CityBench
ESPON CityBench for benchmarking European Urban Zones.

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Inception Report | Version 15/March/2013

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This report presents a more detailed overview of the analytical approach to be applied by the project. This Applied Research Project is conducted within the framework of the ESPON 2013 Programme, partly financed by the European Regional Development Fund.

The partnership behind the ESPON Programme consists of the EU Commission and the Member States of the EU27, plus Iceland, Liechtenstein, Norway and Switzerland. Each partner is represented in the ESPON Monitoring Committee.

This report does not necessarily reflect the opinion of the members of the Monitoring Committee.

Information on the ESPON Programme and projects can be found on www.espon.eu

The web site provides the possibility to download and examine the most recent documents produced by finalised and ongoing ESPON projects.

This basic report exists only in an electronic version.

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1. Introduction

1.1. Policy framework

Sustainable development, economic and social progress, reinforced cohesion and environmental protection are fundamental principles of the European Union (EU) set out in the Treaty on European Union (EU, 2008).

Since the publication of the Brundtland Report (1987), where sustainable development was defined as *"the needs of the present generation should be met without compromising the ability of future generations to meet their own needs"*, that much attention is given to the implementation and monitoring of sustainable practices, including in cities. In fact, a core element of the European Cohesion Policy is the very promotion of sustainable urban development. The cohesion policy seeks to exploit Europe's full economic, social and territorial potential, with an integrated approach involving cities across Europe (an approach already proven successful in the previous URBAN Community Initiative).

The European Union's objectives for sustainable development has been actually taken up by the European ministers responsible for urban and spatial development, who translated them to concrete spatial and urban actions. In the Leipzig Charter on Sustainable European Cities and the Territorial Agenda of the European Union (EU Ministers, 2007), two key objectives are defined: integrated urban development should be applied throughout Europe and deprived urban areas must receive more attention within an integrated urban development policy.

Therefore tools and methods that shed transparency to the status of urban areas throughout Europe are crucial to evaluate the integrated approach to urban development policies. The final goal is to achieve smarter, more sustainable and socially inclusive urban development. One such tool is the development of the Reference Framework of sustainable cities and tools for its implementation and monitoring targeting city governments.

But more stakeholders are involved in sustainable development and economic and social progress (such as citizens and private and public investors). Tools are needed that promote dialogue and transparent assessment and communication of opportunities and needs to implement integrated approaches to urban development.

The ESPON program is playing a crucial role in this implementation. Previous results have revealed that territorial capital and opportunities for development are inherent in the regional diversity that is a characteristic of Europe. Consequently, different types of territories are endowed with diverse combinations of resources, putting them into different positions for contributing to the Europe 2020 Strategy as well as to EU Cohesion Policy. This project intends to contribute to the illustration, analysis and assessment of this Territorial diversity.

As the European process moves towards a more integrated approach to policy making (taking into account territorial dimension), the work from the ESPON 2013 programme becomes crucial in extending and deepening the existing knowledge and contributing to the development of Cohesion Policy beyond 2013.

In this framework, this project intends to enable access and lower thresholds in understanding the vast body of knowledge gained in the ESPON programs.

1.2. Objectives

The purpose of this Inception Report is to set out the objectives, approach, methodology and working programme of the CityBench webtool development project.

The goal of this project is to provide a tool and information that can show patterns of risks and opportunities in European cities. The user group of this tool are practitioners, policymakers, as well as public and private investors. It should make best use of ESPON results, and combine these with other research results and relevant data. the goal is to make the ESPON knowledge base more available and useful to the identified target groups (which are engaged in managing investment in cities).

The tool, a 'quickscan' web application, will be developed in a little more than one year, from conceptualization to delivery. The webtool allows a first understanding of risks and opportunities for cities, the potential aspects for investment and allow benchmarking of cities (comparing city characteristics/indicators side by side).

The tool will be developed in close cooperation and active participation of the steering group that includes the ESPON Monitoring Committee, the Municipal and Regional Unit of the European Investment Bank (MRU-EIB) and Eurostat. The feedback of these target stakeholders will be organized in several feedback sessions in order to steer developments that ensure resultant use and long-term sustainability (usage beyond the project life).

It was identified in the specification document that the tool should make evident economic, social and environmental sustainability of cities in order to support investment decision making of policymakers, practitioners and public and private investors. Accordingly, the tool allows the benchmark of cities against other similar cities, around these themes.

Since such a diverse group of users has different goals, different skills and different interests when comparing cities in search for investment opportunities, we propose a methodology that allows users to select and combine indicators in order to perform custom multivariable analysis in an easy-to-use and straightforward methods (see section 2). This report presents initial results and proposals to be discussed with the steering group in order to be further developed.

Key terms:
Responsive design, Data visualization, interaction design, indicators (environmental, socio-economic, sustainability, life quality), web technology, Interactive & Incremental development, multivariable analyisis, suitability queries.

1.3. Project specific: Link to the Annex III issues:

In italics are "transcribed" issues presented in the Annex III, which are followed descriptions of solutions or links to the sections of this report where detailed descriptions are provided.

1.3.1. Workplan ambition level and Technical elaboration of the webtool

Detailed description of the conceptualisation of the project, taking into account the objectives envisaged, including the identification of priorities, resolution of problems and definition of delimitations.

This report provides a more detailed conceptualization of the project. In section 2 several analysis tasks are described (from user analysis to data analysis) that intend to tackle problems with data availability and assure final user acceptance. In section 3, detailed methods of user interaction are proposed that define the scope of the functionality, in section 5 we present detailed tasks that will be carried in order to complete the project successfully and also the conceptual architecture (an annex to this report is available with detailed descriptions of the architecture).

1.3.2. Data availability

An overview on the data availability, including statistical and geographical data is also necessary, as well as strategies to overcome possible shortcomings on this issue, such as coverage outside the Urban Audit cities

In section 3 we present the results of a preliminary research on data availability (specially focussing on ESPON data and Eurostat). In addition, other data sets were also considered (licensed/commercial and open volunteered data sets). This review intended to bring the TPG abreast with the European indicator and statistical data arena. With this task, now the project team has the necessary understanding to carry out a more in depth data audit, interview experts (especially from other ESPON projects such as the M4D project), and the target group in order to reach a better final list of potential indicators. Another reason to perform the data audit after the delivery of the inception report (and postpone the delivery of a detailed list of data availability) is the intended alignment with the on-going developments at Eurostat. The Eurostat provided feedback to the first CityBench delivery (scoping indicators) stating "*[Eurostat] are currently updating the complete Urban Audit design. The first results will be published hopefully by June. An exact planning will be drafted in March. We will have more cities and less indicators."*

Still, we present a list of candidate indicators for pre-defined themes. This short list enable the start of the tool development, so it this list is a starting point. The development will be modular and when new indicators are defined and selected (from the coming activities) the tool will allow for a straightforward and effortless ingestion and presentation of the new indicators. So the final list of indicators and geographic coverage will be analysed in a subsequent step and presented in the following deliverable, the interim report (which is in accordance to the Annex III, where it states that the *interim deliverable I* presents "*results of dialogue with target group over accessibility, content and needs generally and a final proposal on the list of cities and indicators to be integrated in the webtool and geographical levels to be used*")

In order to do this, all data analysed will be ingested into the CityBench database and related to city ids. This will allow to create an analysis matrix (between cities and indicators) that can be queried in multiple dimensions. We will use this matrix to discuss with the steering group which are the priorities (if certain cities/typologies, we can chose which indicators are more present for these cities, if certain indicators are crucial, we can then make a subselection of cites that have data on the indicators). Completion of the Matrix tool is expected in late March or early April.

The current list presented in this report are potential indicators that the TPG will explore and use for tool development purposes. They are not intended as a complete or exhaustive list of indicators, more research is needed and specially interaction with other ESPON projects (such as the M4D with whom contacts have been established). The project M4 developed a Java API for metadata that can be shared with interested partners. CityBench will develop tools for processing ESPON data, and could use the M4D interface in order to take advantage of the developed data. Discussions are planned for March to discuss on how to carry out this exchange and guarantee compatibility.

The CityBench project will also participate in the Technical meeting exploiting cooperation/synergy and linkages among ESPON tools, scheduled for 16-17 May 2013 at the UMS RIATE premises, Paris, France. In this meeting other ESPON tools will be present and discussed, such as the the ESPON Database, European Territorial Monitoring System, ESPON Online Mapping Tool, OLAP Cube, HyperAtlas, as well as European urban databases. In addition, the digital versions of the ESPON Atlas and the ESPON 2020 Atlas will also be addressed. In this meeting we expect to align and further define the data scope of the urban benchmark tool.

1.3.3. Geographical, thematic and temporal coverage

Indication of the list of cities and indicators that could be successfully integrated into the webtool and geographical levels to be used, as well as the definitions/logic for these

This step has been postponed to after discussions and interviews with experts and the target group (see previous paragraph also). It is expected that it can be delivered with the first interim Report.

From the temporal perspective, the tool should include as much as possible the historical data in order to allow trends and historical developments to be analysed. This does have consequences on the choice of the geographical backbone and thematic coverage. One option is to allow trends and historical data to be accessed in a separate thread than the latest data (a sort of context box where the indicator is described and if it exists for historical data a graph can be presented).

It is proposed to use a two tier approach. A first subset of cities (of around 100 to 150 cities) will be used. The cities will be chosen based on the availability of data. But the key indicators to choose the cities will be defined in consultation with the SC. We are currently developing the database to host all the data in order to make queries as for which cities are present for which indicators.

1.3.4. Usefulness and ease of use

Detailed proposal on the overall approach envisaged to make the European Urban Benchmarking webtool highly communicative, and relevant and useful to the target group

The usefulness is defined in terms of target user content needs, the goal of the webtool is to allow for a potential investors (and other stakeholders) to review the suitability of financial engineering instruments in place-based policymaking for addressing risks and opportunities. This is achieved by benchmark cities in themes as demographic challenges, economic challenges, social disparities/polarisation, urban sprawl and greenhouse gas emissions (as stated in the project specification). These themes need to be reflected in the choice of indicators and composite indicators. But naturally the investment information needs is very dependent on which investment is being made. As IT companies need very different infrastructure than other services. So the indicator list should not be limited to those themes, it should allow for the flexible, custom and dynamic creation of composite indicators so that the users can create their own suitability analysis based on the vast existing data.

The usability of any system depends of different factors according to system context. For the case of CityBench, we have identified the most important factors as:

1) Completeness
    a. Are all the data (indicators) available?
    b. Does the webtool contain all the necessary functionality to present meaningful results?
2) User-friendliness :
    a. Is it easy for user to understand the webtool (even the first time)?
    b. How efficient (in terms of energy/time invested in operating the tool against results) can the user operate the system to get the results he or she needs?
3) Responsiveness and availability
    a. How does the system perform (in term of responsiveness timing, is it clear the interaction, eg. The system is busy with a query)?
    b. Is the system always up and running?

These factors demand different approaches to be guaranteed.
Regarding the *data completeness* approaches are being studied (we will start with a small subset of complete indicators and try to develop methods to guarantee an easy integration of future indicators).

With respect to the *functional completeness*, as well as the user-friendliness, of the system, these will be guaranteed by using a user-centred approach which translates to:

- The client applications of the system will designed by a senior user experience designer (UxDesigner)

- The implementation of the client applications will be overseen by the UxDesigner.
- The design of the client applications will be an iterative, incremental approach meaning different designs will be made and discussed with stakeholders.

As stated in the proposal, the developments will be preferential open source. Just in case there are clear advantages to use closed source components, the TPG will make a proposal to CU in order to evaluate the licenses and make a decision. Until now we envisage all components to be open source, although the final decision will be made once all the user requirements are known. E.g. if complex map manipulation is needed, the TPG will consider using a webmapping server from a commercial company, if the cost-benefit analysis will prove beneficial for the project.

All developed code will be delivered to the CU. The CU will host it in their servers. The webtool should look integrated into the current ESPON website.

An established information systems evaluation methodology will be implemented to test the perceived usefulness and perceived ease-of-use by the users of the system. The chosen methodology is the Technology Acceptance Model (TAM), first introduced by Davis (Davis, 1989) and later extended with social influence and cognitive instrumental processes (Venkatesh and Davis, 2000) that can measure acceptance of the technology and identify the factors that contribute to the use of such an information mechanism (explained in detail in section 3).

The *responsiveness and availability* of the system will be guaranteed by taking different measures:

- The system will be designed, implemented and subsequently tested according to the expected usage and load (this means stress testing simulating large loads of users).
- The design will be scalable and modularly based.
- Code reviews will be conducted to detect and avoid errors and misbehaviour of the system.
- Automated tests (e.g. unit tests of source code, load tests of system parts and the entire system) will be performed to test the implementations and detect any errors and weaknesses.

Proposed workplan, including all activities envisaged, key milestones, timetabling and time planning, with greater detail provided up to the intermediate deliveries and in outline to the interim report

This is presented in section 5

2. Analytical approach

2.1. Data auditing

Data audit is a process to assess how existing data is fit for the given purpose, in our case city benchmarking. This involves profiling the data and assessing the impact of quality, scale (temporal, geographic and thematic) in the results of further analysis and therefore on the appropriateness to support decision making regarding investments.
One of the first tasks is to perform a “data audit” (identifying the availability and accessibility of relevant data) taking into account the fit for purpose of the data. This is a very important step as it precedes and influences all subsequent steps, so it is urgent to consider well the data fitness. Subsequent steps (data analysis, functional requirements and multivariate analysis will depend on this step. Including data visualization techniques. Data visualization methods are tightly dependent to the type, purpose and specific distribution of the data series.

2.2. User analysis

In order to assure the usability, usefulness and sustainability of the webtool, the development team will be in close contact with the steering group. Early ideas and visions for the tool will be shared, evaluated and improved with the target group users. The requirement analysis starts by reviewing existing requirements identified in previous ESPON projects, which should be validated and extended in cooperation with the target group. The target group will also be asked to contribute in the form of interviews in order to identify concrete use-cases and functional requirements from the users,

Specific questions that will be addressed together with the target group include:

- Most appropriate methods to compare cities?
    - Which cities? All the 800 LUZ, or start with pre-selections (top 10 for a given indicator, custom selection by users?) Using typologies of cities? Or selection based on similar performance in a indicators (cluster analysis)?
    - Depending on the indicator, the data could be categorized/classified into scales? If yes, are 7 to 9 point classifications of the indicators appropriate for the intended quick scan? If yes, what is the best categorization or classification methods? Beyond comparison between cities, which trends should be shown (as in comparison with capital city, or with national average, or with European average)?
    - Create theme indicators (define default composite indicators) which are indices composed of indicators). As in overall accessibility (composed by a weighted average of road, plane and train accessibility). Composite could be defined by means of multivariate analysis? Is data standardization needed for the composite?
- Are there repetitive tasks from the users that the tool should automate? E.g. generation of benchmarking reports.
- Eurostat reported that new data is becoming available, what data, when will it be stabilized and how best to capitalize it together with ESPON data?
- Other data relevant data sources? Other

2.3. Composite indicators

Different tools within the ESPON domain and also outside can already display ESPON data and show cities and regions based on selectable indicator or datasets. But the goal of this tool is to support investors in comparing cities. Characteristically, investment decisions are not based on a single factor, but require an integrated analysis of different aspects that often have no common units.

In order to cope with the multiple perspectives of the target groups, one option is to integrate several indicators into estimate composite (or thematic) indicators derived from multivariate analysis of several specific indicators available, this can be a flexible and user led process (for advanced users) or pre-defined as default for standard users.

The mathematical aggregation of a set of indicators is called an "index" or a "composite indicator": *Composite indicators are based on sub-indicators that have no common meaningful unit of measurement and there is no obvious way of weighting these sub-indicators.*(JRC 2013a), the use of composite indicators have advantages and disadvantages a shown in Table 1.

The JRC page on composite indicators starts with a very relevant opinion (JRC 2013a):

> *"[…] it is hard to imagine that the debate on the use of composite indicators will ever be settled […] official statisticians may tend to resent composite indicators, whereby a lot of work in data collection and editing is "wasted" or "hidden" behind a single number of dubious significance. On the other hand, the temptation of stakeholders and practitioners to summarise complex and sometime elusive processes (e.g. sustainability, single market policy, etc.) into a single figure to benchmark country performance for policy consumption seems likewise irresistible."*

Andrea Saltelli, JRC

Table 1 – Advantages and disadvantages of using composite indicators (adapted from JRC 2013b)

Advantages	Disadvantages
Summarise complex or multi-dimensional issues in view of supporting decision-makers	Composite indicators may send misleading, non-robust policy messages if they are poorly constructed or misinterpreted
Provide the big picture. They can be easier to interpret than trying to find a trend in many separate indicators.	The simple “big picture” results which composite indicators show may invite politicians to draw simplistic policy conclusions. Composite indicators should be used in combination with the sub-indicators to draw sophisticated policy conclusions
Help attracting public interest by providing a summary figure with which to compare the performance across cities and their progress over time.	The construction of composite indicators involves stages where judgement has to be made: the selection of sub-indicators, choice of model, weighting indicators and treatment of missing values etc.*
Reduce the size of a list of indicators or to include more information within the existing size limit	The composite indicators increase the quantity of data needed because data are required for all the sub-indicators and for a statistically significant analysis

* These judgements should be transparent and based on sound statistical principles

Process to create composite indicators (adapted from JRC 2013b):

1. Selection of variables and data series
2. Imputation of missing data
3. Multivariate analysis
4. Normalization
5. Weighting and aggregation
6. Uncertainty and sensitivity analysis

The webtool is a quick scan to select cities that comply with needs from investors. It can be translated into a sort of multivariate analysis (which are traditionally used in the selection of alternatives, i.e. to support the selection of concepts to fulfil a “customer” need). Since the user has several hundreds of cities to choose from, the system can support his/hers exploration of the alternatives by allowing selection based on more than one indicator.

2.4. Standardization of data

In multivariate analysis it is common to standardize the input data. Since variables measured at different scales do not contribute equally to the result (a variable that ranges between 0 and 100 will outweigh a variable that ranges between 0 and 1). To prevent this issue, it is advisable to transform the data to comparable scales. Typical data standardization procedures equalize the range and/or data variability. The appropriate standardization method usually depends on the specific characteristics of the data set, specially its distribution. Common standardization techniques include (Gower, 1985; Everitt and Dunn, 2001):

0-1 scaling: each variable in the data set is recalculated as (V - min V)/(max V - min V), where V represents the value of the variable in the original data set. This method allows variables to have differing means and standard deviations (SD) but equal ranges, 0 to 1.

Dividing by range: each value from the dataset is recalculated as V /(max V - min V). In this case, the means, variances, and ranges of the variables are still different, but at least the ranges are likely to be more similar.

Z-score scaling: variables recalculated as (V - mean of V)/s, where "s" is the standard deviation. As a result, all variables in the data set have equal means (0) and standard deviations (1) but different ranges.

Dividing by SD: dividing each value by the standard deviation produces a set of transformed variables with variances of 1, but different means and ranges.

2.5. Quantitative data classification

Another option to standardize data for the multivariate analysis is to first classify the data into scales (from 5, 7, 9 or 11 scale points, that can be "low" to "high") and automatically allocate each value to a position in the scale. This would allow ease selection logical statements; the user can select cities according to his preferences (e.g. "I am looking for a city with high accessibility, low economic performance, high environmental performance").

Data classification groups similar features into classes. Aggregating features into classes allows the user to select and observe patterns in the data (as in the map) more easily. But the results of this analysis is very sensitive to the method of choice to classify the data. The amount of observations (cities) that fall whithin a class directly depends on the class breaks (the boundary between classes). Classes can be created manually, or using a standard classification scheme, such as "Equal Interval", Jenks Natural Breaks(Jenks, 1967), Quantile, Standard Deviation and Head/tail Breaks (Jiang, 2012).

A small explanation of each method (the first 3 are adapted from ESRI help documentation:

Equal interval: when the range of possible values is divided into equal-sized intervals. Because there are usually fewer endpoints at the extremes, the numbers of values are less in the extreme classes. This option is useful to highlight changes in the extremes. It is probably best applied to familiar data ranges such as percentages or temperature

Quantile: The range of possible values is divided into unequal-sized intervals so that the number of values is the same in each class. Classes at the extremes and middle have the same number of values. Because the intervals are generally wider at the extremes, this option is useful to highlight changes in the middle values of the distribution.

Standard deviation: the standard deviation can be used to classify the data. This method finds the mean value, then places class breaks above and below the mean at intervals corresponding to the standard deviation, until all the data values are contained within the classes..

Jenks natural breaks: is a data classification method designed to determine the best arrangement of values into different classes. This is done by seeking to minimize each class's average deviation from the class mean, while maximizing each class's deviation from the means of the other groups. In other words, the method seeks to reduce the variance within classes and maximize the variance between classes (Jenks, 1967)

Head/Tail Breaks: is also a natural break method, but was especially designed for heavy-tailed distributed data (heavy-tailed data distribution has a head with small amounts of high values and a tail with large amounts of low values). This method creates different breaks for the head and for the tail (Jiang, 2012)

Manually create classes: is usually chosen when the user needs the classes to meet meet a specific criterion or when comparing features to specific, meaningful values. In this method the user needs to manually specify the upper and lower limit for each class. It is also used to emphasize values above or below a threshold. For example, the user may be looking for a city with population larger than half million inhabitants, and average temperature above 20 degree. This method is specially used in suitability analysis, so for the investment users, they could set a minimum set of criteria they are looking for and the system would select the cities that fulfil the criteria and he can then explore further the limited set.

3. Methodology and hypothesis for further investigation

3.1. Custom flexible indicators

One of the challenges is to develop a tool that satisfies the needs of very different users. It is envisaged that the CityBench tool adds value and supports investment decisions from practitioners, policymakers, as well as public and private investors. And even within the different roles, the interests can be highly divergent. An ICT company looking for a new city to base a "development office" needs very different criteria than a construction company.

How to allow such a degree of flexibility keeping the tool easy to use, but everyone can customize their needs.

We propose the implementation of a methodology to enable custom composite indicators. The tool starts with a preselection of cities and basic indicators to be decided in consultation with the target group (such as environment quality, accessibility, smartness/knowledge, economic performance, population/size).

The user then is presented with a dashboard type interface, containing a map and several widgets that compare the cities for those indicators.

But 800 cities from the LUZ, would crowd the map and prevent any usefulness information to be derived. Therefore, we propose a filter system where the user can select more or less cities. When the user accesses the tool, there will be a welcome screen explaining that a subset is chosen and how to change that subset (see Figure 1).
This welcome screen only needs to be shown the first time a user joins, and if the user changes the filter settings, these settings should be remembered.

Nota benne: the figures presented below are shown for illustration of functionality, the final layout and look and feel need to be discussed and approved with the steering committee (and in accordance with the corporate identity and look and feel of the hosting ESPON site).

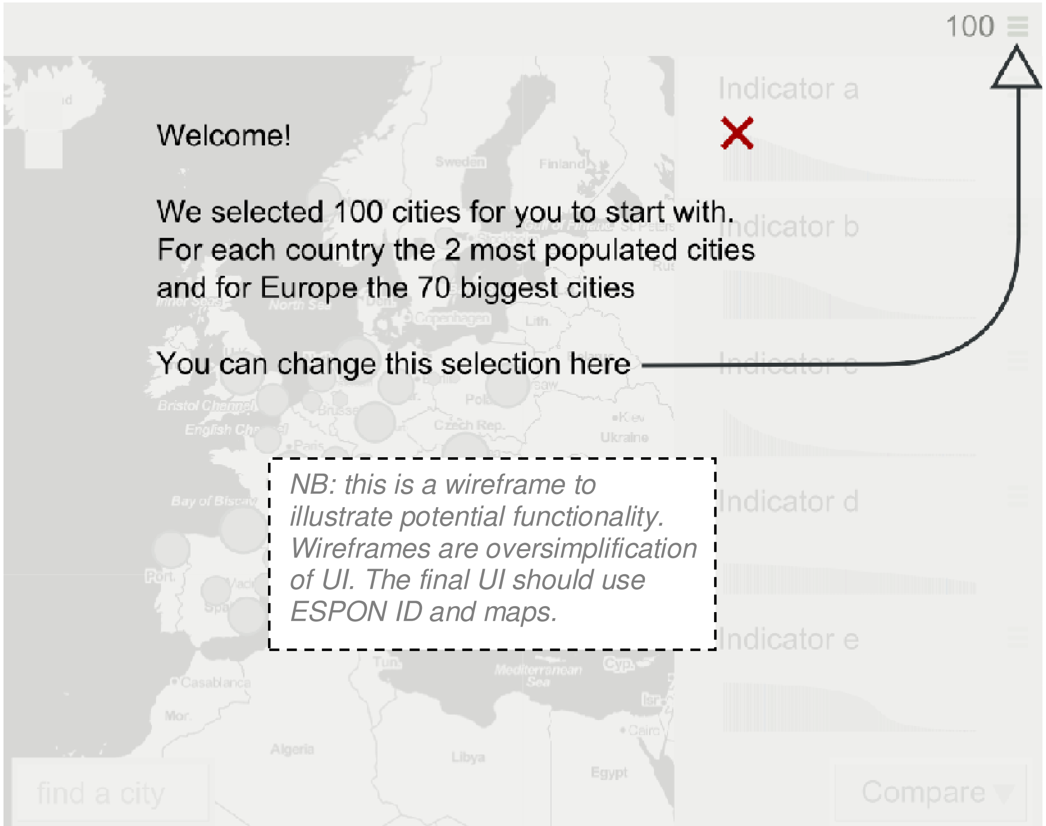

Figure 1 – Initial splash screen warning that only a subselection of cities matching the indicator criteria is available. This example uses size, but it is expected that we can use any different indicator to make an initial sub-selection (including typology).

The user can change the subset by adapting the filter rules. They can be done per country (e.g. choosing to display the biggest cities per country) and on an European level: the 70 biggest cities of europe where they complete each other. A counter will tell the user how many cities he is selecting in total.

This is one of many possibilities to deal with information overload and allow the comparison of cities. If this approach is accepted, further research is needed to define sensible filter categories. Filter candidates are the *size of the population*, the *LUZ area*, but any indicator could be used (e.g. skilled work force).

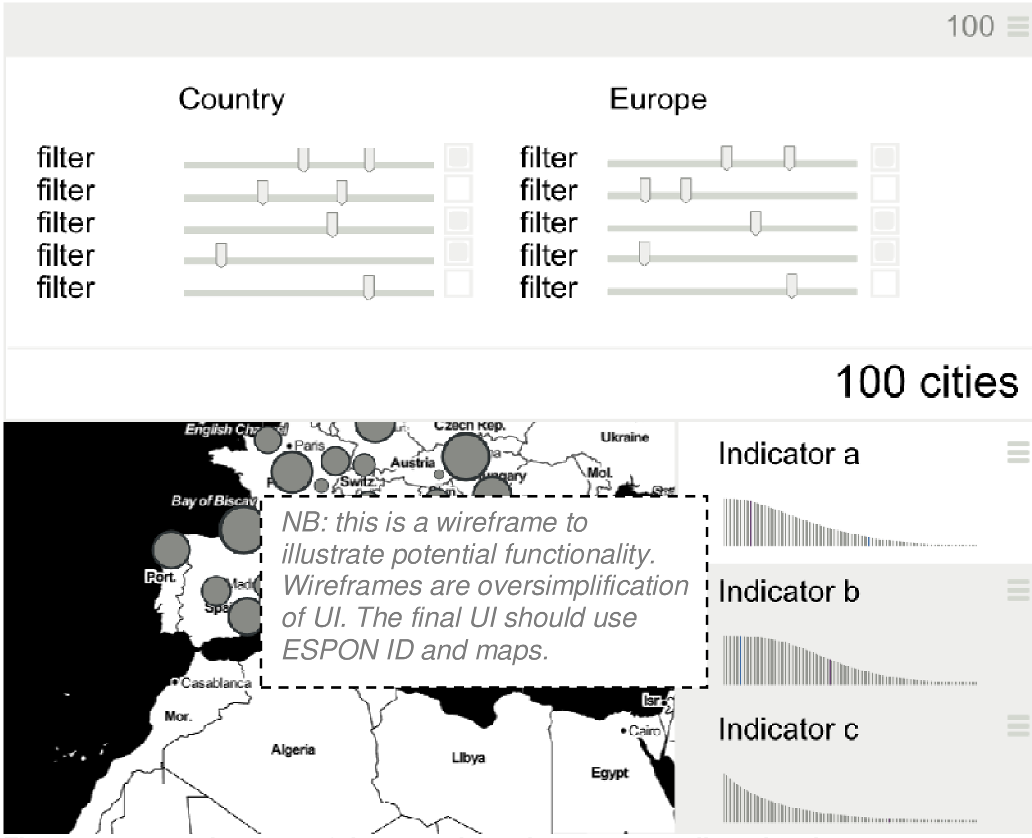

Figure 2 – second screen of the tool where the user can adjust the city selection/display criteria. The bar charts on the right can be limited to the top 10 or 50 cities to avoid ranking bottom cities.

Then the user as a pre-selection and can further explore and compare. The screen shows in the map the symbol size depends on the performance for a particular indicator. And a linked bar-chart is also displayed as a widget. The user can now select one or more particular cities to allow detailed comparisons. He can select a city by clicking on its circle on the map (it will be added to the list at the bottom), and display both in the map and in the bar-chart position a different color to indicate it's position on the map and the position on the ranked chart.

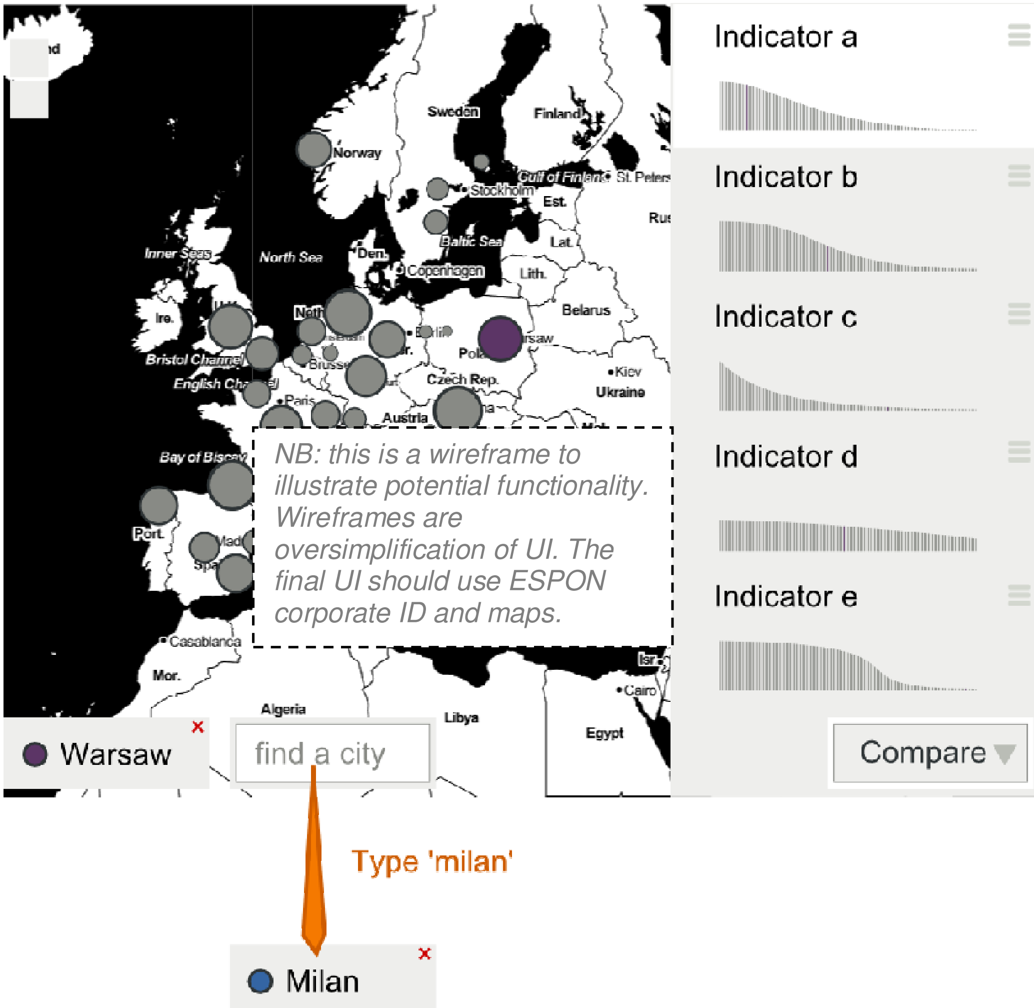

Figure 3 – Note that the city selected on the map, also becomes prominent (different color) in the bar-charts for the different indicators. The bar charts on the right can be limited to the top 10 (or 50) cities to avoid ranking bottom cities.

Clicking again on the circle will remove the city from the list for example. To select another city the user can click on another circle on the map, or type the city name in the search box. If the searched city is not part of the current selection, it will be added (see Figure 4).

The indicator is a composite of several data sources. The indicator theme can be fine-tuned/adapted by clicking on the (☰) icon, this will unfold the sub-indicators that compose the theme via different weights. The weights can then be changed with e.g. sliders to reflect the users preferences (see Figure 5).

e.g. Accessibility is a theme indicator, for example indicator A. by clicking on it, the user accesses the subindicators that compose he indicator. These are accessibility by Air (closeness and connectivity of the closest airport), accessibility per train (number of stations and number of cities it connects to, and connectivity per road (number of roads and/or congestion is taken into account).

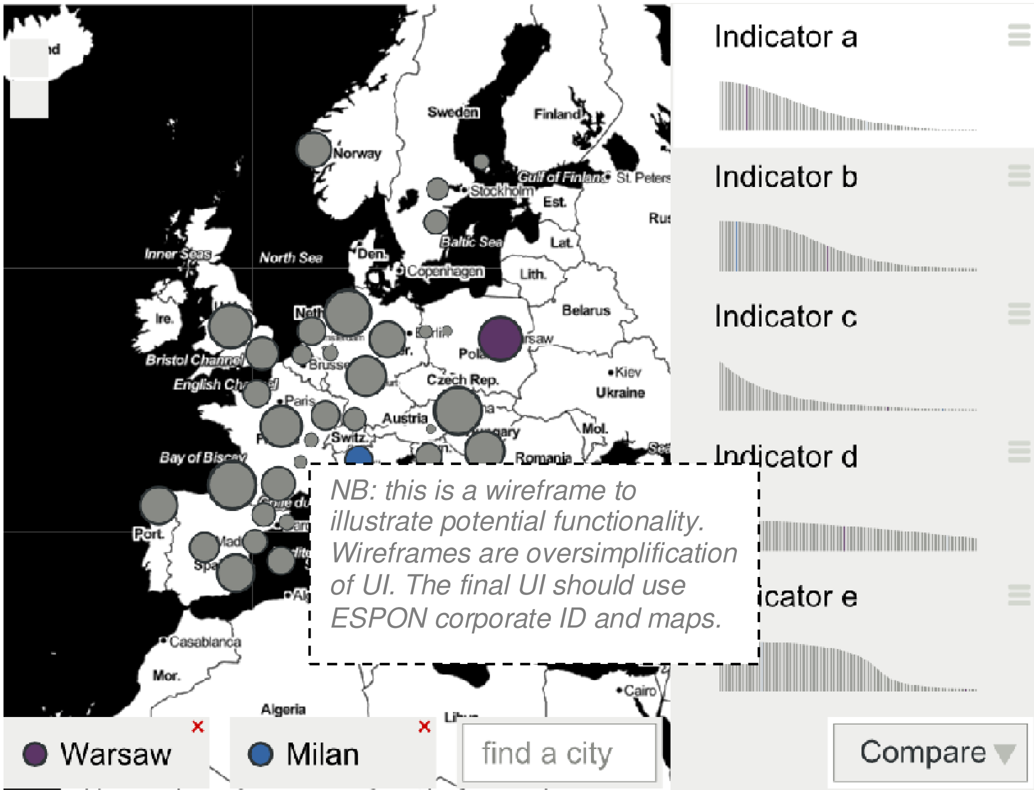

Figure 4 – two cities being compared on the map and on the indicator bar charts. The size in the map reflects the selected indicator (in this example is the top indicator a, as it is white). The bar charts on the right can be limited to the top 10 or 50 cities to avoid ranking bottom cities.

By default the theme indicator has the same weights for all the sub-indicators, but if a user is not interested in connectivity by plane as he dislikes flying terrible, he can then slide the sub-indicator place slider to null and the theme accessibility will be recalculated for all cities, this time not taking the airports in to account.

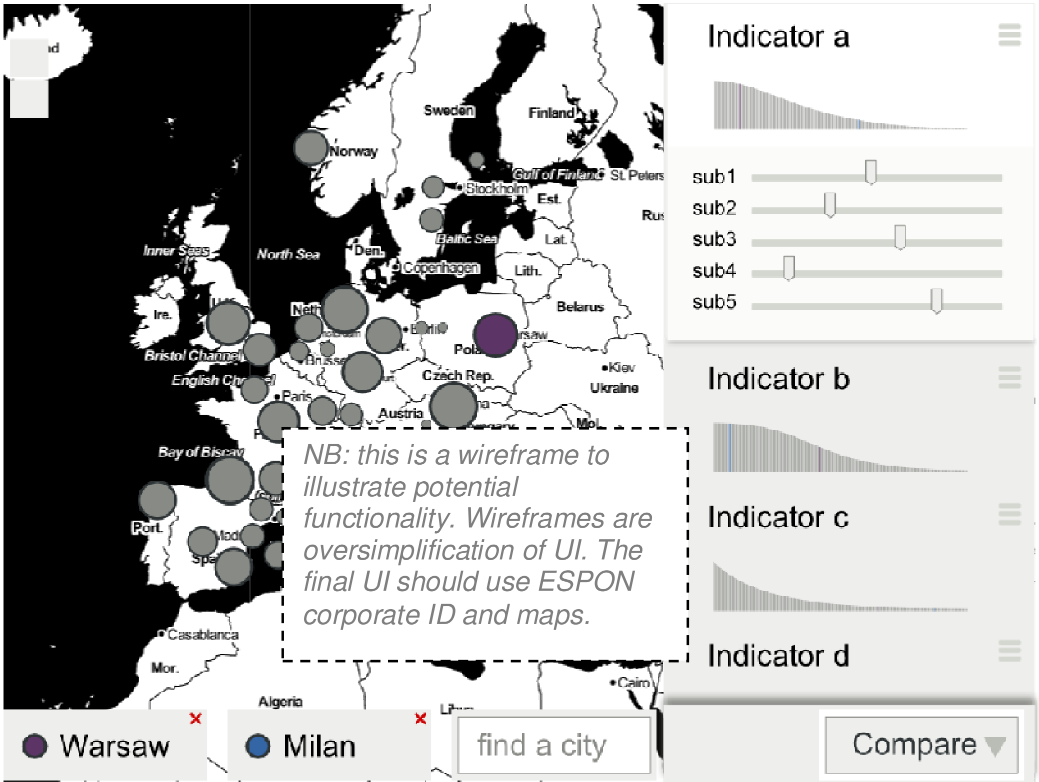

Figure 5 – sub indicators compose the main indicator and relative weights can be changed in real time in order to reflect the user preferences.

Then by clicking the button compare (bottom right), a pop up appears comparing the 2 cities for a number of indicators (see Figure 6) if there was only one city selected, then a detailed chart of that city still appear. The user can print or create a link to the comparison such as: http://citybench/espon/eu/city/Amsterdam.

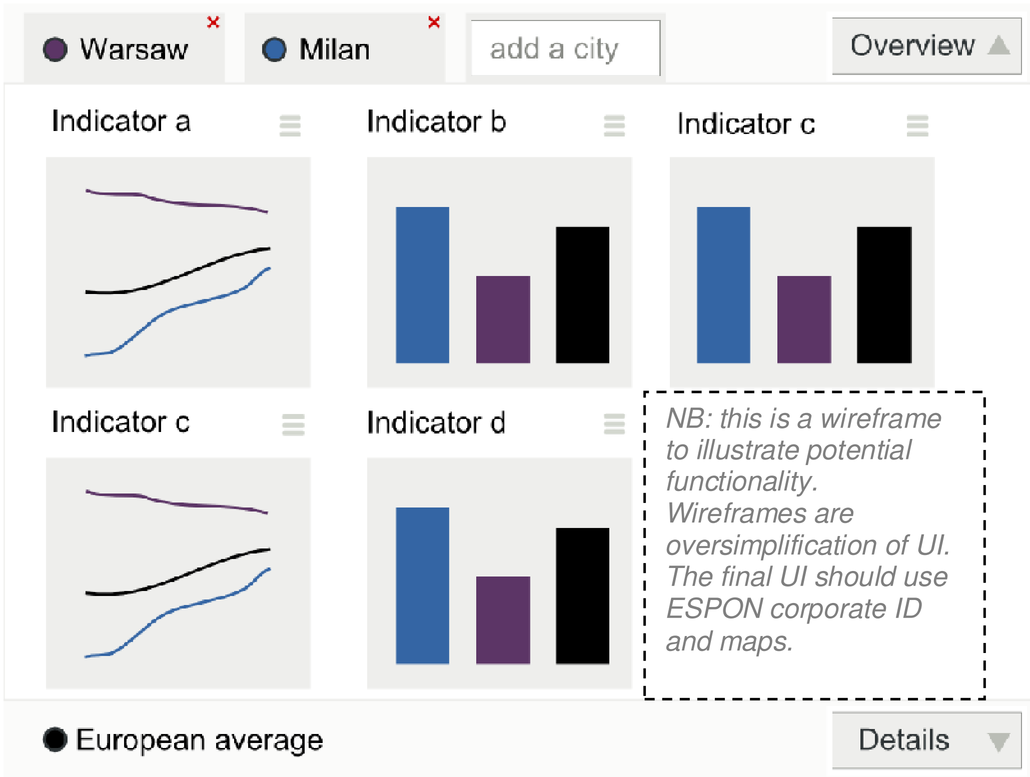

Figure 6 – comparison pop-up window where 2 cities and the European average are compared side by side. Final graphs will have measurement units and can include comparison with national or/and European averages/rates.

The sub-indicators that compose the theme indicator need to be standardized since they have different units, different purposes and different magnitudes. One option is to generalize the data to a classification system, as in a quantitative scale from 1 to 9 (ranging from "low" to "high"). This standardization procedure needs to be further investigated in cooperation with indicator experts.

3.1.1. Data reliability, transparency and lineage.

The user interface will also include transparency and reliability of the data (with indication of its lineage) so that the user can make an informed analysis and decisions.

3.2. Technology Acceptance Model

The Technology Acceptance Model (TAM) was developed by Davis (1989) as an adaptation of the Theory of Reasoned Action (TRA) (Fishbein, 1979), specifically designed to test the acceptance of information systems (IS). The TAM uses the TRA as the theoretical underpinning for defining the links between the two basic constructs and attitude, intention and the adoption behavior. The TAM defines that the acceptance of technology is dependent on two independent constructs: the perceived usefulness (PU), and the perceived ease-of-use (PEoU), and on the causal chain from the TRA: attitude, intention, and, finally, usage behavior. The perceived usefulness is defined as "the degree to which a person believes that using a particular system would enhance his or her job performance" (Davis, 1989). In other words, it is a quantification of the users' perception of how the technology can help them perform their job better. The perceived ease of use is defined as the "degree to which a person believes that using a particular system would be free of effort" (Davis, 1989). This construct is extremely important because, even when a person considers a technology to be

useful, this person can still reject it if she believes that the effort to use it is greater than its performance benefits.
Previous research has explained perceived ease of use to be the based on a model composed of three anchors that determine early perceptions about the ease of use of a new system. These anchors are: control (internal and external – conceptualized as computer self-efficacy and facilitating conditions, respectively); intrinsic motivation (conceptualized as computer playfulness); and emotion (conceptualized as computer anxiety) (Venkatesh and Davis, 2000).
The cost-benefit paradigm is an important concept to understand the relation between perceived usefulness and perceived ease of use. TAM is based on a rational evaluation, where the behavioral intentions are the outcome of the rational assessment of the presented software (balancing the PU and PEoU), and the outcome determines the behavioral intention to use it (Davis, 1989). According to Davis (1989), the perceived usefulness is a major determinant of people's intention to use the tool, whereas perceived ease of use is a (significant) secondary determinant of intention. Figure 7 shows the TRA combined with the technology acceptance model. The arrows represent the relations that underlie the model. The first two relations are based on the TRA, while the others are TAM-specific:

T1: intention determines usage;
T2: attitude determines intention;
T3: perceived usefulness affects intention;
T4: perceived usefulness influences attitude;
T5: perceived ease of use affects attitude;
T6: perceived ease of use affects perceived usefulness;
T7 and T8: external variables (that depend on the field of study) relate to perceived usefulness and ease of use.

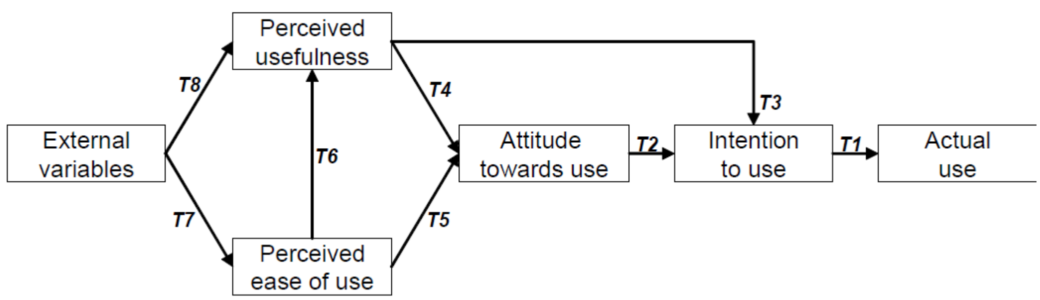

Figure 7 - The Technology Acceptance Model (Davis, 1989).

This model will be used to test the acceptance of the CityBench tool in its interim delivery in order to measure perceived usefulness and perceived ease of use.

3.3 Technology choices

The TPG has a strong commitment to make all developments in open source (without licenses). But when the final user requirments are known (in the interim report 1), we can then evaluate any cost benefit analysis for closed source solutions for parts of the functionality needs. The only component now in doubt is the map analysis complexity, if many different maps are needed to show data, we will weight the benefits vs. the costs of using ESRI server license for the map production. The tool should be (almost) self explanatory and no special expertise is needed to work with it. It is meant for citizens also. From the Admin (data management and updates), we expect that only a admin manual is needed to follow the correct procedures. No special skills will be needed.
The tool will use open standards to allow for the ppossible relation and integration with other tools. The tool will be a web-based (JavaScript, no plugins or additional downloads necessary) so the integration on the current ESPON website should be effortless. It should be noted that the most efficient way is to link the tool from the website, but host it in a separate page (allowing for maximum screen size use).

4. Review of data sources and ESPON results

This section presents a summary of the data review, a more comprehensive list of results is available as Annex I to this inception report where all data is reviewed and for the urban audit and ESPON results, all indicators have been classified into which indicator theme they will contribute.

4.1. The Large Urban Zone

The paper by Lewis Dijkstra and Hugo Poelman (2012), the origin and motivation to create a new and standardized urban definition was explained:

> *"Until recently, there was no harmonised definition of 'a city' for European and other countries member of the Organisation for Economic Cooperation and Development (OECD). This undermined the comparability, and thus also the credibility, of cross-country analysis of cities. To resolve this problem, the OECD and the European Commission developed a new definition of a city and its commuting zone in 2011.*
>
> *This new OECD-EC definition identified 828 (greater) cities with an urban centre of at least 50 000 inhabitants in the EU, Switzerland, Croatia, Iceland and Norway. […] Half of these European cities are relatively small with a centre between 50 000 and 100 000 inhabitants. Only two are global cities (London and Paris). These cities host about 40 % of the EU population. These cities do not include towns and suburbs which cover another 30 % of the EU population according to the revised degree of urbanisation classification.*
>
> *Each city is part of its own commuting zone or a polycentric commuting zone covering multiple cities. These commuting zones are significant, especially for larger cities. The cities and commuting zones together (called Larger Urban Zones) account for 60 % of the EU population."*

4.2. Geographical backbone

A crucial decision is about which LUZ version to use. In the 2012 LUZ version[1], as published in *Urban Atlas update, change and extension maps of the urban atlas 2006 towards the reference year 2012,* the number of LUZ areas is substantially higher (695) than in the 2004 version (313). Although ESPON CU, in the 'CU Response Feedback Paper', states that "*The ideal tool has recent data, LUZ delineated and covers all 2012 Urban Audit cities*", as yet not a single dataset containing indicator data for the newly added (2012) LUZ areas was found. Thus it may be safely assumed that this data, if existent at all, is (still) very scarce indeed. By contrast, indicator data for LUZ 2004 areas (available from Eurostat[2] (URAU_2004_SH.zip) is commonly available - both collected at LUZ level and at NUTS 3 level. In the latter case, a correspondence table LUZ 2004 - NUTS 3 2006 (proxy_nuts32006_luz_checked, found[3] as part of data_FOCI.rar) ensures that NUTS 3 data can be "converted" to LUZ level. (However, this table does not seem to present all LUZ areas, as it contains only 254 unique LUZ ids.) It should be noted that a similar correspondence table for LUZ 2012 - NUTS 3 2006 / 2010 was not found.

---

[1] https://circabc.europa.eu/sd/d/8e5368bd-4994-4b69-87f7-8daff84aba43/LUZ_2012.zip

[2] http://epp.eurostat.ec.europa.eu/portal/page/portal/gisco_Geographical_information_maps/popups/references/administrative_un%20%20its_statistical_units_1

[3] http://database.espon.eu/db2/resource?idCat=43

In view of this, it seems advisable to adopt a two-tier approach:

1. Initially, populate the webtool with (indicators for) the LUZ 2004 areas (313; alternatively, a subset of 100-150 for which indicator data is most complete could be selected).
2. As indicator data for the additional areas included in LUZ 2012 becomes more and more available, integrate this into the webtool and in doing so, expand the number of LUZ areas covered by the webtool.

However, it should be noted that delimitations for LUZ areas existing both in LUZ 2004 and in LUZ 2012 do not overlap exactly in all cases. This could mean that when using the 2012 LUZ delimitations as a basis for the webtool, indicator data collected for certain affected 2004 LUZ areas may not represent the correct values for the corresponding 2012 LUZ. (A solution for this could be extracting the 313 LUZ available for 2004 from the 2012 dataset for the first approach and then, when definitively using 2012 LUZ, it will be more adding data than substituting data.)
The ESPON CU is kindly requested to provide the TPG with their view on this issue.

Potentially interesting indicator data is also available for other geographical levels: City (formerly Core City) and Metropolitan Region. However, integrating (indicators for) these geographical levels into a LUZ-based webtool may lead to MAUP issues: in most cases, the (Core) city delimitation is part of, but smaller than, the corresponding Larger Urban Zone delimitation. Conversely, one or more Larger Urban Zones constitute(s) a Metropolitan Region. As in these cases it is much more difficult (if possible at all) to convert data collected for these geographical levels to LUZ level, a possible solution would be to allow the webtool user to select the desired geographical level (including the corresponding indicators) to be used for analysis. This proposal needs to be discussed with the SC.

4.3. Thematic agglomeration

Even though the final list of indicators is expected to be finalized and presented in the report on indicators (due in June 2013), it was decided to make a pre-selection of potential indicators in order to start developing the tool. The indicators have been agglomerated into themes: *Connectivity / accessibility*, *Economy*, *Environment / air quality*, *Knowledge / smartness*, *Quality of life* and *Population*. There are several indicators that the users can use to calculate the performance of the cities for each theme (or super indicator). As was illustrated in the previous chapter, the user can select which indicator he/she prefers and ascribe weights for each in the calculation of the overall performance. Please note that in the following tables, the column Year indicates the most recent year for which indicator data is available.

4.3.1. Connectivity / accessibility

Source	Indicator	Scale level	Year	Unit / format	Remarks
ESPON	Air, Multimodal, Road and Rail Accessibility	NUTS 3	2006	(change of) standardized EU27/ESPON, absolute level, absolute/relative change	Decide which unit to use
Eurogeographics	Road and (high speed) rail connections	1:250,000	2010	vector	Licensed
OAG Aviation	Number of connections	N/A	2013	Unknown	Licensed

	to/from airports				
OpenFlights	Flight routes	N/A	2012		1

4.3.2. Economy

Source	Indicator	Scale level	Year	Unit / format	Remarks
ESPON	Gross Domestic Product	NUTS 3	2008	absolute (€ x 1,000,000)	
Eurostat	Economic activity / Unemployment rate	LUZ	2009	%	Approx. 65% complete
Eurostat	Euro / Purchasing power standard per inhabitant	Metropolitan region	2009	absolute (€) / % of the EU average	Approx. 95% complete
Cambridge Econometrics	[To be explored]				

4.3.3. Environment / air quality

Source	Indicator	Scale level	Year	Unit / format	Remarks
EEA: CORINE	Green urban areas / other land use	100 x 100m (raster)	2006	% green vs built up	Convert to proportion of LUZ area
European Environment Agency	Residential CO_2 / PM10	5 x 5km	2008	vector / raster	
Eurostat	Registered cars	LUZ	2009	# per 1000 inhabitants	Approx. 65% complete
ESPON	Potential PV power	NUTS2			to be explored (assess by constructed area?)

4.3.4. Knowledge / smartness

Source	Indicator	Scale level	Year	Unit / format	Remarks
ESPON	IP addresses / IP addresses change	NUTS 3	2009 / 2001-2009	Absolute # / absolute difference	Convert to relative # (divide by NUTS 3 population)

Eurostat	Patents	Metropolitan region	2009	# per million of inhabitants	Approx. 99% complete
Harvested from social media *:	City buzz	Variable	All	# news items for a city / social media posts (twitter)	Using keywords?
VGI (twitter)	# of tweets in city / # of tweets containing name of city	N/A	real time	absolute / relative to population	
Publication repositories	# of publications	Variable	All		Possible to discriminate per field

* further research and testing is needed to evaluate the idea to use crowd sourced information (harvested from the twitter API in order to calculate the so called city buzz. Which includes number of twits within a city and/or twits about a city and or specific on some keywords (content analysis)

4.3.5. Quality of life

Source	Indicator	Scale level	Year	Unit / format	Remarks
Eurostat	Cinema seats Other amenities?	Core city	2009	# per 1000 inhabitants	Approx. 55% complete
Eurostat	Car thefts / Available hospital beds	LUZ	2009	# per 1000 inhabitants	Approx. 50% / 60% complete
European Climate assessment	Climate: temperature / rainfall / sunshine				Registration mandatory; dataset is in netCDF format
ESPON	Climate: Mean minimum January / maximum July temperature	NUTS 2	2010	degree Celsius	

4.3.6. Population

Source	Indicator	Scale level	Year	Unit / format	Remarks
ESPON	Total population	NUTS 3	2011	Absolute #	
ESPON	Total population	LUZ	2011	Absolute #	from OLAP Cube
Eurostat	Age bands	LUZ	2007	Absolute #	

			- 2009		
	[Population density]	NUTS / LUZ		# per km^2	Derived indicator

Please note that in particular for economic and smartness indicators, the search is ongoing. Indicators on e.g. skills, innovation, enterprise births and deaths, competition and R&D expenditure might prove very useful in determining the economic and “smart” potential of an area. The UK Office for National Statistics, in their article “Regional economic indicators”, use such indicators to compare UK regions at NUTS 1 level.
Unfortunately, neither ESPON nor Eurostat database provides data on this at a more detailed (NUTS 3, LUZ) level. Therefore, other sources will still have to be explored.

Paragraphs 4.1 and 4.2 are further elaborated in Annex I: Indicators and Cities.

4.4. Alternative data sources

4.4.1. Data sources suggested by ESPON CU

The CU response feedback paper makes some suggestions as to alternative data sources. They are reviewed below.

ESPON database
An assessment of the new ESPON database showed that the availability of recent data is still limited for NUTS 3 level. For NUTS 2010 level 3, database completeness is < 5% for all indicators. Some new data has been found for NUTS 2006 level 3: total population, total area, IP addresses (change) and Gross Domestic Product. These have been included as indicators in Paragraph 4.2. Furthermore, the ESPON OLAP Cube provides 2011 data for area and population at LUZ level (also included as indicators in Paragraph 4.2).

ESPON projects
Analysis of data produced by the ESPON projects KIT, AMCER, Climate Change, SIESTA, TERCO and TRACC (available from either the new ESPON database or Dropbox, both here and here) revealed that in general they have limited added value for the current project, because some of them have useful indicators but at NUTS 2 level, whereas others do have NUTS 3 indicators, which are however not relevant for city benchmarking purposes. Some of them are exemplified below.

- ESPON Climate:
    - Many indicators of (expected) climate change for the periods 1961-2100 or 2071-2100.
    - Adaptive capacity & mitigative capacity for the period 2005-2011.
    - Data available at NUTS 3 level.
    - But... why use data on projected climate change and/ or mitigative capacity for city benchmarking? Current climate indicators (e.g. avg. lowest / highest temperature, avg. rainfall, avg. hours of sunshine per day) might prove more interesting to this end.
- ESPON SIESTA:
    - Folder maps_RIATE contains several tables, but only one table (SIESTA_map22_20130206) contains data at NUTS 3 level: gdppps, pop_t, gdp_cap, gdp_cap_UE27=100 for 2000 and 2010. This data is comparable to that provided by two tables in http://db2.espon.eu/db2/, although for different years.
    - SIESTA.mdb contains several tables at NUTS 3 level; names of included tables should correspond to map numbers in report, but it appears they do not (at least not in all cases). This makes it very difficult to discover what data

a particular table shows, as in most cases column headers do not provide any info on this. Furthermore, while the SIESTA (Draft) Final Report (Version 10/08/2012) contains many tables at LUZ level, SIESTA.mdb contains only one (Map310_LUZ).

- ESPON TRACC:
  - This data is also available in - and identical to - tables on Air, Multimodal, Road and Rail Accessibility in http://database.espon.eu/db2/.
  - These are already listed as accessibility indicators in Paragraph 4.2.

Furthermore, downloadable data from the projects TerrEvi and TIGER was not found; only (final) reports seem to be available. The CU is kindly requested to indicate whether, and if so, where data from these latter projects may be obtained.

Other data sources
The list of sources suggested in the Project Specification (EUROCITIES, EUKN, EUROCHAMBERS, EUROFOUND) was scanned for data availability, but no data at NUTS level 2 or 3 was found.
Question: Again, the CU is kindly requested to indicate whether, and if so, where data from these sources may be obtained.

The ESPON OLAP Cube is a very interesting way to analyze / visualize (combinations of) thematic dimensions and indicators at different regional levels. However, its functionality is perceived to (at least partly) overlap with that of the webtool being developed.
Currently, the ESPON OLAP Cube contains data on area (2011), population (1990 – 2011) and Corine Land Cover (1990 – 2006) at LUZ and NUTS 1,2 and 3 levels. By contrast, the webtool will include a larger collection of indicators, which can be combined and assigned weighting factors according to preference in order to obtain a visualization of LUZ area ranking based on these settings.

4.4.2. Alternative (licensed) data sources

Several data sources were identified which might be interesting but are subject to license / subscription fees. The CU is kindly requested to indicate whether these sources should be taken into consideration.

RRG GIS Database (
The RRG GIS Database covers 38 European countries and features a large number of variables, also at NUTS 3 level. RRG is aiming at providing the most up-to-date state of the database as possible. The license fee is available on request.

EuroGeographics
The EuroRegionalMap contains data on road and (high speed) rail connections, at a 1:250,000 scale. The dataset was released in december 2010. License fees depend upon the coverage and the user band, but might amount to € 77,000.00 annually for European coverage and unlimited users. The less detailed EuroGlobalMap (1:1,000,000) might be an alternative, as it is supposed to be available as open data now.

OAG Aviation
OAG Aviation provides statistics on global air transport. The database is continuously updated. The license fee is available on request.

Cambridge Econometrics
Cambridge Econometrics maintains a European regional database which contains a variety of indicators useful for analyzing regional trends. The data is updated annually, and includes:

- sectoral data for output, employment, hours-worked;
- demographic data;
- NUTS2 and NUTS3 coverage over the EU27.

Subscription is required; however the subscription fee, if any, is unknown.

The Economist Intelligence Unit Data Services
'A comprehensive database of economic indicators and forecasts, covering 300 series for 201 countries, as well as 45 regional aggregates, running from 1980 and forecasting out five years. For the 60 most important markets, key variables are additionally projected to 2030 in order to facilitate business planning'.
To explore coverage and prices...

5. Overview of more detailed activities, deliveries and outputs envisaged by the project

In Figure 8 it is graphically illustrated the envisaged tasks, their temporal relevance, relation to the deliverables and type of tasks: if technical development (red), user involvement (green), data search or evaluation (blue) and deliverables (in black).

5.1. Architecture and components

The architectural framework is based on the requirements and use cases, and the non-functional requirements, e.g. derived from the INSPIRE directive, the functional and technical design will be developed. The tool will take into account the requirements and guidelines for data harmonization and interoperability as defined by the INSPIRE initiative. This includes using the ETRS1989 standard for spatial referencing. For map portrayal the appropriate projection will be used in cooperation with the stakeholder and data suppliers.
The system design will respect INSPIRE architecture guidelines and service requirements (e.g. download/viewing services), standardized components, to ensure interoperability. The Conceptual architecture is illustrated in Figure 9 and Annex I describes in detail the system architecture. The functional and system design will allow for modularity in implementation so that it is easy to expand in the future. This will add an added value to other stakeholders such as SMEs and public administration allowing them to build a business layer on top of it exploiting and extending its functionality.

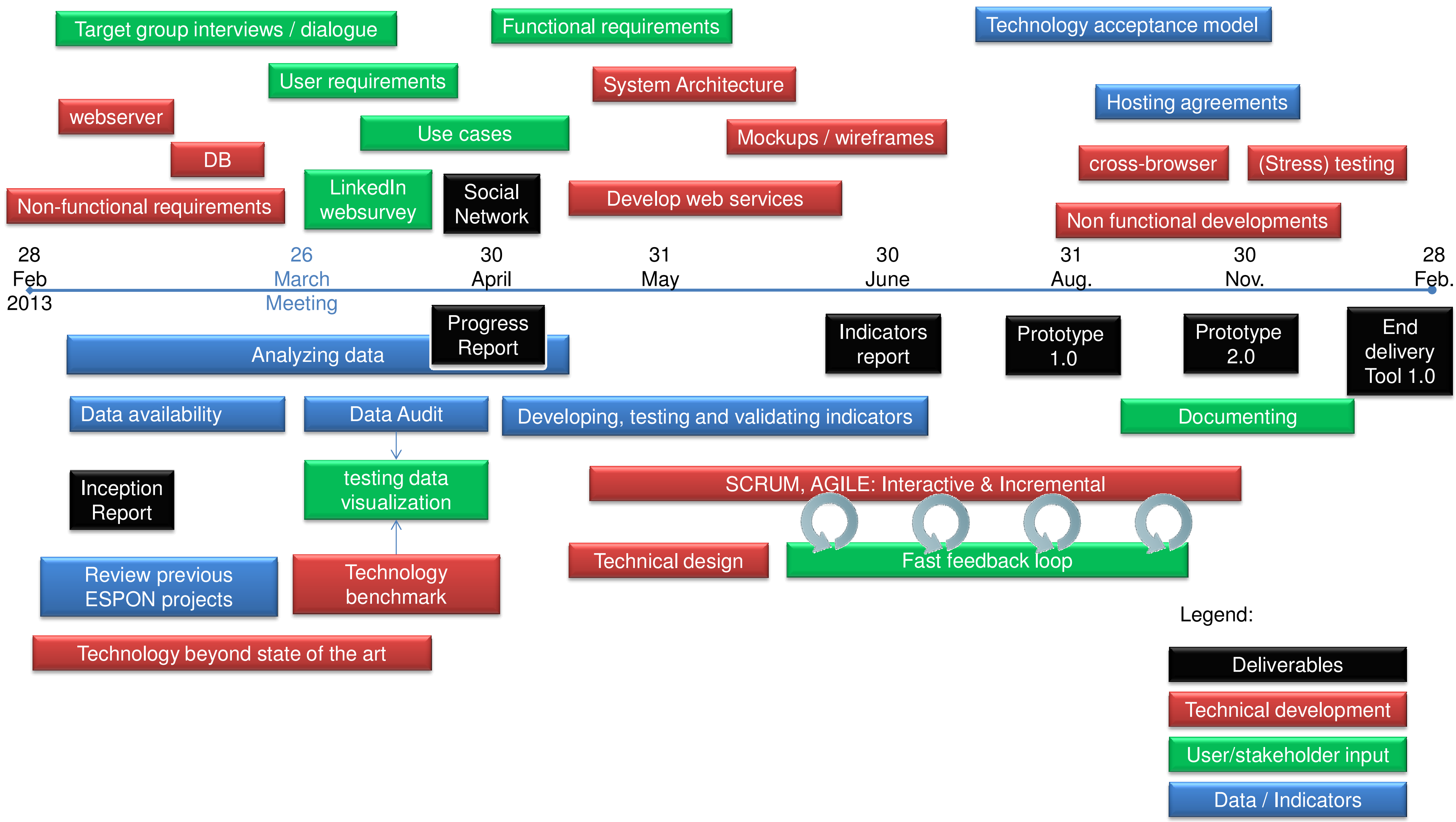

Figure 8 –Task cloud representing the main activities in the project, when they will take place and colors

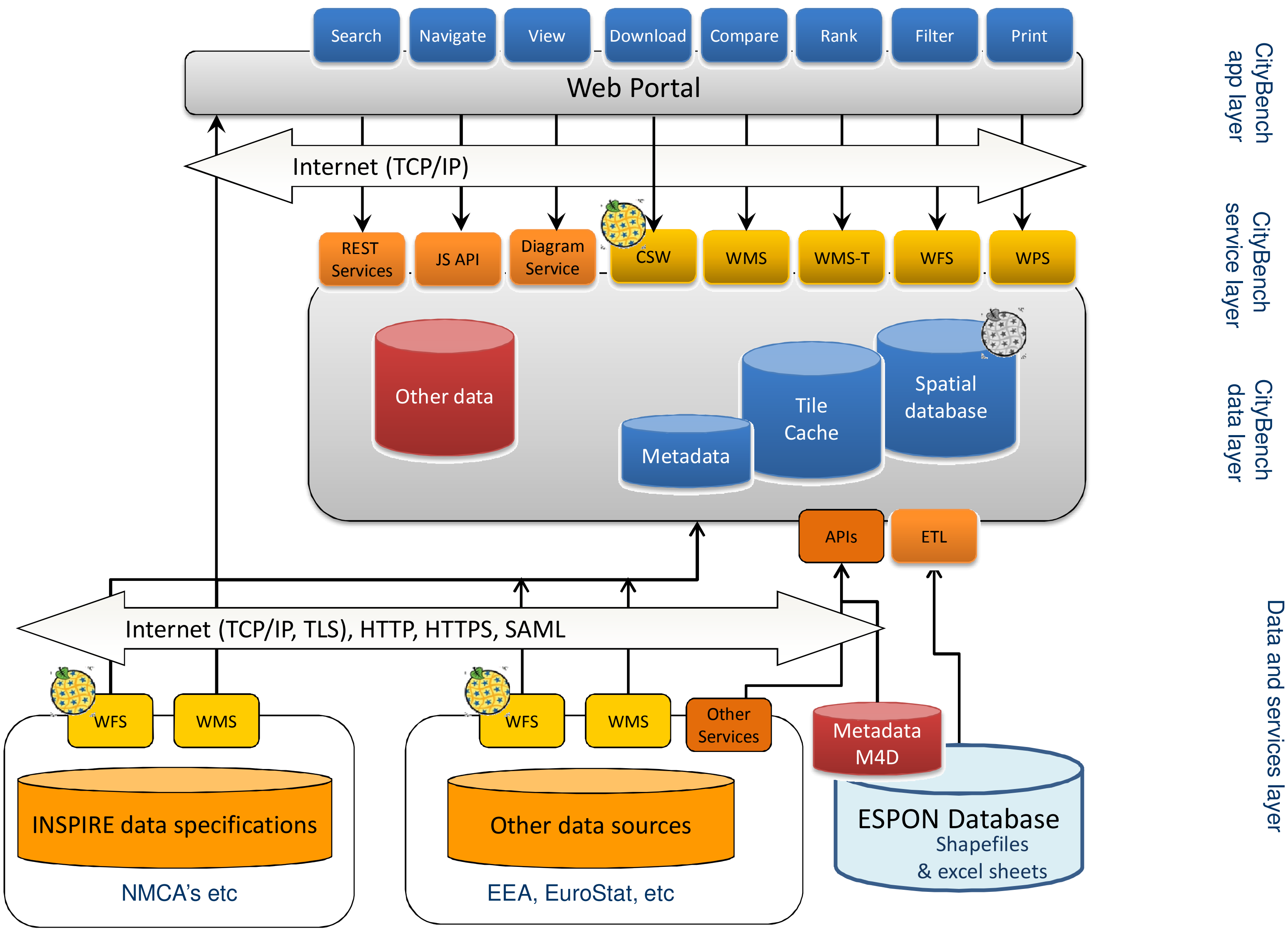

Figure 9 – CityBench conceptual Architecture

5.2. Detailed tasks:

This section provides an update from some of the tasks. The complete list of tasks is available in the proposal document. Here we bring some extra details to some of the tasks and clarity to the division of tasks between the lead and project partner.

T 2.1 Definition of use cases, by Geodan

This task is to develop the scenarios and case studies. These will be broken down into individual use cases which will be used to identify existing gaps and develop the requirements.

T 2.2 Requirements determination and analysis, by Geodan

Using interviews and questionnaires with the steering group and other relevant parties (Linkedin web survey).

Analysis of existing ESPON maps and tools and related projects

T 2.3 Data accessibility and visibility analysis

This task will carry out a survey on the accessibility and visibility of the necessary and available data in order to analyze how it has to be prepared and integrated.

T 2.3.1 Accessibility and visibility, Geodan leads, UJI supports

- Which data from section 4 are discoverable and visible but cannot be accessed, downloadable or used, and why.

T 2.3.2 Availability, Geodan leads, UJI supports

- Which data from section 4 can be accessed, downloadable and integrated to be used, and why.

T 2.4 Development of indicators

T 2.4.1 Existing indicators, Geodan leads, UJI supports

- Expand current list and review additional sources:
    - Global City Indicators Facility
    - ISO TC 268/SC 1 Smart community infrastructures
    - European Environmental Agency Indicators
    - Urban Audit
    - Municipals Indicators System

T 2.4.2 New indicators, Geodan leads, UJI supports

- Assessing economic impacts of expanding existing economic indicators with the geospatial component. Special attention will be given to smart cities' indicators.
- For the final list of indicators, we will proceed as follows:
    - Selection and Definition of Metropolitan Areas
    - Data Sources (as seen in other initiatives/ projects they don't work with a very wide range of data, but exploit them exhaustively)
    - Time Periods
    - Indicators, Scoring and top ranks
    - Additional Analysis

T 2.4.3 Analysis of selected indicators, Geodan leads, UJI supports

For each indicator:

- Data needed: sources, formats, ways of access data,
- Processes needed: (simple process) in the portal, complex process (WPS or REST) in the server (might be slower but cleaner)
- Outputs: formats and styles, where to be rendered (service side (geoserver) or portal)

T 2.5 Design of the webtool

T 2.5.1 Analysis of the functionality of the application, by Geodan

- Functionality (for the selected indicators and use cases). This functionality will dictate the processes to be implemented and deployed (see task 2.4.3)
- Discussed in section 3.

T 2.5.2 Design of the portal, by Geodan

- Layout of the web tool.

T 2.5.3 Architectural framework, by UJI

- As described in section 5.1 and Annex I.
- From task 2.4.3 analysis, definition of Services and Data exchange standards to be used, number of components, format, protocol and where to run/render (as a service or in the portal).
- How the integration of information and components will work. Depending on complexity and velocity needed (desired), we should decide the API for each component: INSPIRE (OGC), REST, others.
- The functional and system design will allow for modularity in implementation so that it is easy to expand in the future. This will add an added value to other stakeholders such as SMEs and public administration allowing them to build a business layer on top of it exploiting and extending its functionality.

T 2.6 Implementation of the webtool

T 2.6.1 Implementation of the database, Geodan & UJI

- Balancing needs and complexity
- The cities table is linked to all the other tables by the unique city luz_id. Each dataset entering the database will be required to have a luz_id.
- Admins can enter new tables from the web interface or use the ETL tool to do this transformation of records to database tables from flat files/excel.
- Views from these tables will be created to suit particular functions as needed by requesting web services.
- Technologies to be used:
    - postgreSQL

T 2.6.2 Implementation of the services, UJI leads, Geodan supports

- "*xls-2-DB ETL tool*". This tool can be from quite simple to really complex. We propose to define one or two transformations from standard ESPON excel sheets and make a document describing how new data from other ESPON projects should be submitted.
- Publish CB database as CB data services
- Other CB Services (see Annex I)
- Technologies to be used:

- Option 1 (open): postgreSQL, gvSIG (or quantumGIS or equivalent), geoserver, geonetwork…
- Option 2 (part licensed): postgreSQL, ESRI solutions. ESRI offers an all-in-one INSPIRE compliant solution, avoiding time and continuously importing data from one technology to another with its related problems, becoming a more robust and sustainable solution. Moreover, it provides a reliable technical support. (If ESPON already maintains an ArcGIS Server, the license cost won't be really important). To be discussed with the SC.

T 2.6.3 Implementation of the front end, by Geodan

- Front-end for xls-2-DB ETL tool
- Processes performed in the portal (as decided in task 2.4.3)
- Web portal

T 3.3 General Interest Publications, UJI leads, Geodan supports

Prepare articles for dissemination. Facilitate publication of professional articles. Attend relevant professional and community-related international conferences and encourage project partners to submit papers/presentations to these conferences.

The consortium has already identified some journals, conferences and events of interest that shall be targeted by the dissemination activities, including:

T 3.3.1 Journals

- Computers, Environment and Urban Systems (Elsevier)
- Earth & Planetary Science (Elsevier)
- Ecological modelling (Elsevier)
- International Journal of Distributed Sensor Networks (Taylor & Francis)
- International Journal of Sensor Networks (IJSNet) (Inder Science Publishers)
- Lecture Notes in Computer Science (Springer)
- Mathematical and Computer Modelling (Elsevier)
- Nature
- Science for Environment Policy: a free service from the European Commission
- Sciences
- Sensors Journal

T 3.3.2 Conferences

- ICT Event
- FIA Event
- Concertation Meetings
- Future Networks and Mobile Networks Summit
- The Lead Partner agrees to participate in meetings, seminars and similar events of the ESPON 2013 Programme and, where appropriate, present results of the project. The upcoming appropriate events are the ESPON Open Seminar in Dublin on 13/14 June 2013 and the ESPON Internal Seminar in Lithuania in December 2012.

T 3.5 technical and user documentation: Geodan leads, UJI supports

Help files and explanatory notes, and installation procedures (automatic install files or installation descriptions) in order to allow for the ESPON program to fully install, manage, maintain and extend the webtool independently.

6. Indication of likely barriers that the project implementation might face

There are three main challenges and risks facing the CityBench system:

1. Lack of data availability at the selected geographical backbone.
2. Sustainability of the tool in the future.
3. Diversity of users' needs expectations, skills and goals (extensively discussed in section 3).

Issues related to missing indicators and indicators available on different scales.
From the analysis of the available indicators and communication with the ESPON CU it is clear there are issues regarding the availability of indicators. Some are missing for certain areas, while others are available only on different scales (in a higher scale, like NUTS2,).

Missing indicators

The project team is very experienced in developing decision support tools and also online, but less experienced in defining and estimating indicators, for this reason, the team will organize strategies to be supported by the steering group, other projects and external expertise in defining, estimating the missing indicators.

A advanced admin interface will be implemented to allow the CU to easily and effortlessly add new indicators as they become available via the import functionality of spreadsheets or other mechanisms to be decided in conjunction with the steering group.

Indicators on different scale

If indicators are available in a LUZ area, but on a different scale, like NUTS2 we will try to interpolate the indicator for the LUZ area itself. One of the strategies is explore suitable pan-european data. The metric of such a dataset will be used to interpolate the indicators . For example the JRC Population dataset could be used to interpolate the indicators based on the metric 'number of people' by intersecting the LUZ area with the JRC population datasets and subsequently interpolate the indicator based on the population within the intersection.

INSPIRE dataspecifications

Not all pan-european data that could be used is available at this moment. More specifically most of dataspecification belonging to INSPIRE Annex III (e.g. human health and safety, utility and governmental services, population distribution and demography) are very relevant as input for the indicator, as well as for interpolation of the indicator data.
As the relevance to the ESPON Benchmark tool (and ESPON in a whole) is very high, the system will include the possibility to use this data once it comes available.

7. Orientation of the project previewed towards the Interim report

The complete list of deliverables, milestones and activities/tasks is provided in the proposal document. The coming period (until the next report: interim), the TPG will focus on the following activities:

- Dialogue with target group over accessibility, content and needs (March and April 2013).
- Dialogue and exploration of synergisms with other ESPON projects (March, April and May 2013).

- Elaboration of a final list of cities and indicators to be integrated in the webtool and geographical levels to be used (end of April 2013)
- Draft version of a European Urban Benchmarking webtool (mock-ups) April 2013
- Draft version of the web text sections in Plain English to populate key website sections such as for example Home, About, How to Use, FAQ etc (April and May 2013).

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