

Climate Change: An overview of the scientific background and potential impacts affecting transport infrastructure and networks



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Report of the Expert Group

- Reviews the scientific background of Climate Change (CC) and its implications on a global scale and in the UNECE region
- Reviews potential CC impacts on ITN
 - identifying particularly issues pertinent to transport infrastructure in the UNECE region;
 - taking into account the different modes of transportation.
- Reviews pertinent studies relating to different modes of transportation and Identifies additional literature of relevance
- Presents the analysis of responses to the Questionnaire sent out to Governments and Organisations
- *International Conference on Adaptation of Transport Networks to Climate Change (June 2012, Alexandroupolis)*
- *Policy Recommendations and Conclusions*

Group of Experts on Climate Change impacts and adaptation for International Transport Networks (5th Session) Geneva 07/12/2012



Questionnaire Results



CLIMATE CHANGE IMPACTS AND ADAPTATION FOR INTERNATIONAL TRANSPORT NETWORKS

Questionnaire

2012

UNECE Transport Division Experts Group

Date

Name Position

Address Organization

City State Zip Code Phone Number

Country Email

SUBJECT I. Level of awareness, availability of information and data on climate change impacts on transport

QUESTION 1. On a scale of 1-10 (1= not at all, 10= very much) to which extent do you consider climate change to be a problem for transport in your country/region?



QUESTION 2. Please specify over which time-scale you consider climate change to be a problem.

Please select

QUESTION 3. On a scale of 1-10 (1= no knowledge at all, 10= very good knowledge on all topics) how would you rate knowledge and level of awareness about the impacts of climate change on transport in your country region



QUESTION 4. In your view, who should be the main target audience when raising awareness about climate change impacts on transport (e.g. ministries, industry managers, operators, investors, etc.)

Please explain

Responses

26 +1 Governments

7 Organisations/industry

All answers are grouped together

ANNEX III: Quantified Summary

Synopsis

5.1 Level of awareness, availability of information/data on CC impacts

5.2 Level of preparedness, existing/planned adaptation policies and measures

5.3 Information data, research needs and financing

5.4 Collaboration mechanisms

5.5 Specific questions for road/rail and inland waterway infrastructure

Key Messages

5.1 Awareness and availability of information/data on CC impacts

64 % of the respondents view CC as a challenge (> 6 on a 1- 10 scale) in their country/region.

34 % consider it an immediate challenge (0 - 15 year) and 80 % as challenge within the next 30 years.

In view of the long timelines in planning/design/construction and the long infrastructure life span responses suggest need for immediate action/initiatives



Target audiences for raising awareness:

- Public regulatory bodies (ministries and local authorities) ~40 %,
- Industry operators, investors, managers, infrastructure providers 44 %
- Users (transport companies/the general public), and the Insurance industry 15 %



The above 'top-down' approach may just reflect the sample demography

5.1 Awareness and availability of information/data on CC impacts (cont.)

Severity of the impacts on transport: 52 % severe, 48 % relatively mild

Transport mode affected: 54 % consider that road and railways bear the brunt of the impacts

Existence of specific vulnerability assessments: 61 % positive re: assessment of potential CC impacts, but only 48% are aware of cost studies

Impacts on Transport Infrastructure and Operations/Services: Awareness mostly on studies concerning floods, rising temperatures, sea level rise/storm surges and winds



Little awareness of studies on heat waves/droughts and permafrost thawing (sample demography?)

Major limiting factor regarding study of impacts: Lack of funds/competing priorities (51%)

Most important actors in the study/research/dissemination: Public bodies; the role of private companies is considered less important (rating > 8 on a 1- 10 scale of 55 %).



5.2 Preparedness, existing/planned adaptation policies and measures

Transport specific adaptation plans: at mid road



Concrete actions: large variety of adaptive actions/measures, reflecting both the arising needs and their field of competence



Planning/design of new transport infrastructure: consideration of climate change effects to some (58%) or to a great extent (29 %)

Development and/or planning of emergency response systems: around 50 % state that their country/organization has already adopted and/or implemented emergency response systems

Insurance industry: Integration of CC considerations into products for the transport sector/industry 27 % and only to some extent

5.3 Information data, research needs and financing

Type of data/predictions needed: Precipitation (28 %), Temperature (24 %), Extreme (land) winds (23 %), coastal storm surge/sea level rise (20 %) (sample demography?)

Best sources of relevant information: Public Authorities/National agencies (41 %), relevant Institutions and Universities; Suitability of International/European Agencies as sources is regarded as low (4 %) (discrepancies)



Data availability, suitability and quality: Negatively skewed answers, i.e. more respondents rate the availability as poor/bad than very good/excellent (the Data Paradox)



51% appear not to be aware of relevant models/software tools; 39 % are. *Further cooperation/wider dissemination of the relevant information/tools would help*

Existing/potential funding mechanisms/sources to support relevant studies and adaptation activities relate mostly to the public purse



There is a clear message for a need for further research/study on the CC risks/impacts and effective warning/adaptation measures.



5.4 Collaboration mechanisms

Current levels of cooperation at the national/local level and regional/sub-regional cooperation are rated as not or only somewhat satisfactory. Slightly better ratings regarding cooperation at the International level



Proposed methods for upgrading cooperation: varied



Legal instruments/ amendments to certain Regional Agreements with a view to promote/facilitate CC adaptation of transport networks: 32 % positive, 10 % possibly and 10 % negative.



5.5 Specific questions for road/rail and inland waterway infrastructure

Awareness/understanding of current vulnerabilities of the road and rail infrastructure: 39 % good. *However, scope for raising awareness, as 36 % do not provide answers and 25 % would like the awareness/understanding to increase*

Establishment of mechanisms to assess current levels of risk: 25 % outright positive answers, 15 % in the process of establishing mechanism

CC effects on Inland waterways: 50-70 % no replies (sample demography). The remainder suggest varied and significant effects, but manageable.



Key Messages

Two thirds of the respondents view CC as a serious challenge and 80 % as a challenge for the next 30 years; in view of the long timelines in design and construction and the long infrastructure life span, immediate action/initiatives required

Target audiences for raising awareness: Public regulatory bodies and the industry; This 'top-down' approach may reflect the sample demography

According to the respondents, roads and railways mostly affected (Ports?)

More risk assessment studies than cost studies

Impacts on Transport Infrastructure and Operations/Services: Awareness mostly of studies concerning floods, rising temperatures, sea level rise/storms and winds

Major constraining factor: Lack of funds/competing priorities

Key Messages

Most important actors in the study/research/dissemination: Public bodies

Transport specific adaptation plans: at mid road

Concrete actions: large variety of adaptive actions/measures

Development and/or planning of emergency response systems: at mid road

Best information sources: Public Authorities/National Agencies, Institutions and Universities; suitability of International/European Agencies as sources is regarded as low (?)

Data availability, suitability and quality: Negatively skewed answers

Existing/potential funding mechanisms/sources mostly public

Key Messages

A clear message concerning need for further research/study on CC risks/impacts and effective warning/adaptation measures

Current levels of cooperation at the national/local level and regional/sub-regional level not considered sufficiently adequate; opinion improves slightly regarding cooperation at the International level

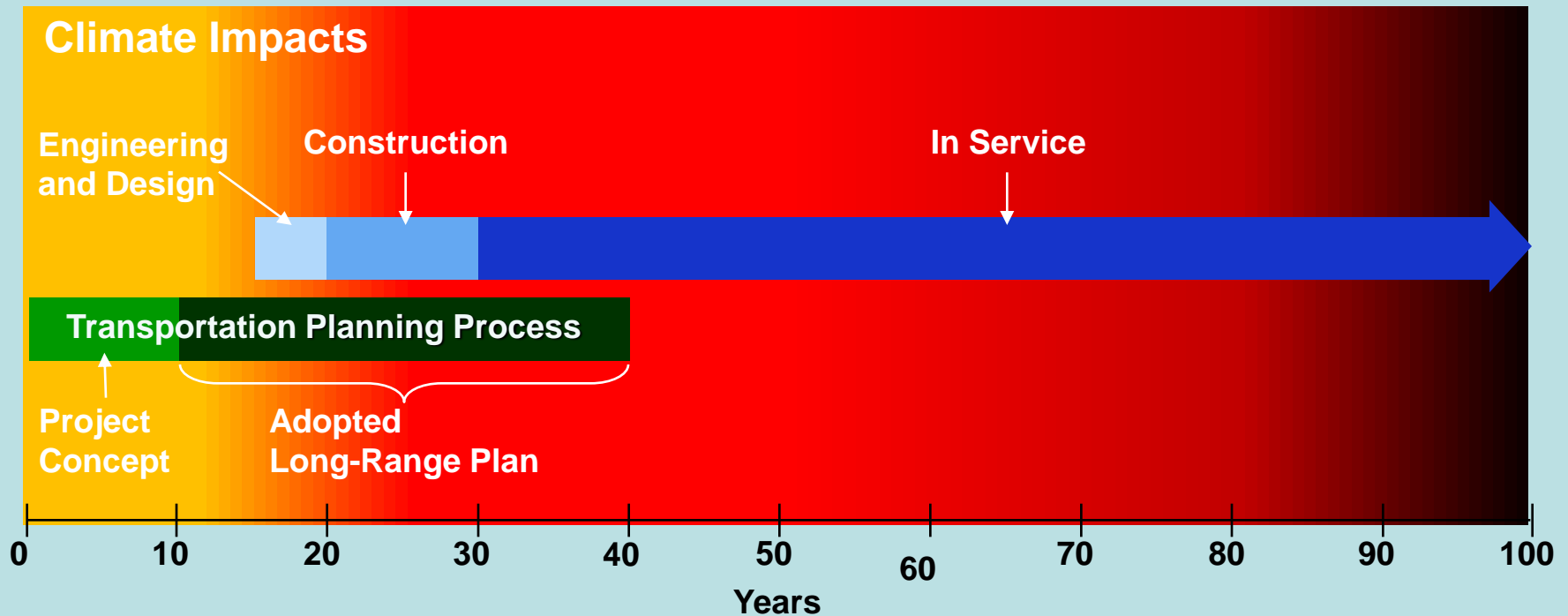
Proposed methods for upgrading cooperation: varied

Legal instruments/amendments to certain Regional Agreements with a view to promote/facilitate CC adaptation: more positive answers than negative answers

There is scope for raising awareness of current vulnerabilities of the road and rail infrastructure

CC effects on Inland waterways are regarded as varied and significant, but also manageable

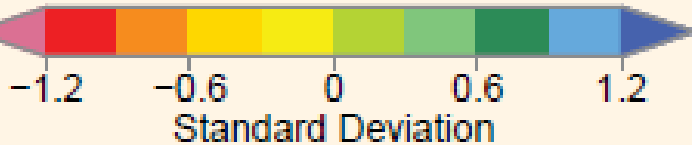
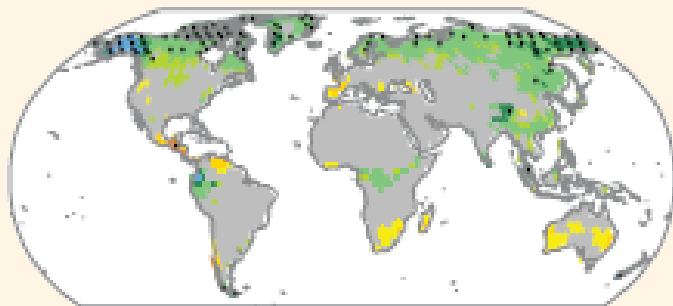
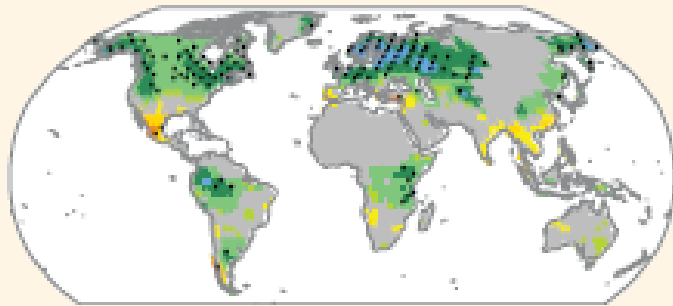
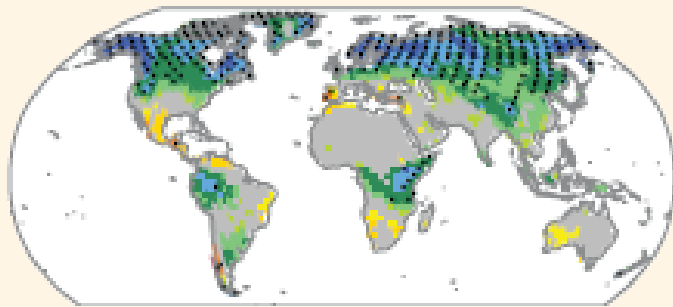
Transportation Timeframes vs. Climate Impacts



Source: Savonis, 2011



Fraction of Days with Pr > 10mm



Latest Projections: Downpours

annual Projected precipitation changes (precipitation > 10 mm) for 2081-2100 relative to 1980-1999 (17 GCM ensemble), as units of standard deviations

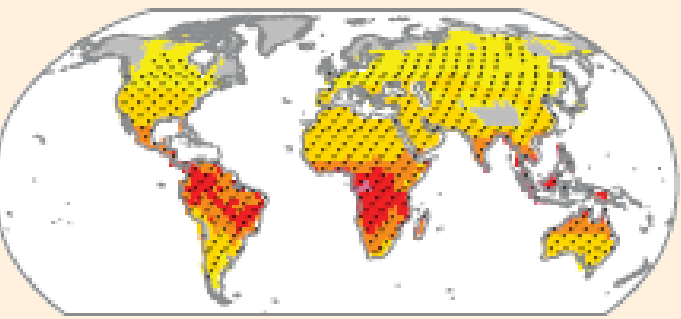
Winter Colour shading applied for areas where $\geq 66\%$ of the GCMs agree on the sign of the change; stippling is applied for regions where $\geq 90\%$ of the GCMs agree on the sign of the change.

(IPCC SREX 2012)

Summer

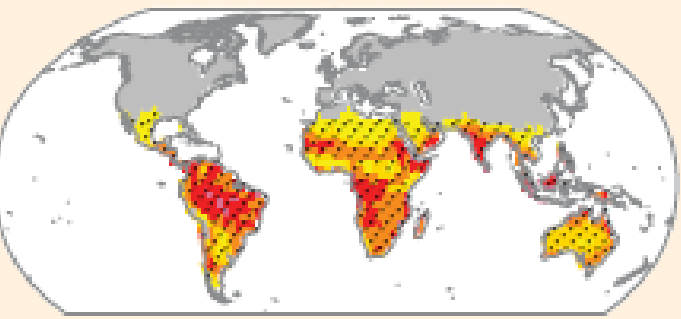


Percentage Days with Tmax>30



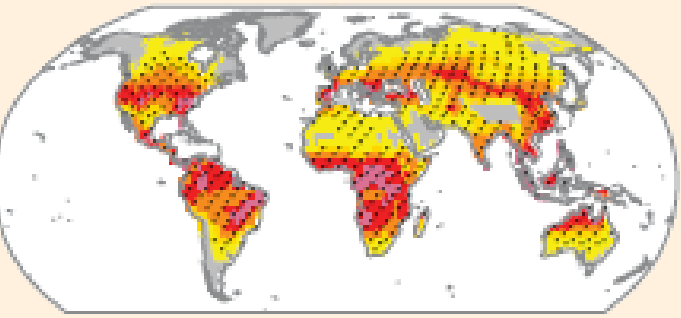
annual

Projected changes in daily Tmax for 2081-2100 (% days with Tmax >30°C) relative to 1980-1999, (14 GCM ensemble).



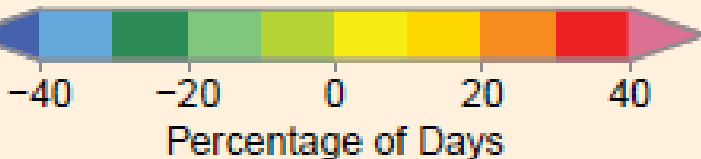
Winter

Tmax > 30°C changes are given as differences where at least 66% of the GCMs agree on the change sign; stippling is for regions where at least 90% of the GCMs agree on change sign .

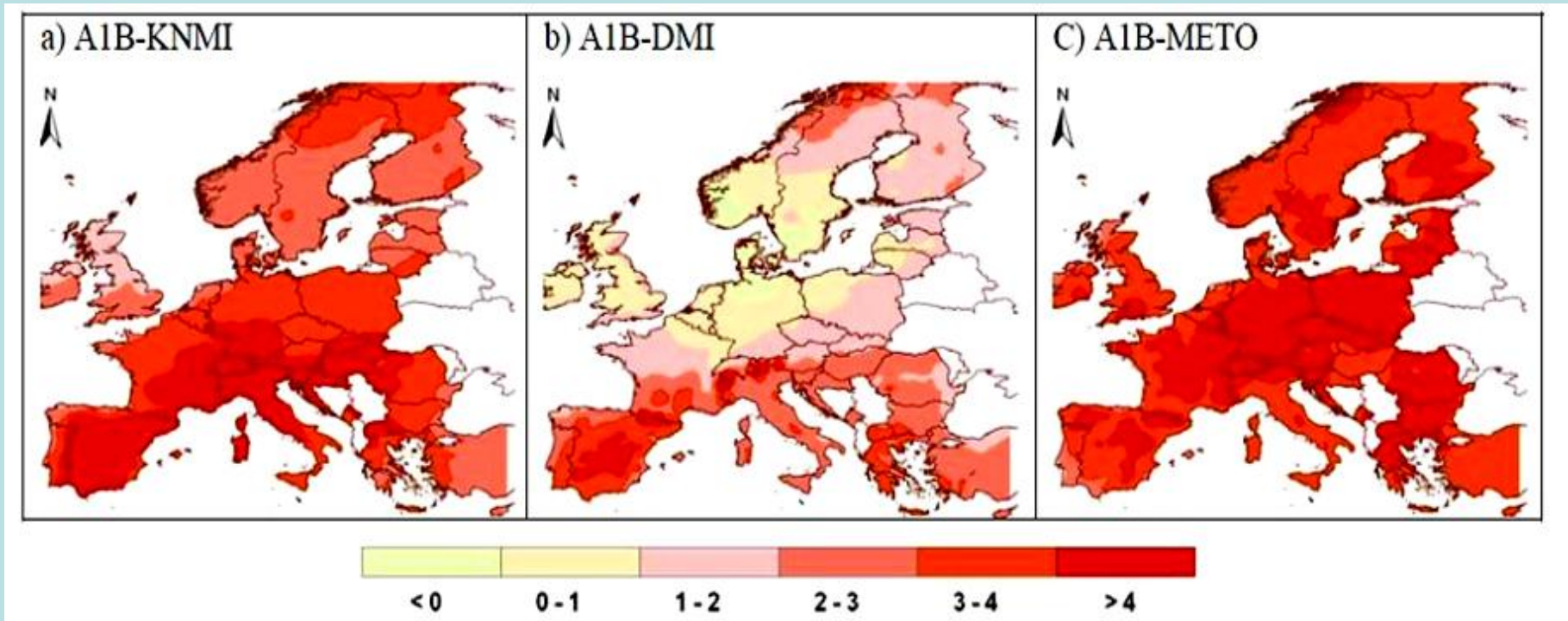


Summer

(IPCC SREX, 2012)



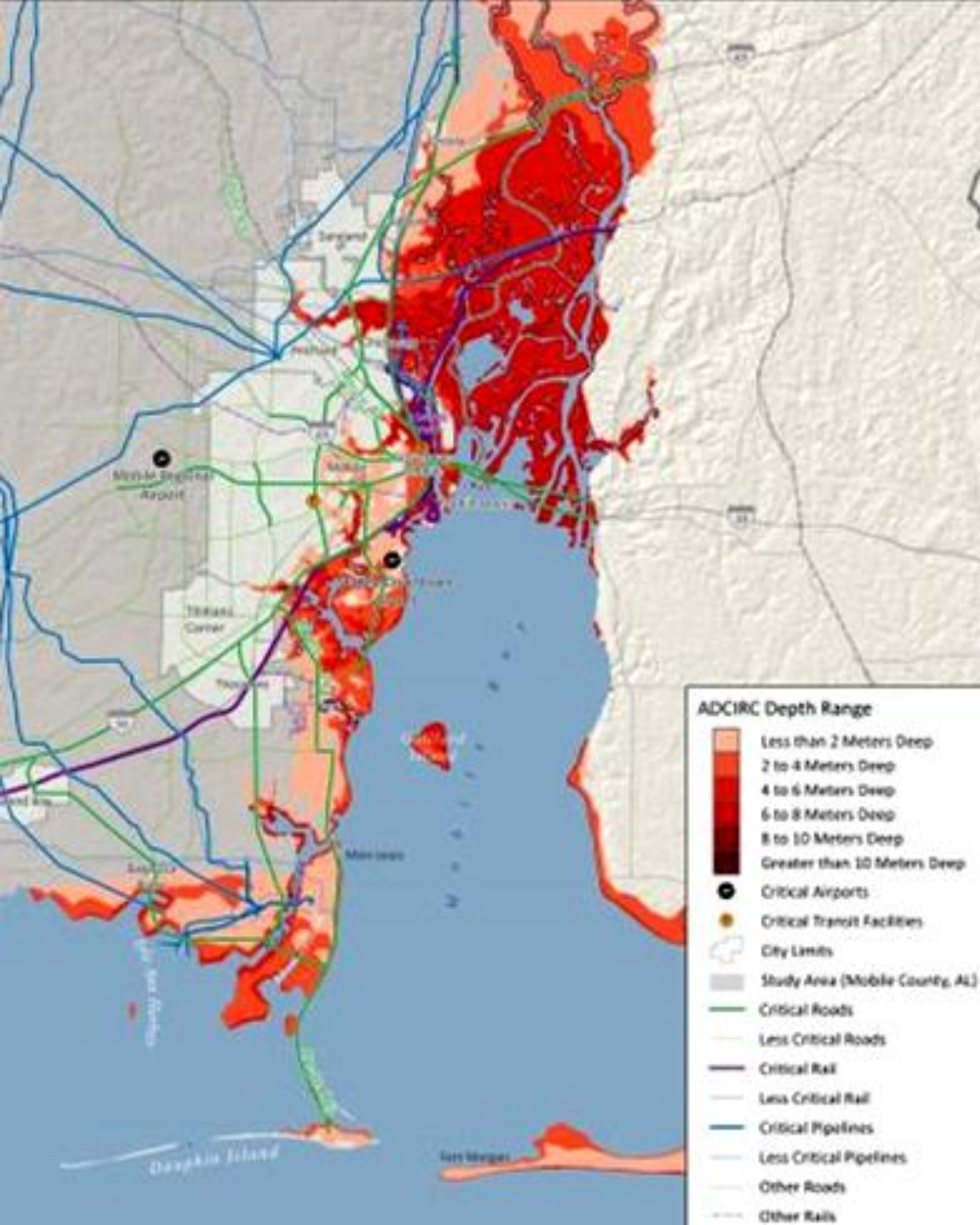
Impacts on road pavement



Change in the 7-day maximum pavement temperature in the different European climate zones, in the case of the A1B scenario (comparison between the periods 2040-2070 and 1990-2010) (EC, 2012).



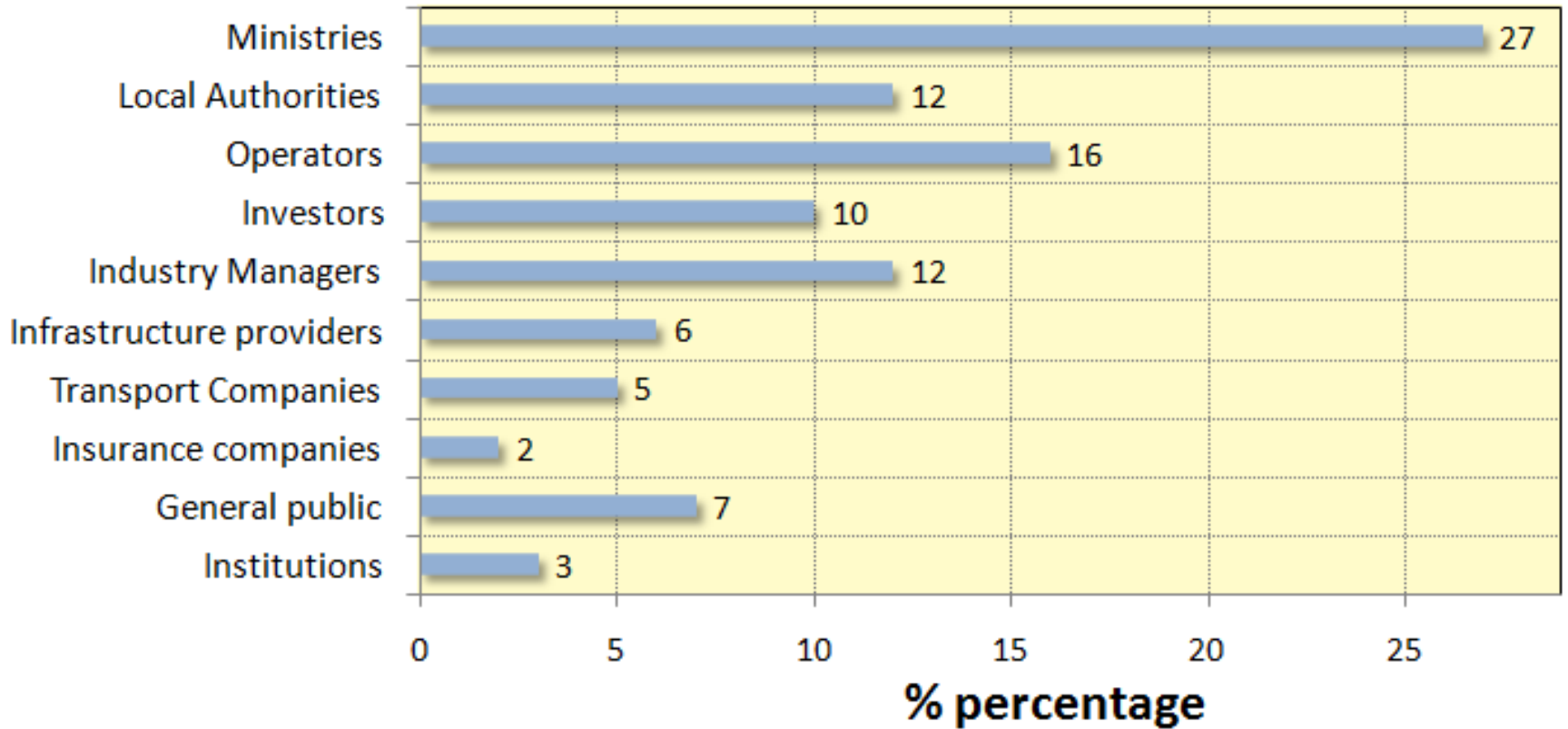
Projections of coastal impacts



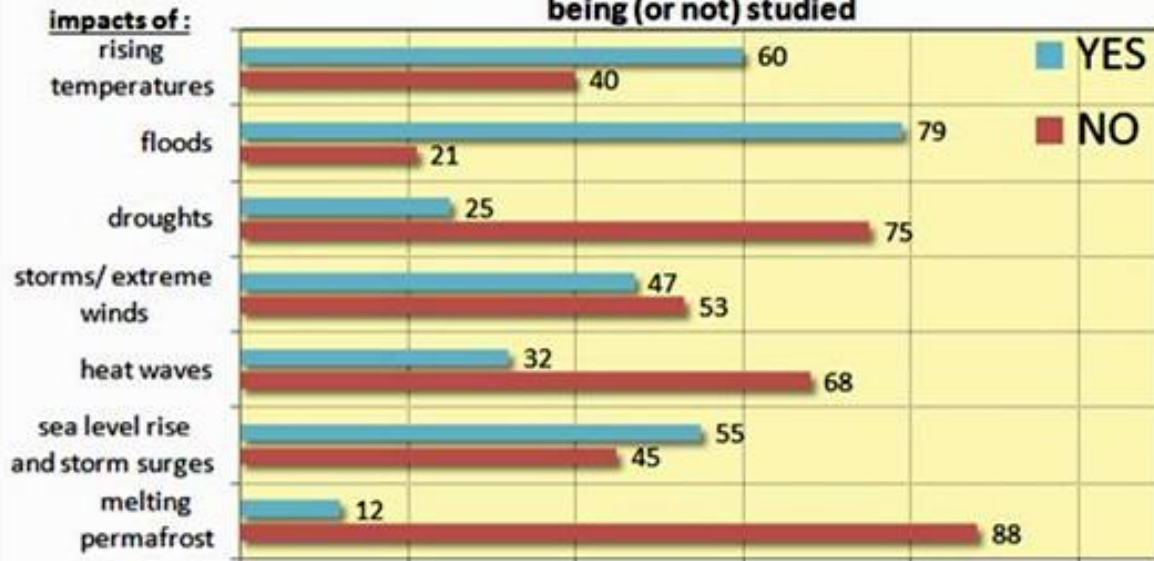
Storm surge depth for a Katrina shifted path scenario with 0.75 m mean sea level rise (USDOT, 2012)



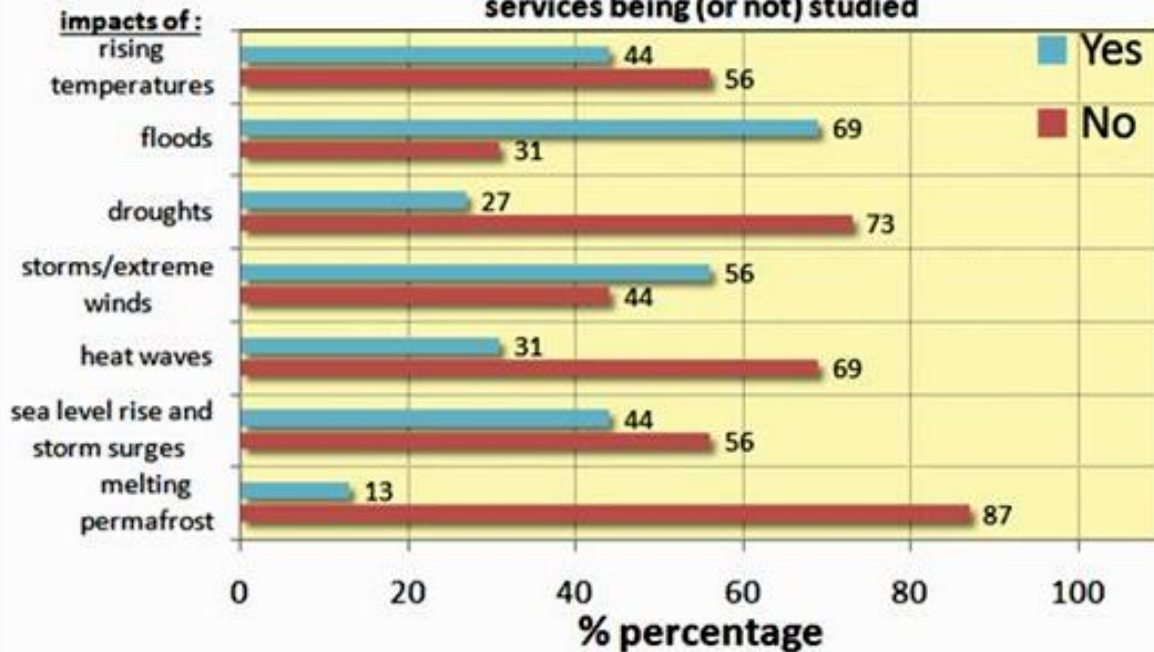
Target audience when raising awareness about climate change impacts on transport



weather or climate change impacts on transport infrastructure being (or not) studied

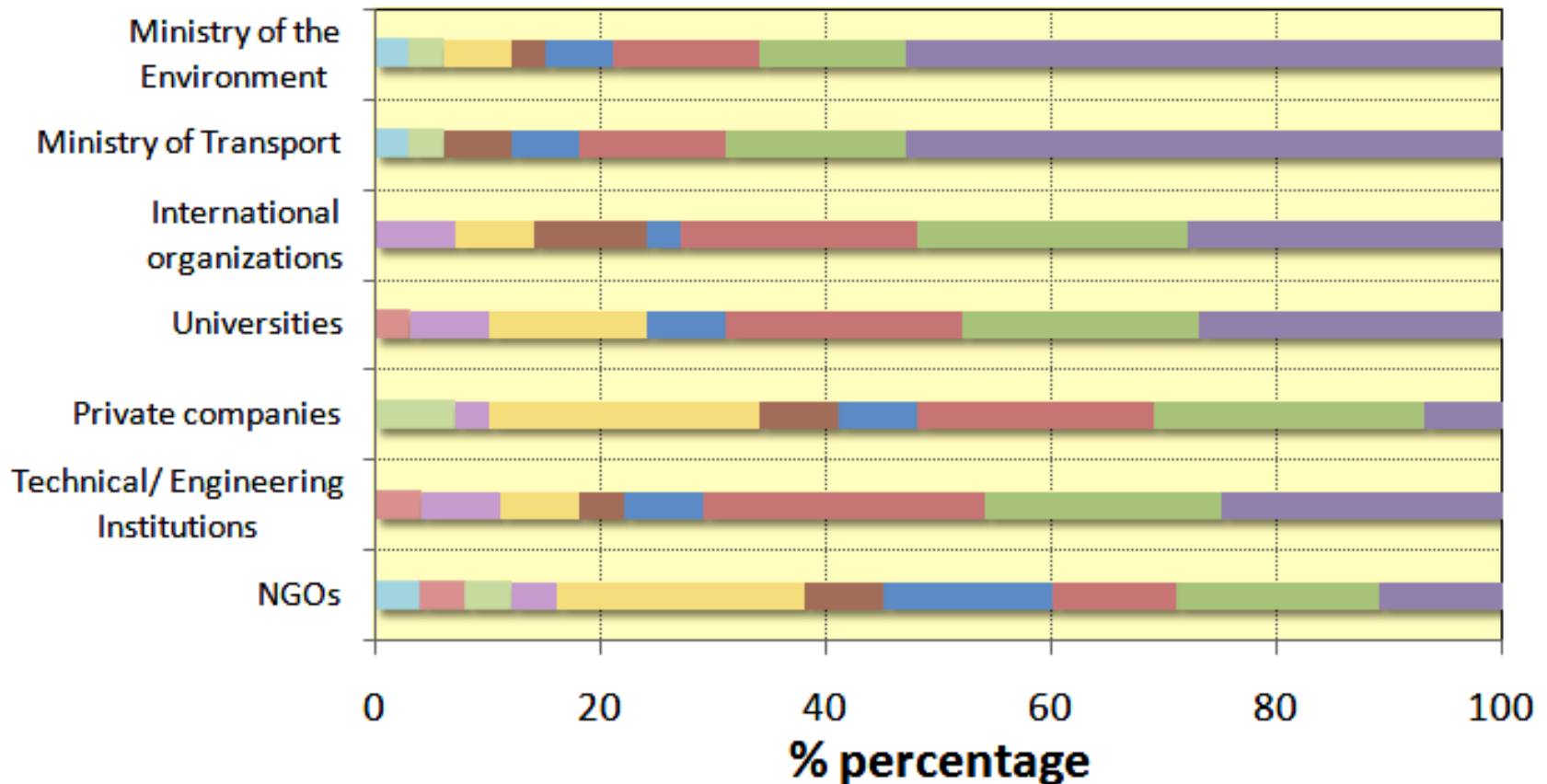


weather or climate change impacts on transport operations/ services being (or not) studied



A scale of 1-10, 1=least important, 10=most important

1 2 3 4 5 6 7 8 9 10

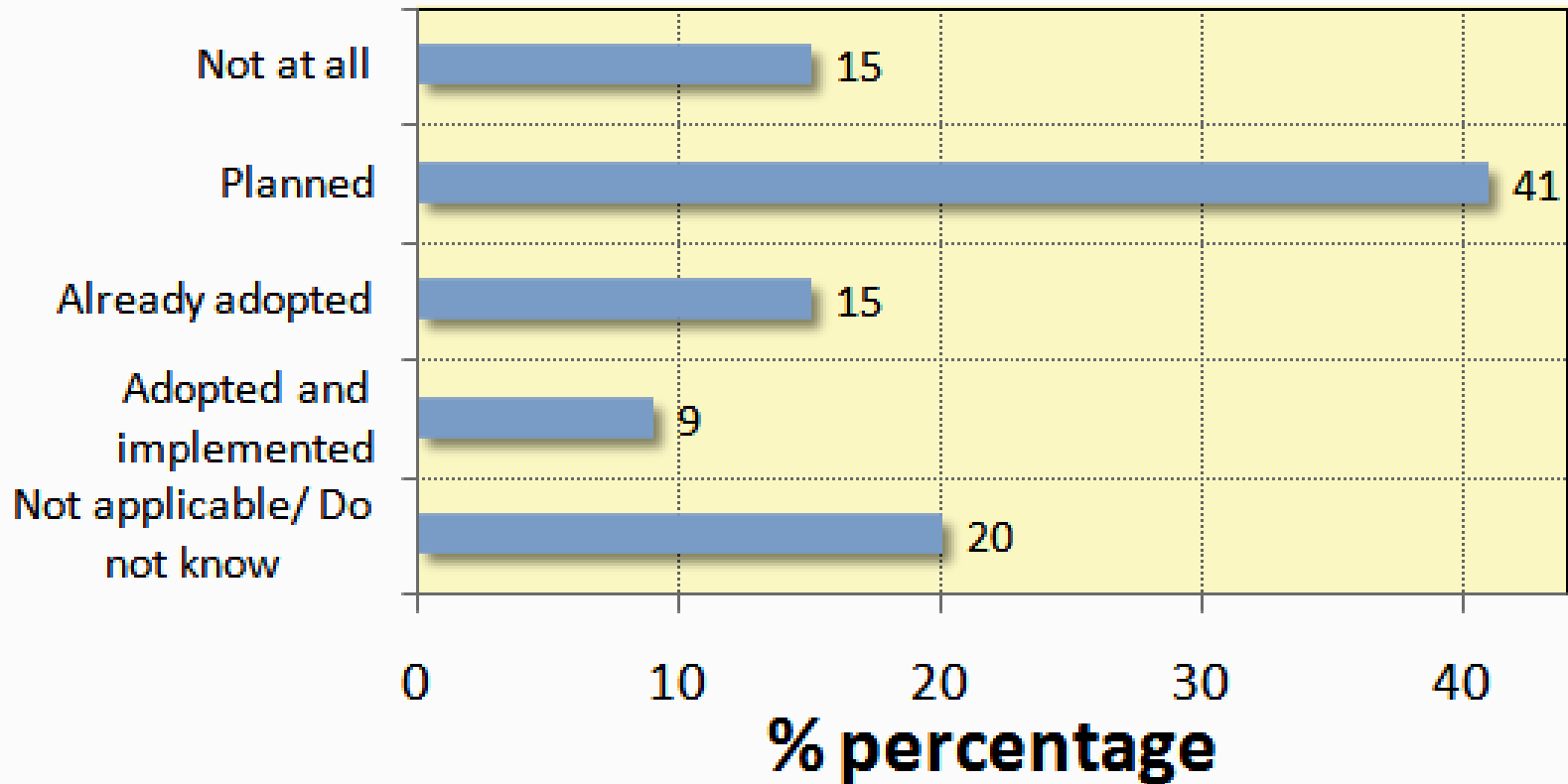


Extent to which actors/entities are considered important for the study, research, dissemination of information on CC impacts on transport.

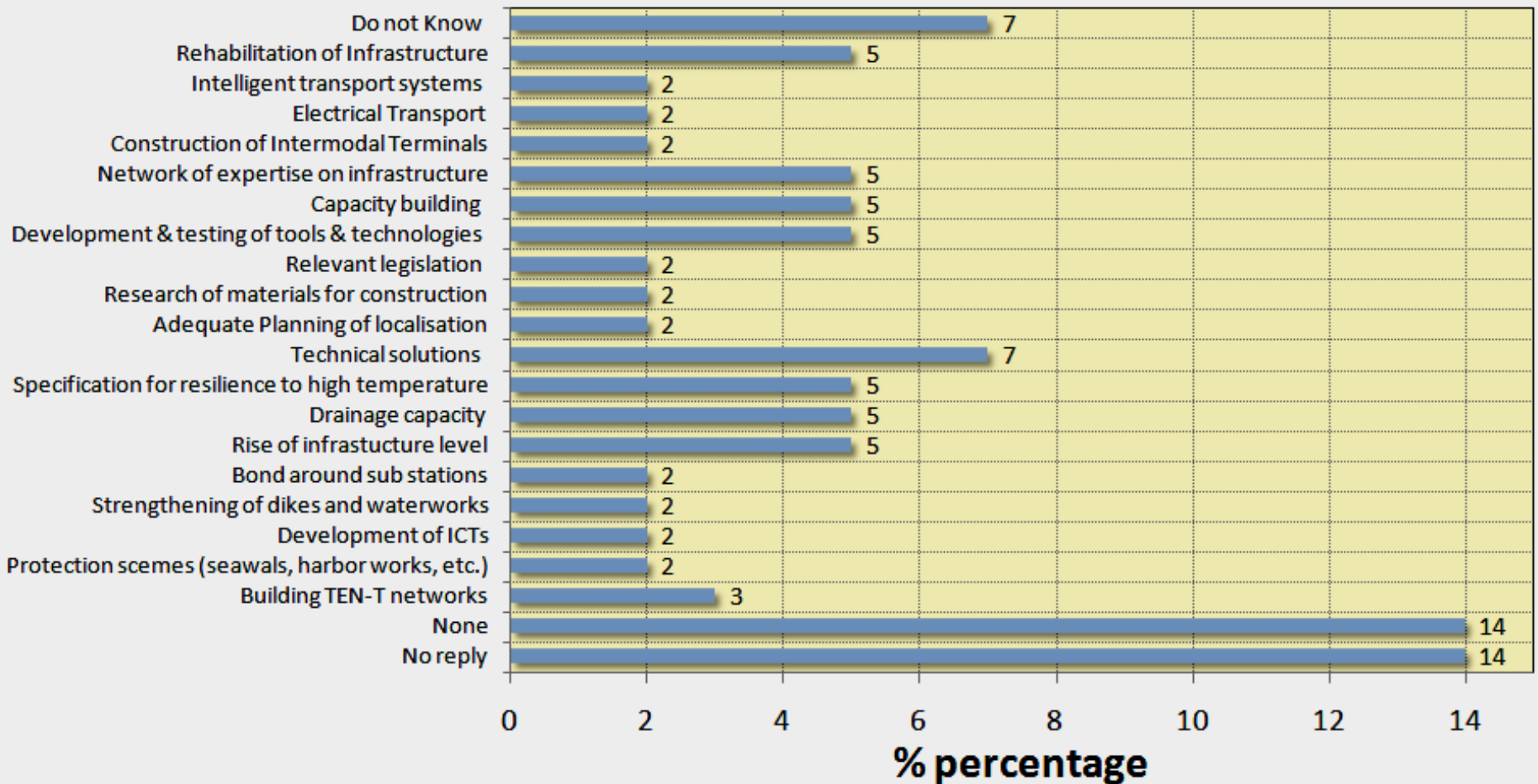


Is a transport specific strategy adopted for adapting to climate impacts?

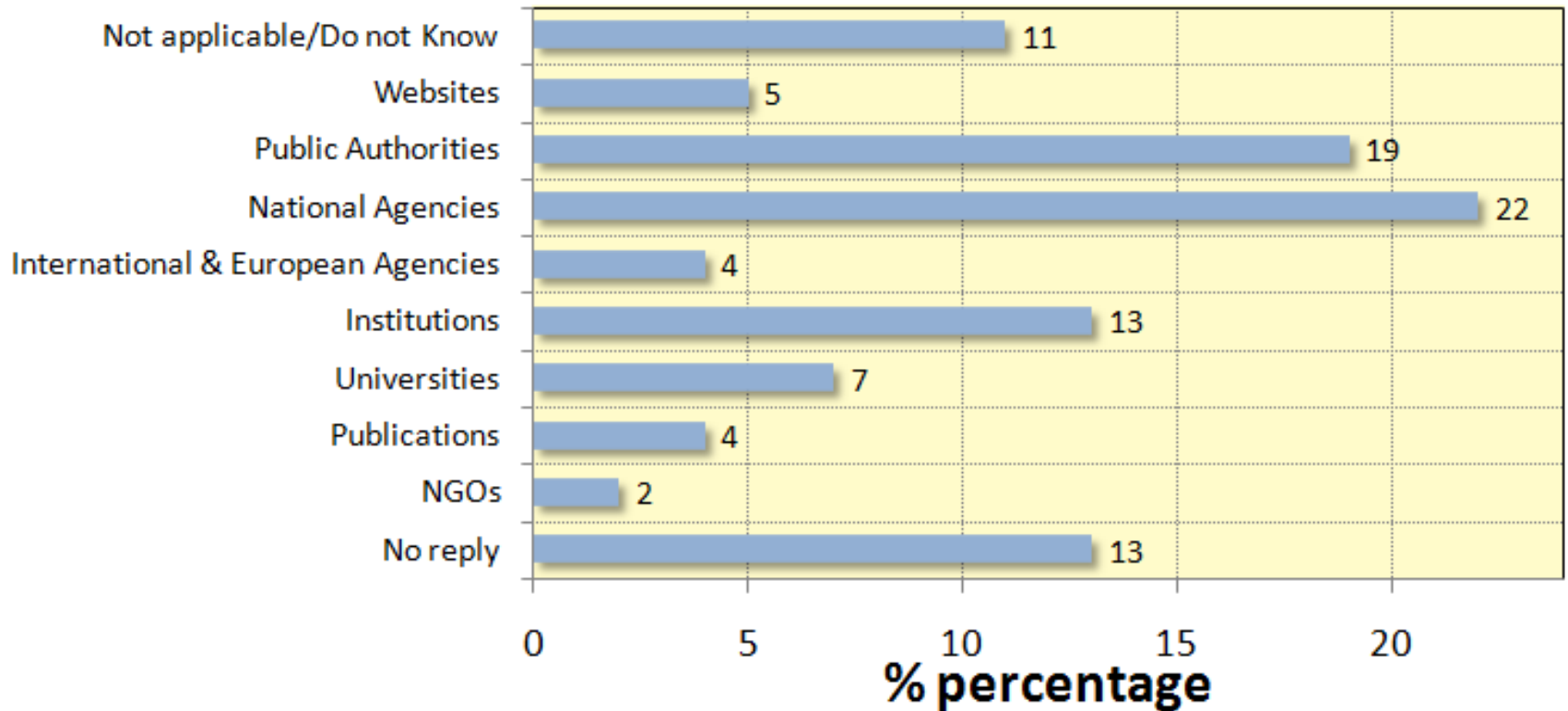
Answers



Concrete actions that have been, or are planned to be, taken with a view to building resilience of transport networks to climate change impacts



Main data/information sources for the purposes of studying climate change impacts/developing adaptation measures in transport



The Data Paradox

There is not enough data

- High quality DEMs rarely available
- Specific data on facility location, condition, costs (of inaction/action) unavailable
- Data are often poorly managed or non-existent

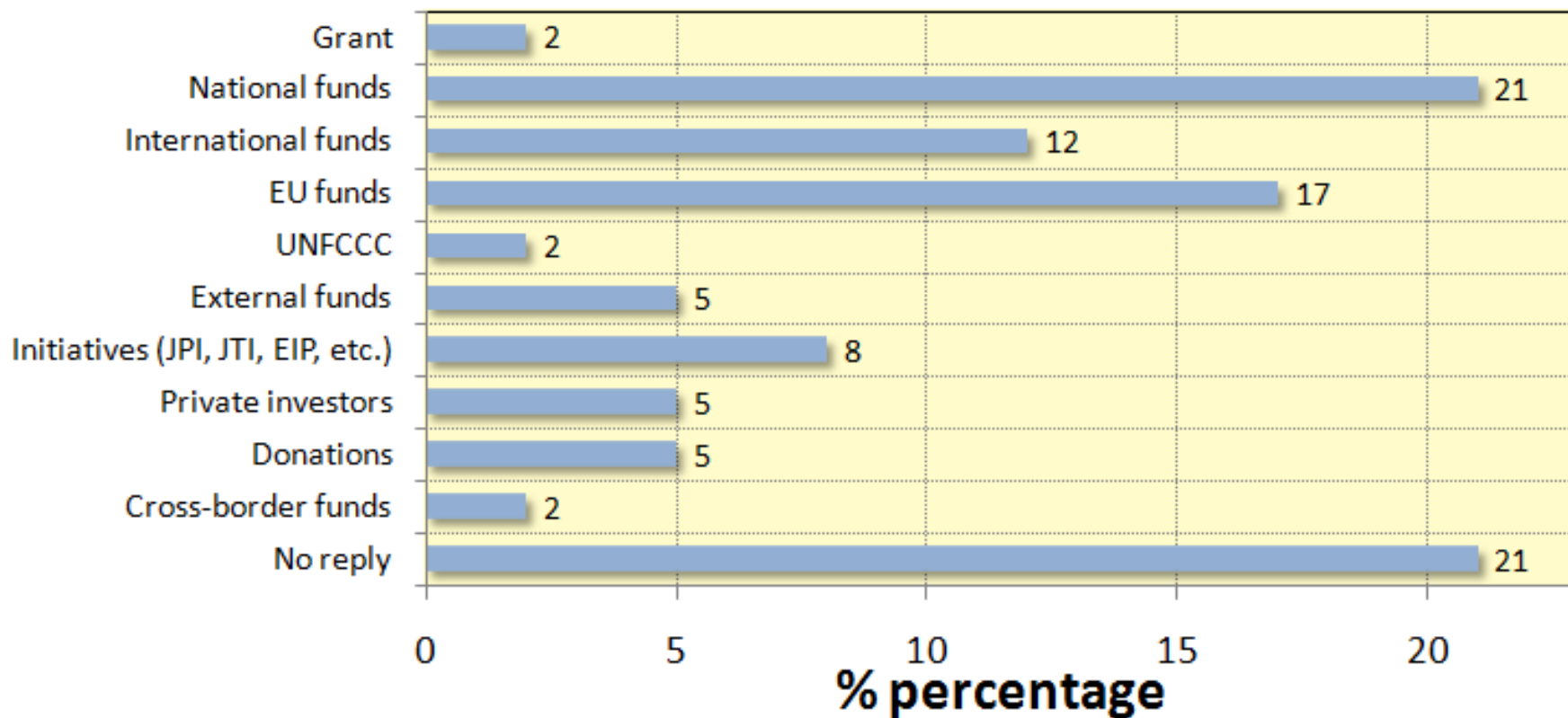
There is too much data

- Lots of climate data, but often conflicting or at irrelevant temporal or spatial scales
- Disparate data formats; even good quality spatial information requires significant manipulation
- Overwhelming number of tools, websites, and resources

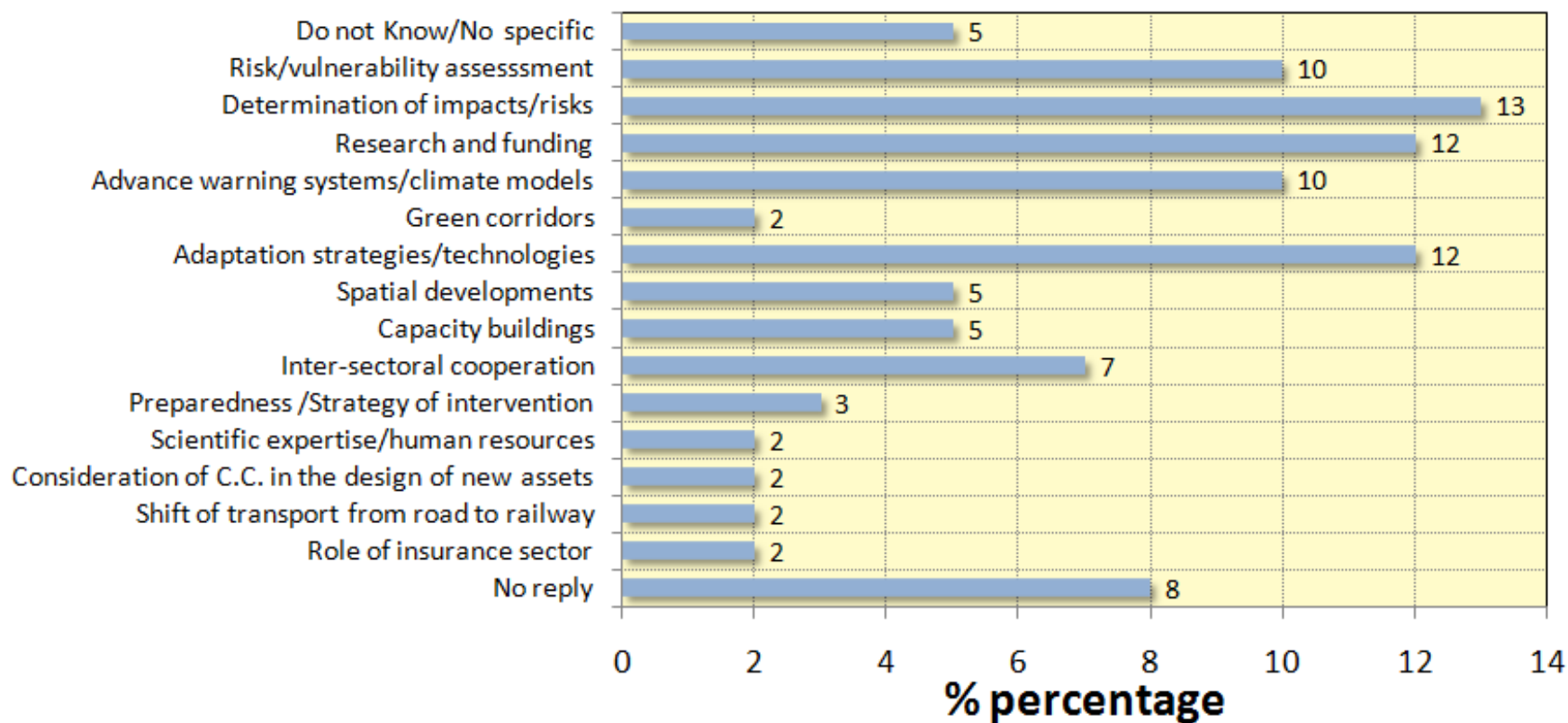


(Potter, 2012)

Funding mechanisms that could support further adaptation action in transport

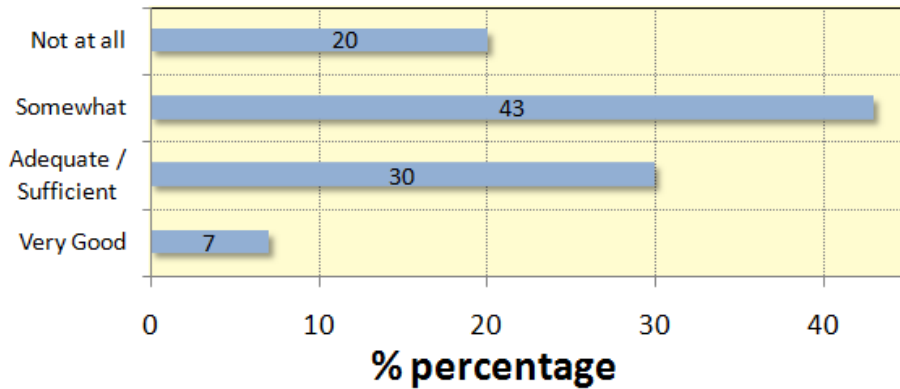


Specific priority areas that require further attention to enable effective adaptation strategies in transport

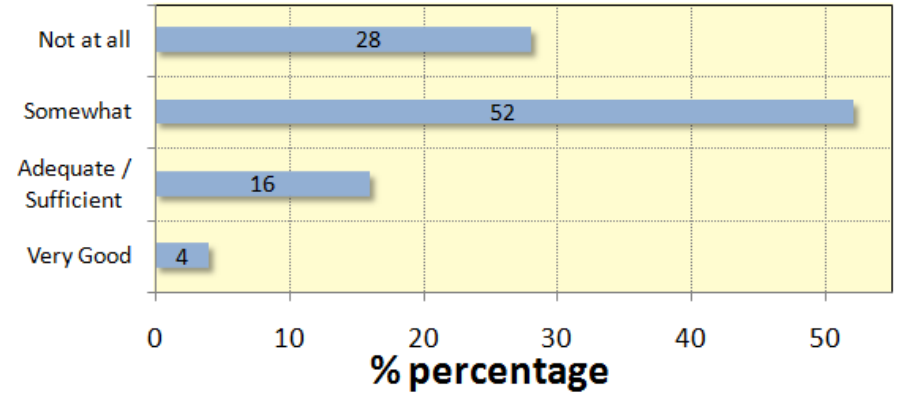


Current level of cooperation

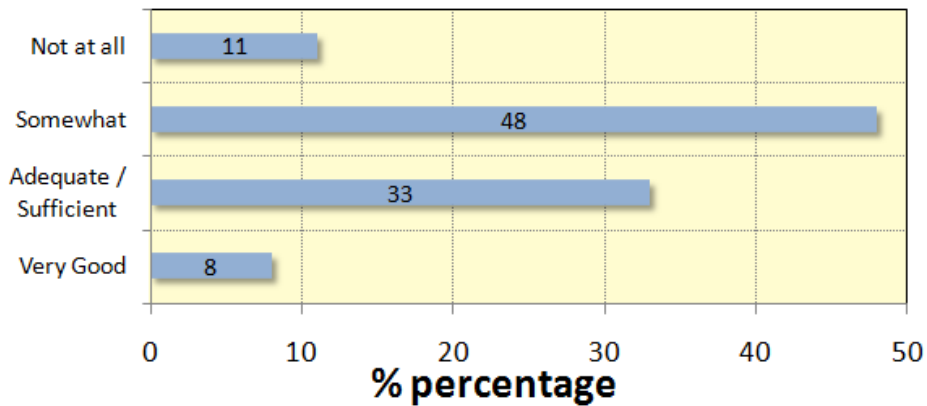
Do you consider the current level of cooperation at the national or local level adequate/sufficient?



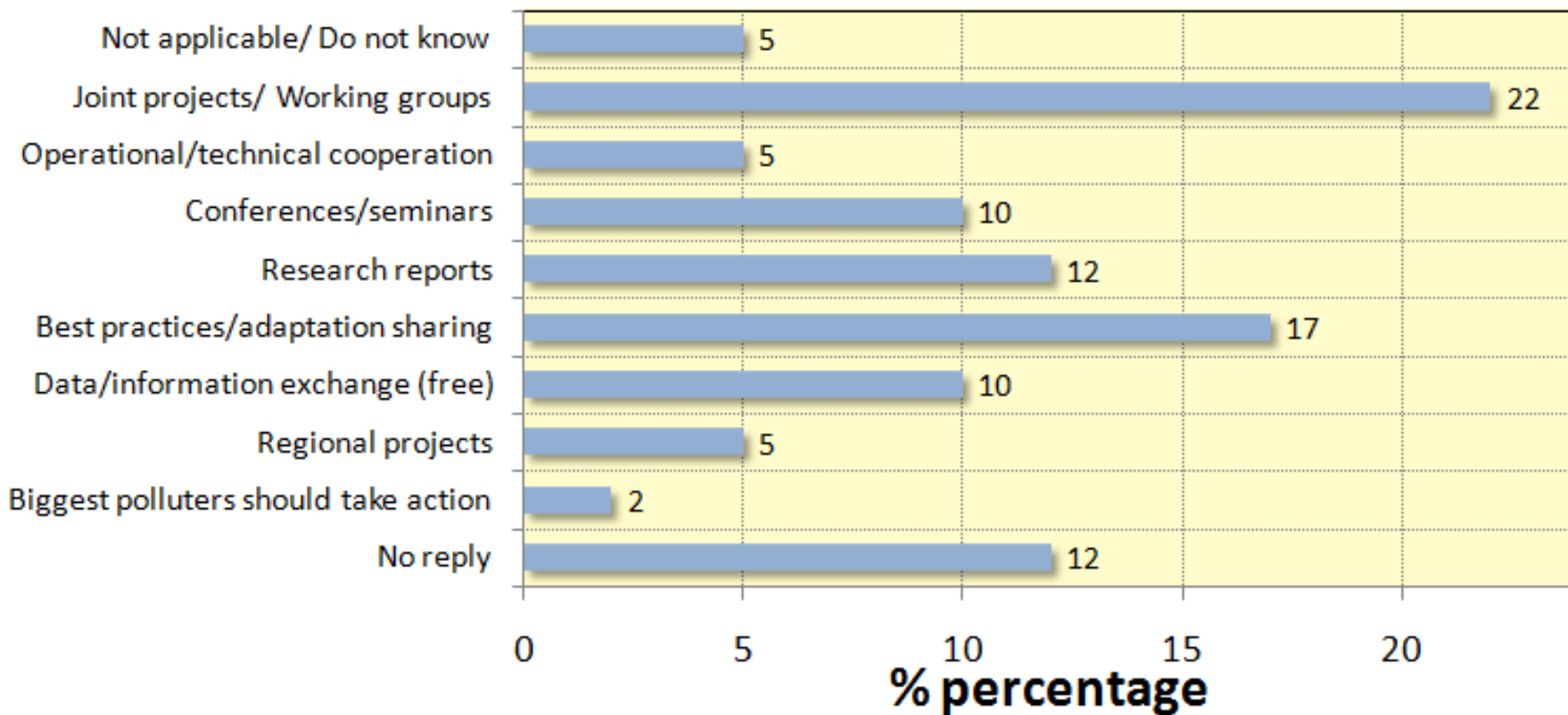
Do you consider the relevant current level of cooperation at the regional/sub-regional level adequate/sufficient?



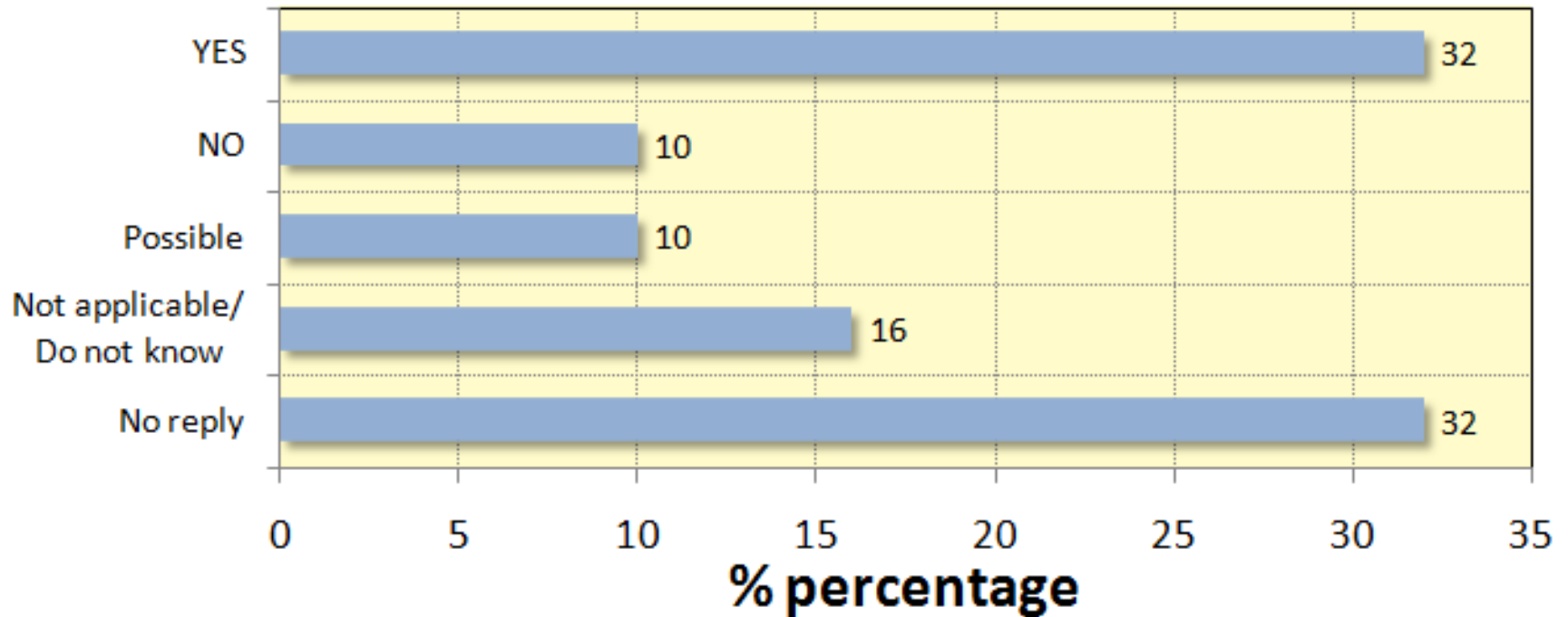
Do you consider the current level of cooperation at the international level adequate/sufficient?



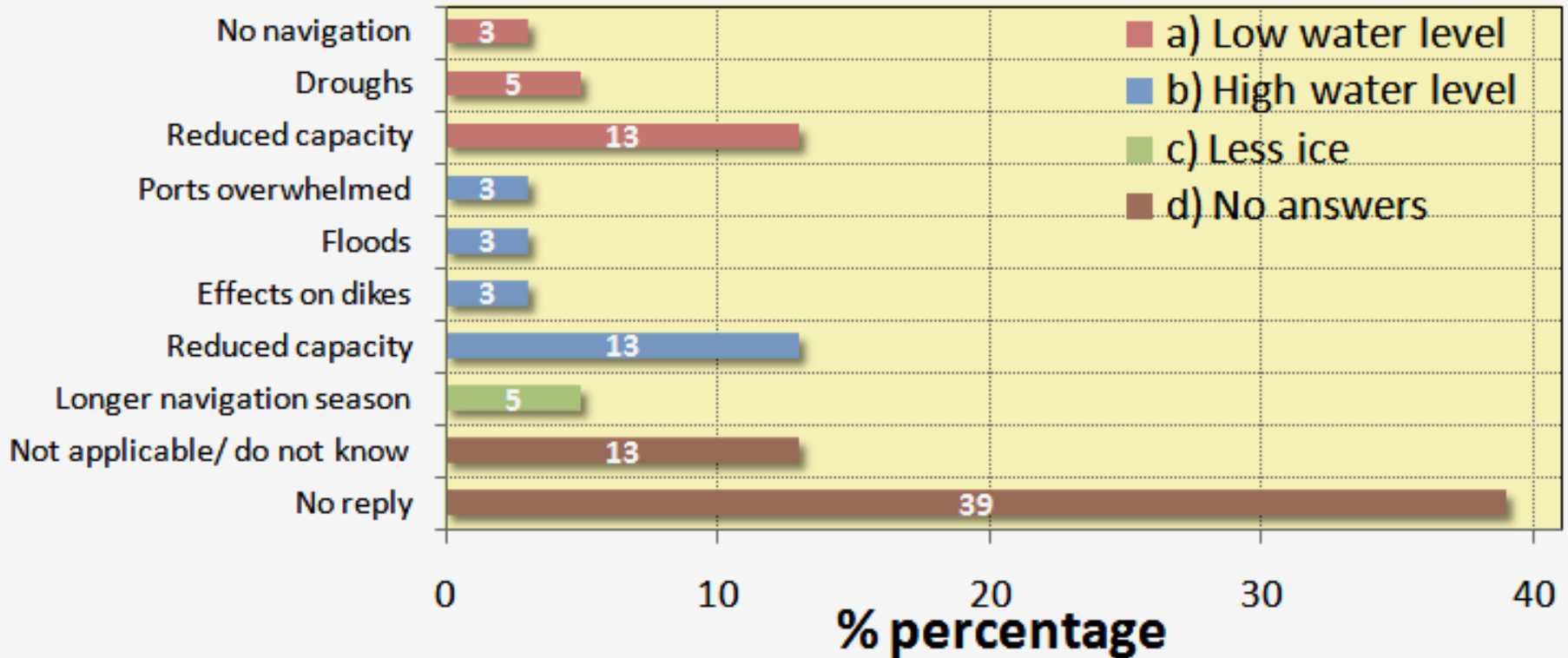
Which type of further international cooperation would be of value in addressing climate change impacts and adaptations requirements?



Do you think that possibility of amendments to existing UNECE infrastructure agreements merits serious consideration with a view to promoting/facilitating climate change adaptation of transport networks?



Effects of climate change on the inland waterway infrastructure



Thank you!!