Executive Summary of *Deliverable D 3.2*
Work Package 3

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Executive summary

Urban economies are highly dependent on resource consumption - especially energy, water, materials and land use. Cities metabolize these resources and return their waste on a scale as large as the amount of people within it and as fast as its urbanization process. The problem addressed leads us to the urban metabolism concept, originally introduced by Abel Wolman in 1965 and further developed in the industrial ecology field .

Recently, the interest for urban metabolism has increased, due to the recognition that the model can provide a more comprehensive understanding of the city sustainability: first, because the model gives a holistic and integrated viewpoint of an urban region; and second, because it is able to examine aspects of urban relationships among infrastructures and inhabitants, beyond the strictly functional analysis of urban systems. By comprising the analysis of all activities in an integrated and circular approach, urban metabolism can offer a way of measuring urban sustainability within the ecosystems capacity to support it. Additionally, there is a need to view the urban system as a whole if we aim at understanding and solving the complexity of urban problems.

Following the design of a Metabolic Impact Assessment (MIA) methodology in the previous report (deliverable 3.1), which had a very strong theoretical formulation, and was based on three key and globally accepted pillars, EIA and SEA, Threshold Analysis and Land Suitability Analysis, this work presents the development and application of this novel methodology.

This novel methodology provides an operational instrument to assess the overall impact of a particular development proposal on the existing urban metabolism performance of a given city, metropolis or city region.

MIA attempts to address a common problem found in many cities throughout Europe and elsewhere. Often times, a particular development project or urban project seen in isolation, i.e. detached from the geographical context in which it will be located, may well look quite attractive and able to secure, in principle, a sustainable performance from an energy, land and materials point of view. However, when *plugged in* to the existing and receiving urban fabric, the final overall results may well fall short of the most reasonable and substantiated expectations and instead of improving the overall urban metabolism performance of the city it may well end up contributing to worsen that same performance. The other way around may also be true. A given development proposal may not be, in isolation, that interesting from an urban metabolism perspective and yet, in the right location, it could provide a positive contribution to the overall metabolic performance of a particular city.

Good practice guide on assessing impacts of urban structures on urban metabolism is the second of three deliverables provided by SUME's Work Package 3 (WP3). While our first report focused on the impacts of urban forms and structures on resource use, presenting the Metabolic Impact Assessment methodology, this manual is about the development of MIA and its application to Oporto, Stockholm, Vienna and Newcastle-upon-Tyne.

The first part of the report comprises an explanation of how MIA can be applied, in a good practice guide format, and describes the development of MIA in six stages. Each stage incorporates the main components of urban metabolism - energy (the sub-components of buildings and transports), water, materials and land use. The aim was to establish a set of procedures to be followed when implementing MIA, sufficiently coherent in order to be valid in different country contexts and at the same time sufficiently simple and pragmatic so that it can be used by different researchers and practitioners, in different cities.

The second part of the report corresponds to the application of MIA to case study in four different cities illustrating what has been previously described. This chapter will also allow comparing the metabolism of these European cities, leading to some findings on how their urban forms influence the way resources are managed.

This will lead us to our last chapter where an effort is made to further explore the potentials of the urban metabolism concept: the characterization of a more sustainable urban environment through improvements in urban form, reaching an optimal urban form. "With the urban metabolism established as an appropriate tool for assessing the sustainability of cities, a desirable next step is to use the metabolism as a guide to *designing* more sustainable cities" (Codoban & Kennedy, 2008). After this, a set of recommendations on MIA application are pointed out.

MIA application

The four selected cities have very distinct metabolic profiles, and the four projects assessed are very different, not only in size, but also in nature. This fact leds to very interesting comparisons between not only these cities but also, and most importantly, to the respective planning proposals under analysis.

The Oporto intervention area corresponds to the detailed plan of *Antas* (the so-called PPA), which was the selected planning proposal not only because it corresponds to a statutory local plan conceived as an operational urban project, but also because it includes a wide variety of functions: residential areas, a stadium, a shopping mall, a light-rail station, and open green spaces. The project occurred under the PPA framework and the redevelopment of the surrounding area due to the then upcoming Euro 2004.

In Stockholm, the project subject to analysis was the Stockholm Royal Seaport, the most environmentally ambitious urban project in Sweden. The development is being promoted largely on the basis of an ambitious environmental profile in Stockholm, the 2010 European Green Capital. Based on Stockholm's Comprehensive Plan of 1999 and 2010, a number of areas that have been used (or are currently being used) for industrial or port-related purposes should be redeveloped into urban locales with a mix of housing, workplaces and services.

The Royal Seaport is forecasted to further develop high environmental building standards in the City. The area is designed to be a mixed use district that will help mitigate housing shortages in the inner city, provide opportunities for business development, promote technological innovation and continue in its role as a port of entry and departure for ferries travelling across the Baltic Sea. The desire to attract firms working with the innovation of environmental technology is also seen as a key aspect in ensuring the economic viability of the area while also enhancing the port's reputation as a leading district in environmental sustainability.

The Viennese development proposal is the Aspern Seestadt project. It was an ex-ante assessment as the also named *Aspern Vienna's Urban Lakeside* will be a modern economic hub at the heart of the CENTROPE Region[1]. It is located in Donaustadt, the 22nd municipal district, at the edge of the Lower Austrian Marchfeld plain and the Danube Wetlands National Park. It is located in a privileged area, East from the city centre, and in proximity to the Slovakian capital Bratislava. It will correspond to a new multi-functional urban area in the city

[1] The European Region CENTROPE is composed of the Austrian Federal Provinces of Vienna, Lower Austria and Burgenland as well as West Hungary, the Bratislava and Trnava Regions in Slovakia and the Czech South Moravian and South Bohemian Regions.

with residential units, spaces for offices and service companies and a centre for industry, science, research and training.

The project will comprise 240 hectares (equivalent to 340 football playing fields or the combined area of Vienna's 7th and 8th municipal districts) and 8.500 residential units for 20.000 residents, 15.000 jobs in offices and for service providers, 5.000 jobs in the centre for industry, science, research and training.

As for the Newcastle urban project analysed, the Newcastle Great Park project, which has been developed over the past decade to satisfy market pressures for detached and semi-detached executive style homes.

It is the largest planned or on-going mixed use development project in the Tyne and Wear urban area and includes a wide variety of functions: residential areas, commercial and business space, public services and preserved natural areas. Additionally, the application of MIA in this intervention area revealed to be very interesting in order to consider the rationale and impacts of the development that are taking place on a Greenfield location rather than one of several available Brownfield sites in the city.

The successful application of the Metabolic Impact Assessment (MIA) methodology to all the four case studies, in very different European cities – Oporto, Stockholm, Vienna and Newcastle-upon-Tyne, and involving four very distinct urban projects – the Detailed Urban Development Plan of *Antas*, the Royal Seaport-Hjorthagen project, The Aspern Vienna's Urban Lakeside, and Newcastle Great Park, was carried out by two separate research teams (CITTA and Nordregio), albeit under the same work-package coordination and working in close contact with each other, enabled to gather sufficient evidence to support some interesting conclusions.

Despite MIA successful application to all four case studies, the assessed components were not equally developed. Data constraints are a limitation factor when working at such a small scale as the neighbourhood level; nevertheless, this methodology has revealed efficient in the evaluation of the metabolic impact of new proposals, although its application was not always possible to all four urban metabolism components usually considered (energy, land use, water and materials).