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EUROPEAN UNION

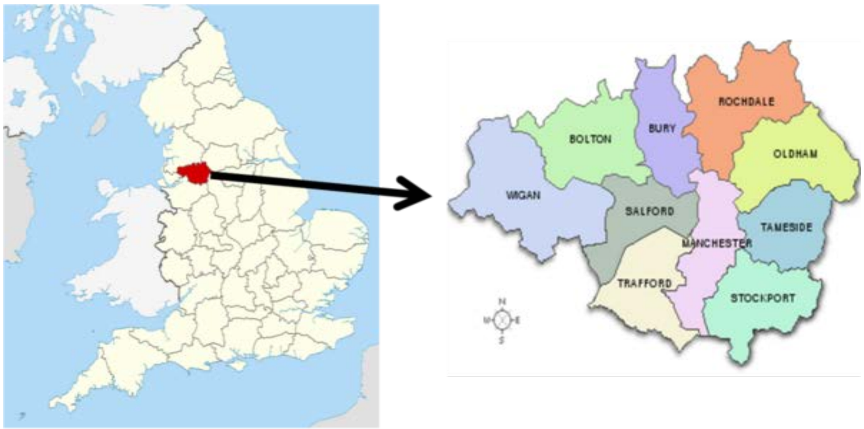
Best practice

Resin project, Manchester

risk assessment

Prepared by:

County of Split and Dalmatia – PP7

Title of the Case study	Resin project, Manchester risk assessment
General data	
Promoter	*Please insert the name of the organization that promoted the case study (i.e. for a project, the Lead partner/main beneficiary):* *RESIN* – TNO, the Netherlands Organization for applied scientific research, regulated by public law, independent (not part of any government, university or company), www.tno.nl, (project coordinator) THE UNIVERSITY OF MANCHESTER United Kingdom https://www.manchester.ac.uk/
Timeframe	*Please insert the year(s) of reference (i.e. for a project, the years of implementation):* *RESIN – 05/2015-11/2018*
Target area and scale	*Please indicate the area covered by the case study, specifying if it is a municipal, regional, or national-level initiative:* *Greater Manchester covers an area of 1,277 km^2 with a population of 2.7m and is comprised of 10 local authority districts (Municipalities). Greater Manchester (GM) was at the heart of the industrial revolution, becoming the world's first industrial city.*  Map of the ten GM districts in context of England (Matt Ellis, GMCA)
Brief	*Please describe briefly the Case study, explaining its context, main objectives, climate-related*

description	*actions, outputs and results, as well as the key actors involved:* *This document has been prepared in the framework of the European project RESIN – Climate Resilient Cities and Infrastructures* *This Case study contains the results of GM's first climate change risk assessment of critical infrastructure undertaken as part of the Horizon 2020 RESIN project. The risk assessment methodology drew on established approaches developed by high profile organisations including the Intergovernmental Panel on Climate Change and the UK Cabinet Office. It provides an evidence-based risk assessment informed by the best available data on the current occurrence of extreme weather and climate change hazards in GM, and on the direction of future climate change projections that will influence the frequency and intensity of these hazards locally.* *The goal of this risk assessment is to establish the most prominent risks in this context, not to identify all possible risks. Six extreme weather and climate change hazards fall within the scope of the risk assessment:* *- Fluvial flooding* *- Pluvial flooding* *- High temperatures* *- Water scarcity* *- Storms (high winds and lightening)* *- Geo hazards (subsidence and landslides)* *This matches the hazards covered within the critical infrastructure chapter of the UK Climate Change Risk Assessment 20173. Within the GM assessment, however, pluvial and fluvial flooding have been considered as separate hazard themes. This is to reflect the different processes underlying these two forms of flooding, and variations in their occurrence in GM.* *Urban critical infrastructure sectors covered within the GM risk assessment have been established with reference to the GM Spatial Framework (GMCA 2015), which identifies GM's critical infrastructure sectors as:* *- Transport: air (Manchester Airport), rail, port (Salford) tram (metrolink), road, walking and cycling).* *- Energy: gas, electricity, heat.* *- ICT: digital connectivity.* *- Water and waste water: water supply and water treatment.* *- Social infrastructure: schools and education, health services, community facilities.* *- Green infrastructure.* *There are four key elements to the risk assessment approach followed within the GM case study*

	which are now outlined: *1. Identify extreme weather and climate change impacts to critical infrastructure* *2. Determine likelihood of extreme weather and climate change impact occurrence* *3. Assess the consequences of extreme weather and climate change impacts for critical infrastructure* *4. Assess extreme weather and climate change risk to critical infrastructure* *This risk assessment has increased political awareness and commitment to actions to adapt to climate change and GM resilience involved in initiatives such as the 100 Resilience Cities Initiative or the UNISDR campaign to make cities more resilient - my city is ready in 2014, etc.* *The risk assessment methodology drew on established approaches developed by high profile organisations including the Intergovernmental Panel on Climate Change and the UK Cabinet Office,.. The assessment has been supported by over 40 individuals working in and around GM RESIN steering group, the majority who have considerable experience (over 5 years) of working in associated fields(individuals from GM including representatives from the Low Carbon Hub, Transport for Greater Manchester and the Civil Contingences and Resilience Unit, the Civil Contingences and Resilience Unit, ARUP, Natural England and City of Trees)*
Contribution of the Case study to the Joint_SECAP guidelines for Vulnerability and Risk assessment	
Modules of the guidelines relevant to the case study	*Please select one or more Modules that you think the Case study gives a significant contribution to (i.e. through methodologies, methods, tools…). Refer to the Joint_SECAP Guidelines for further information on Modules:* • M1 PREPARING THE RISK ASSESSMENT (describes the context of the assessment - processes, knowledge, institutions, resources and external factors –, identifies its objectives, expected outcomes and scope, and defines tasks, responsibilities and time planning) • M2 DEVELOPING IMPACT CHAINS (identifies and clusters impacts and risks, identifies hazard and intermediate impacts, vulnerability and exposure of the system) ☐ M3 IDENTIFYING AND SELECTING INDICATORS (identifies and select indicators for hazards, vulnerability and exposure) • M4 DATA ACQUISITION AND MANAGEMENT (regards the collection, quality check, storage and management of data) ☐ M5 NORMALIZATION OF INDICATOR DATA

	(provides normalized data for each indicator in a standardized value) ☐ M6 WEIGHTING AND AGGREGATING OF INDICATORS (evaluates the influence of the indicators on the respective risk component, assigns different weights, aggregates individual indicators into composite indicators of the risk components hazard, vulnerability and exposure) • M7 AGGREGATING RISK COMPONENTS TO RISK (aggregates the risk components into a composite risk indicator) ☐ M8 PRESENTING THE OUTCOMES OF YOUR RISK ASSESSMENT (describes how to elaborate the risk assessment report, taking into account both the objective and the target audience of the assessment)
Description of the contribution of the Case study to the Joint_SECAP guidelines	*Please provide a detailed description of how the Case study contributes to the modules selected above, i.e. by explaining the methodological approach adopted, the methods and tools used, etc. The lines corresponding to the modules that are NOT been selected above shall be left blank:* M1: *Report City Assessment Report Greater Manchester* this study describes in more detail the economic, social and physical characteristics, current adaptation plans and strategies, the current political situation and the organization working on the plan, the implementation of adaptation and critical infrastructure protection measures to help us better understand options and tools and products for support for decisions that can best suit a particular local context M2: The climate change impact chains developed within the GM RESIN case study offer several functions that can support climate change adaptation and resilience building strategies and actions. These centre on their communication and awareness raising functions, in addition to their role in supporting the development of adaptation and resilience responses. Organisations with responsibilities related to climate change adaptation and resilience could therefore benefit from developing and using impact chains. Given the potential benefits offered by climate change impact chains, it certainly gives us a way to develop them for our own needs. M3: M4: from the risk assessment report critical gives an evidence-based risk assessment, informed from the best available data on the current occurrence of the threat of extreme weather and climate change which is very important because it tells us about the importance of data for future climate change projections that will affect frequency and intensity these hazards locally. M5: M6: M7: from this Climate Change Risk Assessment analysis GM's critical infrastructure offers the following benefits that we must include in our risk assessments: ? Awareness raising ? Prioritization ? Resource allocation ? Strategy and action development

	M8:
References	
Website(s)	*Please include the link to the official website and/or other webpages where information on the Case study can be found:* *https://resin-cities.eu/greatermanchester/* *https://resincities.eu/fileadmin/user_upload/Resources/City_report_GM/GM_Impact_Chains_Final_Report_-_Final_Draft.pdf*
Bibliography	*Please include references to books, papers or articles providing relevant information on the Case study:*
Images	*Please include pictures or graphs you deem relevant to illustrate the Case study:*

Table 1: Extreme weather and climate change impacts to GM's critical infrastructure

	Fluvial flooding	**Pluvial flooding**	**High temperatures and heat waves**	**Water scarcity**	**Storms (high winds and lightening)**	**Geohazards (subsidence and landslides)**
Transport	- Flooding of road network - Flooding of rail network - Road bridge failure due to scour - Rail bridge failure due to scour	- Flooding of road network - Flooding of rail network	- Rail buckling due to high temperatures		- Storm damage to road network - Storm damage to rail network	- Slope and embankment failure on road network - Slope and embankment failure on rail network
Energy (Gas and Electricity)	- Flooding of energy infrastructure (esp. substations) - Flooding of power stations	- Flooding of energy infrastructure (esp. substations)	- Increased energy demand for cooling - Damage to energy infrastructure from high temperatures	- Lack of cooling water for power generation	- Storm damage to energy infrastructure	
ICT (Digital Connectivity)	- Flooding of ICT infrastructure	- Flooding of ICT infrastructure			- Storm damage to ICT infrastructure	
Water Supply and Waste Water Treatment	- Flooding of water supply and waste water treatment infrastructure - Sewer flooding and combined sewer spills	- Flooding of water supply and waste water treatment infrastructure - Sewer flooding and combined sewer spills	- Increased demand for water	- Low groundwater levels and reduced recharge - Water supply and demand deficit (water scarcity) N.B. Also links to temp rise.		
Public Buildings	- Flooding of properties	- Flooding of properties	- Overheating of buildings	- Reduced water availability for buildings		- Subsidence
Green and Blue Infrastructure			- Loss of green and blue infrastructure functions	- Loss of green and blue infrastructure functions	- Tree fall	

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<td>Communication throughout planning processes/stakeholder engagement
Figure 8 sketches out GM's governance structure, which shows the range of public and private stakeholders involved in the delivery of policies and strategies for GM. The private sector is represented through the Greater Manchester Local Economic Partnership (GM LEP) and the Business Leadership Council (BLC). Policies are split into thematic groups including low carbon and health and well-being. Representatives from the ten local authorities work with GM level bodies to deliver services such as transport and waste disposal.</td>
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Fig 8: Governance structure of GM. Source: Greater Manchester Combined Authority</td>
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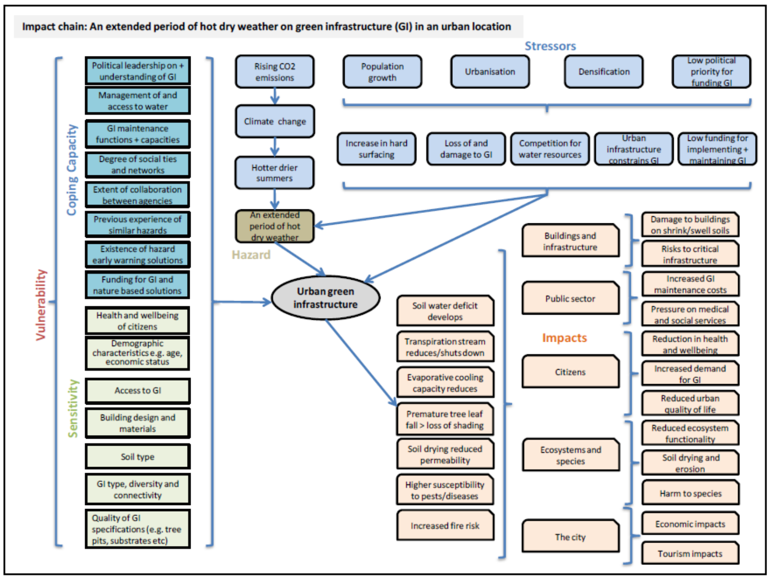
<tr><td>Impact chain for an extended period of hot dry weather to green infrastructure (GI) in Greater Manchester.</td><td>
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