Smart and Resilient Urban Mobility Planning in Thessaloniki

Katerina Chrysostomou
Research Associate

Hellenic Institute of Transport (HIT)
Centre for Research and Technology Hellas (CERTH)
chrysostomou@certh.gr / www.hit.certh.gr
• CERTH – HIT
• The city of Thessaloniki
• Smart Mobility in Thessaloniki
• Resiliency to Climate Change
• Thessaloniki in 100 Resilient Cities
Centre for Research and Technology-Hellas (CERTH)

- The only research center in Northern Greece
- One of the largest ones in Greece
- Founded in 2000
- A legal **public entity governed by private law** with non-profit status
- Supervised by the General Secretariat for Research and Technology (GSRT) of the Greek Ministry of Education and Religious Affairs.
Mission
- High quality scientific research
- Emphasis on Research – Development – Innovation (R&D&I)
- Strong collaboration with the industry and the government for the exploitation of the scientific results
- Innovative synergies with universities and research institutes in Greece and abroad

Personnel
600+ the majority being scientists and engineers.
CertH at a glance (3/3)

Five institutes:

- **Chemical Process & Energy Resources Institute (CPERI)**

- **Information Technologies Institute (ITI)**
  Informatics, Telematics and Telecommunication Technologies

- **Institute of Applied Biosciences (INAB)**
  Agri-biotechnology, Health Translational Research, Informatics for big bio-data

- **Institute for Research & Technology of Thessaly (IRETETH)**
  Agrotechnology, Mechatronics, Biomedicine and Kinesiology

- **Hellenic Institute of Transport (HIT)**
HIT is the main transport research Organisation of Greece. Created in 2000 and started operation 2001.

Primary objectives, to:
1. Promote and conduct advanced research in the Transport field.
2. Represent Greece to International relevant fora.
3. Disseminate research results and support innovation.
4. Support the decision making process at government level.
HIT main research areas today:

1. Sustainable and Smart mobility
2. Intelligent Transport Systems
3. Environment and climate change
4. Clean Energy and energy efficiency in transport
5. Security of the supply chain
6. Port-centric Intermodality monitoring
8. Safety of Vulnerable Road Users
9. .....
The city of Thessaloniki

Second-largest city in Greece
Major Business and Culture hub

- Population: 1,1 million inhabitants
- 11 Municipalities
- Area: 1455,62 km²
The central area of the city with the historic center attracting most activities in the area

- Population: 325,182 inhabitants
- Area: 19.3 km²
Thessaloniki in numbers

- 665 inhabitants/ km²
- 777.544 vehicles (incl. private vehicles, heavy vehicles and motorcycles)
- Modal share: 52% private vehicles - 30% public transport – 8% other modes
- 1.300.000 daily trips by private vehicles
- 1 public urban transport operator (OASTH)
- 1 public administrative authority for urban transport (SASTH)
- 35 intercity public transport operators (buses)
- 1.950 taxis
- 6.433 km. of road network
- 9 km. bus lanes
- 12 km. of cycling infrastructure
- 197.000 parking spaces
- 3 traffic control systems
Region of Central Macedonia (RCM)
Municipalities in the area (11)
THessalononiki's Integrated Transport
Authority
Hellenic Institute of Transport
Aristotle University of Thessaloniki
Egnatia Odos S.A.
Attiko Metro S.A.
Transport Providers (Buses, Sub-urban rail, Taxis, logistics, etc.)
Thessaloniki, smart mobility test lab

- Development of e-infrastructures for «intelligent roads and networks»
- E-mobility services for the citizens
- Real Time data collection and management
- Data exchange between city stakeholders
- Sustainability – prime concern
Smart Cities in the EU-28
The European Innovation Partnership on Smart Cities and Communities

How to make our cities smarter?

The Partnership integrates the ICT, energy, and transport sectors. It aims to apply innovative solutions to tackle issues such as congestion, air pollution, high energy costs, and to achieve better mobility, cleaner urban environment, energy efficiency.

Meet our Partners

In 2014, 370 commitments around smart city projects & solutions were submitted by more than 3,000 partners. The lead organisations come from 31 countries.

Classification of lead organisations

- Public Authorities: 36%
- Business: 26%
- NGOs: 6%
- Private individuals: 2%
- Others: 14%

Some of the areas we are working on

- Urban Mobility
- Open Data
- Business Models
- Finance & Procurement
- Policy & Regulation
- Metrics & Performance Indicators
- Integrated Energy, Transport & Communication Networks
- Energy Efficiency & Low carbon Solutions
Other Smart City related activities

- **2030 Thessaloniki Smart City planning strategy**
  *Themeatics*: Innovation and open data, Resilience, Sustainable mobility and Energy

- **H2020 Smart Cities and Communities call (SCC1-2015)**
  CATALIST proposal, focused on:
  Integrated infrastructures, ICT, Smart Energy and Mobility
  (Thessaloniki ➔ Lighthouse City in the area of Mobility)

- **Regional Operational Plan 2014-2020**
  Relevant activities related to Smart and Resilient City planning have been included

**HIT ➔ Technical know-how provider + Facilitator**
resilience |riˈzɪlɪəns| noun [mass noun]

1 the ability of a substance or object to spring back into shape
2 the capacity to recover quickly from difficulties; toughness

Thesaurus: durability, flexibility, ability to last, toughness, hardiness, adaptability, buoyancy, flexibility, ability to bounce back

Antonyms: vulnerability, weakness
## CERTH/HIT in the resilience motion

<table>
<thead>
<tr>
<th>Project</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>RAIN-EX (EC)</td>
<td>• Ensure the availability of transport infrastructure with regards to natural hazards, especially extreme rainfall, through a risk-based design of the former.</td>
</tr>
<tr>
<td>MOWE-IT (FP7)</td>
<td>• Quantification of climate change related impacts on transportation infrastructures, networks and operations and. Formulation of measures, policies, strategies and roadmaps.</td>
</tr>
<tr>
<td>WEATHER (FP7)</td>
<td>• Identification and assessment of critical and vulnerable transport infrastructures.</td>
</tr>
<tr>
<td>National adaptation study (Bank of Greece)</td>
<td>• Elaboration of the Transport Sector adaptation plan of the National Adaptation Study.</td>
</tr>
<tr>
<td>RESCUE (Interreg)</td>
<td>• Decision Support System for transportation networks response and recovery in case of catastrophic events.</td>
</tr>
<tr>
<td>PROOHF (Interreg)</td>
<td>• Methodological framework for risk assessment of historical heritage monument sites in case of fires.</td>
</tr>
</tbody>
</table>
The 2013 Attica flood

Locations of rain-gauges across the Athens basin and the distribution of total rainfall during the 22 February 2013 storm event.

The Athens basin, the built areas and the extensive road network.
The 2013 Attica flood

Count locations and mostly affected geographical zones within the Athens road network.

Locations and timing of 238 emergency calls received by the Greek Fire Service to report flooding in buildings or other structures.
Findings (passenger transport)
Findings (passenger transport)
Findings (freight transport)
Effects on road network

Effects of flash flooding caused by extreme precipitation events on the road network including: inundated parts (a, b), deposits of debris (c, d), eroded road fill and scoured roads (e), asphalt scouring (f), damages on road equipment (e.g. lighting installations) and (g) complete erosion and road collapse (h)
Effects on river crossings

Types of damages on river crossing infrastructure, ranging from inundation only (a), clogging of waterways (b, c), damages on parts of a bridge (d, f, h) and complete collapse of the infrastructure (e, g)
Impacts on road access

Closed road network after the extreme precipitation events per examined basin
The 2007 Peloponnese wildfires
The 2007 Peloponnese wildfires
The 2007 Peloponnese wildfires
The 2007 Peloponnese wildfires
Identification of Critical Infrastructure

• Application on the Peloponnese 2007 wildfires

Closed network links during the 2007 wildfires

National network - Critical links (that have to remain operational under any conditions)
Identification of Critical Infrastructure

- Application on the Peloponnese 2007 wildfires

Closed network links during the 2007 wildfires

Local Network - Critical links (that have to remain operational under any conditions)
Major climatic changes expected in Thessaloniki.

..based on the meteorological scenarios of the **National Adaptation Plan for Climate Change in Greece**:

- Rise in mean level of sea (0.2 - 2 meters)
- Decreased precipitation (5 - 19%)
- Increased mean air temperature (3 - 4.5°C)
- Increased number of days with temperature of 35°C or more (35 - 40 days more per year)
- Increased number of tropical nights, with minimum temperatures above 20°C (50%)
- Decreased number of nights with frost (40 days less per year)
- Increased winds (5%, especially during summer)
- Increased drought (40 days more per year)
- Decreased cloud cover
- Human discomfort - humidex (10-20 days more per year)
The impacts of these climatic events in Thessaloniki are expected to be negative and in several cases extremely so:

- Direct effects on the built environment, transport (as well as impacts on other sectors which effect transport, e.g. land use, tourism, agriculture and health)
- Increased demand for electricity for cooling (40 days more per year)
- Increased risk of fire (40 days more per year) and forest fires
- Increased frequency of extreme weather events
- Increased number of high intensity storms
- Increased number of flooding and urban flooding events
- Increased landslides
Our work’s essence

- We analyse:
  - how NH and EWE will affect transportation
  - what we have to do to protect it
- Explicit identification of their induced impacts on:
  - transport infrastructure
  - transport networks (and operations)
- Prioritized measures, policies, strategies and actions to:
  - reduce transportation systems vulnerability
  - increase their resilience
  - safe-proof investments in this direction
What we focus on..

• Cooperation between the competent authorities with a view to ranking and evaluating transport infrastructure components in terms of importance, vulnerability and current state.
• Development of monitoring systems for crucial infrastructure and use of ‘smart’ decision-making, risk management and disaster management systems, etc.
• Recording of detailed data concerning the operation of the country’s transport system in cases of extreme weather events; development of impact evaluation indicators.
• Revision of the design specifications of current transport infrastructure, taking climate change parameters into account (e.g. port infrastructure design based on new weather patterns and respective data on wave size and frequency, etc.).
What we focus on..

- Use of **new materials**, more resilient to extreme weather conditions
- **Strategic planning of land use and transport infrastructure**, taking into account the forms of climate change impacts
- Policy measures aimed at **reducing transport demand**, e.g. teleworking, car pooling, mobility management, school transport,..
- Promotion and support of **ecodriving**
- Use of ‘**smart**’ **technologies and systems** with a view to improving freight transport and maximising capacity use of all means of transport (target: zero empty routes).
- Strengthening **intermodal freight transport** and **reducing the share of road transport** in favour of sea and railway transport.
- Promotion of the use of **energy efficient vehicles** through incentive measures and the construction of necessary infrastructure.
100 Resilient Cities

100RC partners with cities around the world to help them become more resilient to the social, economic and physical challenges that are a growing part of the 21st century.
100 Resilient Cities

• Pioneered by the Rockefeller Foundation
• Dedicated to helping cities around the world become more resilient to the physical, social and economic challenges
• Resilience in 100RC:
  ▫ includes not just the shocks – earthquakes, fires, floods
  ▫ but also the stresses that weaken a city on a day to day or cyclical basis – high unemployment; an overtaxed or inefficient public transportation system;
• By addressing both the shocks and the stresses, a city becomes more able to respond to adverse events, and is overall better able to deliver basic functions in both good times and bad, to all populations.
Resilience = Adaptation to:

**Acute shocks**
- Earthquake
- Wildfires
- Flooding
- Sandstorms
- Extreme cold
- Hazardous materials accident
- Severe storms and extreme rainfall
- Terrorism
- Disease outbreak
- Riot/civil unrest
- Infrastructure or building failure
- Heat wave

**Chronic stresses**
- Water Scarcity
- Lack of affordable housing
- Poor air quality
- High unemployment
- Homelessness
- Changing demographics
- Lack of social cohesion
- Poverty/inequity
- Aging Infrastructure
- Shifting macroeconomic trends
- Crime & violence
Thessaloniki in 100 Resilient Cities

Thessaloniki’s Resilience Challenge

This youthful port city is eager to address social inequity, unemployment, and transportation shortfalls in an innovative and coordinated manner.

Resilience Challenges

- Aging Infrastructure
- Earthquake
- Economic Shifts
- High Unemployment
- Riot or Civil Unrest
What 100 Resilient Cities offer

Resources to develop a roadmap to resilience along four main pathways:

1. Financial and logistical guidance for establishing an innovative new position in city government, **Chief Resilience Officer**, who will lead the city’s resilience efforts;

2. **Expert support** for development of a robust resilience strategy;

3. **Access** to solutions, service providers, and partners from the private, public and NGO sectors who can help them develop and implement their resilience strategies and

4. Membership of a **global network** of member cities who can learn from and help each other.
The Final Call for Applications: 2015’s 100 Resilient Cities Challenge
Deadline to apply is November 24, 2015

33 cities will be selected and adding to the 67 already selected will complete the 100 member cities of the programme
Thank you

Katerina Chrysostomou
Research Associate

Hellenic Institute of Transport (HIT)
Centre for Research and Technology Hellas (CERTH)
chrysostomou@certh.gr / www.hit.certh.gr