

Chapter 5

Decision Support Systems for Urban Planning

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Abstract Decision Support System (DSS) is an interactive software-based tool that has been realized in the framework of the project “Development and application of mitigation and adaptation strategies for counteracting the global Urban Heat Islands phenomenon (UHI)” implemented through CE programme 2007–2013 co-financed by the ERDF. DSS is a simplified database management tool that allow the use of the project deliverables uploaded on the web sites with a user-friendly approach.

Users can access to the needed project’s output through knowledge’s needs oriented pathway.

Keywords Decision Support System • UHI • Mitigation actions • Urban planning • Climate change

5.1 Introduction

The construction of Decision Support System (DSS) has been realized in the framework of the Work Package 6 (WP6), in particular with the action 6.1.

The main activity of the WP6 was the UHIs simulation of future alternative scenarios related to the development of the urban areas chosen for the eight pilot actions.

In addition, WP6 was intended to define and realize a set of support actions for fostering the implementation of urban & spatial planning strategies in each involved region.

In particular, it was foreseen a progressive integration of mitigation and adaptation strategies in current urban planning tools.

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Furthermore, DSS is designed to address policies in actions of mitigation and adaptation in the framework of the Urban Heat Island phenomenon.

5.2 Development of the UHI Project's DSS

During the project implementation the partners agreed to choose the hypothesis described below:

A simplified database management tool that allow the use of the project deliverables uploaded on the web sites with a user-friendly approach.

In this case users can access to the needed project's output through knowledge's needs oriented pathway.

To manage the urban development it is compulsory to manage a multitude of purposes and address many different goals, often conflicting, to satisfy the needs of different stakeholders. This poses considerable challenges to policy makers and urban planner. The need for enhanced urban plan decision support systems is evident in the same complexity of the UHI phenomenon.

In the following paragraphs is described the operation of the DSS chosen within the project on UHI.

5.3 UHI's Decision Support System

5.3.1 Structure

The UHI DSS is composed by a structure of html, javascript and php files that allows, via communication with a database, the end users to remotely access the project deliverables produced by UHI partners. In fact, considering the type of files and its structure, the software is a website, that can be installed and run on any platform that provides services http and MySQL.

The logical structure of the files is likely (Fig. 5.1):

From the home page (index.html) you can access to:

- the logical framework of the project, which is a presentation of the UHI project; with a specific links to the official website of the project ;
- the Decision Support System, which allows, through a logical structure, obtaining a specific report based on the user's requests;;
- the Consultation Tool, which is a grid with specific questions about the results of the project deliverables produced by the partners; this tool is useful for users who know in advance what kind of information they are looking for.

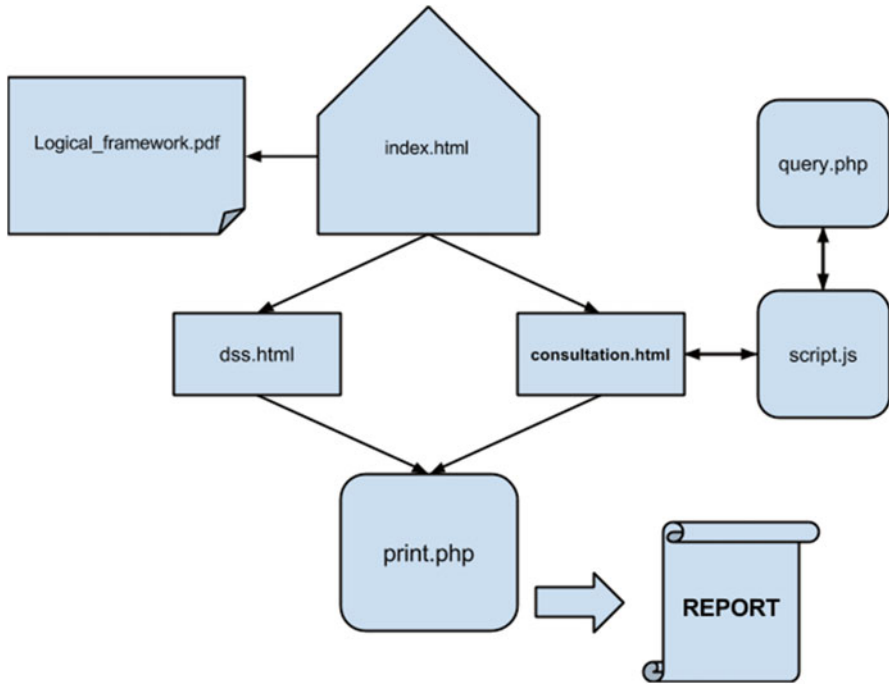


Fig. 5.1 UHI DSS logical structure of the files

The two php files (query.php and print.php) shall only be used to query the database that stores the data that is composing the report: in this case, query.php is part of the communication AJAX of the page consultation.html (through script.js); while print.php dynamically creates a page report based on the choices you make, whether they come from the DSS or from the Consultation Tool.

The database named db_dss_uhi is composed of five separate tables:

- intervention_type: stores data regarding the various types of intervention carried out in the pilot actions;
- legislation: containing the legislative framework for each region involved in the project UHI *;
- pilot_actions: the table with a detailed description of all pilot projects related to UHI project *;
- skills: the list (provided by partners) of the experts who have contributed to the UHI project with a short description of them and their personal contacts;
- software: a list of tools used by partners with a short description;

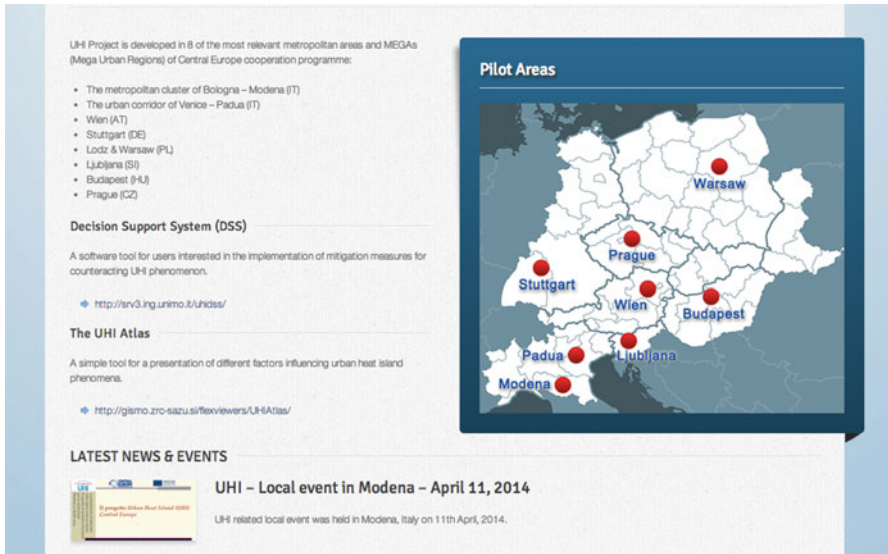


Fig. 5.2 UHI project website



Fig. 5.3 First page of the DSS

5.3.2 The Interface

This paragraph shows the real functioning of the DSS as was finally built with the help of the below pictures.

The link of the DSS can be found on the homepage of the UHI website (Fig. 5.2).

By clicking on the link highlighted above, the first page of the DSS appears like this (Fig. 5.3):



Fig. 5.4 Link to the project logical framework

As the user can immediately see, from this page you can enter other three links to three different tools:

- Logical framework (magnifying glass)
- Consultation tool (open book)
- Decision Support System (right arrow)

5.3.3 *Project Logical Framework*

Clicking on the left icon below, the user can have an overview of the entire UHI project (Fig. 5.4).

As shown in the picture below in this page the user can find: a brief description of the project; the partnership; the framework analysis; the establishment of a UHI monitoring network; mitigation and adaptation strategies; pilot and capitalization actions for limiting UHI's effects (Fig. 5.5).

5.3.4 *The Consultation Tool*

The interface of the Consultation Tool consists of 7 menus, multiple choice or drop-down menu, in which user is asked to select some areas of interest (Fig. 5.6).

- Climate long term perspective, where the user can see through a map the following data:
 - change in annual mean temperature;

- heat wave frequency;
- changes in annual near-surface temperature.
- The Urban Heat Island phenomenon, where the user can select a city name in the drop-down menu between the various European cities that have been studied during the project:



URBAN HEAT ISLAND Central Europe PROJECT
Development and application of mitigation and adaptation strategies and measures for counteracting the global Urban Heat Islands phenomenon (UHI)

The UHI project

The UHI project, starting from a deep **analysis of the phenomenon (WP3)** is designed to both develop mitigation and risk prevention, and management strategies.

The general objective of the project is to establish a **Transnational attention**, as well as policies and practical actions, for the prevention, adaptation and mitigation of the natural and man-made risks arising from the Urban Heat Island phenomenon (**WP2 & WP4**).

In particular, **mitigation strategies** consist in the adoption of urban and land planning models that prevent the establishment of UHI, while **adaptation strategies** aim at reducing the impact of phenomena related to UHI, such as summer bioclimatic discomfort (**WP5**). The innovative strategy of the UHI project is to interact two disciplines that traditionally don't communicate each other: **meteo-climatology** and **urban planning**. Through this interaction will be implemented particular strategies to guide the choices of development and urban renewal.

The UHI partnership

FRAMEWORK ANALYSIS (WP3)

WP3 considers two main scientific aspects: the **characteristics of UHI phenomenon** both in terms of causes and effects on environment and population, and its relationships with **climate change trends**. Activities are focused on CE area, including an analysis of already existent UHIs, as well as a study of those situations that could constitute a potential for an increase of UHIs. Additionally a list of existing **rules and legislation** toward UHI phenomenon in CE regions are prepared.

Fig. 5.5 Logical framework of the project



Dear user, this tool **DECISION SUPPORT SYSTEM (DSS)** is part of the UHI Project implemented through the **CENTRAL EUROPE** Programme co-financed by the ERDF. UHI Project aims at developing mitigation and risk prevention and management strategies concerning the urban heat island (UHI) phenomenon.



The tool will allow you to select your specific interest saving your time.

This Decision Support System (DSS) is a software that can be used by an end user interested in the implementation of mitigation measures for counteracting UHI phenomenon. The DDS interacts with the external user via a graphical user interface: requires the entry of certain inputs and returns the required output in the form of a text document.

Consultation Tool



Fig. 5.6 Link to the consultation tool

- Budapest;
 - Modena;
 - Warsaw;
 - Padua;
 - Stuttgart;
 - Ljubljana;
 - Wien;
 - Prague.
- Spatial and urban planning, where the user can, through the menu, select the following items of the interested area:
 - local rules and regulation;
 - incentives, financing, regulatory action;
 - E.U. rules and regulation.
 - Mitigation strategies, where there is the possibility to choose the mitigation action you want to deepen and find out its benefits on UHI. This sub section is divided into three items:
 - Buildings
 - Cool roofs;
 - Green roofs
 - Green facades;
 - Facade surface and construction selection/retrofit;
 - Geometry of Urban Canyon.
 - Pavements
 - Cool pavements;
 - Pervious pavements.
 - Green areas
 - Planting trees within the urban canyon;
 - Park, green areas.
 - Pilot areas, where the user can choose one of the eight pilot actions have been implemented that he wants to deepen:
 - Padua/Venice –Italy;
 - Modena/Bologna – Italy;
 - Wien – Austria;
 - Stuttgart – Germany;
 - Warsaw – Poland; Prague –
 - Czech Republic; Ljubljana – Slovenia;
 - Budapest – Hungary.
 - Skills, where the user can choose the skill which is interested in:
 - Meteorology;
 - Biometeorology;

- Urban planning;
 - Health;
 - Municipality;
 - Innovation;
 - Engineering;
 - Building skill;
 - Environment;
 - Communication.
- Simulation tools, where the user can, simulating the effect of a mitigation action in the urban area object of the pilot, choose the aspect that he is interested in deepening.
 - Global scale
 - Weather forecast;
 - Climate of your region;
 - Future climatic scenarios;
 - Weather risks for your region due to climate change.
 - Urban/district scale
 - Urban micrometeorology;
 - Influence of land use on urban climate;
 - Effects of street characteristics (orientation, width, buildings height, etc.) on urban climate;
 - Effects of urban topography on climate;
 - Influence of land use on urban climate;
 - Influence of different kind of roofs on urban climate;
 - Influence of different kind of pavements on urban climate;
 - Human perception of climate;
 - Knowing how land use influences the human state of wellness.
 - Building
 - Influence of different kind of roof on building;
 - Effects on micrometeorological variables due to different materials and properties of the building;
 - Influence of good/bad adopted measures on human health/wellness at building scale.

The following pictures show how are graphically displayed the contents above outlined (Figs. 5.7, 5.8 and 5.9).

Once required the information requested by the user, the software searches in the documents produced in the WPs of the project the material/documentation or deliverable (re-organized in a logical framework); this content has been revised in order to obtain a final compact document with all the information selected. The results are

Consultation tool

The tool will allow you to select your specific interest saving your time. The consultation will be easier and the needed material.


<p>Climate long term perspective</p> <p>To understand the different factors influencing urban heat island phenomena, please consult the UHI Atlas, a simple tool realized in the framework of UHI project. You are kindly invited to take a look at Central European Region and to see where areas that have higher air and land surface temperatures are located.</p> <ul style="list-style-type: none"><input type="checkbox"/> Change in annual mean temperature (source: ENSEMBLES climate change project)<input type="checkbox"/> Heat wave frequency (source: ENSEMBLES climate change project)<input type="checkbox"/> Changes in annual near-surface temperature (source: ENSEMBLES climate change project)	
<p>The Urban Heat Island phenomenon (UHI) </p> <p>In this project the Urban Heat Island phenomenon has been studied in various European cities, choose the one that interests you.</p> <p><input type="text" value="--city--"/></p>	
<p>Spatial and urban planning</p> <p>Choose the regulatory framework in your area.</p> <p><input type="text" value="--area--"/></p> <ul style="list-style-type: none"><input type="checkbox"/> Local Rules and Regulation<input type="checkbox"/> Incentives, Financing, Regulatory Action<input type="checkbox"/> E.U. Rules and Regulation	

Fig. 5.7 The first three menus of the consultation tool

<p>Mitigation strategies</p> <p>The phenomenon can be investigated by applying specific mitigation actions; Choose the mitigation action you want to deepen and find out its benefits on UHI.</p> <p>Buildings</p> <ul style="list-style-type: none"><input type="checkbox"/> Cool roofs<input type="checkbox"/> Green roofs<input type="checkbox"/> Green facades<input type="checkbox"/> Facade surface and construction selection/retrofit<input type="checkbox"/> Geometry of Urban Canyon <p>Pavements</p> <ul style="list-style-type: none"><input type="checkbox"/> Cool pavements<input type="checkbox"/> Pervious pavements <p>Green areas</p> <ul style="list-style-type: none"><input type="checkbox"/> Planting trees within the urban canyon<input type="checkbox"/> Park, green areas	
<p>Pilot areas</p> <p>In the project eight pilot action have been implemented; choose the one you want to deepen.</p> <p><input type="text" value="--area--"/></p>	
<p>Skills</p> <p>To accomplish the entire project, experts from throughout Central Europe worked together. What skills do you need?</p> <ul style="list-style-type: none"><input type="checkbox"/> Meteoclimatology<input type="checkbox"/> Biometeoclimatology<input type="checkbox"/> Urban planning<input type="checkbox"/> Health<input type="checkbox"/> Municipality<input type="checkbox"/> Innovation<input type="checkbox"/> Engineering<input type="checkbox"/> Building skill<input type="checkbox"/> Environment<input type="checkbox"/> Communication	

Fig. 5.8 The subsequent three menus

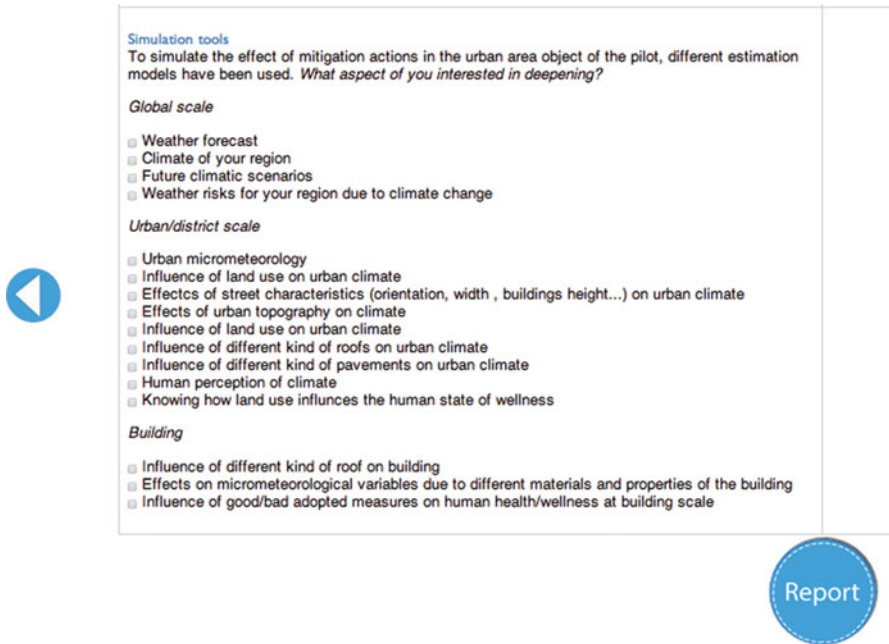


Fig. 5.9 The simulation tool



Fig. 5.10 Link to the UHI's DSS

Outline your pilot study
 sion process, underlining the logical interaction between the different potential choices. In this case you'll be able to explore the project approach designing a healthy and sustainable city.



Fig. 5.11 Interactive map

finally displayed in html pages for instant opening for a quick reference, then the user can print it as a pdf.

5.3.5 *The DSS*

By clicking the icon in the middle of the screen, user is led within the DSS.

By clicking on the different menu items the user can simulate the approach to his pilot study based on the data we gathered in our 8 pilot tests (Fig. 5.10).

This section has 5 menus:

- Location: an interactive Central Europe Map allows the user to select the region of interest, as shown the picture below (Fig. 5.11)
- Scale of intervention: the user can choose between two option, building or urban;
- Typology of intervention: the choice here is between:
 - Menu item A)
 - Existing structure;
 - New construction.
 - Menu item B)

- Facades;
 - Roofs;
 - Surface lots;
 - Urban structure;
 - Urban green.
- Economic assessment: here the user can choose the action he would like to undertake between:
 - Cool roofs;
 - Green roofs
 - Green facades;
 - Facade surface and construction selection/retrofit;
 - Geometry of Urban Canyon.
 - Cool pavements;
 - Pervious pavements.
 - Planting trees within the urban canyon;
 - Park, green areas.

After entering a few data, the software proceeds a quick calculation of the action selected.

- Skills, where the user can choose the skill which is interested in:
 - Meteorology;
 - Biometeorology;
 - Urban planning;
 - Health;
 - Municipality;
 - Innovation;
 - Engineering;
 - Building skill;
 - Environment;
 - Communication;

The selections made in the menus help to match with the material presented above, relating them in a logical way.

This tool aims at presenting the same data of the Consultation Tool but in a more organic way: a combination of a raw data and documents selected shape a report and finally a model.

Indeed the choices are collected and reported in a final html page as a report.

5.4 DSS Input

The inputs of the DSS are all data stored in the database that contribute for processing the final information. In our case inputs are established based on the work developed in the previous Work Packages: WP3, WP4, and WP5.

From the above-cited WPs here follows a synthesis of the most important aspects necessary to set up the DSS.

5.4.1 WP3

WP3 was divided in 2 main actions:

- Action 3.1 was basically a review action in which one has collected different studies about the Urban Heat Island phenomenon. Action 3.1 was split in sub-actions. This analysis focused on anthropogenic causes that generate the UHI phenomenon and the survey techniques used to study it.

The analysis take into account both (1) technical-scientific issues and (2) urban planning and land use regulation.

1. Technical-scientific issues

- 1.a. reviewing knowledge (causes and related factors: anthropogenic causes that generate UHI phenomenon i.e. peculiar urban and building characteristics, particular industrial activities, etc.; the patterning of UHI phenomenon; the measures adopted to fight the intensification of UHI; the survey techniques used to study the phenomenon). Many relationships were found in literature to assess the UHI phenomenon based on different kinds of data. Namely we have a collection of indices to establish the increase of temperature and the maximal increase of temperature based on:

- Population data;
- Urban geometric factors of buildings as well as infrastructures;
- Meteorological data.

- 1.b. scheduling of existing infrastructures to meteorological and environment data assessment in different project areas. A big range of methods can be adopted in order to study the UHI phenomenon. For each project area different data can be available. Based on this availability or lack of information DSS is able to provide as much as possible of accuracy in the results.

2. Urban planning and land use regulation

Urban planning and land use regulation assume an important role to regulate the possible actions of adaptation and mitigation. DSS take into account these in

order to formulate answers. Of course these are not static and can be supported by the DSS to assess and to plan in a better way the urban development taking into account in particular:

- 2.a. Review of different rules and regulation set up by involved local government (reviewing of the local main rules and regulations to plan the urban development and the land use; incentives and regulatory actions in support of environmental restoration, energy conservation and to fight climate change put in act from the different local authorities).
 - 2.b. Review of the main European legislation concerning urban and spatial planning and concerned issues.
- Action 3.2. approaches the problem of UHI vs Climate Change: it aims to study the interaction between UHI and climate change phenomena as well as to understand the influences and correlations between them. Thanks to this Action have been set up indicators establishing relations among urban planning and human activities (main causes of UHI) with climate change trends, estimated on the basis of temperature shifting and other parameters. Regional climate model simulations are able to provide an estimation of the future climate scenarios (temperature, humidity, precipitation, wind speed, cloud cover, etc.) which may serve as outer conditions for the assessment of UHI phenomenon in the CE cities. The simulations can be made with WRF, e.g., for a time slice of 10 years and statistical output on means and standard deviations of the meteorological variables can be supplied. Afterwards a downscaling to regional/town scales is required. Regional climate model uses available boundary conditions provided by existing global climate model. Climate change has the potential to alter shifts in average temperature, cloud cover, wind, speed and precipitation. The strong relationship between wind speed and cloud cover and UHI imply that changes in the magnitude of the UHI effect over the current century will depend at least in part on how cloud cover and wind speed change. Higher temperature might increase evaporation demand and may indirectly create a positive feedback, augmenting the tem-

In summary, tasks of WP3 were to provide the collection of techniques to assess the UHI phenomenon from which a selection have been chosen to be implemented in DSS. Moreover WP3 analyzes the European and local legislation within which decisions can be taken and from which DSS development is dependent.

Another important topic is the connection between UHI and climate change. Climate change will amplify the UHI phenomenon and its consequences for environment and human health have to be carefully taken into account. DSS has to consider then the projections to future scenarios to manage more useful information for administrators and stakeholders.

perature difference between city and rural setting. Though the magnitude of urban–suburban differences may not increase, the population affected by severe pollution episodes may increase as UHI-like conditions become more frequent in outlying suburban locations, presenting additional challenges for policy-makers.

5.4.2 WP4

A large work to be implemented in DSS comes also from WP4 that is divided in three main actions.

- Within Action 4.1. a permanent Transnational Network (TN) among experts scientific and institutional involved was set up. TN monitors UHI in CE area; in addition it develops shared and coordinated strategies in urban planning and land using. Task of the Transnational Focus Groups was to manage the knowledge flow between partners and stakeholders and to share competence and knowledge on thematic issues with Local Working Groups.
- Action 4.2. Methodology and areas definition: definition of sensible indicators, sampling procedures and analysis tools are fundamental issues that need to be shared for a common methodology and compare different characteristics of urban areas. A gold standard in assessment of UHIs and in the respective data sampling, accessing and processing has been defined. Cities without a monitoring network suitable for monitoring UHI should take gold standard as a prototype in creating a new monitoring system. Cities with already existing monitoring systems was asked to adapt their systems to this gold standard, to allow a better coverage of phenomenon and to enhance the comparability between different cities.
- Action 4.3. CE UHIs web database and Atlas: the shared web databases implemented through input from existing local partners/institutions allows to monitor the specific situation. Here, the measurements and data obtained and analysed have been designed to describe as well as possible the intensity of phenomenon and its characteristics. Direct surveys conducted by applying both traditional urban biometeorology techniques and remote sensing techniques, allowed to collect many data and information about the micro–macro meteorological conditions. CE Atlas implementation foresees digitalization and geo-referencing of data collected. Creation of a GIS based data processing tool, where all informa-

In summary from WP4 we acquired for DSS the gold standard to define and to monitor UHIs with common and accepted rules. Moreover Act. 4.3 gave rise to the web database from which DSS will acquire information for model running.

tion about detected UHIs of CE area where loaded and put in relation with meteorological and climatic data and trends as well as to spatial planning information.

5.4.3 *WP5 Mitigation and Adaptation Strategies*

Starting from scientific and institutional framework and from assessment tools provided by previous WPs 3, 4, WP5 was focused on approaches to model for long-terms mitigation strategies and short-medium-term adaptation strategies to encounter UHI.

WP5 deals with the following specific questions: Given the results of WPs 3 and 4:

What are the common and differential features of the UHI that effect the regions studied?

What set of mitigation and adaptation measures and options should be considered as potentially effective and subjected to detailed modelling studies?

How could “top-down” (low-resolution) meteorological prediction models and bottom-up (high-resolution) building models be combined to provide an environment modelling for parametric study of the aforementioned mitigation and adaptation measures and strategies?

Having identified a coupled top-down and bottom-up UHI modelling environment, what would be the outcome and implications (recommendations, guidelines) of the parametric modelling studies of alternative mitigation and adaptation measures?

Three Actions are developed in the WP5 framework: Act. 5.1, 5.2, and 5.3.

- Action 5.1. Extent of UHI effects and corresponding potential Mitigation and Adaptation (M&A) measures: Within the framework of this action, the common and differential features of UHI effects in the selected regions have been identified by the corresponding partners. A set of candidate (potentially effective) M&A measures have been collected and reviewed by the interdisciplinary and transnational research team. Thereby, the mitigation strategies provide the definition and application of urban& spatial-planning approaches (e.g. widening of green areas and rows, spread distribution of populated areas preferring short buildings surrounded by gardens, canyon effect) that prevent UHIs emergences. Likewise, relevant construction parameters for buildings (e.g. surfaces characteristics of external building components) have been considered. As to adaptation strategies, the phenomenon of summer bioclimatic discomfort has been addressed by setting up warning and prevention systems. Mitigation strategies, already mentioned in report 3.1.1., can be divided into three main categories, namely buildings, pavements and vegetation. For buildings one can work on directly either on their heat exchange material properties (valid for new and old buildings), or on the building/street geometry in order to modify the intensity of the so

called canyon effect (valid only for new buildings). To the first category belong the following actions:

- Cool roofs/façades: By applying building materials with high solar reflectance (high albedo) and high infrared emittance (cool materials) one can reduce the cooling load of a building, and thus one can limit the heat emitted by the use of air conditioning facilities to the building's surroundings. Though cool materials can be applied for both roof and façade surfaces, it is usually easier and cheaper to apply them to existing roofs, making the method of "cool roof" creation more prevalent in daily practice.
- Green roofs: a green roof means a roof covered by a vegetative layer of variable width. Compared to traditional high absorptive roof surfaces, green roofs bringing about lower surface temperatures, thus leading to lower cooling loads in the building itself. Irrigation of these roofs can reduce the air temperature next to the roof, as an outcome of the evapotranspiration effect of the vegetative layer. When applied to a large group of buildings, green roof are believed to have a significant effect of urban air temperature.
- Green façades: vegetation can also be used as an overlaying layer for facades, either by enabling the growth of climber plants directly on the façade surface (thus shading parts of it) or by adding a more substantial bedding "wall" which connects to the façade and functions also as an insulating and evapotranspiration layer similar to that of a green roof.
- Street geometry, which is defined by the shape of the buildings and their orientation, might also have an impact on UHI intensity levels by increasing air flow rate through the street, thus replacing the warmer air "trapped" between buildings. Although changing the geometry of existing streets is limited, large urban projects regularly introduce the opportunity to increase the effects of advection by a careful design of their geometry.
- Pavements play also an important role in the formation of the UHI phenomenon, since conventional paving materials (mainly concrete and asphalt) tend to absorb large amounts of solar radiation during daytime and to release it to the cooler surrounding air (cool pavements). Another property of these paving materials is their limited permeability to water, which prevents the absorption of water in the ground and thus reduces the evaporation potential of the ground surface which may help in reducing air temperatures (pervious pavements).
 - Cool pavements are built of materials which have higher albedo (higher solar reflectance) values than conventional paving materials, usually because of their lighter color.
 - Pervious pavements: pavements of pervious materials which enable the draining of water through the porous pavement surface. The water is thus absorbed in the subsoil and evaporates when the paving material is heated, resulting in lower surface temperatures of the pavement. Pervious pavements are also helpful for the storm water management, and then for the prevention from floods.

- Vegetation: trees and vegetation reduces ambient air temperature by evapotranspiration and shading and is therefore expected to help in mitigating UHI intensity levels (Kurn et al. 1994). The common practices within this scope are the planting of trees and vegetation in existing urban fabric (mainly city streets), or the creation or preservation of wider green areas (parks, groves) within the urban fabric.
- Action 5.2. Establishment of an effective UHI modelling environment. The purpose of this action is to establish a coupled “top-down” (meteorological) and bottom-up (built environment) computational modelling environment. Thereby, low-resolution (large-grid) meteorological models provide data on large-scale UHI effects. This data are subsequently used as boundary conditions for medium-small scale thermal modelling tools of the built environment. For this scope, the potential of transfer functions has been explored. These functions derive from weather station data, high-resolution micro-climatic conditions at immediate proximity of built structures. The available simulation tools, used by the project partners are listed. These models and their coupling are the core of the DSS elaboration.
- *Action 5.3.* Definition of mitigation and adaptation strategies. Given the above coupled modelling environment, the relative performance (predicted degree of success) for various alternative M&A strategies and measures could be examined and numerically described. A set of strategies are formulated to be applied at national and transnational scales to address the UHI phenomena. Such M&A measures portfolio includes specific urban and spatial planning guidelines as well as risk management recommendations.

5.5 Main Acronyms

CE:	Central Europe
DSS:	Decision Support System
LP:	Lead Partner
WP:	Work Package
AF:	Application Form
UHI:	Urban Heat Island
ACT:	Action
DBMS:	Database Management Software
MBMS:	Model Base Management Software
DGMS:	Dialogue Generation Management Software
SMS:	Short Message Service
TN:	Transnational Network
M&A:	Mitigation and Adaptation

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