Appendix 3: Typology

Adaptation Strategies for European Cities: Final Report

This is part of the Final Report of the project ”Adaptation Strategies for European Cities” which has been compiled by Ricardo-AEA for the European Commission Directorate General Climate Action

Contact:

Jonathan Perks
Ricardo-AEA Ltd.
Gemini Building, Harwell, Didcot, OX11 0QR
t: +44 (0)1235 753460
e: jonathan.m.perks@ricardo-aea.com
Ricardo-AEA is certificated to ISO9001 and ISO14001

RICARDO-AEA

Appendix 3: Typology

Adaptation Strategies for European Cities: Final Report

Alexander Ballard | MANCHESTER 1824 The University of Manchester | adelphi | ARCADIS | ICLEI Local Governments for Sustainability

Report for EC – DG CLIMA

AEA/R/ED57248
Issue Number 1
Date 02/07/2012

Customer:

EC DG CLIMA

Customer reference:

071201/2011/609697/SER/CLIMA.C3

Ricardo-AEA reference:

Ref: ED57248- Issue Number 1

Contact:

Jonathan Perks
AEA Technology plc
Gemini Building, Harwell, Didcot, OX11 0QR
t: 0870 190 8435
e: jonathan.m.perk@aeat.co.uk
Ricardo-AEA is certificated to ISO9001 and ISO14001

Author:

Sarah Winne

Approved By:

Jonathan Perks

Date:

02 July 2012

Signed:

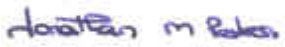


Table of contents

1 Aim of the typology (Tasks 1.1.2, 1.1.3, and 1.1.4)

This sub-task report focuses specifically on the construction and application of the Typology (Tasks 1.1.2, 1.1.3, 1.1.4).

1.1.1 Aim

The Typology was a crucial preliminary step for other tasks in the ASEC project:

- Task 2 – the draft typology was available for presentation, discussion and refinement at stakeholder dialogue meetings (Task 2.2).
- Task 3 – to inform the selection of cities for inclusion in the project (Task 3.1) and to help identify the most appropriate sub-groups for peer exchange and capacity building. The cities' willingness to participate in the project was an additional and critical factor in selection.
- Task 3 – to inform the creation and delivery of appropriately targeted training materials (Task 3.3)
- Task 4 – the typology will be refined based on the experience of the project, and can inform the structure for the final delivery package Toolkit.

The main aim of the typology is to provide justifiable answers to a number of practical or policy questions about identification, selection and prioritisation of groups of European cities, with respect to impacts, vulnerability and adaptation. Table 1 provides examples of the kinds of questions that the typology could address. The first row in the table was considered the most important for the immediate purposes of this project.

Table 1 Questions required of the typology

Possible question	From whom?	Relevant city characteristics
Which cities can be grouped together for (particular kinds of) training?	**This project**	• Climate impacts / risks / hazards • Adaptive capacity • City characteristics
Which other cities face similar climate impacts/hazards?	City authorities	• Climatic / biogeographical zones • City characteristics (e.g. density, extent of flood plain) • Economic situation
Which other cities should I consider "twinning" with to share adaptation experience?	City authorities	Determined by a city's preferences, but could include: • Size / status • Geographic features • Nature of climate events • Existence of national adaptation framework

1.1.2 Additional aims of the typology

A number of other questions could reasonably be served by an extended and updated version of the typology in future. Some of these are noted here to illustrate the potential future use and legacy of this tool:

- Which cities are in most urgent need of (a particular kind of) adaptation support/funding, including scientific and technical support? (of interest to European Commission, National Governments, Research and consultancy)
- Where can resources most usefully be targeted to assist responses to climate impacts? (of interest to European Commission, national and regional governments, city authorities, including elected officials at all levels)
- Which cities should be targeted by particular adaptation policy measures? (of interest to European Commission, National Governments)
- What barriers to adaptation are present in cities/city groups? (of interest to European Commission, National Governments, Research)
- Where are promising markets for new (adaptation) technologies / services? (of interest to finance and business sectors)
- How does my city compare to other cities according to different characteristics? (of interest to city authorities).

1.1.3 Summary

Within the project, the primary purpose of the typology is to support the selection of cities and grouping of participants into sensible clusters for the development of appropriate training materials and the carrying out of engagement (capacity building) activities (in Task 3). In order to inform Task 3 in a robust and transparent way, the typology has been developed using publicly-available data sources with input from all of the project partner organisations.

There are additional ways that the typology could be used beyond the lifetime of the project. It could provide a tool for the Commission to add to and use in the consideration of future activities and funding to support city level adaptation. If made available publicly, it may also be useful to cities to enhance their understanding of the adaptation challenges they may face, and to identify appropriate “twinning” partners to strengthen their ongoing adaptation initiatives.

For the purposes of this sub-task report, the focus is on the use of the typology within the immediate project activities (primarily Task 3). Later in the project (after the training phase) we will re-evaluate the typology in the light of experience and feedback, and consider how it should be refined for future use, discussing with DG CLIMA what can be achieved within the project and what would be recommendations for future work.

2 Concept

2.1 Principles of the typology

The aim during the design phase of the typology was to ensure that it was transparent, simple, and objective. The project team needed to ensure that anyone using the typology would be able to understand how and why different cities were included in a particular cluster. It was especially important that the typology was based on recognised data sources to ensure that it was both statistically robust and as objective as possible. In addition, the project team realised that the typology also needed to be:

Modular: to make it possible for underlying data to be updated, for new indicators and data to be included, and for enhanced understanding of the adaptation process to be incorporated.

Conceptually sound: building on currently accepted understanding of the adaptation process.

Aligning with other ongoing EU-wide workstreams on city-level vulnerability. In particular, we noted ongoing work by the EEA and the JRC, and the previous experience of the EEA in particular, in efforts to create a typology in this area.

Complementing, building on existing work, and providing additional value, to other ongoing EU-wide workstreams on city-level vulnerability.

Iterative: the typology has evolved through the project, based on a broad framework defined in the early stages of the project.

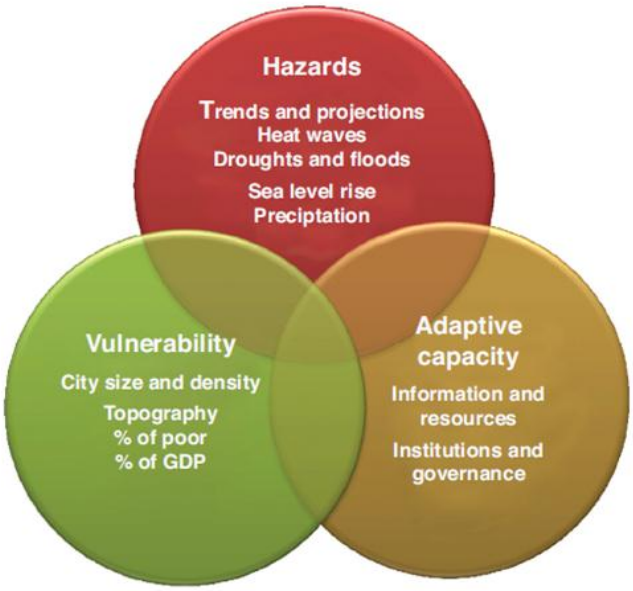
Useful beyond the life time of the project: both as a tool available for cities to identify suitable peers (potentially incorporated into the Clearinghouse), and as a tool to enable the Commission to identify priorities for policy development and adaptation resource allocation.

In order to ensure that the typology is conceptually sound and built on currently accepted framings of the adaptation process for cities, the typology has been framed as in the Urban Climate Change Research Network's assessment report[1] on climate change in cities. Figure 1 shows the three aspects of the UCCRN's framework, labelled as climate hazards, vulnerability and adaptive capacity. The UCCRN report defines these terms as:

- "Climate hazards facing the city, such as more frequent and longer duration heat waves, greater incidence of heavy downpours, and increased and expanded coastal or riverine flooding;
- Vulnerabilities due to a city's social, economic, or physical attributes such as its population size and density, topography, the percentage of its population in poverty, and the percentage of national GDP that it generates;
- Adaptive capacity aspects, factors that relate to the ability of a city to act, such as availability of climate change information, resources to apply to mitigation and adaptation efforts, and the presence of effective institutions, governance, and change agents."

[1] Rosenzweig, C., Soleki, W, Hammer, S., and Mehrotra, S (eds) (2011) Climate change and cities: first assessment report of the urban climate change research network, Cambridge University Press, Cambridge, UK.

Figure 1 Urban Climate Change Research Network Framework for adaptation planning



The UCCRN report further recommends that this framework is adopted as a platform for developing adaptation strategies. Depending on the results from other review tasks in Task 1 (including the research review on impacts, vulnerability and risks, Task 1.1.1, and the review of good practice strategies and tools/guidance), this project may look to adapt the UCCRN framework not only to provide the basis for the elements in the typology, but also to frame the development of training materials and guidance for adaptation strategies.

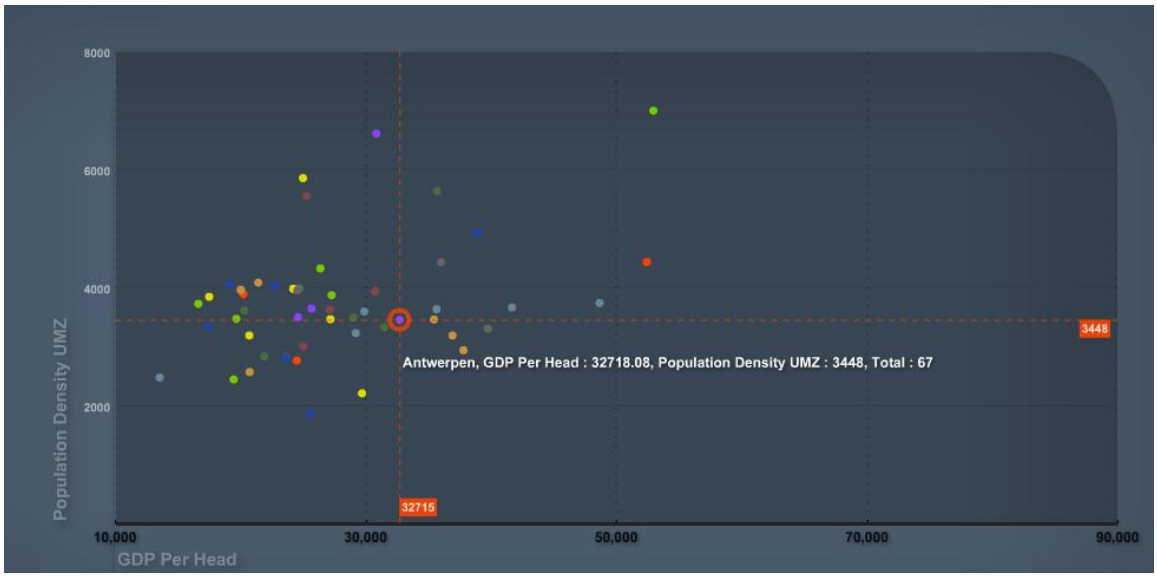
2.2 Design

The basic design of the typology is a web-based database which allows the user to select a number of indicators in order to create a cluster or list of cities. In order for the typology to be objective, transparent, and achievable, the database is populated with existing, city-level data from well-known sources such as the Urban Audit and the EEA.

The typology currently includes a simple, semi-interactive front page that allows the user to filter on sub-sets of data as needed, and also sort the data according to different criteria. Depending on the choices made by the user on the front page, preferred dimensions will be displayed on the output page, providing the selected set of city “types”.

The typology also includes an option to create a scatterplot based on two selected dimensions. Cities are then presented on the scatterplot according to the selected axis. An example is presented below.

Figure 2: Cities in North-western Europe displayed according to population density and per capita GDP



A third page has recently been added to the typology which allows the user to create a cluster of cities according to selected criteria. Figure 3 gives a screen shot of this tool, which allows user to select up to seven indicators that fall into three categories – hazards/impacts, city characteristics/vulnerability, and adaptive capacity. The user must also specify whether they want cities with a "low" or "high" value for each indicator (the median value for each is used at the cut-off to distinguish between low and high values). For example, the user could ask the tool to select cities that have a "high" value for coastal flooding risk, and a "high" population density. The output is a list of cities that have that combination of values for the selected indicators.

Figure 3: Typology cluster tool

Table 2 shows the dimensions that we considered including in the typology, along with options of appropriate city-level indicators for those dimensions, and associated data sources.

Table 2 Dimensions in the typology

Dimension	Indicator	Potential data source
City characteristics	Population/Density GDP	ESPON, Urban Audit
Climate hazards	Current: Frequency of different kinds of events in past 30 years	EEA, ESPON
	Future: Projections from climate/weather variables	
	Climate zones	EEA, ESPON
Vulnerability	Biophysical characteristics	Urban Audit Eurostat
	Socio-economic indicators (GDP per capita)	Urban Audit Eurostat

Adaptive capacity		No currently available European-wide city-level datasets
	Status of adaptation action / engagement Level of adaptation support that exists	ASEC survey responses
	Capacity to incorporate appropriate adaptive measures at city level 'Framework' capacity to support cities at national or regional level.	PACT self-assessment undertaken by participating cities will yield additional relevant information.
Urgency of adaptation action		No currently available European-wide city-level datasets

The typology has the potential to be semi-dynamic, or semi-interactive: the project team have identified some pre-defined clusters ("types"), but there will also be the option for any users to group cities according to the dimensions of most interest to them.

3 Approach

3.1 Methodology

The basic methodology used to design and construct the typology was as follows:

1. Draft a concept note outlining the purpose, structure, and outputs from the typology.
2. The concept note was reviewed by the project partners and updated accordingly.
3. Appropriate city-level data sources were identified and collated in excel spreadsheets.
4. A web-based database and tool were developed to display the collated data in a user-friendly format and allow clusters of cities to be created based on selected data.
5. The draft tool was reviewed by the project partners and data gaps identified.
6. The tool was updated, outputs improved, and where possible, additional data gathered to fill gaps.

As intended, the design of the typology is quite simple and adaptable so that additional data can be added to it quickly when it becomes available. The format and outputs from the typology can also be modified based on feedback from users and project partners as the project progresses.

3.2 Data sources included in the typology

The data identification and assessment process was perhaps the most significant first step in the typology. It is essential that the typology is based on robust, city-level data in order to provide the outputs and classifications needed for the project.

Each dataset was assessed according to the criteria below to determine if it should be included in the typology:

- Pan-European coverage (EU-27)
- Disaggregated to city level (with the exception of some climate hazard data)
- Clear identification of which urban level is covered by the data (e.g. core city, LUZ, NUTS 3, etc.)
- Maintained as a recognised dataset (and peer-reviewed / quality assured)
- Transparent methodology used for collecting data; metadata provided including source details
- Available free of charge to the project, and publicly accessible

Each indicator included in the datasets that met the above criteria was also assessed on its relevance to adaptation and classified according to one of three dimensions: hazards/impacts, city characteristics/vulnerability, or adaptive capacity.

When classifying the indicators in this way, it became clear that there are some dimensions which are not well represented by recognised datasets, in particular in relation to the adaptive capacity and state of play in European cities. For this reason, the evidence base created through the project survey (Task 1.2.2) links closely with the typology and will help to provide city-level information on adaptive capacity.

A number of data sources were assessed during the construction of the typology, but not included. Additional datasets are available from the ESPON-Climate project, but some of that potentially relevant data are only available at NUTS 3 Level rather than at city level. Additional data on city characteristics (which are not directly related to climate hazards or adaptation) are also available from Eurostat, and could potentially be used as proxy data if

needed. Datasets from the DG REGIO Second State of European Cities Report (2010) were also assessed, but not included in the typology at this stage because they were not as specific to adaptation issues as other datasets were. There is also scope for including data from the JRC's European Database of Vulnerabilities to Natural Hazards, but the data is not yet available.

Table 3 below provides a summary of the indicators that ideally would have been used in the typology, and also those which were actually included in the typology. Many of the indicators that we would have liked to include in the typology just do not exist at the city-level at this time. This is particularly true of indicators relating to hazards/impacts which are more commonly assessed at a NUTS3 or larger regional level due to the limitation of climate models. For the purposes of developing the typology, it was more important to use accurate, city-level data rather than attempting to use regional-level data downscaled in an approximate fashion.

Table 3: Indicators considered and included in the typology

	Data Options					
	City Characteristics/ Vulnerability	**Source**	**Hazards/Impacts**	**Source**	**Adaptive Capacity**	**Source**
Preferred indicator	Population growth rate	No source identified at city level	Current frequency of different kinds of events	ASEC survey (tbc by early July)	Status of adaptation action / engagement	ASEC survey
	Expected levels of redevelopment in the future	ASEC survey (tbc by early July)	Projections for future climate/weather events	see specific impacts below	Level of adaptation support that exists	ASEC survey
			Heatwave: # combined tropical nights and hot days	EEA Urban Atlas, 2006 (not available at the city-level)	Capacity to incorporate appropriate adaptive measures at city level	PACT self-assessment by participating cities
			Heatwave: City specific temperature threshold	Baccini et al . 2008 (only available for a few cities) - used in EEA report		
			Flooding: % of city flooded in case water rises 1m	Discussing with EEA if this is available		
			Flooding: Change in annual mean # days with extreme precipitation	Lautenschlager et al, 2009 - used in EEA report (not available at city-level)		
			Drought: Water stress indicator	Florke et at., 2011 - used in EEA report (not available at city-level)		
			Indicators from JRC's European Database of Vulnerabilities to Natural Hazards	Not yet available		
Currently in Typology	City type	Urban Audit 2004			GDP/head	Urban Audit 2004 (via EEA)
	Population density		ESPON Climate Change Region	ESPON Climate - Greiving et al. 2011 (via EEA)	City Commitment to fight climate change	Urban Audit Perceptions Survey
	Percent redevelopment 2000 - 2006	EEA Corine Land Cover (Accessed via ESPON Climate database)	Change in annual mean temp	Disaggregated indicators from Greiving et al 2011		

	Area UMZ inside core city	Urban Audit 2004 (via EEA)	Change in annual mean # summer days	Disaggregated indicators from Greiving et al 2011		
	Total population	Urban Audit 2004 (via EEA)	Change in annual mean precip in winter months	Disaggregated indicators from Greiving et al 2011		
	Area core city	Urban Audit 2004 (via EEA)	Change in annual mean precip in summer months	Disaggregated indicators from Greiving et al 2011		
	% green/blue space	Urban Audit 2004 (via EEA)	Change in annual mean # days with heavy rainfall	Disaggregated indicators from Greiving et al 2011		
	% Population aged 65+	Urban Audit 2004 (via EEA)	% Core City affected by coastal floods	ESPON 2013 (via EEA)		
	Mean soil sealing	EEA (2012), Urban Adaptation to climate change in Europe				
	Percentage of built-up area in core city	EEA Corine Land Cover (Accessed via ESPON Climate database)				

4 Findings

4.1 Overview

A wide variety of findings is available from the typology website; some of these provide insight on the hazards that cities face as a result of climate change; some illustrate the different potential vulnerabilities that could contribute to whether a city will be able to adapt to the relevant hazards; some allow the user to cluster cities according to similar characteristics.

It is important to note that the findings of the typology must be viewed alongside the results of other Task 1 activities such as the survey and the research review. The current typology design allows the user to select any combination of indicators that they are interested in, whether or not it provides meaningful results. If the typology was made available to the public, we may decide to limit the options to ensure that users only pick sensible combinations of indicators. Findings from the survey and the research reviews have helped the project team to understand which combinations of indicators are most useful when determining how to cluster cities.

There are many different questions that the typology could be used to answer. The following sections illustrate the findings to selected questions that could be asked by policy-makers, city planners, or the ASEC project team.

4.2 Selected findings

4.2.1 Question: Which cities should be grouped together for a training session in Southern-central Europe?

This is the sort of question that will be asked by the ASEC project team. The project survey demonstrated that cities are interested in being grouped with other cities that have similar population and economic characteristics, and will also face similar climate risks. Although the cities do not necessarily recognise their Urban Audit city types (e.g. B2 refers to Regional Innovation Centres – these cities are characterised by a particularly dynamic entrepreneurial and research activity) these codes are useful ways of clustering cities according to similar population and economic characteristics. Using the “Southern-central” filter as in the output below also ensures that the cities will face similar climate risks.

Table 4: Southern-central B2 cities

Code	Name	City Type	Climate Change Region
AT002	Graz	B2	Southern-central Europe
DE008	Leipzig	B2	Southern-central Europe
DE010	Dortmund	B2	Southern-central Europe
IT004	Torino	B2	Southern-central Europe
IT012	Verona	B2	Southern-central Europe
CH001	Zurich	B2	Southern-central Europe
CH002	Geneve	B2	Southern-central Europe
DE015	Bochum	B2	Southern-central Europe
DE016	Wuppertal	B2	Southern-central Europe
DE020	Wiesbaden	B2	Southern-central Europe
DE025	Darmstadt	B2	Southern-central Europe

DE026	Trier	B2	Southern-central Europe
DE028	Regensburg	B2	Southern-central Europe
DE033	Augsburg	B2	Southern-central Europe
DE035	Karlsruhe	B2	Southern-central Europe
DE037	Mainz	B2	Southern-central Europe
DE040	Saarbrucken	B2	Southern-central Europe
DE042	Koblenz	B2	Southern-central Europe
IT006	Genova	B2	Southern-central Europe
IT007	Firenze	B2	Southern-central Europe
IT014	Trento	B2	Southern-central Europe
IT015	Trieste	B2	Southern-central Europe
IT019	Pescara	B2	Southern-central Europe
IT030	Modena	B2	Southern-central Europe

4.2.2 Question: Where does my city fit relative to other Mediterranean cities in terms of risk of coastal flooding?

Although some European cities are not included in the datasets in the current typology, the results can still be useful for city planners to understand how their city stands relative to other cities. For example, a city planner in the Mediterranean who has a good understanding of his own city's risk of coastal flooding could create a list such as that in Table 5 and then determine where his city fits relative to the others.

Table 5: Percentage of core city areas affected by coastal flooding (Mediterranean region only)

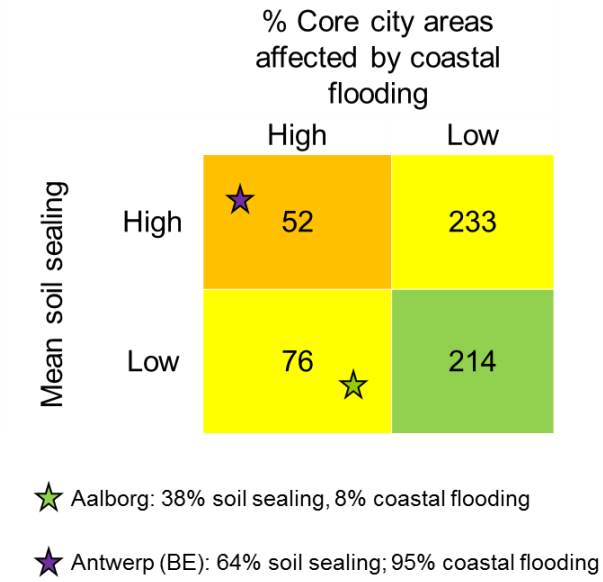
City Code	City Name	Percentage Of Core City Areas Affected By Coastal Floods	Climate Change Region
CY001	Lefkosia	0	Mediterranean region
ES001	Madrid	0	Mediterranean region
ES006	Málaga	0	Mediterranean region
ES013	Oviedo	0	Mediterranean region
GR001	Athina	0	Mediterranean region
GR004	Irakleio	0	Mediterranean region
IT001	Roma	0	Mediterranean region
IT003	Napoli	0	Mediterranean region
PT003	Braga	0	Mediterranean region
BG002	Plovdiv	0	Mediterranean region
BG005	Pleven	0	Mediterranean region
BG006	Ruse	0	Mediterranean region
ES004	Sevilla	0	Mediterranean region
ES005	Zaragoza	0	Mediterranean region
ES007	Murcia	0	Mediterranean region
ES008	Las Palmas	0	Mediterranean region
ES010	Palma di Mallorca	0	Mediterranean region

ES011	Santiago de Compostela	0	Mediterranean region
ES012	Vitoria/Gasteiz	0	Mediterranean region
ES014	Pamplona/Iruña	0	Mediterranean region
ES016	Toledo	0	Mediterranean region
ES017	Badajoz	0	Mediterranean region
ES019	Bilbao	0	Mediterranean region
ES020	Córdoba	0	Mediterranean region
ES022	Vigo	0	Mediterranean region
ES024	L'Hospitalet de Llobregat	0	Mediterranean region
ES025	Santa Cruz de Tenerife	0	Mediterranean region
FR004	Toulouse	0	Mediterranean region
FR027	Ajaccio	0	Mediterranean region
FR202	Aix-en-Provence	0	Mediterranean region
GR002	Thessaloniki	0	Mediterranean region
GR003	Patra	0	Mediterranean region
GR005	Larisa	0	Mediterranean region
GR006	Volos	0	Mediterranean region
GR007	Ioannia	0	Mediterranean region
GR008	Kavala	0	Mediterranean region
GR009	Kalamata	0	Mediterranean region
IT002	Milano	0	Mediterranean region
IT008	Bari	0	Mediterranean region
IT010	Catania	0	Mediterranean region
IT013	Cremona	0	Mediterranean region
IT021	Caserta	0	Mediterranean region
IT022	Taranto	0	Mediterranean region
IT023	Potenza	0	Mediterranean region
IT024	Catanzaro	0	Mediterranean region
IT025	Reggio di Calabria	0	Mediterranean region
IT026	Sassari	0	Mediterranean region
IT028	Padova	0	Mediterranean region
IT031	Foggia	0	Mediterranean region
IT032	Salerno	0	Mediterranean region
PT002	Oporto	0	Mediterranean region
PT004	Funchal	0	Mediterranean region
PT005	Coimbra	0	Mediterranean region
IT027	Cagliari	0.11	Mediterranean region
FR203	Marseille	0.36	Mediterranean region
PT001	Lisboa	0.53	Mediterranean region
IT017	Ancona	0.78	Mediterranean region
IT005	Palermo	0.85	Mediterranean region
ES021	Alicante	1.28	Mediterranean region
FR032	Toulon	2.03	Mediterranean region
BG004	Burgas	2.15	Mediterranean region
ES002	Barcelona	2.16	Mediterranean region

PT006	Setubal	2.62	Mediterranean region
PT008	Aveiro	3.72	Mediterranean region
ES023	Gijón	4.1	Mediterranean region
FR010	Montpellier	5.56	Mediterranean region
ES015	Santander	6.12	Mediterranean region
PT009	Faro	6.75	Mediterranean region
FR007	Bordeaux	13.05	Mediterranean region
ES003	Valencia	24.76	Mediterranean region
IT011	Venezia	47.88	Mediterranean region

The output could also be formatted into a matrix such as the one below. This gives a high-level illustration of the number of cities that are at risk of coastal flooding, separated into those which have a high mean percentage of soil sealing, and those which have a low mean.

Figure 4: Coastal flooding vulnerability



4.2.3 Question: Which cities are potentially most vulnerable to increases in hot summer temperatures?

By choosing the right combination of indicators within the typology, the user can create a cluster of cities that have similar characteristics that make them more likely to be vulnerable to hotter summer temperatures. Table 6 provides the resulting output if the user were to select cities that have high population density, low percentage of green/blue areas, a strong increase in the annual mean number of summer days, and a strong decrease in summer mean precipitation. This is the sort of question that may be of interest to European policy-makers who are interested in understanding vulnerability at a cross-European level.

Table 6: Typology output – Cities with high population density, a low percentage of green/blue areas, a strong decrease in summer mean precipitation, and a strong increase in the annual mean number of summer days

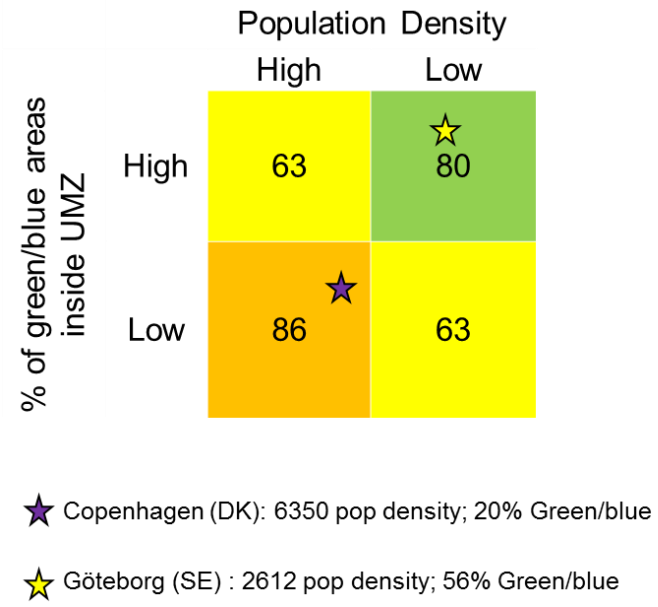
Code	City Name	Population Density UMZ	Percentage Of Green And Blue Areas Inside UMZ	Climate Change Region
BG001	Sofia	5901	21.6	Southern-central Europe
BG004	Burgas	5200	21.7	Mediterranean region
DE003	Munchen	5227	22.6	Southern-central Europe

DE006	Essen	4201	24.4	Southern-central Europe
ES002	Barcelona	19488	16.9	Mediterranean region
ES006	Malaga	8979	24.7	Mediterranean region
FR001	Paris	20494	23.9	Southern-central Europe
FR203	Marseille	4589	19.3	Mediterranean region
GR001	Athina	20422	14.1	Mediterranean region
GR004	Irakleio	10023	10	Mediterranean region
HU001	Budapest	4474	18.8	Southern-central Europe
HU002	Miskolc	4178	14.8	Southern-central Europe
IT003	Napoli	10817	17	Mediterranean region
IT004	Torino	9302	22.5	Southern-central Europe
IT012	Verona	4710	25.2	Southern-central Europe
PT001	Lisboa	6303	24.3	Mediterranean region
RO001	Bucuresti	10828	15.4	Southern-central Europe
RO002	Cluj-Napoca	5991	26.4	Southern-central Europe
SK001	Bratislava	3901	24.6	Southern-central Europe
SK002	Kosice	3917	22.3	Southern-central Europe
BG002	Plovdiv	6764	21.9	Mediterranean region
BG005	Pleven	6415	18.7	Mediterranean region
CZ002	Brno	4276	20.6	Southern-central Europe
DE005	Frankfurt am Main	4461	25.9	Southern-central Europe
DE011	Dusseldorf	4338	24.1	Southern-central Europe
DE016	Wuppertal	4248	24.6	Southern-central Europe
DE020	Wiesbaden	4217	24	Southern-central Europe
DE034	Bonn	4051	23	Southern-central Europe
DE037	Mainz	4135	21.3	Southern-central Europe
ES003	Valencia	16718	18.5	Mediterranean region
ES004	Sevilla	9918	26	Mediterranean region
ES008	Las Palmas	10471	23.2	Mediterranean region
ES009	Valladolid	7847	22.2	Southern-central Europe
ES011	Santiago de Compostela	7692	23.6	Mediterranean region
ES012	Vitoria/Gasteiz	7714	22	Mediterranean region
ES015	Santander	7991	25.1	Mediterranean region
ES019	Bilbao	22020	24.5	Mediterranean region
ES024	L'Hospitalet de Llobregat	17895	9.9	Mediterranean region
ES025	Santa Cruz de Tenerife	8778	20.3	Mediterranean region
FR018	Reims	4123	17.1	Southern-central Europe
FR026	Grenoble	4200	24.5	Southern-central Europe
GR002	Thessaloniki	22743	10.2	Mediterranean region
GR003	Patra	8073	23.2	Mediterranean region
GR005	Larisa	4966	21.6	Mediterranean region
GR006	Volos	6497	12.7	Mediterranean region
GR008	Kavala	9966	18.3	Mediterranean region
HU004	Pecs	4167	16.4	Southern-central Europe
IT002	Milano	9485	16.7	Mediterranean region
IT010	Catania	4854	22.4	Mediterranean region
IT015	Trieste	6275	25.8	Southern-central Europe
IT019	Pescara	5837	15.5	Southern-central Europe
IT020	Campobasso	5737	23.2	Southern-central Europe
IT023	Potenza	6884	22.3	Mediterranean region
IT025	Reggio di Calabria	7627	17	Mediterranean region
IT028	Padova	3978	23.1	Mediterranean region
IT029	Brescia	4270	16.3	Southern-central Europe
IT030	Modena	4868	19.8	Southern-central Europe
PT002	Oporto	6127	18.6	Mediterranean region
PT009	Faro	5831	25.4	Mediterranean region

RO003	Timisoara	5526	16.5	Southern-central Europe
RO004	Craiova	6655	22.6	Southern-central Europe
RO005	Braila	7821	22.6	Southern-central Europe
RO007	Bacau	6038	23.6	Southern-central Europe
RO009	Sibiu	5329	22.6	Southern-central Europe
RO010	Targu Mures	7035	20.1	Southern-central Europe

Obviously, presenting the results in a long list is a bit unwieldy. The project team has also found it useful to summarise the typology output in a matrix such as that in Figure 5. This figure provides the number of cities that fall into different categories (in this case, high or low population density, and high a low percentage of green/blue areas inside the Urban Morphological Zone). The results for two cities have been provided for illustrative purposes.

Figure 5: Heatwave vulnerability



5 Conclusions

The current form of the typology provides a tool to answer many different questions that are of interest to the project team, city planners, and policy-makers. Section 4 presents a selection of answers that the typology can provide to specific questions – there are a good number of additional questions that could be answered by the typology as well.

It is important to note, however, that because the typology is basically a data-driven tool, there are certain limitations. Not surprisingly, the quality of the typology output depends on the quality and availability of city-level data. The indicators included in the typology database are the best ones available at the city-level, but even so there are still gaps in the data.

In addition, the typology in its current format doesn't help the user to decide which selection of indicators to use to answer a question – the user needs to make an informed decision about which datasets should be used in order to group cities together in a certain way.

For this reason, the typology needs to be considered alongside other Task 1 activities which help to provide information on which indicators can be used to answer a particular question. For example, the survey results indicate that cities prefer to be grouped together with cities of a similar size that face broadly similar climate hazards. This sort of information is needed in order to make informed decisions about how to best use the typology tool.

Although the typology in its current form does have certain limitations, it is a useful tool for the project team and can continue to inform Task 2 and Task 3 activities. With further development and refinement, it could potentially be even more useful past the lifetime of the project and could help answer questions for city planners and policy-makers.

Appendices

Appendix 1: Cover Sheet

Appendix 1 – Cover sheet

Cover sheet for Sub-task Technical Reports

Sub-task: Typology 1.1.2, 1.1.3, 1.1.4	**Completed by: Sarah Winne**

Please complete this cover sheet to highlight key findings and learning points for other project tasks.

Please summarise key findings about hazards, impacts and vulnerabilities.
Please summarise key findings about current approaches to and experiences of adaptation in European cities N/A
Please summarise key findings about adaptive capacity in European cities (information & perceptions, technologies & R&D, economic resources & governance) Not surprisingly, there is not much data available at the city level on adaptive capacity. As a result, the typology has not been able to provide any findings in this area. The survey results would be more useful in this respect.

Based on your analysis, what characterises good adaptation practice for European cities? N/A
What capacity-development needs have you identified? Based on your analysis, what should the project training material / toolkit contain? N/A
What insights can you offer with regard to peer learning and exchange among participating cities? N/A
Based on your analysis, how should cities be grouped for training purposes? The typology itself doesn't really provide insight on how cities should be grouped for training purposes. Because it is a data-driven approach to grouping cities, the user needs to make an informed decision about which datasets should be used in order to group cities together in a certain way. Other task 1 activities have helped to provide information on which datasets should be used to cluster cities. For example, the survey results indicate that hazards, population size, and level of adaptation planning are useful ways to cluster cities together.
How could / should the project website be used in the rest of the project? What further content is required? It would be nice to have the typology on the project website, but we would need to be careful about how the introduction and instructions are worded. The user may need to have a limited selection of indicators in order to get a meaningful cluster of cities.
Please identify any key observations or questions to stimulate debate on the web forum

RICARDO-AEA

The Gemini Building
Fermi Avenue
Harwell
Didcot
Oxfordshire
OX11 0QR

Tel: 01235 75 3000
Web: www.ricardo-aea.com