WEATHER

Weather Extremes: Assessment of Impacts on Transport Systems and Hazards for European Regions

---

Impacts of Weather Extremes to Transport: Selecting Efficient Adaption Strategies

Summary Report of the Final Project Conference,
Athens, 23. April 2012

Venue:
Megaron Athens International Conference Centre,
Sofias Ave. & Kokkali St., 115 21 Athens

Status: Public

Version: 2.0 (final)

Date: 30.6.2012

Authors: Claus Doll, Stefan Klug (Fraunhofer ISI)

Document details

This document should be cited as:

Doll, C. and S. Klug (2012): "Impacts of Weather Extremes to Transport: Selecting Efficient Adaption Strategies - Summary Report of the Final Project Conference, Athens, 23. April 2012" Report prepared within the research project WEATHER (Weather Extremes: Impacts on Transport Systems and Hazards for European Regions) funded under the 7th framework program of the European Commission. Project co-ordinator: Fraunhofer ISI. Karlsruhe, 30.6.2012.

Document title:	Impacts of Weather Extremes to Transport: Selecting Efficient Adaption Strategies - Summary Report of the Final Project Conference, Athens, 23.4.2012.
Lead author:	C. Doll, S. Klug (Fraunhofer)
Contributions:	Project partners and conference participants
Version:	2.0 (final)
Date:	30.6.2012
Status:	Public
Quality review:	

:

The WEATHER project:

Full title:	WEATHER – Weather Extremes: Impacts on Transport Systems and Hazards for European Regions
Duration:	November 1st 2009 to April 30th 2012
Funding:	Call 2008-TPT-1, 7th framework program of the European Commission, Directorate General for Research and Technical Development
Contract:	Grant Agreement no. 233 783
Consortium:	Fraunhofer Institute for Systems and Innovation Research (ISI), Karlsruhe – project co-ordinator Fraunhofer Institute for Transportation and Infrastructure Systems (IVI), Dresden , Centre for Research and Technology Hellas (CERTH), Helenic Institute for Transport (HIT), Thessaloniki Société de Mathématiques Appliquées et de Sciences Humaines - International research Center on Environment and Development (SMASH-CIRED), Paris Karlsruhe Institute for Technology (KIT), Institute for Industrial Production (IIP), Karlsruhe Institute of Studies for the Integration of Systems (ISIS), Rome HERRY Consult GmbH, Vienna Agenzia Regionale Prevenzione e Ambiente dell'Emilia Romagna (ARPA-ER), Servizio Idro-Meteo-Clima (SIMC), Bologna NEA Transport Research and Training, Zoetermeer
Internet:	www.weather-project.eu
Contact:	Dr. Claus Doll Fraunhofer Institute for Systems and Innovation Research (ISI), Breslauer Str. 48, 76139 Karlsruhe, Germany, T: +49 721 6809-354, E: claus.doll@isi.fraunhofer.de

Content

1 Introduction

The WEATHER Project aims at adding to the current state of knowledge on the impacts of extreme weather events on economy and society in total and on European transport systems in particular. The project was funded under the European Commission's 7th RTD framework programme from November 2009 to April 2012. The research team was coordinated by the Fraunhofer-Institute for Systems and Innovation Research ISI (Karlsruhe, Germany) and consisted of eight European partners from six countries.

This report provides the results of the final project conference, hosted by the Transport Research Arena (TRA), April 23rd 2012 in Athens, Greece. The objective of the conference was to disseminate effectively the results of the WEATHER project and to promote a wide adoption of its results to the scientific community, policy-makers, public administration and transport professionals at a European, national and local level. Through presentations from the project team, from the project's International Panel of Experts as well as from external speakers, insights into the new developments concerning the assessment of costs and impacts of extreme weather on the transport sector were provided and efficient adaptation strategies to cope with these impacts were proposed. The conference conveyed the three major streams of the WEATHER project, namely impacts, costs and adaptation options of weather extremes.

Key findings and solutions in three thematic blocks were highlighted, namely:

- Damage accounting
- Adaptation policies
- Specific Cases

The conference was an interactive mix of presentations and discussions, with participants encouraged to ask questions and engage with the speakers.

2 Presentations and Discussions

The following paragraphs provide a brief overview of the content of the conference. The short description of each presentation was derived from the abstracts provided by the speakers. Main points of discussion are summarised in the subsequent section on the panel discussion. The full presentations are available at the weather website at http://www.weather-project.eu/weather/inhalte/Final-Conference.php.

2.1 Future Research Framework

Opening the conference, the WEATHER project officer at the Directorate General for Research & Innovation, Mrs, Iona-Olga Adamescu, introduced the new EU Framework Programme for Research and Innovation 2014-2020. Horizon 2020 is the financial instrument implementing the Innovation Union. Running from 2014 to 2020 with an €80 billion budget, the EU's new programme for research and innovation is part of the drive to create new growth and jobs in Europe. It provides major simplification through a single set of rules. It will combine all research and innovation funding currently provided through FP7, the CIP and the EIT.

The proposed support for research and innovation under Horizon 2020 will:

- Strengthen the EU's position in science
- Strengthen industrial leadership in innovation. This includes major investment in key technologies, greater access to capital and support for SMEs.
- Help address major concerns shared by all Europeans such as climate change, developing sustainable transport and mobility, making renewable energy more affordable, ensuring food safety and security, or coping with the challenge of an ageing population.

Horizon 2020 will tackle societal challenges by helping to bridge the gap between research and the market by, for example, helping innovative enterprise to develop their technological breakthroughs into viable products with real commercial potential. This market-driven approach will include creating partnerships with the private sector and Member States to bring together the resources needed.

Horizon 2020 will be complemented by further measures to complete and further develop the European Research Area by 2014. These measures will aim at breaking

down barriers to create a genuine single market for knowledge, research and innovation.

2.2 Session I: Impact Assessment

The first group of scientific presentations was dedicated to the main findings of WEATHER and its sister project EWENT. In addition, the local host CERTH-HIT gave a comprehensive overview of climate change and adaptation policy of the transport sector in Greece.

Chair: Stefan Klug (Fraunhofer ISI)

WEATHER project at a Glance – Main Messages and Achievements (Claus Doll, Fraunhofer ISI, Karlsruhe)

The WEATHER project has worked on the issue of transport exposure to weather extremes for 30 months, touching different issues from impact assessment over emergency management and adaptation options to governance and policy questions. Across Europe, the main findings were that impacts on the transport sector are moderate on average, but show particularly critical hot spots. These are mainly floods in mountain areas and impacts on railways. Efficient adaptation and crises management can significantly reduce costs, but requires skilled personnel and well elaborated communication and response plans across institutional, company and governmental levels. These findings are confirmed by the project case studies and a series of reports from our international panel.

Climate Change and Adaptation Policy for the transport sector in Greece: Where we stand a0nd future directions (Anestis Papanikolaou & Evangelos Mitsakis, CERTH-HIT, Thessaloniki)

Beginning with an introduction of the ‘problem of climate change’, its main (global) characteristics and line of reasoning were highlighted. The impacts of climate change were described from a general viewpoint, followed by a more targeted analysis in the transport sector. Then the presentation zoomed into the Greek case, aiming at presenting the initiatives towards the formulation of the current adaptation policy in Greece. The central point of discussion constitutes the methodology and conclusions derived from the ‘Climate Change Impacts Study’, prepared for the Bank of Greece. This study comprises the first major coordinated scientific effort for identifying the

impacts of climate change in Greece. The results of the study for the transport sector are described and analyzed in detail, together with the recommendations and suggested actions for efficient transport adaptation. In the end, future potential directions of research in transport adaptation to climate change were discussed, on the Greek as well as European level.

EWENT Project – Summary of Relevant Findings (Pekka Leviäkangas, VTT, Helsinki)

The EWENT-Project (Extreme Weather Impacts on European Networks of Transport, www.ewent.vtt.fi) has completed most of its work packages. Along with WEATHER, EWENT aimed to quantify and monetise the impacts of extreme weather on EU transport system. The risk management approach applied in EWENT's research steps provided a holistic view of the problem. Different geographical areas, different infrastructure qualities and different modes create a scattered picture on the ultimate impacts and consequences. Road system seems to be the most vulnerable of the transport sub-systems and least manageable because of its decentralised topology. At the same time, however, it is the most flexible and self-organising of the systems. Safety impacts of extreme weather play a major role in road transport today, but the global trends indicate in the long run the reliability of the system and related time costs might be more relevant and to be considered more seriously than today. The global warming will enhance heat related problems in the Mediterranean climate zone, and relieve winter related hazards in Central Europe. The thinning of the ice of the Baltic Sea will ease maritime transport. Aviation as a centrally controlled and well processed mode suffers mainly from time delay problems caused by snow, wind or reduced visibility. As infrastructure capacity grows scarcer, the negative impacts on reliability will increase – this applies to most modes. Railways seem to be vulnerable especially with respect to infrastructure and traffic control system related impacts: rail system is a resilient system, but once failing, the consequences are more wide-spread through the system.

2.3 Session II: Adaptation Policy

Departing from the policy recommendations elaborated by the WEATHER project, this second scientific part of the conference looked into adaptation options in general and for specific transport modes with regard to Europe as well as to the United States. Presentations were selected such that all land transport modes, road, public transport and the waternway transport sector, are covered.

Chair: Riccardo Enei (ISIS)

Policy options for Sustainable Adaptation Strategies (Christian Trinks, Karlsruhe Institute for Technology KIT, Karlsruhe

The presentation outlined the research conducted in work package 5 "Governance, incentives and innovation". The main objective was to shed light on the structure of actors, policy instruments and innovation issues in terms of fostering climate change adaptation in the transport sector. Consequently, three distinct parts were addressed: actor analysis, policy instruments and innovation management. With regard to fostering adaptation activities to changing patterns of weather extremes the main findings that can be drawn out of the work are hinting at strategies, such as stimulating awareness, preparedness and training of the relevant actors with means of incentives, positive policy guidance and RTD support. In general, infrastructure investments and hard regulations can be considered as too expensive and inflexible.

Rising DOT Maintenance Costs with Extreme Weather: Responding and Adapting to Climate Change in the U.S. (Marie Venner, Venner Consult, Lakewood)

Recent efforts were described to build awareness among state Department of Transportation (DOT) Chief Engineers and Maintenance Directors about the reality and effects of climate change on transportation infrastructure in the US, starting from the standpoint of what is known and state DOTs can see already: the effects of extreme weather. As engineers and planners for public agencies, outside of the political dialogue, DOTs have an important role to play in identifying the impending severe costs of climate change on existing infrastructure and the tradeoffs that will have to be made if rapid reductions in GHG emissions do not occur, but this has not yet been embraced. Some of the most successful current efforts have focused on empirical evidence that is already available and areas already prone to flooding; i.e. "what is keeping maintenance staff up at night," and ways DOTs can move forward with

adaptation planning and hazard mitigation, using existing resources. The presentation discussed some of the current adaptation planning efforts underway, in the context of preparation for extreme weather, and steps forward.

Effects of climate change and adaptation of inland waterway transport, findings of the ECCONET project (Christophe Heyndricks, Transport & Mobility Leuven TML)

ECCONET specifically addresses the topic of climate change, taking Inland Waterway Transport (IWT) as a case-study. The project considers both the impact of climate change and potential adaptation measures on the Danube and Rhine rivers. Climate change affects the prevalence and severity of potentially damaging weather conditions, such as: high water, low water, ice and fog. Research performed within ECCONET and related projects have indicated that the incidence of both high and low water will increase towards the end of the century, while problems caused by ice and fog will decrease. Empirically, low water levels have been proved to be most damaging to the sector and to the economic system as whole, therefore the focus of ECCONET is on avoiding interruptions caused by low water. Adaptation measures are split into four categories: ship engineering, waterway infrastructure, improved seasonal forecasting and logistic processes. Besides a number of more technical measures, more intensive use of barges, sufficient dredging and a better cooperation with railway transport have been selected as potential adaptation strategies. We show how adaptation can be integrated within transport network projections by impacting transport costs or otherwise facilitating the transport process, and how the measures can be processed for cost-effectiveness analysis and eventually policy advice.

Resilient Transport Systems in Europe – The STAR-TRANS project (Thanasis Sfetsos, NCSR DEMOKRITOS, Athens)

The functioning and viability of modern societies is heavily depended upon the continuous and uninterruptible operation of surface transportation systems. Their operation can be disrupted or even be severely damaged by a range of threats such as deliberate acts or natural phenomena. STAR-TRANS, an EC partly funded project under the 2007 Joint ICT-SEC call, introduces a holistic Strategic Risk Assessment Framework for heterogeneous, transportation networks where risk is propagated between interconnected networks. Other specific objectives include

- Strategic Level Tools: Offer tools to decision makers to determine priorities among multiple contingency alternatives by evaluating consequences from propagating risks across the “networks of networks” (NoN).

- Better Preparedness: Identification of best practices and tools for emergency preparedness and response and minimizing disruption to services of the transport networks operators
- Easier Communication: Introduction of a harmonized holistic approach for preventive measures and risk assessment
- Means for Policy: Provide the means to develop an integrated transportation security policy

2.4 Session III: Specific Cases

After having an overview of the WEATHER case studies this block included an insight in the Australian situation as well as modelling results of the wider economic impacts of weather extremes.

Chair: Anestis Pananikolaou (CERTH-HIT)

The WEATHER Case Studies (Hedi Maurer, Panteia-NEA, Zoetermeer)

In total six case studies were selected for reviewing local issues of climate adaptation in Europe: 'Flood of 2002 in Eastern Germany', 'Summer heat 2007 in Southern Europe', 'Flooding of the rail link Vienna – Prague in 2006' , 'Windstorm Xynthia in 2010', 'Heavy snow on mountainous roads in Italy in 2004' and 'Rhine shipping during the 2003 summer heat'. Local specificities, lessons learned and long-term adaptation strategies were discussed. The case studies provide recommendations of better emergency management, adaptation measures and policy implementation on a local level. In summary, the case studies highlight that efficient communications structures, coordination of the involved authorities, strict maintenance of protection systems, in-time information on upcoming disasters, and the development of contingency plans for people and logistics nods as well as timely, direct responses are fundamental for a successful emergency management.

Seaports, Logistics and Climate Change in Australia (Prem Chhetri, RMIT, Melbourne)

The 2009 heatwave, the Queensland and Victorian floods, and bushfires were presented as case studies from Australia. It includes an assessment of the effectiveness of existing transportation provisions and the capacity of logistics

infrastructure and management support systems in coping with extreme weather events, which are not uncommon in Australia but which seem to have become extreme and more frequent in recent decades. The case studies explore the magnitude of damages to infrastructure assets and operations, user time losses and safety; the protection measures existing before the event and how effective these have been; and the adaptation strategies after the event and the policy instruments applied. The general findings pointed out that existing transportation and infrastructure systems were not able to cope with disaster situations that are considered extreme. Furthermore, the analysis of such extreme events generally finds that post-event actions most likely result in only marginal improvements in resilience to such events unless a systematic and structured response is adopted. The findings also indicated that there is a significant opportunity to improve all aspects of existing disaster management planning, *in situ* policy response and post disaster recovery. However plans need to be prepared for the execution of projects targeting upgrades and repairs to social, economic and logistics infrastructures with a view that they become more resilient in the future.

Wider Economic Impacts – the ARIO model results (Valentin Przeluski / Stephane Hallegatte, SMASH-CIRED, Paris)

The impact of transport interruption is a particularly interesting aspect, because of the role of transportation of goods and persons, which makes all economic activities possible. Moreover, transport infrastructures are huge investments and are particularly weather sensitive. Therefore, small changes in how they are designed and managed could make a large difference in terms of total economic impacts from extreme events. With climate change, the adaptation of transport infrastructure is a major challenge. The purpose of the presentation is to estimate the costs of extreme event on the transport sector, and on the wider economy through transportation indirect effects. Direct and indirect losses are accounted using the Input-Output based ARIO-T model developed for the WEATHER project. According to this analysis the transport-related costs of extreme events are of the order of a few hundred million Euros per year.

3 Panel Discussion and Conclusion

Based on the contents of the presentations and points of discussions raised during the three sections a panel discussion was held at the end of the conference. Its aim was to collect important aspects – also from outside Europe – as a base to indicate the issues to be tackled by politics, the transport sector and further research. *Chairs: Evangelos Mitsakis (CERTH-HIT), Claus Doll (Fraunhofer ISI)*

The Panellists were as follows:

1. Marie Venner (Venner Consult: US Climate Adaptation Strategy)
2. Prem Chhetri (RMIT University, Melbourne)
3. Alexandre Kaddouri (SNCF, French Rail Adaptation Strategy, France)
4. Rachel Burbidge (EUROCONTROL, Brussels)
5. Vangelis Katsaros (TRAINOSE, Emergency Management, Greece)
6. Yves Ennesser (EGIS, France)

In the following the discussions have been re-ordered according to thematic areas and the need enriched by remarks from the plenary and by questions and answers during the previous sessions. The main conclusions can be formulated as follows:

3.1 Transport sectors

Aviation sector:

Aviation has always been dealing with weather phenomena plus the most dynamic rise of demand. However, up until now changing weather patterns have not been a priority issue for the sector. In front of this background the question arises whether powerful adaptation systems can be installed by serving both, air congestion and incident management.

The air transport sector needs to look for **integrated, system-wide solutions** at European level, which can be applied to the whole network. The ongoing project SESAR (Single European Sky ATM Research Programme) is addressing this issue, fostering system wide information management, collaborative decision making between various aviation entities, and developing measures to increase resilience. All measures should be part of a general climate adaptation plan for the entire European aviation sector.

On top of sector-internal adaptation strategies **co-modality** can also be beneficial for the aviation sector by making use of the strengths of each transport modes under emergency situations. A potential economic co-benefit of co-operation between air and rail transport could be the replacement of local and regional flights by long distance flights at airports with tight capacity.

Road sector in developing countries

The road network contains most assets of all transport modes all over the world. But building codes, design standards, climate conditions, traffic patterns and available funds for construction and maintenance vary considerably between countries. In particular developing countries, facing the most expressed burden of climate change, are developing more dynamically than the old industrialised states and at the same time have least resources for network maintenance available. Thus the question arises whether adaptation strategies should be of fundamentally different nature in the developed and in developing world.

In general it is necessary to **adapt maintenance cycles** to the differences in vulnerability specific to particular climate zones. New materials and building practices are of second order. From the point of view of the road operators it is wishful to identify critical sections within the network in order to focus on emergency and urgent adaptation measures

Rail sector

Railways have been found to be the a very sensitive mode with respect to climate change, which is partly due to infrastructure costs (to build and to maintain), but also because of less flexible operational procedures. The discussion, whether crises management can be supported by more flexible timetabling and train routing or by better staff training, thus seems to be of practical relevance.

Panel members pointed out, that **soft measures** such as flexible time tabling and staff training can support the current crisis management and that they constitute part of the adaptation plans, which are currently developed by the European rail operators. Nevertheless, adaptation strategies should benefit the management of today's extreme weather.

For implementing these plans it is of utmost importance, that **different levels of governance** – from national to very local – and the interaction with other modes needs

to be taken into account in order to apply a system view, which also incorporates other transport sectors.

Moreover, the possible technical requirements and the regular updates of technical norms will require mobilising railway operators as rolling stock owners, as railways Infrastructure manager and as operator for the urban transportation in one company. By this concentration of decision power a **systemic view** is created, which is important to make good choices from the perspective of the railways.

3.2 Data problem and communication

Even more than in Europe the consequences of changing climate and weather patterns are visible elsewhere around the globe. But – also alike Europe and in many industries – action to adapt is rather modest all over the world. One could suspect that this is due to a still high scepticism against climate change and / or that the uncertainty of predictions is still not within a satisfying range and we thus need better climate forecasts to start acting.

On this point the panel members clearly pointed out that even though the existing climate models are indeed still not sufficiently detailed on the very local level, they **give us enough data to start with**. Researchers are asked to communicate with the transport agencies in order to determine where action needs to be taken now.

For instance in case of the US it can be assumed that the existing data bases, transport network- and meteorological models provide a good starting point for implementation adaptation measures. In case the communication between researchers and transport agencies is lead carefully, the implementation of a **system to increase resiliencies** of transport networks and operations is one of the biggest current opportunities

The Australian case studies showed that the responsibilities and roles for the case of emergency are sufficiently defined. But the learning effects from past events have not been overwhelmingly intensive in Australia as well as for some of the European case studies of the WEATHER project. This calls for a **stronger centralised command structure** within the government helping to enact the dialogue and to share information and data in real time. Nevertheless, bit event like the Queensland floods or the Victoria Bushfires can exceed the coping capacity even of well organised agencies. Furthermore, the change of building codes and the risk awareness of people provide a challenge for long term strategy development.

3.3 Damage estimates

Concerning the WEATHER project results it was discussed whether there is a bias towards large catastrophes, while smaller, but much more frequent weather and climate hazards are under-reported. Indeed, the **lack of availability of damage data** for all modes, across Europe and over a longer period of time was one of the problems for the WEATHER project due to the documentation practice of the agencies: mainly the big events were thoroughly evaluated, while the smaller events on a regular base are often not recorded. But it has been tried to make up for this bias by a in-depth review and assessment of all kinds of impacts reported in media.

There is no simple rule for estimating the economic impacts of natural or climate hazards on transport systems. The direct costs differ widely according to the level of magnitude of the event as well as on the underlying accounting framework. The differences in the results of total costs for Europe found by the WEATHER and the EVENT project demonstrate this impressively as they differ by a factor ten for the road sector alone.

The significance of direct or indirect costs depends very much on the extent of the event: in case of major events with a high level of casualties the restoration of the transport system should not have first priority. Only the function of transport systems to rescue and supply people in danger needs to be ensured. On the other hand, for less severe but more frequent weather hazards the costs to the transport system need to be minimised by suitable adaptation strategies.

3.4 Further Research

Against the background of the EU Future Research Framework “Horizon 2020” the question arises, what are the key challenges of climate change and extreme weather in the future? Where should research go to? What are the important things what we don’t know?

For the railway sector one key issue is the **development of more accurate models for climate forecasts** in order to have a higher precision as a base for adapting timetables and business plans. However, the Horizon 2020 with its approach to reduce noise and other emissions of the railway is regarded as suitable to reduce the environmental footprint of this sector.

Also for the aviation sector that is the most important research gap to fill: a **sector specific quantification model** to find out, which climate changes we might expect. On this base it will be possible to identify what the actual impacts might be, and what concrete adaptation measures need to be taken. This includes operational, technological and coordination measures between the different transport sectors and within the aviation industry itself.

Another important research question is the determination of the point, when it becomes necessary to change the approach and turn from already known engineering adaptation measures to the **development of entirely new strategies/ technologie**s, which will become necessary towards the end of the century. It is necessary to get knowledge on how we can cope with this necessary strategy change.

The panellists from outside of the EU emphasized that the WEATHER-Projects produced outstanding output by pursuing a systematic approach of linking climate scenarios with transport capacity models. It gives a good base for expending it further in terms of constructing real time …system spread across all EU countries. However, one key issue is to put in place a set of protocols which ensure and underpin **data sharing** across different countries and regions. To tackle the complex issue of adapting to climate change, a collective, holistic and systematic governance model within the European Union is needed.

The WEATHER results are also seen as a good base for more research in the USA and further collaboration with Europe. It would be particularly viable to do further estimates on what how the climate and weather will develop by 2020 and 2030 in order to engage the transportation agencies further. Thereby it is important to **share models and practises internationally** to also better estimate the long range costs and potential effects on infrastructure and the economy. This can be a good input for public discussions and legislative action for adaptation and avoiding effects of weather extremes. The ongoing dialogue among the researchers, the tools and the models are seen as very important dots to be connected and find collaborative solutions on how to avoid these impacts.

4 Additional information

4.1 Acknowledgement

This document constitutes preliminary minutes and results of the WEATHER final project conference held in Athens, April 23rd 2012. The report is published on the WEATHER website at http://www.weather-project.eu/weather/inhalte/Final-Conference.php. Here, all presentations given at the workshop have already been provided for download.

The results of the workshop have been integrated in WEATHER Deliverable 7: “Policy Recommendations”. This final report of the WEATHER project is expected for publication in August 2012.

At this stage the WEATHER project team would like to express thanks to all participants attending, contributing to and supporting this final project conference and providing valuable comments and additions to this report.

4.2 Context: The WEATHER project

There is a clear evidence of rising damages by natural catastrophes and extreme weather events, which can at least partly be attributed to climate change. While many studies focus on CO_2 mitigation in transport, research on the vulnerability of the sector on climate driven effects, such as extreme weather events, is coming up only recently.

The WEATHER project concentrates on singular weather events which either exceed the long term average of comparable meteorological activities and/ or have considerable negative impacts on assets and operation, human health or lives. It aims at analysing the economic costs of more frequent and more extreme weather events on transport as well as on the wider economy. Furthermore we explore adaptation strategies for reducing these costs in the context of sustainable policy design. The assessment includes all 27 EU Member States plus Switzerland and Norway.

The research is carried out by an international team of eight European institutes, lead by the Fraunhofer-Institute for Systems and Innovation Research (ISI). The project runs for 30 months from November 2009 until April 2012. Further details are available at www.weather-project.eu.

4.3 Conference Participants

Participant	Affiliation
Special Guests	
Ioana ADAMESCU	EC DG RTD
Rachel BURBIDGE	EUROCONTROL
Prem CHHETRI	RMIT Melbourne, AUS
Yves ENNESSER	EGIS, FR
Christophe HEYNDRICKX	Transport & Mobility Leuven, BE
Vangelis KATSAROS	TRAINOSE, GR
Thanasis SFETSOS	DEMOKRITOS, GR
Pekka LEVIÄKANGAS	VTT, FI
Marie VENNER	Venner Consult, US
Regular Registrations	
Alexandre KADDOURI	SNCF - French National Railways, F
Irina STIPANOVIC OSLAKOVIC	University of Twente, NL
Pavlos TAMVAKIS	AUTH, GR
Ioannis XENIDIS	AUTH, GR

Andreas HARTMANN	University of Twente, NL
Lefteris SDOUKOPOULOS	CERTH-HIT
Michael FASTENBAUER	via donau, A

Project team members

Claus DOLL	Fraunhofer-ISI
Stefan KLUG	Fraunhofer-ISI
Katja RISCHE	Fraunhofer-ISI
Evangelos MITSAKIS	CERTH-HIT
Anestis PAPANIKOLAOU	CERTH-HIT
Riccardo ENEI	ISIS
Jan KIEL	Panteia-NEA
Hedi MAURER	Panteia-NEA
Ina PARTZSCH	Fraunhofer-IVI
Andreas KÜSTER	Fraunhofer-IVI
Valentin PRZYLUSKI	SMASH-CIRED
Norbert SEDLACEK	HERRY Consult
Christian TRINKS	KIT-IIP / CEDIM

4.4 Contact information

WEATHER project coordination

Fraunhofer Institute for Systems and Innovation Research ISI
Breslauer Str. 48, 76139 Karlsruhe, Germany
Fax: +49 721 6809-135, web: www.isi.fraunhofer.de.

Dr. Claus Doll (claus.doll@isi.fraunhofer.de, Tel.: +49 721 6809-354)

Dr. Stefan Klug (stefan.klug@isi.fraunhofer.de, Tel.: +49 721 6809-410)

Dr. Jonathan Köhler (jonathan.koehler@isi.fraunhofer.de, Tel.: +49 721 6809-377)