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ANALYSIS AND CLASSIFICATION OF ADAPTATION TOOLS FOR TRANSPORT SECTOR ADAPTATION PLANNING

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Outline and structure

1. Introduction
2. Climate Change Adaptation Assessment
3. Climate Adaptation Tools Analysis
4. Classification of Adaptation Tools
5. Conclusions

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1. Introduction

- Paper goals:
  1. Focus on climate-related adaptation planning
  2. Provide detailed classification of tools which facilitate adaptation assessment and risk planning.
  3. Present multi-faceted taxonomy and analysis of available Climate Change Adaptation tools.

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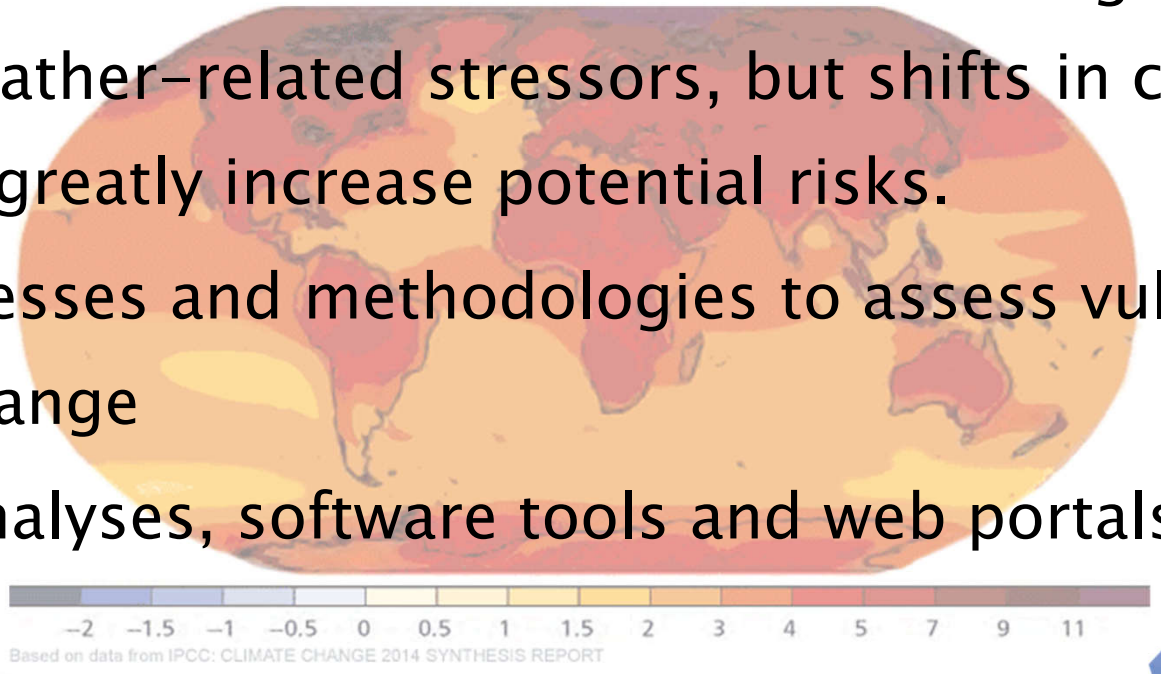
1. Introduction

- Climate change is an upcoming challenge for all CIs
- Transport and its network substructures are designed to withstand weather-related stressors, but shifts in climate patterns will greatly increase potential risks.
- Various processes and methodologies to assess vulnerability to climate change
- Geospatial analyses, software tools and web portals.



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2. Climate Change Adaptation

- Adaptation
  - actions responding to current and future climate vulnerabilities,
  - protecting against negative impacts,
  - building resilience,
  - taking advantage of any benefits
- Spontaneous evolutionary process depending on existing capacity (called '*adaptive capacity*'), or planned and designed
- Require support in terms of knowledge, financing and technology

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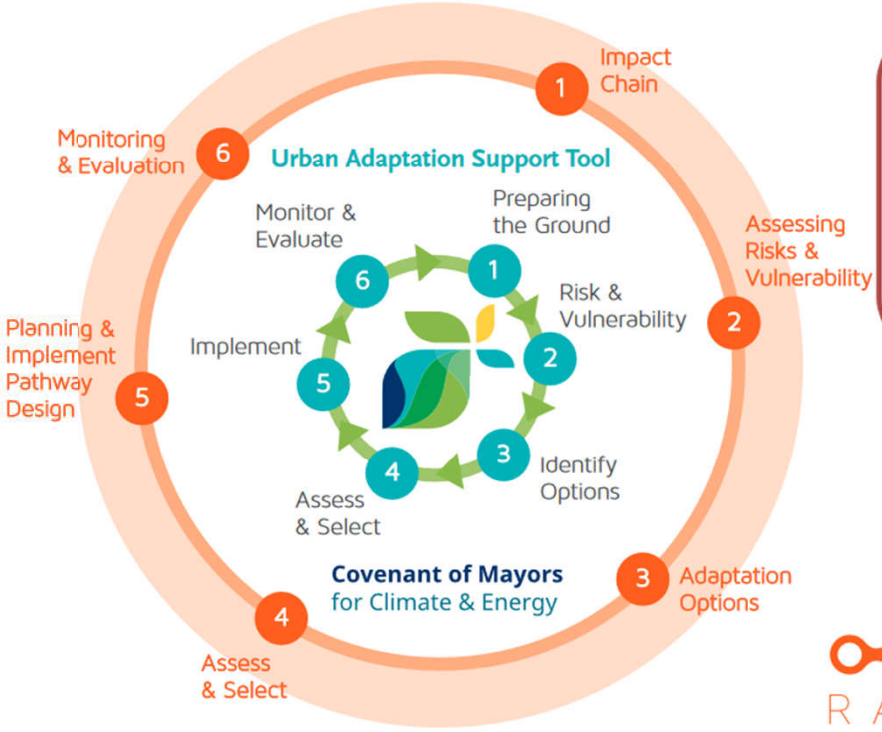
2. Climate Change Adaptation

Basic Steps of Adaptation Planning processes



1. Scope & Organize
- Identify scope & planning area
- Review climate change impacts
- Identify stakeholders and gain involvement
- Build working group

2. Access
- Refine impacts assessment & conduct asset inventory
- Conduct vulnerability & risk assessment
- Identify Adaptation Options

3. Plan & Implement
- Establish vision & resiliency goals
- Identify & prioritize adaptation strategies
- Create action plan & schedule implementation

4. Monitor & Evaluate
- Implement high priority actions
- Utilize plans to seek funding
- Track progress & evaluate effectiveness
- Assess new impacts information
- Revise strategies & priorities as needed

RAMSES project (FP7) a transition Handbook

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RAMSES

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3. Climate adaptation Tools Analysis

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- Adatation Tools provide the information necessary to select appropriate measures and manage risk
- Increased demand by governments and international agencies for practical guidance on methods for adaptation assessment
- Analytical tools support communities, decision makers and stakeholders
- Open literature adaptation tools examined to create an inventory for CIs adaptation assessment.
- 17 tools distinguished, incorporate transport sector and networks substructures

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4. Classification of Adaptation Tools

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Tools classified according to:

- 4.1. Typology and target audience
- 4.2. Geo Scope, Climate impacts and Sectors affected
- 4.3. Adaptation planning steps
- 4.4. Functionality & Mode of use (for software tools only)
- 4.5. Strengths and Weaknesses (for all examined tools)

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4.1 Classification by Type and Target Audience

Type categories are:

- *Informative Guidelines* : informational databases, open libraries and repositories, supporting research and knowledge spread.
- *Methodologies & Assessments*: describe a sequence of steps for a specific task within a larger framework. Vulnerability and risk assessments included.
- *Software Tools*: calculating platforms for performing a specific task, model a problem and enhance experience by visualizing provided information.

Target groups are:

- i) Designers & Engineers (D)
- ii) Operators and Managers (O)
- iii) Policy Makers (P)

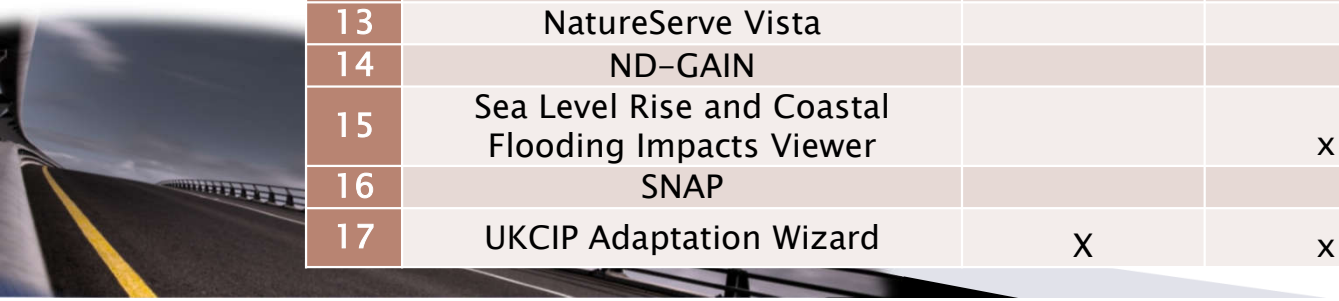
4.1 Classification by Type and Target Audience

No	Name	Tool Category			Target Group
		Informative Guidelines	Methodology Assessment	Software Tools	
1	Baltic Climate Toolkit	X	X		P- D-O
2	Blue Spot Model		X		O
3	Climate Change Knowledge Portal			X	P-O
4	Climate Vulnerability Monitor			X	D-O
5	Climada			X	O
6	Climate Guide: Climate Change Impacts in Finland			X	P-O
7	CommunityViz			X	P
8	The Ecocities Spatial Portal	X	X		D-O
9	EconAdapt			X	D-O
10	HAZUS-MH (Hazards-United States-Multi-Hazard)			X	O
11	MACC	X		X	P-O
12	MOWE-IT			X	P-D-O
13	NatureServe Vista			X	P
14	ND-GAIN			X	P
15	Sea Level Rise and Coastal Flooding Impacts Viewer		x		P-O
16	SNAP			X	P-O
17	UKCIP Adaptation Wizard	X	x		O

P = Policy Makers,

D= Engineers/Developers,

O= Operators & Managers



4.2. Sectors and Climate Impacts

G = Global Scope
MS= Multi State Area
S= State

No	Tool Name	Geographic Scope	Vulnerable Sector					Climate Impacts				
			Urban	Transport	Agriculture	Energy	Water & Resources	Flood	Heat	Cold	Storms	Drought
1	Baltic Climate Toolkit	MS	X	X	X	X	X	X	X			X
2	Blue Spot Model	G		X				X			X	
3	Climate Vulnerability Monitor	G		X	X	X	X	X			X	X
4	Climada	G	X	X		X	X	X		X	X	
5	Climate Guide/ Finland	S		X	X	X	X	X	X	X	X	X
6	CommunityViz	MS	X	X	X	X	X	X	X	X	X	X
7	The EcoCities Spatial Portal	MS	X	X		X	X	X	X			X
8	EconAdapt	G	X	X	X	X	X	X	X	X	X	X
9	HAZUS-MH	MS	X	X			X	X			X	
10	MACC	G	X	X	X	X	X	X	X	X	X	X
11	MOWE-IT	MS		X				X	X	X	X	
12	NatureServe Vista	G	X	X	X	X	X	X	X	X	X	X
13	ND-GAIN	G	X	X	X	X	X	X				X
14	Sea Level Rise and Coastal Flooding Impacts Viewer	MS	X	X			X	X				
15	SNAP	G	X	X	X	X	X	X	X	X	X	X
16	UKCIP Adaptation Wizard	G	X	X	X			X	X	X	X	X
17	The Urban Adaptation Support Tool	MS	X	X		X		X	X	X	X	X

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4.3. Adaptation Planning Steps

No	Tool Name	Climate Adaptation Steps				
		Information Engagement, Scoping	Vulnarability Assesment	Scenario Building	Adaptation Planning	Implement & Monitor
1	Baltic Climate Toolkit	X	X		x	
2	Blue Spot Model		X			
3	Climate Vulnerability Monitor	X	X			
4	Climada		X	x	x	
5	Climate Guide / Finland	X	X	x		
6	CommunityViz	X	X	x	x	
7	The EcoCities Spatial Portal	X	X	x		
8	EconAdapt	X	X			
9	HAZUS-MH		X	x		
10	MACC				x	x
11	MOWE-IT	X		x		
12	NatureServe Vista			x	x	
13	ND-GAIN	X	X			
14	Sea Level Rise and Coastal Flooding Viewer	X	X	x		
15	SNAP				x	x
16	UKCIP Adaptation Wizard	X	X	x	x	x
17	Urban Adaptation Support Tool	X	X	x	x	x

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4.4 Software tools classification

No	Tool Name	Software Tools			Mode of Use		Modeling Algorithms Used
		Visualize	Modeling	DSS	Web Based	Download	
1	Climate Vulnerability Monitor	x			x		Data visualization, WordPress, Javascript Framework (jquery)
2	Climada		x			x	Probablistic model, Matlab functions
3	Climate Guide / Finland	x			x		Environmental Data Visualization, OpenLayer maps and Javascript Frameworks (AlloyUI, YUI, jquery)
4	CommunityViz	x		x		x	3D Visualization, Realtime predictive model, decision tree,
5	The EcoCities Spatial Portal	x			x		Environmental and Geophysical spatial data visualization on map, openlayer map, jquery
6	HAZUS-MH		x			x	Predictive model
7	MACC		x			x	Excel based tool
8	MOWE-IT	x			x		Data Visualization, Javascript Frameworks and Google Maps
9	NatureServe Vista			x		x	Decision tree, predictive model
10	ND-GAIN	x			x		Data visualization on maps, Javascript Framework (jquery, node.js, D3, backbone.js, underscore.js)
11	Sea Level Rise and Coastal Flooding Viewer	x			x		Environmental Data Visualization on map

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4.5. Strengths and Weaknesses

No	Tool Name	STRENGTHS	WEAKNESSES
1	Baltic Climate Toolkit	• It describes guidelines and methodology easy to understand. • Can be used as a model of regional adaptation planning	• Not enough data to make informed decisions. • Example links stopped working.
2	Blue Spot Model	• Complete protection for any sector and type of hazard. • It can be used for new roads the planning phase. • Potential to expand to other counties	• It requires extensive data related to precipitation, elevation etc. around the targeted road networks
3	Climate Vulnerability Monitor	• Valuable information for all countries worldwide. • Financial analysis and communication on clim.change. • Policy development guidance & resource allocation	• Data classifications of confidence levels • Uncertainty factor
4	Climada	• Wide variety of simulated hazards. • Simulation for natural catastrophes, quantifies costs and damages. • The tool is open source • Allows users to write their own modules	• Some modules might not have been thoroughly tested, but core climada works without limitations. • Uncertainty factor
5	Climate Guide: Clim. Change Impacts	• Comprehensive tool offers a wide range of climate related information. • Can be used in conjunction with the BalticClimate Tool	• Some parts of the tool are available in Finnish only. • Local scope, only for Finland.
6	CommunityViz	• Interactive and highly visual decision-support tool • Versatile, widely used well supported, and updated • Works as an integration framework connecting to Hazus-MH and NatureServe Vista.	• No built-in data and relatively little built-in modeling. • Uncertainty factor • Not free , high cost to obtain
7	Ecocities Spatial Portal	• Wide variety of scenarios presented on a map • Used as a template to assist vulnerability assessment. • Can be combined with Urban Adaptation tool.	• It has a very limited scope, covering only the region of Manchester. • Uncertainty factor
8	EconAdapt	• Rich library of economics of climate change adaptation • Detailed deliverables support decision makers in adaptation process • Easy accessible info on adaptation economic assessment	• Some aspects of the toolbox do not seem to work properly • Uncertainty factor

4.5. Strengths and Weaknesses

No	Tool Name	STRENGTHS	WEAKNESSES
9	HAZUS-MH (Hazards-United States-Multi-Hazard)	· Results for large-scale events for planning, mitigation, emergency preparedness and response · Intuitive graphic and tabular formats · GIS software to map hazard and economic loss · Vehicle & traffic data · Allows users to estimate the impacts on populations	· Components of default inventory data may not line up on maps, e.g. bridges and roads. · Can run out of memory and fail during coastal floodplain delineation for complex regions
10	MACC	·Useful manual and tutorial videos ·The auto-generated indicator and progress charts · The charts and monitoring data can be exported	· As with many Excel-based tools, formula can be deleted or altered · Uncertainty factor
11	MOWE-IT	·Wide variety of information for different stakeholders ·There is a library of good practices and methodologies · Visualization tool offers details for transport network	· Not very detailed analysis on results calculations · Uncertainty factor
12	NatureServe Vista	· Integrates information from other tools · Covers integration and modeling assessment · Works well with a variety of other tools · Number of conservation elements, objectives, & multiple land-use	· Raster-based platform · Limited scale · The breadth of functions provided may lead to a slow learning curve · Uncertainty factor
13	ND-GAIN	·A wide variety of sectors on almost every country. ·Comparison methods of countries and explanation. ·The tool is updated bi-annually	· Incomplete measures of institu-tional and governmental capacity. · Uncertainty factor
14	Sea Level Rise and Coastal Flooding Impacts	· User friendly - GIS analysis for coastal areas · Contains photos and visualize impacts of sea · Diversity of information for different stakeholders.	· Deficient inundation scenarios · Cannot customize outputs
15	SNAP	·It can be used by a variety of stakeholders and in different projects ·It can both lay the groundwork for adaptation as well as assess the adaptation process	·It requires preparation that must be conducted outside of the tool and is not supported by it
16	UKCIP Adaptation Wizard	· Captures information on weather events · It assesses organization vulnerability to climate · Range of tools to help user plan his adaptation strategy	· Does not produce a tailor made climate adaptation strategy at the click of a button
17	Urban Adaptation Support Tool	·A complete methodology covering all steps ·Feedback system helps tool evolution · Covers a wide range of different regions	·It is more focused on municipality-urban levels

5. Conclusions

- Majority of tools deal with all climate change impacts /all sectors approach, to provide a holistic support for stakeholders
- GIS functionality is incorporated/ Landscape-based, better addressed by geospatial visualization tools
- 'Urban Adaptation Support Tool' as complete methodology-guide & UKCIP Wizard' for its variety of functionalities

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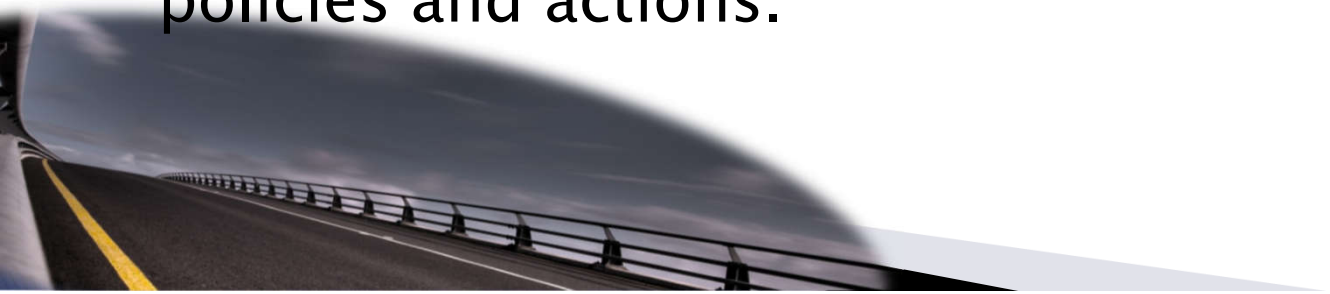
5. Conclusions

- Software tools: EU:‘Climada’, USA:‘CommunityViz’ software with 3D real-time visualization, and interoperability with ‘Hazus’ & ‘NatureServeVista’
- Adaptation tools should constantly improve data robustness and modeling algorithms to protect stakeholders from unnecessary measures, costs and complexity on adaptation policies and actions.



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Any questions for clarification?

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Thank you for your attention!

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