Towards a harmonised methodology for statistical indicators

PART 2 — COMMUNICATING THROUGH INDICATORS

2017 edition

eurostat

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Foreword

Indicators constitute an essential resource for policy makers, business leaders and the general public. They assist an evidence-based decision making, allow comparisons to be made over time and between policies and programmes, countries and regions, social groups and industries, and contribute to increased transparency and accountability. Indicators also provide a very powerful way of communicating information.

Indicators are used in many areas of social and environmental science, economics, business, and project management. A vast empirical experience of communicating through indicators now exists. However, only limited attempts to develop a methodology for this topic have so far been carried out. The purpose of this paper is to make an initial summary of the existing best practices on this theme encompassing communication and statistical knowledge. The paper should be regarded as an occasion to raise awareness and stimulate a debate about what is good communication through statistical indicators.

This paper is the second in a series of three papers on statistical indicators published by Eurostat. A first paper on 'Indicator typologies and terminologies' was published in 2014. The third paper in the series will discuss the relevance of indicators for policy making.

This paper, as with the whole series, is primarily addressed to producers of official statistics. However, I am convinced that other statistical producers as well as users will also find in these pages useful food for thought.

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1 About indicators, information and communication

How indicators relate to information transmission and interactive communication

Like the mediators who strive to communicate between different parties to find their point of agreement, communication through indicators ([1]) allows to overpass boundaries between policy, science, statistics and public debate. Thus indicators are able to reveal various phenomena to different user groups — policy makers, researchers, citizens, journalists, statisticians, specialists in different domains. Reaching various types of audiences through their communication function, indicators can ensure that statistics are usable and useful.

To clarify the specificities of communication through indicators we chose as a starting point the basic processes of communication. In particular, it is useful to distinguish between the simple one-directional **information transmission** and communication as **an interactive process**.

The one-directional communication focusing on information transmission is conceptualised as a simple process of message delivery from a sender to a receiver ([2]) and is known as the 'informational' approach to communication. What matters here is the process of **information** sharing, in particular **how transparent are the transmission channels** and **how precisely the message is delivered**. The 'sender' determines the content and way of transmission of the message and the 'receiver' is in the role of absorbing and interpreting information.

As regards the interactive process, the meaning of the message is actively constructed by both the sender and the receiver(s) who exchange information in a feedback loop. An additional element in this model of communication is the field of experience of the participants. This includes factors such as their culture, social and psychological situation, and their knowledge. In the end each part

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([1]) Currently there is no universal consensus on the definition of a statistical indicator. Provisionally the paper series 'Towards a harmonised methodology for statistical indicators' uses the definition stemming from *Regulation (EU) No 99/2013* of the European Parliament and of the Council of 15 January 2013 on the European Statistical Programme 2013–2017: 'A statistical indicator is a summary measure related to a key issue or phenomenon and derived from a series of observed facts. Indicators can be used to reveal relative positions or show positive or negative change. Indicators are usually a direct input into EU and global policies. In strategic policy fields they are important for setting targets and monitoring their achievement'. As an alternative, an indicator can be defined as 'what relates concepts to reality through observation'. The word has a Latin origin where indicator is 'who or what indicates' and index is 'anything that is useful to indicate'. An indicator is not simply crude statistical information but a measure organically connected to a conceptual model. See also European Commission, Eurostat, *Towards a harmonised methodology for statistical indicators — Part 1: Indicator typologies and terminologies — 2014 edition*.

([2]) The model was originally developed by Shannon and Weaver. It is used mainly in mathematics and IT sciences. See: Shannon Claude E. & Warren Weaver, A Mathematical Model of Communication. Urbana, IL: University of Illinois Press, 1949.

interprets the communication message from the point of view of their specific context (³). **Interactivity** and the interpretation of the **context** by the receiver are the key elements of this type of process.

How indicators relate to data, information, and knowledge

The constituent elements of indicator-based communication can be described in terms of the knowledge management pyramid, also known as the data-information-knowledge pyramid (⁴) (see Figure 1 below). Data, at the basis of the pyramid, are non-contextualised figures which can be used for several purposes (⁵). The information layer in the middle of the pyramid refers to 'contextualized, categorized, calculated and condensed data' (⁶). When it comes to indicators, the information layer refers to data structured and calculated according to some conceptual model such as accounting systems and supplemented with metadata, as for instance the System of National Accounts. This information, disseminated without reference to a specific context, can still be used for different purposes. The knowledge level, on top of the pyramid, refers to 'framed experience, values, contextual information, expert insight, and grounded intuition that provides an environment and framework for evaluating and incorporating new experiences and information'. When it comes to statistical indicators, knowledge stems from statistical information put in a specific context, referring to a specific policy or to another relevant theoretical framework (⁷). Indicators in the proper meaning of the word belong to the knowledge layer as they are developed to answer a specific political or policy question (⁸). Communicating through indicators goes therefore well beyond the simple dissemination of numbers. It is the specific context which turns multipurpose statistics into indicators. Possible examples are provided by indicators used to monitor policy strategies, such as the Sustainable Development indicators, the Europe 2020 indicators or the Macroeconomic Imbalance Procedure scoreboard, which are based on data at the basis of the pyramid, but convey information specific to the context they are used for. At the same time, knowledge passes through the user's interpretation of the context. In this sense, communicating through indicators has the potential to establish an interactive process, when feedback returns from the users to the indicator producers.

(³) According to certain schools of thought in the social sciences communication is based on the concept of interactivity and it is focused on the context of the message delivery: situational, social, institutional, political, cultural, historical etc. The meaning of the message cannot be independent of such contexts and it goes through several contexts: first it is put in the context the sender decides it is relevant for, then this message is read through the personal context of the receiver, it depends on the personal circumstances of the receiver how he will accept the message (here the receiver is already a co-creator of the meaning). See Jakobson, R. and Halle, M., Fundamentals of Language. The Hague: Mouton, 1956; Hall, S., Encoding/Decoding, In: Culture, Media, Language: Working Papers in Cultural Studies, 1972-79. (Ed. by Centre for Contemporary Cultural Studies) London: Hutchinson, 1980; Eco, U., The Role of the Reader. London: Hutchinson, 1981; Barnlund, D. C., A transactional model of communication, In. C. D. Mortensen (Eds.), Communication theory (2nd ed., pp47–57). New Brunswick, New Jersey: Transaction, 2008.

(⁴) Theirauf, R.J., Knowledge Management Systems for Business. Westport, CT: Quorum Books, 1999.

(⁵) Data are unstructured figures which provide no further information about patterns and context: Thierauf, 1999.

(⁶) Davenport, T. H. and Prusak, L., Working knowledge: How organizations manage what they know, Boston, MA: Harvard Business School Press, 2000.

(⁷) Gamble and Blackwell, 2001.

(⁸) See for example *OECD's series on Green Growth.*

Figure 1: Data, information, knowledge
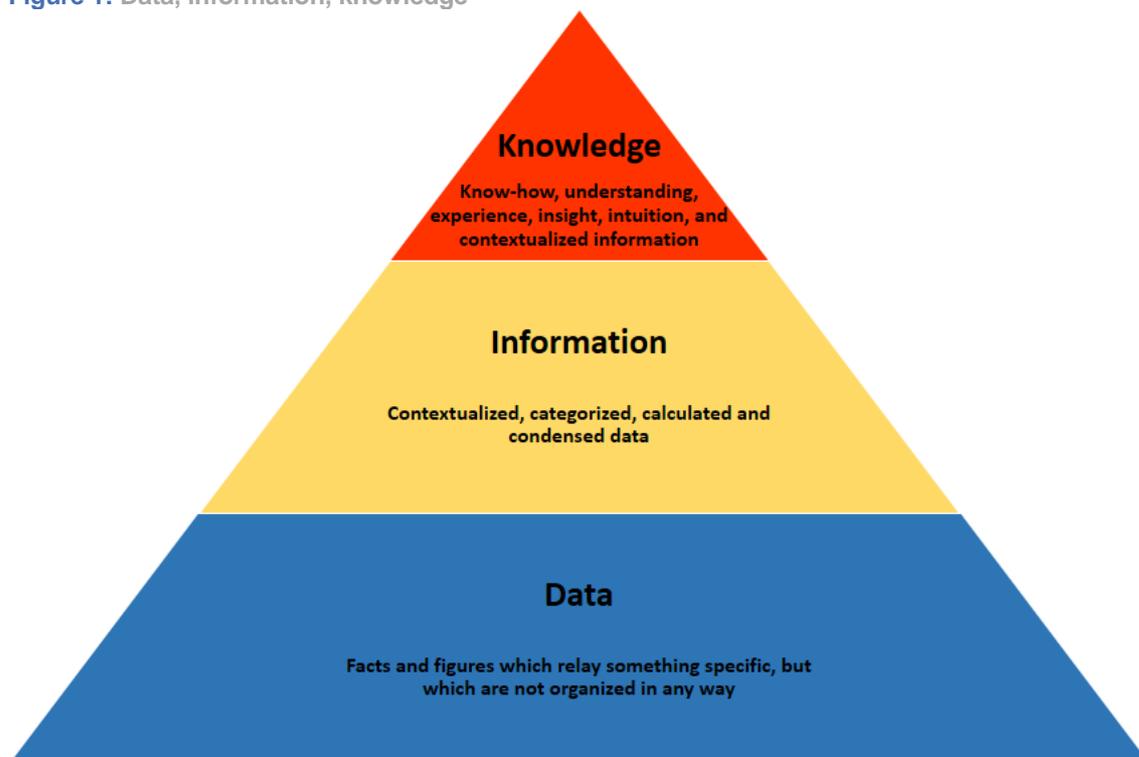
Source: Theirauf, 1999

Context and process of indicator-based communication

To understand how the context enters into indicator-based communication one should closely look at the process of communicating through indicators. From a semiotic (⁹) point of view, indicators can be seen as 'quantitative conventional proper communicative signs' (¹⁰) which 'are produced with communicative intent and interpreted as such by their interpreters' (¹¹). Thus indicators follow the traditional communication path of encoding (communicative intent) and decoding of meaning (interpretation) (¹²). This process is represented in Figure 2 below. In this model, the first phase in the communication chain is the *encoding of the meaning*. For indicators this takes place when the **theoretical/political/social contextualisation behind the numerical part of the indicator message** is introduced. Through explanatory communication the content of indicator communication reaches the user. What follows is the user's understanding/interpretation of the concept behind the statistical message. To reach this stage **the user processes the content of the indicator communication through his or her own specific context**. This is the phase of the *decoding of the meaning*, which can deviate from the intended meaning. As a summary, the context is a key factor with a constituent role for both phases of the indicator-based communication.

(⁹) Semiotics is 'the study of signs and symbols and of their meaning and use' (Oxford Dictionary of English (3 ed.), Ed. by Stevenson, A., Oxford University Press, 2010, p.1619.

(¹⁰) Lawn, P., *Sustainable Development Indicators in Ecological Economics*, Edward Elgar Publishing, 2006, p.332.

(¹¹) Clarke, D., *Principles of Semiotics*, Routledge and Kegan, London, 1987, p.73.

(¹²) Hall, S., *Encoding and Decoding in the Television Discourse*, Centre for Cultural Studies, University of Birmingham, 1973, p. 507–517.

Theoretical/policy contextualisation — encoding of the meaning

Explanatory communication

Decoding of the meaning processed through user's context
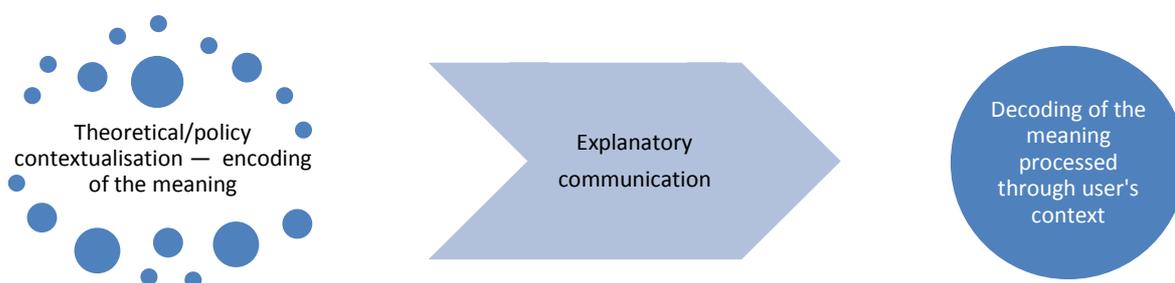
Source: Diagram by author

Informative and social functions of indicator-based communication

Indicator-based communication can have different functions. One case is when one communicates through indicators in order to **inform** about different phenomena. This is **the informative function** of the indicator-based communication. Another case is when one communicates through indicators to assess performance in a chosen thematic area. Here one communicates in order to asses societal trends and thus to allow different social groups to participate in the governance of society with a better informed opinion. This is referred to as **social function** of the indicator-based communication. Indicators are thus 'meant to be an instrument of democratic evaluation just as much as a management tool in the hands of the authorities alone' ([13]).

Especially through their social function, indicators 'can contribute to the construction of a common definition of the situation and to prior agreement on the facts' ([14]) for the progress of society. In this way official statistics, i.e. statistics produced by national and supra-national statistical systems, assume the role of an important element in the democratic process. Referring to Principle 1 of the UN Fundamental Principles of Official Statistics: 'Official statistics provide an indispensable element in the information system of a democratic society'. **Thus indicator-based communication cannot be regarded simply as information transmission but as a specific type of communication with a high societal engagement**, which contributes to the democratic governance of today's society. In order to ensure that official statistics are relevant for society, citizens could be involved in the definition and selection of indicators, e.g. through public consultations.

When indicator-based communication is only used in its one-directional informative function, the most important elements are the clarity of the message and the transparency of the transmission channels. Interactivity reinforces the social function of indicator-based communication.

To summarise, three elements play a key role in indicator-based communication, which also determine the function (informational or social) that indicators assume: **the theoretical/political/social context** (discussed in Chapter 2), **the interactivity** (addressed in Chapter 3) and **the clarity of the intended message.** This latter issue is addressed in three separate chapters: Chapter 4 describes the various user groups and their needs. Chapter 5 looks at the different tools, types and practices of statistical narratives which need to be produced to reach different audiences. Chapter 6 is dedicated to how to get clear messages out of complexity by using composite indicators, dashboards and indicator sets in general. Finally, Chapter 7 summarises the main discussion points.

([13]) See Boulanger, P-M., Sustainable development indicators: a scientific challenge, a democratic issue, 2008.

([14]) Ibid.

2 The role of the context in indicator-based communication

The role of the context at the creation level

In the first phase of encoding of the meaning it is crucial to start from the phenomenon the indicator is called to describe or the policy question the indicator should answer. A sound theoretical analysis is crucial for the correct contextualisation of the message and to define indicators or indicator sets which go beyond being just a computational exercise and which instead 'speak' to the users. To be able to answer the fundamental question of 'what do we need to measure?' one has to be competent on all the different aspects and specific characteristics of the measured phenomena.

For example, when dealing with poverty indicators (such as 'persons at-risk-of-poverty or social exclusion'), one should be aware that the concept of poverty covers an economic/material dimension, but also a social/non-material one (e.g. exclusion, marginalisation). As this is a multidimensional concept, the next question is how these dimensions relate to each other. Furthermore, one should be aware that the material dimension is itself multi-faceted, including financial components (income, level of indebtedness, other financial burdens) and non-financial ones (health, housing, rights). The questions that can and need to be raised about the social/non-material dimension of poverty are not of lesser complexity [15]. For the selection and construction of statistical indicators interdisciplinary team work is required, encompassing thematic competencies (e.g. economic, sociological and environmental, alone or in combination) as well as a solid statistical background. An appropriate combination of this wide range of competences is crucial for a correct definition of indicators which takes into account the right context behind the intended statistical message.

When dealing with complex topics, individual indicators are limited in their representative role because they are able to cover only part of a broad topic [16]. To depict wider topics, indicators should be part of an indicator set or system. To properly take account of the broader context, it is crucial to define a sound conceptual framework, which is the combination of a frame of reference and of a typology [17]. As opposed to indicator lists, this **conceptual framework gives the overall context of the indicator set**, putting its individual parts into a system. The internal consistency of indicator systems allows to communicate in a coherent way and to elaborate appropriate story lines. The conceptual structure of an indicator system guides the choice of indicators and helps to address possible measurement gaps for a particular topic. An example is provided by the DPSIR [18] framework used in environmental statistics.

An indicator can be used in **different contexts**. This entails that the same indicator can convey different and even contradictory messages, depending on the purpose for which it is used (see

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[15] Eurostat addressed some of these conceptual questions with the development of the indicator 'At risk of poverty or social exclusion'.

[16] Federal Statistical Office, Pedrini, S., De Montmollin A., *Creation of clusters to supplement legislature indicators*, Federal Statistical Office, 2015, p.6.

[17] Examples of indicator typologies are provided by the Swiss FSO's MONET indicator system (see Federal Statistical Office, Altwegg, D., Roth, I., Scheller, A., Monitoring Sustainable Development. Final Report. Methods and Results, Federal Statistical Office, 2004, p. 22 and the *OECD's Green Growth framework.*

[18] The abbreviation 'DPSIR' stands for Driving forces; Pressures; States; Impacts; Responses.

Chapter 6). As an example, a drop in energy consumption can be interpreted as positive from an environmental perspective, but negatively if it stems from a reduction in economic activity. In general the choice of indicators serves as a kind of gatekeeper for distinguishing between what matters and what does not. For example, the leading indicator Gross Domestic Product (GDP) focuses on economic activity and does not take into account environmental destruction or the well-being or happiness of the citizens. Any subsequent discussion on progress in society based on GDP may therefore ignore environmental or well-being issues.

There are cases where individual indicators, even when part of an indicator set, are not able to convey clear messages if not supported by contextual information. The creation of **clusters of indicators,** through criteria determined in advance ([19]) thus reinforces the link between indicators and the broader context they refer to and reduces the risk of a simplified or decontextualised use ([20]). Defining clusters of indicators enable a more in-depth analysis and strengthen the explanatory power of the indicators. The approach of indicator clustering is for instance used by the Swiss Federal Statistical Office (FSO) ([21]) in the monitoring of the Swiss Legislature Plan. FSO's cluster approach is not the only one using contextual indicators. For instance, Eurostat's Sustainable Development Indicator (SDI) set ([22]) is organised in a three-level hierarchical structure, where each level provides increasingly specific information to enable a more and more in-depth analysis. The three-level indicators are further complemented with contextual indicators which broaden the analysis in the context of the EU Sustainable Development Strategy (EU SDS). Contrary to the FSO's cluster approach, where contextual indicators are 'attached' to a single headline indicator, contextual indicators in Eurostat's SDI set relate to a whole theme. Eurostat's hierarchical structure is meant to monitor the invariable, established objectives of the EU Sustainable Development Strategy. The flexibility of the FSO's clusters makes it appropriate for dynamic conceptual agendas such as the Swiss Legislature Plan.

Eurostat introduces the approach of indicator clusters in the 2016 edition of 'Figures for the future' (see Figure 3) ([23]).

([19]) Federal Statistical Office, Pedrini, S., De Montmollin A.,*Creation of clusters to supplement legislature indicators*, 2015, p.5.

([20]) Feller-Länzlinger, R. et al., Messen, werten, steuern. Indikatoren — Entstehung und Nutzung in der Politik, TA-SWISS Zentrum für Technologiefolgen-Abschätzungen,TA-54/2010, Bern, 2010, p.93.

([21]) Federal Statistical Office, Pedrini, S., De Montmollin A., *Creation of clusters to supplement legislature indicators*, 2015.

([22]) See http://ec.europa.eu/eurostat/web/sdi/indicators

([23]) Figures for the future. Sustainable development in our everyday life. A guide for citizens, Eurostat, 2016.

Figure 3: Figures for the Future — presentation of contextual indicators

Employment & Education

Employment rate by educational level, EU-28, 2015

82.7 % tertiary

70.7 % upper secondary

52.6 % lower secondary or less

70.1 % employment rate in the EU 2015

Early leavers face deterioration in job perspectives

2005

15 %
54 %
31 %

2015

19 %
42 %
39 %

- employed
- want to work (not employed)
- do not want to work (not employed)

Context

Unemployment

Youth unemployment
20.4 %
of 15-24 year olds were unemployed in 2015

People unemployed at least one year are long-term unemployed

Share of long-term unemployed increased from 36.9 % in 2008 to 48.1 % in 2015

Education

Tertiary education rose by 10.6 percentage points among people 30 to 34 years old from 2005 (28.1 %) to 2015 (38.7 %)

Compared to men, women ...
▷ are less likely to leave education and training early (18-24 years olds)
▷ attain more tertiary education levels (30-34 year olds)
▷ participate stronger in lifelong lerning (25-64year olds)

Source : Eurostat (online data codes: tsdec410, tsdec430, tsdsc330, lfsa_urgaed, tsdsc410, tsdsc480 and tsdsc440)

Source: Figures for the future. Sustainable development in our everyday life. A guide for citizens, Eurostat.

The role of the context at the dissemination level

The encoded meaning, i.e. the message an indicator should convey in the **specific context** it is used, should be properly 'decoded', which means properly understood and interpreted. Thus the main challenge here is to be clear and understandable to the user. Especially when dealing with non-specialists, the meaning of an indicator with reference to a specific context should be revealed by

explanatory communication techniques here referred to as meta-communication (^{24}). In order to explain the concept behind the numbers, one can choose between different options: the techniques for explanatory meta-communication include visual separation of the theoretical concept into dedicated **explanatory narratives** or presenting it through **storytelling** — putting the concept into a story which is adapted for an easy understanding.

Box 1: Context explained — examples

In the **promotional video** of the 2013 Monitoring Report on EU Sustainable Development Strategy, the concrete numbers of the indicators trends are put in a specially designed story explaining the concept of sustainable development as based on three dimensions: economic, social and environmental. In order to reach an audience as wide as possible, the conceptual story is visualised with the universal symbol of a bee.

In the 2013 Monitoring Report on EU Sustainable Development Strategy the political and conceptual aspects of the indicators are presented with dedicated narratives available under the title 'What lies beneath this indicator?' The illustrative example below refers to the indicator 'Shares of environmental and labour taxes in total tax revenues from taxes and social contributions'.

What lies beneath this indicator?

One of the policy guiding principles of the EU Sustainable Development Strategy is to ensure prices reflect the real costs of consumption and production activities to society and that polluters pay for the damage they cause to human health and the environment. More specifically, the strategy encourages Member States to consider further steps to shift taxation from labour into resource and energy consumption and/or pollution. The Europe 2020 strategy also calls for a shift from labour to energy and environmental taxes as part of a 'greening' of taxation systems.

The indicator compares the shares of environmental and labour taxes in total revenues from taxes and social contributions. Environmental taxes are defined as taxes where the tax base is a physical unit (or a proxy of a physical unit) of something that has a proven, specific negative impact on the environment and which is identified in ESA 2010 (31) as a tax. Environmental tax revenues are of four types: energy taxes, transport taxes, pollution taxes and resource taxes.

Taxes on labour are generally defined as personal income taxes, payroll taxes and social contributions of employees and employers that are levied on labour income (both employed and non-employed).

The choice of the appropriate techniques should be adapted to each concrete case so that the communication achieves its goal and allows the users to decode the message behind the numerical values of the indicator (^{25}). For an effective communication, not only should the encoded conceptual context be clearly understood, but it should also be relevant to the context of the user. Therefore, one should pay special attention to encode the context that the user can relate to.

(^{24}) Since these techniques are additional to the basic communication offered by the indicator they constitute a second layer of communication, i.e. meta-communication.

(^{25}) See more on the use of meta-communication in Chapter 5.

3 Indicator-based communication — 'two-way road' or why interactivity matters

The European Commission's understanding about communication is based on a 'more-than-information' approach: 'Communication is more than information: it establishes a relationship and initiates a dialogue with European citizens, it listens carefully and it connects to people. It is not a neutral exercise devoid of value, it is an essential part of the political process' [26]. The key element here is the interactive relationship between the communicator and the audience, which enables the latter to have its voice heard. Here one refers not to 'target audience' but to 'citizens' because communication is not just a technical exercise of message delivery but part of a democratic involvement of citizens [27]. It is the interactivity component that enables communication to play this important role in today's society.

If we translate this more-than-information understanding of communication into statistical terms, we find a direct match with the social function of indicator-based communication (the one that enables citizens to participate with a better informed opinion in society's decision making [28]). In this more-than-information type of communication interactivity plays a central role for indicators both at the creation and dissemination level.

Interactivity at the creation level: indicators and public dialogue

Interactivity allows for exchange of ideas and a shared creation of the content of the message. In this respect, in the statistical field an important case of reference are the different practices of user involvement in the construction of indicators and indicator sets. These practices enable users to have their say on the relevance of the statistical message, opening statistics to the democratic political process. Fundamental to these practices is the idea that the development of specific indicators and indicator sets need to be based on a wide consensus reached through a dialogue involving as many social groups as appropriate. The parties that need to be consulted depend on factors such as (1) the purpose of the exercise, i.e. the construction of an indicator set covering more specialised or more general policy area; (2) the political system and traditions of the different countries; (3) the policy priorities of the responsible organisations; and (4) the time and resources available for the development of the indicator set. For technical topics such as the measurement of economic

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[26] European Commission, *Communication to the Commission of the Commission Action Plan to Improve Communicating Europe by the Commission*, SEC(2005) 985 final, Brussels, 20.7.2005, p.3; The European Commission understanding of communication as intrinsically connected with the policy process has direct implications for the functions of the indicator-based communication. Thus Eurostat in its role of the statistical office of the European Union has an important function to play in underpinning institutional communication with indicators. This means that Eurostat's communication scope should take into consideration the most important communication actions of the Commission and look for synergies and communication opportunities. In this regard one of the first activities of Eurostat after the Juncker Commission entered into office was the release of a short publication on the Eurostat availability of indicators to underpin the Commission 10 priorities: *European Statistics for European Policies A wealth of data to underpin the Commission Priorities*.

[27] See the discussion about the social function of indicators in Chapter 1.

[28] For more details see the discussion in Chapter 1.

performance, where a specific expertise is required both at the political and at the statistical level, the relevant stakeholders could be only policy makers and experts specialised in that domain. On the other hand, for topics potentially engaging the society at large, such as measuring well-being or sustainable development, 'the process of selection and definition of indicators should involve a much wider group than technical experts' ([29]). Stakeholders may thus also include citizens and non-governmental organisations representing different segments of society. These could be approached through online consultations and discussion events, to be organised according to the available time and resources. There is no standard for whom to involve and how to develop an indicator (set). Nonetheless, whichever approach is taken the key issue is to have a dialogue-type communication rather than a top-down approach where indicators are 'imposed' on the users by the technical experts. The OECD, for example, in its work on Measuring the Progress of Societies ([30]), approaches this issue through the concept of consultation. If properly designed this approach can have several advantages:

- it can help ensure that the indicators are legitimate. Progress is not strictly defined and there are many ways of considering progress;

- it can build a broader ownership of the indicators themselves, to better ensure they are used, supported and promoted

- it is a way to capture expert advice. Understanding the opinions of civil society organisations can help ensure that the indicators do not reflect the potentially narrow viewpoint of the statistician or bureaucrat ([31]).

Box 2: Democratic user involvement — examples

Germany: Macro indicators on the state of the environment ([32])

The development of the macro indicators describing the state of the environment involved communication among three different actors — representatives of science, statistics and politics/representatives of social interest groups.

The communication process was realised in two forms: as a permanent dialogue accompanying the project at the working level in the project group (statistical and scientific specialists) and in the form of 'consensus-finding roundtables'. The latter were based on the concept of the 'bazaar' — a negotiation exercise between the representatives of different social interest groups and experts. It gave the opportunity to the social interest groups to have their say, to influence the process of indicator construction and make it more socially legitimate ([33]).

Eurostat: Quality of Life indicator set

The construction of the Quality of Life (QoL) indicator set started with conceptual and technical level work involving consultation with specialised groups of experts, statisticians and policy makers ([34]).

([29]) Jackson, A., *Measuring and Monitoring Economic and Social Well-Being: Comments from a Labour Perspective*, Statistics, Knowledge, and Policy: Key indicators to Inform Decision Making, OECD Publishing, Paris, 2004.

([30]) Organisation for Economic Cooperation and Development, *What to measure: the specific dimensions of progress; Applying the Framework: Consultation and Community Engagement*, e-Learning Course on Measuring the Progress of Societies, Statistics, Knowledge and Policy: Understanding Societal Change.

([31]) Ibid.

([32]) Radermacher, W., *The Reduction of Complexity by Means of Indicators: Case Studies in the Environmental Domain*, Statistics, Knowledge and Policy: Key Indicators to Inform Decision Making, Organisation for Economic Cooperation and Development, OECD Publishing, Paris, 2005.

([33]) The author notes that 'the indicators developed in that process have remained theoretical and that there has not been any regular empirical coverage of the macro indicators. Although politics was involved in indicator construction, the subsequent implementation was not supported because the financial burden of collecting the required basic data was too large', Radermacher, W., 2005, p.10.

([34]) For the consecutive stages of work on QoL indicator set at expert and political level consult European Statistical System, *Sponsorship Group on Measuring Progress, Well-being and Sustainable Development: Final Report*, 2011; The Eurostat expert group has played an important role for the refinement of the list of indicators and their computation. The group consisted of representatives of about 10 NSIs, OECD, UNECE, and Eurofound and Commission DGs.

After this initial phase a wider public and academic debate has been initiated. It was done mainly through cooperation with the European Statistical Advisory Committee (ESAC). Being an advisory body for the EU institutions (European Parliament, the Council and the European Commission), one of its main task is to advise the Commission on how to improve the relevance of European statistics to users. The Committee comprises twenty-four members, representing users, respondents, the scientific community, the social partners and civil society ([35]).

At European level among the best practices of public consultations on statistical indicator sets are the consultation procedures of the Italian and the UK statistical offices on their respective 'Sustainable well-being' and 'Quality of Life' indicator sets ([36]).

Australia ([37]): Public consultation for the development of the indicator set, 'Tasmania Together' ([38])

When developing the set of indicators for the Tasmania Together initiative, the Australian state of Tasmania undertook a massive consultation exercise. The initiative and its subsequent reviews were intended to reach not only some specific interest groups but as many representatives of the Tasmanian society as possible ([39]).

Although some studies suggest that groups such as the 'elderly, disabled or those with young children were not well represented' ([40]), this is still one of the best examples of public consultation exercise in terms of social inclusiveness.

By taking part in public consultations the users enter into a dynamic change of institutional roles. First, by being involved in the development of indicator sets ([41]), the citizens no longer play the role of passive users of statistics and become instead 'co-creators' of statistical content. Then, after the indicator set is ready the citizens become again users of the statistical information through various dissemination channels. This gives them the knowledge allowing them to evaluate societal progress and having a better informed opinion. This potentially leads to some form of engagement which may influence the political decision-making process. In this model of dynamic indicator-based communication, aiming at establishing democratic dialogue, citizens' interactivity plays a central role both at the early stage of creating indicators and indicator sets and later at the stage of their dissemination.

For important policy initiatives, however, policy makers tend to have a close control on the

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([35]) Composition of ESAC: (1) Twelve members are appointed by the Commission, after consulting the European Parliament and the Council. They represent users, respondents, and other stakeholders in Community statistics (including the scientific community, the social partners and civil society). (2) Eleven members are appointed directly by the institutions and bodies to which they belong (currently from European Parliament, Council of the EU, European Economic and Social Committee, Committee of the Regions European Central Bank, European Statistical System Committee, Confederation of European Business (BUSINESSEUROPE), European Trade Union Confederation, European Association of Craft, Small and Medium-sized Enterprises, European Data Protection Supervisor). (3) The Director General of Eurostat is an ex officio member of the Committee, without a voting right.

([36]) See Office for National Statistics, National Well-being Measures, September 2015; Italian National Council for Economics and Labour (CNEL) and the Italian National Institute of Statistics (ISTAT), Report on Equitable and Sustainable Wellbeing (BES 2014) — Media Summary, 2014.

([37]) Although most of the examples in the paper come from the European Statistical System Australia is quoted here because worldwide its public consultation 'Tasmania Together' is one of the best practices in terms of inclusiveness of the consultation. In Europe similar initiatives are the public consultations on quality of life in Italy and United Kingdom. The following numbers give a quick idea about the comprehensiveness of the UK consultation procedure: 175 events were held throughout the whole country, more than 7 000 people participated in the discussions and there were more than 34 000 responses to the questionnaire of the UK statistical office. At the European Commission level a public consultation with a wide scope was carried out to set up the resource efficiency scoreboard. Another project of the European Commission aimed at improvement of people's engagement with statistics is 'Web Communities for Statistics for Social Innovation'.

([38]) For more information see http://participedia.net/en/organizations/tasmania-together.

([39]) These included: families, young people and older people, Tasmanian Aboriginal community, specific interest groups, partners and supporters and coalitions of interest, peak bodies in the business, community and government sectors, community groups such as service clubs, religious groups, cultural organisations, sporting and recreation groups, environmental groups and other special interest groups, State, Commonwealth and Local Government, businesses, Unions and Industry Councils, University of Tasmania, the media Tasmania Together Progress Board, *Tasmania Together Five year Review*, Report to the Parliament, 2006.

([40]) Jackson, A., 2004.

([41]) One should note that the involvement of the citizens in the production of statistical indicators is not an absolute goal and it has its own limitations especially in the cases where the proposals from 'the public' are not representative.

development of related indicator sets. Indicators are crucial to assess progress towards a policy target, and there are cases when policy targets are expressed in numerical terms and therefore can be directly measured. A widespread idea is that only what can be measured is important and that what cannot be measured ends to be irrelevant (which of course is not true). A frequent expectation is that suitable indicators exist or can be easily and cheaply produced for any policy initiative or phenomenon potentially interesting from a policy perspective (which of course is also not true). This at times results in difficult discussions between policy makers, who are publicly accountable for their choices and want to know how effective these are, and official statisticians, who can find themselves under heavy pressure both at the stage of the creation of indicator sets and when disseminating the results of a statistical monitoring. The topic of the relation between official statistics and policy makers is fully developed in the third paper in this series and is not further addressed here.

Interactivity at the dissemination level

The advancement of internet technologies paved the way to a rapid development of Web2.0-style approaches, including interactivity and customisation. This advancement gave birth to various interactive tools, which are recognised as an effective way to facilitate the process of indicator-based communication also at the stage of disseminating results.

An important example at Eurostat in this regard is the Europe 2020 Strategy Flexible Dashboard. This tool makes it possible for users to reach information about Europe 2020 Strategy indicators in an attractive and highly customisable manner. All individual indicators are presented via choropleth maps, bar charts and line graphs. Comparisons can be made across countries and changes in time can be seen in motion. A dynamic radar chart shows animated progress towards the targets of the Europe 2020 Strategy like in a mini film (Figure 4).

**Figure 4:** Europe 2020 Strategy Flexible Dashboard
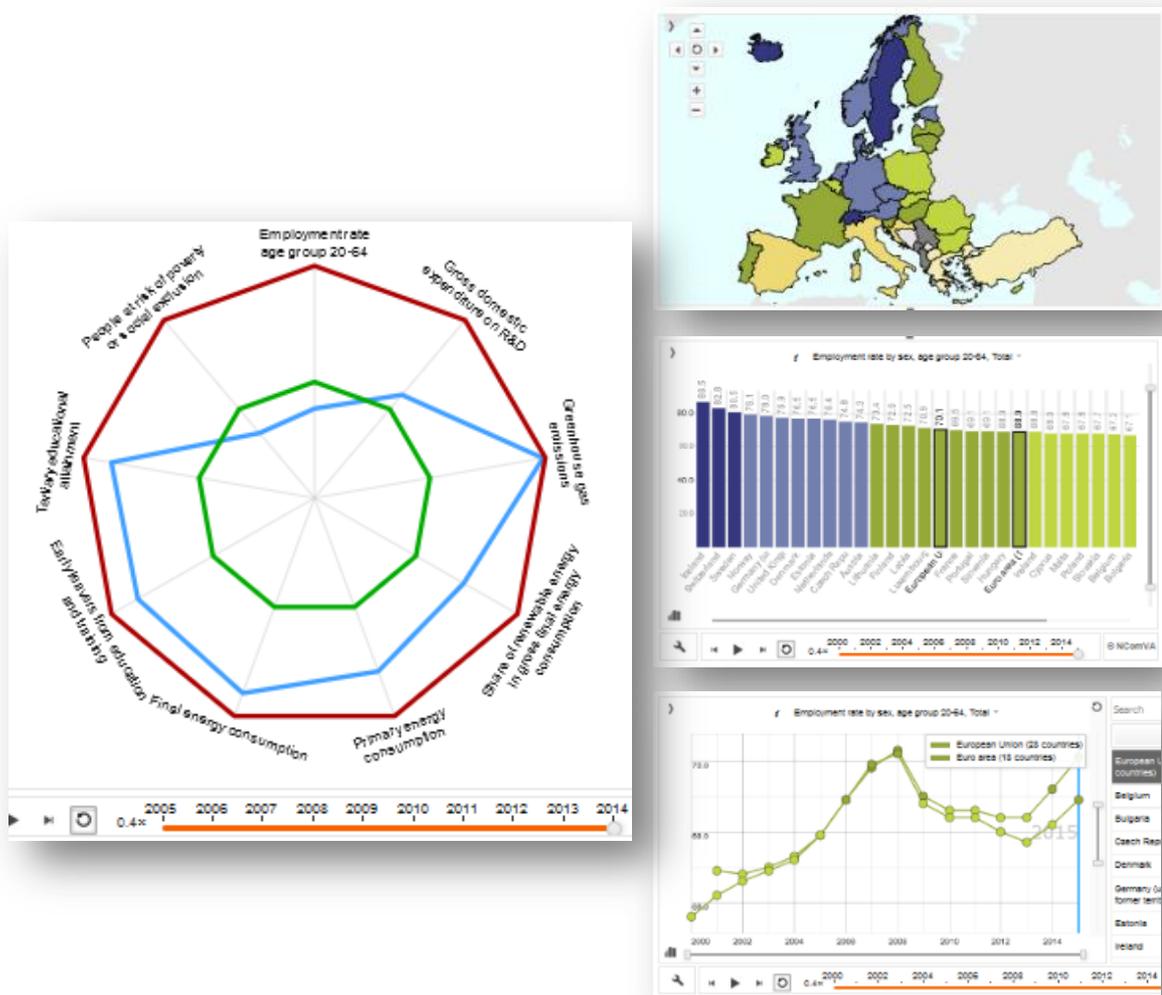
Source: Eurostat

Another example is the OECD's 'Your Better Life Index' which aggregates several dimensions and indicators of well-being into a single measure (Figure 5). This composite indicator addresses the weighting issue via an interactive tool which lets people express their own concerns and values. In this way, each user can calculate his/her own personal index. If, for instance, a user considers health status and environmental quality as the most important aspects of his/her life, he/she will have the possibility to rank them higher than other dimensions, and be able to see how countries perform in terms of overall well-being when these dimensions are more prominent than others. The weights provided by the users of the index are then used to establish country and theme rankings.

The interactivity provided by the 'Your Better Life Index' is essential for the transparency of its functioning and thus ensuring understanding of the matter for all types of users. Furthermore, users can compare their ranking and share their index via social networks, email or their own blogs or websites ([42]).

([42]) Another example of extensive use of the interactivity benefits is the European Environmental Agency's utilisation of its data visualisation tool DaViz enabling users to explore the charts interactively: http://www.eea.europa.eu/data-and-maps/daviz.

Figure 5: 'Your Better Life Index'
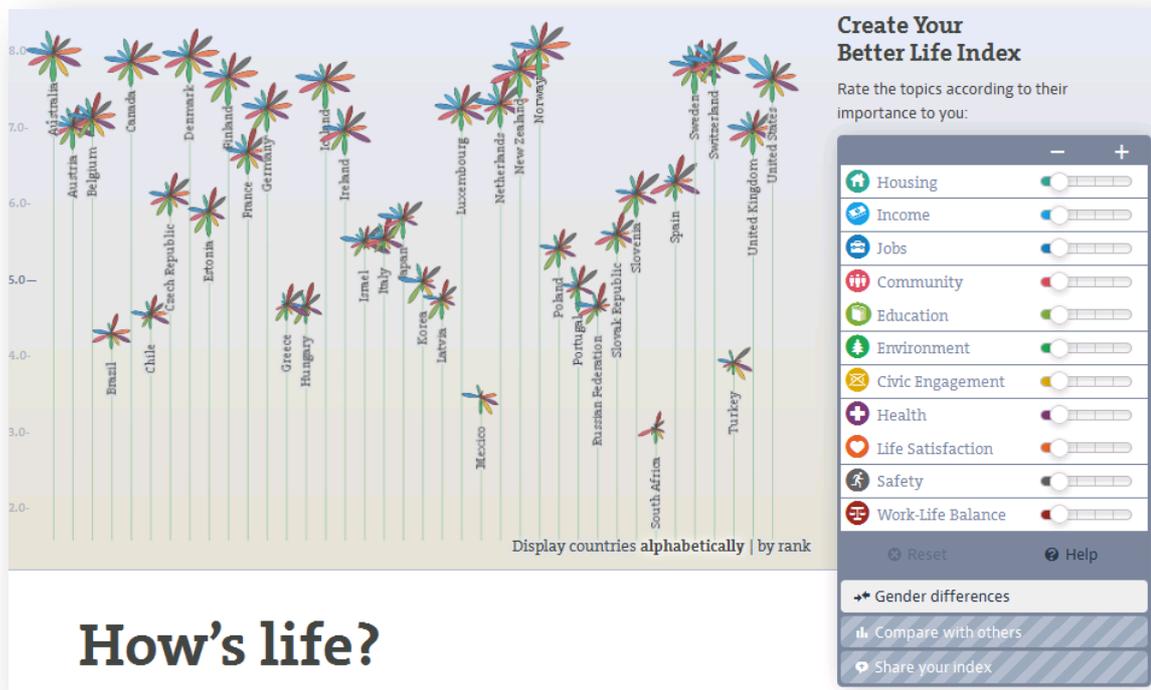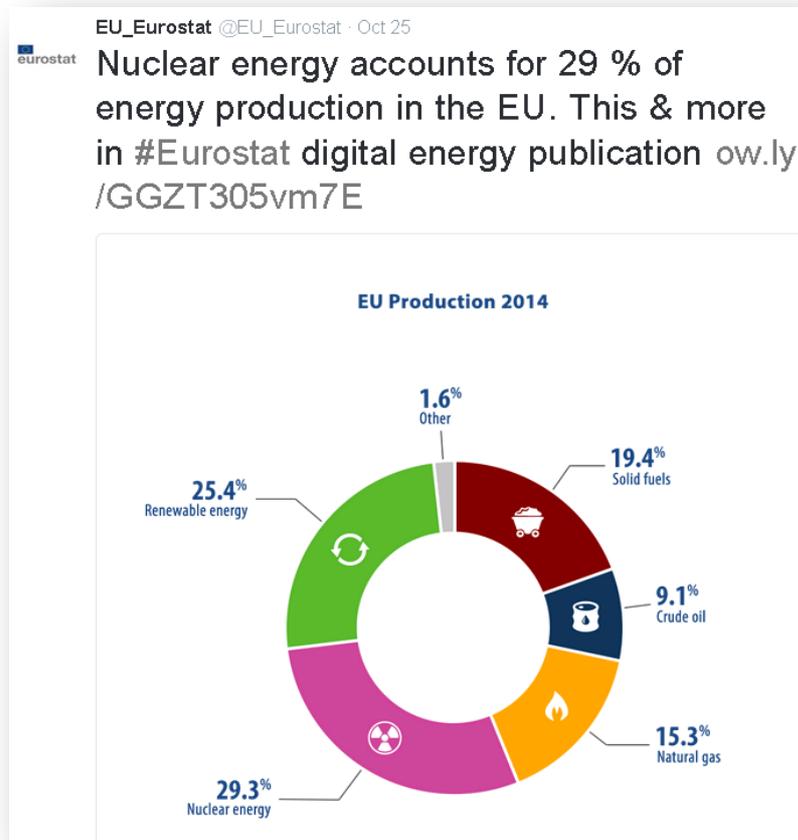

Source: OECD

In general the rise of social media in recent years has increased the opportunities for interactive communication. As indicators can make concise and yet influential messages on their own, communicating through indicators is well fit to short message social networks such as Twitter where Eurostat regularly posts indicator-based messages (Figure 6) including infographics (Figure 7).

Figure 6: Twitter message on resource productivity

EU_Eurostat @EU_Eurostat · Jul 7
Resource productivity in the EU up by 35% in 2015 compared with
2000 #Eurostat ec.europa.eu/eurostat/docum…

Source: Eurostat Twitter account

Figure 7: Infographic of energy production

Source: Eurostat Twitter account

4 Indicators for whom? — Users and user needs

Indicators are a powerful means of communication, but this is the case only when their messages reach the right audience. Thus in order to ensure efficient communication one first needs to ask the question: 'Indicators for whom?'

When answering this question a broad distinction can be made between two major user groups:

- the **specialists**, i.e. statisticians, academia, specialised journalists and policy analysts, who possess expert-level statistical knowledge and are able to process and interpret detailed data sets;

- **citizens** or the **general public**, i.e. people without or with limited statistical knowledge.

These two broad user groups have different communication needs and they should be approached through different communication channels.

The primary interest of **specialists** is to receive precise and detailed information, including exact methodological definitions, presentation of the statistical trends, harmonised time series, detailed metadata, etc. In this regard, and given their familiarity with the topic and own ability to analyse related data, their needs are mainly for information *strictu sensu* ([43]), rather than for the explanatory techniques needed for the decoding of the statistical message by non-specialists.

Eurostat's main communication channel for the dissemination of indicators to users with expert-level statistical knowledge are the detailed tables in Eurobase, including break-downs which often reach a high level of detail (see Figure 8).

([43]) See the description of the informational approach to communication in Chapter 1.

Figure 8: Detailed tables in Eurobase

Source: Eurostat

As regards **citizens** which normally do not have specialist knowledge in statistics, their main need is high-level accessibility to the content of the indicators. This relates to the fulfilment of one of the UN Fundamental Principles of Official Statistics, namely: **the citizens' entitlement to public information (**[44]**)**. However the implementation of this fundamental principle is not straightforward. In reality, statistics are often perceived as a highly complex domain, out of reach for non-specialists, to the point that 'citizens can feel distanced from statistical information' ([45]). This is mainly the result of the specificity of the 'language of numbers'. Like any other type of language this is a specific code which requires specific knowledge in order to be decoded and understood, and this knowledge is often accessible only to a restricted audience of specialists. To overcome this shortcoming and give statistics an appropriate role in the public debate, it is essential to find appropriate tools and channels to convey the relevant statistical information to the broader public of non-specialists, also taking into account its heterogeneity.

To appropriately address the communication needs of the 'general public', carrying out a detailed segmentation analysis of this broad group is fundamental. This analysis should be based on various criteria: demographic and social categories, geographical location and psychographic factors. Depending on the resources available and employed for the purpose of indicator communication, citizens could be further segmented according to age groups, household types, education, income and living conditions, employment, citizenship, lifestyles, subcultures, communities, etc. Thus within the general public one could outline user groups such as policy-makers, youngsters, university students, pensioners, families, representatives of the civil society, generalist journalists.

Each of these groups has different needs and behavioural patterns as regards the use of statistics, which should be carefully considered in order to select appropriate communication channels. Several possible user classifications can be made. As an example, European Statistical Advisory Committee (ESAC) distinguishes two major groups ([46]):

([44]) Principle 1 of the UN Fundamental Principles of Official Statistics

([45]) *GDP and beyond — measuring progress in a changing world*, COM(2009) 433/2009

([46]) Vichi, M., Rosa, M., Ruane, F., *The Users of Statistics and their role in the European Society*, European Statistical Advisory Committee (ESAC), 2015, p.3.

- Institutional users which include European and EU institutions
- Non-institutional users which include:
    - Users with a general interest
    - Users with a specific subject/domain interest
    - Users with a research interest

According to their frequency of statistical usage and proficiency ESAC further distinguishes between:

- Heavy users — researcher, specialist, politically or civically-engaged citizen, and others that use statistics on a daily basis. Typically this is the person who knows where to find data and how to interpret it.

- Light (occasional) users — user who from time to time checks some figures. He/she would know the National Official Statistics and Eurostat websites but would find some difficulty in getting the data he/she needs and would not be looking for metadata.

- Non-users who might be Potential-users — all people who do not go looking for data believing it is something hard to understand and not being aware of data's relevance and richness.

With a view to match the different user groups to communication channels, this paper proposes the following classification of users by behavioural patterns:

- **Group A:** Users who look for an in-depth analysis of the respective issue and devote more time for it. They might compare information across several sources. Usually they have background information on the subject and use information from analytical publications for reaching conclusion in their own research or for taking evidence-based policy decisions. They may or may not have an in-depth statistical knowledge.

- **Group B:** Users who look for the analysis and the findings of analytical publications but want as well to profit from an easier navigation among the various themes and topics. They prefer 'wiki' style of information (encyclopaedia style, containing quick links to other information).

- **Group C:** Traditional website users, who need to see the statistical trends in relevant policy frameworks. Often they are redirected from other policy-related websites.

- **Group D:** Users who prefer visual communication and/or have time only for the key messages. Such users are usually active in social networks. They receive a lot of digested information and the attractiveness of the presentation plays a key role for having their attention.

- **Group E:** Users who prefer video communication. Typically they do not have time for long readings and/or need to be informed about the latest trends and developments or basic features of a respective issue. Usually they use the videos as a general source of information with no specific purposes of using the information in their own analysis or research.

- **Group F:** Tech-savvy users. They are often early adopters of new technologies and prefer synthesised text-and-visual information rather than traditional publications. Usually they have some background information on the subject which allows them to make use of the interactivity of technological products by setting their own content preferences.

Of course, the same user can actually belong to more than one group in this classification. It might also evolve and move from one group to another.

The next chapter will discuss how the above user groups relate to the different possible communication channels.

5 How to reach the citizens?

A wide range of communication channels

There are some general criteria that should be met regarding the channels of indicator-based communication aimed at the general public. In these channels the use of technical definitions should be limited and/or replaced by descriptions based on easy-to-understand language. In order to reach the citizens, indicators should be presented in a way which has a direct relevance to people's everyday lives. Examples should be based on real-life situations. Descriptive narratives should be accompanied by attractive infographics ([47]) to exploit the explanatory power of images. Videos can be a useful complementary form of visual communication.

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[47] Infographics are graphic visual representations of information, data or knowledge intended to present complex information quickly and clearly. (Newsom, D., Haynes J., *Public Relations Writing: Form and Style*, 2004, p.236). In general infographics are very convenient for quick reach of wide audiences with their simplified design that maximises content and minimises confusion.
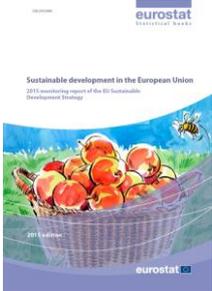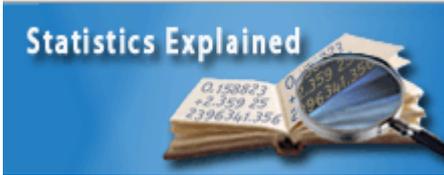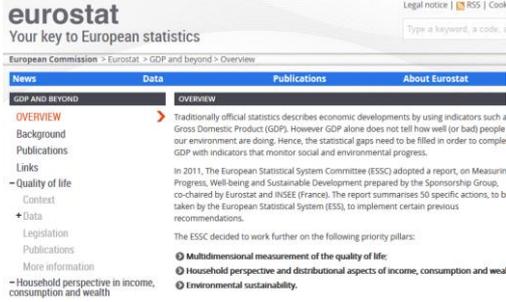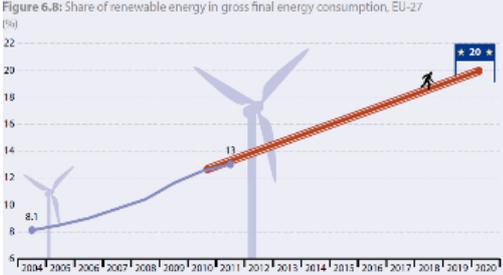
Box 3: 'Speaking to citizens': an example of Eurostat's communication aimed at the general public

As an attempt to address existing communication gaps, Eurostat produced a 'Speaking to Citizens' communication package on the occasion of the 2012 Rio+20 United Nations Conference on Sustainable Development. It approaches the wide audience of the citizens with a publication and a series of four videos. They make use of innovative infographics and a language easy to understand. The innovative communication products also put the sustainable development indicators in the context of everyday life in order for people to be able to find the statistics' relevance to their personal situations.

Publication	Separate release of infographics	Videos

Presentation on sustainable development indicators (slides of the publication):
This presentation is also available in 22 of the EU official languages, see below.

bg cs da de el es et fi fr hu it lt lv mt nl pl pt ro sk sl sv

Average carbon dioxide emissions from new passenger cars
Grams of CO₂ per kilometre

EU-15 1995 **186**   **22 %**   EU-15 2009 **145**
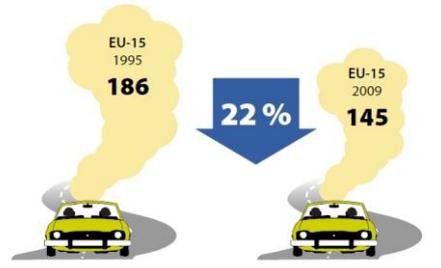
Source: Eurostat (online data codes: tsdtr450)

Videos:
- Making More From Less – Stepping Towards Green Growth in the EU
- Poverty in Europe – Beyond just income
- Poverty in Europe – a question of perspective
- Electricity in the EU – Sparking a green economy

The different behavioural patterns should be addressed by **diversifying the communication channels.** Table 1 provides examples of communication channels appropriate for each behavioural group:

Table 1: Communication channels and behavioural groups

Behavioural group	Communication channel	Examples		
Group A	Analytical / informative publications		EU Sustainable Development Strategy Monitoring Report	
Group B	Eurostat Statistics Explained			
Group C	Eurostat website pages dedicated to statistical themes			
Group D	Separate release of infographics			

Group E	Audio-visual productions		Hans Rosling — 'The joy of statistics' video series
			Four promotional / educational videos on the occasion of UN Rio+20 2012 conference, placed on EUtube ([48]), EC AV portal and Eurostat website ([49]) and YouTube dedicated channel ([50]).
			Eurostat's 2015 video on indicators
Group F	Flexible dashboards / Widgets / Apps/Social media		Europe 2020 Strategy flexible dashboard
			OECD Factbook eXplorer
			Twitter

([48]) http://www.youtube.com/user/eutube

([49]) http://ec.europa.eu/eurostat/web/sdi/videos

([50]) http://www.youtube.com/channel/UCjO2YQzR0ZzNc-YKFI7rTrQ/videos

The synergies between the different communication channels can also be combined in an eclectic panel in order to reach an audience as wide as possible. See an illustrative example in Box 4.

Box 4: Finding the synergies — examples

OECD: The Rio+20 conference communication package combines an analytical publication and a video

Eurostat: The 2013 Monitoring Report on EU Sustainable Development Strategy combines a publication and a promotional video

Conveying clear and understandable messages

In order to address the general public, indicators should be clearly understood by the various types of users. The essence of this requirement can be traced in Principle 15 of the European Statistics Code of Practice which states: 'European Statistics are presented in a clear and understandable form' ([51]). There are a number of issues to be addressed in that respect, ranging from clarity of the indicator title to the challenges of streamlining the information in the indicator sets. These are discussed in more details below.

Indicator title

Regarding the clarity of the indicator a crucial role plays its **title**, because it is the main communicative summary of the concept presented by the indicator. In the domain of public policy, the title feeds into the so-called symbolic policy, signalling which dimensions of a phenomenon are politically important. For example, in the title of the indicator 'at risk of poverty or social exclusion', which is used in different EU policy indicator sets, the concept of *poverty* is accompanied by the concept of *social exclusion*. At symbolic level, this mirrors the importance of the social dimension in the EU public policy — the EU terminology does not refer to 'market economy' but to 'social market

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([51]) European Commission, Eurostat, *European Statistics Code of Practice*, 2011.

economy' (^{52}). Hence the title should be chosen with high precision paying attention to the exact wording. It should thoroughly provide the logic of the subject, which is often a very complex one, while being clear, simple and concise. In terms of length, according to Eurostat standards ideally an indicator title should not exceed 100 characters (^{53}). Important information to be provided to the user but too long to be included in the title should be reported in the metadata (^{54}). In addition the title should begin with the main information on the indicator content such as GDP, population, electricity consumption (^{55}):

Some illustrative examples coming from Eurostat's practice are:

- Population by citizenship — Foreigners
- Use of inorganic fertilisers
- Serious accidents at work

To improve clarity, especially when indicators have very technical titles that can only be understood by professionals in the respective field, additional explanatory techniques (meta-communication) can be used to convey the message to the wider audience (^{56}). These are described in the following.

Short text messages

Irrespective of how clear a title, an infographic or a table is, a short narrative or brief textual information can put into a few words the main message that needs to be revealed (see Figure 9). This is particularly useful for people to whom the numbers say little or nothing.

The infographic below shows the evolution of the 'Common bird index' in 19 EU countries as presented in the report '2011 monitoring report of the EU sustainable development strategy'. The general trend and the period evaluated are made more detectable by placing an explanatory text next to the infographic.

(^{52}) For example Article 3 of the *Treaty on European Union and the Treaty on the Functioning of the European Union* states that: 'The Union shall establish an internal market. It shall work for the sustainable development of Europe based on balanced economic growth and price stability, a highly competitive social market economy, aiming at full employment and social progress, and a high level of protection and improvement of the quality of the environment. It shall promote scientific and technological advance.'

(^{53}) Since in the majority of cases indicator titles are used interchangeably with titles of statistical tables, some of the examples here comes from *Table title guidelines — writing titles and short descriptions*.

(^{54}) Information that is too long to be carried by the indicator title could be also reported in a subtitle or a footnote.

(^{55}) Ibid.

(^{56}) The examples below come from Boesch, A. et al, *Getting messages across using indicators: A handbook based on experiences from assessing Sustainable Development Indicators*, Eurostat, Luxembourg, 2014.

Figure 9: Short text message — example

Figure 8.1: Common bird index, EU
(index 2000 = 100)

Period evaluated: 2000-2008 (all common birds)

Average annual rates of change:

All common birds: +0.5 %

Common farmland birds: -0.7 %

All common birds   Common farmland birds
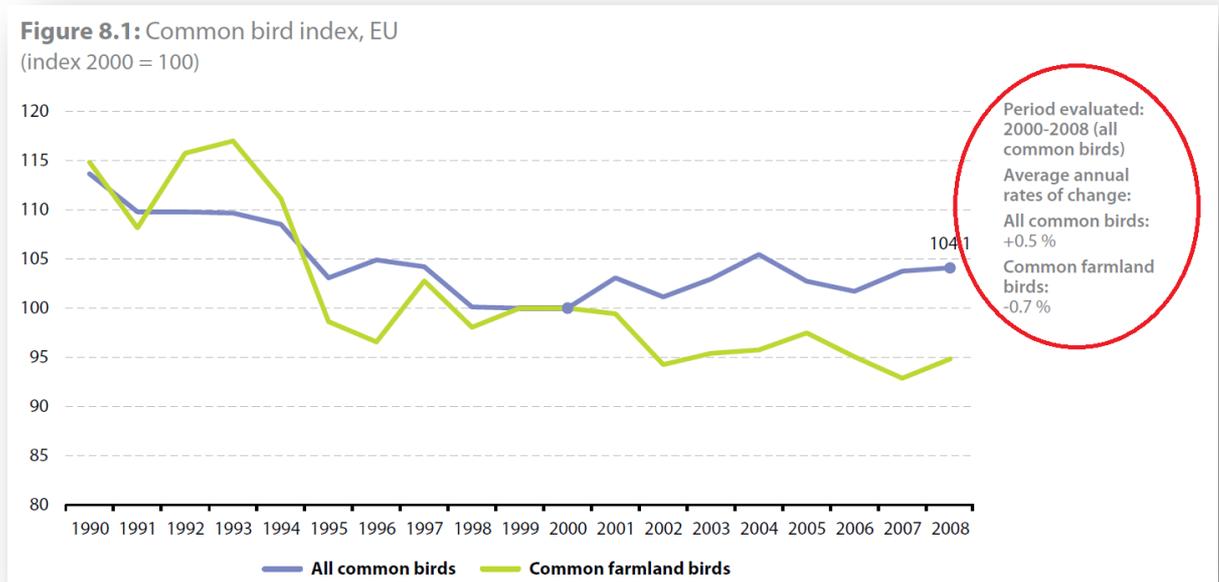
Source: Sustainable development in the European Union. 2011 monitoring report.

Explicit and implicit communication — explanatory narratives

There are two types of indicators where the desired trend is not straightforward:

Expenditure indicators (e.g. 'Expenditure on health'), for which we cannot say without knowing the context whether an increase or a decrease is desirable. In order to assess these types of indicators extra information is required.

Indicators on not well-known phenomena, with which only experts are familiar with, such as 'Material flow', 'Energy trade balance' or 'Nitrogen surplus' — only one familiar with those concepts will be able to indicate the desired trend ([57]).

In these two cases explanatory narrative messages next to the infographics indicating the desired trend would provide the reader with the necessary information to assess the actual development shown by the indicator.

An example of a structured approach to the use of explanatory narratives is provided by the Swiss FSO's online presentation of indicators. It consists of the following elements: textual narrative about the significance of the phenomenon portrayed by the indicator; data of the indicator presented in a graph; textual narrative with commentary about the developments of the indicator trend; textual information on the methodology used for the construction of the indicator and links to further information ([58]).

([57]) Ibid.

([58]) For example see the presentation of the indicator 'Greenhouse gas emissions'

Evaluation: clear presentation of the message

Most users are interested in the basic message: do numbers bring 'good' or 'bad' news? This requires an evaluation of a trend or a level of the phenomenon captured by the indicator in question. Evaluation is however something official statistics are very cautious to do: while showing the distance to political or scientific targets is usually accepted as sufficiently factual, proposing causal relations or projecting future trends may well go beyond the realm of official statistics. Evaluation crosses the border between statistics and policy making — what indicators anyway intend to do. Using a sound assessment methodology and presenting it in an accessible and transparent way are therefore crucial elements for official statistics to keep their neutrality and credibility.

The use of basic **symbols or icons** for the overall evaluation of a particular trend or level applies the principle of an unambiguous visualisation of complex information. The symbols should be easy to understand in terms of their purpose and description. Table 2 provides a few examples of symbols actually used by different national and international institutions:

Table 2: Symbols used for communicating assessment results ([59])

Symbols	Characteristics	Institution/country
	Smileys (in combination with traffic lights colours)	Federal Planning Bureau, Belgium
	Traffic lights colours (in combination with arrows)	Centraal Bureau voor de Statistiek (CBS), The Netherlands
	Traffic lights colours (in combination with typographic symbols)	Office for National Statistics (ONS), United Kingdom, Federal Statistical Office (FSO), Switzerland
	Weather symbols/icons	Eurostat, Destatis, Germany

([59]) Boesch, A. et al, 2014.

Metadata, indicator profiles

Metadata contain essential information needed to understand and effectively use the data ([60]). In general, they provide users with background information on data sources, data collection, statistical processing, accessibility and quality. Statistical indicators, which are used for specific purposes, require specific metadata. In particular, indicator metadata should provide a deeper focus on the context in which the indicator is used (e.g. monitoring a policy strategy) and the exact definition and an explanation of the indicator-specific methodology, information which is normally not included in the metadata of data sets. On the other hand, methodological details on the underlying sources, normally included in metadata for data sets in general, may be less relevant for an indicator-specific documentation.

Metadata for indicators should also provide a **concise grading summarising the overall quality** of an indicator. It is important that users are able to understand 'at a glance' the possibilities and limitations of using indicators, especially when used for decision making. Figure 10 shows an example of dimensions covered by Eurostat's indicator-specific metadata ([61]).

Figure 10: Example of Eurostat's indicator-specific metadata
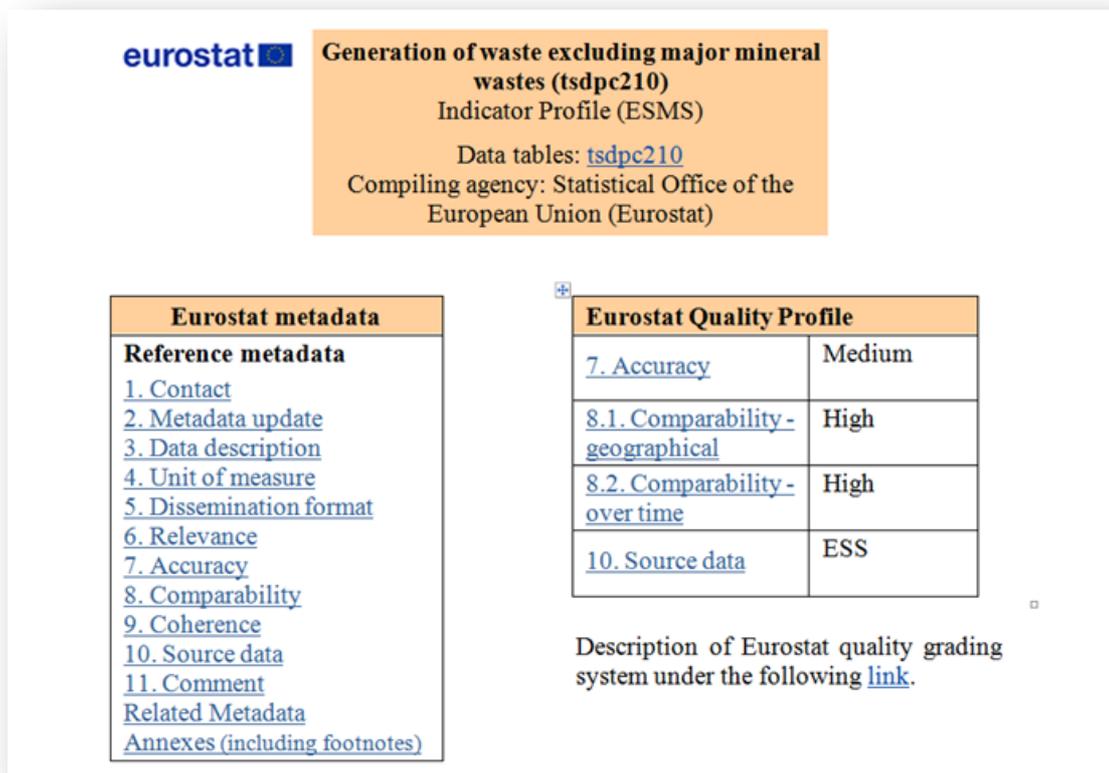
Source: Eurostat

([60]) Metadata provide a more precise message of the statistical indicators. However, there are cases which are difficult to be communicated in a structured and yet concise manner. These might range from how to deal with uncertainty of the indicator estimates to detailing the specific choices made in the construction of a particular indicator. Such issues could be addressed by additional notes and methodological papers.

([61]) Eurostat is currently streamlining its metadata structure for policy indicators, called 'indicator profile', to make it more concise and more specific than the one currently used for data sets in general. A reflection on the existing synthetic quality grading is also ongoing, to find out possibilities to make it more relevant for the user.

6 | Communicating complexity

In general indicator systems measuring multi-dimensional phenomena entail the challenge to synthesise complex information and to communicate it in a simple way without losing transparency. This issue concerns both the situation in which indicators are used to assess progress towards explicit policy targets or consistency with expected trends, and the one in which indicators are only used for analytical or descriptive purposes.

Several alternative options are available to deal with complexity, each one with specific properties that make them more or less fit for a given purpose. A first approach consists in developing indicator sets (including scoreboards or dashboards as specific types of sets) and showing all the information for each individual indicator. A second approach is to combine indicators on different phenomena and/or dimensions into aggregate, composite or synthetic indicators. A third way in between is to show the detailed information on the individual indicators while combining the assessment in 'aggregated dashboards' (see below). The following sections analyse the main features of these options from the point of view of communication, i.e. looking in particular at the clarity of the message and how the provided information is democratically accountable.

Indicator sets: scoreboards and dashboards

Regarding the communication of complex subjects, Eurostat normally opts for **sets of indicators** often in a form of scoreboards or dashboards. Scoreboards are concise lists of key performance indicators (often derived from a larger set) which are assessed against specific targets. Dashboards, on the other hand, do not necessarily have an evaluation function, in the sense that the observed indicator values are not necessarily compared to (policy) targets to assess performance. Dashboards are supposed to be very concise, with a very limited number of indicators (a typical example is a car 'dashboard', which has only few measurement instruments so that they can be monitored also by non-experts simultaneously). In scoreboards and dashboards indicators are not combined (e.g. to obtain composite indicators) but individually displayed side by side ([62]), although they can include aggregated indicators. Dashboards can be scoreboards if all or at least most indicators are performance indicators.

([62]) See European Commission, Eurostat, *Towards a harmonised methodology for statistical indicators — Part 1: Indicator typologies and terminologies — 2014 edition*, 2014, p.17.

Box 5: Examples of scoreboards maintained by Eurostat

Europe 2020 Indicators Scoreboard

The Europe 2020 Scoreboard measures progress in meeting the Europe 2020 strategy goals. Five headline target areas have been agreed for the EU as a whole. They are monitored with nine headline indicators. Target values for the nine indicators are shown in the scoreboard.

	UNIT	REFERENCE PERIOD						TARGET	TABLE	
		2008	2011	2012	2013	2014	2015			
75% of the population aged 20-64 should be employed										
Employment rate - age group 20-64	% of population aged 20-64	70.3	68.6	68.4	68.4	69.2	70.1	75		
Additional data (Show)										
3% of the EU's GDP should be invested in R&D										
Gross domestic expenditure on R&D	% of GDP	1.85	1.97	2.01	2.03	2.03 (p)	(:)	3		
Greenhouse gas emissions should be reduced by 20% compared to 1990 **The share of renewable energy sources in final energy consumption should be increased to 20%** **Energy efficiency should improve by 20%**										
Greenhouse gas emissions	Index 1990 = 100	90.29	82.99	81.8	80.24	77.05	(:)	80		
Greenhouse gas emissions in non-ETS sectors	million tonnes of CO2 equivalent	(:)	(:)	(:)	(:)	(:)	(:)	(:)		
Additional data (Show)										
Share of renewable energy in gross final energy consumption	%	11.0	13.1	14.3	15.0	16.0	(:)	20		
Primary energy consumption	million tonnes of oil equivalent (TOE)	1693.1	1593.3	1584.0	1569.1	1507.1	(:)	1483		
Additional data (Show)										
Final energy consumption	million tonnes of oil equivalent (TOE)	1180.0	1105.0	1104.5	1106.2	1061.2	(:)	1086		
Additional data (Show)										
The share of early school leavers should be under 10% and at least 40% of 30-34 years old should have completed a tertiary or equivalent education										
Early leavers from education and training	% of population aged 18-24	14.7	13.4	12.7	11.9	11.2 (b)	11.0	10		
Additional data (Show)										
Tertiary educational attainment	% of population aged 30-34	31.1	34.8	36.0	37.1	37.9 (b)	38.7	40		
Additional data (Show)										
Poverty should be reduced by lifting at least 20 million people out of the risk of poverty or social exclusion in the EU-27										
People at risk of poverty or social exclusion[1]	Cumulative difference from 2008 in thousand	(:)	3498	6301	5361	4643	(:)	(:)		
Additional data (Show)										
People living in households with very low work intensity	Thousand	(:)	39502	39704	40910	41810	(:)	(:)		
Additional data (Show)										
People at risk of poverty after social transfers	Thousand	(:)	83998	84131	83433	86196	(:)	(:)		
Additional data (Show)										
People severely materially deprived	Thousand	(:)	44271	49595	48145	44516	45225 (e)	(:)		

Macroeconomic Imbalance Procedure Scoreboard

The indicators in the Macroeconomic Imbalances Procedure (MIP) scoreboard are used to identify emerging or persistent macroeconomic imbalances in a country. The MIP scoreboard is part of an annual exercise, where the first step is the compilation of an Alert Mechanism Report (AMR). This scoreboard is not structured along a conceptual framework and each indicator is selected to cover a specific domain. However, their combined reading provides a picture of a country's possible macroeconomic imbalances.

	UNIT	2010	2011	2012	2013	2014	2015
Current account balance - % of GDP	3 year average	-2.8	-2.8	-2.3	-0.9	0.8	1.6
Net international investment position	% of GDP	-23.4	-21.9	-26.6	-28.8	-28.3	-26.7
Real effective exchange rate - 42 trading partners[1]	3 year % change	-1.9	-3.3	-6.2	0.0	0.2	-2.1
Export market share - % of world exports	5 year % change	-18.72	-18.92	-25.10	-19.63	-14.32	-8.82
Nominal unit labour cost index (2010=100)	3 year % change	8.9	5.3	2.1	2.9	2.8	2.2
House price index (2010=100) - deflated	1 year % change	-2.2 (b)	-2.1 (p)	-5.4 (p)	-6.9 (p)	-4.6 (p)	-2.5 (p)
Private sector credit flow - consolidated	% of GDP	5.0	3.1	-0.8	-2.7	-0.9	(:)
Private sector debt - consolidated	% of GDP	121.6	121.1	123.5	121.0	119.5	(:)
General government gross debt	% of GDP	115.4	116.5	123.3	129.0	132.5	132.7
Unemployment rate	3 year average	7.6	8.2	9.2	10.4	11.8	12.2
Total financial sector liabilities - non-consolidated	1 year % change	3.4	3.2	7.5	-0.8	-0.7	(:)
Activity rate - % of total population aged 15-64	3 year change in p.p	-0.4	-0.8	1.2	1.4	1.8	0.5
Long term unemployment rate - % of active population aged 15-74	3 year change in p.p	1.1	1.3	2.2	2.9	3.4	1.3
Youth unemployment rate - % of active population aged 15-24	3 year change in p.p	7.5	8.0	10.0	12.1	13.5	5.0

One advantage of using indicator sets is that all relevant dimensions are presented in a transparent way. Users can follow all the information provided by each indicator individually, which allows them to obtain detailed information on performance in all topical dimensions. This is an advantage from the accountability point of view.

Another advantage of indicator sets is that each indicator is able to transmit information both on its own and being part of the set. Thus despite possible overlapping of individual indicators between different sets, each set conveys a specific message. This is possible by using specific thematic structuring, indicator hierarchy and contextualisation of the individual indicators [63]. For example, Eurostat presents developments concerning efficient management of natural resources through the use of relevant indicators in the resource efficiency theme of the Sustainable Development indicator set as well as in the Resource Efficiency scoreboard. Similarly, social developments are presented through both the Sustainable Development indicator set and the Quality of Life indicator set.

The use of indicator sets suffers also some shortages. One of the main criticism is related to the fact that usually in the indicator sets the information is provided by a large number of individual indicators, which to a certain extent dilutes the overall message of the whole indicator set. Too many indicators might not be easy to interpret as the message might not be clear and the user might be even misguided. This can be a disadvantage from a communicative and clarity of message point of view.

To minimise subjectivity and maximise transparency, it is crucial to apply strict criteria for the inclusion of indicators in an indicator set. A first one is parsimony of the indicator set, which should not contain more indicators than necessary depending on the concrete context and purpose of use. Another recommendation when dealing with a large number of indicators is to structure the indicator set according to the *themes* or objectives of the respective policy or a theoretical concept. Thus the set of sustainable development indicators is structured into ten groups corresponding to the seven key challenges of the EU Sustainable Development Strategy. Also the Conference of European Statisticians recommendations on measuring sustainable development [64] propose a framework

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[63] This is an application of the main principle of communication that the content of the message depends on the context. See Chapter 1.

[64] UNECE, *Conference of European Statisticians recommendations on measuring sustainable development*, United Nations, New York and Geneva, 2014.

including 20 themes and three cross-cutting dimensions. The Principal European Economic Indicators (PEEIs) are structured in eight categories of economic and financial data. In addition, one may use a hierarchical approach, where on the top of the pyramid are the headline indicators followed by other layers of second or third level indicators. In this way it is possible even with a high number of indicators to achieve parsimony of the set with regard to the first level indicators, while at the same time ensuring a complete and exhaustive information though the lower layers. This approach is for instance followed by Eurostat for the Sustainable Development indicator set, which is hierarchically structured in three levels.

Another potential point of criticism concerns the choice of the indicator hierarchy in the set, which is often a product of the expertise and sometimes also of personal preferences of a very limited number of professionals specialised in a particular field. When this happens, the indicator set may not reflect the preferences of the wider audience to which the policy related to the set is addressed.

To prevent this, one might apply the procedure of democratic user involvement in the development/structuring of indicator sets, as described in the previous chapters. Yet this cannot be regarded as a universal principle for application. It should be considered mainly in the cases where one deals with more general agendas that concern large parts of society, e.g. Quality of Life. For more specialised topics, e.g. the Macroeconomic Imbalance Procedure of the European Commission, the application of well-established statistical typologies (see Chapter 2) should be sufficient.

Composite indicators

One way to convey simple messages when dealing with complex information is to use composite indicators. 'A composite indicator is created when individual indicators with different measurements units are combined into a single measure' ([65]) on the basis of an underlying model of the multi-dimensional concept that is being measured. 'A composite indicator measures multi-dimensional concepts (e.g. competitiveness, industrialisation, sustainability, single market integration, knowledge-based society, e-trade or environmental quality) which cannot be captured by a single indicator. Ideally, a composite indicator should be based on a theoretical framework/definition, which allows individual indicators/variables to be selected, combined and weighted in a manner which reflects the dimensions or structure of the phenomena being measured' ([66]).

In terms of communication the most important advantage of the composite indicators is that they allow for a simple **single number message**, which summarises various and different dimensions of a complex concept. Composite indicators are convenient for ranking, e.g. between countries, as for instance the Global Innovation Index (shown in Figure 11) ([67]).

([65]) European Commission, Eurostat, *Towards a harmonised methodology for statistical indicators — Part 1: Indicator typologies and terminologies — 2014 edition*, 2014, p.17.

([66]) Radermacher W. et al., *Terminology Relating to the Implementation of the Vision of the Production Method of EU Statistics*, Eurostat, Luxembourg, 2009.

([67]) The Global Innovation Index is co-published by Cornell University, INSEAD, and the World Intellectual Property Organization. Every year, since 2011, the Global Innovation Index is submitted to an independent statistical audit by the Joint Research Centre (JRC) of the European Commission. See https://www.globalinnovationindex.org.

Figure 11: Global Innovation Index 2015 ([68])
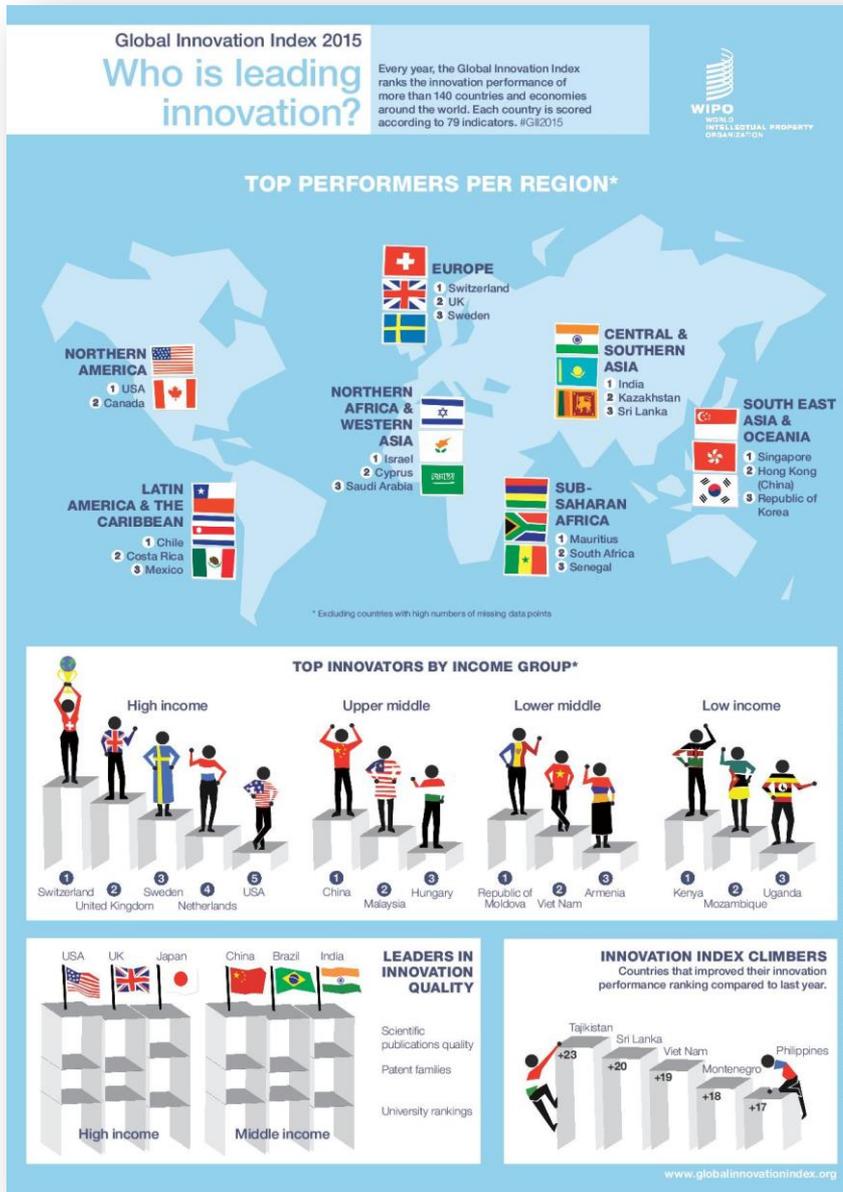
Source: World Intellectual Property Organisation

However 'theoretical frameworks for deriving coherent weighting approaches are difficult to construct' ([69]) and thus cases with arbitrarily and randomly assigned weights are not uncommon.

While at first glance composite indicators are convenient for communication purposes, their use raises a number of questions, mainly related to the aggregation of indicators of different nature. In general Eurostat takes a cautious approach to indicator aggregation, for instance as regards data measured in different units and when no well-established scientific reference exists. Composite

([68]) See https://www.globalinnovationindex.org/userfiles/file/GII-2015-Infographics.pdf

([69]) Freudenberg, M., *Composite Indicators of Country Performance*, OECD Science, Technology and Industry Working Papers 2003/16, OECD, 2003, p. 12.

indicators combining indicators expressed in different units through subjective and not widely accepted weighting systems should be considered of lower quality compared to official statistics. The weighting system ([70]) poses specific issues of democratic accountability when it ultimately reflects 'the relative power of the various social groups' ([71]) rather than being established through a democratic process.

With the advancement of new technologies there are already some remedies to this situation, as the example of the 'Your Better Life Index' mentioned in Chapter 3 shows. Also the application of methodological approaches as they developed further contributes to the improvement of the situation ([72]). In any case, when disseminating composite indicators, the producer should warn about the possibilities and the limitations of such indicators, illustrating which purpose they can serve and stressing in which cases they should not be used.

Eurostat synthetic indicators

Eurostat considers as synthetic indicators those computed by aggregating multiple highly-correlated variables ([73]). Such synthetic indicators aggregate indicators defined in the same unit of measurement (e.g. individuals) and from a same source (e.g. EU-SILC, the EU statistics on Income and Living Conditions). As a result, the weighting of the individual components is based on the structure of the data and not on value judgments. The indicator 'At risk of poverty or social exclusion' ([74]) is an example of a synthetic indicator produced and disseminated by Eurostat.

While the synthetic indicators have advantages over the composite indicators, they are still aggregations and as such they are exposed to some of the same quality risks as the other types of aggregations, especially in the case when no sound theoretical framework is applied.

([70]) It should be noted that besides the choice of the weighting there are other important factors which have an impact on the construction of the composite indicators. The OECD/JRC/Eurostat (2008) '*Handbook on Constructing Composite Indicators: Methodology and User Guide*' offers a guide and discussion on how to deal with the many assumptions that can have an impact when building a composite indicator, such as: methods for estimating (or not) missing data, methods for treating outliers, methods for normalisation, methods for choosing the weights (based on expert opinion or statistical techniques), aggregation formulas, including/excluding indicators and other factors.

([71]) Boulanger, P-M., 2008, section 3.5 paragraph 26.

([72]) See for example OECD/JRC, 2008.

([73]) There are different views among practitioners on the minimum magnitude of sub-indicator correlation needed for the construction of a reliable synthetic or composite indicator (see for example Nardo, M. et al., *Tools for Composite Indicators Building*, Joint Research Centre, 2005, p. 27). In general this is subject to various factors such as the domain, available data, political context, etc.

([74]) The indicator 'At risk of poverty or social exclusion' presents the overall poverty and social exclusion situation that is computed with three variables dealing with monetary poverty (People at-risk-of-poverty, after social transfers), lack of access to basic goods and services (Severely materially deprived people) and lack of access or limited access to labour market (People living in households with very low work intensity).

Aggregated dashboards

Aggregated dashboards are used to present the information provided by a large number of indicators in a synthetic way ([75]). Aggregated dashboards consist of several indicators, measuring different elements of complex phenomena. As for indicator sets, a dashboard provides access to the details of each indicator (underlying data and the methodology employed for the indicator evaluation) ([76]). On the other hand, aggregated dashboards provide synthetic information on the assessment of the indicators, as they combine the assessment on the individual indicators while keeping them separated. Of course, for the aggregation of the assessment different methods are possible and should be made transparent.

An example is provided by the 'Dashboard of the Sustainable Development Strategy of the Federal Council' produced by the Swiss Federal Statistical Office (see Figure 12) ([77]). The overall evaluation of the indicators measuring the Sustainable Development Strategy of the Swiss Federal Council is shown by 9 red-to-green-scales. They show the result of all 9 SD key challenges at a glance, i.e. this is a summary picture of all SDS indicators but also the evaluation for each key challenge.

Figure 12: The overall evaluation of the Dashboard of the Sustainable Development Strategy 2016-2019

Source: Swiss Federal Council

([75]) Here 'dashboard' refers to the term 'aggregated dashboard' in which the result of the assessment of trends is 'communicated for a number of indicators collectively [...] which, if it was presented alone, would not allow the user to know which indicator contributed to the aggregated information [...] nor to what extent.' (Boesch, A. et al, *Getting messages across using indicators: A handbook based on experiences from assessing Sustainable Development Indicators*, Eurostat, Luxembourg, 2014, p. 44.) Aggregated dashboards should be distinguished from the dashboards described above in this chapter, where the latter are presented as a specific type of indicator sets (see section 'Indicator sets: scoreboards and dashboards').

([76]) 'By providing an access to each single indicator, a dashboard ensures transparency and makes it a powerful communication tool. When developing a dashboard, achieving transparency is of crucial importance'. Wachtl J., et al., *Dashboard of Sustainable Development: Visual aggregation of the Swiss Sustainable Indicators System*, Federal Statistical Office, 2010.

([77]) See https://www.bfs.admin.ch/bfs/fr/home/statistiques/developpement-durable/cockpit.html

A frequent criticism of aggregated dashboards is that they lack indications about causal links, and/or hierarchies amongst the indicators used. In terms of communication such cases may easily be the reason for transparency loss and thus impede the level of democratic accountability originally sought. For that reason, Wachtl et al. ([78]) suggest several criteria for the communication of assessment results with aggregated dashboards. Using the sustainable development concept as a reference, according to the authors a dashboard should:

- Be built upon a solid conceptual framework or SD strategy;

- Allow for a global evaluation of the trends of the single indicators in regard to SD;

- Provide a synoptic overview of a group of indicators as well as the result of the assessment of the situation (colour-coded indicator light or symbol);

- Give information about the assessment methods used;

- Provide access to underlying data;

- Provide the possibility to navigate between the level of single indicator (graph presenting data) and the synthesis level.

([78]) Wachtl et al., 2010.

7 Summary

To sum up, the key issues of indicator-based communication are:

- Conveying clear, understandable and accessible messages;
- Importance of the specific context;
- Democratic accountability and ownership of the produced information.

As to the first point, the main challenge is to be clear and simple while remaining relevant and precise. This task requires cross-cutting expertise, for which team work of communication specialists, thematic experts —ideally from policy, practice and academia — and statisticians is essential.

Several elements play an important role for indicators to convey clear and simple messages, such as the title, the use of short explanatory text messages, a clear presentation of the message e.g. through the use of icons or symbols, the availability of metadata and of quality profiles.

For an effective communication through indicators it is important to identify the target audience and to adapt communication tools to the characteristics of the different user groups. The use of appropriate communication packages/channels combining different products allows to reach a wider audience.

When it comes to communicating complexity, the challenge is the need to convey clear messages while remaining fully accurate and relevant. All options have pros and cons. However, as a general approach, particular caution is needed for practices which imply many subjective choices, such as composite indicators which aggregate individual indicators of different nature and that are measured in different units. Key elements for a correct interpretation of these indicators include education of users about their possibilities and limitations and the communication of detailed information on the underlying individual components, regarding both their evolution and the methodology for their selection and weighting.

The second point highlights the fact that indicators are context-specific, contrary to statistical data in general which can be used for several purposes. Depending on the specific context, indicators can convey different messages and support different decisions. It is therefore of crucial importance that the context in which indicators are used is accurately and transparently described, so as to provide the users with the right background to correctly decode the message embedded in the indicators and to correctly judge its quality.

The third point refers to the various challenges related to the use of statistical indicators in the democratic governance of today's societies. The standard communication process through indicators goes from the data producer to the users. This process produces information which is then used by the different user groups as input for their participation in the democratic debate. However, an active involvement of citizens at an early stage has been part of several indicator initiatives around the world. This early involvement of users could potentially make them 'co-developers' of statistical indicators, with the users explaining their needs and the statisticians proposing the most appropriate technical solutions. Such a shift could complement the established development and dissemination processes of indicators with a two-way 'communication'. Advancements in information technology which allow for interactivity can facilitate this approach.

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Towards a harmonised methodology for statistical indicators

Indicators constitute an essential resource for policy makers, business leaders and the general public. They assist an evidence-based decision making, allow comparisons to be made over time and between policies and programmes, countries and regions, social groups and industries, and contribute to increased transparency and accountability. Indicators also provide a very powerful way of communicating information.

Indicators are used in many areas of social and environmental science, economics, business, and project management. A vast empirical experience of communicating through indicators now exists. However, only limited attempts to develop a methodology for this topic have so far been carried out. The purpose of this paper is to make an initial summary of the existing best practices on this theme encompassing communication and statistical knowledge. The paper should be regarded as an occasion to raise awareness and stimulate a debate about what is good communication through statistical indicators.

This paper is the second in a series of three papers on statistical indicators published by Eurostat. A first paper on 'Indicator typologies and terminologies' was published in 2014. The third paper in the series will discuss the relevance of indicators for policy making.

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