

Best practices guidelines for climate change adaptation of the vulnerable Transport sector

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Best practices guidelines for climate change adaptation of the vulnerable Transport sector

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ABBREVIATIONS

MMAP	Ministry of Environment, Water and Forests
APM SB	Environmental Protection Agency of Sibiu
KS	The Norwegian Association of Local and Regional Authorities
ULBS	Lucian Blaga University, Sibiu
ANM	NATIONAL METEOROLOGICAL ADMINISTRATION

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Introduction

This document was produced within the "Calea Verde spre Dezvoltare Durabilă – Greenway to Sustainable Development", financed by funds provided by Iceland, Liechtenstein and Norway through the European Economic Area Financial Mechanism 2009-2014 EEA, on the RO07 adaptation to climate change. The project promoter is the Environmental Protection Agency Sibiu and the following partners: the Norwegian Association of Local and Regional Authorities - KS, National Meteorological Administration, Municipality of Sibiu, Brasov City Hall, Tg. Mures City Hall and "Lucian Blaga" University of Sibiu. The project was carried out between January 2015 and October 2016. The overall objective of the project is to reduce human and ecosystem vulnerability to climate change and aims to develop a set of best practices on adaptation to climate change.

In this project, among other activities, there were created the Strategies and action plans on the adaptation to climate change in three municipalities in Romania: Sibiu, Brasov and Tg. Mures. Also, there were selected four important sectors of priority interest: transport, energy, infrastructure / construction / urban planning and ecosystems. The sectors were selected based on the Local Action Plans and Development Strategies in every county and are considered to have the greatest impact on people's lives, given that people use ways and means of transport, depend on energy and ecosystem and live in buildings.

This document is part of a series of guidelines documents created during the the project:

- ✓ Guidelines for the preparation of municipal development strategies for climate change adaptation
- ✓ Best practices guidelines on adaptation to climate change in the vulnerable sector Energy
- ✓ Best practices guidelines on adaptation to climate change in the vulnerable sector Transport
- ✓ Best practices guidelines on adaptation to climate change in the vulnerable sector infrastructure / construction / urban planning
- ✓ Best practices guidelines on adaptation to climate change in the vulnerable sector Ecosystems

The guide aims to present some methodological aspects, but mainly examples of best practices in the Transport sector, referring to already drafted documents: the Strategies and Plans of Action on adaptation to climate change in the three municipalities and the guidelines for the preparation of developing strategies for climate change adaptation. This document is designed primarily for local governments, but also for other relevant actors in the Transport sector at local or national level, including citizens.

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1. Summary of the methodology proposed in the guidelines

The methodology proposed in the guidelines closely follows the methodology proposed in the general guidelines for the preparation of municipal development strategies on adaptation to climate change, and it provides, in addition to common elements, specific tools for the Transport sector.

Similar to the general guidelines, there are three main phases in developing a strategy for adaptation to climate change in the Transport sector:

- ✓ **The initiation stage** or preparing the ground for drafting the document, which is designed for building the team that will manage the process, identifying the stakeholders and activity planning
- ✓ **The strategy and action plan drafting stage** aimed at analyzing the main risks and vulnerabilities in the Transport sector, setting goals and measures in this sector, defining, evaluating and selecting alternatives and making the Action Plan for the Transport sector
- ✓ **The implementation stage** aimed at establishing the implementation and communication mechanism, as well as identifying the monitoring and evaluation indicators and the framework in which these activities will take place

2. Details of the process stages

2.1 Initiation

As mentioned above, this first phase is dedicated to creating the necessary framework for developing and implementing the strategy and action plan on adaptation to climate change in the vulnerable sector of Transport.

In the case of this vulnerable sector, the initiator may be the local public administration that can ensure the coordination and integration of knowledge and interests of the various actors in the Transport sector, and the involvement of all stakeholders at the local level. Therefore, at the administration level, a coordination team can be formed by people with competences and skills in the planning field (executive coordinator), the climate change and Transport (sector experts), the financial and legal fields (support experts). If the locality already has strategies targeted on the Transport sector (e.g. integrated urban development strategy, socio-economic strategy, urban mobility plan etc.), we recommend the involvement of the same people. The departments / services / offices that may give the coordination team members are: strategy / development programs / European funds, transport / technical / public utilities,

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environmental protection, public domain administration, urban planning / land use / land register, chief architect, economic, legal.

The development of a strategy for adaptation to climate change in the Transport sector, should involve, as partners, the representatives of relevant stakeholders (see proposal of partnership structures in the general Guidelines). The working group and the local advisory committee may include: public and private transport operators, airport operators, Romanian Railway Infrastructure, the environmental protection agency, transport companies, clusters and travel agencies, representatives of transport and environmental NGOs, property owners associations, research and educational institutions, as well as financial and credit institutions. The advisory committee can extend the list of stakeholders with actors from higher territorial levels such as: Ministry of Transport, CNADNR, Ministry of Environment, Waters and Forests, the National Environmental Agency, MFE, MDRAP, the Regional Development Agency, County Council, Prefect's Office, as well as the general public.

Once identified the stakeholders and the establishment of partnership structures, the activities of the drafting process will be mutually agreed, mentioning also the officers, deadlines and deliverables, using the Gantt chart tool.

2.2 Development stage

2.2.1 Analysis of the existing situation in the Transport sector

The first step in this phase presents the existing situation in the Transport sector (data on vehicle traffic counters, transportation habits of consumers, average fuel consumption), as well as the weather events that have affected this sector. Examples of indicators that can be collected and analyzed at this stage, and the sources of information

Indicators	Information sources
- Status / wear and tear of the transport infrastructure	- Tempo Online database, INS
- Traffic volume	- Traffic surveys
- Vehicle fleet numbers	- Sustainable Urban Mobility Plan (SUMP)
- Travel duration and speed	- Statistics and information provided by public transport, railway, airline operators
- Weather events' impact on transport infrastructure and operations	
- Public transport infrastructure and quality	
- Alternative transport mode infrastructure	

Once collected and analyzed the data on the Transport sector, conclusions can be drawn on how this sector is or may be affected by climate change in the future, thus identifying the main challenges and assessing the risks and vulnerabilities of the sector.

For example, the National Strategy on Climate Change 2013-2020 identified the following challenges in the Romanian Transport sector:

- ✓ As the main threats to the transport, and the transport infrastructure in particular, are the floods, landslides, and mud-flows, the climate change

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adaptation projects should start with the construction/rehabilitation of embankments and river bank protection systems.

- ✓ Other negative effects of climate change to be fought are the silt-clogged waterways and ports due to increased erosion, and infrastructure damage due to high temperatures.
- ✓ Real-time warning systems are needed for water levels and landslides, as well as for potentially destructive and extreme weather events.
- ✓ Studies and research should be carried out on the influence of climate factors on various transport modes, and the new technologies resilient to climate change effects so as to ensure that Romania's transport system will not be affected by the projected or unforeseen climate changes
- ✓ Hazard maps should also be created, to help prioritize the adaptation measures to climate change
- ✓ The best practices for ASC in the transport sector can be identified in the waterway transport sector, where the relevant authorities have already taken action to protect shipping and inland waterways against extreme events.

Table 1. Risks identified by the European Commission regarding climate impacts on the Transport sector

<i>Infrastructure type</i>	<i>Climatic pressure</i>	<i>Risks</i>
Rail infrastructure	Summer heat	Railway track buckling Fatigue of the rolling stock Increased instability of embankments Equipment overheating (eg. engine ventilation, temperature control system) Increase in wildfires can damage the infrastructure
	Winter cold / ice	Ice on trains and catenaries
	Extreme precipitation	Damaged infrastructure due to flooding and/or landslides Scour to structures Destabilisation of embankments
	Extreme storms	Damage on infrastructure, such as signals, power cables etc. (eg. Due to falling trees)
	In general	Reduced safety Increased repair and maintenance costs Delays

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Road infrastructure (roads, bridges, tunnels)	Summer heat	Pavement deterioration and subsidence Melting road surfaces Cracked road surfaces Increase in wildfires can damage the infrastructure Expansion of bridges
	Extreme precipitation / floods	Damage on infrastructure (eg. pavements, road washout) Road submersion Underpassage flooding Overstrained drainage systems Landslide risk Instability of embankments
	Extreme storm events	Damage on infrastructure Roadside trees/vegetation blocking roads
	In general	Reduced travel speed Road closure or road safety hazards Delays Material, economic losses Higher repair and maintenance costs
	Sea-level rise, extreme storm and heavy precipitation events	Damaged coastal road infrastructure due to flooding Coastal erosion Road closure
	Permafrost melting in mountain areas	Decreasing stability Rockfalls Landslides Road closure
Aviation infrastructure (including runways)	Summer heat	Greater need for ground cooling Degradation of runways and their foundations Higher-density altitudes reducing the engine combustion efficiency Increased runway lengths
	Heavy precipitation	Damage to runways and

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		other infrastructure Water run-off exceeds capacity of drainage system
	Sea-level rise	Flooding of runways, outbuildings and access roads
	In general	Interruption and disruption to services supplied and to ground access Frequent airport closures Higher maintenance costs
Inland shipping	High river flow (eg. extreme precipitation, snow melt)	Problems for the passage of bridges Speed limitations due to dike instability Restrictions on vessel height
	Low river flow (eg. drought)	Loading capacity restrictions Navigation problems, speed Reduction
	Change in ice cover of rivers	Ice jams, and damage to navigation signs and infrastructure
	In general	Delays Stopping of inland shipping Material / economic loss
Maritime transport	Sea-level rise	Navigability could be affected by changes in sedimentation rates and location of shoals More frequent closure
	Change in sea conditions	More severe storms and extreme waves might affect ships
	Less days with temperatures below the freezing point	Reduce problems with ice deposits on vessels, decks, riggings and docks Occurrence of dangerous ice fog
	Reduced sea ice	Improved access Longer shipping seasons New shipping routes
Ports	Extreme storms, sea-level rise, floods, and landslides	Damage to infrastructure Interruptions and blocking of goods' transit through

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		ports
	In general	Delays Welfare losses Higher repair and maintenance costs
Urban transport	Increasing temperature and heatwaves	Increasing heat island effect (eg. melting asphalt, increased asphalt rutting due to material constraints, thermal expansion on bridge expansion joints and paved surfaces, and damage to bridge structure material)
	Heavy precipitation events (extreme flash floods)	Damage to infrastructure due to flooding, property at risk due to location, heavy water run-off
	Sea-level rise and storm surge flooding	Risk of flooding of road infrastructure and underground tunnels Degradation of the road surface and base layers from salt penetration
	Extreme storms, strong winds	Damage Higher maintenance costs

www.eea.europa.eu/publications/adaptation-of-transport-to-climate/at_download/file

The project included such an analysis of the Transport sector for Sibiu and Tg. Mureș municipalities, and the main risks, vulnerabilities, and opportunities are presented below:

Risks/vulnerabilities	Opportunities/ actions
<ul style="list-style-type: none"> - Delayed interventions in emergency situations by specialized teams, and increased urban heat islands due to traffic congestion caused by the lack of a traffic management system - Impaired traffic due to the lack of bypasses, of park & ride facilities, and intermodal terminals, the existence of streets with inadequate configuration, dysfunctional intersections, scarcity of parking spaces and illegal parking on side streets, the insufficient capacity of public transport at peak hours, lack of dedicated lanes - Reduced accessibility in extreme weather 	<ul style="list-style-type: none"> - Reorientation towards green and mass transport alternatives to relieve the road traffic - Adapting the transport infrastructure to the new weather conditions and events - Development of Research-development-innovation in the transport sector to adapt it to climate change - Expansion, rehabilitation and upgrading of the

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<ul style="list-style-type: none"> conditions (eg. landslides and rockfalls, heavy deposits of snow) - Disruption of rail traffic during periods of extreme temperatures - Disruption of air traffic and damage to aircraft and airline infrastructure due to increasingly frequent fog, high temperature deviations between the summer and cold season, strong winds, heavy rains, storms and frost - Deforming and cracking roadway and sidewalks due to high temperature deviations, and the use of technology unsuitable for specific weather conditions - Transport infrastructure affected by land degradation - Communication paths affected by extreme weather events in the absence of protection forests - Falling trees and utility poles (overhead power and communication lines) due to storms - Temporary street flooding during heavy rainfalls (possible causes: undersized and clogged centralized sewer system, the absence of separate sewer systems, of rainwater harvesting tanks, and paved sidewalks) - Impaired health of public transport users due to the absence of functional heating and air conditioning systems 	<p>transport infrastructure and development of the intermodal transport</p>
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2.2.2 Risk assessment for the Transport sector

The following phase analyses the risks and prioritize them, based on the results obtained from the analysis, by estimating the impact (the weight of the affected target group – citizens, companies) of climate change on each risk and by considering the probability that a certain change might occur, using a scale from 1 to 5 and building a matrix (where 1 is a very low impact-probability, and 5 a very high impact-probability). After filling out the matrix, we obtain the points for each identified risk, and the score is calculated as the product between Impact*Probability. A score that exceeds 15 points shows a very high risk, 8 - 12 score points show a high risk, 3 - 6 score points show an average risk, and a score below 2 points shows a low risk

In the case of Sibiu Municipality, the matrix identified the following risks for the Transport sector:

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Hazard	Vulnerabilities	Risks	Effects	Probability	Impact	Total score
Extreme temperature	Low percentage of transport means equipped with temperature control systems; Overcrowded buses at peak hours; outdated vehicle fleet; big investment in electrical buses/trams / trolleybuses; Lack of dedicated lanes for the public transport	Unfriendly / inappropriate transportation conditions	Decreasing life quality	5	3	15
	Fatigue infrastructure; Insufficient equipment/information systems (board computer, software etc.); Lack of dedicated lanes for the public transport	Mass transport delays	Economic loss	5	2	10
		Rail transport restrictions / delays	Economic loss	4	1	4
+snowfall	Inappropriate material used on streets / sidewalks; De-icing with substances damaging the asphalt; lack of technologies and materials for asphalt reconditioning during winter (cold asphalt - high storage	Occurrence of street holes Asphalt degradation	Vehicle degradation / accidents	5	4	20

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	price); improper repairs					
High temperature	Asphalt mixtures without considering its resistance to high temperature; Transit through the city by heavy vehicles - city access roads; Lack of a southern ring road	Occurrence of buckling				
Excess precipitation	Old unitary sewer system; U-shape streets (CFR bridge) Urban development without considering the taking-over of excess rainwater	Temporary street flooding	Traffic congestion, flooding of basements and properties at lower levels	5	4	20
+ snowfall	Non-compliance with civic duties; improper de-icing; high costs; illegal parking, hampering the de-icing operations; narrow streets	Difficult traffic due to snow; Difficult interventions in emergency situations	Accidents	5	2	10
Storms	Improper management at CFR; improper tree grooming; overhead lines; opposition by citizens	Falling trees and traffic jams	Economic loss	5	1	5
Fog Snowfall Storms	Wear and tear of signalling and navigation systems; Fatigue / insufficient intervention equipment	Air transport restrictions; disturbed air traffic	Economic loss	5	2	10
Storms	Existence of the	Power	Economic	5	3	15

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	air transport and distribution network; outdated equipment; lack of UPS devices	failures	loss			
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2.2.3 SWOT analysis and defining the alternatives

The third stage in drafting the document for the adaptation to climate change is the development of the SWOT matrix for the Transport sector, i.e. identifying the internal and external factors that may be desirable or undesirable. To make the transition to defining the alternatives for the pilot municipalities we used the SWOT analysis on chains, by linking the threats and opportunities to the weaknesses and strengths identified for the analyzed sector, and the fishbone diagrams (for details, see the overall Guidelines).

SWOT analysis by chains for Sibiu City for the Transport sector:

Identified risk	Deforming asphalt layer, buckling rail tracks	
Possible impact	Difficult traffic, loss and accidents; train speed limitations	
City weaknesses	Natural threat	City strengths
Asphalt mixtures without considering the asphalt resistance to high temperature	Extreme temperature (mainly in summer) <i>Impact on objects/people:</i> roads and their users, railways and train passengers <i>Action mechanism:</i> intense traffic (heavy traffic, in particular) deforming the asphalt during hot days; high temperatures cause the buckling of rail tracks and lead to trains speed restrictions	Existence of the highway in the north to takeover the heavy traffic (partly)
Difficult traffic through the city – city access roads		Increasing interest in alternative transport solutions (bicycles)
Absence of a southern ring road		Increasing no. of bike lane km
Fatigue infrastructure		Few train commuters
Identified risk	Difficult traffic	
Possible impact	Difficult interventions in case of emergency situations, accidents	
City weaknesses	Natural threat	City strengths
Non-fulfilment of civic duties	Heavy snowfall <i>Impact on objects/people:</i> road users <i>Action mechanism:</i> heavy snowfalls may hinder the movement of vehicles, including the intervention vehicles	Payment system for de-icing providers calculated pe m ²
Improper de-icing		
High costs		
Illegal parking, thus hampering the de-icing operations		
Narrow streets		
Identified risk	Trees breaking and falling on the road or rail tracks	

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Possible impact	Impaired traffic	
City weaknesses	Natural threat	City strengths
Improper management at CFR Infrastructure	<p>Storms <i>Impact on objects/people:</i> trees in the city <i>Action mechanism:</i> the wind may take down the trees onto the roads or rail tracks, and hamper the traffic</p>	Rapid intervention capacity
Improper tree grooming		Regular tree grooming / replacement
Citizens opposing the tree grooming / replacement works		
Identified risk	Temporary street flooding	
Possible impact	Impaired traffic, jams	
City weaknesses	Natural threat	City strengths
Outdated unitary sewer system	<p>Extreme precipitation <i>Impact on objects/people:</i> road users <i>Action mechanism:</i> heavy rainfall generate the flooding of U-shape streets, in particular</p>	Rapid intervention capacity
People's habits (all people use their cars when it rains)		Increasing the rainwater discharge capacity in the CFR bridge area, following investments
U-shape streets (CFR bridge)		
Identified risk	Inappropriate public transport conditions	
Possible impact	Decreasing life quality, discontent citizens	
City weaknesses	Natural threat	City strengths
Low percentage of public transport means equipped with auto temperature control systems	<p>Heat <i>Impact on objects/people:</i> users of public transport means <i>Action mechanism:</i> high temperatures and congestion generate unpleasant travel experiences</p>	Existence of alternative transport options (e.g. taxi)
Overcrowded buses at peak hours		
Obsolete car fleet		
High procurement costs of electrical buses/ trams/ trolleys		
Lack of dedicated public transport lanes		
Identified risk	Damage to the asphalt layer and holes in spring	
Possible impact	Impaired traffic, jams, loss	
City weaknesses	Natural threat	City strengths

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Improper materials used for paving streets and sidewalks	<p>Heavy snowfall <i>Impact on objects/people:</i> roads and their users <i>Action mechanism:</i> De-icing with substances damaging the asphalt layer</p>	
De-icing with substances damaging the asphalt layer		
Lack of technologies and materials for repairs in winter (storable cold asphalt) due to their high costs		
Poor quality asphalt refurbishment		
Identified risk	Impaired and restricted air transport	
Possible impact	Passengers' lack of satisfaction, economic loss	
City weaknesses	Natural threat	City strengths
The signalling systems need to be upgraded	<p>Fog / snow/ storms <i>Impact on objects/people:</i> airplanes, airline companies and their customers <i>Action mechanism:</i> each of the abovementioned hazards hinder the landings and / or take-offs from Sibiu International Airport</p>	
Navigation systems need to be upgraded		
Insufficient / obsolete intervention equipment		
Identified risk	Breaking of power lines and electricity poles	
Possible impact	Power failures, domestic and industrial damage, public lighting interruption, impaired transport safety	
City weaknesses	Natural threat	City strengths
Existence of an overhead electric power transmission and distribution network	<p>Blizzards + freezing rain <i>Impact on objects/people:</i> electric power distribution networks <i>Action mechanism:</i> winds (and ice) may cause the breaking of cables and poles, with a negative impact on the electric power supply</p>	Ongoing projects for cable undergrounding on 5 avenues in the city
Obsolete equipment		
Lack of UPS equipment		

2.2.4 Setting the goals and measures related to the Transport sector

Starting from the risks identified and selected as priorities, according to their hierarchy in earlier stages, we will define the objectives of the Transport sector. These objectives should be SMART and will contain an action verb (e.g. reduction

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/ increase) and a noun (e.g. transport / waiting time). These goals reflect the long-term impact of the strategy on the sector.

Table 2. Transport-related objectives and actions, according to the National Strategy on Climate Change 2013-2020:

To integrate climate change considerations in the major planning and decision-making processes	Planning the preparation for emergency situations
	Reviewing the design and safety standards in the field of road and rail transport
	Reviewing the planning and project documents
To perform assessments of the Transport vulnerabilities	Inventory of the infrastructure – areas vulnerable to climate change
	Technical assistance for the assessment of vulnerabilities
	Inventory of the infrastructure – areas vulnerable to climate change

Moreover, starting from the causes identified by the problem tree and the fishbone diagram, we will define the measures that detail the results to be obtained following the implementation of the strategy. Table 3 presents an example of adaptation alternative proposed by the Institute for European Environmental Policy.

Table 3. Adaptation alternatives proposed by the Institute for European Environmental Policy for the Transportation sector

<i>Climate threat</i>	<i>Adaptation solutions</i>
Extreme temperatures	Asphalt resistant to high temperature and adaptation of maintenance (eg. new materials, heat resistant, greater use of polymer modified bitumen, improved paving technology, the use of surface materials that reflect sunlight)
Coastal and river floods	Re-localization of road alignments outside risk areas
Coastal and/or river floods	Rehabilitation of the current road infrastructure considering the increasing precipitation (e.g. Upgrading of the drainage system)
Flooding, soil erosion, storms, freezing / snow, extreme temperatures, fires	Adjusting the railway infrastructure maintenance (eg. Maintenance of the rolling stock and replacement in due time, maintenance of embankments and drainage channels, permanent bridge control (against corrosion)
Extreme temperatures and high temperature	Adjusting the railway infrastructure to high temperature and temperature deviations (adjusting the rails’ resistance to maximum temperature by using another type of steel)

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deviations	
Extreme temperatures and high temperature deviations	Upgrading the air conditioning in trains to cope with higher temperature values (e.g. New systems or upgrading/adjusting the existing ones)
Extreme temperatures and high temperature deviations	Rehabilitation of the air transport infrastructure to cope with high temperatures (eg. New & heat-resistant materials, frequent use of polymer modified bitumen, upgrading of paving technology, use of reflective surface materials)
Extreme precipitation	Rehabilitation of the air transport infrastructure to cope with increasing precipitation (e.g. Preparing and programming the maintenance of lane drainage systems, upgrading of the lane drainage systems)
Coastal and/or river floods	Rehabilitation of the current maritime infrastructure by considering the extreme weather events (e.g. embankments - groynes)
Coastal and/or river floods	Improving the waterways management, including the establishment of storage facilities (e.g. Mounting floodgates (grey investment) or polders relocated inland)
Heat, flooding, flash floods	Proper design and maintenance of bridges and tunnels (e.g. Review of the engineering and maintenance of bridges and tunnels by considering the extreme weather events, and more maintenance works)
Storms, flooding, flash floods	Management of the vegetation along roads and railways (e.g. Cutting-down the trees at risk of falling during extreme storms, selecting the adequate plants that may stabilize the soil along the routes and prevent the landslides and erosion)

https://www.iea.org/publications/freepublications/publication/COP21_Resilience_Brochure.pdf

The strategy on climate change adaptation for Sibiu's Transport sector identified one overall objective, five specific objectives and six measures, while the Tg. Mures' strategy includes one overall objective, two specific objectives, and five measures, as follows:

Sibiu Municipality		
Overall objective	Specific objectives	Measures
Reducing the waiting times / traffic delays (car, public transport, and air transport) by minimum	1. Reducing the travel times of people and providing proper transport conditions during periods of extreme	1.1 Optimizing the local public transport and raising its attractiveness for citizens
		1.2 Promoting the alternative transport options within the city

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15% by 2020, and by 30% by 2050. Increasing the share of population using the public transport by minimum 10% by 2020, and by 25% by 2050¹.	temperatures	
	2. Reducing the number of air traffic disruptions during periods of fog, snowfall, storms	2.1 Developing the infrastructure and providing the airport with modern equipment
	3. Reducing the asphalt layer degradation in extreme temperature and snowfall conditions	3.1 Ensuring the adaptation / resilience of the local transport infrastructure to climate change – related phenomena and its adequate maintenance
	4. Increasing the power distribution and telecommunication networks' resilience to extreme weather events	4.1 Developing the metropolitan cabling infrastructure
	5. Ensuring an efficient traffic flow in snowfall and emergency conditions	5.1 Ensuring the easy street access to all de-icing and ISU vehicles; use of de-icing solutions with low-environmental impact, to protect the green areas along roads and parking areas
Tg. Mureș Municipality		
Reducing the travel times in the city by minimum 20% by 2020, and by 50% by 2050	1. Reducing the share of streets/sidewalks buckling during extreme temperature periods	1.1 Adjusting the materials used in heat islands to extreme weather conditions
		1.2 Developing the alternative transport infrastructure (pedestrian corridors and bike lanes)
		1.3 Improving the motorized traffic flow within the municipality, including the implementation of traffic management measures
	2. Reducing the traffic disruptions and ensuring quality transport conditions during extreme temperature periods	1.4 Reducing the heavy traffic transiting the city (city belt)
		2.1 Upgrading and increasing the public transport efficiency

¹The overall and specific objectives of the Transport Priority sector shall be reviewed, for setting the reference values, at the completion of the Sustainable Urban Mobility Plan for Sibiu City

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2.2.5 Evaluation and selection of alternatives (prioritizing the measures for Transport sector)

The next step is the evaluation and selection of alternatives, by prioritizing the measures, provided that several decisions on the various intervention scenarios to be approached have been taken in prior. The following are some categories of scenarios for selecting the best one through discussions with the stakeholders.

Possible scenarios:

- ✓ Interventions by the government / public institutions
- ✓ Interventions by citizens/ civil society
- ✓ Interventions by private companies
- ✓ **Mixed interventions** – the most complex, given the interventions undertaken by all categories of relevant actors in the city, thus ensuring their correlation and integration, and, of course, a greater impact on the territory and the sector of interest.

Options for approaching the adaptation:

- ✓ "Soft" non-structural approaches – design and implementation of policies and procedures, land use control, information dissemination, and economic incentives to reduce and prevent the vulnerability to disasters. (Human systems management)
- ✓ "Green" structural approaches – help increase the resilience of ecosystems, aiming at the same time, to stop the loss of biodiversity and the ecosystem degradation, restoring the water cycle, and using functions and services provided by ecosystems to achieve more cost-effective, and sometimes more feasible, adaptation solutions than relying solely on the grey infrastructure
- ✓ "Grey" infrastructure approaches (hard actions) – physical intervention (using engineering services) to make buildings and infrastructures that are essential for the social and economic wellbeing of society, more resilient to extreme events caused by climate change

Some adaptation alternatives are presented below:

- ✓ **No-regrets** – adaptation measures that worth being adopted (provide real social and economic benefits) regardless of future climate change. It includes measures which are justified (in terms of profitability) in the present climate conditions, and are justified for the future, if their adoption is consistent with the risks associated with the forecasted changes. They are suitable in the short term because there is a higher probability of being implemented (provide obvious and immediate benefits) and may provide the necessary experience for conducting future assessments of climate risks and adaptation measures

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- ✓ *Low-regrets (or limited regrets)* - adaptation measures for which the associated costs are relatively low and the benefits can be relatively high
- ✓ *Win-Win* - adaptation measures that lead to the desired result in terms of minimizing climate risks or potential exploitation opportunities, as well as other social, environmental or economic benefits. Win-win options are often associated with those measures or activities addressing the climate change impact, but also contribute to their mitigation or other social and environmental objectives. These types of measures include the primary ones taken for reasons other than climate risks, but also ensure the desired benefits of adaptation
- ✓ *Flexible and adjustable management* - implementation of progressive adaptation options, and not taking one-time adaptation measures widely, thus allowing the avoidance of mistakes and adaptation to changes that occur over time in terms of knowledge, experience, technologies (eg. postponing the adoption of a measure / set of adaptation measures, provided that this decision is accompanied by a commitment to continue the adjustment, along with the monitoring and evaluation of risk development). Such a decision of deferral is taken when the climate risks are below a certain threshold or when resilience (regulations, institutional circumstances) is insufficient to allow such actions be initiated.

The following criteria may be considered for prioritizing the measures, each being scored with 1 point, as follows:

- ✓ C1. Relevance to large-scale strategies / complementary with other strategies
- ✓ C2. Multiple sectors targeted
- ✓ C3. Multiple risks addressed
- ✓ C4. Emergency (score points above 15 - high risk)
- ✓ C5. Implementation by the local government as the main lead
- ✓ C6. Impact on all three fields: economic, social, environmental
- ✓ C7. External financing options
- ✓ C8. Availability of resources for implementation (human resources, knowledge)
- ✓ C9. Socially accepted
- ✓ C10. The required legal framework exists

The example below presents the risk prioritization matrix for the Transport sector in Sibiu Municipality:

Proposed measure	SCORE POINTS										
	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	TOTAL
Optimizing the local public transport and raising its attractiveness for citizens	1	1	1	1	1	1	1	1	1	1	10
Developing the infrastructure and providing	1	1	1	1	0	1	1	1	1	1	9

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the airport with modern equipment												
Ensuring the adaptation / resilience of the local transport infrastructure to climate change – related phenomena and its adequate maintenance	1	1	1	0	1	1	1	1	1	1	1	9
Developing the metropolitan cabling infrastructure	1	1	1	0	1	1	1	1	1	1	1	9
Promoting the alternative transport in the city	1	1	1	0	1	1	1	1	1	1	1	9
Ensuring the easy street access to all de-icing and ISU vehicles	1	1	1	0	1	0	0	1	1	1	1	7

2.2.6 Drafting the action plan

This stage identifies the actions necessary to achieve the objectives set in the strategy, while providing the information necessary for implementing the climate change adaptation strategy in the Transport sector. There are several types of adaptation measures: information / educational / awareness actions, institutional action / institutional capacity building, investments, political / legislative actions. The data collected, together with the list of adaptation actions should be structured so that it can carry out a detailed plan showing concretely what should be done, by whom, by when and how to implement a successful adaptation strategy. This information will be presented in a table:

- ✓ measures / actions proposed,
- ✓ connection with the specific objectives of the Strategy,
- ✓ main leads and partners,
- ✓ proposed actions and necessary preparatory activities,
- ✓ expected results,
- ✓ timelines
- ✓ estimated budget
- ✓ possible funding sources

Below, the Action plan on the Transport sector for Sibiu Municipality:

Proposed measure/ action	Strategic Objective	Main lead / Partners	Summary (proposed activities)	Expected results	Preparatory actions	Implementation period	Estimated budget	Funding sources
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<p>Optimizing the local public transport and raising its attractiveness for citizens</p>	<p>Reducing the travel times of people and providing proper transport conditions during periods of extreme temperatures</p> <p>Ensuring quality transport conditions during extreme temperature periods</p>	<p>S.C. TURSIB S.A. Department for Strategy, Programmes, Forecasts</p>	<p>1. Re-design / upgrading of public transport stations to protect passengers against sunlight / precipitation; 2. Re-organizing the public transport routes, including the implementation of dedicated lanes, according to the SUMP provisions; 3. Providing sustainable and comfortable public transport means; 4. Implementing passenger information systems in stations; 5. Implementing e-ticketing systems.</p>	<p>No. of refurbished / upgraded stations: 50 No. of transportation means purchased : 45 No. of e-ticketing systems implemented: 20 ticket vending machines</p>	<p>SUMP completion</p>	<p>2020</p>	<p>20 mil. Euro</p>	<p>POR 2014-2020, A.P. nr. 4 BERD funds Loans Local budget</p>
<p>Developing the infrastructure and providing the Sibiu International Airport with modern equipment</p>	<p>Reducing the number of air traffic disruptions during periods of fog, snowfall, storms</p>	<p>Sibiu International Airport Sibiu CC Ministry of Transport Department for Strategy, Programmes, Forecasts</p>	<p>1. Upgrading the signalling system; 2. Equipping the airport with ice and snow removal equipment.</p>	<p>No. of upgraded signalling systems to comply with the European requirements: 1 No. of ice and snow removal devices purchased : 4</p>		<p>2020</p>	<p>2,2 mil. Euro</p>	<p>POIM 2014-2020 Own funds County Council Budget</p>

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<p>Ensuring the adaptation / resilience of the local transport infrastructure to climate change – related phenomena and its adequate maintenance</p>	<p>Reducing the asphalt layer degradation in extreme temperature and snowfall conditions</p>	<p>Technical Department Urban Planning Department PIU Department of Investments and Contractors Utility Providers</p>	<p>1. Adjusting the local urban planning and sanitation / snow removal regulations to integrate aspects related to climate change, and monitoring their implementation; 2. Upgrading the unpaved streets (project financed under the EBRD loan for 2016-2018 – target areas: Marmeladă, Obor-Viitorului, Lupeni, Piața Cluj, Lazaret, Țiglari, Tilișca, Turnișor, Gușterița), including rehabilitation works for road surface, sidewalks, water supply and sewer networks, street lighting, metropolitan cabling; 3. Ensuring the timely and spatial correlation of street upgrading / maintenance works with those performed by utility</p>	<p>No. of local regulations including climate change adaptation measures adopted: 2 Length of upgraded streets: 18 km No. of partnerships signed with utility providers to correlate the interventions: 3 No. of newly created grass surfaced parking areas: 200</p>	<p>Studies to identify technical solutions of proper adjustment of various public works</p>	<p>2020</p>	<p>15 mil. Euro</p>	<p>EBRD loan Local budget</p>
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			providers; 4. Creating grass surfaced parkings, particularly in the identified heat island areas; 5. Adjusting the interventions to the local transport infrastructure to integrate the climate change related aspects in the technologies and materials used, including through specific local procedures, regulations and tender books.					
Developing the metropolitan cabling infrastructure	Increasing the power distribution and telecommunication networks' resilience to extreme weather events	Technical Department Department of Investments Department for Strategy, Programmes, Forecasts Public and Private Operators	1. Creating the metropolitan cabling infrastructure to dismantle the overhead lines and underground them.	Length of the metropolitan cabling network: 18 km	Notifying the operators	2020	Budget included in the project run under BERD financing for upgrading of unpaved streets	Local budget
Promoting the alternative transport options within the	Reducing the travel times of people and providing proper transport	Technical Department Department for Strategy, Programmes	1. Creating new shaded pedestrian areas and rehabilitation of sidewalks; 2. New bike	Indicators to be set at the completion of SUMP	SUMP completion	2020	5 mil. Euro	POR 2014-2020, A.P. no. 4 Local budget

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city, according to SUMP	conditions during periods of extreme temperatures	es, Forecasts Public Service of Public and Private Assets Management NGOs	lanes; 3. Implementing a bike sharing system.					
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Among potential funding sources for the Transport -related actions / projects, we mention: POIM 2014-2020, POR 2014-2020, Own funds of transport operators, National Budget, Local budgets, POCA 2014-2020, POAT 2014-2020, Swiss and Norway grants, private funds, EBRD funds, loans.

2.3. Implementation of the strategy / action plan

2.3.1 Establishing the implementation mechanism

The implementation of the strategy will be coordinated by the author of the Strategy on adaptation to climate change for the Transport sector (coordination team within the City Hall), but this will be successful through the active involvement of all interested stakeholders, identified in the action plan as in charge with this.

For the successful implementation of the strategy, the following concrete actions should be carried out between 2016 and 2020 (at the monitoring stage in 2020, the City Hall and the proposed Monitoring Committee will review these actions in order to continue some of them by 2030, and 2050, respectively):

- ✓ Local Council's approval of the Strategy and Action Plan on adaptation to climate change in the vulnerable Transport sector, by adopting decisions in this regard;
- ✓ Development, in collaboration with the relevant bodies (eg. OAR and RUR) and local stakeholders, and adoption by the Local Council of a regulation approving and implementing the local measures on adaptation to climate change, which become mandatory for all real estate developers until the next revision of PUG and RLU. If the process of reviewing the PUG and RLU will not be completed by that time, these measures will be included directly in the new versions of these urban planning documents;
- ✓ Correlation of the Strategy and Plan of Action on climate change adaptation of vulnerable Transport sector with all planning documents (urban, transport-related) that already exist and / or will be further elaborated locally (eg. revision of the Regulation on the organization and functioning of public sanitation service in the sense of using de-icing solutions with less impact on the environment during periods of abundant

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- snow and ice, in compliance with NTPA 002 and NTPA 001 regulations, with no negative effects onto the soil, vegetation and trees - recommendation made by the representatives of APM Sibiu);
- ✓ Dissemination of the Strategy and Action Plan on climate change adaptation of vulnerable Transport sector (in accordance with the proposed communication measures);
 - ✓ Development of justifying / opportunity studies needed to implement the measures on adaptation to climate change in the Transport sector proposed in the strategy and action plan (eg. Flood studies, mobility studies);
 - ✓ Production of technical and economic documents related to the projects identified in the Action Plan;
 - ✓ Identification, analysis and selection of the funding sources for the projects proposed for implementation;
 - ✓ Identification of public and private partners to develop and implement projects;
 - ✓ Signing partnership agreements between the City Hall and the relevant actors at local, county and national levels for the development of the projects in the Action Plan;
 - ✓ Identification and information of potential beneficiaries on the existing complementary funding sources, in order to increase the absorption of European funds;
 - ✓ Annual budget planning by considering the resources needed to implement projects;
 - ✓ Preparing the institutional and human resources for the successful implementation of the projects;
 - ✓ Project implementation;
 - ✓ Promotion of project results at national and international level (promotional materials, participation in international events, websites, etc.);
 - ✓ Monitoring the progress of project implementation and the production of progress reports by the Monitoring Committee (City Hall, other public institutions with Infrastructure / construction / urban planning -related tasks, private companies, NGOs, universities etc.);
 - ✓ Interim evaluation of the Strategy and Action Plan on adaptation to climate change in the Transport sector;
 - ✓ Assessment-based review of the Strategy and Action Plan on adaptation to climate change in the Transport sector and corrective actions.

2.3.2 Communication and Dissemination Actions

In terms of the communication / dissemination of the strategy on the Transport sector’s adaptation to climate change to the local stakeholders and the general public, following its approval by the Local Council, some concrete actions that could be envisaged for 2014-2020 are proposed below:

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- Organizing a press conference and issuing a press release by the City Hall, on the City Council `s adoption of the Strategy and Action Plan on the Transport sector’s adaptation to climate change;
- Promoting the Strategy and Action Plan on the Transport sector’s adaptation to climate change in the virtual environment, through postings on the website and the Facebook page of the City Hall and the partner institutions involved in the development process;
- Organizing, under inter-institutional partnership, an annual international conference on the Transport sector’s adaptation to climate change, that brings together experts from academia and research, government, and practitioners from the public and private sectors active and interested in this field;
- Organizing professional training courses in the field of Transport sector’s adaptation to climate change addressing the education personnel, that will be later the vectors of communication with students;
- Developing promotional materials for the strategy and action plan on Transport sector’s adaptation to climate change, and a video presentation that will be promoted online, on websites and Facebook pages of the institutions involved. The video will also run at the premises of some institutions and in some public areas;
- Concluding partnership agreements with local opinion leaders (NGOs, representatives of the owners associations, family doctors and school head teachers, spiritual leaders, etc.) to carry out information, public awareness campaigns;
- Organization of competitions for ideas and concrete measures to adapt the Transport sector to climate change among different categories of local stakeholders (e.g. students, retirees, housing associations, companies, etc.).

2.3.3 Monitoring & evaluation, review & improvement

This activity will identify a set of result and objective indicators to measure the progress in implementing the adaptation measures proposed in the action plan. The monitoring and evaluation framework clarifies the aspects to be monitored and evaluated, considering the timetable for their implementation and helps to establish the tasks for carrying out these activities. The following aspects should be clarified through discussions with the stakeholders in the partnership structures: What needs to be monitored and evaluated, Time and frequency of monitoring, Who is responsible for the monitoring and evaluation, Provision of the resources and commitment of those involved in this process.

Table 4. Result indicators proposed in the 2016-2020 Action Plan on Climate Change:

Number of emergency plans considering the climate change aspects
Number of road and railway transport design and safety standards reviewed that consider the climate change aspects
Number of technical assistance actions to assess the vulnerabilities

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Number of areas vulnerable to the identified climate change aspects

Monitoring activities will be carried out on the basis of the indicators proposed for this purpose. Thus, we can speak about at least two categories of indicators: result (short term) and objective (long term).

Result indicators:

- measure the progress of the actions and measures set
- indicate the results achieved at the end of each type of project
- are the main indicators used in the ongoing monitoring and evaluation of the Strategy and Action Plan

Objective indicators:

- measure the progress of the sectoral objectives set
- obtained after the completion of the strategic projects corresponding to each objective and used in the final evaluation of the Strategy and Action Plan implementation.

The indicators proposed for monitoring the implementation of the Transport sector's adaptation strategy in Sibiu and Tg. Mureș Cities, are presented below:

Objective indicators (by sector)	Result indicators (by measure/project)
Sibiu City	
Reducing the waiting times / traffic delays (car, public transport, and air transport) and increasing the share of population using the public transport	<ul style="list-style-type: none"> • No. of refurbished / upgraded stations • No. of transportation means purchased • No. of e-ticketing systems implemented • No. of upgraded signalling systems to comply with the European requirements • No. of ice and snow removal devices purchased • No. of local regulations including climate change adaptation measures adopted • Length of upgraded streets • No. of partnerships signed with utility providers to correlate the interventions • No. of newly created grass surfaced parking areas • Length (Km) of the metropolitan cabling network
Tg. Mureș City	
Reducing the travel times in the city by minimum 20% by 2020, and by 50% by 2050	<ul style="list-style-type: none"> • No. of idea contests organized • Length of rehabilitate / upgraded streets using adjusted materials • Length of new bike lanes • Surface of pedestrian areas created • No. of public transport means purchased

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- No. of public transport means equipped with GPS
- No. of public transport stations equipped with information systems
- No. of upgraded public transport stations
- Length of new streets within the inner city ring
- No. of re-designed intersections
- Length of the city belt

The monitoring of the Strategy implementation can be run according to the following timetable of activities:

- The monitoring of the implementation of the strategy on the Transport sector's adaptation to climate change, will be carried out in 2020, the year when the implementation of measures and actions provided in the strategy should end, be reviewed, in order to select the interventions proposed for 2030 or 2050 (the entire period covered by the vision). Basically, this monitoring action corresponds to a "stage" / interim strategy implementation assessment, given that it refers to three time horizons: short (2020), medium (2030) and long term (2050);
- The results of the proposed monitoring (2020) will be centralized in a monitoring report. The main purpose of the monitoring report is to highlight the status of the strategy and to propose recommendations for its effective implementation. It is recommended that the report has a simple structure, including an introduction (with information about the period covered by the monitoring report, the data sources used for assessing the progress in implementing the strategy, difficulties encountered), a section that describes the monitoring activities undertaken chronologically and synthetically, a chapter that provides the measures and actions that have been monitored, and recommendations to streamline the implementation of each measure and action, and a final section that provides a synthetic view of the overall report on the progress made in implementing the strategy for the period 2016-2020;
- The monitoring report will be discussed in the plenum of the City Council to review the progress in implementing the strategy on the Transport sector's adaptation to climate change and identify the recommendations for improving the implementation thereof;
- The City Hall, who will assume the strategic document by HCL, will have the task of documenting the values of the selected monitoring indicators, based on secondary sources: statistical data provided by the National Institute of Statistics (e.g. TEMPO Online database), own data, transport operators, other institutions etc. as well as from the Annual Implementation / Progress Reports of the Operational Programmes for 2014-2020, drawn up by the Management Authorities / Intermediary Organisms (based on SMIS data), given that some of the priority projects of strategy's portfolio are proposed for funding from the Operational Programmes;
- If the information made available by the existing sources is insufficient to reflect the progress of the strategy implementation, monitoring

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questionnaires may be applied at the organizations that implement projects relevant to the strategy (see the people in charge / partners in the action plan);

- To ensure the representation of the stakeholders at local level, the continuity of the planning process and the success of the monitoring, we recommend, as mentioned above, the setting up of a Monitoring Committee of the strategy, to carry out the interim monitoring activities (eg. yearly or every two years) and to provide direct support to the City Hall representatives (eg. documenting the indicators for monitoring, establishing measures to streamline the implementation, identifying new projects, partners, funding sources, etc.) in the monitoring process which will be implemented by 2020;

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3. Best practices of adaptation for the Transport sector

Project title	Adaptation of French standards for design, maintenance and operation of transport infrastructures
Short description	At the request of the Ministry of Ecology, Sustainable Development and Energy (DGITM), the Cerema under supervision of the French Administration, completed in 2015 a systematic review of standards and guidelines on the design, maintenance and operation of transport infrastructures. The aim of this review is to adapt transport infrastructures and systems to future climate conditions and foster greater resilience to the effects of extreme weather events on long term (over 100 years). The new standards will replace the existing ones.
Challenges	Increase in average temperature, decrease in the number of frozen days, and changes in daily temperature variations. Precipitation tends to decrease in spring and summer; reduction in the number of snowy and rainy days. Surface water with increased flows in winter and more severe low flows in summer; annual average groundwater levels would tend to decrease. Overall trend to a sea level rise Extreme weather events would tend to increase in frequency and intensity; extreme rainfall associated with these events would decrease in frequency but increase in intensity.
Solutions	Summarizing the major climate trends at short and long term Screening the existing standards, in order to identify those that include references to key climate concepts The selected standards were subsequently classified into three groups, in accordance with the needs for revision from a climate change adaptation perspective: (1) those with no need for revision; (2) those in need of revision, and (3) those needing more precise information of the climatic variables and indicators involved for assessing their revision needs Some hundreds of technical standards (more than 800 only for roads) have been revised. Examples of standards in each category: 1. Road traffic noise, road landscape design, road drainage guidelines, recommendations for structural design (limit states) in aquatic sites 2. Road pavement design, estimate of general

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	<p>actions for aquatic structures (snow, wind, etc.).</p> <p>3. Design and construction of new roads, maintenance of urban roads, draining road pavements, guidance on road embankments, principles to laying of long welded rails.</p>
Stakeholder participation	<p>The review has been undertaken in coordination with the DGITM (Directorate General for Infrastructure, Transport and Sea) and various technical services of the French government: Centre d'Études et d'Expertise sur les Risques, l'Environnement, la Mobilité et l'Aménagement, Centre d'Études Techniques des Tunnels, Service Technique de l'Aviation Civile, Service Technique des Remontées Mécaniques et des Transports Guidés, and and from the various public transport managers: RFF and SNCF (rail), VNF (inland waterways), and from IFRECOR (Initiative Française pour les Récifs Coralliens).</p> <p>The review has been carried out by a technical working group involving experts of various transport infrastructures and systems: roads, bridges, earthworks, cableway, railway, aeronautic, waterway, maritime and port sectors.</p> <p>Their tasks included the calculation of climate projections and the adaptation of the standards.</p>
Legal aspects	<p>The main legal framework of this review is the French National Climate Change Adaptation Plan, which includes a mandate to the Ministry of Ecology, Sustainable Development and Energy (Direction Générale des Infrastructures de Transports et de la Mer) to set up a working group on this action.</p>

Project title	Integrating adaptation in the design of the metro of Copenhagen
Short description	<p>Climate change impact assessment has been an integrated part of the design and planning of the Copenhagen metro since the first metro line was designed. Presently, the Copenhagen metro company is now constructing the City ring, an underground metro ring in the city centre. The biggest planning challenge is changing projections of increasingly higher mean sea water level as a consequence of climate change, meaning that entrances, ventilation (plus other infrastructure elements) to stations and shafts near the harbour and the coastline should provide sufficient protection against storm surges.</p>
Challenges	<p>heavy rainfall, storm surges and storms can impact the infrastructure, affecting the metro operation and passenger safety. Heavy rainfalls, storms and storm</p>

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	<p>surge affect locally and are hard to predict as they can vary greatly within a short distance. In this context, The highest water level has been identified separately for each station in order to estimate the exact level for each entrance, stairs, tunnel ventilation, ramp, technique room, shaft, elevator, and control and maintenance centre.</p>
<p>Solutions</p>	<p>The elevation level of critical elements of the Copenhagen metro stations increased from approximately 2.25 m on the existing metro to approximately 2.50 m on the City ring, which is currently under construction.</p> <p>To adapt the infrastructure of the Copenhagen metro to the future climatic changes, several other actions have been identified and incorporated in the design of the metro: The area around the entrances to the underground stations is designed to ensure the runoff of rainwater away from the openings. Furthermore, at some underground stations, a step has been incorporated, which requires a step up before you go down to the station; All underground stations have pumping capacity to face the most pessimistic scenario, some stations have floodgates to secure the metro from flooding; drains are installed along the track leading the water out into the local sewer system; The underground stations are protected against backflow from the city's sewerage system; Installations of waterproof outer doors to the technique rooms at several stations as well as electrical and mechanical installations have been made them waterproof; Waterproof walls up to level 2.3 m and against waves up to level 2.55 m along the exposed above-ground metro sections.</p> <p>The Municipality of Copenhagen is therefore elaborating general plans to protect the city from storm surges and as they are being implemented, obviously they will be included in the protection of the subway (cultural institutions, government buildings).</p>
<p>Stakeholder participation</p>	<p>The main institutional stakeholders in this project are the city of Copenhagen, the city of Frederiksberg, the National Parliament and the Ministry of Transport. Public consultation, based on the Environmental Impact Assessment of the project, was conducted in 2008; 200 citizens voiced concerns about the project. The approval of the final project was made by the two cities concerned in January 2009.</p>
<p>Legal aspects</p>	<p>The project is based on an Act on construction of a City Circle Line</p>

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Project title	Implementing climate change allowances in drainage standards across the UK railway network
<p>Short description</p>	<p>The UK is generally projected to experience increases in precipitation as a result of climate change. An important resilience action to mitigate the impacts from such increases is improvements in drainage management. Climate change resilience within Network Rail, the national railway infrastructure manager in Great Britain, is driven by corporate strategic objectives within the Network Rail Sustainable Development strategy. In this context, there have been published Route Weather Resilience and Climate Change Adaptation plans covering the whole rail network.</p>
<p>Challenges</p>	<p>The effective control of water is essential for the management of infrastructure to support safe and efficient railway services. Water has a role in many degradation mechanisms that affect infrastructure; such as the scour of bridges and embankments, and the long-term softening of materials that form the Track Support System. Drainage problems can result in speed restrictions or temporary closures of the line, as well as increasing maintenance costs. Network Rail is addressing different climate-related challenges, including increases in average and maximum daily temperatures, changes in rainfall patterns and occasionally very cold winter conditions. Network Rail will continue to pursue improved assets knowledge, and to seek a clearer understanding of how changes in rainfall intensity and frequency will impact on new asset specification and maintenance regimes.</p>
<p>Solutions</p>	<p>The revision and implementation of the drainage standards is a key asset management instrument within Network Rail's drainage policy. The drainage standards adopt a precautionary approach, by increasing the design flow and providing further capacity in new and refurbished drainage systems. The climate change should be also considered. Asset policy revision, technology adoption and root cause analysis are also essential actions. The Railway Drainage Systems Manual sets standards that include allowances for impacts from future climate in the design of railway assets. Some of the actions performed include the following, for the areas exposed to flooding: major works by providing an attenuation system, new pipe work and an attenuation pond,</p>

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	improved drainage management capability, Remediation of the flood site at Penmanshiel siphon.
Stakeholder participation	The project initiator is the National Railway, the national operator of railway infrastructure in UK, that provides progress reports to the stakeholders from the railway industry through several forums. The delivery of drainage plans is specifically monitored internally and by the Office of Rail Regulation. Network Rail liaises with England, Wales and Scotland environment agencies.
Legal aspects	The Network Rail operates under a Network Licence which sets out the conditions under which it must operate. In particular, Licence Condition 1 sets out Network Rail's core obligations to secure the operation, maintenance, renewal and enhancement of the network in order to satisfy the reasonable requirements of persons providing services to railways and funders.

Project title	Floating or elevated roads
Short description	Floating roads are more flexible than bridges and can also be useful as a bypass in the event of road blockages by reasons other than flooding, e.g. due to roadwork on a bridge or road along a waterway. When regular roads are turned into rivers, the citizens can still evacuate using the elevated (or flood protected) roads. Floating roads are more flexible than bridges and can also be useful as a bypass in the event of road blockages by reasons other than flooding, e.g. due to roadwork on a bridge or road along a waterway. They might look like a traditional bridge construction but with floating supports instead of fixed ones or it might be a series of floating pontoons over which a vehicle can be driven. This kind of solution to roadworks would minimise disruption, but it would have to be quick to assemble and easy to relocate.
Challenges	Road transport infrastructure and evacuation routes that are prone to flooding need to be flood proofed to reduce the vulnerability and negative impacts of flooding of transport routes. Available options to reduce the negative impacts of flooding are not only maintenance of infrastructure and the use of appropriate design and materials, but also creation of floating roads or elevated roads for evacuation routes.
Solutions	Floating roads are literally roads that float on the water. Ideally they are flexible in both time and space; they do not only float but can also move to accommodate a changing water level. Instead of a fixed bridge it consists of a series of floating pontoons on which vehicles can

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	drive. Elevated roads can look like a fixed bridge, but are longer and form a network of streets leading to higher grounds. An elevated road can also be a road on top of a bank, thus elevated with sand. Taking less space than traditional alternatives, floating roads would be very much in line with innovative thinking about using space in a variety of ways.
Stakeholder participation	Stakeholder involvement appears particularly important for elevated roads and in situations when floating roads are a permanent solution.
Legal aspects	Local authorities and government are responsible for the realization and management of floating roads and elevated roads.

Project title	New locks in Albertkanaal in Flanders, Belgium
Short description	The Albert canal in the eastern part of Flanders connects the industrial zones around Liege with the harbour of Antwerp. Because of the building of the canal also some important industrial areas were developed along it, making it an economically extremely important waterway for Belgium, with a total traffic of 40 million tons per year, avoiding 6000 trucks daily on the highways. In the future the Meuse basin, from which the Albert canal receives its water, is projected to experience more and longer periods of low river discharge, as a consequence of climate change, and so less water is expected to be available for sluicing ships.
Challenges	Because of climate change, Belgium is experiencing more and longer periods of drought. In the future this is projected to be aggravated. The canal gets its water from the river Maas (Meuse), a river only fed by rain. The Maas is also feeding other canals, with the Juliana canal to the Netherlands being the most important. So agreements had to be established with the Netherlands to address situations of extreme weather events, including low water events. During these periods, the water level of the Albert canal can drop, so that the allowed draft for ships has to be reduced, making inland navigation less attractive as transport mode.
Solutions	Big Archimedes screws were built at the locks in the canal in Ham. In case of drought these enormous screw pumps are pumping up water lost by the passing from the ship through the lock. In case of an excess of water, mainly in winter, the screws are used as a bypass to get rid of the excessive amount. In that case the pumps work as an electricity generator, with hydropower as

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	renewable energy reducing GHG emissions. The canal is also a possible waterway for migrating fish. Therefore the screws are designed to allow fish migration, protecting biodiversity.
Stakeholder participation	The organization “NV de Scheepvaart” resorting under the policy area “Mobility and Public Works” has searched for solutions together with its partners: industries, shipping representatives, drinking water supply companies, power companies, nature protection organizations, municipalities and others.
Legal aspects	A legal agreement was established between Flanders and The Netherlands about the water availability in the river Meuse. In particular, this agreement addressed the water extractions from the Meuse by the Zuid-Willemsvaart in Maastricht; the reduction of water losses in the Meuse in case of low run-off, collaboration on research and development of the common Meuse, and compensation of fresh water losses of the Kreekraksluizen.

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Conclusions and recommendations

The principles underlying the development of a good strategy for adaptation to climate change:

- ✓ involving the relevant stakeholders
- ✓ understanding the risks and barriers
- ✓ defining smart objectives and results and communicating them
- ✓ managing the climate and non-climate risk in a balanced approach, integrating the adaptation measures into existing programs and policies (taking into account the context provided by the general development objectives)
- ✓ focusing on priority climate risk management actions, sector focus
- ✓ addressing the prioritized risks associated with current climate variability and extremes
- ✓ using a flexible management to cope with uncertainties
- ✓ recognizing the importance of no-regret / low-regret and win-win adaptation options in terms of cost effectiveness and multiple benefits
- ✓ ongoing review of the effectiveness of adaptation decisions by monitoring and re-evaluation of risk
- ✓ ongoing process, and the documents to be reviewed and updated to take into account the new developments in the field (science, research, technology)
- ✓ effective communication and awareness

We present below some specific conclusions and recommendations for the Transport sector:

- ✓ besides protecting the existing infrastructure, it is essential that future infrastructure planning to be carried out taking into account the adaptation to climate change
- ✓ moreover, the public transport vehicles must be adapted and / or built to be resilient to climate change
- ✓ a sustainable transport infrastructure involves, for example, roads surfaced with a material resistant to temperature fluctuations and flooding, and bridges that take into account the unprecedented and water flows
- ✓ it is necessary to improve the mobility planning policy and to support cycling as an alternative and environmentally friendly transport mean, mainly in urban areas through the reorganization of urban space, adequate infrastructure, integrated transport systems and multimodal networks
- ✓ timely and constant monitoring is recommended at regional and local level in order to record the effects of weather events and risks for transport activities
- ✓ the main measures and potential solutions in the Transport field aims at actions to stimulate the public transport and increase the energy efficiency of the vehicles, promoting and encouraging environmentally friendly

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- alternatives to motorized transport, restricting the traffic in the central areas, implementation of new policies on parking etc.
- ✓ it is necessary that the area planning of urban transport systems to be known by as many local actors
 - ✓ the adaptation to climate change requires the joint efforts of individuals, businesses, industries, authorities affected by climate change impact, which means that we must involve all relevant actors in both the drafting and implementation of the strategy and in its communication process
 - ✓ it is very important to support and promote public policies and actions to change attitudes and behavior of the younger generation with regard to the transport problems and to have a healthy lifestyle based on sustainable mobility
 - ✓ the relevant actors in the Transport sector should integrate the awareness, management and adaptation to climate change in their planning process on the short and long term
 - ✓ partnering with experts in climate and weather services is crucial to define the future climate conditions and to understand their implications on various elements of transport infrastructure
 - ✓ It is recommended a pragmatic approach that establishes clear priorities and allows the quick achievement of results

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Sources of information

European Environmental Agency, Adaptation of transport to climate change in Europe, 2014 (www.eea.europa.eu/publications/adaptation-of-transport-to-climate/at_download/file)

Center for Sciences in the Earth System, Joint Institute of the Atmosphere and Ocean, University of Washington, Preparing for Climate Change. A Guidebook for Local, Regional, and State Governments, 2007 (iclei.usa.org/wp-content/uploads/2015/08/PreparingForClimateChange_Sept2007.pdf)

Climate Adaptation Services foundation, Guide to spatial adaptation (<http://www.ruimtelijkeadaptatie.nl/en/>)

Ecological Institute, Berlin, AEA group, ICLEI – Local Governments for Sustainability, European Secretariat, the Regional Environmental Center for Central and Eastern Europe, Adaptation to Climate Change. Policy instruments for adaptation to climate change in big European cities and metropolitan areas (<http://cor.europa.eu/en/documentation/studies/Documents/Adaptation-to-Climate-Change/EN.pdf>)

European Commission, Working document 137, Adapting infrastructure to climate change, 2013 (http://ec.europa.eu/clima/policies/adaptation/what/docs/swd_2013_137_en.pdf)

European Commission, Working document 134, Ghid privind dezvoltarea strategiilor de adaptare, 2013 (http://ec.europa.eu/clima/policies/adaptation/what/docs/swd_2013_134_en.pdf)

European Environment Agency, Adaptation in Europe. Addressing risks and opportunities from climate change in the context of socio-economic developments, Report No.3 / 2013 (www.eea.europa.eu/publications/adaptation-in-europe/at_download/file)

Giordano, F., Capriolo, A., Mascolo, R.A. (coord), Planning for adaptation to climate change. Guidelines for municipalities, Life project No LIFE08 ENV/IT/000436 (<http://base-adaptation.eu/sites/default/files/306-guidelinesversionefinale20.pdf>)

Local Government Association of South Australia, Climate adaptation planning guidelines (<https://www.lga.sa.gov.au/webdata/resources/files/LGA%20CAPG%20Final%20Print%20Version.pdf>)

McGuinn, J., Stokenberga, L., Medarova-Bergstorm, K., Banfi, P., Volkery, A., Hjerp, P., Climate Proofing Cohesion Policy, Technical Guidance, A report for DG Climate Action, 2012 (http://ec.europa.eu/clima/policies/adaptation/what/docs/sectoral_fiches_en.pdf)

Ministry of Environment, Water and Forest, National Strategy of Romania on Climate Change 2013-2020, 2012 (http://www.mmediu.ro/beta/wp-content/uploads/2012/10/2012-10-05-Strategia_NR-SC.pdf)

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Granturilor SEE 2009 - 2014

Ministry of Environment, Water and Forest, National Action Plan 2016-2020 on Climate Change, 2015 (http://www.mmediu.ro/app/webroot/uploads/files/2015-07-14_Plan_actiune_schimbari_climatice_2016-2020.pdf)

Prutsch, A., Felderer, A., Balas, M., Konig, M., Clar, C., Steurer, R., Methods and Tools for Adaptation to Climate Change. A Handbook for Provinces, Regions and Cities, 2014

(<http://www.klimawandelanpassung.at/ms/klimawandelanpassung/en/>)

UK Climate Impacts Programme (UKCIP - www.ukcip.org.uk)

*** Case study – Adaptation of French standards for design, maintenance and operation of transport infrastructures, 2015 (<http://climate-adapt.eea.europa.eu/metadata/case-studies/adaptation-of-french-standards-for-design-maintenance-and-operation-of-transport-infrastructures>)

*** Case study – Implementing climate change allowances in drainage standards across the UK railway network, 2015 (<http://climate-adapt.eea.europa.eu/metadata/case-studies/implementing-climate-change-allowances-in-drainage-standards-across-the-uk-railway-network>)

*** Case study – Integrating adaptation in the design of the metro of Copenhagen, 2015 (<http://climate-adapt.eea.europa.eu/metadata/case-studies/integrating-adaptation-in-the-design-of-the-metro-of-copenhagen>)

*** Case study – Floating or elevated roads (<http://climate-adapt.eea.europa.eu/metadata/adaptation-options/floating-or-elevated-roads>)

*** Case study – New locks in Albertkanaal in Flanders, Belgium, 2015 (<http://climate-adapt.eea.europa.eu/metadata/case-studies/new-locks-in-albertkanaal-in-flanders-belgium>)

For further details on the drafting and implementation methodology and the tools used, please also refer to the Guidelines for developing municipal strategies for climate change adaptation.

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The project develops between January 2015 – April 2017. The overall objective of this project is to reduce the vulnerability of humans and of the ecosystem to the climate change and envisages to create a best practices set on the adaptation to climate change.

“The contents of this material does not necessarily represent the official stand of the Financial Mechanism of the European Economic Area (EEA) grants 2009 – 2014”

For official information regarding the EEA Grants, please access www.eeagrants.org, www.eeagrants.ro

The EEA Grants and Norway Grants represent the contribution of Iceland, Liechtenstein and Norway to reducing economic and social disparities and to strengthening bilateral relations with the beneficiary European countries. The three countries have a close cooperation with the EU by the European Economic Area (EEA) Agreement.

For the period 2009-2014, €1.79 billion has been set aside under the Grants. Norway contribution is approximately 97% of the total funds. The grants are available for NGOs, research and academic institutions and the public and private sector from 16 EU Member States, from Central and South Europe. There is a deep cooperation with the donor states entities and the activities can be implemented before 2016.

The key support fields are the environmental protection and climate change, research grants and scholarships, civil society, healthcare and children, gender equality, justice and cultural heritage.

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