STORM

Safeguarding Cultural Heritage through Technical and Organisational Resources Management

Project Overview

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European Commission | Horizon 2020 European Union funding for Research & Innovation

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About Sparta

Zulf Choudhary CEO of Sparta Digital, a technology economist

We are specialist digital consultancy based in Manchester UK using cutting edge engagement to citizens

I hope I do not lose friends after this presentation!

European Commission
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http://ec.europa.eu/eurostat/statistics-explained/index.php/Tourism_statistics
https://www.statista.com/topics/962/global-tourism/

What is STORM?

- **The aim is to create a set of novel predictive models** and improved non-invasive and non-destructive methods of diagnosis for cultural heritage sites
- **To determine how different vulnerable materials, structures** and buildings are affected by different extreme weather with risks associated to climatic conditions or natural hazards
- **Technology:** Sensors based technology, IOT, Data Analysis and Machine Learning
- **There are 20 partners across Europe** with Sparta representing UK Node
- **Using Disaster Risk Recovery** (DRR) Approach

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Why?: Impacts on sustainability, culture, politics

7.8 trillion USD value of direct and total contribution of travel and tourism to the global economy from 2006 to 2017 (in trillion U.S. dollars)

These 2.3 million enterprises employed an estimated 12.3 million persons.

Tax and VAT receipts to governments.

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Project Objectives

OBJ2: Mitigation of natural hazards and the assessment/management of threats

OBJ3: Survey and diagnosis based on the study of materials properties, particular environmental conditions, and profile of cultural assets to be assessed

OBJ4: Models and services for generating and managing a situational picture based on data collected by physical and human sensors

OBJ1: environmental assessment methodologies and services

OBJ5: Methodologies, practices and software tools for more reliable maintenance, quick restoration and long-term conservation

OBJ6: Collaboration and knowledge-sharing framework for the community of stakeholders for sustainable management and conservation of cultural heritage in Europe

OBJ8: Cost analysis for the sites protection against natural hazards managed by the STORM data analytics tools

OBJ7: Propose adaptations and changes in existing policies and validation of new knowledge of government processes

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Expected results: a dual approach

Methodological framework

- Predictive **models using Big Data**
- Surveying and diagnostic **methods**
- Risk assessment & management **models**

To manage and forecast environmental threats

Implementation of demonstrators

- **Real life scenarios**
- State of the art **sensor technologies**
- **Crowd-sensing/Crowd-sourcing**
- Cyberphysical framework over **IoT technologies**

proposals on **strategies** and **policies to improve the processes at governmental level**

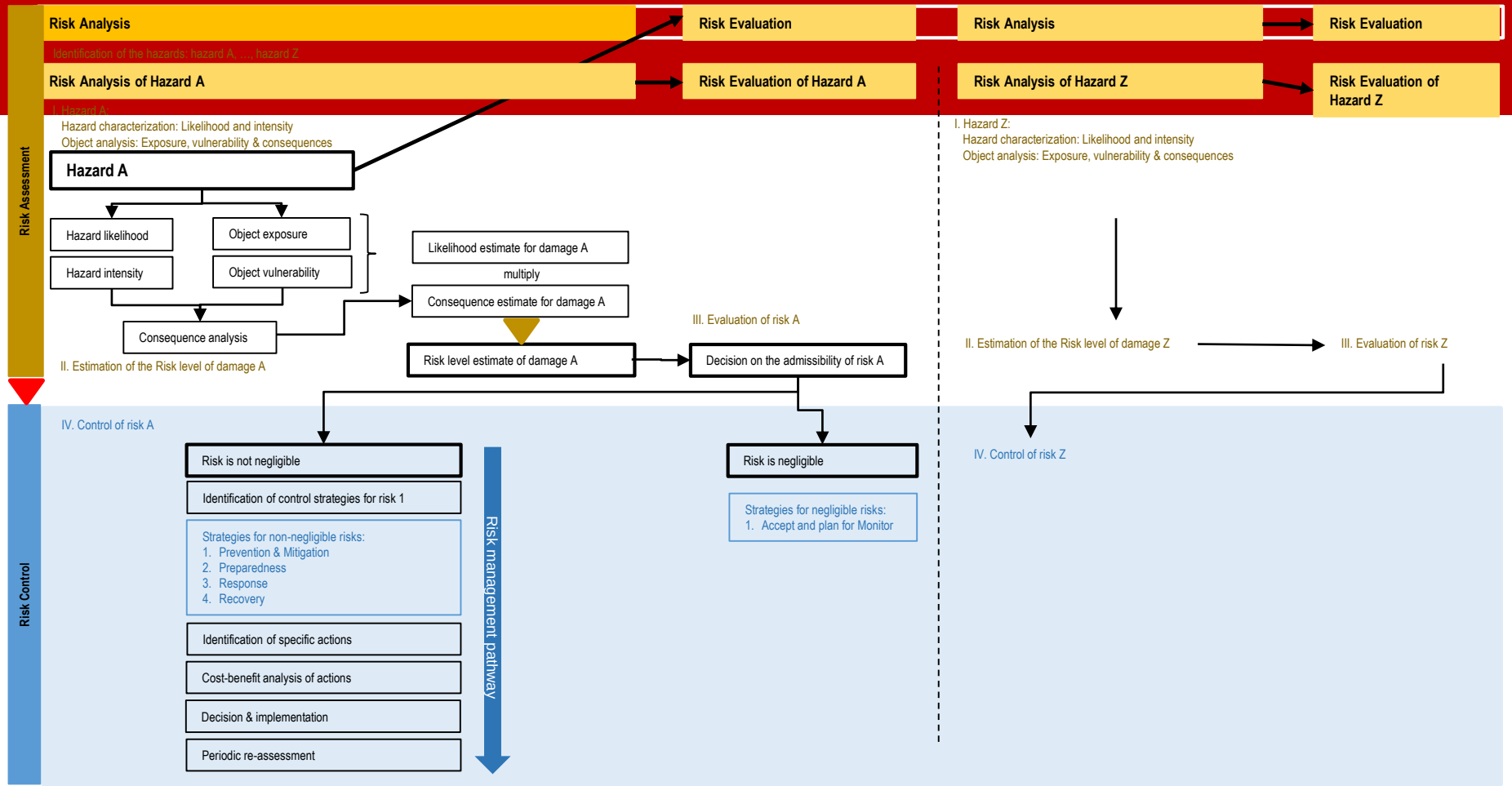
Pilot sites validators to implement, assess and improve the methodological framework

DRR Classification of Hazard and Climate Change Indicators

- Significant primary or secondary hazards (Red)
- Secondary/ consequential anthropogenic hazards (Yellow)
- Additional threats associated to human intervention (Green)

SIGNIFICANCE OF HAZARDS IN THE STORM PROJECT					
Natural Hazards			Anthropogenic Hazards		Human-induced Threats/Errors[5]
Geological Hazards	**Hydro-meteorological Hazards (Climate Change-related extreme weather[6])**	**Biological Hazards**	**Industrial/ Technological Hazards[7]**	**Human-induced Hazards**	
Earthquakes	*Flooding* Flash-floods River floods Coastal floods Storm surges	Insect/pest infestation Fungal infestation Vegetation infestation(e.g. spreading weeds) Coral bleaching event	*Critical infrastructure failure* Train/aircraft crash Major road accident System failures Power failure Dam/levee failures Cyber incidents	Armed conflict Civil unrest Fires and explosion Critical infrastructure failure or collapse Terrorism Biological attack Chemical attack Cyber incident Explosive/radiological attack Hazardous Materials Spill (chemical, radiological, biological)	*Mismanagement* Lack of maintenance Inadequate emergency response/ damage assessment Improper past intervention Large-scale/improper archaeological excavation Inadequate drainage system
Mass movements (dry) Landslides Subsidence Rockslides	*Storms* Tropical cyclones (typhoons and hurricanes) Thunderstorms Hailstorms Lightning Tornadoes				
	Mass movements (wet) Landslides Subsidence Rockslides Avalanches	*Epidemics* Viral disease Bacterial disease Fungal disease	*Explosion and pollution* Industrial pollution Nuclear radiation Toxic wastes Factory explosions Fires/ urban conflagrations Waste mass movement Hazardous Materials Spill (chemical, radiological, biological)		Looting Vandalism Ecosystem destruction
Volcanic eruption Lava flows Ash falls Gas emissions	*Extreme temperature* Heat waves Cold waves Frost/freeze Fog Wildfires Droughts	*Animal stampede*			*Development pressure* Land use change Constructions and infrastructure expansion Tourism pressure Encroachment Mining activities
	Tsunamis[8]				

DRR & Risk Mapping and Assessment of Cultural Heritage site

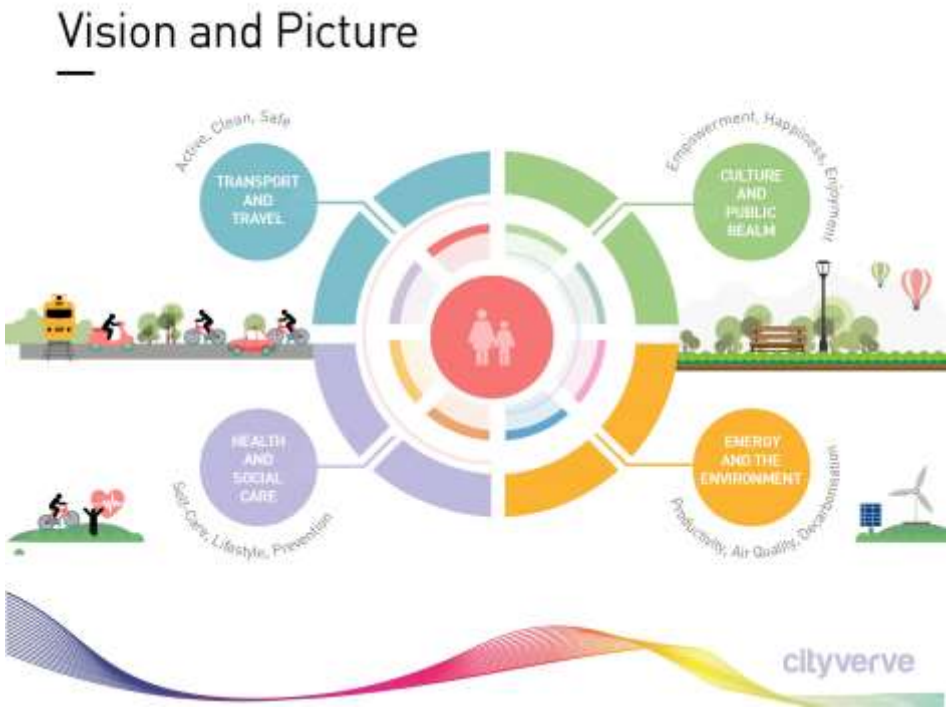


Current state

- Following Sensors have been installed in Mellor Site :
  - Environmental Sensors
  - Weather Stations
- Ongoing studies of data collection from last December
- Historic data is used to build analysis models from weather stations in order to identify thresholds for alerts and warning systems to be integrated into our dashboard
- A data dashboard is in its conception stage and we are yet to settle on an appropriate platform : https://storm-mellor-datadash.shinyapps.io/STORMapp/
- User engagement through the built-in iBeacon technology

Data Dashboard

Cityverve a £10m IoT and Big Data project



IoT and Big data to improve citizens experience in Smart Cities of the future

- **Risk Monitoring**
- **Risk Assessments**
- **Risk Mitigation**
- **Stakeholder Response**
- **Remedial Action**

User engagement

- Mobile alerts
- Augmented reality APP
- Learning and feedback loops
- Local schools, travel, local authorities, Universities and key stakeholders (community)

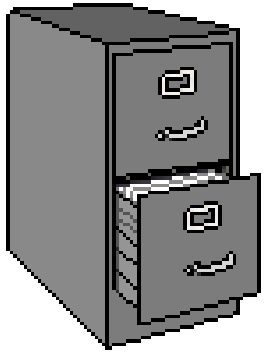
http://www.manchestereveningnews.co.uk/whats-on/arts-culture-news/terracotta-army-lanterns-manchester-chinese-12508353

The truth - project morphs

Intentions

Transformation

Results

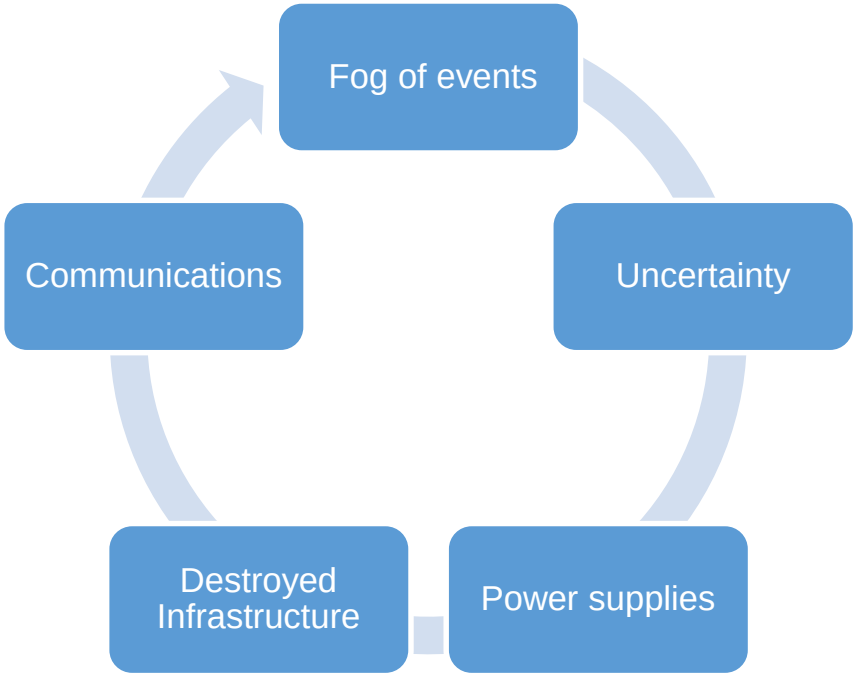


Learning from experience

STORM teaches that stakeholders self-interest is very importune& order of importance in responses

- Responders (doers) adopt simple processes, awareness, engagement & rick understanding in their language
- Policy makers – facilitators and resource management risk impacts.
- Academics provide evidence, give insights linking the dots.

Local Challenges



Ssustainability and Resilience

Economic factors are the key to sustainability and risk awareness

- Loss of asset, cost of replacement plus actuarial risk and costs
- Multipliers effects (Cascading effects) on jobs, health and wellbeing
- Gamification to rebuild local assets and engage younger communities
- Give data away to responders and industry

Conclusion

Next steps:

1. Education and community awareness programmes.
2. Data base of assets (pictures, images and to help rebuild structures
3. Simple frameworks needed
4. Integrated connected approach - military style processes

Conclusion

Next steps:

1. Needed education and community awareness programmes.
2. Data base of assets (pictures, images and to help rebuild structures)
3. Simple frameworks needed for site managers
4. Integrated connected approach using AI for predictive responses

Q & A

I hope still have friends

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