

13th ROAD TECHNICAL COMMITTEE Technical Assistance State of play

Project Team September 2023

Improving Climate Resilience and Adaptation Measures in the Indicative Extension of TEN-T Road and Rail Networks in Western Balkans Project Context

- Ensure the development of the indicative extension of the TEN-T Core and Comprehensive networks to the Western Balkans
- This Project is one of the actions set in the Sustainable and Smart Mobility Strategy for the Western Balkans
- Project assignment focus shall be given to the existing indicative extension of TEN-T roads networks
- Project shall also consider planned sections that are currently under development



Roads

The indicative roads extension of TEN-T in Western Balkan includes:

5,287 km of TEN-T roads, out of which 3,540 km on the Core Network

*This designation is without prejudice to positions on status and is in line with UNSCR 1244 (1999) and the ICJ Opinion on the Kosovo declaration of independence.

Project objective

Reduce climate change risks

Vulnerability analysis

Undertake the Vulnerability analysis based on the sensitivity and the exposure to climaterelated hazards

Measures and strategies

Identify and select adaptation measures and strategies for mitigation of climate hazards on road and rail

Criticality assessment

Undertake the Criticality assessment of the road TEN-T network

Build capacity

Build institutional capacity on climate resilience

Project Timeline

From beginning to end



Stakeholder Engagement

Support the project from the very beginning

Transport Ministry (and/or Infrastructure Ministry)

Ministry-level commitment and accountability; Policy and regulatory influence Rail/Road operators (planning department, investment/finance planning department and maintenance department)

Planning department is responsible for ensuring that the road infrastructure is designed, constructed / maintained to withstand the potential impacts of climate change

Maintenance department

Ensuring that the infrastructure is in good working order and can withstand the wear and tear of daily use, as well as the potential impacts of climate change (including prompt response to climaterelated emergencies and restoring operations after a weather event has occurred)

Investment/Finance planning department

Important for allocating funds to maintain and upgrade existing infrastructure and invest in new projects, and it is directly linked with the Planning department

Data Collection

Aiming for successful Project outcomes

Different group of data needed for the successful project outcomes. All related to TEN-T Core/Comprehensive corridors :

- Database of hazard occurrence: such as rockfalls, floods, snowstorms and landslides
- Database regarding performed work (maintenance, rehabilitation, reconstruction) related to above listed hazards occurrence
- Current state (condition) of the subject TEN-T infrastructure
- Traffic demand data per TEN-T sections/ links for year 2021 and 2022
- Historic traffic accidents along TEN-T sections/ links related to above listed hazard occurrence

Note: All database are preferably required in open format (GIS or excel)

Methodology

Technical guidance on the climate proofing of infrastructure by European Commission (drafted in 2021)

Part 1 Mitigating climate change (climate neutrality) Part 2 Adaptation to climate change (climate resilience) Our focus

- Screening Phase 1 (ToR tasks 1-2)
 - Sensitivity
 - Exposure
 - Vulnerability
- Detailed analysis Phase 2 (ToR tasks 2-4)
 - Likelihood
 - Impact
 - Risks
 - Adaptation measures



"This guidance may be complemented with additional national and sectoral considerations and guidance."

Climate variables and hazards

EXPOSURE ANALYSIS

Indicative exposure table:

Methodology

46°0'0"N

44"0'0"N

42°0'0"N

Technical guidance on the climate proofing



SENSITIVITY ANALYSIS

Climate variables and hazards

Indicative sensitivity table:



Methodology

Improved methodology

"There are multiple definitions of vulnerability and risk. For example, see IPCC AR4 (2007) on vulnerability and IPCC SREX (2012) and IPCC AR5 (2014) on risk (as a function of likelihood and the consequences of the hazard)"

Identifying infrastructure sensitivity high-low to climate-related hazard

- Assets and processes
- Inputs
- Outputs
- Access and transport links
- Defining spatial asset exposure
- Current climate
- Future climate
- Vulnerability of asset to climate-related hazard
- Sensitivity vs. Exposure

Technical guidance approach

Sensitivity (our approach): Appraisal of network intrinsic features (e.g., link length - LL) + historical records on reported damage, interruption or closure.

Exposure (our approach): Pre-defined (existing) hazard models in current and projected climate (H)

Vulnerability (our approach): GIS context of exposed network links V=H_{mean}/LL

Methodology

Improved methodology

Impact assessment elaborates 'how fundamental this infrastructure is to the wider network or system (i.e. criticality) and whether it may lead to additional wider impacts and cascading effects.'

Indicative scale for assessing the potential impact of	Impacts:	ant				ohic
a climate hazard (example) <i>Risk areas:</i>		Insignifica	Minor	Moderate	Major	Catastrop
Asset damage, engineering, operational						
Safety and health						
Environment, cultural heritage						
Social						
Financial						
Reputation						
Any other relevant risk area(s)						
Overall for the above-listed risk areas						

Impact of climate hazards (our approach):

- 1. Road failure assessment: a) decreased speed, b) decreased capacity, c) closed road link, d) duration of failure
- 2. Transport demand assessment (current and projected)
- **3. Socio-economic assessment** (Travel time, VOC, social and env. impact, impact on the local/regional economy)

Prioritisation (our approach):

- MCA including CBA
- Short-, Medium-, and Long-term measures

Technical guidance

Methodology

Improved methodology

Based on regional experience and data available (in compliance with the original Methodology):

- Hazard selection
- Hazard spatial distribution (susceptibility)
- Network definition
- Current and future (based on climate projections) exposure to hazard (likelihood)
- Current and future network risk (likelihood)



Vulnerability Assessment

Final Results

Hazard selection (Sensitivity)

By analysing publicly available hazard databases, the WB region is primarily affected by:

- Floods (riverine and flash floods)
- Landslides (type* unspecified)

By consulting stakeholders and summarizing completed or on-going projects in transport domain, transport infrastructure in the WB region is additionally affected by:

- Snow drift
- Extremely high temperatures
- Sea level rise

(limited section of the TEN-T network)

Preliminary sensitivity table	Flood	Landslide	Snow drift	High temperature	Sea level rise
Assets and processes	High	High	Low	Medium	Low
Inputs	Medium	Medium	Low	Low	Low
Outputs	Low	Low	Low	Low	Low
Access and transport links	High	High	Medium	Low	Medium
					Source:

*landslides = slides, rockfalls, debris flows etc.









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Vulnerability Assessment

Final Results

Hazard spatial distribution (Exposure)

European Commission

Due to the extent of the interest region and other constrains (time, potentially unharmonized national level data, analogue data, etc.) existing (freely available) large-scale models, approved or initiated by EC (JRC) were used:

- ✓ European Flood Hazard Map (EC JRC FLOODS: <u>https://data.jrc.ec.europa.eu/dataset/1d128b6c-a4ee-4858-9e34-6210707f3c81</u>)
- ✓ Pan-European Landslides Susceptibility Map (EC JRC ESDAC: <u>https://esdac.jrc.ec.europa.eu/</u>)
- ✓ Precipitation indices (Climate Change Centre Austria: <u>https://data.ccca.ac.at/</u>)
- ✓ Snow indices (Climate Change Centre Austria: <u>https://data.ccca.ac.at/</u>)
- ✓ Wind indices (Climate Change Centre Austria: <u>https://data.ccca.ac.at/</u>)
- ✓ Temperature indices (Climate Change Centre Austria: <u>https://data.ccca.ac.at/</u>)
- ✓ Global sea level model (NASA: <u>https://sealevel.nasa.gov/ipcc-ar6-sea-level-projection-tool</u>)

These are all georeferenced raster models, with resolution which varies from 100 to 250 m which is sufficient for TEN-T network level of detail, or with resolution (climate variables) that requires **downscaling** process to adapt coarse models from >1 km resolution to 25 m resolution using Climaproof project tools.

Their **verification** is conducted by using stakeholder data on recorded events

- Analogue format \rightarrow digital georeferenced points
- Existing spatial databases



Vulnerability Assessment

Final Results

Hazard spatial distribution (Exposure)

ClimaProof (Enhancing Environmental Performance and Climate Proofing of Infrastructure Investments in the Western Balkan Region from an EU integration perspective: <u>climaproof.net</u>) is a climate change adaptation-oriented project targeting the WB region

It consists of several tools which are design to facilitate easier implementation of climate change agenda in planning and design (which may use regular spatial modelling, such as hazard mapping):

- \checkmark Selection tool (helps to select among 3000+ climate change models for a particular case)
- ✓ Downscaling tool (adapts coarse resolution multi-temporal models to fine resolution)
 - ICC-OBS tool (allows the user to generate bias-corrected climate models from own datasets)

It contains a repository with over 3000 climate models and indices suitable for various climate parameters and for various time spans

It can partly compensate for a climate change expert

It can be used for subsequent likelihood assessment





Our focus

ARUP

Vulnerability Assessment

Final Results

Hazard spatial distribution (Exposure)

Outputs:

- Landslide hazard map
 - LS Original landslide susceptibility map normalized to 0-1
 - PF Downscaled Precipitation factor (daily annual average) map normalized to 0-1
 - LH=LS x PF Landslide hazard map
 - ✓ for 2030
 - ✓ for 2050
- Flood hazard map
 - Different return periods
 - \checkmark 50y corresponds to 2030
 - ✓ 100y corresponds to 2050



Vulnerability Assessment

Final Results

Hazard spatial distribution (Exposure)

Outputs:

- Snow drift hazard map
 - Normalized snow days indicator SD
 - Normalized wind speed climate index WS
 - SH=SD x WS Snow drift hazard map
 - ✓ for 2030
 - ✓ for 2050
- Temperature hazard map
 - Normalized maximal temperature change
 - ✓ for 2030
 - ✓ for 2050
- Sea surge hazard map
 - Digital terrain model DTM
 - Simulated sea level SSL
 - SLH=DTM-SSL
 - ✓ for 2030
 - ✓ for 2050



Vulnerability Assessment

Final Results

Network characteristics (Vulnerability)

TEN-T comprehensive and core road network:

- With predefined network links and nodes (TCT)
 199 road links with different lengths
- With arbitrarily split segments intervals of ~1 km in length
- Versioning for current, 2030 and 2050 road network state

Vulnerability Assessment

Final Results

Current and future exposure to hazard (Vulnerability)

PER LINK for 2030 and 2050 time split Overlapping road network vector with:

- Landslide hazard map
- Flood hazard map
- Snow drift hazard
- Temperature hazard map
- Sea surge hazard map
- MULTI HAZARD

Vulnerability Assessment

Final Results

Current and future exposure to hazard (Vulnerability)

PER SUB-LINK for 2030 and 2050 time split

Overlapping road network vector with:

- Landslide hazard map
- Flood hazard map
- Snow drift hazard
- Temperature hazard map
- Sea surge hazard map
- MULTI HAZARD

Vulnerability Assessment

Final Results

Current and future exposure to hazard (Vulnerability)

Example of comparing LINK vs. SUBLINK

• Landslide hazard map

Vulnerability Assessment

Final Results

Current and future exposure to hazard (Vulnerability)

Example of comparing CURRENT vs. FUTURE

- Flood hazard map per link
- Flood hazard map per sublink

Vulnerability Assessment

Final Results

Current and future exposure to hazard (Vulnerability)

Output spreadsheets for roads:

- Ranking most vulnerable links/segments
- Appending additional criticality criteria such as population, social, economic components, etc.
- Allowing prioritization per link/segment and mapping them in GIS environment

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1 FA XL1 2 5 Feb VM 3.22 0.0000 0.0000 0.127038 1 138 H0.04 5 5 11.18 0.0000 0.0000 0.127038 1 138 H0.70 5 5 F781 63.2 22.78 0.1993 0.19912 0.11111 1 118 H0.77 5 5 F781 63.6 48.8 0.0000 0.0000 0.131601 1 118 H0.75 5 5 F781 63.6 48.8 0.0000 0.0000 0.131601 2 127 H0.02 5 5 F781 156.7 0.0000 0.0000 0.131601 2 4793 H7.08 5 5 H0 44.4 34.9 0.0000 0.131601 2 4793 H7.08 5 5 H0 44.4 3.0726 0.0000 0.131701 2 355 VIII.5.18 5 H0 44.4 0.0726 0.0000 0.131701 2 368 H2.04 5 5 F762 14.40 0.0726 0.0000 0.131701 2 368 H2.04 5 5 F762 14.40 <t< td=""><td></td><td>113 84.3</td><td>13</td><td>5</td><td>5 E 763</td><td>1823</td><td>48.12</td><td>0.0075</td><td>0.0085</td><td>0.192318</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></t<>		113 84.3	13	5	5 E 763	1823	48.12	0.0075	0.0085	0.192318									
1948 H7.08 5 11.19 0.0000 0.0000 0.18991 109 H4.09 2 5 FN3 82.3 22.78 0.1998 0.1998 0.11991 111 H3.07 2 5 FN1 0.0000 0.0000 0.1000 1.1989 111 H3.07 5 5 FN1 8956 48.48 0.0000 0.0000 0.11809 11 H3.08 5 5 FN1 19.77 0.0000 0.0000 0.11809 4 709. H7.08 5 5 0.0000 0.0000 0.11809 11 H3.08 5 FF1 19.77 0.0000 0.0000 0.11809 1 Y5 KL3 5 FB0 144 94.59 0.0068 0.0016 0.14703 2 255 VIII.518 5 EB71 14.60 0.0000 0.10278 0.14703 2 255 VIII.518 5 EB72 24.43 0.0756 0.00216 0.14703 2 255 VIII.518 5 EB72 24.43 0.0756 0.00216 0.142783 2 255 VIII.518 5 EB72 24.43		4781 86b	-01	5	5 100	- Contra	26.00	0.0000	6.0000	0.177158									
108 44.09 5 FN3 923 22.78 0.1993 0.1992 0.418181 112 85.07 5 FN1 8584 20.16 0.0000 0.0000 0.13634 114 85.01 5 FN1 8584 43.85 0.0000 0.0000 0.13634 114 85.01 5 FN1 85.7 50.00 0.0000 0.13634 114 85.01 5 FN1 15.7 23.00 0.0019 0.01344 114 85.01 5 FN1 15.7 23.00 0.0019 0.01347 128 87.04 5 23.00 0.0219 0.0024 0.14761 255 Wm.518 5 FS1 14.40 0.0200 0.0024 0.14761 255 Wm.518 5 FS2 24.40 0.0252 0.0276 0.0284 0.02761 128 87.04 5 FS2 24.40 0.13657 0.13781 0.14781 0.14781 120 270 83.04 5 FN2 13.00 1.6673 1.6999 0.13881 0.02784 0.12781 122 8470.01 5 FS42 50.00 0.0266 0.0110 0.12819 0.128193 0.128193 <t< td=""><td></td><td>1948 R7.</td><td>04</td><td>5</td><td>5</td><td></td><td>11.39</td><td>0.0000</td><td>0.0000</td><td>0.165901</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></t<>		1948 R7.	04	5	5		11.39	0.0000	0.0000	0.165901									
112 #8.07 2 5 EVAL 20.10 0.0000 0.0000 0.1997 116 #501 5 5 FVAL #636 48.83 0.0000 0.0000 0.135598 111 #3.08 2 5 EVAL 15.27 0.0000 0.0000 0.135598 111 #3.08 2 5 EVAL 15.27 0.0000 0.0000 0.143598 4794 #7.03 4 5 23.80 0.0019 0.0015 0.147504 2 255 W1.31 5 5 EVAL 14.40 0.0000 0.0000 0.147504 2 255 W1.51.81 5 5 EVAL 14.00 0.0000 0.0000 0.147504 2 255 W1.51.81 5 5 FVAL 14.00 0.0025 0.147714 1 268 #20.44 5 5 13.00 0.14828 0.1321 0.14829 2 277 #3.06 5 5 13.00 0.14828 0.1321 0.14829 2 258 #20.44 5 5 5.00 0.0056 0.0110 0.125895 2 268 #20.45 5 5.00 0.0056 0.0120 0.12595 </td <td>2</td> <td>109 84.0</td> <td>09</td> <td>2</td> <td>5 E763</td> <td>1823</td> <td>22.78</td> <td>0.1993</td> <td>0.1992</td> <td>0.161881</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td>	2	109 84.0	09	2	5 E763	1823	22.78	0.1993	0.1992	0.161881									
116 H5.01 2 5 FN1 636 48.83 0.0000 0.0000 0.13658 233 H3.02 5 5 23.0 0.0000 0.0000 0.13558 4 732 H7.03 4 5 23.0 0.0029 0.0025 0.147502 4 732 H7.03 4 5 23.0 0.0029 0.0000 0.147502 4 732 H7.03 5 5 E871 14.00 0.0000 0.0000 0.147502 2 255 VIII.5.18 5 E872 24.43 0.0255 0.0077 0.143757 1 256 H2.04 5 5 77.00 0.2355 0.0025 0.147501 2 268 H2.04 5 5 77.00 0.2355 0.0025 0.147501 2 268 H2.04 5 5 77.00 0.2555 0.0025 0.147501 2 268 H2.04 5 5 13.60 0.14818 0.132509 0.147501 2 268 H2.04 5 5 13.60 0.0455 0.14988 0.125995 2 257 H3.04 5 5 5 13.00 0.0455 0.129909 </td <td>ξ.</td> <td>112 83.0</td> <td>07</td> <td>2</td> <td>5 E761</td> <td></td> <td>20.10</td> <td>0.0000</td> <td>0.0000</td> <td>0.15957</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td>	ξ.	112 83.0	07	2	5 E761		20.10	0.0000	0.0000	0.15957									
23 8 7.02 3 5 50/0 0.0000 6.0000 0.113378 111 8 7.08 5 28,30 0.0019 0.0025 0.147901 1 4791 7.08 5 50 4.4 34,39 0.0068 0.147701 2 55 V115.18 5 5 77.00 0.7555 6.0000 0.147701 2 55 V115.18 5 5 77.00 0.7555 6.0000 0.147705 2 55 V115.18 5 5 77.00 0.7555 6.0000 0.147705 1 268 702.04 5 5 77.00 0.7555 6.0000 0.147705 1 269 702.05 5 5 13.60 1.1408 6.1511 0.14029 2 258 702.04 5 5 13.60 1.6623 1.0998 0.112888 5 3 22 702.01 5 5 5.00 0.0055 0.112968 6 3 65 V1.08 5 5 1.00 0.155 0.112968 6 3 65 V1.08 5 5 1.00 0.155 0.112964 7 13.86 V1.08 5.12.0 0.12564 0.112964 0.121964 6 3 60 V1.08 5 5 788 32.00 0.00000 0.	4	116 R5.	01	2	5 E761	1836	48.83	0.0000	0.0000	0.136598									
111 H2.08 2 5 F.91 19.17 0.0000 0.0000 0.0000 4705 H7.08 4 5 28.30 0.0019 0.0019 0.0019 6 176 K1.3 2 5 F.80 4.44 34.59 0.00268 0.0026 9 255 VII.5.18 5 F.871 14.60 0.0000 0.0000 0.147637 1 268 R2a.04 5 5 77.00 0.7525 0.7077 0.33215 1 258 R3a.04 7 5 F.92 24.43 0.0726 0.0838 0.147637 1 277 R3.6 5 5 34.60 0.3557 0.1994 0.11888 1 269 R2a.05 5 5 13.20 0.6629 1.0999 0.11888 2322 R2a.04 5 5 30.0 0.0066 0.0100 0.128637 3322 R2a.05 5 5 21.00 0.1622 0.0155 0.12964 302 R4.03 5 5 82.3 86.01 0.5867 0.12863 1 323 R2a.02 5 F.98 82.3 86.01 <td>Ε.</td> <td>273 R3.0</td> <td>02</td> <td>3</td> <td>5</td> <td></td> <td>50.00</td> <td>0.0000</td> <td>0.0000</td> <td>0.193798</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td>	Ε.	273 R3.0	02	3	5		50.00	0.0000	0.0000	0.193798									
176 176 5 560 144 34.59 0.0012 0.0020 0.0000 255 VIII.518 5 5 E871 14.00 0.0000 0.0000 0.147637 0 268 R0a.04 5 5 77.00 0.7525 0.7007 0.147637 1 268 R0a.04 5 5 77.00 0.7525 0.7007 0.14764 1 268 R0a.04 5 5 77.00 0.7525 0.7007 0.14764 1 268 R0a.04 5 5 77.00 0.7525 0.7007 0.14764 1 268 R0a.05 5 5 13.00 0.1486 0.1521 0.14909 208 R0a.05 5 5 13.00 0.1462 0.15996 0.12898 208 R0a.05 5 5 13.00 0.0162 0.0155 0.128964 302 R0.02 7 5 5 656/580 22.00 0.0162 0.0155 0.12964 309 Vc.11 5 5	1	4791 87.0	08	5	5 5/61		29.30	0.0000	0.0000	0.101430									
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0 268 R0a 04 3 5 77.00 0.2525 0.2077 0.181216 1 268 R0b 04 7 5 E7%2 24.43 0.0026 0.0828 0.042701 1 269 R0b 04 7 5 E7%2 24.43 0.0026 0.0828 0.042701 1 269 R0b 04 7 5 5 34.00 0.557 0.5994 0.125076 2 269 R0b 04 3 5 13.00 1.6623 1.06998 0.12888 5 322 R0b 01 5 5 F762 50.00 0.0565 0.110 0.12888 5 326 R0b 15 5 5.588 21.00 0.1653 0.12019 0.126195 6 302 R0b 3 5 5.884 32.00 0.0000 0.0000 0.12994 10 30 R0b 3 5 5.88 32.00 0.0000 0.0000 0.12994 10 30 9 Vc.11 5 5 5 33.00 0.0140 0.12994 12 32 R0b 02 5 5.762 33.00 0.0000 0.012779 0.1385 12 323 R2b 02 5 5.7	9	255 VIII	5.18	5	5 E871		14.00	0.0000	0.0000	8.147625									
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277 R3.06 3 5 13.00 0.04838 0.14329 286 R12a05 5 34.00 0.5857 0.5994 0.12838 227 R3.04 3 5 13.00 1.6623 0.099 0.12838 322 R2b.01 3 5 F762 50.00 0.0096 0.0110 0.12838 3 36 V.08 5 21.00 0.1455 0.3726 0.12838 7 213 R6.02 5 5 E55/E80 29.00 0.0162 0.0155 0.119964 0 302 R6.03 5 5 F768 823 36.01 0.5867 0.5775 0.12964 0 309 V.11 5 5 F768 823 36.01 0.5867 0.119964 0.117142 1 223 R2b.02 5 5 F768 823 36.01 0.0000 0.0000 0.129131 1 223 R2b.02 5 5 F762 33.00 0.1148 0.117142 11742 2 271 R2a.07 5 5 823 31.01 0.0007 0.1097 2 283 R7.15.16 5 883 31.01 0.0073 0.0077 0.1085<	1	196 R2b	.04	2	5 E762		24.43	0.0726	0.0823	0.142701									
200 ft.2405 3 5 34.00 0.0807 0.1994 0.11994 6 205 ft.240.01 5 5 13.00 1.6629 0.11994 5 322 ft.20.01 5 5 50.00 0.0056 0.0110 0.125933 6 306 vc.08 5 5 21.00 0.1453 0.17210 0.125934 7 5 5 21.00 0.1452 0.0155 0.12995 13 6.02 7 5 5 5 11 15 5 5 21.00 0.0000 0.0000 115 84.03 5 5 82.3 0.0000 0.0000 115 5 5 5 82.3 0.0000 0.0000 0.12133 1 10 5 5 752 0.11122 0.111742 1 10 7 5 5 82.3 0.0000 0.0000 1 10 7 5 5 83.60 0.0000 0.0197 2 10 7 5 5 83.5 0.007 0.0077 2 10 7 5 5 83.5 0.007 0.0077 <t< td=""><td>1</td><td>277 R3.0</td><td>96</td><td>3</td><td>5</td><td></td><td>13.00</td><td>11.1438</td><td>0.1521</td><td>0.140309</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></t<>	1	277 R3.0	96	3	5		13.00	11.1438	0.1521	0.140309									
332 R2b.01 3 5 E762 50.00 0.0569 0.0110 0.12636 5 356 Vc.08 5 5 21.00 0.1355 6.1370 0.126195 5 366 Vc.08 5 5 5 21.00 0.1355 6.1370 0.126195 6 302 R4.03 5 5 R8 32.00 0.0000 0.0000 0.01001 9 115 R4.15 5 5 E768 82.3 36.01 0.5647 0.5775 0.121001 0 309 Vc.11 5 5 5 F762 83.80 0.0000 0.0000 0.117742 1 323 R20.02 5 5 F762 33.00 0.0144 0.11742 1 210 R4.12 2 5 F763 82.3 36.61 0.0000 1 10 R4.12 2 5 F763 83.30 0.0144 0.117742 1 227 R28.07 5 5 33.00 0.0007 0.1097 1 23 R7.15.16 5 5 F84 15.0 0.0077 0.1085 1 77 Xr.4 5 5 F84 15.0 0.0077 0.1085 1 77 Xr.4 5 5 F84 15.0 0.0077 0.1085	-	200 824	0.03	5	3		13.00	1.6673	1.6593	0.129976									
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7 213 R6.02 5 5 5 5 55/580 29.00 0.0162 0.0155 0.129964 0 002 R6.03 5 5 88 32.00 0.0000 0.129150 0 115 R4.15 2 5 5768 82.30 0.5867 0.5775 0 309 Vc.11 5 5 81.30 0.1132 0.1148 1 223 R3b.02 5 5 5768 82.33 0.0000 0.0000 1 10 R4.12 5 5 1768 82.33 33.66 0.0000 0.11739 1 217 R2a.07 5 5 33.00 0.1540 0.1513 0.1097 2 283 R7.15.16 2 5 1835 31.01 0.0073 0.0077 0.1085 1 10 R4.12 5 5 1835 31.01 0.0073 0.0077 0.1085 1 177 Xc.4 5 5 190 ta4 15.78 0.0107 0.1085	6	306 Vc.1	08	5	5		21.00	0.1653	0.1720	0.126195									
a) a) a) a) a) b)	7	213 R6.0	02	5	5 E65/E80		29,00	0.0162	0.0155	0.125964									
0 115 84.15 2 5 F763 88.23 38.01 0.5547 0.5775 0.121011 0 309 Vc.11 3 5 81.30 0.1132 0.1148 0.117926 1 218 82.02 5 5 F763 4823 39.65 0.0000 0.0000 0.11120 1 10 84.12 2 5 F763 4823 39.65 0.0000 0.11120 2 21 102.07 5 5 83.00 0.1540 0.1007 0.1097 2 218 87.15.16 2 5 1835 31.01 0.0077 0.1097 10 7X c4 5 5 FW 14.4 15.78 0.0170 0.0077 0.1097 117 X c4 5 5 FW 14.4 15.78 0.0170 0.0177 0.1007 1 117 X c4 5 5 FW 14.4 15.78 0.0170 0.1077	8]	302 RB.I	60	3	5 R8		32.00	0.0000	0.0000	0.123158									
0 007 VC.11 3 5 81.50 0.1152 0.1148 0.117378 1 323 R2b.02 5 5 5 F762 33.60 0.0000 0.017378 2 10 R4.12 2 5 F768 6823 39.65 0.0000 0.0000 3 271 R2a.07 5 5 33.00 0.1447 0.1519 0.1097 4 283 R7.15.16 5 5 8835 31.01 0.0073 0.0077 0.1087 5 177 Xc.4 5 5 FW 16.38 0.0104 0.1107	2	115 84.1	15	2	5 E763	1823	36.01	0.5647	0.5775	0.121001									
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271, 102a 07 \$ \$ 33.00 0.1949 0.1917 4 283 97,155.16 \$2 \$ 8835 31.01 0.0077 0.1085 177 Xc.4 \$ \$ \$ \$ \$ 0.0104 0.1097 177 Xc.4 \$ \$ \$ \$ 0.0077 0.1085 177 Xc.4 \$ \$ \$ \$ \$		110 PA	12	5	5 E763	(82)	39.65	0.0000	0.0000	0.1112									
4 263 R7.15.16 2 5 8835 31.01 0.0073 0.0077 0.1065 1 177 Xr.4 5 5 FW1 144 15.78 0.0170 0.0149 0.1027 tmpRoadVutnerabilityPerLink + I 4		271 824	.07	5	5		33.00	0.1540	0.1513	0,1097									
s 177 Xr.4 5 5 FW1 144 15.78 0.0120 0.0048 0.1027 tmpRoadVuharabilityPerLink + 2 4	£	283 R7.	15.16	2	5	1835	31,01	0.0073	0.0077	0.1065									
tmpRoadVuberabilityPerLink + i 4	9	177 Xc.4	1	1	5 FI01	144	15.78	0.0120	0.0149	0.1027									
	1		tmpRe	oadVulnerability	PerLink	+				Ĩ	4						-		

Project Deliverables

Delivery on time

Our work plan and time schedule are ultimately based on the time frame and submission dates for deliverables.

Deliverable 1	Deliverable 2	Deliverable 3	Deliverable 4	Deliverable 5	Deliverable 6
Inception Report (1 month)	Vulnerability Assessment Report (5 month)	Criticality Assessment Report (10 month)	Identification and prioritisation of adaptation measures (11 month)	Report on Institutional activities (11 month)	Final Report (12 month)