



Citizen Science Observatory of New Indicators of  
Urban Sustainability (project 1076)  
WP 2014 – Deliverable 201401

**New Indicators of Quality of Life: A Review of the  
Literature, Projects, and Applications**

**Francesco Pantisano, Massimo Craglia and Cristina Rosales-  
Sanchez**

2014

## EXECUTIVE SUMMARY

An increasing number of governmental and economic institutions, including Eurostat, the Organization for Economic Co-operation and Development (OECD), and the World Bank acknowledge that the drivers that have dominated the worldwide economic policy for the past five decades – maximizing the Gross Domestic Product (GDP) and the market efficiency – are no longer sufficient goals for ensuring societal prosperity. They recognize that economic growth alone cannot ensure sustainability, social equity, and improved well-being. As a result, both governments and institutions are considering a diverse set of economic policy objectives, based on ‘Beyond-GDP’ indicators, in an attempt to promote greater equality, improved quality of life and sustainable long-term progress. Against the background of these considerations, the JRC Digital Earth and Reference Data Unit launched a project in 2014 on Citizen Science Observatory of New Indicators of Urban Sustainability. The aim of the project is to leverage the expertise of the Unit in the interoperability of data, services, and systems and combine data coming from a diverse range of sources, official government sources, sensors networks, and citizens, to construct new indicators of Quality of Life (QoL). This report reviews the literature on QoL indicators, analyses key projects and initiatives at the international level measuring QoL and well-being, and recommends promising areas in which new indicators could be developed.

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# 1 Introduction

## 1.1 About the UrbanQool Project

The Citizen Observatory of New Indicators of Quality of Life (UrbanQool) Project is an institutional project of the European Commission Joint Research Centre and its Unit on Digital Earth and Reference Data. This Unit is responsible for the technical coordination of the INSPIRE Directive (2007/2/EC) establishing an infrastructure to share spatial datasets and services supporting the implementation of European environmental policies or policies affecting the environment. INSPIRE is currently half-way through its implementation programme (2007-2020), and the JRC supports the member states through dedicated projects and activities related to the implementation of INSPIRE, its evolution addressing other policy areas, and building synergy with Open Data and e-government activities.

As technical coordinator of INSPIRE, it is important that the JRC undertakes the research necessary to make sure that the spatial data infrastructures (SDIs) developed by the member states to comply with INSPIRE are open to future developments in technology, policy, and society. As such the JRC started a series of meetings, workshops, and technical analyses to identify the key features of the next generation spatial data infrastructure, or Digital Earth. Compared to INSPIRE, the key characteristics of Digital Earth are to include more dynamic and diverse data sources from space, sensor networks and citizens, to be more participatory and interactive, and more ubiquitous and accessible anytime anywhere through personal and mobile devices (see for example Craglia et al. 2008, Goodchild et al. 2012). The opportunity of combining diverse data sources, official and citizen-based, both quantitative and qualitative, raises important research challenges with respect to computing infrastructure, data management, analytical methods, and confidentiality. To explore these challenges, the JRC launched two new projects in 2014: UrbanQool, and Digital Earth Platform. The former is more short-term and explore the possibilities of combining data from INSPIRE, Open Data and other official government initiatives with data coming from sensor networks and citizens. The latter is more medium term and analyses emerging methods for complex data analysis (Big Data analytics) and visualisation.

The policy context for the UrbanQool project is provided by the 2009 European Commission's Communication to the Council and European Parliament on "GDP and Beyond: Measuring Progress in a Changing World" (COM(2009) 433 final). The Communication acknowledges that Gross Domestic Product (GDP) is not only the best-known measure of macroeconomic activity, but has also been regarded for decades as a proxy indicator for overall societal development and progress. This second function has however increasingly shown its limitations, as GDP does not measure environmental sustainability or social inclusion, which are critical aspects to be considered in policy debates, and all the more at times of financial difficulty. With this in mind, the Communication sets the stage for the development of more inclusive and reliable indicators able to inform policy decisions better. It also identifies a number of short mid-term measures, including the development of more timely environmental and social indicators, including people's perceptions of well-being. INSPIRE and new satellite data from Copernicus (formerly GMES) are specifically mentioned in the Communication as contributing to the development of more timely environmental indicators. To

develop more timely social indicators, the Communication acknowledges the need to streamline and improve social surveys and improve their timeliness.

The 2009 Communication did not consider alternatives to the traditional survey methods to capture social and environmental indicators. However, the enormous take up of social networks, social media, and citizen-generated content since 2009, together with the convergence of data from satellites, and the commercial sector is creating complex new data flows under the banner of Big Data. This has the potential to change radically the way in which social and environmental indicators, and more in general all official statistics are generated. This opportunity, and challenge, is recognized by the Directors of the Official Statistical Institutes in the Scheveningen Memorandum<sup>1</sup>, which sets out to develop an Official Statistics Big Data strategy, and roadmap during 2014. Within this broad policy framework UrbanQool explores how the combination of official data with new data sources from sensor networks and citizens-generated initiatives can complement traditional methods in the creation of timely social and environmental indicators.

This report reviews the literature on QoL indicators (Section 2), analyses key projects and initiatives at the international level measuring QoL and well-being (section 3), and recommends promising areas in which new indicators could be developed addressing both subjective and objective measures of QoL (Section 4).

The UrbanQool project has also carried out a review of selected citizen science projects and smart cities initiatives and applications, which complements this report (Craglia and Granell, 2014).

## 2 Beyond-GDP and Quality of life

### 2.1 Definition of GDP and its main limitations

The Gross Domestic Product (GDP) measures the *monetary value of all final goods and services produced in a country* in a given period of time. It generally measures the production in a country regardless of the various uses of a given production. For example, production can be intended for immediate consumption, or for investments, or for replacing depreciated assets.

All goods and services considered in the GDP definition are evaluated at current market price (i.e., at the price those goods and services are actually sold). The GDP does not consider all those commodities that are illegally produced and sold, as well as those goods and services that are provided by autonomous production.

Although GDP has been proposed to quantify the economic activity of a country, the growth rate of GDP has often been considered as an indicator for the pace of a country's progress,

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[http://epp.eurostat.ec.europa.eu/portal/page/portal/pgp\\_ess/0\\_DOCS/estat/SCHVENINGEN\\_MEMORANDUM%20Final%20version\\_0.pdf](http://epp.eurostat.ec.europa.eu/portal/page/portal/pgp_ess/0_DOCS/estat/SCHVENINGEN_MEMORANDUM%20Final%20version_0.pdf)

and a proxy for well-being of its population. Nevertheless, GDP does not account for fundamental factors of progress, as, most notably, the environmental assets. In principle, GDP does not consider all the non-economic environmental processes that provide benefits to the societies at no cost, while they require a cost when they are to be restored. For example, the forests provide for oxygen, CO2 reduction, flood and avalanche control at no market cost. These services are not tradable, hence, they are not accounted for in GDP. However, forests are invaluable natural assets that cannot be replaced if irreversibly damaged. Similarly, the positive impacts of environment on human health are invaluable, while degraded or poor environmental conditions may lead to illnesses or depression, which, in turn, yield large medical expenses for society. In summary, all non-marketable environmental and human factors are not considered in the computation of GDP, although they have profound effects on quality of life.

Due to the reasons above, there is a need to bridge the gap between economic, environmental and social policy objectives, as economic objectives are often predominant. By noticing that there is a bias in policy-making towards prioritizing GDP growth and markets enlargement, the scope of beyond-GDP initiatives is to correct this bias. It is necessary to stress that, in terms of their use, beyond-GDP indicators are not just going to be used in parallel with traditional economic indicators, rather to become a part of an integrated, more holistic, process of policy making.

## 2.2 The Stiglitz-Sen-Fitoussi commission and its recommendations

In line with the philosophy of beyond-GDP, in early 2008, former French President Sarkozy established the Commission on the Measurement of Economic Performance and Social Progress, led by experts Joseph Stiglitz, Amartya Sen and Jean Paul Fitoussi, with the aim of identifying the fundamental limits of GDP in measuring social progress. The Stiglitz-Sen-Fitoussi commission investigated the information required for the construction of more appropriate indicators of social progress and “to shift emphasis from measuring economic production to measuring people's well-being”. In response, the Commission did not propose either an indicator or a dashboard of indicators of well-being. Instead, they filed twelve recommendations, grouped in three classes (Stiglitz-Sen-Fitoussi commission report): Material living conditions, QoL and Sustainability.

The first set of recommendations includes suggestions aimed at overcoming classical GDP limitations. To this end, it is recommended to:

- Consider income and consumption jointly with wealth.
- Give emphasis to the household perspective.
- When evaluating material well-being, look at income and consumption rather than production.
- Focus on the distribution of income, consumption and wealth.
- Consider the income from non-market activities.

The second group of recommendations refers to QoL:

- QoL depends on individual objective conditions and capabilities. Steps should be taken to improve measures of health, education, personal activities and environmental conditions. In particular, substantial effort should be devoted to developing and implementing robust, reliable measures of social relations, political interest, and insecurity that can be shown to predict life satisfaction.
- QoL indicators should assess inequalities in a comprehensive way.
- Surveys should be designed to assess links between the various QoL domains for each person, and this information should be used when designing policies.
- Statistical offices should provide information needed to aggregate across QoL dimensions, allowing the construction of different indices.
- Measures of both objective and subjective well-being provide key information about QoL. In their surveys statistical offices should incorporate questions which include people's life evaluations, experiences and priorities.

The third set of recommendations is on *sustainable development* and *environment*:

- Sustainability assessment requires a well-identified dashboard of indicators. The distinctive feature of the components of this dashboard should be that they are interpretable as variations of some underlying "stocks". A monetary index of sustainability has its place in this kind of dashboard but, in the current state of the art, it should remain essentially focused on economic aspects of sustainability.
- The environmental aspects of sustainability deserve a separate follow-up based on a well-chosen set of physical indicators. In particular there is need for a clear indicator of our proximity to dangerous levels of environmental damage (such as those associated with climate change or the depletion of fish stocks.)

In summary, the Stiglitz-Sen-Fitoussi commission recommends that beyond-GDP projects should not just plan the construction of a synthetic alternative indicator, but to overcome the view of the market as a societal good in itself. Measuring well-being is far from being a purely technical problem as the very concept of well-being depends on individual preferences and the values of a society. As a result, it is very impractical to compare the characteristics of a society based on one indicator. To this end, the commission's recommends the collection of multi-dimension statistical measures able to envelop societal well-being.

The recommendations of the Stiglitz-Sen-Fitoussi commission represent the basic guidelines for the definition of QoL indicators. Such indicators are, therefore, required to exhibit three main characteristics. First, social indicators should relate to individuals or households rather than to very large social aggregates. Second, they should be oriented towards societal objectives and functions. Finally, QoL indicators should be able to measure the output of social processes or policies. In conclusion, well-being indicators, as social indicators, are intended to have a direct normative importance, thus, one should be able to interpret changes in indicators as QoL improvement or deterioration without ambiguity.

## 2.3 Measuring well-being by means of QoL indicator: Definitions and functions

### 2.3.1 What is 'well' in well-being?

In order to measure well-being, one must identify the factors that characterize *well-being* (Cobb, 2000: 6). There is a variety of such theories and notions of what constitutes a 'good life' or a 'good society' and correspondingly different concepts of welfare and quality of life have been developed by highlighting different components and dimensions. Moreover, the kind of indicators chosen for empirical measurement largely depends on the underlying conceptualization of quality of life, notably by the distinction of 'objective' and 'subjective' social indicators. Here, while objective social indicators are statistics representing social facts independent of personal evaluations, subjective social indicators are measures of individual perceptions and evaluations of social conditions. The nature of these two components has important implication on the techniques of data collection. In fact, while objective data can be collected without interviewing individuals, subjective indicators cannot transcend from an individual's background and sensitivity towards specific social matters.

In summary, objective and subjective well-being respectively define one's living environmental context and how that is perceived.

## 2.4 Classification criteria

In order to define or identify a set of suitable QoL indicators, a necessary operation is the definition of the social and environmental context of the analysis. In this respect, focusing on a specific category of indicators can facilitate such contextualization. In this section, we discuss the main classification criteria, proposed in the literature, based on the purpose of the analysis.

### 2.4.1 Objective and Subjective well-being

One classic distinction is between objective and subjective indicators. These dimensions correspond to two fundamental (yet opposite) methodologies for measuring well-being. On the one hand, Scandinavian researchers Erikson (1993) and Uusitalo (1994) conceptualized objective well-being by exclusively focusing on physical resources and life objectives, which reflect fundamental human needs and to which extent they are met. In this respect, recurrent objective well-being indicators include population composition, wealth distribution, occupation rate, literacy rate, as well as economic production indices. On the other hand, subjective well-being has been formulated by American researchers Campbell, Converse and Rodgers (1976) as the final outcome of an individual's sense of fulfillment, happiness and adequacy/fitness with respect to the standards of a society (Diener and Lucas 1999; Easterlin 2003).



With respect to the classification above, an important debate exists on whether well-being should be measured through objective or subjective indicators. In this regard, a frequent argument is that objective well-being indicators (notably those quantifying urban distress factors) are inconclusive due to the fact that external conditions are always filtered through personal experience, in which personal judgment, sensitivity, social roles differ from person to person. Similarly, subjective well-being indicators cannot be generalized since none of the obvious human behaviors yields to well-being in a certain or consistent manner. Therefore, since objective properties are ultimately experienced through the subjective, personal involvement of the stakeholders, both classes of indicators serve their purpose only if used in combination or strictly related to one another.

A possible unification of those two methodologies has been proposed by Nobel laureate Amartya Sen by describing “living as a combination of various ‘doings and beings’”, and proposing the assessment of well-being in terms of the capability to achieve valuable functionings (Sen, 1993). These functionings “represent parts of the state of a person – in particular the various things that he or she manages to do or be in leading a life. Some functionings are very elementary, such as being adequately nourished, or being in good health, others may be more complex but still widely valued, such as achieving self-respect or being socially integrated” (Sen, 1993). Such a notion of well-being has been further elaborated within the United Nations Development Program in the framework of ‘Human Development Approach’ (UNDP 1998) and also included in the report of the Stiglitz-Sen-Fitoussi commission (Stiglitz-Sen-Fitoussi commission report).

#### **2.4.2 Individual and Societal Well-being**

Well-being is often regarded not only as a state, but as a process that emphasizes the role of personal experience and the capacity of individuals. In these terms, a constitutive element of life quality is the ‘quality of persons’, since life is defined by the relations between two persons or between an individual and the elements of his or her living environment (Lane 1996). Although individual well-being have been part of the early QoL studies, more recent research trends focus on dimensions of societal well-being, which affect the ‘quality of a community or society’ in terms of fairness, equity, or freedom.

Two main examples of societal well-being are given by social cohesion and sustainability. In particular, the concept of social cohesion received great attention within policy making processes by monitoring how it is affected by income inequality, poverty, unemployment, and crime. With respect to the concept of sustainability, the quality of urban life has often been envisioned as a component of a broader concept of sustainable growth (Nordhaus 1972, Veenhoven 2006). Thus, the concept of sustainability can be seen as a new answer to the traditional concern with societal development and QoL continuous enhancement.

While sustainable growth implicitly refers to the importance of how urban settlements will expand in the future, the economy perspective, and natural resources consumption trends, QoL mainly focuses on the present status quo. As a result, if on the one side, sustainable development projects typically include long-term plans intended to guide future urban expansions, QoL studies are aimed at monitoring the effects of current policies and prompt-

ly modify them, if necessary. Although these two approaches typically have different paces, they are interdependent and both necessary to the full understanding of societal needs.

### 2.4.3 Evaluative and Hedonic Well-being

When defining a set of QoL indicators and devising their sampling over time, two main approaches exist. In the first approach, it is assumed that a person's evaluation of an event is based largely on the most intense (peak) emotion experienced during the event and by the last (end) emotion experienced. This approach is also known as hedonic, or affective, i.e., based on the 'peak-end rule'. The second approach relies on people remembering their experiences, thus judging a circumstance based on their overall life status, on the integral of their emotional experiences. Such an approach is said to be evaluative or cognitive.

These two approaches have important implications in the design of QoL data sampling techniques. In fact, while hedonic QoL can be measured by observing individual snapshot-like samples, an evaluative approach requires the construction of historical series spanning large time windows. A mixed approach has been proposed by Noble laureate Daniel Kahneman (Kahneman 2004, 2005), who argued that the sum of the hedonic experience of an individual over their lifetime, is a good metric of overall well-being. As a result, the affective component of subjective well-being can be inferred by sampling and averaging out an individual's moods with respect to a given topic or oneself, over an adequate time horizon. Such a concept has initiated the study of sentiment analysis that recently has drawn the attention of advertising and marketing specialists.

## 2.5 Modern definitions and purposes of QoL indicators

Among the modern definitions of QoL indicators, two are particularly noteworthy. The first was provided by the Australian bureau of Statistics: "Social indicators are measures of social well-being which provide a contemporary view of social conditions and monitor trends in a range of areas of social concern over time". The second appears in a United Nations document: "Social indicators can be defined as statistics that usefully reflect important social conditions and that facilitate the process of assessing those conditions and their evolution. Social indicators are used to identify social problems that require action, to develop priorities and goals for action and spending, and to assess the effectiveness of programmes and policies" (United Nations, 1994). This latter definition notably proposes the use of indicators not simply for the description of social behaviours but most importantly for in the identification of issues and for the assessment of the impact of policies. In this sense, the primary function is not the direct guidance and efficiency control of political programmes, but the broad the provision of an information base which supports the policy making process in an indirect way.

To this end, defining a comprehensive set of indicators for the analysis and progress evaluation of well-being in large urban areas is becoming a frequent task, notably in light of the technological advancement towards smart cities and internet-based acquisition of citizen QoL data. To this aim, the Calvert-Henderson QoL Indicators (Flynn 2000) are widely recognized as the most suitable to the assessment of how converging technologies of nanocom-

puting, biology-inspired design, smart metering and the ubiquitous Internet access affect life and the behaviour of developed country citizens, in diverse scenarios. The Calvert-Henderson QoL indicators cover twelve socio-economic areas of major impact, such as education, employment, energy, environment, health, human rights, income, infrastructure, national security, public safety, re-creation and shelter. These indicators quantify dimensions of objective well-being and are measured with the support of ICT automated technologies, beside traditional survey-based methods.

Since 2007, defining beyond-GDP indicators is a top priority for European Commission statisticians measuring societal progress and the effects of well-being-relevant policy-making. With these objectives, the European Statistical System Committee (ESSC) in November 2011 has defined an extensive set of indicators spanning topics of material living conditions, productive activity, health, education, leisure and social interactions, economic and physical safety, governance and basic rights, natural and living environment, overall experience of life. The direction taken by the ESSC promises to integrate mainstream objective indicators with indices of subjective perception of well-being. Clearly, gathering subjective well-being data demands direct interaction with the interviewees, on a different time scale, and an approach tailored to the cultural background, technology literacy, and environmental context under evaluation.

### 3 Review of the QoL projects and initiatives

#### 3.1 Recent QoL projects and indicators

Table I reviews a selection of key projects measuring QoL and the indicators they adopt.

**Table I – QoL projects and indicators**

Project/indicator name	Description	Notes
Better Life Index	<p>The Better Life Index is an interactive composite index of well-being proposed by the Organization for Economic Cooperation and Development (OECD). One of its main features is the involvement of citizens in the debate on its construction. The advantage of a composite index is that it can provide an easy-to-read overview of well-being patterns. This index allows comparing well-being across countries, and is based on 11 topics defined as essential by the OECD.</p> <p>1) Housing</p> <ul style="list-style-type: none"> <li>i. Rooms per person</li> <li>ii. Housing expenditure</li> <li>iii. Dwelling with basic facilities</li> </ul> <p>2) Income</p> <ul style="list-style-type: none"> <li>i. Household disposable income</li> <li>ii. Household financial wealth</li> </ul> <p>3) Jobs</p> <ul style="list-style-type: none"> <li>i. Employment rate</li> <li>ii. Long-term unemployment rate</li> <li>iii. Personal earnings</li> <li>iv. Job security</li> </ul>	<ul style="list-style-type: none"> <li>• Subjective and objective indicators</li> <li>• International project</li> <li>• These 11 dimensions reflect essential well-being in terms of material living conditions (housing, income, jobs) and quality of life (community, education, environment, governance, health, life satisfaction, safety and work-life balance). Each of the 11 topics of the index is currently based on one to three indicators. Within each topic, the indicators are equally weighted and averaged. Data cover the 34 countries that are members of the OECD and mainly come from official sources such as the OECD or National Accounts, United Nations Statistics, National Statistics Offices. So far, data on most of the dimensions of the Better Life Index (BLI) are not available at a disaggregated level. In other words, comparisons between various social groups (e.g. men vs. women, youth vs. elderly, etc.) are not yet possible. In addition, the BLI index cannot be compared over time, as its methodology is still being developed. In addition, many of the BLI dimensions do not change quickly over</li> </ul>

	<p>4) Community i. Quality of support network</p> <p>5) Education i. Educational attainment ii. Years in education iii. Students skills in maths, reading and science</p> <p>6) Environment i. Air pollution ii. Water quality</p> <p>7) Civic engagement i. Voter turnout ii. Consultation on rule-making</p> <p>8) Health i. Life expectancy ii. Self-reported health</p> <p>9) Life Satisfaction i. Life satisfaction in general</p> <p>10) Safety i. Homicide rate ii. Assault rate</p> <p>11) Work-life balance i. Employees working very long hours ii. Time devoted to leisure and personal care</p>	<p>time, and therefore some years will have to pass before assessment of genuine progress/regression is possible.</p> <ul style="list-style-type: none"> <li>• An updated version of the index, launched in 2012, also includes data on gender and inequality.</li> <li>• <a href="http://www.oecdbetterlifeindex.org/">http://www.oecdbetterlifeindex.org/</a></li> </ul>
<p>Plan Nacional para el Buen Vivir (Well-being plan for Ecuador)</p>	<p>The index of “Buen Vivir” – Spanish for “good living” -- was proposed by the Ecuadorian National Statistics Office (INEC) and by the Department for Planning in Ecuador and subsequently adopted in Bolivia and Brazil. In these South-American countries, it is reckoned as one of the most notable alternatives to GDP.</p> <p>Although, it is based on the concept of well-being, it delves into aspects not ordinarily considered in traditional well-being indices. In fact, it emphasizes living in harmony with others and with the environment. Buen Vivir is a multi-dimensional indicator that encompasses:</p> <ol style="list-style-type: none"> <li>1) satisfaction of human needs,</li> <li>2) QoL,</li> <li>3) loving and being loved,</li> <li>4) healthy living in peace and harmony with nature.</li> </ol>	<ul style="list-style-type: none"> <li>• Subjective and objective indicators.</li> <li>• National project (Ecuador, Bolivia, Brazil)</li> <li>• The peculiarity of his indicator is the final value that the index adopts since it gives, as a result, the number of years of life (time) wasted because of degradation of the natural environment. The final structure of this measure is a dashboard of indicators.</li> <li>• Notably, the Ecuadorian National Statistics Office is attempting at extending this index to incorporate subjective well-being dimensions.</li> <li>• <a href="http://plan.senplades.gob.ec/">http://plan.senplades.gob.ec/</a></li> </ul>
<p>Canadian Index of Wellbeing (CIW)</p>	<p>The Canadian Index of Wellbeing (CIW) is an initiative that reports on the quality of life of Canadians. Since the 1960’s in Canada there has been increasing interest and effort in measuring social progress. In 1999 the Atkinson Charitable Foundation (ACF) recognized the need to create an independent and credible national voice to measure the economic, health, social and environmental wellbeing of Canadians, and developed the Canadian Index of Wellbeing (CIW). This index is a new way of measuring well-being that goes beyond narrow economic measures like GDP. The CIW measures</p>	<ul style="list-style-type: none"> <li>• Based on subjective and objective indicators (with predominance of the former type)</li> <li>• National project</li> <li>• It is calculated annually and since 2012 also at provincial level.</li> <li>• <a href="https://uwaterloo.ca/canadian-index-wellbeing/">https://uwaterloo.ca/canadian-index-wellbeing/</a></li> </ul>

	<p>well-being in Canada across 8 interconnected domains of wellbeing:</p> <ol style="list-style-type: none"> <li>1) Community vitality: measures strength, activity and inclusiveness of relationships between residents, private sector, public sector and civil society organizations that foster individual and collective wellbeing.</li> <li>2) Democratic engagement: measures the participation of citizens in public life and in governance, the functioning of Canadian government and the role Canadians and their institutions play as global citizens.</li> <li>3) Education: measures literacy and skill levels of the population, including the ability of both children and adults to function in various contexts and the ability to plan for and adapt to future situations.</li> <li>4) Environment (= Ecosystem wealth): measures the state of, and trends in, Canada's environment by looking at the stocks and flows of Canada's environmental goods and services.</li> <li>5) Healthy Populations: measures the physical, mental, and social wellbeing of the population by looking at different aspects of health status and certain determinants of health.</li> <li>6) Leisure and culture: measures activity in the widespread field of culture, which involves all forms of human expression; the more focused area of the arts; and recreational activities.</li> <li>7) Living standard: measures the level and distribution of income and wealth, including trends in poverty; income volatility; and economic security, including job security, food, housing and the social safety net.</li> <li>8) Time use: it measures the use of time; how people experience time, and how it affects wellbeing.</li> </ol>	
Capability Index (CI)	<p>The Capability Index (CI) was formulated by Robeyns and Van der Veen as a synthetic indicator of quality of life. In the formulation of the index, a list of recommendations for policy-relevant areas of quality of life is proposed:</p> <ol style="list-style-type: none"> <li>1) physical health</li> <li>2) mental health</li> <li>3) knowledge and intellectual development</li> <li>4) labor</li> <li>5) care</li> <li>6) social relations</li> <li>7) recreation</li> <li>8) shelter</li> <li>9) living-environment</li> <li>10) mobility</li> <li>11) security</li> <li>12) non-discrimination and respect for diversity</li> <li>13) political participation</li> </ol>	<ul style="list-style-type: none"> <li>• Based only on objective indicators</li> <li>• International project</li> <li>• <a href="http://www.mnp.nl/en/publications/2007/Sustainablequalityoflife.html">http://www.mnp.nl/en/publications/2007/Sustainablequalityoflife.html</a></li> </ul>

Comparison of the welfare of nations	<p>The working group for Economic Analysis at the Swedish Department of Economic Statistics has developed a composite indicator, taking in account several dimensions of well-being, such as:</p> <ol style="list-style-type: none"> <li>1) Economic standard,</li> <li>2) Leisure time,</li> <li>3) Health,</li> <li>4) Environment,</li> <li>5) Welfare.</li> </ol>	<ul style="list-style-type: none"> <li>• Based exclusively on objective indicators</li> <li>• International project</li> <li>• <a href="http://www.scb.se/statistik/OV/OV9999/2004A01/OV9999_2004A01_BR_X100ST0415.pdf">http://www.scb.se/statistik/OV/OV9999/2004A01/OV9999_2004A01_BR_X100ST0415.pdf</a></li> </ul>
EEA Core Set of Indicators	<p>The European Environmental Agency (EEA) annually launches several environmental indicators and fact sheets about Europe's environment, such as transport emissions of air pollutants; Total primary energy intensity; Energy efficiency and specific CO2 emissions, Distribution of marine species, among others. All these indicators belong to five macro areas:</p> <ol style="list-style-type: none"> <li>1) Air pollution,</li> <li>2) Biodiversity,</li> <li>3) Climate change,</li> <li>4) Land use,</li> <li>5) Water quality.</li> </ol>	<ul style="list-style-type: none"> <li>• Objective indicators</li> <li>• International project</li> <li>• <a href="http://www.eea.europa.eu/data-and-maps/indicators#c5=&amp;c7=all&amp;c0=10&amp;b_st art=0">http://www.eea.europa.eu/data-and-maps/indicators#c5=&amp;c7=all&amp;c0=10&amp;b_st art=0</a></li> </ul>
Ensuring QoL in Europe's cities and towns	<p>Report that collects EU cities projects and visions on:</p> <ol style="list-style-type: none"> <li>1) Urban environment,</li> <li>2) Democratic participation,</li> <li>3) Cultural participation,</li> <li>4) Social issues</li> <li>5) Economic challenges.</li> </ol> <p>It defines a vision for progress towards a more sustainable, well-designed urban future by understanding cities complexities and considering an integrated approach.</p>	<ul style="list-style-type: none"> <li>• Based on objective and subjective indicators</li> <li>• International project</li> <li>• <a href="http://www.eea.europa.eu/publications/quality-of-life-in-Europes-cities-and-towns">http://www.eea.europa.eu/publications/quality-of-life-in-Europes-cities-and-towns</a></li> </ul>
EU set of Sustainable Development Indicators	<p>Sustainable Development Indicators (SDIs) are used in the European Union to monitor the EU Sustainable Development Strategy (EU SDS). Every two years the results are published in a report by Eurostat. All the indicators (more than 100) are grouped in ten themes:</p> <ol style="list-style-type: none"> <li>1) Socio-economic development,</li> <li>2) Sustainable consumption and production,</li> <li>3) Social inclusion,</li> <li>4) Demographic changes,</li> <li>5) Public health,</li> <li>6) Climate change and energy,</li> <li>7) Sustainable transport,</li> <li>8) Natural resources,</li> <li>9) Global partnership</li> <li>10) Good governance.</li> </ol>	<ul style="list-style-type: none"> <li>• Objective indicators</li> <li>• International project</li> <li>• <a href="http://epp.eurostat.ec.europa.eu/portal/page/portal/sdi/context">http://epp.eurostat.ec.europa.eu/portal/page/portal/sdi/context</a></li> </ul>
Gallup-Healthways Well-Being Index	<p>Barometer of Americans' perception of their wellbeing that for six years has collected data the six</p>	<ul style="list-style-type: none"> <li>• Based on objective indicators</li> </ul>

	<p>domains that comprise the national well-being index:</p> <ol style="list-style-type: none"> <li>1) life evaluation,</li> <li>2) emotional health,</li> <li>3) working conditions,</li> <li>4) physical health,</li> <li>5) healthy behaviors</li> <li>6) access to basic services</li> </ol> <p>Upcoming versions will intend to cover a more global area.</p>	<ul style="list-style-type: none"> <li>• National project (United States of America)</li> <li>• <a href="http://www.healthways.com/solution/default.aspx?id=1125">http://www.healthways.com/solution/default.aspx?id=1125</a></li> </ul>
Gender Empowerment Measure (GEM)	<p>The Gender Empowerment Measure (GEM) is an attempt, by the United Nations Development Programme, to measure the extents of worldwide gender inequality, based on estimates of women's:</p> <ol style="list-style-type: none"> <li>1) relative economic income,</li> <li>2) participations in high-paying positions</li> <li>3) economic power,</li> <li>4) access to professional and parliamentary positions.</li> </ol>	<ul style="list-style-type: none"> <li>• Based on objective indicators</li> <li>• International project</li> <li>• <a href="http://hdr.undp.org/en/statistics/indices/gdi_gem/">http://hdr.undp.org/en/statistics/indices/gdi_gem/</a></li> </ul>
Gender Inequality Index (GII)	<p>The Gender Inequality Index (GII) measures the inequality in life achievements between women and men. The greater the gender disparity in basic capabilities, the lower a country's GII compared with its Human Development Index (also proposed by the UN).</p> <p>It ranges from 0, which indicates that women and men fare equally, to 1, which indicates that women fare as poorly as possible in all measured dimensions. Two indicators measure the health dimension: maternal mortality ratio and adolescent fertility rate. Two indicators also measure the empowerment dimension: the share of parliamentary seats held by each sex and by secondary and higher education attainment levels. Work dimension is measured by women's participation in the work force.</p>	<ul style="list-style-type: none"> <li>• Based on objective indicators</li> <li>• International project</li> <li>• In practice, the GII is an HDI adjusted according to the gender inequality in a given country.</li> <li>• <a href="http://hdr.undp.org/en/statistics/gii/">http://hdr.undp.org/en/statistics/gii/</a></li> </ul>
Genuine Progress Indicator	<p>The Genuine Progress Indicator (GPI) derives from the Index of Sustainable Economic Welfare (ISEW). It was developed by the non-profit organization Redefining Progress (based in Oakland, California) in 1995 and it is essentially a second-generation version of the ISEW.</p> <p>GPI=</p> <ul style="list-style-type: none"> <li>+ Personal consumption weighted by income distribution index</li> <li>+ Value of household work and parenting</li> <li>+ Value of higher education</li> <li>+ Value of volunteer work</li> <li>+ Services of consumer durables</li> <li>+ Services of highways and streets</li> <li>- Cost of crime</li> <li>- Loss of leisure time</li> <li>- Cost of unemployment</li> <li>- Cost of consumer durables</li> <li>- Cost of commuting</li> <li>- Cost of household pollution abatement</li> <li>- Cost of automobile accidents</li> <li>- Cost of water pollution</li> <li>- Cost of air pollution</li> </ul>	<ul style="list-style-type: none"> <li>• Based on objective indicators</li> <li>• National project. Assessments at regional and community level are under study.</li> <li>• The purpose of both indicators is the same: to portray economic progress (or lack thereof) more accurately by accounting for those factors that affect quality of life and our ability to sustain it into the future.</li> <li>• <a href="http://rprogress.org/index.htm">http://rprogress.org/index.htm</a></li> </ul>

	<ul style="list-style-type: none"> <li>- Cost of noise pollution</li> <li>- Loss of wetlands</li> <li>- Loss of farmland</li> <li>-/+ Loss of forest area and damage from logging roads</li> <li>- Depletion of non-renewable energy resources</li> <li>- Carbon dioxide emissions damage</li> <li>- Cost of ozone depletion</li> <li>+/- Net capital investment</li> <li>+/- Net foreign borrowing</li> </ul>	
Gross National Happiness Index (Buthan)	<p>Gross National Happiness is a term coined by His Majesty the Fourth King of Bhutan, Jigme Singye Wangchuck in the 1970s. Its four pillars have often explained the concept of GNH: good governance, sustainable socio-economic development, cultural preservation, and environmental conservation. Lately the four pillars have been further expanded into nine domains</p> <p>The Gross National Happiness Index (GNH) is a single number index developed from 33 indicators categorized under nine domains:</p> <ol style="list-style-type: none"> <li>1) psychological wellbeing,</li> <li>2) health,</li> <li>3) education,</li> <li>4) time use,</li> <li>5) cultural diversity and resilience,</li> <li>6) good governance,</li> <li>7) community vitality,</li> <li>8) ecological diversity and resilience,</li> <li>9) living standards.</li> </ol>	<ul style="list-style-type: none"> <li>• Based on objective and subjective indicators.</li> <li>• National project (Buthan)</li> <li>• Each domain represents one of the components of wellbeing of the Bhutanese people, and here the term 'well-being' refers to fulfilling conditions of a 'good life' as per the values and principles laid down by the concept of Gross National Happiness.</li> <li>• <a href="http://www.grossnationalhappiness.com/">http://www.grossnationalhappiness.com/</a></li> </ul>
Happy Planet Index (HPI)	<p>The Happy Planet Index (HPI) was introduced by the New Economics Foundation (NEF) in July 2006. It is an index of human well-being and environmental impact that incorporates three separate indicators: ecological footprint, life satisfaction and life expectancy as follows:</p> $\text{HPI} = (\text{Life satisfaction} \times \text{Life expectancy}) / \text{Ecological Footprint}$ <p>The final value belongs to the interval 0 – 100. The 2012 HPI report ranks 151 countries and is the third time the index has been published.</p>	<ul style="list-style-type: none"> <li>• Based on objective and subjective indicators.</li> <li>• International project</li> <li>• Much criticism of the index has been due to commentators falsely understanding it to be a measure of happiness, when it is in fact a measure of the ecological efficiency of supporting well-being.</li> <li>• <a href="http://www.happyplanetindex.org/">http://www.happyplanetindex.org/</a></li> <li>• <a href="http://www.neweconomics.org/publications/happy-planet-index">http://www.neweconomics.org/publications/happy-planet-index</a></li> </ul>
Index of Economic Well-being (IEWB)	<p>The Index of Economic Well-being (IEWB) was developed in 1998. The objective of the IEWB is to provide a well-organized and manageable set of objective economic data, rather than to summarize the economic well-being of society in a single objective index.</p> <p>The index is the result of a weighted average of four combined indicators on:</p> <ol style="list-style-type: none"> <li>1) Consumption flows: based on effective per capita consumption flows, including consumption of marketed goods and services; government services; effective per capita flows of household production; leisure; and changes in a life span.</li> <li>2) Wealth (economic, human and environmental): based on net societal accumulation of stocks of productive resources, including net</li> </ol>	<ul style="list-style-type: none"> <li>• Based on objective indicators.</li> <li>• International project</li> <li>• The IEWB was formulated by a no-profit Canadian organization, called "Centre for the Study of Living Standards" following the original idea of Osberg (a member of the MacDonald Commission entitled "<i>The Measurement of Economic Welfare</i>").</li> <li>• The overall IEWB is calculated as the weighted average of the four scaled components, with aggregation weight subjectively determined according to individual views on relative importance of each.</li> <li>• The index was calculated for Canada, United States and several OECD member countries.</li> <li>• <a href="http://www.csls.ca/iwb.asp">www.csls.ca/iwb.asp</a></li> </ul>



	<p>accumulation of tangible capital; housing stocks; net changes in the value of natural resources stocks; environmental costs; net changes in the level of foreign indebtedness; accumulation of human capital; and the stock of R&amp;D investment.</p> <p>3) Inequalities: based on income distribution, including the intensity of poverty (incidence and depth) and the inequality of income.</p> <p>4) Economic security (within a present and future perspective): based on economic security from job loss and unemployment, illness, family breakup, and poverty in old age.</p>	
Index of Individuals Living Conditions	<p>The Index of Individual Living Conditions is an integrated part of the European System of Social Indicators. Within this system, it is considered as a summary measure of objective living conditions of life as a total. The indicators system provides time series data for more than 30 nations: the EU member states, Switzerland, Norway, as well as Japan and the United States as the two major reference societies.</p>	<ul style="list-style-type: none"> <li>• Based on objective indicators.</li> <li>• International project</li> <li>• <a href="http://www.gesis.org/unser-angebot/daten-analysieren/soziale-indikatoren//data/eusi/index.htm">http://www.gesis.org/unser-angebot/daten-analysieren/soziale-indikatoren//data/eusi/index.htm</a></li> </ul>
Legatum Institute Prosperity Index (PI)	<p>The Legatum Institute is an independent non-partisan public policy organization whose research advance ideas and policies in support of free and prosperous societies around the world. The Prosperity Index (PI) incorporates a mixture of traditional economic indicators alongside measurements of wellbeing and life satisfaction, including sub-indicators on:</p> <ol style="list-style-type: none"> <li>1) economy</li> <li>2) entrepreneurship and opportunities</li> <li>3) governance</li> <li>4) education</li> <li>5) health</li> <li>6) safety and security</li> <li>7) personal freedom</li> <li>8) social capital</li> </ol>	<ul style="list-style-type: none"> <li>• Based on objective and subjective indicators.</li> <li>• International project</li> <li>• The PI index covers 96% of the world's population and approximately 99% of global GDP. Results are visualized through an interactive dashboard.</li> <li>• <a href="http://www.prosperity.com/#!/?aspxerrorpath=%2Fdefault.aspx">http://www.prosperity.com/#!/?aspxerrorpath=%2Fdefault.aspx</a></li> </ul>
Measures of Australia's progress (MAP)	<p>On April 2002, the Australian Bureau of Statistics (ABS) made a major contribution to measuring whether life is improving in Australia with the release of the first issue of <i>Measures of Australia's Progress</i> (MAP). These measures are designed to help Australians address the question, "Is life in Australia getting better?" The main idea is that Australians can use this evidence to form their own view of how their country is progressing. Progress dimensions are grouped under three broad headings: society, economy and environment.</p> <ol style="list-style-type: none"> <li>1) Society: <ol style="list-style-type: none"> <li>i. Health</li> <li>ii. Education and training</li> <li>iii. Work</li> <li>iv. Crime</li> <li>v. Family, community and social cohesion</li> <li>vi. Democracy, governance and citizenship</li> </ol> </li> <li>2) Economy:</li> </ol>	<ul style="list-style-type: none"> <li>• Objective and subjective indicators.</li> <li>• National project (Australia). Indicators are also assessed at regional level.</li> <li>• A headline indicator, which directly addresses the notion of progress, is proposed in most of these dimensions.</li> <li>• Some dimensions also include information regarding specific groups of interest, such as men and women.</li> <li>• MAP does not include indicators for every aspect of progress, which could be significant to Australia. This is partly because some areas of progress are inherently subjective and hence difficult to measure reliably.</li> </ul>

	<ul style="list-style-type: none"> <li>i. National income</li> <li>ii. National wealth</li> <li>iii. Household economic wellbeing</li> <li>iv. Housing</li> <li>v. Productivity</li> </ul> <p>3) Environment:</p> <ul style="list-style-type: none"> <li>i. Biodiversity</li> <li>ii. Land</li> <li>iii. Inland waters</li> <li>iv. Oceans and estuaries</li> <li>v. Atmosphere</li> <li>vi. Waste</li> </ul> <p>Moreover there are also some supplementary dimensions:</p> <p>4) Supplementary dimensions</p> <ul style="list-style-type: none"> <li>i. Supplementary dimension</li> <li>ii. Culture and leisure</li> <li>iii. Communication</li> <li>iv. Transport</li> <li>v. Inflation</li> <li>vi. Competitiveness and openness</li> </ul>	<ul style="list-style-type: none"> <li>• At the beginning of the 2013, the ABS launched a new initiative, called “You spoke, we listened” aimed at developing a feedback mechanism with Australian people and construct an indicator that better reflect their idea of progress. After this online consultation the ABS issued a new version of MAP in late 2013.</li> <li>• <a href="http://www.abs.gov.au/ausstats/abs@.nsf/Lookup/by%20Subject/1370.0~2010~Main%20Features~Home%20page%20(1)">http://www.abs.gov.au/ausstats/abs@.nsf/Lookup/by%20Subject/1370.0~2010~Main%20Features~Home%20page%20(1)</a></li> </ul>
<p>Measuring equitable and sustainable wellbeing in Italy (BES –Benessere Equo e Sostenibile)</p>	<p>The CNEL (Consiglio nazionale dell'economia e del lavoro – Italian National Council of economy and work) and ISTAT (Istituto Nazionale di Statistica – Italian National Institute of Statistics) launched, in 2011, an 18-month initiative for the measurement of "equitable and sustainable well-being" aimed at producing a set of indicators able to provide a shared vision of progress for Italy. This information will be legitimated by a council of experts, relevant stakeholders and citizens in dedicated meetings and workgroups, online consultation and the inclusion of a question set to identify people's priorities when dealing with individual and national well-being. Results highlight that the factors considered to be the most important are health, environment, education and training, and quality of public services</p> <p>The Key domains for the Italian BES are conceptual and divided in: Individual sphere and Context.</p> <p>The domains belonging to the first group are:</p> <ul style="list-style-type: none"> <li>1) Environment</li> <li>2) Health</li> <li>3) Economic well-being</li> <li>4) Education and training</li> <li>5) Work and life balance</li> <li>6) Social relationship</li> <li>7) Security</li> <li>8) Landscape and cultural heritage</li> <li>9) Research and innovation</li> <li>10) Quality of services</li> <li>11) Policy and institutions</li> </ul>	<ul style="list-style-type: none"> <li>• Based on objective and subjective indicators.</li> <li>• National project (Italy)</li> <li>• The total number of indicators divided in the domains is 134.</li> <li>• There are also several initiatives, under ISTAT supervision, planned to calculate BES at local level (provinces).</li> <li>• <a href="http://www.misuredelbenessere.it/">http://www.misuredelbenessere.it/</a></li> </ul>
<p>Measuring Ireland's Progress (MIP)</p>	<p>Measuring Ireland's Progress is a statistical report that provides an overall view of the economic, social and environmental situation in Ireland. The Central Statistics Office publishes it every year. The aim of this report is to analyze Ireland's progress and it also benchmarks the situation in Ireland against the other 26 EU member states and six additional countries (Iceland, Norway, Switzerland, Croatia, Turkey and Macedonia).</p>	<ul style="list-style-type: none"> <li>• Based exclusively on objective indicators.</li> <li>• National project. It uses average EU indicators as a reference for national indicators.</li> <li>• Selected domains, such as air quality and prices, are studied at local (i.e., city) level.</li> <li>• In total, a set of 109 indicators have been proposed in 49 sub-domains.</li> </ul>

	<p>It consists of 10 dimensions (domains):</p> <ol style="list-style-type: none"> <li>1) Economy</li> <li>2) Prices</li> <li>3) Employment and unemployment</li> <li>4) Social cohesion:</li> <li>5) Education</li> <li>6) Health</li> <li>7) Population</li> <li>8) Housing:</li> <li>9) Crime</li> <li>10) Environment</li> </ol>	<ul style="list-style-type: none"> <li>• <a href="http://www.cso.ie/en/releasesandpublications/measuringirelandsprogress/">http://www.cso.ie/en/releasesandpublications/measuringirelandsprogress/</a></li> </ul>
Measuring Sustainable Development	<p>Report developed by the Joint UNECE/Eurostat/OECD Task Force presents a broad conceptual framework for measuring sustainable development and suggests sustainable development indicators that can be used for international comparison. It is a step towards harmonizing the various approaches and indicators that are used by countries and international organizations for measuring sustainable development. The Report takes into account existing approaches used by the various initiatives undertaken by United Nations, European Commission and OECD, as well as initiatives of various individual countries.</p>	<ul style="list-style-type: none"> <li>• Based exclusively on objective indicators.</li> <li>• International project</li> <li>• <a href="http://www.unece.org/stats/sustainable-development.html">http://www.unece.org/stats/sustainable-development.html</a></li> </ul>
QoL Index (Eurostat)	<p>Following the recommendations of the up The Sponsorship Group on Measuring Progress, Well-Being and Sustainable Development, the measurement of quality of life is achieved by a multidimensional approach, in order to better represent the different aspects of wellbeing.</p> <p>The dimensions defined as an overarching framework for the measurement of well-being are:</p> <ol style="list-style-type: none"> <li>1) Material living conditions (income, consumption and material conditions)</li> <li>2) Productive or main activity</li> <li>3) Health</li> <li>4) Education</li> <li>5) Leisure and social interactions</li> <li>6) Economic and physical safety</li> <li>7) Governance and basic rights</li> <li>8) Natural and living environment</li> <li>9) Overall experience of life</li> </ol>	<ul style="list-style-type: none"> <li>• Based exclusively on objective indicators.</li> <li>• International project</li> <li>• <a href="http://epp.eurostat.ec.europa.eu/statistics_explained/index.php/Quality_of_life_indicators_-_measuring_quality_of_life">http://epp.eurostat.ec.europa.eu/statistics_explained/index.php/Quality_of_life_indicators_-_measuring_quality_of_life</a></li> </ul>
Regional Index of Quality of development (QUARS)	<p>QUARS is the Regional Index of Quality of development (Indice di Qualità dello Sviluppo Regionale). It is an indicator that tries to identify and connect with the other components of development based on sustainability, quality, equity, solidarity and peace.</p> <p>The over 40 indicators are divided into 7 categories:</p> <ol style="list-style-type: none"> <li>1) Environment,</li> <li>2) Economy and Work,</li> <li>3) Rights and Citizenship,</li> <li>4) Health,</li> <li>5) Education,</li> <li>6) Social Inequalities,</li> <li>7) Active public participation.</li> </ol>	<ul style="list-style-type: none"> <li>• Based on objective and subjective indicators.</li> <li>• National project (Italy). Regional level.</li> <li>• The aggregation of these domains contributes to the final classification of the regions.</li> <li>• It is annually published in a report by Sbilanciamoci: <a href="http://www.sbilanciamoci.org/quars/">http://www.sbilanciamoci.org/quars/</a></li> </ul>

Sustainable Society Index	<p>The Sustainable Society Index (SSI) is calculated each year for 151 countries. It is based on 24 indicators belonging to three wellbeing dimensions:</p> <ol style="list-style-type: none"> <li>1) Human,</li> <li>2) Environmental Sustainability</li> <li>3) Economic Wellbeing.</li> </ol> <p>It consistently shows the roadmap to achieve full sustainability for each of the 24 domains.</p>	<ul style="list-style-type: none"> <li>• Based exclusively on objective indicators.</li> <li>• International project</li> <li>• <a href="http://www.sustainablesocietyindex.com">www.sustainablesocietyindex.com</a></li> </ul>
Social Progress Index	<p>The Social Progress Index is developed by the nonprofit Social Progress Imperative association. SPI scores countries considering 3 different dimensions:</p> <ol style="list-style-type: none"> <li>1) Basic Human Needs,</li> <li>2) Foundations of Wellbeing,</li> <li>3) Opportunity.</li> </ol> <p>The method aims to capture an interrelated set of factors that represent the primary elements which combine to produce a given level of social progress.</p>	<ul style="list-style-type: none"> <li>• Based on both objective and subjective indicators.</li> <li>• International project</li> <li>• The used methodology allows measurement of each component and each dimension, and yields an overall score and ranking.</li> <li>• <a href="http://www.socialprogressimperative.org/data/spi">http://www.socialprogressimperative.org/data/spi</a></li> </ul>
Well-being and Resilience Measure (WARM)	<p>The Wellbeing and Resilience Measure (WARM) is a framework to measure well-being and resilience at a local level. Developed by the Young Foundation, WARM helps local authorities and communities to explore deeper the performances and needs. It assists on the use of existing data to create a narrative about their local neighborhoods.</p>	<ul style="list-style-type: none"> <li>• Based on both objective and subjective indicators.</li> <li>• International project. Indicators at city level.</li> <li>• <a href="http://youngfoundation.org/wp-content/uploads/2012/10/Taking-the-Temperature-of-Local-Communities-summary.pdf">http://youngfoundation.org/wp-content/uploads/2012/10/Taking-the-Temperature-of-Local-Communities-summary.pdf</a></li> </ul>
World Database of Happiness	<p>The World Database of Happiness is an ongoing register of scientific research on the subjective enjoyment of life. It brings together findings that are scattered throughout many studies and provides a basis for synthetic work. The database consists of the following interrelated collections, the interconnections of which are visualized on a flow chart.</p> <p>The World Database of Happiness includes a repository of the most popular international surveys on happiness. In addition, the database includes all contemporary scientific publications and it involves a detailed subject-classification. The bibliography can be browsed by first author, subject, and title. The related Directory of Happiness Investigators provides the addresses of most authors.</p>	<ul style="list-style-type: none"> <li>• Based on both objective and subjective indicators.</li> <li>• International project</li> <li>• <a href="http://worlddatabaseofhappiness.eur.nl/">http://worlddatabaseofhappiness.eur.nl/</a></li> </ul>
World Happiness Report	<p>Measure of happiness published by United Nations every year, providing a worldwide ranking primarily using the Gallup World Poll that provides a comparable data for the largest number of countries.</p>	<ul style="list-style-type: none"> <li>• Based on both objective and subjective indicators.</li> <li>• International project</li> <li>• <a href="http://unsdsn.org/wp-content/uploads/2014/02/WorldHappinessReport2013_online.pdf">http://unsdsn.org/wp-content/uploads/2014/02/WorldHappinessReport2013_online.pdf</a></li> </ul>
UN Human Development Index	<p>The Human Development Index (HDI) is a synthetic indicator that ranks a country's achievements in several areas of human development. These areas are life expectancy at birth, educational attainment (i.e., adult literacy combined with gross enrolment in primary, secondary and tertiary education) and standard of living (based on purchasing power in US</p>	<ul style="list-style-type: none"> <li>• Based exclusively on objective indicators.</li> <li>• International project</li> <li>• <a href="http://hdr.undp.org/en/2013-report">http://hdr.undp.org/en/2013-report</a></li> </ul>

	<p>dollars per capita).</p> <p>Since 2000, an alternative formulation was proposed. The major novelties are the way of aggregation (instead of calculating the algebraic mean, the geometric one was introduced) and normalization over three dimensions:</p> <ol style="list-style-type: none"> <li>1) Life expectancy,</li> <li>2) Education index (depending on years of schooling and expected years of schooling),</li> <li>3) Income.</li> </ol>	
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### 3.1.1 Factors of success

In the early phase of the study, we found that common aims of the projects in Table I are to be influential for policy-making, to raise awareness on environmental and social aspects, and to induce behavioural change. Nevertheless, the amount and the diversity of QoL dimensions have often made it difficult for decision makers to understand fully the relevance of single indicators, notably in the case of large international projects. Some of the key features behind the reviewed projects' success is provided below:

**Coverage and locality**– QoL indicators measured at international scale (e.g., UN Human Development Index, or the EEA Core Set of Indicators) strive to achieve wide citizen engagement, while they are instrumental to prioritize the political decisions according to the QoL dimensions of relevance. Conversely, several project focusing on a regional or local dimension have shown to have traction in local policy making. For example, projects as the Regional Index of Quality of development (QUARS), the Well-being and Resilience Measure (WARM), and the indicators used in Measuring Ireland's progress (MIP) have been notably integrated with economic growth indicators for regional assessments, in Italy, UK, and Ireland, respectively. One of the reasons for the success of local or regional indicators can be found in the precise geographical correspondence between the area of interest for the project and the area where the 'addressees' of the indicators reside (i.e., the citizens living in the observed area). In particular, for such type of indicators, the attribute of locality has been shown to increase the sense of fitness and legitimacy.

**Alignment to citizens' priorities** – Another reason of the success of QoL projects is the ability to connect with the priorities of the citizens. By addressing QoL dimensions that are of primary relevance for citizens, the indicators can reach for a broader audience, receive more feedbacks and facilitate the assessment of policy making.

**Relationship-building** – A factor of success is the creation of relationships between the QoL indicator developers and the audience at whom the indicators are targeted. Involving citizens in the definition of a set of QoL indicators corroborates the indicators' credibility and neutrality, while also focusing on dimensions towards which communities are most sympathetic.

To achieve the above properties and to actively involve citizens in the definition of a set of QoL indicators, a common practice is the formulation of surveys, which we discuss in the following section.

### 3.2 Measuring QoL – Review of the Analytical Tools

Data sources of interest for research on quality of life are shown in Table II. These initiatives gather information in relation to different aspects of well-being either directly, mainly via surveys, or indirectly, by considering statistical procedures from census and other existent official databases.

**Table II – Surveys on QoL and life satisfaction**

Urban Audit	<p>The "Urban Audit" data collection provides information and comparable measurements on the different aspects of the quality of urban life in European cities.</p> <p>Conducted every three years, it is addressed for a better understanding on current QoL situation on city levels and to facilitate the monitoring and future development and progress.</p> <p><a href="http://epp.eurostat.ec.europa.eu/portal/page/portal/region_cities/city_urban">http://epp.eurostat.ec.europa.eu/portal/page/portal/region_cities/city_urban</a></p>
EU-Statistics on Income and Living Conditions (EU-SILC)	<p>The EU-Statistics on Income and Living Conditions (EU-SILC) instrument is the EU reference source for comparative statistics on income distribution and social inclusion at the European level. It contains a module on wellbeing, gathering information from surveys every 5 years.</p> <p><a href="http://epp.eurostat.ec.europa.eu/portal/page/portal/income_social_inclusion_living_conditions/introduction">http://epp.eurostat.ec.europa.eu/portal/page/portal/income_social_inclusion_living_conditions/introduction</a></p>
European Social Survey (ESS)	<p>The European Social Survey (ESS) is an academically driven cross-national survey that has been conducted every two years across Europe since 2001.</p> <p>The survey measures the attitudes, beliefs and behavior patterns of diverse populations in more than thirty nations.</p> <p><a href="http://www.europeansocialsurvey.org/">http://www.europeansocialsurvey.org/</a></p>
ESPON	<p>The ESPON Database contributes to better understanding territorial structures, the current situation and past and future trends of different types of European territories in relation with various geographical contexts (from local to global) and within a large variety of themes, such as:</p> <ol style="list-style-type: none"> <li>1) Price convergence between EU Members States</li> <li>2) Healthy Life Years</li> <li>3) Biodiversity</li> <li>4) Urban population exposure to air pollution by ozone and</li> <li>5) Urban population exposure to air pollution by particles (PM10)</li> <li>6) Consumption of toxic chemicals</li> <li>7) Generation of hazardous waste</li> <li>8) Recycling rate of selected materials</li> <li>9) Resource productivity (i.e. the ratio between GDP and Domestic Material Consumption (DMC)).</li> <li>10) E-business indicator</li> </ol> <p><a href="http://www.espon.eu/">http://www.espon.eu/</a></p>
World Values Survey (WVS)	<p>Research project coordinated by the nonprofit World Values Survey Association that has compiled information from 6 waves of surveys from 1981 to 2014, regarding people's values and beliefs, their changes over time and their social and political impacts.</p> <p><a href="http://www.worldvaluessurvey.org/wvs.jsp">http://www.worldvaluessurvey.org/wvs.jsp</a></p>
World Health Organization Quality of Life (WHOQOL)	<p>The WHOQOL is a quality of life assessment developed by the WHOQOL Group simultaneously with fifteen international field centers, in an attempt to develop a quality of life assessment that would be cross-culturally applicable. Adaptations have been developed for people with HIV (WHOQOL-HIV) and an additional 32 item instrument has been developed to assess aspects of Spirituality, Religiousness and Personal Beliefs (WHOQOL-SRPB). The main output has been the formulation of an extensive tool to be used in conjunction with the WHOQOL-100 (The manual of WHOQOL-100 is available from WHO in Geneva). These questions respond to the definition of subjective Quality of Life as individuals' perceptions of their position in life in the context of the culture and value systems in which they live and in relation to their goals, expectations, standards and concerns. <a href="http://www.who.int/mental_health/publications/whoqol/en/">http://www.who.int/mental_health/publications/whoqol/en/</a></p>

A traditional approach for measuring well-being in the current initiatives, listed in Table II, is through individual surveys, in which respondents are asked to evaluate different aspects of QoL and their level of satisfaction regarding specific services. Official data from national databases and census can also be used to assess some aspects of well-being, as the Urban Audit initiative that derives most of the defined variables from the Eurostat databases. However, to complement objective data, parallel surveys are often proposed to obtain citizens' subjective perception of QoL<sup>2</sup>.

The reviewed surveys in Table II consider multiple dimensions of well-being, structuring the survey questions in order to obtain information from the different domains in accordance to the survey objective. For instance, WHOQOL initiative, proposed by the World Health Organization (WHO), organizes the survey establishing six health-related domains<sup>3</sup>: physical, psychological, level of independence, social relationships, environment and spirituality/religion/personal beliefs. Similarly, the Urban Audit Perception Survey proposes inquires on the citizens' satisfaction of urban services.

Survey programmes are designed to allow traceability and temporal analyses. According to the scope of the surveys, the interval between two surveys ranges between 2 years (e.g., as the European Social Survey (ESS)), and five years (WVS, EU-SILC module of well-being).

## 4 Recommendations for new QoL indicators

### 4.1 Key attributes of QoL indicators

QoL indicators quantify complex events, social trends and ecosystem dynamics. They aim to address both environmental and behavioral characteristics, in a consistent and simplified fashion. The primary scope of indicator-based analysis is to support policy-making and to make public communication easier and more transparent. Decisions about what to measure should always be grounded in a clear understanding of user needs. In addition to this, having an analytical model can assist in thinking in a structured way about how user needs relate to specific decisions about what data to collect. Understanding user needs entails the identification of key policy and research questions that the user is trying to address. Clearly, indicators track evolutions and allow comparisons that can be based either on targets, benchmarks, or on past performance. To this end, QoL indicators are charted in the form of time series, or visualized over time, so as to facilitate the assessment of progress, the direction of current change and gap from a target value. In addition, comparable trends across different communities or locations can be marked as a third layer of comparability.

The definition of a set of QoL indicators begins with an appropriate selection criteria, according to which the number and scope of the indicators can be narrowed. A set of criteria

<sup>2</sup> [http://epp.eurostat.ec.europa.eu/portal/page/portal/region\\_cities/city\\_urban/perception\\_surveys](http://epp.eurostat.ec.europa.eu/portal/page/portal/region_cities/city_urban/perception_surveys)

<sup>3</sup> WHOQOL-HIV Instrument. Users Manual.

[http://apps.who.int/iris/bitstream/10665/77776/1/WHO\\_MSD\\_MER\\_Rev.2012.03\\_eng.pdf?ua=1](http://apps.who.int/iris/bitstream/10665/77776/1/WHO_MSD_MER_Rev.2012.03_eng.pdf?ua=1)

(also used in the definition of the Calvert-Henderson and the ESSC QoL indicators) is provided below:

*Scope* – The ultimate scope of the QoL indicator-based study defines the choice of a suitable set of indicators. Whereas complex indicators are meant for allowing comparisons across different groups or areas, simple indicators are more desirable. Instead, if the scope of the study is understanding the relationship between different aspects of objective and subjective well-being, a more detailed set of co-variated indicators is typically more suitable.

*Classification* – Measuring well-being is far from being holistic. The primary interest of the study should focus on one among individual or societal, objective or subjective well-being, in terms of life evaluation, affective or eudemonic well-being (as discussed in Section 3.2), or a combination of those.

*Simplicity* – When targeting wide audience, easily understandable information is an appealing approach. Nonetheless, complex issues or computations can also yield clearly presentable information if accompanied by examples or references, which the audience can relate to.

*Self-explanatory* – Even for simple assessments, the list of potential indicators can easily grow very large. For practical reasons, indicators able to self-present or to consistently combine several information on a range of issues are generally preferable.

*Validity* – A QoL framework should consider indicators which reflect true nature of facts, i.e., data that is collected and managed using robust, scientifically defensible measurement techniques. As a result, methodological rigor is a strong requirement, notably when data is collected across large communities. This can become a stringent requirement for subjective well-being analysis and may be partly alleviated by including reference data or by comparing similar contexts.

*Sensitivity* – The scope of a single indicator is usually limited to one dimension of a broader issue. Nevertheless, indicators that are able to be combined or complemented are more valuable. Indicator aggregation and complementarity are desirable features, albeit not without risks, and require careful consideration in the phase of data management.

*Policy relevance* – Indicators of sustainable development are often transversal to several projects and frameworks. Nevertheless, they might have different weight, according to the ultimate project mission or the EU directive addressed. The set of indicators of a QoL framework should be strictly relevant to the policy considered. In other words, it should empower the project committee to motivate critical decisions and defend policy-making proposals that are among the outcomes of the project. The main focus should be on what the policy questions are. The proposed indicators should always be appropriate to respond to the policy questions and to monitor changes over time, or between different population groups.

*Demographics* – QoL in all its declination is strongly context-dependent, and thus, it should be measured locally or at small scales. Depending on the extent of the study, specific population sub-groups might be of greater interest among others (e.g., groups based on gender



or age, or language, which often allow for international comparisons). If the study aims at the observation of the same population at different points in time (i.e., for time series analysis), the criteria for identifying a population sample should be clearly defined. As a matter of fact, this will have implications both for sampling technique and the types of data to collect. In the case of international comparisons, indicators with good cross-cultural reliability will be most relevant, while in the analysis of groups within the same country or environmental context, the study may focus on may allow for context-specific indicators, and a larger population sample size.

*Compatibility* – Defining new data sets according to popular existing formats ensures consistencies with other sources, allowing for comparisons and quicker verification. Moreover, compatible indicator formats ultimately yield time and expenditure savings.

*Comparability* – Monitoring QoL indicators is typically aimed at comparing them either at geographic level or through historical time series or both. In all cases, QoL indicator should remain consistent to the format and the references adopted upon their definition.

*Insightfulness* – QoL indicators are inevitably bound to a narrow time interval, in which a social characteristic or phenomenon is observed. As a result, inferring trends and predictions, even over a short time horizon, typically requires the collection of sufficiently long time series, beyond the necessary computational power for successfully developing an effective knowledge. Human behaviors are understood at different temporal and spatial scales when the observed society is not homogeneous. As a result, devising a suitable time scale, or equivalently, a sampling rate for the indicators is strongly application-dependent and often obtained empirically.

In summary, the sampling rates strongly depends on the question or problem of interest, the geographical extents of the analysis (e.g., individual, regional, or national level), the required level of participation from the studied community, and the scope of the study (i.e., the policy triggered by the insights of the study).

From the analysis above, one can notice a clear tension between the application of the criteria, which requires longer periods for survey preparation, data capture, quality control and processing, and the pressures to identify more timely indicators. New data sources, including mobile devices, and social media can potentially help in devising more timely indicators, but are likely to stumble on many of the criteria reviewed above. There are trade-offs to be made between timeliness and statistical robustness, and in principle one can envisage that a combination of multiple approaches and cross-referencing of data sources may provide a framework of indicators that are at least fit-for-purpose. With these considerations in mind, the sections below suggest a few selected dimensions of QoL in which UrbanQool will start analysing the opportunities and limitations of new indicators based on a range of official and non-official sources.

## 4.2 Proposed well-being dimensions and identified research opportunities

### 4.2.1 Urban mobility

By 2020, more than 70% of the European population will concentrate in urban areas (DG Move 2013). Energy efficient, safe and environmentally-friendly urban mobility is essential for ensuring that economic growth will be accompanied with good quality of life.

In contemporary society, urban mobility is heavily affected by static and dynamic factors. Static factors, mainly depending on the road surface conditions have a direct impact on safety, urban mobility, as well as commercial activities. Dynamic factors include sudden and temporary changes in ordinary mobility, mainly due to unplanned events, such as traffic congestion, or extraordinary weather conditions. Due to their slowly changing nature, static factors can be more easily identified and accounted for in urban mobility plans. Instead, tracking the dynamic factors of urban mobility is a complex task, which deserves further investigation in order to produce accurate forecasts. In this respect, UrbanQool aims to explore the large amount of geo-referenced citizen contributed information (from social networks such as Twitter, Foursquare, Facebook and Waze), in order to infer additional properties of urban mobility. For instance, by combining the stream of geo-referenced tweets and the location-based information available on Foursquare, it becomes possible to reconstruct the dynamic formation of hotspots (in which citizen aggregate), over time, and observe daily, weekly and monthly periodicities. Properties such as the density of citizens, their geographical origin, age, gender, most frequent transportation option will be investigated. Such an activity will have two main outcomes. First, combining the harvested data (tightly sampled) with the available data on urban mobility (more loosely sampled) allows to compute the degree of accuracy of citizen contributed data, and thus, to evaluate the confidence interval of mobility prediction based on such type of data. Second, evaluating the accuracy of citizen-contributed data allows to fill the information gaps in official data, and trigger early detection of the dynamic factors that produce traffic congestion and delays.

Besides the early detection of dynamic factors of mobility, the assessment of inter-modality is another key activity for UrbanQool. Inter-(multi-)modality is a key service for reducing car traffic and carbon footprint in urban areas. Therefore, metropolitan transit companies strive to estimate the level of utilization of inter-modality services (e.g., drive and ride), to identify promptly the strengths and weaknesses of current inter-modality plans, and assess citizen engagement in such services. The complexity of such estimations increases for dynamic assessments. In this respect, UrbanQool aims at supporting the planning of efficient inter-modality programs by defining and measuring key performance indicators, such the average commuting time, the frequency of use, the most engaged communities or individual profiles, the inter-modal traffic flows, and the impact of bike/car sharing programmes on the overall traffic flows.

The investigation of UrbanQool will comprise two main phases. In the first phase, we propose to harvest geo-referenced Twitter data, location information from Foursquare and Facebook, and live traffic conditions from Waze, in a selected urban area (e.g., Milan metropolitan area). In the same phase, a set of suitable key performance indicators on urban mobility will be defined, based on the related literature. The second phase of the study will

focus on the data analysis, the data accuracy and statistical representativeness estimation, and the statistical integration of official and harvested data. Future activities will consider the integration of existing data sets with mobile network operator data, aiming at a more precise characterization of the observed metropolitan area. Similarly, the proposed methodology can be validated through comparison in other urban areas in Europe.

#### 4.2.2 Active Citizenship

Social cohesion and community building is a key factor recognized in the Lisbon Strategy in a European level. Citizens' engagement influences in social capital, increasing social trust, the opportunities of cooperation between citizens and reducing the possibilities of anti-social conduct (Putnam 2000).

Public participation appears in the literature related with citizens' involvement in decision-making and public administration. This is the considered aspect in Eurostat programs as Urban Audit (indicator of Civic involvement) or the Flash Eurobarometer on participatory democracy. Moreover, the definition of active citizenship for democracy by Hoskins (2006) offers a holistic perspective of civic engagement, defining it as "participation in civil society, community and/or political life, characterized by mutual respect and non-violence and in accordance with human rights and democracy".

This broad consideration on civic engagement from Hoskins is reflected in the composite indicator developed by the Centre for Research on Lifelong Learning (CRELL)<sup>4</sup> to attempt the measurement of active citizenship. The Active Citizenship Composite Indicator (ACCI) considers four different dimensions of active citizenship: participation in political life, civil society, community life and the values that support active citizenship. The elements included in each dimension are shown in Table 3 (Mascherini et al. 2007).

However, data accessibility in the domains covered by the ACCI is specially limited, with insufficient spatial and temporal data coverage. Mascherini et al. (2007) used national data on citizenship gathered in 2002 by the European Social Survey (ESS)<sup>5</sup>. However their study doesn't include new less conventional ways of participation that are arising driven by the social, political and economic critical situation worldwide. These difficult economic and political situations have increased citizens' awareness on their role towards the societal progress, on how citizens' efforts can achieve societal development, without waiting for governmental actions in this regard. Community currencies like time banking are gaining followers as an alternative to the economic-based service and resources market. These kinds of initiatives are facilitated by the opportunities offered by the Web 2.0 technologies, allowing easy communication among the members of an initiative, the projects advertisement and resources management. Considering such assumptions, initiatives on civic engagement are expected to be found through analysis on social networks like Twitter, Facebook or others.

Empirical work on the opportunity of using social media, and other Internet-based resources to build indicators of active citizenship will initially focus on two indicators of ethical con-

<sup>4</sup> <https://crell.jrc.ec.europa.eu/>

<sup>5</sup> <http://www.europeansocialsurvey.org/>

sumption: car sharing and food responsible consumption in Madrid, to extend subsequently to other cities and assess replicability, and comparability of the indicators.

Table 3: Indicators included in the four dimensions of Active Citizenship Composite Indicator

POLITICAL LIFE DIMENSION	
Political parties—Membership	
Political parties—Participation	
Political parties—Donating money	
Political parties—Voluntary work	
European Parliament—Voting turnout	
National Parliament—Voting turnout	
Women’s participation in national parliament	
CIVIL SOCIETY DIMENSION	
Protest	Working with a non-governmental organization or an association
	Signing a petition
	Taking part in lawful demonstrations
	Boycotting products
	Ethical consumption
	Contacted a politician
Human Rights (HR) organisations	HR organisations—Membership
	HR Organisations—Participation
	HR Organisations—Donating money
	HR Organisations—Voluntary work
Environmental Organisations	Environmental Organisations—Membership
	Environmental Organisations—Participation
	Environmental organisations—Donating money
	Environmental Organisations—Voluntary work
Trade Union Organization	Trade Union Organisations—Membership
	Trade Union Organisations—Participation
	Trade Union organisations—Donating money
	Trade Union Organisations—Voluntary work
COMMUNITY DIMENSION	
Non-organized help	Unorganized help in the community
Religious org.	Religious Organisations—Membership
	Religious Organisations—Participation
	Religious Organisations—Donating money
	Religious Organisations—Voluntary work
Sports org.	Sports Organisations—Membership
	Sports Organisations—Participation
	Sports Organisations—Donating money
	Sports Organisations—Voluntary work
Cultures and hobbies	Culture and hobbies organisations—Membership
	Culture and Hobbies Organisations—Participation
	Culture and Hobbies Organisations—Donating money
	Culture and Hobbies Organisations—Voluntary work

Source: Mascherini et al 2007

### 4.2.3 Air quality

Monitoring air quality by tracking the concentration air pollutants (such as carbon monoxide, sulfur oxides, nitrogen oxides, and particulate matter) is an objective of numerous QoL projects (Citi-sense, EveryAware, Epic Projects).

Air quality is regulated by European legislation, and monitored through agreed protocols in the Member States. Due to the critical importance of the sampling accuracy, air quality indicators are normally developed using data from fixed measuring stations, which are carefully calibrated and coordinated. Nevertheless, the finite number of fixed measuring stations means that values over large urban areas have to be interpolated and local peaks are smoothed. There are therefore opportunities for mass deployment of cheap air quality sensors carried by the public, public transport, or urban furniture, to obtain a more accurate picture of air quality levels in urban areas across space and time. However, the current state of the art in cheap sensors does not allow the implementation of this approach, in a legally regulated activity like air quality, as the quality of the measurements rapidly decays as the sensors become saturated. With this in mind, UrbanQool aims at developing a calibration protocol for the mobile sensors and design a network architecture based on the concepts of protocol interoperability, and distributed computing.

The main outcome of this work will be the implementation of a citizen science-based sensing platform for air quality, whose data accuracy is directly correlated to that of the carefully calibrated fixed measuring stations. In addition, a number of network issues (i.e., coverage, connectivity, calibration error propagation) will be evaluated during the study.

The study will comprise of two main activities. First, having reviewed the state of the art of available air sampling techniques, equipment and network calibration algorithms, UrbanQool will develop the INSPIRE-compliant protocols for delivering accurate calibration data from the operational fixed stations to the mobile sensors. Network issues, device hardware heterogeneity and calibration accuracy will be addressed in this phase of the study. Second, the collected data will be processed to estimate the accuracy with respect to official data.

### 4.2.4 Noise

Persistent exposure to man-produced noise in urban environments is largely responsible for stress symptoms, particular overstrain, lack of sleep and difficulties in concentration. Projects on acoustic pollution reductions aim at raising awareness towards noise levels, the manifold effects on well-being, and to assess the effects of noise-aware urban planning and mobility policies (Defra, Everyaware Project).

There are several projects funded by the EC in relation to noise (see for example <http://ec.europa.eu/environment/noise/research.htm>). Some have been involving also the public in collecting noise measurements (e.g. the WideNoise app in the EveryAware project) and we can expect more projects in this area in H2020. One of the problems is that most of the data collected and applications developed in these research projects disappear rapidly after the end of the project. Moreover, the data even if accessible is often not interopera-

ble. The Citizen Science and Smart Cities Summit held at JRC in February 2014 clearly identified the need for the JRC to become a repository for selected projects n H2020, and noise-related projects could be good starting points.

An initial pilot will involve the EveryAware project to identify the technical, organisational and legal issues to be addressed to host the data collected by the project and make it accessible for re-use after the end of the project. This initial pilot, will then be extended to other urban-related research projects. As the base of supported projects extends, we will focus in particular on the interoperability arrangements that need to be put in place to make the data accessible, reusable and able to be integrated with other data sources, including INSPIRE.

## 5 Conclusions

This report has reviewed a range of projects and initiatives working on 'Beyond-GDP' indicators to promote greater equality, improved quality of life and sustainable long-term progress. Most initiatives use diverse methods for collecting the data but they are largely based on official statistics and surveys. The advantage of these sources is quality and representativeness. The disadvantage is lack of timeliness and costs. The widespread diffusion of mobile technologies, social media, and citizen-generated content together with new data sources from sensor networks and space creates new opportunities and challenges to the development of indicators of QoL and well-being, as also recognized by official statistical institutes. Against the background of these considerations, the JRC Digital Earth and Reference Data Unit launched a project in 2014 on Citizen Science Observatory of New Indicators of Urban Sustainability. The aim of the project is to leverage the expertise of the Unit in the interoperability of data, services, and systems and combine data coming from a diverse range of sources, official government sources, sensors networks, and citizens, to construct new indicators of Quality of Life (QoL). This report reviews the literature on QoL indicators, analyses key projects and initiatives at the international level measuring QoL and well-being, and recommends promising areas in which new indicators could be developed. Initial work in the project will focus on new indicators of mobility and active citizenship, while work on air quality and noise will leverage contributions and activities from other projects. The outcomes of these activities will inform policy discussions on QoL indicators, and contribute also to the Big data for Official Statistics activities coordinated by Eurostat.

## 6 Key resources and projects

*Stiglitz-Sen-Fitoussi commission report*

[Commission on the Measurement of Economic Performance and Social Progress](#)

*Beyond GDP*

[Measuring progress, true wealth, and the well-being of nations](#)

*OECD*

[Better Life Initiative: Measuring Well-being and Progress](#)

*Joint UNECE/Eurostat/OECD Initiatives*

[Joint UNECE/Eurostat/OECD Working Group on Statistics on Sustainable Development](#) (report finalized in 2009)

[Joint UNECE/Eurostat/OECD Task Force on Measuring Sustainable Development](#) (TFSD)

*European Commission and Eurostat initiatives on measuring well-being:*

[Commission Communication 433/2009 on “GDP and beyond. Measuring progress in a changing world”](#)

[DEFRA – Noise Mapping England](#)

[Europe 2020 strategy](#)

[Eurostat commitment on «GDP and beyond»](#)

[ESS Sponsorship Group on Measuring Progress, Well-being and Sustainable Development](#)

[Sofia Memorandum on Measuring progress, well-being and sustainable development](#)

[SIGMA: the Bulletin of European Statistics: Issue 02/2010: GDP and Beyond – Focus on measuring economic development and well-being](#)

[Sustainable development in the European Union 2009 - Monitoring report of the EU sustainable development strategy](#)

### **EU Projects of QoL:**

[Ameli Fp7 Project](#)

[Brainpool](#)

[Coinvest Fp7 Project](#)

[Eerqui Fp7 Project](#)

[Gini Fp7 Project](#)

[Iareg Fp7 Project](#)

[Innodrivre Fp7 Project](#)

[Instream Fp7 Project](#)

[Justis Fp7 Project](#)

[Point Fp7 Project](#)

[Risq Fp7 Project](#)

[Sample Fp7 Project](#)

[Smile Fp7 Project](#)

[Wiod Fp7 Project](#)

[Citi-sense Project](#)

[Omniscientis Project](#)

[Citizen Cyber lab](#)

[WeSenseIt: Citizen Observatories of Water](#)  
[European Platform for Intelligent Cities' \(EPIC\)](#)  
[Everyaware Project](#)  
[MyNeighborhood Project](#)  
[Zero Waste Scotland Project](#)

### Other relevant activities

IBM social sentiment - <http://www.ibm.com/analytics/us/en/conversations/social-sentiment.html>  
 Gross National Happiness - <http://www.grossnationalhappiness.com/>  
 Gallup-Healthways Wellbeing Index – <http://www.well-beingindex.com>  
 Happy Planet Index – <http://www.happyplanetintex.org>  
 Action for Happiness - <http://www.actionforhappiness.org/>  
 19.20.21 Project - <http://www.192021.org/>  
 Smart Mobility Management - <http://www.smart-mobilitymanagement.com/>  
 Urban Observatory - <http://www.urbanobservatory.org/>

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