Asian LICs to increase the resilience of road, rail and urban transport infrastructure and services caused by climate change
- Joint production for IMC Worldwide by University of Birmingham, TRL and funded by UK Aid
- Used ISO 14090 framework as core structure in analysing capability of existing policies – highly praised by Project Advisory Group



# Case studies

## UK Rail Regulator

- Used ISO 14090 framework
- Interest in comparing plans and strategies against international best practice
- Regulator required analyses of operator plans
- Lessons learned include aligning metrics to suit the system
  - i.e. with the movement of people and freight rather than against timetables



Pictures courtesy Network Rail and Bahnbuilder.de

# Case studies

## UK Network Rail Eastern Region Rail

### 5 year Weather Resilience and Climate Change Adaptation Plans – 2024 - 2029

- Using ISO 14090 framework and in context of asset management ISO 55000
- Adding elements to plans and strategies using international best practice
- Including monitoring, evaluation and learning
- Communications fundamental



Pictures courtesy Network Rail and Bahnbuilder.de



# Case studies

## UIC – International Union of Railways

- Global organisation for railways
- 200 members in 95 countries
- Published 'RailAdapt' in 2017
- Made use of ISO 14090 as source material
- Strong on *adaptive capacity* recommendations



INTERNATIONAL UNION  
OF RAILWAYS

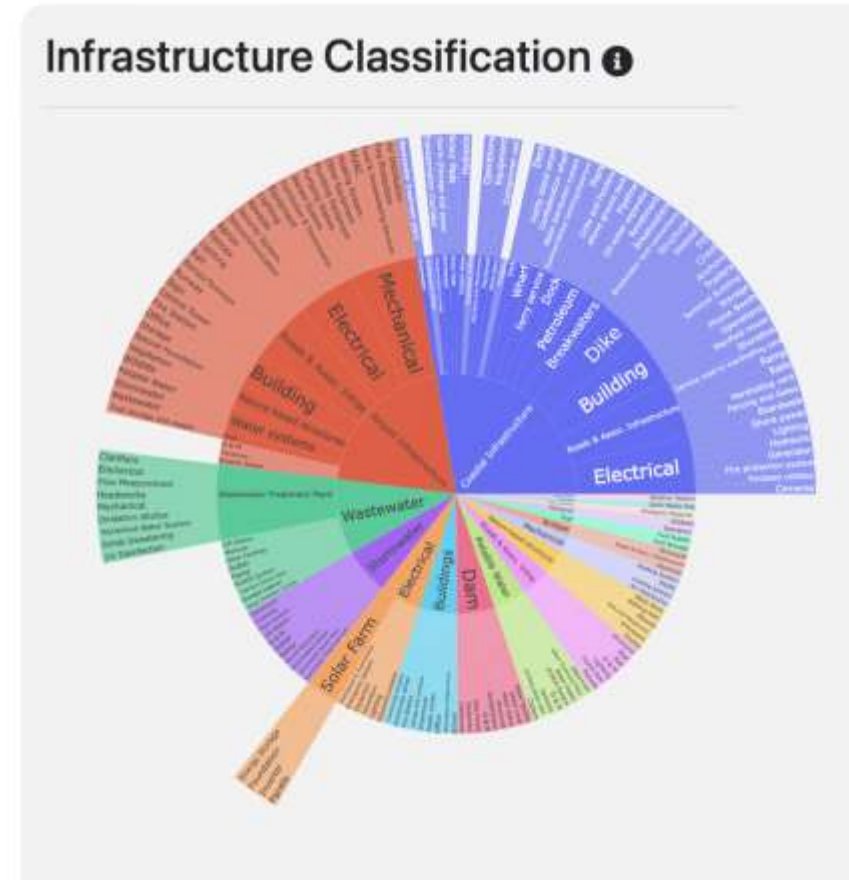


# Case studies

## The PIEVC High Level Screening Guide ([link](#))

### Public Infrastructure Engineering Vulnerability Committee

- Systematically reviews historical climate information and projects the nature, severity and probability of future climate changes and events
- Applied to assess climate risks and vulnerabilities across a wide range of infrastructure in Canada
- Over 100 infrastructure risk assessments completed
- Refers to applications compliant with ISO 31000 (risk management) and ISO 14090



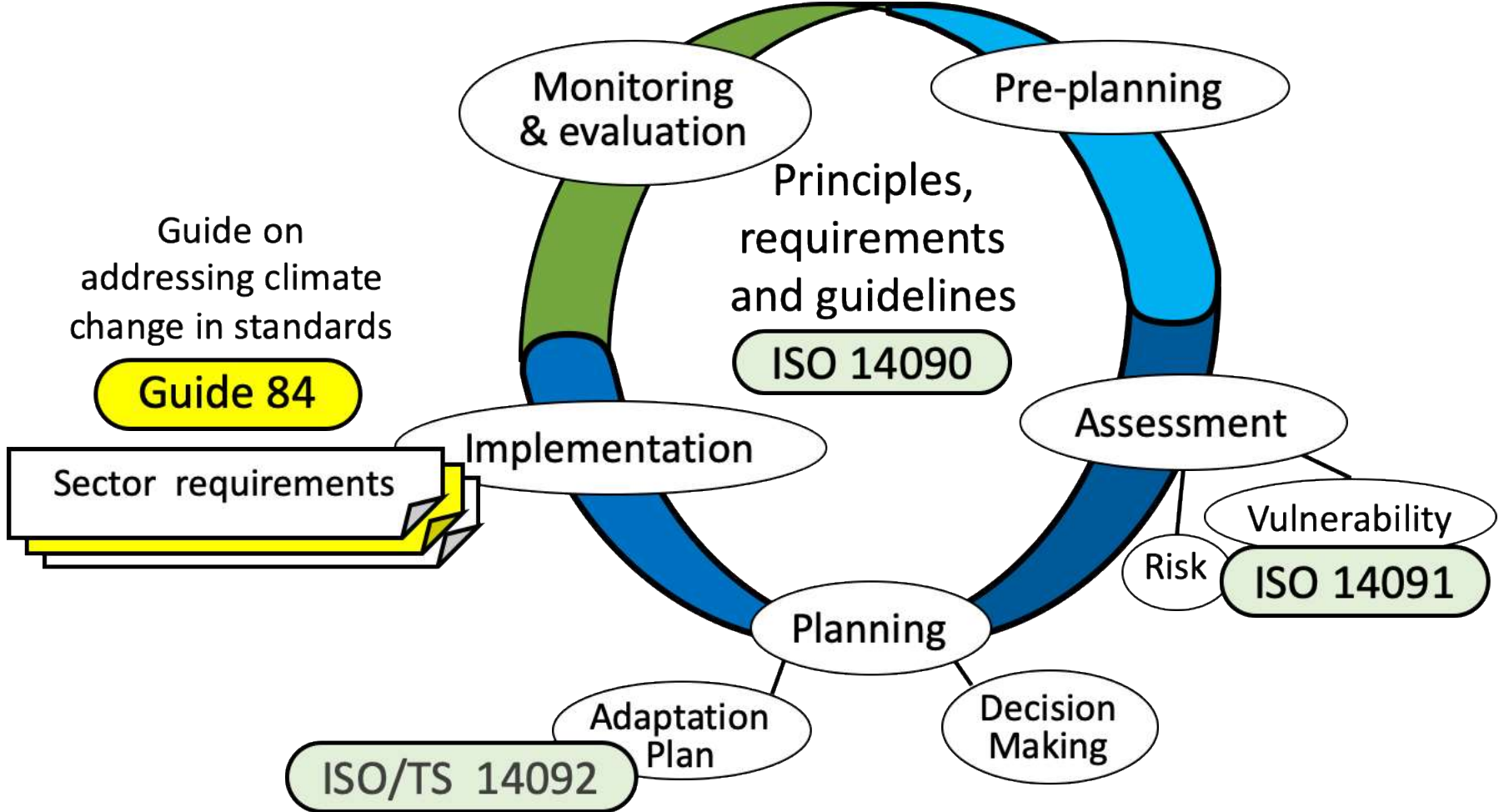
# Case studies

## First Nations Infrastructure Resilience Toolkit (FN-IRT) ([link](#))

- For the Ontario First Nations Technical Services Corporation
- The climate risk assessment module is also based on the [www.PIEVC.ca](http://www.PIEVC.ca) Protocol and is also called the FN-PIEVC
- PIEVC also refers to ISO 14090



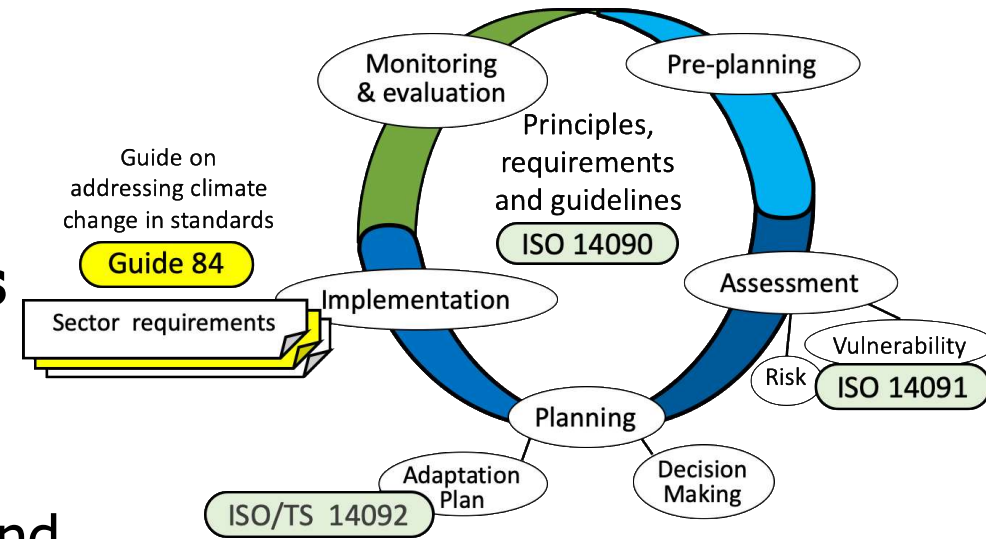
# More to come – ISO adaptation strategy



# ISO adaptation strategy

- **Aim to introduce more detailed standards**

- ISO 14090 provides the 'framework'
- Subsequent standards in same 'family'
- Including BS 8631:2021 Adaptation pathways and Climate Services ([link](#))



- **May be topic (horizontal) or sector (vertical) specific**

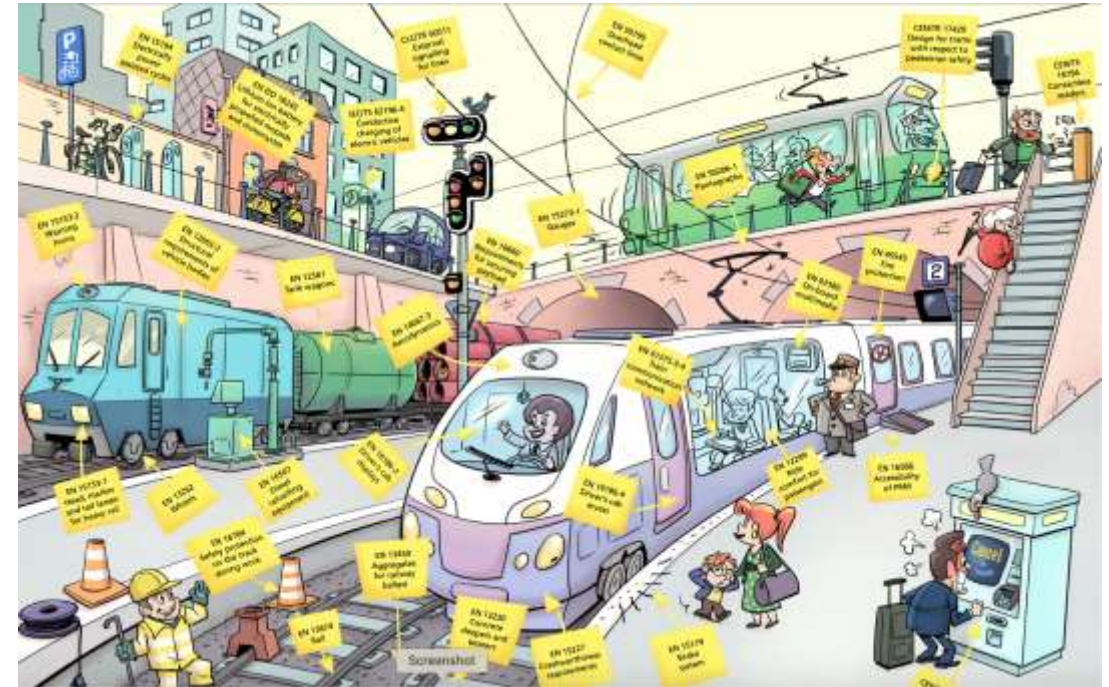
- ISO/ TS 14092 - Requirements and guidance on adaptation planning for local governments and communities
- ISO 14091 – Guidelines on vulnerability, impacts and risk assessment

# CEN/ Cenelec on Adaptation



- New infrastructure needs **designed** for future hazards
- Much existing infrastructure needs **modified** for future hazards
- Structural Eurocodes and others being modified to account for new climate hazards
  - Vital – most anchored in past climate
  - See European Commission Mandate 526 on *Infrastructure standards*

***Client organisations can require this now!***



Picture from CEN/ CENELEC

**See CEN's Tailored guidance ([link](#)) and ISO Guide 84 ([link](#)). Both are guidelines for addressing climate change in standards**

# CLIMATE SENSE



# Training on ISO 14090

- Climate Sense has developed training modules
- Virtual delivery – see [link](#)
- Organisations taking advantage come from:
  - Transport sector – national + urban
  - Health sector – national
  - Fisheries – national
  - Human rights – international
  - Nuclear energy – niche
  - Environmental – national
  - Academia



**Adaptation to Climate Change: Training**

Our training programme on climate adaptation provides expert insight into the [ISO 14090 standard](#) and its principles, requirements and guidelines.

We will help you draft a climate-smart adaptation plan, benchmark your existing plan, and make informed decisions around your organisation's capacity and resources to bridge any gaps.

Complete our full programme at a discounted rate, or pick and mix your modules. Click on each one below to find out more about its content.

Self-learning	Module 1	Module 2	Module 3
Building organisational resilience with ISO 14090	Foundation: Introducing ISO 14090 and its requirements	Climate Risk Profiling: impact, vulnerability and thresholds assessment	Assembling and mainstreaming adaptation plans
Access anytime	6-7 October 2021 19-20 January 2022	13-14 October 2021	24-25 November 2021
£0 Free	£1000	£1000	£1000
<a href="#">View now</a>	<a href="#">Book now</a>	<a href="#">Book now</a>	<a href="#">Book now</a>



# Climate Sense: [www.climatesense.global](http://www.climatesense.global)

Climate Sense uses a systematic approach to identify, rectify and implement company specific solutions to mitigate the impacts of climate change on a company or system and future risk

## **Climate risk management due diligence**

Minimise adverse organisational impact on the environment whilst delivering cost-effective products and services.

## **Climate adaptation mapping**

Identify, map and manage the adaptation capacity of an organisation. This process enables an organisation to expediently manage the negative impacts that climate change and changing environments can have on the organisation, a system or infrastructure.

## **International standards benchmarking**

Our team led the development of the international standards for climate adaptation, including ISO 14090 and ISO 14091. We work alongside your leadership to ensure that adaptation and mitigation strategies meet international best practice.

## **Training**

Standards training for ISO, CEN, BSI standards on Climate Adaptation and NVQ Adaptation to Climate Change International and GB/EU standards training and TCFD OECD best-practice reporting frameworks.

[Visit our dedicated training platform to find out more.](#)

## **Data-driven organisational capability mapping**

Our CaDD and RAPA platforms map systemic and organisational climate risk data and information to generate a highly tailored, prioritised strategy that efficiently expands an organisations capacity to put in place a climate adaptation strategy.



# Our clients include:





Thank You!





# Q&A

Please ask your questions via the Q&A box

# Thank you for joining us today!

## Upcoming webinars:

**Strengthening climate resilience for aviation organizations through climate risk assessments and adaptation measures**

Tuesday, March 7<sup>th</sup>, 2023, 1:00 to 2:30 pm ET

**Understanding and using the latest climate data to build resilience in the transportation sector**

Tuesday, March 14<sup>th</sup>, 2023, 1:00 pm to 2:30 pm ET

Register:

[https://laurentian.zoom.us/webinar/register/WN\\_ajE5wskjT7G\\_6yo0Ugng7w](https://laurentian.zoom.us/webinar/register/WN_ajE5wskjT7G_6yo0Ugng7w)

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