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Guidelines on producing leading, composite and sentiment indicators - interim report

Guidelines on producing leading, composite and sentiment indicators - draft

Prepared by the Task Force on leading, composite and sentiment indicators

Summary

The document presents the draft *Guidelines on producing leading, composite and sentiment indicators***.** The purpose of the Guidelines is to clarify the possible roles of NSOs in producing leading, composite and sentiment indicators, and to provide practical guidance on the production of these types of indicators.

The Guidelines are prepared by the Task Force on leading, composite and sentiment indicators, composed of Denmark (Chair), Hungary, Israel, Italy, Mexico, Netherlands, Turkey, Eurostat, Organisation for Economic Co-operation and Development and United Nations Statistics Division. Mr Jeroen Boelhouwer and Mr Gian Luigi Mazzi are members of the group as independent experts. Sweden chaired the Task Force until October 2017.

In October 2017, the CES Bureau reviewed the draft and requested the UNECE secretariat to send the document to all members of the CES for electronic consultation to gather input for finalising the Guidelines.

The deadline for comments is 30 April 2018. Please send your comments using the attached feedback questionnaire to **economic.stats@unece.org**. The draft Guidelines and the questionnaire are also available at the UNECE website: https://statswiki.unece.org/x/hoCmCg

The Secretariat will summarize the replies and inform the CES 2018 plenary session about the outcome of the consultation. Based on the comments and proposals received, the Task Force will continue to improve the draft Guidelines with the aim to submit the document to the CES 2019 plenary session for endorsement.

DRAFT
Guidelines on producing leading, composite and sentiment indicators

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1.1 Background

Leading, composite and sentiment indicators

1.1 Leading, composite and sentiment (LCS) indicators cover a broad and diverse group of statistical measures, which in different ways aim to provide information about the society and its individuals.

1.2 Leading indicators aim to anticipate the development of a reference series. Typically, leading indicators are constructed to predict the cycles of industrial production or gross domestic product (GDP), which are used as proxy measures for economic development. Composite indicators are constructed to measure more complex, or multidimensional phenomena by combining individual indicators into one single measure. Sentiment indicators are compiled to reflect the perceptions, attitudes or expectations of groups of respondents, e.g. different groups of individuals, households or businesses.

1.3 LCS indicators offer information on a range of topics that are not covered by what may be considered traditional official statistics, or which typically have not been covered by national statistical offices. Moreover, LCS Indicators may also provide information on complex issues in a relative simple or condensed form, which appeals to many users of statistics, including policy makers and the media, who increasingly refer to LCS indicators.

1.4 Over the previous decade there has been a growing demand for LCS indicators, which are becoming still more common in different areas, including business cycles analysis, measuring of well-being and sentiment indicators expressing the confidence of business in the economic development or that of households towards the future or their sense of happiness or safety. LCS indicators are also becoming more and more common for international comparisons to assess country performance, and are increasingly used for policy making.

1.5 The demand for LCS indicators has been driven by evolving user needs for indicators that are easier to compare, provide information in condensed form and shed light on areas traditionally not covered, or not covered very well, by most national statistical offices (NSOs). Some LCS can be compiled relatively quickly and hence give earlier indications of developments than can be found in traditional statistical series. The development is facilitated by the growing abundance of data, processing power and IT tools, which makes the production of LCS indicators much easier than in the past. Hence, many LCS indicators are produced by other data providers than the NSOs.

The role of NSOs in producing LCS indicators

1.6 LCS indicators are potentially an area where official statistics could engage for the benefit of all stakeholders. However, there are different practices among countries, as well as different views on the role of NSOs in the production of LCS indicators. Some NSOs consider LCS indicators out of scope of what they should produce, or do not see LCS indicators as a priority. Some NSOs also fear that engaging in the production of LCS may harm the credibility of the NSOs as the provider of official statistics.

1.7 Other NSOs have considerable experience in producing LCS indicators, or are considering the possibility to engage in the production of LCS indicators. NSOs can ensure that indicators are produced based on the principles of official statistics and by disseminating the indicators improve users' perception of the relevance and value of official statistics. It can also be argued that if statistical offices do not use their data and expertise to produce these indicators, they may be produced by other organisations not adhering to the principles of official statistics. Such organisations may not invest the necessary resources to ensure the production of high quality indicators, nor disseminate sufficient documentation of data sources and methods.

1.8 There is, however, no consensus on what the role of national statistical offices should be with regard to LCS indicators. Should LCS indicators be left to others, or should NSOs take a greater role in the development and production of LCS indicators? Should NSOs be more active in providing data and offering their expertise to other organisations producing LCS indicators?

Scope of the guidelines

1.9 The scope of the guidelines is leading, composite and sentiment indicators. The focus is on sentiment and composite indicators. Leading indicators are not dealt with as a separate group of indicators but considered a subset of composite and sentiment indicators. Hence, the discussion of composite indicators also covers leading composite indicators and the discussion of sentiment indicators cover leading sentiment indicators.

1.10 The guidelines do not deal with individual quantitative indicators that may be interpreted or used as sentiment or leading indicators. For instance, inventory statistics, building permits statistics, car sales statistics or industrial production indices may be used as indicators of business expectations, or as early indicators of the business cycle. The guidelines also do not deal with traditional statistical measures, such as the gross domestic product (GDP) or the consumer price index (CPI). The role of NSOs in their production is well-established and a wealth of international statistical standards and recommendations on their production are available for NSOs to draw upon.

1.2 Initiatives by the Conference of European Statistician

1.11 Due to the growing importance of LCS indicators the Bureau of the Conference of European Statisticians (CES) undertook an in-depth review of leading, composite and sentiment indicators in January 2014 with the aim to discuss the role of official statistics in this context. As a basis for the in-depth review, the UNECE Secretariat carried out a survey on the practices in the area of LCS indicators of NSOs in December 2013 and received replies from 38 CES countries1. The survey confirmed different practices and different views on the involvement of NSOs in the production of LCS indicators.

[1] Armenia, Australia, Austria, Azerbaijan, Belarus, Belgium, Bulgaria, Canada, Colombia, Czech Republic, Denmark, Estonia, Finland, France, Georgia, Germany, Hungary, Israel, Italy, Japan, Kazakhstan, Latvia, Lithuania, Mexico, Moldova, Mongolia, Netherlands, Norway, Poland, Portugal, Romania, Russia, Slovak Republic, Sweden, Switzerland, Turkey, Ukraine and United Kingdom.

1.12 The Bureau concluded that exchange of experiences and best practices would help countries, which are producing such indicators, even though work in this area is not a priority for all statistical offices. Development work should be carried out at an international level with the NSOs' involvement to share experiences and avoid duplication of efforts. The Bureau also found that the area lacks international coordination and a systematic approach, that there is a need to achieve a common understanding of the role of statistical offices in this area as well as for guidance for NSOs that produce or consider producing LCS indicators.

1.13 The CES plenary session in April 2014 confirmed a large interest of NSOs in LCS indicators but also different views on to what extent NSOs should engage in the production of LCS indicators. The Conference concluded that it would be useful to further discuss the role of official statistics and the challenges in compiling and disseminating LCS indicators and to clarify the responsibilities and boundaries of national statistical offices' roles with regard to LCS indicators.

1.14 In February 2016 the Bureau agreed to establish a Task Force on Leading, Composite and Sentiment Indicators to develop recommendations of good practices for NSOs for producing LCS indicators. The recommendations should clarify the possible roles of NSOs in producing LCS indicators, suggest criteria for NSOs involvement in the production of LCS indicators and provide guidance for NSOs' production of such indicators. Throughout, the recommendations should take relevant methodological guidelines and handbooks into account, such as those provided by Eurostat, the OECD and UNSD[2]. The recommendations should not duplicate existing material but refer to this when useful and give guidance on how to select between different methods.

1.15 Two Seminars on the role of NSOs in producing LCS were organised as part of the work. The first Seminar in December 2015 focused on discussions of the role of national statistical offices in the production of LCS indicators, criteria for their involvement and communication challenges related to these types of indicators. The second Seminar in July 2017 discussed the draft chapters of the recommendations and country experiences and best practices.

1.3 Purpose of the guidelines

1.16 The guidelines should provide guidance to compilers and managers in NSOs that produce or consider producing composite or sentiment indicators. The guidelines should meet the needs of countries with experience in producing LCS indicators as well as countries that have no or less experience in this area.

1.17 There are three main objectives of the guidelines:

1. To clarify the role of NSOs and official statistics in producing LCS indicators.

1.18 The guidelines should clarify the different roles of NSO in producing LCS indicators and give strategic advice on how to meet user demands for LCS indicators while adhering to the principles of official statistics and not risking the trust in NSOs statistics. Identify problems and issues associated with the production of the indicators and discuss the challenges –

[2] The Handbook on Constructing Composite Indicators (OECD, 2008), Towards a Harmonised Methodology for Statistical Indicators Parts 1-3 (Eurostat, 2014, 2017 and 2017a) and the Handbook on Cyclical Composite Indicators (EU and UNSD, 2017).

opportunities and risks – for NSOs in producing LCS indicators. Guidance on the preconditions and limits for NSOs involvement in the compilation of the different types of indicators and on communication should also be provided.

2. Provide strategic and operational guidance to NSOs on producing LCS indicators

1.19 The guidelines should give strategic and operational guidance on how to compile and disseminate LCS indicators. To this end, it should include a typology of LCS indicators and recommend steps and methods that can be applied by NSOs, without going into methodological or technical details. Instead, references to existing methodological manuals and handbooks should be provided. The Guidelines should also address quality assurance based on the principles of official statistics for NSOs' production of LCS indicators, highlight risks and pitfalls in the compilation and dissemination and how these may be dealt with, and address issues related to international comparability.

3. To provide examples of good practice to NSOs for producing LCS indicators.

1.20 The Recommendations provide a collection of good practice examples of compilation and dissemination of LCS indicators, which describes data sources, compilation methods and dissemination.

1.4 Overview of the guidelines

1.21 The guidelines are structured in seven chapters and annexes. Each chapter can be read separately, while the reader should be familiar with the main concepts used, which are described in Chapter 3. The guidelines also include national and international good practice examples presented throughout the chapters and in the Annexes.

1.22 *Chapter 2* discusses the role of NSOs in producing LCS indicators to meet user needs while adhering to the principles of official statistics by providing impartial and relevant information to the society. The chapter discusses the main challenges faced by NSOs and describes different strategies applied by NSOs in relation to producing LCS indicators. It also presents an analysis of possible strengths, weaknesses, opportunities and threats (SWOT) of NSOs producing LCS-indicators.

1.23 *Chapter 3* presents a typology of LCS indicators. The typology defines and explains the different types of indicators and provides examples of the main indicator types. The typology focuses on sentiment and composite indicators. For both a distinction is made between indicators with a reference series i.e. a series that the indicator aims to estimate, and indicators without reference series. Leading indicators are not dealt with as a separate group of indicators but considered a subset of composite and sentiment indicators.

1.24 *Chapter 4* presents sentiment indicators. The chapter deals mainly with single economic and single socio-economic sentiment indicators. The chapter provides information on the background, compilation procedures, usage, pros and cons and analysis of sentiment indicators. Issues related to international comparability are also addressed in this chapter.

1.25 *Chapter 5* provides an overview of economic composite indicators. This chapter presents the most commonly used models for composite economic indicators and provide guidance on their compilation. It highlights advantages and disadvantages/risks of composite

economic indicators and issues and pitfalls NSOs should be aware of when constructing these. A distinction is made between *cyclical indicators* and *structural indicators*. The chapter presents in a condensed form the steps involved in the production of a cyclical composite economic indicator based on the OECD (2008) Handbook for constructing composite indicators and the EU/UNSD (2017) Handbook on Cyclical Composite Indicators.

1.26 *Chapter 6* focuses on Composite socio-economic indicators. It provides some background on socio-economic composite indicators and highlights their difference to economic composite indicators treated in Chapter 5. Furthermore, it presents the main steps for constructing a composite socio-economic indicator: setting-up the conceptual model of the indicator; selection of dimensions and indicators; data treatment; multivariate analysis, normalisation of data, weighting and aggregation; and validation. Aggregating over different dimensions, lack of reference series and lack of a common unit of measurement (as given in monetary units for economic indicators) bring in additional challenges in the construction of socio-economic indicators that are discussed.

1.27 *Chapter 7* discusses the communicating of LCS indicators, which is considered a strategic factor for success. The chapter lists the specific challenges involved in communicating indicators and gives guidance on how to meet the quality criteria of official statistics when disseminating the indicators. The chapter also gives advice on communicating the indicators in their right context and more briefly on targeting user groups. The chapter provides practical examples of good communication of indicators by use of different means of communication and visualization methods.

1.5 Acknowledgements

1.28 The Recommendations were prepared by the UNECE Task Force on Leading, Composite and Sentiment Indicators. The Task Force consisted of the following members: Erik Slentø (Denmark), Aron Kincses (Hungary, until September 2017), Natalie Jamalia (Hungary, from September 2017), Daniel Roash (Israel), Fabio Bacchini and Roberto Iannaccone (Italy), Yuriko Yabuta Osorio (Mexico), Leendert Hoven, Frank van de Pol, Hans Schmeets (Netherlands), Monica Nelson Edberg (Sweden, until October 2017), Hans-Olof Hagén (Sweden, until December 2016), Arzu Eratak (Turkey), Gian Luigi Mazzi (Independent Expert), Rosa Ruggeri Cannata (Eurostat), Jeroen Boelhouwer (Netherlands Institute for Social Research), Pierre-Alain Pionnier (OECD), Ilaria DiMatteo and Herman Smith (UNSD), Carsten Boldsen, Evan Brand (until May 2017), Evita Sisene and Albert Bredt (from January 2018) (UNECE). The Task force was chaired by Monica Nelson Edberg (Sweden) until October 2017. From November 2017 the task force was chaired by Erik Slentø (Denmark). The annexes of the Recommendations include country examples and case studies provided by: Italy, Mexico, Netherlands, Sweden and Turkey.

2 The role of NSOs in producing Leading, Composite and Sentiment indicators

2.1 Introduction

2.1 The growing demand and use of leading, composite and sentiment (LCS) indicators raises a number of challenges to national statistical offices (NSO) in terms of their role in the production of such indicators, which involves both opportunities and risks.

2.2 Historically most LCS indicators have been produced by other organisations than NSOs, including government organisations, research institutes or private bodies, or international organisations. However, today many NSOs have engaged in the production of LCS indicators, or are considering whether to move into this area of statistical indicators.

2.3 Engaging in the production of LCS indicators is an opportunity to address changing user needs, gain visibility and demonstrate the relevance of official statistics by meeting societies' need for statistics produced according to the principles of official statistics. On the other hand, LCS indicators may be considered to fall outside what NSOs should be producing. Measuring subjective or complex/multi-dimensional phenomena may not be seen as in line with the role of official statistics, and there is a concern that engaging in the production of such indicators could harm the trustworthiness of the NSO.

2.4 To respond to the demand for LCS indicators, NSOs therefore need to consider the opportunities and risks of engaging in the production of LCS indicators in line with the requirements of impartiality and quality of official statistics.

2.5 Section 2.2 provides a brief background of the recent development in the demand for LCS indicators. Section 2.3 describes the main pros and cons of LCS indicators. Section 2.4 discusses the role of official statistics in meeting user needs and providing impartial and relevant information to the society. Cooperation with users and stakeholders is important for the development of LCS indicators, and is discussed in section 2.5. Section 2.6 gives an overview of the quality criteria that would be particularly relevant when engaging in the production of LCS indicators. Section 2.7 provides an overview of policy and strategic challenges faced by NSOs in relation to producing LCS indicators. Section 2.7 provides a general SWOT analysis by listing possible strengths, weaknesses, opportunities and threats of NSOs producing LCS-indicators.

2.6 The chapter draws in particular on Eurostat (2017), Towards a harmonised methodology for statistical indicators. Part 2: Communicating through Indicators.

2.2 Growing and changing user needs

2.7 Over the last decades user needs have evolved quickly reflecting technological and economic developments. In many areas such as well-being, IT-investments, business cycle indicators, environment and sustainable development policy makers and societies have demanded more and timelier data and new types of statistics.

Socio-economic sentiment indicators

2.8 The Stiglitz-Sen-Fitoussi Commission[3] on the measurement of economic performance and social progress looked beyond the traditional GDP measure and suggested areas where more statistical information is needed. The report concluded, among other things, that many aspects of well-being remain difficult or impossible to measure in monetary units and greater importance should be given to develop qualitative and multi-dimensional measures of well-being. Some of these non-monetary indicators are objective but the report also recommends the use of subjective indicators. The Commission listed the following dimensions of well-being and quality of life that should be taken into account: material living conditions (income, consumption, and wealth), health, education, personal activities (including work), political voice, social connections and relationships, environmental conditions and physical and economic security.

2.9 The work of the Stiglitz-Sen-Fitoussi Commission was followed by an increased interest in measuring well-being, satisfaction with quality of life (including quality of employment), happiness and other 'subjective' areas of life and society that may fall outside what traditionally has been considered in scope of many statistical offices. This, in turn, increased the demand for composite socio-economic indicators covering different dimensions and measures of subjective well-being and triggered comprehensive research of new and more appropriate socio-economic indicators.

Economic sentiment indicators

2.10 Business and consumer tendency surveys and resulting confidence indicators have emerged since the 1960's. In the 70's the EU established standard frameworks which the OECD adapted in the 1990's and currently assist Asian and Latin American countries in adopting. The economic crisis in 2008-2009 revealed a lack in economic statistics regarding data that describes such developments in a better and timelier way, taking the growing complexity in the financial markets and the intertwined relations between real and financial economics into account. As a result of the economic crisis a considerable amount of research have been devoted to further developing business cycle indicators, indicators intended to forecast economic turning points and consumer confidence indicators.

2.11 Obviously, societies will continue to change as will the demands from users of official statistics. Evidence-based decision making will increase the demand for coherent and relevant statistics at a national level. At the same time, continuing globalisation will increase the importance of the statistics being internationally comparable in order to perform comparisons between countries and regions.

2.3 Pros and cons of LCS indicators

2.12 Leading, composite and sentiment (LCS) indicators cover a broad group of statistical measures, which in different ways aims to provide information about the society and its individuals. The main pros and cons of the different types of indicators are summarised below.

[3] Stiglitz, Sen and Fitoussi (2009)

Composite indicators

Pros	Cons
• Can summarize complex, multi-dimensional realities • Are easier to interpret than a battery of many separate indicators • Facilitate communication with general public and promote accountability • Suitable to bring issues on the policy agenda • Help to construct/underpin narratives for lay and literate audiences • Enable users to compare complex dimensions effectively • Can be used to assess developments over time and for evaluating country performance	• May send misleading information • Invite to simplistic conclusions • Use of weighting that could be subject of political disputes • May disguise serious failings in some dimensions and increase the difficulty of identifying proper remedial action, if the construction process is not transparent • Lack of internationally agreed practices

Source: OECD (2008), pp 13-14.

Leading indicators

Pros	Cons
• Can be used to give early warnings of changes in the business cycle • Can be used for forecasting possible turning points and recession/expansion phases	• May prove to provide poor predictions/forecasts • May not over time maintain its leading quality compared to a given reference series • Underlying methodology may be questioned

Sentiment indicators

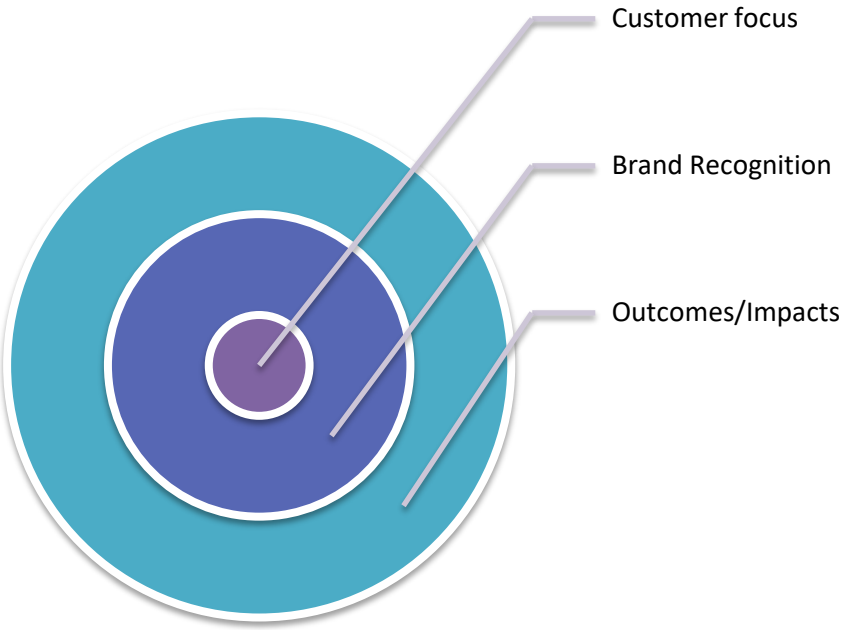
Pros	Cons
• Can provide information of sentiment/subjective issues not elsewhere available • Timely and present, which may be published in advance of any corresponding *quantitative* statistics • Simple in its messages, well-suited for communication	• May be criticized for being subjective, and not reflecting reality • Production and communication of the indicators may challenge the traditions and practices of the NSO

2.4 The role of Official statistics

2.13 Producing official statistics to meet societies' needs for relevant, independent and reliable statistical information is a key purpose of NSOs. According to the Fundamental Principles of Official Statistics, official statistics should provide relevant and impartial statistics to be made available to the citizens. NSOs need to continuously develop their statistics to reflect the changes in society and stay relevant. As societies are changing, NSOs have to develop and refine statistics to meet the changing user needs.

2.14 Figure 2.1 illustrates three key dimensions of the value of official statistics. *Customer focus* is in the centre, underlining the responsibility of NSOs to meet society's need for relevant and impartial information. *Brand recognition* means that statistics produced by NSOs (or others) according to the principles of official statistics is being recognized as impartial and reliable and of high quality. The *outcomes/impacts* dimension refers to the use of official statistics. The value added of official statistics increases with increasing use of the data. Hence, user needs should be in focus of the NSOs' planning and production of statistics.

Figure 2.1
The dimensions of the value of official statistics



Source: Recommendations on the value of official statistics. Note by the Task Force on the value of official statistics, presented to the CES Bureau meeting in February 2017.

2.15 However, the principles of official statistics do not spell out in detail what to be considered as official statistics, or how official statistics in detail should be compiled or published. Also, the borderline of official statistics is not static. As societies change, NSOs need to review and eventually change the way in which statistics is produced and develop new statistics to remain relevant, while adhering to the principles of official statistics. Recent examples include, e.g. the frameworks to compile sustainable development indicators and for

measuring quality of employment, areas in which NSOs have engaged by producing statistics only recently[4]. The development of the System of Environmental-Economic Accounting is another example of a framework that allows NSOs to engage in the production of statistics which earlier were not undertaken by NSOs.

2.16 Looking at LCS indicators in terms of the above-mentioned dimensions of the value of official statistics, the starting point would be an assessment of whether there is a need for statistics of this type. The NSO would need to evaluate priorities, available resources and cost/benefits of engaging in the production of LCS indicators.

2.17 Secondly, if the NSO decides to produce a LCS indicator, it should ensure that the indicator is produced meeting the quality criteria of the statistical office and that the indicator is considered of high reliability and quality by users to live up to the brand of official statistics. The outcomes/impacts of producing LCS will depend on the use of the indicators.

2.5 Cooperation with stakeholders and users

2.18 It is useful to recall two functions that indicators may have[5]. Firstly, the **informative function,** when indicators are communicated to inform about different phenomena. Secondly, indicators may also have a **social function**. This is the case when indicators are used to assess the development or the performance in a given area. This allows different social groups or the public in general to participate in the discussions and the decisions in society on a better informed base.

2.19 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" for the progress of society[6]. In this way, official statistics assume the role of an important element in the democratic process as referred to in the first of the UN Fundamental Principles of Official Statistics: "Official statistics provide an indispensable element in the information system of a democratic society".

2.20 Relevance is a core quality of official statistics. To ensure the relevance stakeholders and users should be consulted. Stakeholders and users will have needs and views on e.g. which dimensions should be included in a composite indicator, which questions should enter a sentiment indicator, or which population or population groups should be in scope etc. Furthermore, stakeholders and users may have expert knowledge in the specific area that the indicator aims to cover that the NSO can draw on. Those developing indicators also need to understand how and why indicators are being used, so they can be designed in a form that is understandable to users and meets their needs. Box 2.1 provides an example of an NSO actively engaging with stakeholders and citizens in the development of a composite indicators for well-being.

[4] UNECE (2013), Measuring Sustainable Development, and UNECE (2015), Handbook on Measuring Quality of Employment

[5] This distinction is from Eurostat (2017).

[6] Eurostat (2017), p. 10.

Box 2.1

Developing well-being indicators in Israel

The Israeli indicator of well-being, sustainability and national resilience

In 2012 the Israeli government adopted a resolution to develop indicators on well-being, sustainability and national resilience. The purpose was to have a comprehensible, updated and sound picture of the well-being of Israeli citizens in terms of a set of economic, social and environmental indicators. The indicators should provide information for policy making, whether by the government or other decision makers, and to the public for assessing progress and changes in well-being.

The development of the well-being indicators was led by a Steering Committee comprising representatives of the Office of the Prime Minister, the National Economic Council, the Ministry for Environmental Protection, the Ministry of Finance and the Central Bureau of Statistics. The Steering Committee was asked to decide what dimensions to include, appoint work teams for each dimension and present a recommendation to the government on which dimensions and indicators to include. To ensure broad consensus, a thorough consultation with stakeholders and the public in general was carried out. As part of this, online questionnaires were conducted as well as workshops and focus groups to get a feedback from the public. The online questionnaire asked respondents to rank proposed dimensions by their importance to quality of life and to suggest other dimensions that could be included or possible indicators to be used for the dimensions.

As a result of the consultation 9 dimensions were selected: 1) quality of employment, 2) personal security, 3) health, 4) housing and infrastructure, 5) education and skills, 6) personal and social well-being, 7) environment, 8) civic engagement and governance, and 9) material standard of living. For each dimension, an expert team was established consisting of representatives of government departments, research institutions, civil society organisations and private sector organisations, to suggest 8 indicators for each dimension and the desired direction of change of each indicator. The work of each team was led by a relevant ministry. E.g. the work on material standard and living was led by the ministry of finance, and the work on education was led by the ministry of education.

Based on the proposal by the Steering Committee the Israeli government adopted a resolution in 2015, requesting the Central Bureau of Statistics to publish annually the indicators of well-being, sustainability and national resilience. The indicators were first published in 2016. For the dimensions where it was found meaningful to compile a composite indicator the composite indicator is compiled as the unweighted average of the individual indicators of the dimension. It was also decided to develop two additional dimensions: information technology; and leisure, culture and community. Indicators for these two dimensions have been established and were included in the release of the indicators in March 2017 comprising 11 dimensions.

The Publication CBS-IL (2015), 'Well-being, sustainability and national resilience indicators' provides additional information and details. It is available on http://www.cbs.gov.il/statistical/sust161_e.pdf

2.21 In principle, the development of indicators should be based on a wide consensus reached through a dialogue involving all relevant stakeholders and user groups. Potential groups that could be consulted depend on factors such as (1) the purpose of the indicator; (2) the institutional and political set-up and traditions of the country; (3) the policy priorities of the involved organisations; and (4) the time and resources available for the development of the indicator.[7]

2.22 For technical topics such as the measurement of economic performance, where a specific expertise is required, the relevant stakeholders could be only policy makers and experts specialised in that domain. For other topics potentially engaging the society at large, such as measuring well-being or sustainable development, a much wider group than the technical experts should be involved. Stakeholders may thus also include citizens and non-governmental organisations representing different segments of society.

2.23 It is essential to establish an ongoing interaction between data producers and data users. Users, for instance policy makers, user groups or organisations, may assess the relevance of proposed dimensions and indicators for a given purpose, and statisticians can assess the measurability of dimensions and indicators in an iterative process. An ongoing dialogue with users is a key to producing high quality statistics that are also policy relevant, especially as indicators may change as scientific knowledge, policy concerns and data availability progress. It is worth mentioning that when indicators are used for monitoring a specific policy, the definition of the indicators should be kept constant to be able to assess the development over time, e.g. if the situation is moving towards a given kind of target.

2.24 In summary, communication with stakeholders and users relates to the social function of indicator-based communication, which enables citizens to participate with a better informed opinion in society's decision making. It opens statistics to the democratic process and enables users to have their say on the relevance of the statistical indicators. By being involved in the development of indicator sets, citizens no longer play the role of passive users of statistics but become 'co-creators' of the statists. As a result, they may obtain knowledge allowing them to evaluate societal progress and to develop informed opinion. Interactivity plays a central role both at the early stage of developing the indicators and later at the stage of their dissemination. Advancements in information technology which allow for interactivity can facilitate this approach.[8]

2.6 Quality assurance of LCS indicators

2.25 Different quality assurance frameworks for official statistics exist, such as provided by the UN, the European Statistical System or OECD. The frameworks cover Institutional environment, Statistical processes and Statistical output and list a number of criteria to be met to ensure the quality of the statistical production. The frameworks to some extend diverge and provide different levels of detail, but essentially cover the same criteria required

[7] See Eurostat (2017), which provides addition explanations on two-way communication and interaction with users and stakeholders. The following paragraphs also draw on Eurostat (2017).

[8] Readers are referred to Eurostat (2017) and Eurostat (2017a) for more information about interactive communication with users and use of IT communication tools.

to ensure that statistics produced are relevant, timely and accurate and comply with the principles of professional independence, impartiality and objectivity.

2.26 While the production of LCS indicators should meet all criteria of official statistics the following criteria are particularly important to consider for the production of LCS indicators

Institutional environment, Statistical processes

- Professional independence
- Impartiality and objectivity
- Methodological soundness

Statistical output

- Relevance
- Accuracy and reliability
- Coherence and comparability
- Accessibility and clarity
- Timeliness and punctuality

Institutional environment, Statistical processes

2.27 Professional independence, impartiality and objectivity, and methodological soundness refer to the institutional environment and the statistical processes. In brief, these criteria can be summarised as follow:

2.28 *Professional independence* implies that statistics should be developed and produced without interference or pressure from other government agencies, policy makers, or the private sector. This is required to ensure the credibility of official statistics. Developing LCS indicators may involve engaging with stakeholders, including government agencies, policy makers and organisations. Such cooperation should be transparent and organised to ensure proper roles for all involved groups.

2.29 *Impartiality and objectivity* imply that statistics should be produced on an objective basis determined solely by statistical considerations. Sources, concepts, methods, processes and data dissemination should be chosen based on statistical considerations and national and international principles and best practices.

2.30 *Methodological soundness*. This criterion means that statistics should be produced based on sound statistical methods and according to internationally agreed standards, guidelines or best practices. Methods involved in the production of LCS indicators may not be familiar to the NSO and may be questioned or criticised for being based on value judgements. Hence, before engaging in their production, NSOs need to carefully consider and examine possible compilation methods and ensure that the indicators can be produced on sound methodological basis without jeopardizing the trust in official statistics or questioning the impartiality of the NSO. To this end, data sources and methods should be fully documented and made available to users to ensure transparency.

2.31 To the extent possible, indicators and their component series should align with the scope and definitions of other statistics. For indicators with a reference series scope and definitions should follow those of the reference series. For indicators without reference series, for example a composite indicator on well-being or a single sentiment indicator on

households' perception of security or their economic situation, there is no measured statistics to target.

2.32 However, the quality of component series, including their scope, is transmitted to the composite indicators. Therefore, to the extent possible, component series should be in line with agreed scope and definitions in the areas they are intended to cover. Components series may often come from other official statistics, in which case they should follow agreed definitions. When this is not the case, as with component series from other organisations that do not follow agreed definitions, differences in e.g. scope and definitions should be considered before introducing the component series in the composite indicator. Using component series that are in line with existing definitions will improve the quality of the composite indicator and facilitate comparison with other related statistical series, also when there are no reference series.

2.33 It is recommended to refer to available international methodological guidelines, such as provided by Eurostat, OECD and the UN.

Statistical Output

2.34 Statistical output should meet the following quality criteria:

2.35 *Relevance*, which reflects the degree to which the statistics meets user needs. The statistical agency's challenge is to assess and balance the conflicting needs of current and potential users in order to produce statistics that satisfy the most important needs within given resource constraints.

2.36 *Accuracy and reliability*. Statistics should accurately and reliably portray reality. The accuracy of statistical information reflects the degree to which the information correctly describes the phenomena it was designed to measure. Reliability concerns whether the statistics measure the reality that they are designed to represent consistently over time.

2.37 *Coherence and comparability* imply that statistics are consistent internally and over time and comparable over statistical domains and geographical areas. This also implies that the statistics should be produced using common standards with respect to scope, definitions, classifications and units.

2.38 *Accessibility and clarity*. Statistics should be made available in a clear and understandable form, accessible to all users in suitable and convenient formats. Documentation and supplementary explanation, which are necessary for the proper understanding and use of the statistics should be made publicly available.

2.39 *Timeliness and punctuality*. Timeliness refers to how fast after the reference period data are released. Punctuality refers to whether data are released on the expected, preannounced dates. LCS indicators should be released according to international recommendations on timeliness and punctuality, and be in line with the release of other official statistics. The added value of leading indicators derives from being timelier than the statistics whose movement they aim to anticipate, e.g. by providing an idea about the macroeconomic development before the established statistics is released.

2.40 The quality criteria that relate to the statistical output and their implications for the dissemination of LCS indicators are discussed in more detail in Chapter 7.

Experimental statistics

2.41 When developing LCS indicators it may be the case that not all quality criteria can be met or the statistical office may feel uncertain if the indicator is suitable to be published. In such cases statistical offices have the possibility to publish the indicator as experimental statistics, with a clear distinction from other official products. This would allow the statistical office to gain experiences and collect feedback from users and stakeholders without putting the impartiality or the professional reputation at risk.

2.7 Challenges and strategies

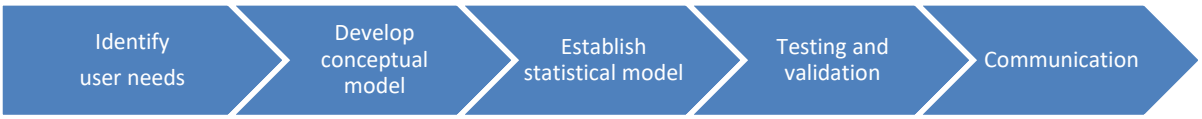
2.42 Many NSOs are already involved in producing LCS indicators or are considering whether to produce such indicators to meet user needs. Several NSOs have good experience in producing LCS indicators and have found that the statistical expertise and impartiality of the NSO places them in a strong position for compiling and disseminating such indicators. Compiling and disseminating LCS is seen as an opportunity for NSOs to demonstrate the relevance and value of official statistics and an opportunity to reach out to new user groups and gain visibility.

2.43 Other countries do not see LCS indicators as a priority area, or they find that LCS indicators are out of scope of what the NSO should produce. The methods involved in their production may not be considered in line with the principles of official statistics since they may involve value judgements or subjectivity in the selection of data sources and methods, and the quality of the indicators may not meet the quality standards for official statistics. There is also a concern that producing LCS could harm the general trust and reputation of the NSO and compromise its role as the provider of impartial statistical information based strictly on professional considerations. Being a new area for many NSOs, the dissemination of LCS may also constitute a risk, including on how to react on misuse or misunderstandings or explain unexpected developments of the indicators. NSOs refraining from or hesitating towards producing LCS indicators may consider entering cooperation with external statistical agencies.

2.7.1 Policy challenges of producing LCS indicators

2.44 The development and the production of an LCS indicator would involve a number of steps similar to those that would be used when developing other statistics, as illustrated in

Figure 2.2
Steps in developing an LCS indicator



2.45 As mentioned earlier, the first step when developing new statistics is to identify user needs, which may involve consultation with users and stakeholders. Once the needs are identified, it is crucial to develop a sound conceptual model to serve as a framework or reference frame on which to base the compilation of the indicator. Based on the conceptual model the statistical model should be established. The statistical model would define the

indicator series and all component series and the involved calculation steps to get from the component series to the indicator, including procedures for aggregation and weighting and any treatment of data series (i.e. normalisation, smoothing or other manipulations). To the extent possible the statistical model should be tested and validated using available data series to ensure it has the intended properties. This step may also involve consultation with users, stakeholders or experts with particular knowledge. After careful validation, the statistics should be released and communicated to the users with appropriate documentation and explanations. Obviously, there may be feedback from the users that should be considered and which eventually could lead to changes in the way the indicator is being produced.

2.46 While the development of LCS indicators to some extent follow the same steps as many other official statistics, LCS indicators nevertheless challenge the borderline of what type of statistics should be produced by NSOs. Depending on the type of indicator, their production may question existing policy and practices in different ways.

Leading indicators

2.47 Many NSOs restrict their statistics to cover only historical periods for which data can be obtained, and are not involved in producing forecasts or predictions of what may happen in the future. There may be a 'division of labour' according to which the NSO produces historical data, while it is left to the users of the statistics to produce forecasts or estimates of future developments. However, the limit is not clear.

2.48 While many NSOs already produce model based statistics such as nowcasts, flash estimates or early indicators, NSOs in general refrain from compiling or disseminating forecasts, even if the borderline between these may not always be very clear, for instance they may rely on similar statistical models or techniques.[9]

Composite indicators

2.49 Compiling composite indicators involves the selection of individual component series and weighting these together to one composite measure. The composite indicator may include several different dimensions, which also will have to be selected and weighted together. For example, a composite index of well-being may include dimensions such as income, health, employment, housing, personal/family relations and more. Assigning weights to the component series and the dimensions may be seen as difficult or subjective, and beyond the role of official statistics. Some international methodological guidelines are available, notably the Handbook on Constructing Composite Indicators (OECD, 2008) and the Handbook on Cyclical Composite Indicators (EU and UNSD, 2017). However, no commonly agreed practices in statistical offices have been developed.

Sentiment indicators

2.50 Sentiment indicators are sometimes viewed as dubious and of inferior quality compared to traditional *quantitative* statistics. Hence, producing sentiment indicators may be seen as outside the scope of what the NSO should be engaged in, and e.g. not in line with producing *quantitative* or "objective" statistics. There is a distinction between relatively simple and well-established sentiment indicators and more complex sentiment indicators such as requested by Stiglitz, Sen and Fitoussi (2009). Simple sentiment indicators are

[9] Eurostat and UNSD (2017a): Handbook on Rapid Estimates, provides comprehensive methodological guidance for compilation of rapid estimates.

produced by many statistical offices based on business or household surveys that include questions on whether the respondent expects production to develop in the next period, or households' plans for their future consumption etc. More complex sentiment indicators that aim to measure different aspects of quality of life or wellbeing are rarer. These require a theoretical and statistical framework to be developed and may involve different dimensions in which case both dimensions and individual indicators of the dimensions will have to be selected and aggregated. These may also be more difficult to communicate to the users and the public in general and may be subject to discussion and criticism.

2.7.2 Strategic Challenges

2.51 The growing demand for LCS indicators poses strategic challenges to NSOs in terms of both opportunities and risks. On the one hand, engaging in the production of LCS indicators is an opportunity to produce such indicators according to the principles of official statistics, meeting user needs, reaching out to new user group and demonstrate the relevance of official statistics. Producing LCS indicators may also be a first step in developing standardized indicators aimed to measure such phenomena as the Sustainable Development Goals (SDG) or Beyond GDP/Quality-of-life concepts, as they can be adapted for specific purposes. If what matters is not measured, there is a risk that official statistics will lose visibility and may become marginalized. In addition, not engaging in the production of LCS indicators does not imply that these are not produced by others, but they may be produced in a less standardized way and not adhering to the principles of official statistics, and hence may be of poorer quality. It may also be argued that NSOs should engage in the production of LCS indicators from a cost-benefit point of view, since NSOs would have the statistical infrastructure required for and easy access to statistical series that could feed into the production of the indicators.

2.52 On the other hand, broadening the scope of official statistics to areas that have traditionally been considered outside the competence of NSOs can be a risk. Measuring subjective or complex/multi-dimensional phenomena may be controversial and seen as non-compatible with objectivity and impartiality, and could reduce trust in official statistics. The main strategic challenges that come with the demand for LCS indicators may be summarized as follows:

- Should the NSO engage in the production of LCS indicators, or leave this to others? And what are the opportunities and the risks of engaging or not engaging?
- If the NSO decides to engage in production of LCS indicators, how should the compilation and the dissemination be organized within the quality framework of official statistics?
- What role could the NSO play in relation to other organisations producing LCS indicators, e.g. in terms of providing data input and methodological expertise?
- How to continue work towards developing and harmonising the production of LCS-indicators as part of official statistics?

2.53 Based on practices in different countries three main strategies can be identified:

The proactive strategy

2.54 NSOs with a proactive strategy are already producing LCSs, and are not waiting for international guidelines or recommendations. Focus in this strategy is to meet user needs and being visible in the realm of data being published by other institutions than the NSO. The strategy presumes availability of methodological expertise (or this needs to be developed) and involves some degree of learning-by-doing. It is also necessary to develop dissemination and communication practices. Advantages include gaining early experiences and reaching out to new user groups. On the disadvantage side, published data and underlying methods may be questioned and there is a risk that the impartiality and the general trust of the NSO may be harmed. This strategy is relatively resource demanding.

The pending strategy

2.55 NSOs with a pending strategy consider producing LCS indicators but are in doubt and wait for more international guidelines or recommendations. This group also includes NSOs that produce one or two simple sentiment indicators or a composite index, but would like to do more. The strategy requires less in-house methodological resources than the proactive strategy. It benefits from using methods developed by others and is less resource demanding. The risks of making mistakes, for being criticised or harming the general trust to the NSO should also be reduced, compared to the proactive strategy.

The non-producing or non-involving strategy

2.56 Some NSOs find that compiling and disseminating LCS would fall outside of what they should do and do not see this as a priority of official statistics. It may also be that the NSO does not feel to have the necessary expertise or, more generally, the resources to allocate to this area. Another possibility is that LCS indicators are produced by other organisations, so there may not be a significant demand for the NSO to move into the area. While a safe strategy, abstaining from producing any LCS indicators may lead to loss of visibility and failing to address changed user needs.

Strategic partnerships – providing data and statistical expertise to other producers of indicators

2.57 The limited resources of official statistics and the increasing availability of 'non-official' data (e.g. big data) suggest that official statistics will not be the only source of information. There is therefor also the possibility that the NSO engage as provider of input data or statistical expertise to other producers of LCSs. This could also involve e.g. quality control for third-party data, which could result in development of more trusted data. Box 2.2 gives an example of a strategic partnership between Statistics Sweden and the Swedish National Research institute.

2.58 The strategies are not static. An NSO can have different strategies for different types of LCS indicators, and the strategy for a particular type of indicator may change over time and depending on the relevance of the indicator and the users' request for it.

Box 2.2
Strategic partnerships of Statistics Sweden

Strategic partnerships. Most official statistics in Sweden is produced by Statistics Sweden. Official statistics not produced by Statistics Sweden is produced by other agencies adhering to the principles of official statistics, with whom Statistics Sweden cooperates. One example is the ***Business Cycle Barometer for Sweden***, which is a composite sentiment indicator produced by the National Research Institute. The indicator is part of official statistics, and Statistics Sweden provides statistical and methodological support and advice to the National Research Institute on the production of the indicators, including on the weighting of component series etc.

Source: The Swedish national research institute

2.8 Strengths, weaknesses, opportunities and threats

2.59 This section considers possible strengths, weaknesses, opportunities and threats for NSOs engaging in producing LCS indicators. Strengths and weaknesses are considered to catch factors that are *internal* to the organisation, while opportunities and threats generally relate to *external* factors.

2.60 *Strengths* include advantages of NSOs compared to other organisations in the production of LCS indicators. What puts the NSO in a better position than other organisations in terms of knowledge, IT, economic, legal or other factors. It also includes what the public would consider a strength of the organisation.

2.61 *Weaknesses* are considered to cover internal factors that may prevent the organisation from engaging in the production of LCS indicators, or make this difficult. Weaknesses may also be limitations, such as e.g. the need for NSOs to compile statistics according to the principles of official statistics, which on the other hand also presents a strength of NSOs.

2.62 *Opportunities* may come from changes in demand and in technologies, or changes in government policy related to official statistics. When assessing opportunities, it is useful to look at the organisation's strengths and ask whether these open up any opportunities. Alternatively, one may look at the weaknesses and ask whether eliminating these would open opportunities.

2.63 *Threats* include external factors which one way or the other provide risks or obstacles to the NSO. This could include activities of competitors or budget restrictions, or technological development, for instance.

2.64 The boxes below only cover what could be of general concern to all or most NSOs. NSOs may conduct their own SWOT, or similar analysis, taking more detailed and country specific factors into account.

Strengths	Weaknesses
- The brand of official statistics and the general trusts in NSOs as providers of impartial and high-quality statistics - The global network of recommendations and statistical competences that NSOs can draw on - Statistical and methodological expertise - Wide knowledge of and access to data sources - Efficient production by drawing on existing infrastructure and in-house data sources - Experiences in communicating statistical information - The use of existing tools and platforms for dissemination	- Possible conflicts with the role or the priorities of the NSO or limitations by national legislation - Lack of internationally agreed good practices on producing LCS indicators to lean on - LCS indicators may not live up to the existing quality standards of the NSO - Lack of resources to develop or regularly compile and communicate LCS indicators, which may require new methods and competences - Necessity to implement a suitable quality assuring programme

Opportunities	Threats
- Demonstrate the relevance and value of official statistics by producing needed LCS indicators - Meet emerging user needs, reach out to new user groups and gain visibility, while ensuring compliance with the principles of official statistics - Increase trust in the indicators and facilitate broader usage of these as tools for policy making and business decisions - Increased relevance of official statistics already produced, as input into LCS indicators - Opportunity to engage in or strengthen partnerships with other producers of LCS indicators - Increase expertise by using new IT-tools and new data sources	- Possible criticism of the NSO and reduced trust in official statistics if the LCS indicator is seen as non-compatible with the role of the NSO - Poor performance of LCS indicators may lead to criticism of methods and statistical professionalism - Possible higher risks for misinterpretation or misuse compared to other, well-established statistical series - Influence from outside the NSO on the production of LCS indicators could be a serious threat to the quality of the indicators and the general trust in the NSO - Lack of resources and budget constraints

3 Typology of indicators

3.1 Introduction

3.1 Indicators are used in many areas of economic, social and environmental statistics as a useful way to summarise and present information. In many cases, a variety of different types of indicators can be applied, ranging from simple, single-variable indicators to more complex composite indicators that bring together information from a number of different sources or areas into one common measure. Some indicators are "leading" and aim to predict the development of a certain phenomenon, such as economic growth; some indicators will be coincident or lagging compared to the phenomena that they try to estimate. The existing definitions and terms have been developed over time for different uses and are not always used or understood in the same meaning. The following sections discuss sentiment and composite indicators in further detail and set out definitions of other key terms used in these guidelines.

3.2 Section 3.2 discusses the characteristics of indicators compared to other statistics. Section 3.3 discusses sentiment indicators, and makes the distinction between sentiment indicators with reference series and sentiment indicators without reference series. Section 3.4 defines composite indicators and is structured similarly to Section 3.3: composite indicators with reference series and further divided into composite leading indicators, composite coincident indicators and composite lagging indicators. Finally, the section discusses composite indicators without reference series.

3.3 The chapter draws upon the Handbook on Constructing Composite Indicators (OECD, 2008), Towards a Harmonised Methodology for Statistical Indicators (Eurostat, 2014) and the Handbook on Cyclical Composite Indicators (Eurostat and UNSD, 2017).

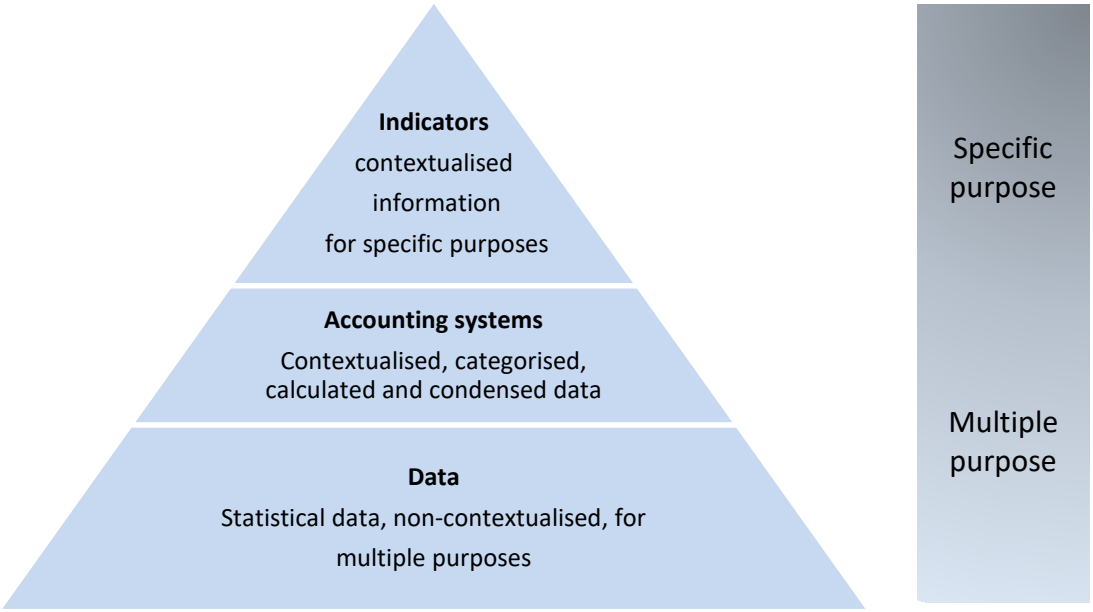
3.2 Characteristics of indicators

3.4 Before discussing the types of indicators covered by these recommendations, it is helpful to have a common understanding of the term *indicator*. There is no internationally agreed definition of statistical indicator and the term is used in a number of domains and can have quite different meanings. For the purposes of these recommendations, the term indicator is defined as *a summary measure related to a key issue or phenomenon and derived from a series of observed facts or reported opinions, attitudes or expectations*, where *series* refers to any collection of data, not necessarily a time series. This definition is similar to the definition used by Eurostat (2014) but has been expanded to explicitly include sentiment indicators.

3.5 An indicator may be any summary measure of the data – a mean, count, percentage, etc., related to or based on a conceptual model or context on which it provides information, it is not simply basic statistical data. Indicators share characteristics with other statistical information that is compiled and disseminated by statistical offices but also have some

distinctive features. Indicators can be described in terms of the knowledge management pyramid, also known as the data-information-knowledge pyramid (Figure 3.1).

Figure 3.1
Data information knowledge pyramid



Source: Eurostat (2017).

3.6 The base of the pyramid consists of statistical data, e.g. from surveys and register data. This is multipurpose statistics that can have many different usages, and is used as input to produce contextualized statistics at the next level.

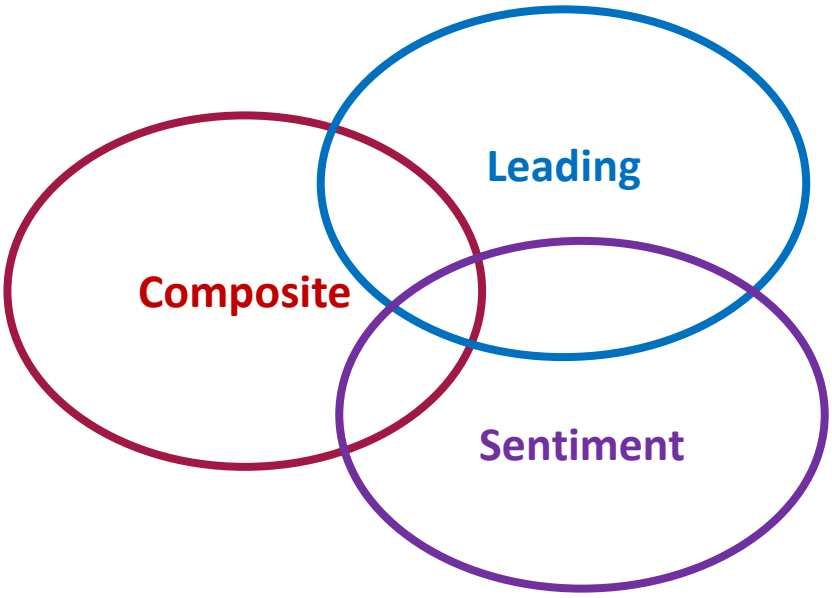
3.7 The middle of the pyramid refers to contextualized and condensed data structured and calculated according to a conceptual model such as accounting systems and supplemented with metadata, as for instance the System of National Accounts. This information can still be used for different purposes.

3.8 The Indicators level, on top of the pyramid, refers to contextual information, referring to a specific policy area or a given framework, which are developed to describe a specific phenomenon. This level includes leading, composite and sentiment indicators. These are not yet or only to some extent considered part of official statistics, even though some of these may be based on data series that come from official statistics. Communicating through indicators goes well beyond the simple dissemination of numbers since the communication of the context is crucial for the correct understanding and interpretation of the indicator.

3.9 The scope of these guidelines and this typology is leading, composite and sentiment indicators, which may give the impression that these are distinctive types of indicators. However, the terms are not mutually exclusive, as illustrated in Figure 3.2. For example, an indicator could be both *composite* and *leading*, or *sentiment* and *leading*, or all three. The European Commission's Economic Sentiment Indicator (ESI) is an example of an indicator that may be classified as both a sentiment indicator and a composite indicator. Furthermore, composite indicators may include one or more sentiment indicators which make it difficult to draw a clear line between composite and sentiment indicators. Hence, the typology also does

not make a distinction between sentiment composite indicators and non-sentiment composite indicators depending on whether all components are sentiment indicators or a mix of sentiment and non-sentiment indicators.

Figure 3.2
Leading, composite and sentiment indicators



3.10 Both composite and sentiment indicators may be leading indicators aiming at predicting some likely future development, but may also be constructed to estimate a current or past development or phenomenon. The *temporal* dimension of composite and sentiment indicators, whether they are supposed to estimate future, coincident or past phenomena, can be considered a characteristic of the indicators. For this reason, the typology does not deal with leading indicators as a separate group of indicators but consider these as subsets of composite and sentiment indicators. Hence, the discussion of composite indicators also covers leading composite indicators and the discussions of sentiment indicators also cover leading sentiment indicators.

3.11 An important consideration for both sentiment indicators and composite indicators is the presence or absence of a *reference series*, a series that an indicator aims to approximate or predict. Indicators with reference series may exhibit a leading, coincident or lagging relationship with the reference series. For indicators without reference series it is not possible to make this distinction. Economic composite indicators, introduced in Chapter 5, usually have a reference series whereas socio-economic composite indicators, introduced in Chapter 6 usually do not have a reference series. Sentiment indicators, introduced in Chapter 4, may be of both types.

3.12 NSOs may be less familiar with producing indicators with no reference series. The usual techniques based on the minimization of a distance to the reference series cannot be used to construct the indicators and users may feel that some subjectivity is involved in their construction. Therefore, these types of indicators pose particular challenges to NSOs.

3.13 The typology does not cover individual *quantitative*, non-sentiment data series that may be interpreted or used as leading or sentiment indicators, such as e.g. inventory statistics, building permits statistics or statistics on forced closed downs of business. The typology also does not cover traditional statistical economic or socio-economic measures, such as the GDP or the CPI.

3.3 Sentiment indicators

3.14 In the past, indicators that involved subjective assessment on the part of the respondent were widely considered outside the purview of official statistics. But national statistical offices have become increasingly involved in producing these kinds of indicators in recent years. Many countries produce indicators based on business and consumer tendency surveys that rely on questions about perceptions or expectations of the future. In 2013, the European Union Statistics on Income and Living Conditions instrument added an ad hoc module on subjective well-being, which included questions on life satisfaction, happiness and overall well-being. According to Eurostat (2015), "Subjective measures such as life satisfaction and meaning of life today are considered as reliable measures backed by international studies and guidelines. Subjective measures have also turned out to be relatively consistent with objective indicators which function as external validators."

3.15 Sentiment indicators encompass these kinds of "subjective" indicators and are defined as follows:

> ***Sentiment indicators*** *are indicators that rely on the opinions, attitudes or expectations of respondents.*

Table 3.1 provides an overview of the types of sentiment indicators that official statisticians may encounter, including some examples.

Table 3.1 Types of sentiment indicators

	With reference series			Without reference series
	Leading	Coincident	Lagging	
Sentiment indicators	Production expectations over the next 3 months, as available in business tendency surveys	Assessment of the current stock of finished products as available in business tendency surveys	Financial situation of the household over the last 12 month as available in consumer tendency surveys	Life satisfaction/ happiness in Europe

3.16 Sentiment indicators can be grouped according to whether they have a *reference series*. Some sentiment indicators have reference series to compare them with, for example the

quarterly GDP growth rate. In such cases, the indicator will exhibit a leading, coincident or lagging relationship with the reference series. Other indicators do not have reference series, for example indicators of life satisfaction, in which case the concepts of leading, coincident and lagging do not apply.

3.17 Broadly speaking, there are two main types of sentiment indicators of interest to national statistical offices. The first type is *economic sentiment indicators*, which are generally produced from business and consumer tendency surveys. Examples include consumer confidence indicators and business production expectations. Indicators of consumer confidence are common in many countries, but may be compiled in very different ways. They can be produced from a special consumer survey or be based on a mix of different sources. It should be noted, however, that in the European Union and OECD countries, business and consumer confidence indicators have been largely harmonized.

3.18 The second type of sentiment indicators is *socio-economic sentiment indicators*, which typically involve asking individuals about how they perceive different aspects of their life, such as their job or income, family or health situation. The indicators may be based on special surveys or the information may be collected through e.g. existing household surveys.

3.19 Chapter 4 presents recommendations on compiling and producing sentiment indicators.

Examples		
Type	Economic	Socio-economic
Sentiment indicator	Employment expectations, consumer and business confidence indices, European Commission's Economic Sentiment Indicator (ESI)[10]	Job satisfaction, perceived usefulness of training, belief that country is on the right track.

3.3.1 Sentiment indicators with reference series

3.20 Some sentiment indicators have reference series. In other words, they are produced with the explicit intention of approximating or predicting another indicator. Sentiment indicators that have reference series may exhibit a leading, coincident or lagging relationship with their reference series. As the concept of a reference series is of particular interest for composite indicators, a more detailed discussion of reference series and indicators' relationships to them is presented in Section 3.4.1 Composite indicators with reference series. In fact, many of the sentiment indicators that have reference series are also composite indicators, such as the ESI, which uses GDP growth as its reference series.

[10] The ESI is also a composite indicator. Consumer and business confidence indices may also be considered composite indicators (see chapter 4).

3.3.2 Sentiment indicators without reference series

3.21 Some sentiment indicators aim to measure a phenomenon directly and do not attempt to track the movements of another indicator. These indicators do not have reference series. Sentiment indicators in the social statistics domain, such as indicators of well-being or job satisfaction, generally do not have reference series.

3.4 Composite indicators

3.22 A composite indicator is created when individual indicators are combined into a single measure. Composite indicators are often used to measure multidimensional and in many cases abstract concepts, which cannot be captured by single indicators. Examples include composite indices of well-being or happiness or business cycle indices, summarizing a range of different indicators into one number in order to simplify interpretation. The definition of composite indicator used for these recommendations follows the OECD definition[11]:

> *A **composite indicator** is formed when individual indicators are compiled into a single index, on the basis of an underlying model of the multi-dimensional concept that is being measured.*

3.23 The indicators that make up a composite indicator are referred to as *components* or component indicators. The production of composite indicators involves choices regarding which component indicators to include and how to weight or aggregate them. These steps can be subject to criticism related to the subjectivity of choices associated with them. Ideally, a composite indicator should be based on a theoretical framework or model, 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.

3.24 The Table below provides an overview of the different types of composite indicators that exist, along with examples of each type.

[11] See http://stats.oecd.org/glossary/

Table 3.2 Types of composite indicators

	With reference series			Without reference series
	Leading	Coincident	Lagging	
Composite indicators	OECD Composite Leading Indicators[12] (CLIs), Conference Board Leading Economic Indexes, IFO Business Climate Index	Economic Sentiment Indicator (ESI) produced by the European Commission. EuroCoin (Factor model based on quantitative data for the GDP growth estimate)	Conference Board Lagging Economic Indexes (LAG)	The Affect Balance Scale (ABS)[13], OECD Better Life Index (BLI)[14], OECD measure of job quality[15], UNDP Human Development Index (HDI)

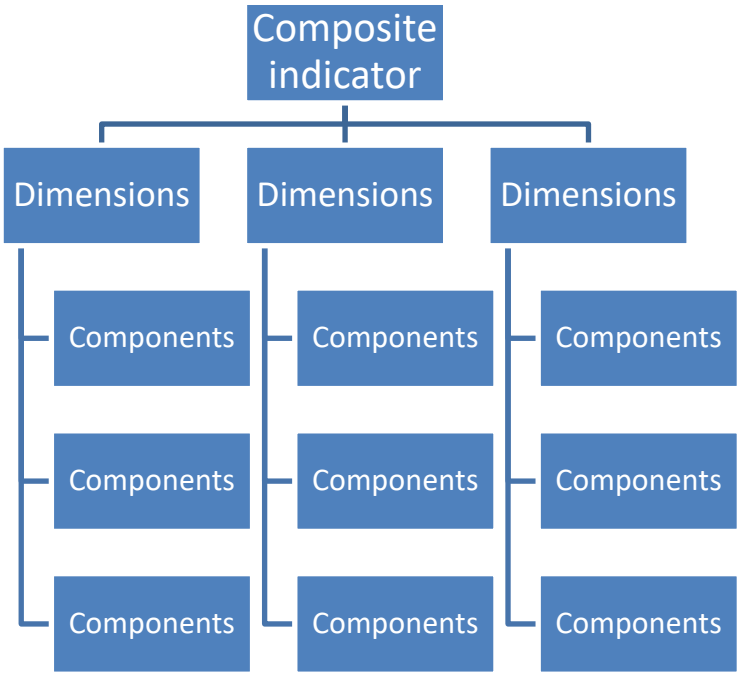
3.25 Just as sentiment indicators can be grouped according to whether they have a reference series and their relationship (leading, coincident or lagging) with it, so too can composite indicators. In fact, the distinction is rather important for composite indicators, as a composite indicator's ability to track its reference series provides a basis for impartial comparison of different sets of component indicators, normalization procedures and weighting schemes.

3.26 A composite indicator may include several *dimensions*, where the dimensions represent different domains or aspects of the phenomenon being measured. For example, a composite indicator of well-being may cover dimensions such as income, employment, health and education. If the composite indicator covers more than one dimension it is usually compiled in two steps, as illustrated in Figure 3.3. In the first step, component indicators within each dimension are weighted together into one indicator for the dimension. In the second step, the indicators of the dimensions are aggregated into a composite indicator. Often, different methods are used to weight components within a dimension from those used to combine the dimensions into the composite indicator.

Type	Examples
Composite indicator	UNDP Human Development Index (HDI), OECD Composite Leading Indicators (CLIs), European Commission's Economic Sentiment Indicator (ESI)[16]

[12] See http://www.oecd.org/sdd/leading-indicators/
[13] See Bradburn (2015)
[14] See http://www.oecdbetterlifeindex.org/
[15] See http://www.oecd.org/statistics/job-quality.htm
[16] These Economic Sentiment Indicators are produced by the European Commission's Directorate-General for Economic and Financial Affairs (DG ECFIN) and member states.

Figure 3.3
Dimension approach to constructing composite indicators



3.27 Chapter 5 discusses composite economic indicators in greater detail, and Chapter 6 presents an in-depth discussion of composite socio-economic indicators.

Box 3.1 Relationship with the concept being measured

An important consideration when selecting components to include in a composite indicator is whether changes in the component indicators have an easily interpretable relationship with the concept being measured. In other words, if a component indicator increases, it should be understood what the implication is for the concept. For example, a higher life expectancy means an increase in the human development index produced by the UNDP.

In many cases, however, single indicators do not exhibit a clear relationship with the concept being measured, even though they may be highly relevant to the concept. These kinds of indicators are not suitable for inclusion in a composite indicator. For example, in UNECE's framework for measuring quality of employment, the relationship between the indicators proposed and employment quality is not always straightforward.[17] One of the indicators, for instance, measures the number of days not worked due to strikes and lockouts. While this indicator is clearly relevant to employment quality, an increase does not necessarily mean a decrease in employment quality. An increase could reflect a reaction to negative working conditions, but it could also reflect increased freedom to negotiate with employers. For this reason, it would not be suitable to include this indicator in a composite indicator for quality of employment.

[17] See UNECE (2015)

3.28 It is worth mentioning that an alternative to combining component indicators into a single composite indicator is to present the components individually in dashboards or scoreboards. This approach aims to provide an overall picture of a given phenomenon while avoiding weight assignment and loss of information from combining multiple indicators.[18]

3.4.1 Composite indicators with reference series

3.29 In some cases, composite indicators are produced to provide information similar to a reference series at a lower cost, more rapidly, or at more frequent intervals. In other cases, a composite indicator may be produced to predict how its reference series will behave in the near future.

3.30 In practice, most composite indicators that have a reference series are economic indicators. Many of them use various transformations of GDP (e.g. the growth rate of GDP) or key short-term statistics (e.g. the growth rate of industrial production) as their reference series. If an indicator has a reference series, it may exhibit a leading, coincident or lagging relationship with its reference series. The distance from a reference series[19] is a common way to determine whether the choice of component indicators and weighting scheme or aggregation method for a composite indicator are appropriate.

Composite leading indicators

3.31 Composite leading indicators aim to estimate or predict the development of a given reference series. Most composite leading indicators are economic indicators.

> *A **composite leading indicator** is a composite indicator that aims to anticipate the movements of its reference series.*

3.32 Examples of composite leading indicators are the OECD's Composite Leading Indicators (CLIs) and the Conference Board's Leading Economic Indexes (LEIs). Admittedly, finding indicators that exhibit clear and consistent leading relationships with their reference series may be difficult in practice.

Type	Examples
Composite leading indicator	OECD Composite Leading Indicators (CLIs), Conference Board's Leading Economic Indexes (LEIs)

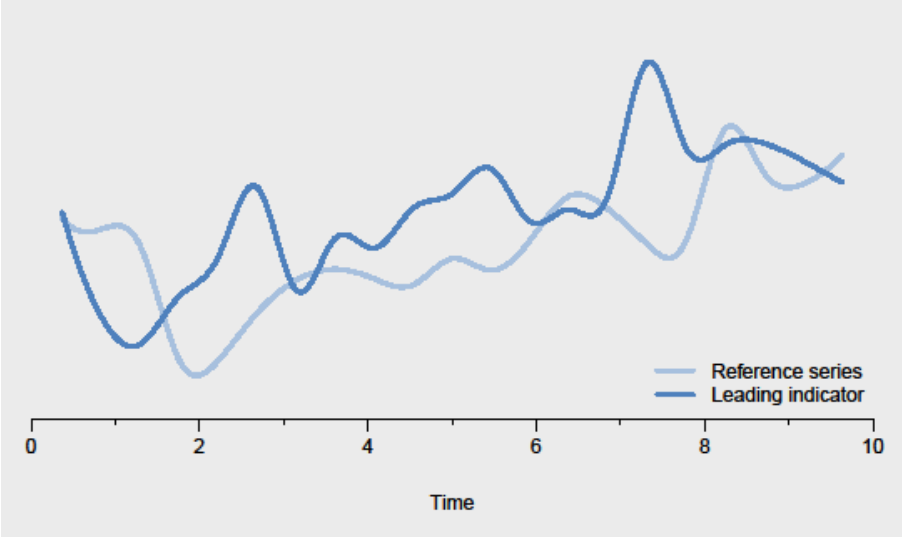
3.33 Another way to think about leading indicators is that a leading indicator at time *t* is most highly correlated with its reference series at time *t+k*, where *k>0*. Figure 3.4 shows what a

[18] One example of such a scoreboard is the European Commission's Macroeconomic Imbalance Procedure (MIP) scoreboard, which consists of several macroeconomic indicators in order to identify imbalances in member states' economies. See http://ec.europa.eu/eurostat/web/macroeconomic-imbalances-procedure/indicators

[19] Measuring distance from a reference series requires first defining how distance is measured – or choosing a distance metric. The L^2 norm, which corresponds to the usual sense of distance between two points on a graph, is a common choice.

typical leading relationship might look like with the example of a lead of one period. A peak or trough of the leading indicator at time *t* roughly corresponds to a peak or trough of the reference series at time *t+1*.

Figure 3.4
A leading relationship



3.34 It is important to note that an indicator that is released earlier or more frequently than its reference series is not necessarily a leading indicator. For example, many countries produce Industrial Production Indices (IPIs) on a monthly basis and GDP on a quarterly basis. While the IPI will be released before GDP estimates and can thus give an idea about the movement of GDP before its release, the IPI and GDP are coincident indicators because their movements generally occur at the same time.

Composite coincident indicators

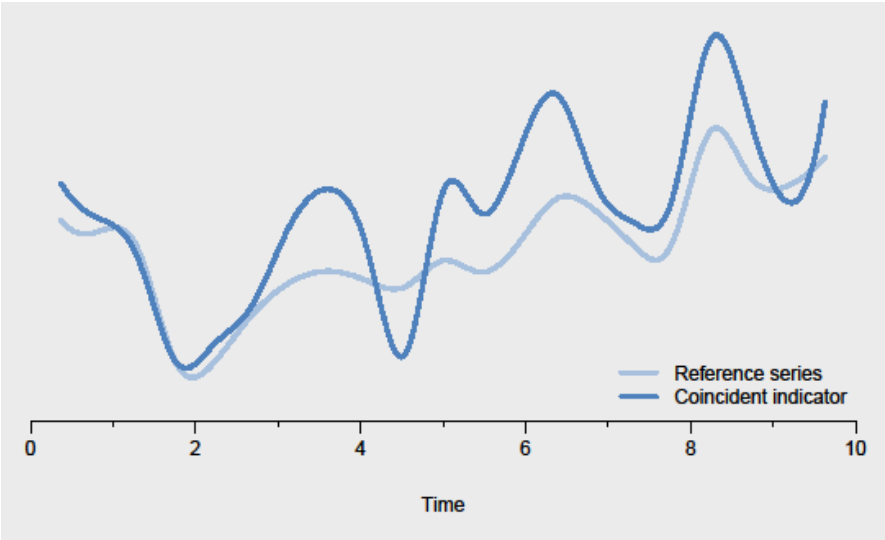
3.35 Composite coincident indicators aim at estimating a current development or phenomenon. For instance, a composite coincident economic indicator would change at roughly the same time as overall economic activity.

*A **composite coincident indicator** is a composite indicator whose movements occur at the same time as those of its reference series.*

Type	Examples
Composite coincident indicator	Conference Board's Coincident Economic Indexes (CEIs)

3.36 Another way to think about coincident indicators is that a coincident indicator at time *t* is most highly correlated with its reference series at time *t*. Figure 3.5 shows what a typical coincident relationship might look like. The peaks and troughs of the coincident indicator occur at roughly the same time as those of the reference series (though the magnitude of the peaks and troughs differs).

Figure 3.5
A coincident relationship



Composite lagging indicators

3.37 Finally, there are composite indicators whose movements follow the movements of their reference series with a delay.

> *A **composite lagging indicator** is a composite indicator whose movements follow those of its reference series.*

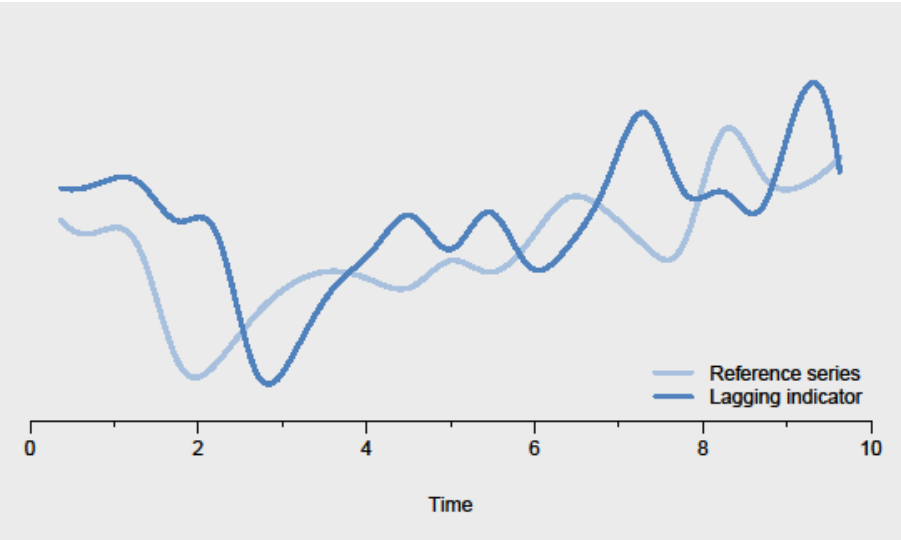
3.38 Many lagging indicators are produced because of their intrinsic value, and their lagging relationship with other phenomena is secondary. Lagging indicators may be used to validate movements in coincident or leading indicators, and may serve as input to analyses on structural imbalances or changes in the economy[20].

3.39 Another way to think about lagging indicators is that a lagging indicator at time *t* is most highly correlated with its reference series at time *t-k*, where *k>0*. Figure 3.6 shows what a typical lagging relationship might look like in the case of a lag of one period. A peak or trough of the lagging indicator at time *t* roughly corresponds to a peak or trough of the reference series at time *t-1*.

Type	Examples
Composite lagging indicator	Conference Board's Lagging Economic Indexes (LAGs)

[20] According to The Conference Board (2001).

Figure 3.6
A lagging relationship



3.4.2 Composite indicators without reference series

3.40 Just as there are sentiment indicators without reference series, so too are there composite indicators without reference series. These composite indicators aim to measure a phenomenon directly and do not attempt to track the movements of another indicator. These phenomena are mainly not quantifiable by traditional measures and of a more abstract nature. Examples are the UNDP Human Development Index (HDI) or the OECD Better Life Index (BLI). The main goal of these indicators is to assess the evolution of a phenomenon, for example well-being, between different points in time, or to create a ranking across countries or regions at a given point in time.

3.41 It can be difficult to reach agreement on methods of component selection, normalization and weighting for these kinds of indicators. However, Chapter 6 provides guidance or references to internationally agreed guidelines to assist national statistical offices in dealing with components of composite indicators without reference series.

3.42 In practice, most composite indicators that do not have reference series will be social, socioeconomic or environmental indicators (see Chapter 6 for discussion of composite socio-economic indicators). Sustainable development indicators, which span multiple domains, also lack reference series.

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4 Sentiment indicators

4.1 Introduction

4.1 Sentiment indicators in this report are defined as indicators that reflect the opinions, attitudes or expectations of respondents.

4.2 Sentiment indicators can be divided in two main groups: economic sentiment indicators and socio-economic sentiment indicators. Economic sentiment indicators typically aim to give a picture of the current economic situation in terms of e.g. an assessment of the current development in production, turnover or employment, or it reflects expectations about the future economic development, for instance the expected production or sale in the next month, or over the next quarter or year.

4.3 Socio-economic sentiment indicators are based on individuals' or households' assessments of their current situation, their opinion on various issues or expectations about the future development. This may include, for instance, their sense of well-being, satisfaction with the different aspects of life or their expectations or plans for the next year.

4.4 Both economic and socio-economic sentiment indicators have become more common and are used for a variety of purposes. Economic sentiment indicators are often used to provide early information about the likely economic development before any official statistics is published. Sentiment indicators on well-being, the quality of life or any aspects of quality of life, e.g. on health, education, family relations etc., provide information about households or individuals perception or expectation which is not obtainable elsewhere and which can be used to feed into the public discussion or policy decisions and planning.

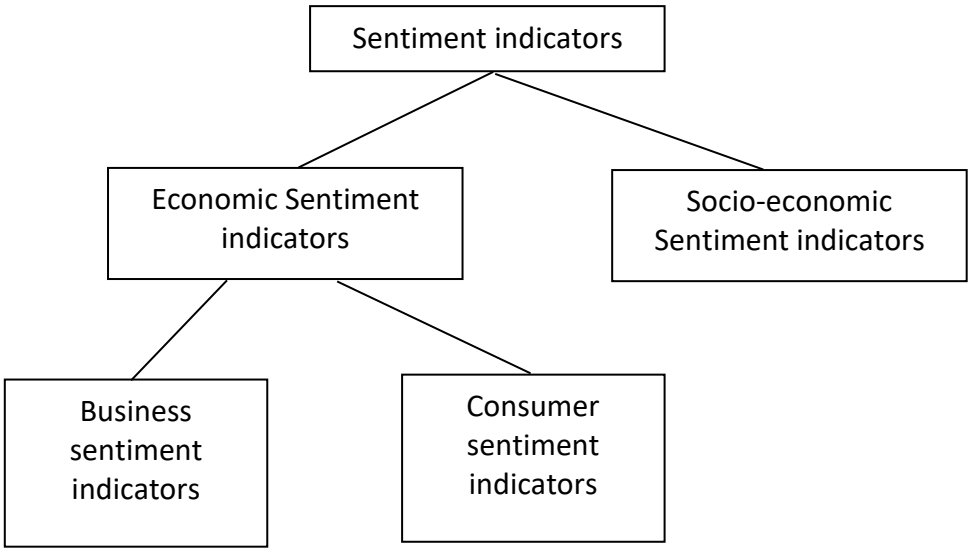
4.5 This chapter focuses on the compilation of single sentiment indicators. This include sentiment indicators that are based on a single question and sentiment indicators that are based on several questions within the same dimension, often obtained in the same survey, and which can relatively easily be averaged or aggregated into one single measure. For instance, an economic sentiment indicator based on questions about the production in the previous, the current and the next quarter may be used for the construction of a sentiment indicator of the confidence of the economic development.

4.6 Sentiment indicators may be used as component series in composite indicators. *Composite* economic indicators and *composite* socio-economic indicators, which may include sentiment component indicators, are discussed in Chapter 5 and Chapter 6, respectively. However, in this chapter in section 4.2.6, is discussed *composite sentiment indicator* based solely on sentiment indicators.

4.7 Quantitative data in some cases may be used as estimates of the perception or expectation of individuals. For instance, retail sales collected via credit card transactions might be used to reflect consumers' confidence in the current economic situation, or investment statistics may be used as an indicator of business expectations. The use of single quantitative series for estimation of sentiments - perceptions or expectations – is not dealt with in these guidelines.

4.8 Single sentiment indicators dealt with in these guidelines can be grouped in two main types, economic sentiment indicators and socio-economic sentiment indicators, as shown in Figure 4.1. Furthermore, economic Sentiment indicators are sub grouped into Business Sentiment Indicators and Consumer Sentiment Indicators.

Figure 4.1
Overview on types of Sentiment Indicators.



4.9 Section 4.1 provides a brief overview of sentiment indicators. Section 4.2 discusses *economic sentiment* indicators, and describes the two most frequent surveys which produce this type of indicator, namely *Business Tendency Surveys* and *Consumer Tendency Surveys*. The section also gives advice on comparison to reference series and determination if the indicator is leading, coincident or lagging. In section 4.3 *Socio-economic sentiment* indicators are discussed. Section 4.4 discusses issues in relation to international comparability. Finally, Section 4.5 provides a summary of recommendations for producing sentiment indicators.

4.2 Economic sentiment indicator

4.10 Economic tendency surveys are the main data sources for economic sentiment indicators providing essential information for economic surveillance, short-term forecasting and economic research. Tendency surveys provide timely qualitative data thanks to pre-coded and relative simple questionnaires. The type of the information collected allows for using data without doing advanced calculations, consistency checks within data or even cross-checks with external sources. The simple production process and the timeliness are two of the main characteristics of economic sentiment indicators.

4.11 There are two prominent types of economic tendency surveys; *business* tendency surveys and *consumer* tendency surveys. Typically, questions are of qualitative nature, asking for an indication of direction of development: improve, worsening or remain unchanged.

4.12 Business situation evaluation, demand-turnover expectation and sale price expectation are typical examples for economic sentiment indicators based on business tendency surveys. In contrast, general economic situation expectations, like the statements on the current financial situation of households, assessments on spending money on semi-durable goods, and the probability of buying a car are referred to as examples on economic sentiment indicators based on consumer tendency surveys.

4.13 The historical development of economic tendency surveys might be summarized as follows; in the 1920s trade associations in England and Germany started conducting tendency surveys and in the 1950s NSOs, research institutions and central banks of countries like France, Germany, Italy, etc. followed them. The Centre for International Research on Economic Tendency Surveys (CIRET) was also founded in this decade. CIRET is a forum for leading economists and institutions concerned with analysing and predicting the development of the business cycle and the economic and socio-political consequences. In the 1960s the European Commission's predecessor launched what is now known as the Joint Harmonised EU Programme of Business and Consumer Surveys. In the 1990s the OECD started a programme on business tendency surveys and lastly, in the aftermath of the financial crisis of 2007-2008, it could be said that the importance of economic tendency surveys was acknowledged at an international level. This is reflected in the data template for short term statistics that was established as part of the international programme on short-term economic statistics endorsed by the United Nations Statistical Commission in 2011 and that includes economic sentiment indicators from business and consumer tendency surveys. See the United Nations (2018) *Handbook on Data template and metadata for short-term statistics.* The data template includes a set of indicators that are internationally recognized as being important for macroeconomic surveillance, early warning of economic and financial vulnerabilities and the detection of turning points in business cycles.

4.2.1 Methodological material

4.14 Several methodological guidelines and handbooks are available that producers of sentiment indicators may refer to. The European Commission's Directorate General for Economic and Financial Affairs (DG ECFIN) is the EU partner which in collaboration with NSO's, research institutions, central banks and private statistical institutes conducts the Business and Consumer Tendency Surveys. At the DG ECFIN homepage the *Methodological guidelines and other documents* is available, which provides recommendations for conducting the surveys. The DG ECFIN (2017) *Methodological User Guide* provides the basics of the surveys including sampling, aggregation and weighting, seasonal adjustment and calculation of balances. In the guidelines are also listed the questions asked within the monthly/quarterly Industry survey, construction survey, services survey and retail trade survey, as well as within the monthly consumer survey and the biannual Industry Investment survey.

4.15 The publication *List of 'best practice' for the conduct of business and consumer surveys* (DG ECFIN, 2014) complements the above guideline with recommendations for best practices. Here sampling frame, sampling size, sampling methods, weighting procedures, seasonal adjustments and measures to increase response rates are reviewed.

4.16 Also, to be mentioned is the Special report No 5 / 2006. European Economy: *The Joint Harmonised EU Programme of Business and Consumer Surveys* (DG ECFIN, 2006) which

provides a) A user manual to the Joint Harmonised EU Programme of Business and Consumer Surveys b) International guidelines and recommendations on the conduct of business and consumer surveys and c) Studies related to the EU BCS programme.

4.17 The United Nations (UN, 2015) publication *Handbook on Economic Tendency Surveys* aims to provide best practices and harmonized principles on these aspects of tendency surveys; sample selection, questionnaire design, survey questions, survey execution, data processing and the use of composite tendency indicators.

4.18 Finally, it is worth to mention the OECD (2003) *Business Tendency Surveys: A Handbook*. Also, here recommendations on questionnaire design, sample selection, uncertainties, and result processing is to be found.

4.2.2 Pros and cons of Economic Sentiment indicators

4.19 When deciding on whether to engage in the production of economic sentiment indicators NSOs should consider possible pros and cons of producing such indicators. In contrast to quantitative statistics providing 'hard data' sentiment indicators are often based on qualitative surveys, and at first glance may seem less clear, more open to interpretation and perhaps less reliable.

4.20 Usually national statistics have established quality assurance frameworks for their production, wherein quality standards in different dimensions are defined. Those also apply for sentiment indicators. Please refer to Chapter 2.6 for an elaboration on quality assurance framework.

4.21 Also in Chapter 2, section 2.3, is provided an overview on pros and cons in of producing Leading, Composite and Sentiment indicators. With regard to sentiment indicators, advantages to highlight are:

- Sentiment indicators enlighten topics or issues which normal quantitative statistics may not cover.
- They provide simple messages and present information straightforwardly.
- Simple production process.
- Timeliness. Often, the statistics are collected and processed quickly, allowing for publication in same month as the survey, or at least early next month. This is of valuable importance to the utilization of the statistics. Government, trade organizations, national banks and financial analysts get data at hand almost simultaneously with its occurring. In conjunction with other information this makes sentiment indicators useful for:
    - Forecast and nowcast analysis.
    - Financial and structural monitoring and regulations.
- Qualitative questionnaires are easy and quick to fill in. Often the information asked for is instant knowledge in the respondent's mind and who does not need to look it up. This may ensure higher willingness to respond and yield more reliable answers in cases where quantitative questions (exact figures) may be difficult to procure.

4.22 Hesitations may root in:

- Sentiment indicators may oversimplify complex issues and lead to wrong conclusions. The perception of sentiment indicators as being politically flavoured and the risk of political or biased interpretation by users.
- The board of the NSO may think that producing sentiment indicators is a step into an unclear area, which will undermine the general trust of the institution as the provider of impractical and reliable statistics.
- Criticism for being subjective.
- Budget constraints. Often this type of statistics is not on the governmental financing plan of the NSO. Unless expenses are covered by sales of detailed disaggregation of the statistics into regions and/or branches the production may be a non-profit service. This can be a challenge for the NSO.

Balancing the pros and cons

4.23 The advantage of economic sentiment indicators is that they are available much faster than related quantitative measures covering the same types of economic activity. In this way, they may be considered as complementary to existing quantitative based statistics.

4.24 The timeliness of economic sentiment indicators stems from the use of simple survey questionnaires and a short production process. Qualitative surveys do not require numerical evaluation and allow economic agents to assess the past, the present and expected developments in variables of interest by a few predetermined replies, like: “increase”, ”unchanged”, “decrease”. Little choice of answers and the possibility to rank them from pessimistic to optimistic make the respondent feel more confidence to evaluate and greatly reduce time of data collection.

4.25 Economic sentiment indicators obtained through surveys are primarily designed to signal changes in economic activity and widely used in macroeconomic assessments and forecasts. For instance, the specific usage of a business sentiment indicator is detecting turning points in the economic cycle. These indicators are used to help both the government and the private sector decision-makers to check their performance and plan their actions. Therefore, countries have begun to improve their indicator system by including indicators from tendency surveys.

4.26 Central Banks are one main user of economic sentiment indicators among other user groups like international organizations, trade organizations, research institutes, the press and other media. For instance, in terms of monetary policy decision making, reliable and timely information on the inflationary pressure and early signals about slowdowns or expansions in the economy is of key importance for Central Banks.

4.27 National Statistical Offices can take advantage of their recognition, reliability, experience, infrastructure and human resources in conducting sentiment surveys. These advantages make it possible to conduct the study in a better way in terms of using proper sampling techniques, data processing procedures, well trained interviewers and selecting appropriate weighting, calibration and correction techniques. Moreover, communication and collaboration of NSOs with international and national bodies give them the opportunity of following latest developments and detecting needs and integrating this information to the study.

4.28 On the other hand, the risks of producing economic sentiment indicators by NSOs might be related to their subjective features. As explained above, economic sentiment

indicators may be used as leading indicators to track changes in the economy, which are measured by other indicators produced by the NSO. However, the indicator may show poor leading performance compared to the reference series that it aims to track. Therefore, the NSOs are advised to carefully explain the purpose of the indicators and that the indicators reflect the perception or expectation of individuals, which may, eventually, deviate from the actual development.

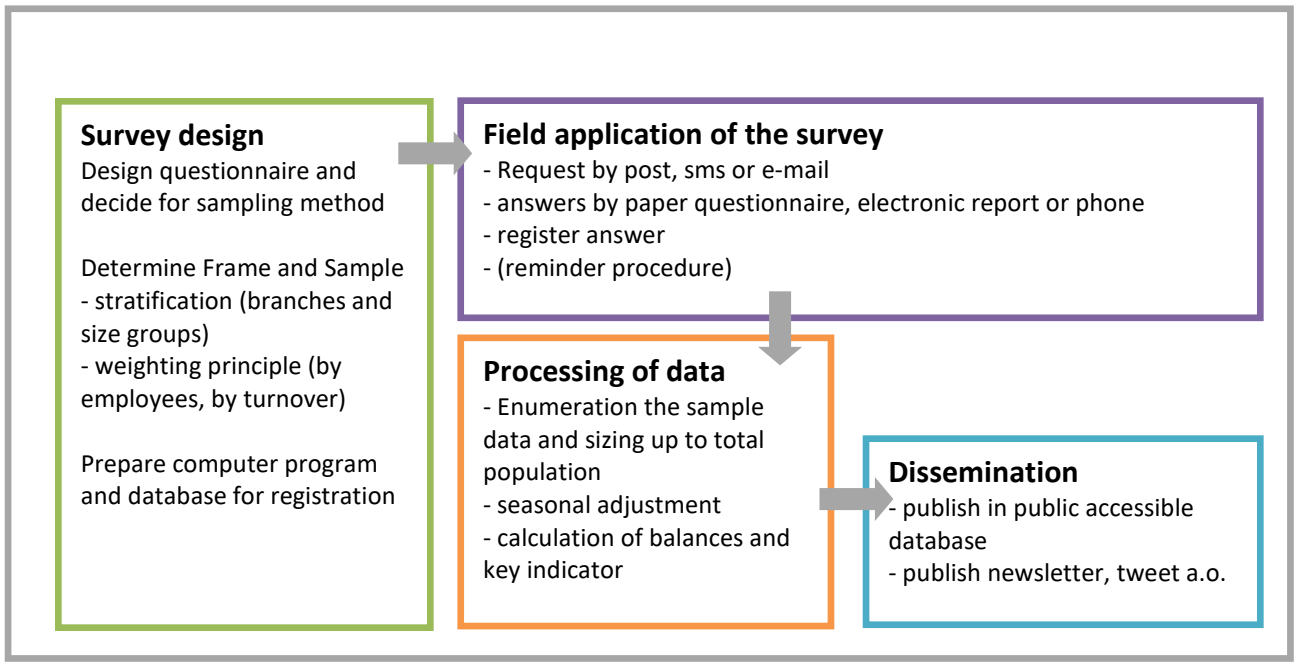
4.2.3 Compiling business tendency surveys

4.29 As referred to in section 4.2.1, various guidelines, recommendations and handbooks exist from the EU, OECD and UN. In the following shall be touched upon characteristic issues of the business tendency surveys, namely phrasing of questions, actual field application, weighting, imputation, balances and confidence indicators.

4.30 Business Tendency Surveys (BTS) are carried out in many countries around the world in various forms and under different labels. As example can serve the European Commission Business Tendency Surveys, which are part of the Joint Harmonized EU Programme of Business and Consumer Surveys. The programme includes monthly surveys of Industry (manufacturing), Construction (building), Retail Trade and Services. Moreover, a half-yearly investment survey within the manufacturing industry is carried out. Often the monthly questionnaire is expanded with additional questions each quarter. The participation in business tendency surveys is mostly voluntary but compulsory in some countries, and the quality of the results depends on the willingness of enterprises to participate. To what extend the compulsive surveys are actually enforced is probably limited. Hesitations towards compulsory surveys especially regarding tendency surveys are that it could reduce the quality of the answers and slow down the field work because of reminding procedures.

4.31 The responding unit should be the manager of the enterprise in business tendency surveys while accountants are generally responsible for filling in quantitative surveys. This is related to the qualitative nature of the survey since the managers are supposed to have the overall information on the current situation of the company and the sector.

Figure 4.2
The process of conducting business tendency surveys



4.32 The enterprises included in the survey should be convinced that the information they provide is not only an important input for macro-economic analysis (policy making) by trade associations, the financial sector and the governmental administration, but also valuable information that can be used by the enterprises more directly e.g. in market research.

4.33 The flow chart above depicts the main steps of compilation procedure, from survey design, over conductions and data processing and finally dissemination, which is discussed in detail in Chapter 7.

Survey Design

4.34 The survey can either be conducted as a random sample or as a panel sample, which in the latter case implies that the same companies recurrent month after month are receiving request on participation. Because of drop outs the panel sample must be supplemented either monthly or within bigger intervals.

4.35 For the sample design, division according to economic activity is a useful stratification. Stratification into groups of company size is also common. The DG ECFIN (2017) *Methodological User Guide* gives additional guidance on sample design.

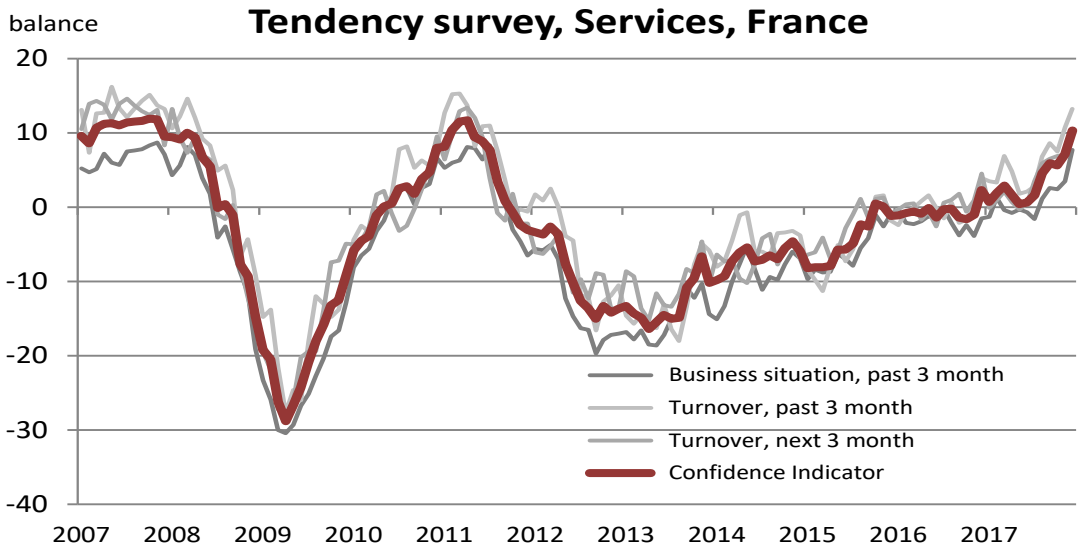
4.36 Furthermore, the survey sample may be divided by regions; this is especially of importance for larger countries and for countries with large regional differences.

4.37 The coverage of economic activities (line of businesses) within each sector (services, manufacturing etc.) is determined by taking into account some factors: Most market oriented economic activities which are sensitive to cyclical movements of the economy are covered in the survey, if also number of employees or size of turnover is at a significant level. The coverage of the services sector raises particular challenges, since public and semi-public institutions may have commercial activities and for this reason should be included in the sample.

Box 4.1

EU harmonized Business Tendency Survey, Services - France

The French Services tendency survey is part of the EU harmonized programme. The survey sample is stratified using two criteria: principal economic activity, at the NACE sub-class level, and turnover used as an indicator of enterprise size, with four turnover brackets. The survey is monthly, and requests are sent by e-mail or post. Most of the respondents answer online on a dedicated and secure website, the rest fill in a paper questionnaire. A reminder procedure is activated about the 7th in the month. By the 21th in the survey month, the data are compiled, all questions are processed and the *balances* for each indicator are calculated.



Confidence indicator and components; seasonally adjusted. Source: DG ECFIN based on INSEE data.

The set of questions asked each month includes: the six harmonised questions within the EU Joint Programme, about the business situation development over the past three months, the change in turnover and employment over the past three months and over the next three months, and the expected trend of sales prices for the next three months. The respondent answers simply by selecting an up, stable or down arrow. Additional quarterly questions are asked about factors limiting production (insufficient demand; shortage of labour force; shortage of space/equipment; financial constraints; other factors; none). Also, the company is asked if its volume of activity could be raised with present resources if demand increased; and if so, by what percentage.

Besides the EU harmonized questions, the French National Statistical Institute (INSEE) places complementary questions, for instance about hiring problems; the trend of export turnover and operating balance result; opinion about the general outlook for their whole sector; the recent change in sales prices, and the development of the company's investments.

The balances summarising the qualitative information provided by the business tendency surveys play an important role in the forecasting process carried out by the INSEE, as these balances generally present a close correlation with the corresponding macro-economic variables. Furthermore, in France, a specific composite Business Climate Indicator is calculated from eight of the *balances*, using the factor analysis method, for the whole services sector as well as at sub-sector level, to better track the economic outlook in these activities.

4.38 In general, economic activities should be classified according to the UNSD classification system ISIC[21] or the EU classification system NACE[22], to ensure international comparability. Also, when selecting the economic activities within a survey one could ensure the indicator targets the same coverage as the reference series. Within the EU Business and Consumer Surveys the exact economic activity coverage is defined according to DG ECFIN (2017).

Formulation of survey questions

4.39 Questions in business survey are usually asked about business situation, turnover, sales, employment, sales prices, stock and order. Questions about actual development target a previous time period up until present, and questions about expected development target a future time period from present and onwards. Also questions about the present - current situation - are asked.

4.40 Typically, three answering options are given with negative, neutral or positive value. For questions about current stock answers can be of the type too large, adequate or too small. For questions about development answers can be of the type: decrease, unchanged or increase. This follows an ordinal Likert scale. If finer nuance is needed, answering options can be expanded to five: strong increase, increase, unchanged, decrease or strong decrease.

4.41 Questions can be assessed value-laden. For example, a question on current overall order books can be assessed by *more than sufficient, sufficient,* or *not sufficient.* However, a more neutral phrasing of the assessment options is also possible*: above normal, normal for the season,* or *below normal.* The latter is not as value-laden as the first, but the first may be easier for the respondent to cope with. Most important is to stick to the choice over time from survey to survey. Changes may lead to level shifts and thus data break in a time series.

4.42 Respondents may be asked to look away from seasonal effects, when assessing the changes. Nevertheless, in practice, survey results will show a seasonal pattern, which is recommended to adjust for (see paragraph on Seasonal adjustment).

4.43 The horizon over which respondents are asked to reason may differ from one country to another. In the European program of business and consumer surveys, businesses and consumers are asked to reason over the past or next three months including the survey month. According to the guidelines they evaluate the changes *over* the three-month period, from the beginning to the end, so to say.

4.44 As a reminiscent from only quarterly surveys, some countries which have switched to monthly surveys, ask the respondent to assess the past three months as compared to the previous three non-overlapping months. Of course, some countries might deliberately have settled for posing the question like this. Others may operate with a shorter or longer time horizon than three months; see e.g. Example on Services Survey from Statistics Israel.

[21] UN (2008). International Standard Industrial Classification of All Economic Activities. Revision 4.
[22] EUROSTAT (2008). NACE Rev. 2 - Statistical classification of economic activities in the European Community.

Box 4.2
The European Commission harmonized Business Tendency Survey

The European Commission harmonized Business Tendency Survey targets the development over the past 3 months and the next 3 months along with questions on the current situation. Here, four surveys are carried out within the sectors Manufacturing, Services, Retail trade and Construction.
In the questionnaire of the EC Business Tendency Surveys, the main section of questions typically covers production/turnover, employment, order books, stock, prices, and they are answered by ticking one of three options with either negative, positive or neutral value, like e.g. decrease, increase or unchanged. The actual questions are fitted to each survey.
Additional questions are to be answered in different ways, some like the above. Others, for example questions about certain factors limiting the company's production, the various listed factors like Insufficient demand, shortage of labour force or financial constraints are answered by tick marks if positive. Other questions should be answered with numbers, e.g. for a question on capacity utilisation a percentage number should be entered, and a question on how many months' production is secured in the order books should be answered with a one-digit number.
While the Retail trade survey within the EC Business Tendency Surveys has identical questionnaires from month to month, the three others expand their questionnaires in the first month of a quarter (January, April, July, and October) with additional questions. For more information about the EC Business and Consumer Surveys refer to DG ECFIN (2017).

Field application of the survey

4.45 Generally, BTS are conducted via web-forms to fill inn or via paper questionnaires send by post. However, also reporting by fax, telephone interviewing or computer assisted face-to-face interviewing is used for data collection in some countries. For monthly surveys the field application period is usually the first two or three weeks of the month. Data dissemination and possible newsletters are published by the end of the same month as the survey month if possible or at the beginning of the next month.

4.46 Mostly, business tendency surveys are not mandatory for the businesses, since questions are qualitative and about opinions, which cannot be enforced. Reminders can be send urging businesses to respond.

4.47 In the field application process, it is recommended to draw on the experiences of other voluntarily surveys and from expertise knowledge, how the willingness to participate in the survey can be expected to be. What will it take to get sufficient amount of responses? How should the survey be promoted? Which will be the hurdles to overcome? Should the respondents receive a thank-you-letter including graph over main results?

4.48 It is more and more common to conduct the surveys over the internet or by smart phone apps. Establishing an online web-form system is appealing because it saves paper, prints, postage and man hours for typing answers into database. In practice the newly selected respondents may receive an introduction letter by post, guiding into the web form. When filling in the web form the respondent can be asked entering an email-address for further contact. Thus, for next survey the respondent receives an email saying it is time to fill in the next web form.

4.49 Many respondents welcome online questionnaires or smart phone apps, however one also must be aware that some will prefer paper questionnaires. Among the latter may be large companies whose responses are important for the overall quality of the survey. A mixed mode of responding options (paper and web) can be considered in a transition phase.

4.50 One of the factors impeding the easiness of web forms is the security portal. Often access to online form demands that the respondent is identified by login and password, since the respondent will get access to other information about the company. This can be perceived as an obstacle. However, one-directional systems are developed where the respondent by clicking a uniquely generated link in the request email only gains access to the specific survey.

Processing of data

4.51 Once data is registered either via online forms, via telephone surveys or via paper questionnaires it should be processed. Important steps in the processing are elaborated in the following. After the processing the result should be communicated to the outside world, a process which is dealt with in Chapter 7.

4.52 For the economic sentiment indicators data is processed by methodologies which are quite common. However, also specific steps like calculation of balances and confidence indicators are involved. Here automated computing and management systems must possible be adjusted to fit to the specific survey and indicators. This also goes for data base set up.

4.53 Basically, answers to the survey questions from the individual businesses are enumerated, i.e. calculated as statistics covering the entire population of the sector. In principle it is calculating the percentage shares that have answered at the different options to a question; most simple: turnover increase, decrease or unchanged. The calculations become a bit more complicated, because of stratifications, size and sample weights.

Size weights and sample weights

4.54 In a typical business tendency sample, companies in the sample are *weighted by their size*, measured e.g. by number of employees or by turnover. This is because a positive or negative development in a big company is more important for the business and society economy than in a small company – and which is not reflected directly in the figures as in a quantitative survey.

4.55 It is also typical to stratify into size groups, where the probability of being chosen is much higher for big companies than for small companies. This helps to minimize the size of the sample, since the sample coverage measured by e.g. employees becomes bigger when compared to the entire population.

4.56 The enumeration process is the transformation of the sample results to cover the entire population within the same economic activity/activities. In the enumeration process, strata with small companies will have a higher weight (*sample weight*) than big companies,

since their weight is determined by the inverse of the probability of being chosen. In other words, a small company represents many other small companies which are not in the sample, while a big company only represents itself, since all other big companies (in principle) are chosen for the sample.

4.57 In general, number of employees is a good proxy for company size, however turnover, production or income may be more accurate, and especially considering the current post-industrial internet era, there may be larger and larger differences on turnover per employee between companies, leading to biases within and among branches. Whichever method is agreed upon it is recommended that the same method is used throughout for all indicators in the survey to maintain the comparability.

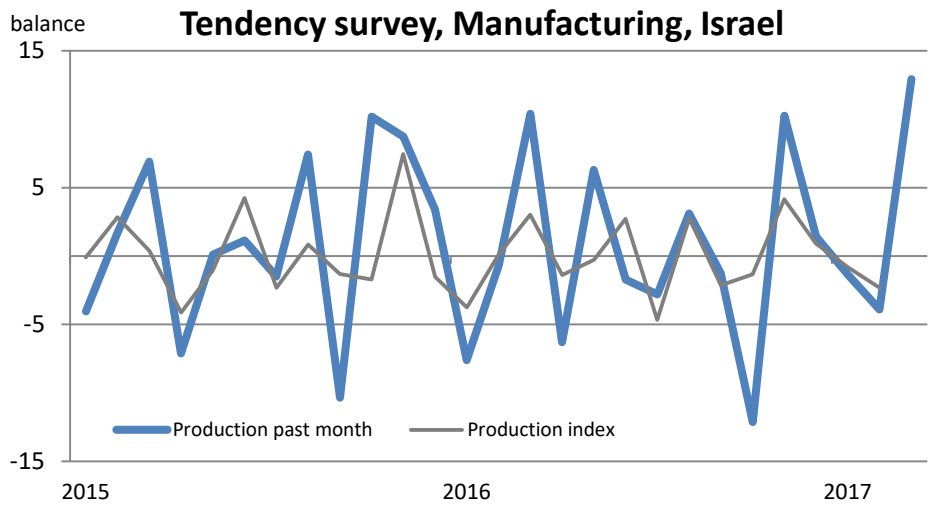
Indirect imputation of missing replies

4.58 It is not recommended to impute data from previous months' surveys. The problem is that the survey is qualitative not quantitative. The answers a company reported last month were not exact figures e.g. for turnover, but assessments on the development over some specific time period (down, up, neutral), and which may be very different in the following period. The recommendation is thus taking use of indirect imputation in the enumeration process. This is simply done by assuming that the non-responding companies would have answered like the responding companies within the stratum.

Box 4.3

Business Tendency Survey, Manufacturing, Statistics Israel (2017)

The Israeli business tendency survey covers a population of 14.000 manufacturing companies in Israel within ISIC groups 6-33. There are 7.500 companies after cutting off companies with below 5 employees. For the panel sample frame 400 companies are selected. The sample is stratified into the above-mentioned ISIC groups for economic activities, and further stratified into five size groups: 5-10; 10-49; 50-100; 100-250 and above 250 employees.



Source: Central Bureau of Statistics, Israel

The survey questions are about current business situation, the past development and expected development regarding order books, output, sales, finished goods inventories and employment. Furthermore, is asked about the expected inflation rate and about the expected foreign exchange rate, which targets the next 3 months and the next year. Because of high correlation to the Production Index the media release on the manufacturing tendency survey results focuses on the indicator for Production past month.

The monthly survey questionnaire is sent in the beginning of the month by email or fax. According to an individually adjusted methodology different from the EU harmonized methodology, the sample is randomly divided into 4 weeks of collection, which means that the respondent is asked to perform the reporting in the selected week of the month. This is in order to level out the effects of possible sudden political and other external events.

Also, different to the harmonized EU-methodology the Israeli business tendency survey only asks about developments in the past single month as compared to the previous month, and likewise only asks about expected development in the next single month as compared to previous month. Here EU countries ask regarding to the past 3 months and the next 3 months' period.

Seasonal adjustment

4.59 In some surveys the respondent is asked to ignore seasonal effects when evaluating the past, present and future. This may be difficult and still results may show seasonal patterns, which is recommended to adjust for, in order to evaluate the development from month to the succeeding month, instead of from a specific month to the same month another year. For further methodological guidance on the treatment of seasonality, readers are referred to the already mentioned handbooks from OECD, UN and DG ECFIN. Eurostat has developed the JDEMETRA+ application[23] which is able to establish advanced correction models, taking specific national holidays and national trading days into account.

Balances

4.60 Increasing, decreasing or unchanged? Below normal, normal or above normal? Those are some of the responses businesses or households are expected to provide each month or quarter to questions on their past, present or expected situation.

4.61 In the compiling procedure, for each indicator the weighted number of answers is distributed on the three answer options in percentages summing to 100 pct. If e.g. 15 pct. for increase, 48 pct. for unchanged and 37 pct. for decrease, the balance (or *net value*) is the result of subtracting positive assessment from negative assessment, which is 15 minus 37 resulting in the net value minus 22, denominated the balance. When communicating the results, the balance at minus 22 is better indicated without the "pct." specification in order not to confuse. However, the balance can e.g. be worded as follows: "An overweight at 22 percentages of the companies, weighted by size, within the sector expects the production to decrease over the next three month".

4.62 It is noted that answers for neutral (unchanged, normal, sufficient etc.) are excluded from the balance calculation. It is assumed that if asked to choose, the members of the group would split even to each side, thus leaving the balance unchanged. Some NSOs, like the Israeli Central Bureau of Statistics, have chosen to expand the set of answer options to five of this type: *strong increase, increase, unchanged, decrease or strong decrease*. When calculating the balance, *strong* increase/decrease counts with full weight, while increase/decrease only counts with half weight. For a practical example see the sub section on processing of data in the section 4.2.4 on consumer surveys below.

Aggregated key indicator

4.63 Economic sentiment indicators may be based on one single question, or they may be based on several questions within the same dimension, which can be aggregated into one single indicator. Typically, such an indicator will summarise the results of a limited number of survey questions by averaging the balances into one measure. For example, the so-called *confidence indicator* within the EC Services Tendency survey is calculated as the simple average of the following balances:

- business situation (over the past 3 months)
- demand / turnover (over the past 3 months)

[23] https://ec.europa.eu/eurostat/cros/content/download_en

- demand / turnover (next 3 months)

The selection of those three indicators was guided by the aim of maximizing the correlation to the reference series, like for example output or gross value added.

In communication of the results, this kind of aggregated indicator is the key indicator, providing an overall result in one figure.

4.2.4 Compiling consumer tendency surveys

4.64 Consumer tendency surveys aim to measure consumers' or households' assessment of their current economic situation or their expectations on future economic developments. Data are usually collected in household surveys through questions about the current economic situation in general or the economic situation of the households and about the future, i.e. questions about planned consumption expenditures (including plans to purchase major consumer durables) and savings, or expectations about inflation or employment situation. Outcomes of consumer surveys often have the media's awareness and are widely used in economic analysis by researchers and policy makers.

4.65 In the following, the compilation of the consumer tendency survey is briefly explained. More detailed descriptions and considerations are to be found in EU (2014, 2017), UN (2015) and OECD (2003) and in previous sections about business tendency survey.

4.66 Consumer tendency surveys are mostly monthly surveys conducted by NSOs, central banks, universities or private agencies. The Conference Board's consumer confidence index or the consumer sentiment indicator of University of Michigan are examples for USA, while the central bank of India is carrying out the CTS in India. European Commission Director General Economic and Financial Affairs (DG ECFIN) coordinates business and consumer tendency surveys for EU member and candidate countries.

4.67 DG ECFIN collects and publishes data through joint projects with the institutions conducting the survey in the country. The Methodological User Guide (DG ECFIN, 2017) to the "Joint Harmonised European Union Programme of Business and Consumer Surveys" provides a theoretical framework covering all aspects and methodologies of consumer surveys.

Survey design

4.68 The consumer tendency survey would usually target the whole adult population of a country. The representative individuals are selected directly or from a selected household on the basis of socio-economic and demographic characteristics. The sampling method, categories of weighting for sampling and survey method are determined by financial restrictions of the organization balanced with quality requirements. Every month, nationally representative sample households are interviewed selected by using an appropriate sampling framework.

4.69 Depending on mode of the survey, sampling frames might be census frame or population registers (register of all residents of country), telephone registers (fix telephone directory, official telephone directory, database of households' phone numbers, public telephone registers, private database of randomly generated mobile and landline telephone numbers), address etc.

4.70 Categories of weighting or strata for sampling can be age, age group, gender, education, occupation, work regime, size of household, size of municipality, income of household (income classes or quartiles), region, geographical partitions or all categories of population etc.

4.71 The questionnaire of the survey should consist of two main parts collecting information on household features and tendencies of the selected individual. The tendency part contains pre-coded questions, generally using a five level Likert scale. The reference period of the questions usually targets from "last 12 months" to "next 12 months". DG ECFIN's harmonized questionnaire can be used as a base and if it is necessary some questions could be added to the questionnaire to cover country specific cases.

Field application

4.72 Consumer tendency surveys are generally conducted by telephone (CATI - computer-assisted telephone interview). Other modes could also be used in accordance with the conditions of the respective country like CAPI (computer-assisted personal interview), CAWI (computer-assisted web interview), PAPI (paper and pencil interview) or mix mode.

4.73 Tendency survey results are generally published and used within the data collection month. Hence, the field work should be organised so that it is possible to collect a sufficient number of replies to allow early publication of the results of the survey.

4.74 The fieldwork period of the consumer survey is generally the first two weeks of each month. The survey results concerning the reference month are expected to be published at the end of the field application month or just after completion of that month.

Processing of data

4.75 For categorical data such as respondents replies on whether they agree or disagree with statements an average need to be compiled, which is usually referred to as the balance. A balance value is calculated by using the weighted responses to the Likert scale questions. In the case of five levels, the answers range from "extremely positive" to "extremely negative". The balance is calculated as the difference between the percentages of positive and negative responses, after following formula: B = (PP + ½P) − (½N + NN). This means the most positive, PP, and the most negative, NN, count with their full percentage shares, while the moderate positive, P, and the moderate negative, N, count with half their percentage share. Thus, if for example the percentage distribution between five answers on this question "How has the financial situation of your household changed over the last 12 months" is distributed like this: got a lot better (4%), a little better (11%), stayed the same (63%), a little worse (15%), a lot worse (7%), the balance is (4+ ½*11) – (½*15 + 7) = minus 5. As mentioned before in the section about business tendency surveys, this balance figure, or net value, is better communicated without percentage unit. The single figure gains more meaning when presented in a time series for comparison to the previous months. However, the stand-alone figure can also be communicated like this: With an overweight of 5 % participants state that their financial situation has worsened over the past 12 months.

4.76 Within the EU consumer survey, the consumer confidence indicator is the arithmetic mean of the balances (in percentage points) of the following four indicators:

- Financial situation of households, expectation over the next 12 months

- General economic situation, expectation over the next 12 months
- Number of people unemployed, expectation over the next 12 months
- The probability of saving over the next 12 months

4.77 The confidence indicator as well as its balances, are presented on a scale ranging from minus 100 (pct.) to plus 100 (pct.), where those extremes are reached if all respondents either answers “a lot worse” or “a lot better” respectively. An indicator value at 0 indicates no change. And the indicator value minus 5 (pct.) mentioned in the example above would indicate a little overweight in the “worse” direction.

4.78 For the reporting of the survey results, balance statistics are widely used. However, there are other ways of quantifying the results, like for example diffusion indices. For instance, the Turkish Statistical Institute disseminates the consumer survey results converting balance values to a diffusion index. It is simply done by adding 100 to the balance values and eases the interpretation of the resulting figure. The shifting of the above-mentioned scale (from -100 to 100, to 0 to 200) means that the balance at minus 5 calculated above turns into 95. Thus, the index value 100 indicates a neutral balance.

4.2.5 Reference series analysis

4.79 It is important to validate the sentiment indicator against the reference series to assess its overall quality, and determine its possible usage in various forecast models. Further, one needs the comparison to the reference series to get an understanding whether the indicator is leading, coincident or lagging in comparison to the reference series. A leading economic sentiment indicator, which is the first indicator to give notice about turning points in the economy, has a great value, especially for business and financial sector analysts.

4.80 As mentioned earlier in this chapter a sentiment indicator may not necessarily compare fully to a reference series, since economic sentiment indicators reflect the perception of individuals, which inherently are affected by the surrounding business and political climate. However, for the use of economic sentiment indicators it is a key feature that they somehow compare to reference series.

4.81 Business tendency survey indicators are often compared to GDP, Value added or Production output statistics or indices. The purpose of comparison can be to validate the quality of the sentiment indicator in an initial stage of compiling the indicator from several individual indicators. It can also be to assess the general performance of the sentiment indicator in comparison to a reference series, to offer possibilities to analyse gaps between the two series and to find possible explanations for those. Finally, the purpose can be to learn if the sentiment indicators have lagging, coincident or leading properties as compared to the reference series.

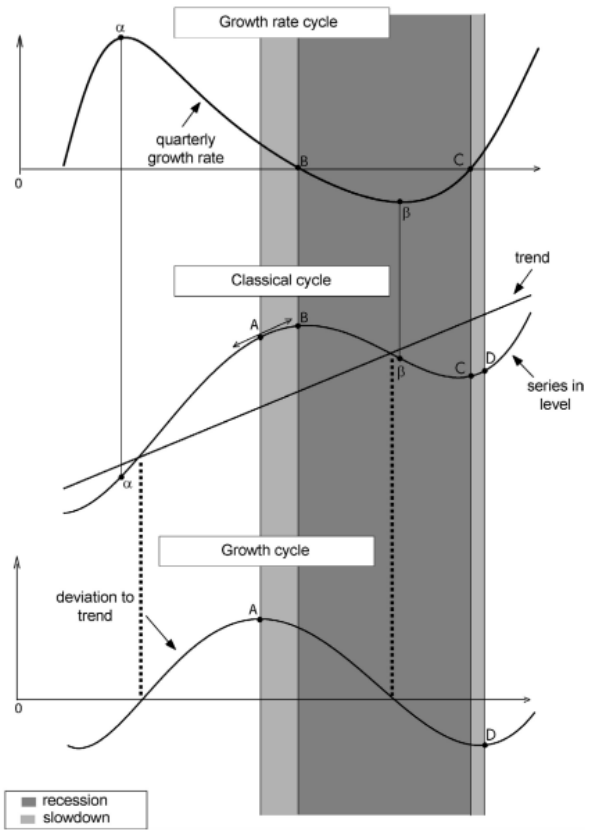
4.82 One of the virtues about the sentiment indicators is their timeliness. Some economic statistics based on quantitative data is published with such big delay that even sentiment indicators with lagging properties may still be the first to hint about the development. However, with nowadays timelier publication of first version of GDP and production data (e.g. only with quarterly delays), attention is on coincident and leading sentiment indicators.

The business tendency indicator corresponds to the cyclical component of the economic time series

4.83 Per definition the business tendency survey indicators trace the cyclic component of the economy in question. With qualitative questions about which direction e.g. turnover is developing (increase, decrease or unchanged) or about relative level e.g. if stock of order is above normal, below normal or normal, the underlying reference series will be the business cycle; is the cycle going up or down, is it above or below a normal level.

4.84 An economic time series can be decomposed into a trend (T) component, a cyclical (C) component, a seasonal (S) component and an irregular (I) component. The above-mentioned business tendency indicator is to be perceived as the cyclical component C in such a decomposition, excluding the seasonal component and irregular fluctuations.

Figure 4.3
Business cycle representations



Source: Anas and Ferrara, 2004

Methods to filter and detrend

4.85 Various methods to filter trend, seasonal, cyclical and irregular components exist. Already touched upon are the seasonal adjustment methods in section 4.2.3.

4.86 Detrending is about determining a time series' long-term trend component and subtract it from the remaining time series. A well-known method is Hodrick-Prescott filter. Also well-known are the Baxter-King filter and the Christiano-Fidgerald filter methods (OECD, 2012). Some are built into seasonal adjustment software like Eurostat's JDemetra+ available[24] for free. Such software also detects and filters possible outliers, possibly caused by external "shocks" like election results, strikes or natural disasters.

4.87 Short term fluctuation of time series, i.e. the irregular component, can be removed by a filter method like the above mentioned Hodrick-Prescott-filter or simply by smoothing the time series with moving average. See also Section 5.5.3

Different cycle representations

4.88 Figure 4.3 illustrates three representations of the cyclic element of an economic time series. The seasonal and irregular fluctuations are removed, so only trend and cyclical components are left. In the middle is the *classical cycle* representation. It shows the real data series (removed the seasonal and irregular components) which develops in cyclic wave, which moves along the long term upwards trend. In point B and C the curve has its respectively maximum and minimum where the cycle is turning to respectively negative and positive growth.

4.89 In the lower depiction, *growth cycle*, is depicted the detrended cyclic component of the reference series, thus horizontal direction of waves. Usually, it is named growth cycle, but also trend deviation is used. In the growth cycle analysis, the maximum, the peak A, appears earlier than the peak B above, and the trough D appears later than the through C above. The distance between A and B and between C and D allows to speak about a slowdown phase before and after the actual recession period.

4.90 In the upper depiction is shown the *growth rate cycle* calculated from the real data time series. Here is a phase shift; the peak α appears before the two other peaks, while the trough β appears in the depression period before the C and D troughs. The growth rates can be calculated sequential from one month to the next, m-o-m, or one quarter to the next, q-o-q.

4.91 Growth rate can also be calculated year over year, y-o-y, implying comparing one time period one year with same period next year. The period may for example be month, quarter or year, depending on data quality and availability. Y-o-y growth rates usually provide smoother curves than m-o-m or q-o-q growth rates, but the wave pattern of the former may be delayed in comparison to the latter, which should be taken under consideration in the analysis, and is thus better suited for overall comparison, than detection of turning points.

4.92 Chapter 10.11 in the UN (2015) *Handbook on Economic Tendency Surveys* dwell upon the issue.

Methods to compare business tendency indicators to economic reference series

4.93 Two often used methods to compare economic tendency indicators to economic reference series are treated in the following. In theory, method 1 fits to cases where the economic tendency indicator is based on assessment whether the current *level* is normal, or

[24] https://ec.europa.eu/eurostat/cros/content/download_en

above or below normal, while the method 2 fits to cases where the indicator is bases on assessment whether the *development* is unchanged, increasing or decreasing. However, since sentiment indicators often are composed of various individual indicators covering both categories, practice becomes less clear, and actual analyses will decide how to interpret the results. Since the composition often consists of indicators about past development (e.g. past 3 month), coming development (next 3 month) and current situation, this averaging usually results in a signal similar to a growth cycle definition (a cycle characterized by deviation from trend).

Method 1: Comparing Business tendency indicator to growth cycle of reference series

4.94 One method of comparing business tendency indicator to reference economic time series is to compare the cyclical components of the two series. To do so, the possible seasonal effect and irregular fluctuations is removed from the business tendency indicator. Filtering methods are described in a paragraph above.

4.95 Seasonal effects and irregular fluctuations are also filtered away from the economic reference series compared to. Moreover, the trend component is removed. The result is the so-called growth cycle (trend deviation) as represented in figure 4.3.

4.96 Remaining is the cyclical element of the two series now to be compared. In beforehand it is recommended to harmonize[25] the two series, implying that the peaks and troughs on average are at same level for the two series.

4.97 The comparison is simply done by plotting the two cycles in one graph. By this, performance can be roughly analysed; how is upswing and downswing phases compared to each other, where peaks and troughs are indicating turning points.

4.98 Correlations analysis will give a value (between -1 and 1) about how well the correlation is, i.e. how well the two curves swings in similar manner.

4.99 In subsequently paragraph Coincident, lagging or leading properties, interpretation of the comparison is touched upon.

Method 2: Comparing Business tendency indicator to growth rate cycle of reference series

4.100 Another method is the first difference method, calculating the growth rate of the reference series, and compare this to either the business tendency indicator as it is or compare it to its growth rate also.

4.101 The economic reference series is seasonally adjusted and smoothed, i.e. the seasonal component and irregular fluctuations are removed. The growth rate, sequential month to month or quarter to quarter, is calculated and leading to the growth rate cycle represented in figure 4.3.

4.102 The business tendency indicator is seasonal adjusted and smoothed. Typically, the indicator is not transformed to growth rate cycle, but compared to the reference series growth rate cycle as it is. The background for this is the previously mentioned perception that

[25] Harmonization covers different methods to bring two or more data series on comparable form. A widely used method is the z-score standardization, which transform the series into mean values at zero and the value ranges into standard deviation range.

the indicator in this case is based on questions if the development is increasing, decreasing or unchanged, thus represents growth rates in itself.

4.103 Visual and correlation comparison can be done as described in previous paragraph.

4.104 If it is wanted to calculate growth rates related to the business tendency indicator it is recommended first to trend restore the indicator (OECD, 2012). The method is first to determine the trend of the reference series, and adding this to the business cycle providing a trend-cycle signal to calculate growth rates from, to be able to compare to the growth rates of the original reference series.

Coincident, lagging or leading properties

4.105 The two cycles, the business tendency cycle and the cyclic component of the economic reference series can be compared by correlations and cross correlation analysis. By correlation analysis is determined the similarity of the two series, and by cross correlations is determined time delay between the two series.

4.106 If following method 1 (see above) and the correlation is optimal not at the same time, but with a time delay or time lead, e.g. one or two quarters, it indicates that the business tendency indicator is not *coincident* but either *leading* or *lagging* in comparison to the reference series. Coincident means that movements coincide with the reference series, e.g. peaks and troughs occurs at the same time. Leading means that movements precede those of the reference series, while lagging means the movements follows after those of the reference series. From the cross-correlation analysis the actual delay is determined.

4.107 Following method 2 (see above) the comparison method to determine coincident, lagging or leading properties is the same. However, it should be mentioned, having the representations in figure 4.3 in mind, when comparing a business tendency indicator to a growth rate reference series, and it shows coincident property, it will be leading to the *growth cycle* or the real data *classical cycle representation* of the reference series; this because of the phase shift that the growth rate representation implies.

4.108 The determination whether an economic tendency indicator has leading, coincident or lagging properties is much up to actual analyses and considerations. Many factors may affect the decision. As previously mentioned, sentiment indicators may be composed of individual indicators of different nature. Some may reflect past month, some reflects next month and some reflects current situation. Furthermore, some individual indicators are inherently leading though they refer to the present situation, for example an indicator about current stock of orders inherently points towards future production based on the order book.

4.109 Another method to determine if the business tendency series is leading, lagging or coincident is *turning point detection*. Various methods, like e.g. the Bry-Boschan algorithm is mentioned in the OECD system of composite Leading Indicators (OECD, 2012) to detect peaks and troughs in time series, and thus turning points. The position of turning points of business tendency series along the time scale as compared to the reference series similar tuning points indicates if the business tendency indicator is lagging, coincident or leading. Read more about leading, coincident and lagging indicators in Section 5.4.1.

4.110 The OECD Composite Leading Indicator (CLI) is “designed to provide early signals of turning points in business cycles showing fluctuation of the economic activity around its long

term potential level[26]" The CLI is developed both for individual countries and for country aggregations like G7-countries, EURO-area, OECD total, and based on various compositions of individual short term economic indicators having optimal reference to GDP, and because of its leading property providing early signals about possible turning points.

4.111 The above-mentioned OECD (2012) paper is recommended as a good entry guide to the methodology of constructing business cycle indicators with coincident or leading property as compared to reference series. The Paper "Detecting Cyclical Turning Points: The ABCD Approach and Two Probabilistic Indicators" (Anas and Ferrara, 2004) from where the figure 4.3. is cited, deepens various concepts and methodologies in turning point detection.

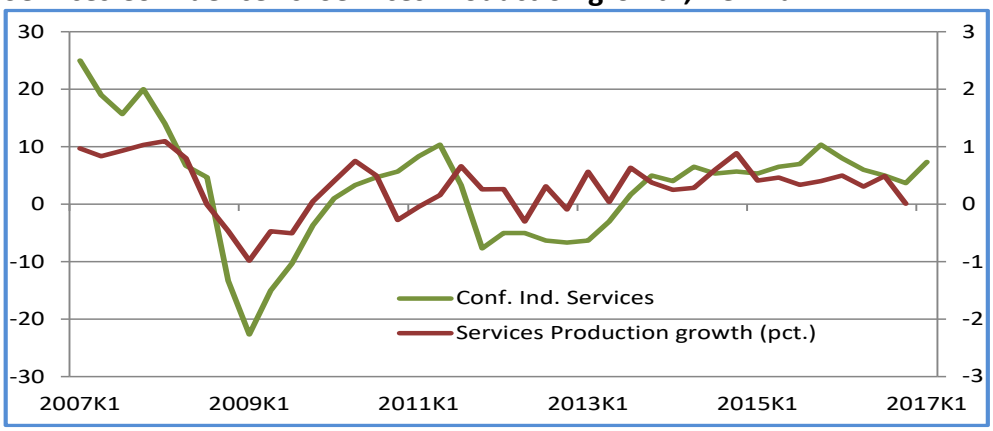
[26] https://data.oecd.org/leadind/composite-leading-indicator-cli.htm

Box 4.4

Comparing with reference series by correlation analysis

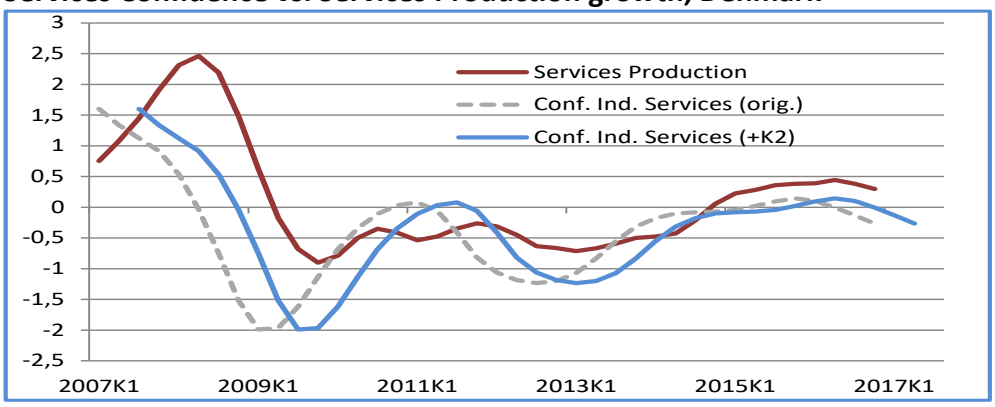
The figure below shows the seasonally adjusted confidence indicator from the Services tendency survey of Statistics Denmark. It is compared to the Services Production Output *growth rates* from the National Accounts, also seasonally adjusted. This follows the comparison Method 2 (growth rate cycle) mentioned in the text. The correlation is 0.80 and this is not improving if shifting the Services Confidence Indicator forward with one or more quarters. In other words, the series are *coincident*. This implies that confidence indicator is *leading* to the original reference series, since the first deviate of the reference series, the growth rate series, in itself is leading to the original reference series' movements, through its phase shift.

Services Confidence vs. Services Production growth, Denmark



In the figure below, the same confidence indicator from the Services tendency survey is compared to the Services Production output using method 1. With the use of Hodrick-Prescott filter the trend is filtered from the Production output series (filter factor 1600), and also the irregular component is filtered (factor 4) from both series. Since the series in beforehand is seasonally adjusted, the remaining information is the cyclic component of the reference series. Both series are standardized, before correlation analysis.

Services Confidence vs. Services Production growth, Denmark



The grey dotted series is the original Services Confidence Indicator. It correlates to the reference series with 0.36. If the confidence indicator is shifted forward one quarter the correlation coefficient gets 0.59 and if shifted forward another quarter (Q2+) the correlation coefficient gets 0.72. This indicates *leading* qualities of the Services Confidence indicator, when comparing to the reference series.

Source: Statistics Denmark

Consumer survey and reference series

4.112 Perceptions and expectations of consumers constitute their consumption plans. The realized consumption plans are the subject of traditional quantitative surveys. On the other hand, having the information on consumption plans of these economic agents, the consumers, gives us prior information. The theory on the link between consumers' attitudes and consumption pattern was first studied by George Katona (1951) and now there is a great literature on this area.

4.113 The quantitative data are measured by value or volume terms while economic tendency survey data is expressed in ordinal terms (e.g. going from agreement over neutral to disagreement). Therefore, typically the balance of the consumer tendency indicator is compared to the growth rate of the reference series which as first deviate is trend free. See Method 2 in previous paragraphs on reference series analysis.

4.114 The final consumption expenditure of households is the reference series for consumer confidence. In other words, consumer confidence anticipates the final consumption expenditure of households. Therefore, a close relation between consumer confidence and the growth rate of (month over month, quarter over quarter or year over year rates) household final consumption expenditure is expected. The relation between a confidence indicator and its reference series also reflects the quality of the indicator.

4.115 Besides the consumer confidence indicator, individual balance series from the consumer survey might also have reference series to compare to.

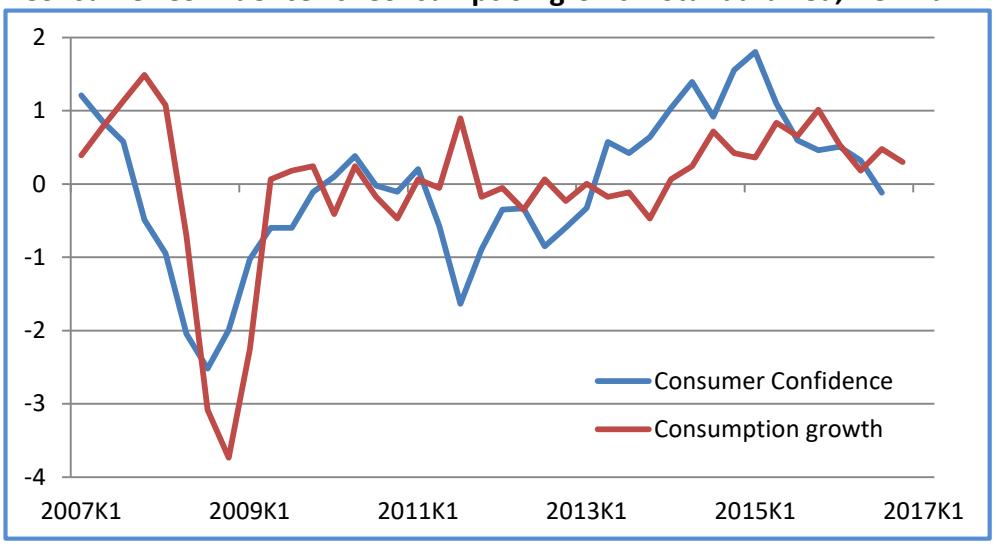
4.116 The reference period of individual questions of a consumer tendency survey usually will be helpful to decide if the balance indicator is a leading or coincident. While questions evaluating past and current economic situation of the household and the country are expected to be coincident, questions asking about future expectations might result in leading indicators. Examples on leading indicators might be general economic expectation and unemployment expectations. However, the relations between the individual balance series and the reference series should be investigated, and on this basis it can be decided if the indicator should be considered coincident or leading.

4.117 Consumer confidence aims to indicate the current and near future development with respect to the various questions included in the survey. For some uses of the statistics it is sufficient to know whether the development is improving or deteriorating. The example below also shows the leading property is not necessary consistent over a longer period. Since the consumer confidence indicator reflects subjective assessments it is likely to vary with changes in the circumstances and consumers' perceptions and expectations, and may therefore not follow consistently over time the development of the reference series.

Box 4.5
Consumer Confidence vs. Household consumption growth

The graph shows the relation between consumer confidence and household consumption growth. The two series are standardized for visualization purposes. It is seen that the two graphs in general compare well.

Consumer Confidence vs. Consumption growth. Standardized, Denmark



Source: Statistics Denmark

The Consumer Confidence Indicator is an unweighted arithmetic average of four indicators about future plans, and therefore expected to show leading properties. For 2007 to 2009 the CCI shows leading property, and again from 2012 and forward. In the period in between the relation seems more coincident. The overall correlations coefficient for 2007 - 2017 is 0,72. If only measured for 2012-2016 the correlation coefficient is 0,65. However, if shifted by 3 quarters so the CCI value for 2012Q1 match the consumption growth for 2012Q4 the correlations coefficient increases to 0,84. In other words, the CCI have leading property and indicates the growth development three quarters ahead for the latest five years.

4.2.6 Composite Sentiment Indicators

4.118 This section describes the aggregation of individual sentiment indicators into a composite sentiment indicator. Those indicators are usually based on sentiment surveys assessing the phases and developments of the business cycle. Hence, it is a sub group of composite cyclical economic Indicators dealt with in Chapter 5 on Composite Economic Indicators.

4.119 The purpose of composite sentiment indicators is often to produce one single key figure which either indicates the development of the entire economy or the development of certain sectors within the economy. If harmonized between countries, also aggregated sentiment indicators at country group level can be composed and the performance of countries can be compared. Prominent international indicators are the Purchasing Managers

Index produced by several institutes[27] and the EU commissions Economic Sentiment Indicator (ESI).

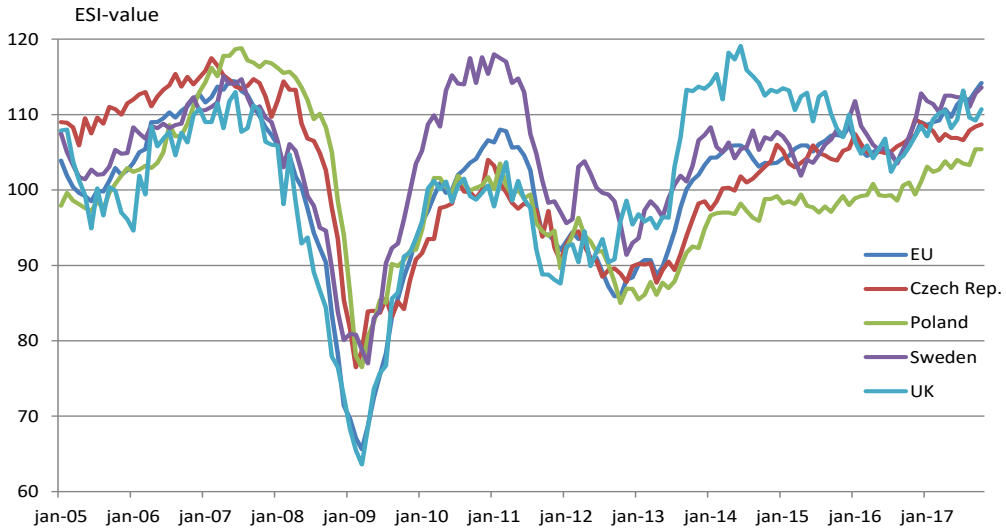
4.120 An important virtue of composite sentiment indicators is their timeliness compared to statistics such as the GDP or sectoral production data. Thus, for the purpose of detecting turning points in the economy they are useful. Also, they serve as suggestion for the often requested one key figure indicator summarising the present phase of the economy.

4.121 The common methodologies of producing composite sentiment indicators are relatively simple since all input components are at same qualitative form. In the following two examples should serve to illustrate methods to bring sentiment indicators at aggregated form. First the Economic Sentiment Indicator and thereafter the Climate Tracer.

The Economic Sentiment Indicator

4.122 The Economic Sentiment Indicator (ESI) is produced and published monthly by the EU commission at both country level and EU level. It is supposed to be leading to the GDP. The methodology is simple and individual NSOs can of course produce their own versions. The figure 4.4 brings together a random selection of countries along with the entire EU.

Figure 4.4
Economic Sentiment Indicators



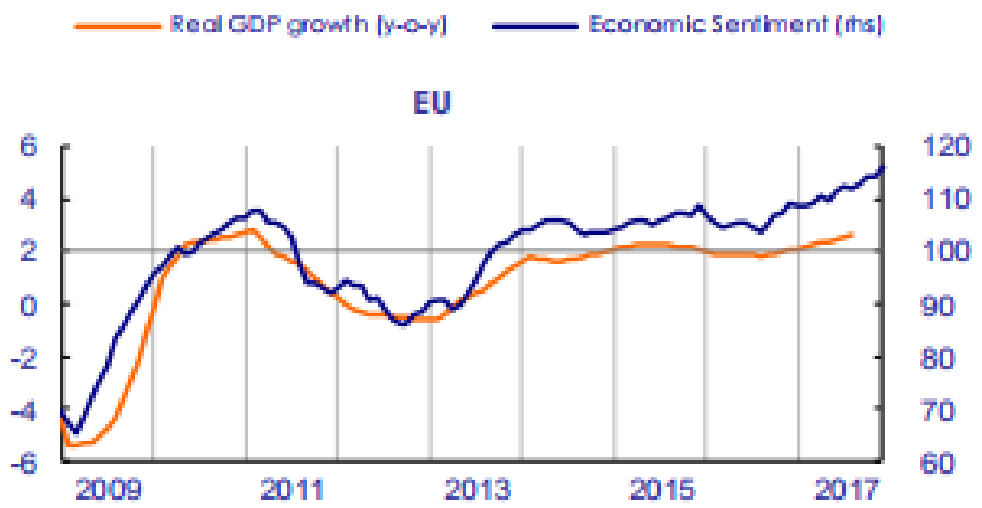
Source: DG ECFIN database on Economic Sentiment Indicator (ESI) https://ec.europa.eu/info/business-economy-euro/indicators-statistics/economic-databases/business-and-consumer-surveys/download-business-and-consumer-survey-data/time-series_en

[27] Various institutes produce PMIs. Internationally renowned is the Markit institute which produces PMI for several countries worldwide, and the ISM which produces PMI for the US, but also e.g. China's Bureau of Statistics produces PMI.

4.123 The ESI[28] is based on the Business and Consumer indicators which constitutes the individual sector's confidence indicators; see sections 4.2.3 and 4.2.4 on processing of business and consumer survey data. Within each sector the component's balances are normalized (z-score standardization) and weighted together equally. Thus having indicators for four business sectors and the consumers they are again normalized and weighted together with fixed weights across time and countries based on their leading properties and contribution to the output of the economy. Thus, manufacturing weights with 40 %, Services 30 %, Consumer 20%, Construction 5 % and Retail trade 5 %.

4.124 When aggregating into EU-level the individual country ESI's are weighted together according to the size of their economy. The figure 4.5 illustrates the leading property of the overall EU ESI as compared to the GDP.

Figure 4.5
The EU Economic Sentiment Indicators compared to GDP



Source: European Business Cycle Indicators, e.g. for 4th Quarter 2017. Technical Paper 021; January 2018

Business cycle tracer or clocks

4.125 The Climate Tracer[29] is an example of a more advanced method of aggregating sentiment indicators and visualizing them. See Box 7.6 in Chapter 7 on Denmark's Business Cycle tracer, which shows screen shots from an interactive tool developed by the Dutch CBS.

4.126 Again the tracers can be calculated at sector level or at entire economy level, and at national or international level.

[28] The most recent publication of the ESI can be found on https://ec.europa.eu/info/business-economy-euro/indicators-statistics/economic-databases/business-and-consumer-surveys/latest-business-and-consumer-surveys_en

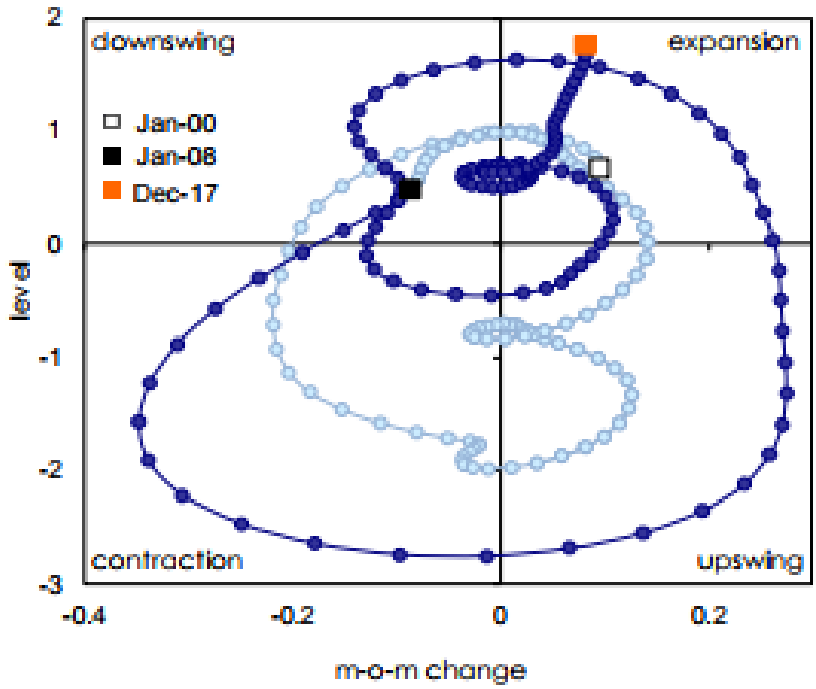
[29] Description of the exact methodology in producing the EU's Business Climate Tracer is found in their quarterly publication on European Business Cycle Indicators, e.g. for 4th Quarter 2017. Technical Paper 021; January 2018. https://ec.europa.eu/info/sites/info/files/economy-finance/upd_tp021_en.pdf

4.127 First step is to build an indicator for each sector of the economy. A set of basic indicators for a given sector, seasonally adjusted, is chosen and by Principal Component Analysis a single representative indicator is calculated. In its essence the Principal Component Analysis correlates the input indicators against each other and weights them together to a single indicator according to their correlation significance. This implies having incorporated as much as possible information from the underlying indicators into the new synthetic indicator. This method is therefore different to simple averaging a set of indicators assigning equal weights, since in the principal component analysis the indicators with weak correlation only weights little.

Box 4.6

Business Cycle Tracer for Germany

The graph shows the business climate tracer for Germany aggregating tracers calculated from sentiment indicators of the manufacturing, construction, services and retail trade sectors along with the consumer survey indicators.



In a model world, the graph in the figure above would show clean circular movements, however reality develops a bit more erratic. Still it is seen that the overall movements are circular, moving through the business cycles four phases of upswing, expansion, downswing and contraction. Each dot marks a month. Along the y-axis is plotted the indicator level, as calculated by the principal component analysis. It is plotted up against its first deviate (change from month to month) of the indicator along the x-axis. As seen, since January 2008 the graph has moved through downswing to contraction and further through upswing to the expansion phase where it was by December 2017.

Source: European Business Cycle Indicators, 4th Quarter 2017. Technical Paper 021; January 2018

4.128 If going further constructing a composite sentiment indicator for the entire economy, the method of EU can be used, which is weighting the sectors manufacturing, services, consumer, construction and retail trade together with similar percentages as when constructing the above mentioned ESI-indicator.

4.129 For analysis and communication purposes the sentiment indicator is smoothened to eliminate minor fluctuations and only show long term business cycles movements. This is done by Hodrick-Prescott Filter[30]. By studies it has been generally agreed that filter factor 69 will eliminate fluctuation within 18 months from the indicator. Filtering, provides a smooth curve which can be plotted along ordinary time line, or the time series can be transformed to a cyclical clock movement. See the example on Germany in Box 4.6.

4.3 Socio-economic sentiment indicator

4.130 Socio-economic sentiment indicators are quite different to economic sentiment indicators. Where the primary aim of economic sentiment indicators is to deliver information on the present or future state of the economy, the socio-economic sentiment indicators are targeting a range of aspects for which there may be no monetary measures.

4.131 Subjective well-being measurement is a growing area and NSOs are recommended to meet user needs in this relatively new area of official statistics. OECD, as a leading international institution in this area has been working on encouraging countries to produce subjective well-being indicators and use them in political decision-making.

4.132 Single socio-economic sentiment indicators could be simply defined as perception of individuals on different aspects of their life such as their health, financial situation and life satisfaction, but also on their environment. These indicators aim to measure the phenomenon of subjective well-being directly so usually do not have directly comparable reference series.

Background

4.133 Measuring social progress brings individual citizens and their perceptions into focus in every life dimension besides the economic dimension. These measures track social progress and portray peoples' state of *well-being* or *quality of life*.

4.134 Based on earlier work, Diener and Seligman (2004), Kahneman et al. (2006) and various other researchers formulated a general understanding of different properties of subjective well-being. These studies founded a background for the jointly organised conference "Beyond GDP" in 2007[31], and the constitution of the Stiglitz-Sen-Fitoussi Commission in 2008 and leading to the *Report by the Commission on the Measurement of Economic Performance and Social Progress* by Stiglitz, Sen and Fitoussi (2009).

4.135 As mentioned in the report of the Commission, the concept of well-being is accepted as not directly measurable, but as a structured concept of many different dimensions. This includes *subjective well-being* as a separate indicator, perceived as a complementary measure but not a substitute measure, to other well-being indicators. Indeed, according to OECD

[30] If applying Hodrick-Prescott filter the user is recommended to consult literature on endpoint problems associated to this and other so called symmetric filters.
[31] http://ec.europa.eu/environment/beyond_gdp/2007_conference_en.html

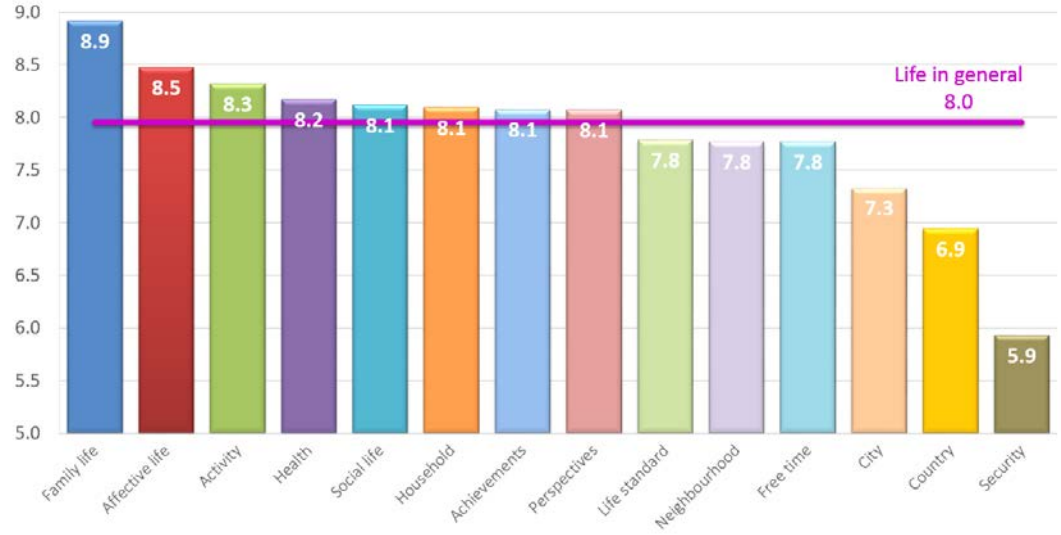
(2013, p.185) general level of *life satisfaction* was evaluated as one of the most important domain for the public opinion assessments in enquiries conducted by UK Office for National Statistics and by the OECD in 2012.

4.136 In the Report of the Stiglitz-Sen-Fitoussi Commission, NSOs are invited to broaden their working areas to collect and publish measures of *subjective well-being*. The Commission notes that the determinants of subjective well-being go well beyond people's income and material condition and NSOs should incorporate questions on subjective well-being in their standard surveys to capture people's life evaluations, hedonic experiences and life priorities.

4.137 Subjective well-being will include a range of dimensions, including respondents' satisfaction or expectations about their economic situation, employment, housing conditions, safety, health and social relations. Information about the respondent's general satisfaction or expectations on their well-being or quality of life will need to be compiled on the basis of single sentiment indicators.

Box 4.7
Well-being index in Mexico

According to the OECD (2015) the Instituto Nacional de Estadística y Geografía of Mexico (INEGI) conducts a compelling survey on subjective well-being both in terms of detail of questions and geographical coverage. The survey provides data both at regional level and state level through various modules under the main name BIARE (Bienestar Autorreportado), (INEGI, 2015) which is a so called self-reporting well-being module system that accompany the household surveys of the Institute. The version Amplified BIARE (2014) surveyed about 40.000 households which allowed for indices both at federal and national level.
The indicators are among others: life satisfaction, self-reported health, social connections, civic engagement, satisfaction with time available for leisure, neighbourhood etc. The graph shows the national outcome. In a scale from 0 to 10 the general well-being is at 8.0, divided on satisfaction domains of the type the OECD recommends.



4.138 The data sources of socio-economic sentiment indicators are social surveys which collect data on respondents' evaluations, expectations and perceptions. The frequency of these surveys is generally annually or more rare, for two main reasons. First, the well-being of people usually does not change from month to month; therefore, a monthly survey is not necessary in this area. Second, these kinds of social surveys are large-scale surveys, thus costly for the survey institution to implement and causing heavy response burden on the respondent. Some well-known studies covering socio-economic sentiment indicators are mentioned in the following part, including brief information about their data sources.

Well-known socio-economic sentiment indicators studies

4.139 The "OECD Better Life Index"[32] makes it possible to compare well-being across countries based on topics identified as essential in the areas of material living conditions and quality of life for OECD countries and some few non-OECD countries, Brazil, Russia and South Africa. The Index covers four socio-economic sentiment indicators; self-reported health, quality of support network, satisfaction with water quality and feeling safe walking alone at night.

4.140 Eurostat has a section on the topic of Quality of Life on the Eurostat website[33]. The data presented in this dedicated section come from several sources from within the European Statistical System (ESS), in particular SILC[34] (statistics on income and living conditions), LFS (labour force survey), EHIS (European Health Interview Survey), and administrative sources. In case no data are available from within the ESS, external links to non-ESS sources, such as the EQLS (European Quality of Life Survey), are used as placeholders.

4.141 The European Commission has conducted other studies like e.g. *Qualitative survey about Well-being*[35], *Qualitative study about Well-being in 2030*[36] etc. The Eurobarometer[37] analysed how Europeans perceive their political institutions, the current economic situation, European citizenship etc. The Qualitative survey about Well-being was conducted in 15 member states providing insights into the notion of personal well-being.

4.142 The United Nations Sustainable Development Solutions Network (UN SDSN) publishes the World Happiness Report[38] which includes the ranking on happiness scores based on GDP levels, life expectancy, generosity, social support, freedom, and corruption.

4.143 The World Values Survey[39] is also a source for socio-economic sentiment indicators. It is a global network of social scientists studying changing of values and their impact on social and political life. Among other topics like economic development, democratization, religion, gender equality and social capital, subjective well-being assessment is also covered in the survey.

[32] http://www.oecdbetterlifeindex.org/
[33] http://ec.europa.eu/eurostat/web/gdp-and-beyond/quality-of-life
[34] http://ec.europa.eu/eurostat/web/microdata/european-union-statistics-on-income-and-living-conditions
[35] European Commission (2011)
[36] European Commission (2011a)
[37] http://ec.europa.eu/commfrontoffice/publicopinion/index.cfm/General/index
[38] UN SDSN (2017)
[39] http://www.worldvaluessurvey.org/wvs.jsp

4.144 World Database of Happiness[40] is an archive of research findings on subjective enjoyment of life, run by the Erasmus University Rotterdam, Happiness Economics Research Organization, which states that it brings together findings that are scattered throughout many studies and provides a basis for synthetic work. The database is indeed an archive of research findings on subjective enjoyment of life. The findings on happiness stored in this database are largely based on responses to survey questions on happiness using verbal response options, such as “very happy” and “fairly happy”. The aim is to estimate what degrees of happiness are denoted by such terms in different questions and languages. These degrees are expressed in numerical values on a 0 to 10 scale, which are then used to compute 'transformed' means and standard deviations.

4.3.1 Pros and cons of socio-economic sentiment indicators

4.145 When engaging in the production of socio-economic sentiment indicators the NSO should consider the pros and cons of producing these sentiment indicators. Section 2.3 provides an overview of the pros and cons in relation to producing Leading, Composite and Sentiment indicators.

4.146 In terms of *socio-economic* sentiment indicators the main advantages are:

- Enlighten aspects of life, which normal quantitative statistics may not cover.
- Supporting better public policies intended to improve well-being, service etc.
- NSO might be the obvious choice of institution to conduct this kind of surveys due to their capacity, professionalism and institutional strength.

4.147 Disadvantages may be rooted in:

- Compiling and disseminating subjective indicators may challenge the traditional perspective and perception of the NSO.
- Production of sentiment indicators may call for different methods than the ones usually used for other well-established statistics.
- Dissemination and communication of sentiment indicators will require careful preparation and may, nevertheless, lead to criticism. Respondent may be hesitant to inform about feelings and personal views to a governmental body like the NSO, leading to biases.

4.148 The aim of the subjective well-being studies is to end up with better public policies to improve the well-being of people. Thus, policy relevance should be the main incentive point for NSOs to produce socio-economic sentiment indicators. These indicators are even needed disaggregated by regions of the country, by gender etc. to be used in local policies and disadvantaged groups for instance.

4.149 It is obvious that NSOs have strong advantages in producing socio-economic sentiment indicators due to their capacity, professionalism and institutionalism. NSOs could prefer placing subjective well-being questions to an existing household survey or conducting

[40] https://worlddatabaseofhappiness.eur.nl/

independent surveys like life satisfaction surveys. In both cases NSOs could use their experiences, network and communication power to produce these statistics.

4.150 In meeting the growing demand on this type of data, the greatest challenge might be the traditional perspective and perception of NSOs itself. Capacity of understanding and explaining this new concept and admitting that subjective well-being indicators are strong complements of traditional indicators might be good starting points to enter this new area of statistics.

4.151 Producing and disseminating of subjective well-being indicators are somewhat different than traditional ones. In the production process; placement and wording of the questions and training of interviewers becomes more important in case of collecting these kinds of data. Asking the question on happiness at the beginning or at the end of the questionnaire might lead to having different answers. The replies of the respondents might also depend on the instantaneous mood of him/her, or the behaviour of the interviewer. Therefore, the training process should cover the relevant approaches. When it comes to dissemination, users of the data should be informed about the nature of the data set. NSOs are advised to explain well that "subjective measurement" is not a "biased measurement" but a sound statistical measurement on quality of life dimensions.

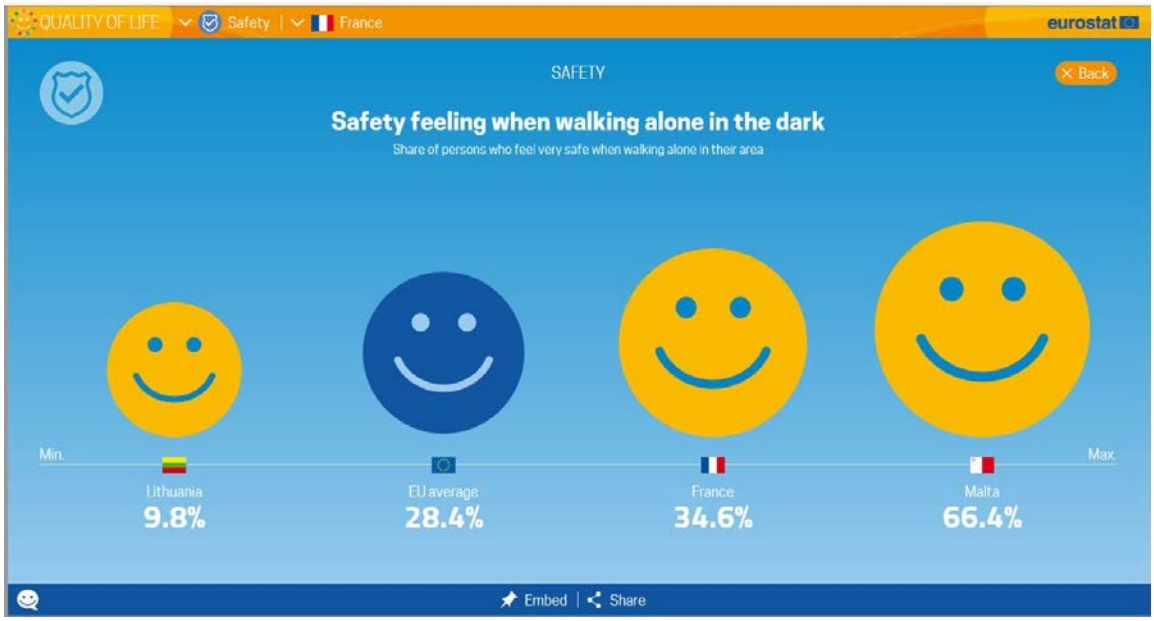
4.152 Lastly, it should be noted that because NSOs are governmental organizations, collecting data on individuals' feelings and perceptions may be difficult. Respondents may be hesitant to inform about personal views on e.g. the performance of the government or their satisfaction with public services might. In cases where reliable answers cannot be obtained statistics should not be published.

Box 4.8
Quality of Life - Well-being of Europeans

Eurostat present in the Quality of life study Well-being of Europeans. Within eleven life dimensions subjective sentiment indicators are selected to illustrate and indicate the topic:

Dimension	Subjective sentiment indicator
Overall life satisfaction	Overall life satisfaction
Material living conditions	Satisfaction with finances
Housing conditions	Housing satisfaction
Employment	Job satisfaction
Time use	Satisfaction with time use
Education	life satisfaction gap: high and low education level
Health	Self-perceived health
Social relations	Satisfaction with personal relationships
Safety	Safety feeling when walking alone in the dark
Governance	Trust in the legal system
Environment	Satisfaction with living environment

The well-being interactive infographic allows for comparing subjective sentiment indicators across countries; e.g. *Safety feeling when walking alone in the dark*.



Source: http://ec.europa.eu/eurostat/cache/infographs/qol/index_en.html

4.3.2 Compiling socio-economic indicators

4.153 The subjective well-being measures might be integrated to existing household surveys. Time use surveys, living conditions surveys or health surveys might be good examples

where to include subjective well-being questions. To monitor changes in well-being over time, annual surveys might be preferable. Including measures of subjective well-being in panel surveys might be preferable for researching causality and the drivers of subjective well-being. Methodology of conducting and compiling socio-economic surveys (time use, living conditions etc.) within the broad range of socio-economic indicators may differ, according to the specific setups, and is not dealt with in detail here.

4.154 Another option is to conduct an independent survey aiming to measure well-being of people in the country. Individual quality of life surveys are also carried out in various countries bringing about more detailed information on quality of life illustrated by various socioeconomic and geographical characteristics. Data may be collected by telephone interviewing, by questionnaires send by mail or by web form questionnaire.

4.155 Questions asked are about people's satisfaction with life, their economic situation, social relationships, work, health, sense of security, confidence in politicians etc.

In the design of the survey the following should be taken into consideration:

- The wording of the questions should not be complex or ambiguous, instead should be easily translated across languages and cultures.
- The tone of the question should be sufficiently neutral so that it does not suggest any particular answers.
- The response options are advised to be easily remembered and mutually exclusive. There must be enough response categories to enable views to be expressed fully.
- Field application time influence on responses should be taken into consideration, e.g. day of the week, the time of year, effect of day-to-day events or the weather.
- Question order should be considered if preceding questions influence how an item is interpreted and/or prime the use of certain information

4.156 In the processing data is calibrated or post stratified into various socio-economic characteristics like age, level of education, income etc. via register data.

4.157 *OECD Guidelines on Measuring Subjective Well-being* (OECD, 2013) is the main source on compiling socio-economic surveys. The guideline gives methodological considerations in the measurement of subjective well-being and gives recommendations on question wording, response formats, question order, context effects, survey mode, timing, response styles and international comparability.

The example OECD Life evaluation questions illustrate how questions can be posed:

Box 4.9
OECD Life evaluation questions

Please imagine a ladder with steps numbered from 0 at the bottom to 10 at the top. The top of the ladder represents the best possible life for you and the bottom of the ladder represents the worst possible life for you.

B1. On which step of the ladder would you say you personally feel you stand at this time? [0-10]

The following question asks how happy you feel, on a scale from 0 to 10. Zero means you feel "not at all happy" and 10 means "completely happy".

B2. Taking all things together, how happy would you say you are? [0-10]

The following questions ask how satisfied you feel, on a scale from 0 to 10. Zero means you feel "not at all satisfied" and 10 means "completely satisfied".

B3. Overall, how satisfied with your life were you 5 years ago? [0-10]
B4. As your best guess, overall how satisfied with your life do you expect to feel in 5 years' time? [0-10]

Below are five statements with which you may agree or disagree. Using the 1-7 scale below, indicate your agreement with each item. Please be open and honest in your responding. The 7 point scale is as follows:

1. Strongly disagree.
2. Disagree.
3. Slightly agree.
4. Neither agree nor disagree.
5. Slightly agree.
6. Agree.
7. Strongly agree.

B5. In most ways my life is close to my ideal [1-7]
B6. The conditions of my life are excellent [1-7]
B7. I am satisfied with my life [1-7]
B8. So far I have gotten the important things I want in life [1-7]
B9. If I could live my life over, I would change almost nothing [1-7]

4.158 On measuring subjective well-being, the guideline gives advises on sample design, survey design, data processing, coding and questionnaire design. For instance, computer assisted personal interviewing (CAPI) with show cards is advised in terms of data quality, although NSOs are advised to test experimentally the impact of different survey modes on responses to the core measures of subjective well-being, and publish the results of both modes. Lastly, the guideline gives advises on output and analysis of subjective well-being measures.

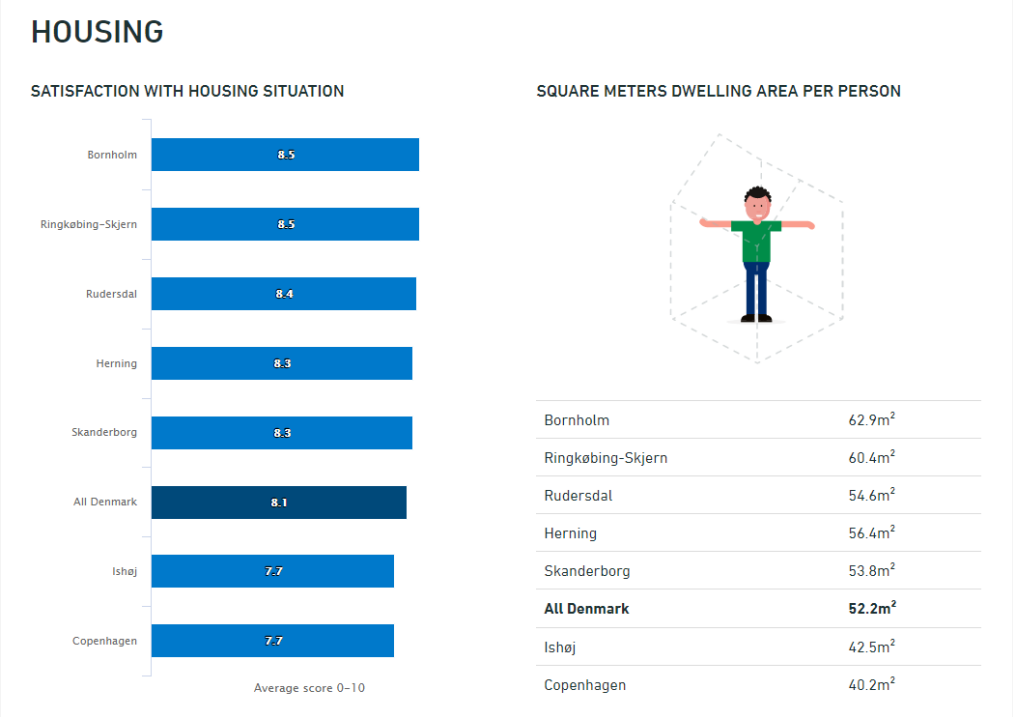
4.3.3 Comparing to reference series

4.159 Usually there will not be a reference series to compare the socio-economic indicators directly to as is the case with economic indicators. However, it is possible to evaluate the development over time of the indicator: how is the trend moving, and how it actual quarter level as compared to same quarter level last year. In addition, while there may be no reference series, it may still be useful to compare the indicator with available statistics that describes the same area. For instance, households' satisfaction with public transport may be compared with transport statistics, perception of health may be compared with statistics on health or households' satisfaction with their housing situation may be compared with available dwelling statistics.

4.160 Often life quality indicators are weighted according to the individuals belonging to income group and various demographic features, which ensure a stable quality of the statistics over time, mirroring the actual population.

Box 4.10
Example. Life quality indicator compared to dwelling size.

In the Quality of Life survey conducted by Statistics Denmark, 2015-16, results from the various dimensions, divided into municipalities is compared to an relevant quantitative indicator. As pictured below the life quality indicator Satisfaction with (own) housing situation is visualized along with data on average dwelling size, for some selected municipalities. Though not an all-embracing reference, it is clear that the satisfaction level follows the square metres level.



Source: http://dst.dk/extranet/livskvalitet/livskvalitet.html?lang=en

4.4 International comparability of Sentiment Indicators

4.161 Surveys measuring the perceptions of individuals, either economic or socio-economic, are conducted somewhat differently across countries. As mentioned in sub section 4.2.1 internationally harmonized principles for the conduct of tendency surveys covering the questionnaire design, survey frame and sample design, estimation procedures, data collection, dissemination and use of tendency survey results are provided in UN (2015), EU (2017) and OECD (2003). International recommendations for emerging concepts such as sentiment indicators are still needed for the sake of comparability.

4.162 For individual countries data collection and reference periods may differ, different questions are used and questions which are intended to measure the same phenomenon may be formulated in different ways. In addition, different scales are used when evaluating qualitative survey replies, balances may be calculated in different ways and different weights may be assigned to the individual questions when their balances are aggregated into one measure. Such differences will, eventually, affect the comparability across countries. While there are no globally agreed guidelines or best practices, it is recommended to follow existing handbooks and manuals on tendency surveys (e.g. EU (2017), UN (2015).

4.163 However, it should also be noted that even if individual questions may differ, if the sentiment indicator is composed from a set of many questions these differences may tend to cancel out so that the resulting indicator nevertheless may be used for international comparisons.

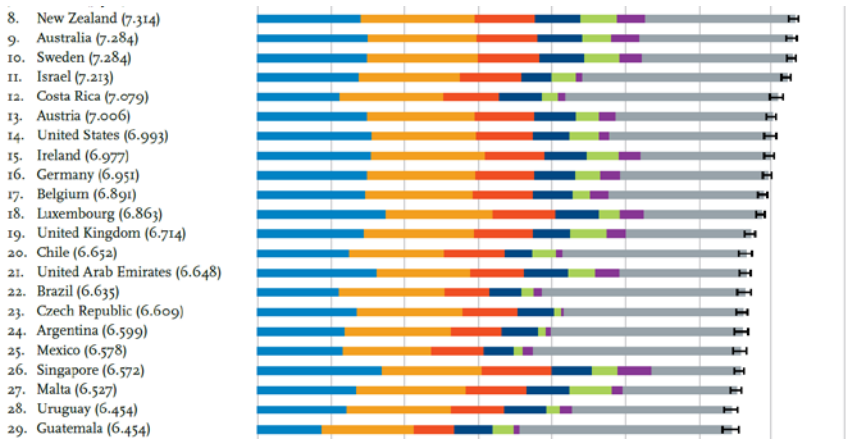
4.164 Within the EU the Commission features the Harmonized programme on Business and Tendency indicators and in various publications the EU analyses and communicates basic results and composite indicators like the Economic Sentiment Indicator which allows for directly comparison between EU countries (see section 4.2.6).

4.165 The OECD.stat databank[41] includes the theme Monthly Economic indicators and here the sub selection Business Tendency and Consumer Opinion Surveys. The database of course aims for the users primarily; however, it is also a good facility for data producers to get an overview on results and various practices among countries worldwide. Depending of what is provided from the individual countries the facility also includes information on the data producer and methodology.

[41] http://stats.oecd.org/

Box 4.11
The world happiness report.

The Social Foundations of World Happiness produceses regular rankings of the worlds countries within the lable happiness, among others based on variuous national socio-economic sentiment surveys. The score is composed by seven topics: GDP per capita, Social support, Healthy life expectancy, Freedom to make life choices, Generosity, Perception of corruption, and Dystopia.
The graph shows an exerpt no. 8 to 29 of the total ranking.



Source: UN SDSN (2017)

4.166 When it comes to the socio-economic sentiment indicators, comparison may be more difficult, if not based on a common methodology. Therefore, it is recommended in any case that international methodologies are followed, and if national conditions make it not possible, it is recommended that the national methodology is developed as a subset to the international methodology, so comparison will still be possible by aggregations or eliminations of results.

4.167 Please refer to further reading in the following two chapters 5 and 6 on composite economic and socio-economic indicators.

4.5 Recommendations

4.168 In conclusion to this chapter the following recommendations for the production of sentiment indicators can be made:

- Allocate the necessary resources for the development of the indicator and its future production. To this end, it may be useful to engage possible stakeholders, user groups and experts.
- In developing a sentiment indicator references should be made to available international guidelines and handbooks on sentiment indicators and survey design. To the extent

possible, the indicator should be designed to meet national needs and facilitate international comparability.

- Ensure the indicators can be produced in line with the quality criteria of official statistics concerning accuracy, reliability, accessibility, clarity and timeliness. The production of the sentiment indicators, including methods used and questions asked in surveys, should be fully documented and made available to the public.
- Experiences from other surveys will be useful to take into account, concerning e.g. sample size, response rates and communication with the respondents. The use of electronic, on-line questionnaires may substantially reduce running costs and be helpful in improving timeliness.
- Because of the importance of timeliness of economic sentiment indicators, data collection periods would need to be short and the data processing steps should be automated to the extent possible to facilitate timely production.
- Sentiment indicators should be published with sufficient documentation and explanation to facilitate correct use of the indicators and avoid misunderstandings. It is useful to design the communication according to possible target groups. Sentiment indicators differ from established quantitative statistics and may need additional explanations. Social media like Twitter, Instagram and Facebook may be interesting communication channels to explore.

5 Composite economic indicators

5.1 Introduction

5.1 This chapter aims to present the methodology to produce composite economic indicators, discuss their use, and give guidance to NSOs on their construction. The chapter will also highlight issues and pitfalls that the NSOs should be aware of when constructing composite economic indicators and give examples of their construction. The content of this chapter will also be useful when reading Chapter 6 on composite socio-economic indicators, to better understand the similarities and differences between these indicators.

5.2 The chapter focuses on *cyclical composite economic indicators*, which are the most common in use. Cyclical indicators aim to measure the development in economic activity as measured by the development in GDP or other economic aggregates. They are usually constructed to measure the business cycle development, including turning points, but may also be compiled with the purpose of having an early indicator of the short-term economic development in economic aggregates, such as the GDP. The cyclical indicators are constructed by aggregating individual indicators into one measure, the composite indicator. The indicators may include sentiment as well as non-sentiment indicators as component series. Some cyclical composite economic indicators are constructed purely based on sentiment indicators, typically derived by aggregation of survey results. These are often referred to as *sentiment indicators* or *confidence indicators*. This type of composite sentiment indicators is dealt with in Chapter 4. Chapter 5 also briefly presents *structural Composite economic indicators*, which are rarer in practice. These include a broad group of indicators that aim to describe phenomena such as competition, technological development or other structural changes such as globalisation.

5.3 Section 5.2 gives an overview of composite economic indicators. Section 5.3 presents arguments for and against composite economic indicators in the context of national statistical offices' production and dissemination. Cyclical composite economic indicators are presented in Section 5.4, while recommended steps and methods to produce these are presented in section 5.5. Section 5.6 briefly presents structural composite indicators. Section 5.7 addresses issues in relation to international comparability of the indicators. Finally, section 5.8 summarises recommendations for compiling composite economic indicators.

5.4 The chapter draws upon the Handbook on Cyclical Composite Indicators (Eurostat and UNSD, 2017), the Handbook on constructing composite indicators (OECD 2008), the OECD system of Composite leading indicators (OECD 2012) and the 10 step Guide for composite indicators from EU/OECD[42].

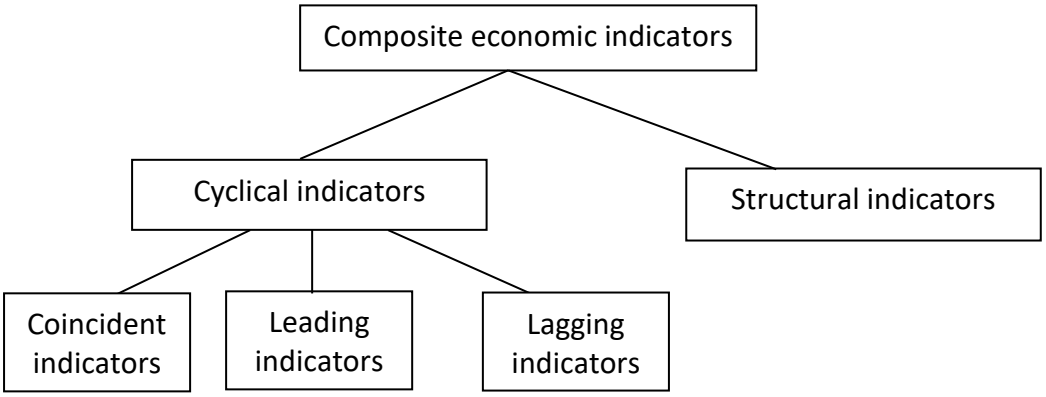
[42] https://ec.europa.eu/jrc/en/coin/10-step-guide/overview

5.2 Overview of composite Economic Indicators

5.5 Composite economic indicators can be divided in two main categories: *cyclical* and *structural* composite economic indicators, as illustrated in Figure 5.1.

5.6 Cyclical composite economic indicators usually will have a reference series which movement they aim to estimate. They can be leading, coincident or lagging indicators, depending on their timing with respect to the reference series. Structural composite economic indicators usually will not have a reference series so it is not possible or not relevant to group these indicators according to their leading or lagging properties.

Figure 5.1
Types of composite economic indicators



5.7 Composite economic indicators have been in use for many years. In the first attempts to derive an economic indicator for a target variable, a single indicator was used, for example industrial production as a proxy for GDP. The further development of this approach led to the construction of so-called synthetic indicators or barometers, which combine a homogenous set of single indicators representing a specific economic sector or a particular aspect of economic fluctuations[43]. The synthetic indicator is obtained by means of an average of the selected indicators that are assumed to be most related to the cyclical movements of the target variable.

5.8 Cyclical composite economic indicators represent the next step in which the composite indicator can be based on a broad set of individual indicators which may cover different sectors of the economy and include both quantitative and sentiment single indicators. The main reason for developing composite economic indicators is either to anticipate movements or simply to track the reference variable that the indicator aims to measure, usually GDP, industrial production or unemployment rate. Composite economic indicators have been traditionally also related to monitoring cyclical movements and signalling peaks and troughs in business cycles.

[43] EU and UNSD (2017)

5.9 One of the first and most known composite indicators is the Conference Board Leading Index[44]. Until 1995, this indicator was compiled by the US Bureau of Economic Analysis (BEA)[45]. The Composite Leading economic index (LEI) for the U.S. produced by the Conference Board is compiled based on ten component series:

- Average weekly hours, manufacturing
- Average weekly initial claims for unemployment insurance
- Manufacturers' new orders, consumer goods and materials
- Institute For Supply Management (ISM) Index of New Orders
- Manufacturers' new orders, nondefense capital goods excluding aircraft orders
- Building permits, new private housing units
- Stock prices, 500 common stocks
- Leading Credit Index
- Interest rate spread, 10-year Treasury bonds less federal funds
- Average consumer expectations for business conditions

5.10 The economic recession in 2008-2009 reinforced user requests for cyclical composite economic indicators. These requests focus on the availability of a more homogenous, timely and comparable set of macroeconomic indicators, allowing for a real-time monitoring of the economic situation and cross-country comparisons. Composite economic indicators appear relevant in this respect because they "are valued for their ability to integrate large amounts of information into easily understood formats for a general audience" (OECD, 2008, p. 3).

5.11 The main reason for constructing and producing composite economic indicators is the need for early warning signals, e.g. to identify or anticipate turning points in economic activity. The methodology used in the construction of CEIs has varied over time and between producers.

5.12 A composite indicator is constructed by compiling individual indicators into a single index, based on an underlying model of the multi-dimensional concept that is being measured[46]. As pointed out by Zarnowitz (1992) in the case of leading composite economic indicators, "to increase the chances of getting true signals and reduce those of getting false ones, it is therefore advisable to rely on a reasonably diversified group of leading series with demonstrated predictive potential. This suggests combining selected leaders into an appropriately constructed index and monitoring changes in that index as well as in its components on a regular basis". CEIs are the most used composite indicators historically and the components that build these indicators are usually official statistics.

5.13 Cyclical composite economic indicators typically will aim to measure the development in economic activity as measured by the development in GDP or a similar aggregate measure. They can be constructed with the purpose of measuring the business cycle development, including turning points, but may also be compiled with the purpose of having an early indicator of the short-term development in GDP. Composite economic indicators with reference series can be leading, coincident or lagging indicators, depending on their timing with respect to the reference series (see Chapter 3).

[44] https://www.conference-board.org/data/bci/index.cfm?id=2154
[45] https://www.conference-board.org/data/bci/index.cfm?id=2157
[46] This definition is taken from chapter 3

5.14 In comparison to individual indicators, composite indicators can provide a measure that balances responsiveness and stability, showing the underlying development and only allowing the individual indicators limited impact on the composite indicator. Composite indicators can also be used to identify various sources of economic fluctuations by analysing the individual components' behaviour in comparison to each other and to the composite indicator.

5.15 While composite indicators provide a synthetic signal associated to a given phenomenon, dashboards and scoreboards provide a detailed picture of the same phenomenon by listing a set of selected individual indicators (Mazzi 2015). Composite indicators and dashboards/scoreboards can be complementary tools and the ultimate choice between them depends on user's needs.

5.3 Arguments for and against composite economic indicators

5.16 The main advantages of composite economic indicators are the following:

- They allow extracting relevant latent signals (i.e. trend and cycle) from a number of economic variables
- They can have leading properties and anticipate future economic events
- They complement the economic picture provided by an indicator set with a synthetic information on specific aspects such as cyclical movements and occurrence of turning points.
- In summarizing the information coming from multiple indicators, they facilitate the communication of NSOs, including towards a non-specialist audience.

5.17 However, there are also arguments against producing composite economic indicators, such as the following:

- The indicators may send misleading messages if they are poorly constructed or maintained.
- They may invite to simplistic conclusions if not properly communicated.
- The indicator may be misused, especially if it is not transparent or lacks sound theoretical and statistical ground.

Balancing the pros and cons

5.18 Even if users frequently ask for composite economic indicators, there are risks of misinterpretation if users do not understand the methodology used for the construction of these indicators. However, this risk is common with all kinds of statistical indicators. Therefore, it is essential that all statistical indicators are well communicated to users, thus ensuring that they are correctly interpreted. There are several ways to do this, which are discussed in Chapter 7, but it should be stressed that the dialogue between producers and users is an essential part of the work that should take place before starting any construction or production of statistical indicators.

5.19 NSOs have the competencies and communication channels to meet user needs, probably better than many other institutions. The production of composite economic indicators could be considered as a refinement of or complement to the statistical information, which is already available from NSOs. Easy access to and use of official statistics

as input to the composite indicator is an additional advantage, which may also help users to better understand which sources have been used, even if the methodology behind composite indicators can be seen as complex.

5.20 The regular assessment of all components is essential part of the production of composite economic indicators. Most NSOs have regular quality assessments, which should also be applied for composite indicators being produced. It is important to look at all dimensions of statistical quality (see next section), to check whether the indicator is still accurately tracking their reference series, and to act by improving the statistical methodology or replacing components if it is not the case. It is also important that all changes be communicated to users in a timely and clear way.

5.21 The availability of many manuals and handbooks shows that there has been a lot of work on composite economic indicators in the scientific community for quite a long time. These guidelines only provide an overview of these techniques.

5.22 NSOs must evaluate the pros and cons of getting involved in the production of CEIs and it might be a matter of resources for many of them. Some NSOs, for example in Switzerland and the Netherlands, have found ways to cooperate with external research institutions to produce composite indicators. The development of economic composite indicators can help in getting better information at a moderate cost for the respondent, limiting statistical burden and filling the gap in cases of lack of data.

5.4 Cyclical composite Economic Indicators

5.23 Cyclical Composite economic indicators aim to estimate developments in real time or to forecast the cyclical component of the reference variable or detect its peaks and troughs (turning points). They may also aim to estimate in real time or forecast the short-term pattern (period-on-period or year-on-year grow rates) of the reference variable. In practice, most composite indicators having a reference series are cyclical economic indicators, and the reference series are usually various transformations of GDP or other economic aggregates.

5.24 Composite economic indicators extract a common signal from the component series. This signal is generally clearer and more stable over time than signals returned by individual component series. According to the typology proposed in Chapter 3 of the Eurostat and UNSD Handbook on cyclical composite indicators, cyclical composite economic indicators are constructed with the three following objectives in mind:

1) Provide an estimate of the current state of the reference series, which is also useful for forecasting purposes.
2) Estimate unobserved components of the reference variable such as its trend or its cycle.
3) Identify turning points in economic activity.[47]

5.25 The main properties of Cyclical Composite Economic Indicators[48] are:

[47] Mazzi (2015, p.75)
[48] EU and UNSD (2017)

a) Consistent timing
b) Reduction of volatility of month-on-month changes
c) Data quality

5.26 Consistent timing is a main property of a cyclical indicator, meaning that the indicator should identify turning points without major delays. The indicator should also reduce month-on-moth changes to ease interpretation. Most NSOs conducting business tendency surveys select a set of survey series and combine them into a composite indicator. This is done to summarise the information, reduce the risk of false signals, and arrive at better nowcasting/forecasting results. This is described in Section 4.2.6.

5.27 The quality of the data series that are used for the construction of the composite indicator is crucial. This implies that component series should be of economic significance (components should not be selected by chance or based on spurious correlations). The quality of the component series should be ensured and they should be expected to be available in the future. Further, the component indicators should be as timely as possible and not be subject too big revisions. Hence, the choice of the components in the construction of composite indicators is essential from many points of views.

5.4.1 Leading, coincident and lagging indicators

5.28 Cyclical composite economic indicators are usually classified into leading, coincident and lagging indicators according to whether their turning points occur before, at the same time or after those of the reference series.

5.29 The leading and coincident indicators are used for business cycle analysis while lagging indicators are less frequent and mostly used as a validation tool for leading and coincident indicators. A lagging composite indicator should be able to track the leading and the coincident with different lags but with the same cyclical characteristics. Leading indicators are based on components that have shown leading abilities, such as data on orders or expectations, while coincident indicators are based on components within the same “time frame”, such as monthly production data within a quarter.

5.30 Leading indicators can be represented by single statistical indicators such as a specific sentiment indicator or quantitative indicators such as new orders or new passenger car registrations. Furthermore, some financial variables like the interest rate can have some leading properties as well as certain indicators available on the market like the Purchase Managers Index (PMI). The usefulness of single leading indicators for business cyclical purposes, however, is limited by the fact that they provide information on a very specific aspect and because their leading property may vary over time.

5.31 Leading composite indicators are produced by many institutions. The best known might be the OECD Composite Leading Indicator (CLI), the Conference Board Leading Economic Indicator (LEI) and the EU Economic Sentiment Indicator, ESI (see chapter 4). Several National Statistical Offices and Central Banks are also producing leading indicators on a regular basis. Two examples of Mexico and Italy are provided below.

Box 5.1

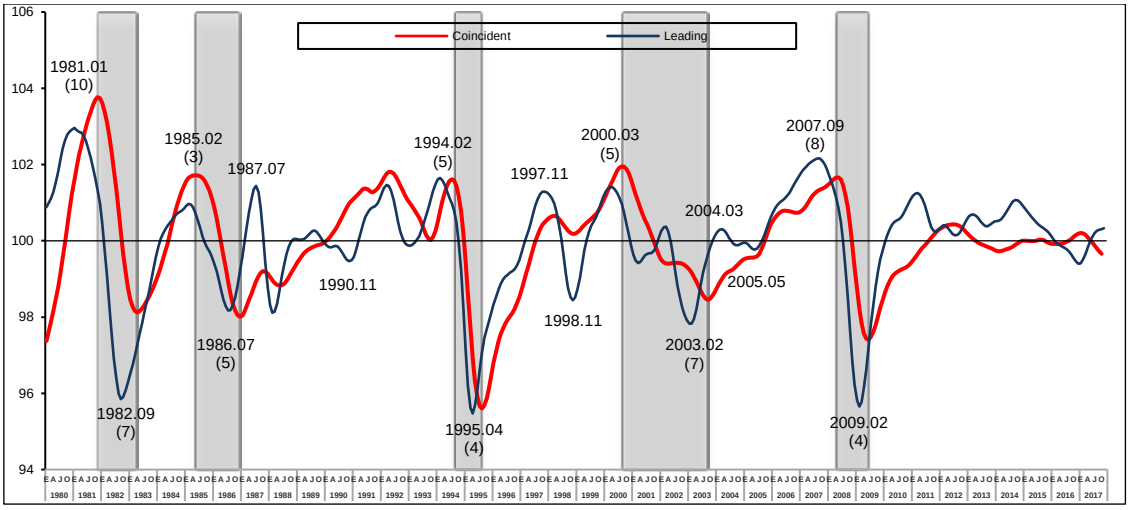
The Mexican System of Cyclical Indicators

Produced by the National Institute of Statistics and Geography (INEGI)

INEGI produces a coincident and leading composite economic indicator to monitor the behaviour of the economy and detect turning points in the economic cycle. The coincident indicator provides a general vision of economic performance, while the leading indicator seeks to anticipate possible turning points in the coincident indicator. The indicators are updated and disseminated monthly according to a release calendar published in advance. The leading indicator anticipates turning points of the coincident indicator by 5.8 months on average. The development of the indicators in relation to their long-term trend allows identifying four phases of the economic cycle: growing (above or below the trend) or decreasing (above or below the trend)

The indicators follow OECD´s methodological recommendations based on the growth-cycle approach, which identifies the deviations of the economy from its long-term trend. The components of the coincident indicator are selected based on their correlation with the turning points of the economic cycles. Series with leading properties are selected to construct the leading indicator. Cycles are extracted using the Hodrick-Prescott filter twice to remove the long-term trend and high-frequency fluctuations which are not relevant for business cycle analysis. Once the smoothed cycles are obtained, they are normalized. The aggregation is done by averaging the monthly growth rates of the component indicators. The average growth rates are chained to form the final indicator time series. Further details are provided in the annexes.

The Mexican composite economic indicators



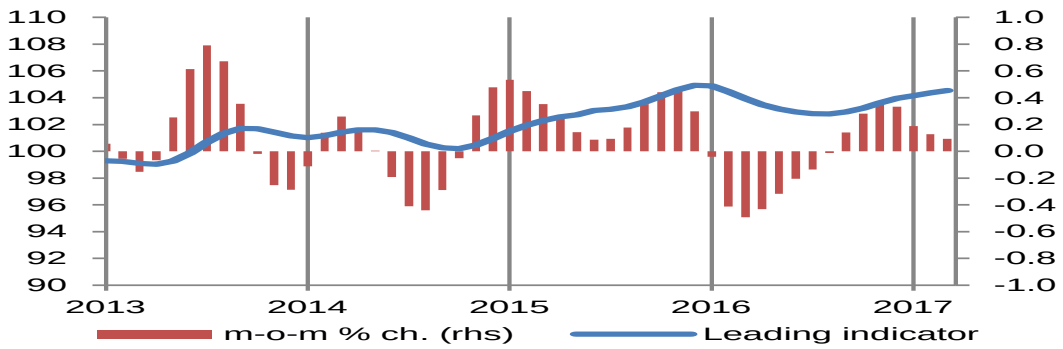
Source: National Institute of Statistics and Geography (INEGI).

Box 5.2

The Italian Composite Leading Indicator produced by ISTAT

First week each month ISTAT releases the *Monthly report on the Italian economy* which provides a picture of the state of the economy. The release includes the composite leading economic indicator for the Italian economy together with the results of consumer and business tendency surveys, which provide insight on GDP developments in the current and the following months.
The leading indicator aims to track the development in the Italian economy, which is measured by a composite coincident indicator based. The composite coincident indicator is constructed based on analysis of a large set of variables from which those indicators with higher correlation with the turning points of the economic activity are selected. The leading indicator is constructed based on about ten component series selected according to their correlation with the reference series with a lead of at least three months. The component series are selected to represent different sectors of the economy as well as the economic activity in other countries. The leading composite indicator of March 2017 are reported below. Additional details about the construction of the indicator can be found in the annexes.

The Italian Leading indicator (index and % change)



An alternative approach

5.32 Often the cyclical composite economic indicator will be based on a limited number of individual indicators that are selected from a set of potential indicators because of their expected causality and correlation with the reference series. An alternative to this approach is the KOF Economic Barometer developed by the Swiss Economic Institute. The KOF Economic Barometer is based on a very large number of individual indicators (about 270), which are selected based on their correlation with a reference series reflecting the Swiss growth rate cycle.

5.33 Because of changes in economic relations, availability of data and data revisions, composite indicators need to be updated. In the traditional approach where a number of input variables are selected and kept constant over time there may be a tendency to postpone revisions until after significant deterioration in forecasting performance. In the KOF Economic Barometer the set of individual indicators is updated annually. The annual update of the large number of variables means that structural changes to some extent can be gradually incorporated by omitting or including variables, which helps to preserve the leading properties of the composite indicator, as compared to the same composite indicator without such updates. The KOF Economic Barometer is presented in more detail in Box 5.3.

Box 5.3
The KOF Economic Barometer

The Economic Barometer produced by the KOF Swiss Economic Institute is a prominent leading composite economic indicator for Switzerland. The production of the indicator is based on a standardised procedure for selection and updating of input variables, which avoids some of the weaknesses in traditional approaches to constructing leading composite economic indicators.

Standardised variable selection procedure

The input variables are selected from a large number of variables, currently almost 500 series and all sensible transformation of these, which may potentially have a close correlation with the Swiss growth rate cycle. These are mainly series of the domestic economy but also include variables on the international economy and developments in trading partner countries. Where possible, the theoretical expected sign of the correlation with the reference series is determined. From the pool of potential variables, the input variables are selected based on pre-established rules. Only those variables are selected for which 1) observations are available throughout a 10-year observation window. 2) The sign of the correlation with the reference series corresponds to the expected sign. 3) The correlation with the reference series meets a predefined level, taking the correlation and the variables' leading properties into account. Approximately 270 series are currently selected as input variables.

Regular and rules based compilation of the composite indicator

The weights of the input variables are calculated by use of principal components analysis and kept constant for one year. The composite leading indicator is compiled and published monthly based on the weights and the latest observations of the input variables. The indicator is updated annually by moving the observation window forward by one year and calculating a new vintage of the indicator. As part of the update the list of potential variables is revised, some may have disappeared and new may have emerged, and the set of input variables is re-selected according to the established rules and a new set of weights is calculated. The regular updating procedure preserves the leading properties of the composite indicator by gradually incorporating structural and other changes. The regular and rule-based procedure also reduces the arbitrariness of the selection and updating of component series and reduces suspicion that revisions are made because the results are not liked.

Source: Abberger et al. (2017)

5.5 Steps for the construction of cyclical composite indicators

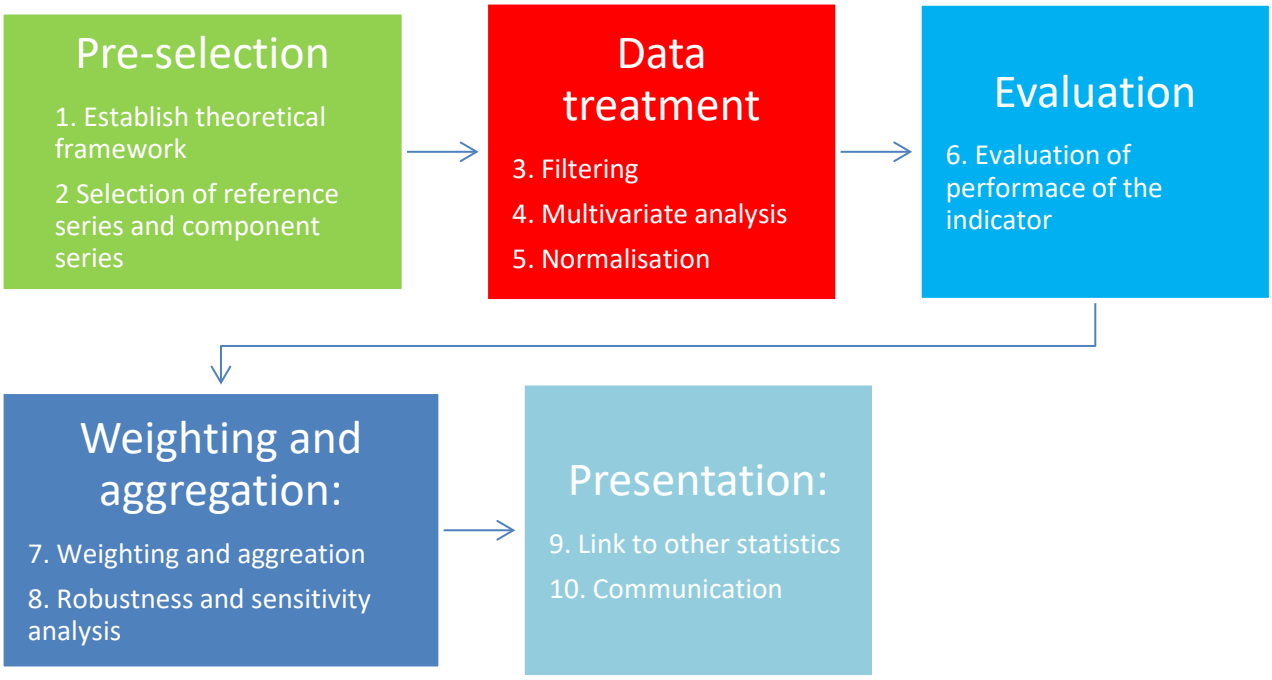
5.34 The construction of cyclical composite indicators can be divided into five main processes, which include ten steps to be undertaken.[49] The processes and the steps, which

[49] The steps of constructing cyclical composite indicators are described in OECD (2008) and in OECD (2012). Eurostat and UNSD (2017) also provides detailed guidance for the construction of cyclical composite. This publication in the annex to chapter 14 gives guidance on methods to detect turning points. Chapter 22 of the

follows the OECD (2008) Handbook on Constructing Composite Indicators, are shown in figure 5.2.

5.35 The steps presented below are mainly focusing on the construction of the cyclical composite economic indicators. However, some of those steps also apply to the construction of structural composite indicators. This is the case e.g., of the step related to variable selection and of the step describing aggregation methods.

Figure 5.2
Production Process for Composite Economic Indicators



5.5.1 Establishing the theoretical framework

5.36 To construct a composite indicator, a theoretical framework must be established. The framework should:

- Define and describe the phenomenon (the reference series) the indicator aims to measure
- The choice of cyclical model and whether the indicator aims to estimate the entire cycle, turning points or short-term developments
- Define the timing of the indicator, i.e. whether it should be leading, coincident or lagging.

publication presents detailed guidelines for the construction of cyclical composite indicators, jointly prepared by Eurostat and the Conference Board, which aim to serve as reference for NSOs wanting to implement this type of indicators.

5.37 The cyclical movements of the reference series can be described using different models. Looking at the business cycle it is possible to refer to the classical cycle or the so-called growth cycle or deviation cycle. The acceleration or growth cycle is generally not considered suitable due to its volatility (see for example Anas and Ferrara (2004)), while problems with volatility can be reduced by smoothening time series or applying year-on-year growth rates rather than monthly or quarterly growth rates.

5.38 As regards the choice between estimating the cyclical component of the reference series or just its turning points, both the Conference Board's Leading Economic Indicator and OECD's Composite Leading indicator are based on the *classical cycle* definition while the Eurostat cyclical composite indicators refer to the *growth cycle*. (The different types of cycles are explained in chapter 4.2.5). Finally, the choice between leading or coincident indicators is crucial because it influences most of the following steps. The *relevance* of the indicator, including the choice of cyclical model, should be carefully evaluated and discussed with users.

5.5.2 Selection of data series

5.39 For most cyclical composite indicators aiming at describing the overall economic development the ideal reference series is GDP. Nevertheless, since GDP is only available on a quarterly basis and cyclical composite indicators are usually requested on a monthly basis, either a monthly estimate of GDP is needed, or another reference variable is used. In the second case, one obvious candidate is the industrial production index.

5.40 Concerning the selection of component series, it is important to look at the quality (especially reliability and timeliness), and at the leading properties of candidate series. It is recommended that candidate series include as much as possible official statistics and sentiment variables which could be complemented, whenever needed, by non-official source. Component series could be either accepted or rejected starting from large information sets, or large information sets could be summarized using factor analysis models (see, for example OECD (2008) for more details on factor analysis).

5.41 The timeliness of the composite cyclical economic indicator is crucial for its purpose. Hence, when selecting individual indicators their timeliness needs to be considered to allow for a timely release of the composite indicator.

5.42 As already mentioned, the quality of component series is essential in constructing cyclical composite indicators. In this context, the availability of exhaustive and updated metadata can be used to assess the quality of the series and identify shortcomings and is thus very useful to statisticians in charge of constructing cyclical composite indicators.

5.5.3 Filtering

5.43 It is typical that both the individual indicator time series and the reference time series needs various data transformations. This may include, e.g., first-differencing, standardization, estimation of missing observations, and detection of outliers. The data transformations must be chosen in relation to the phenomenon that is being measured. For example, if the aim is to estimate economic fluctuations around a trend, the reference series needs to be filtered to remove the trend and the irregular component.

5.44 Data transformations may apply well-known filtering techniques, such as those described in Baxter and King (1999) or Hodrick and Prescott (1997). Traditional seasonal adjustment procedures, either TRAMO-SEATS (Gomez and Maravall, 1998) or X-13-ARIMA[50] can also be used at this stage of the process. The outlier identification should also be taken into consideration as these can disturb the picture. The treatment of outliers should be fully transparent and well documented for users and analysts. Seasonal adjustment of time series can be carried out through use of available software packages (e.g. JDemetra+).

5.5.4 Multivariate analysis

5.45 In this step, an analysis of the suitability of the dataset is performed to have a better understanding of the data structure. There are several methods of how to perform a multivariate analysis, which are recommended in the OECD Handbook on Constructing Composite Indicators (OECD, 2008), such as for example Principal Component Analysis, Factor Analysis and Cluster Analysis. In brief, these analyses can be used to group the individual indicators according to their statistical correlation and to derive their impact, or weight, on the composite indicator. To each group the analysis associates a score, the so-called loading, which indicates how much of the information of each group is included in the Composite indicator, which is an indication of statistical quality of the groupings of the individual indicators. Principal component and factor analyses are suitable for business cycle indicators and other macroeconomic Indicators, while the cluster analysis is more suitable for structural indicators.

5.46 It should be recalled that these analytical models are based purely on the statistical correlations between the indicators, and does not necessarily imply presence or absence of causality. Hence, expected causalities must be considered in the selection of individual indicators and concerning how they are grouped as a result of the statistical analysis. The statistical based analysis is more suited for sets of indicators that are related and within the same dimension.

5.47 It is recommended to take some time to have a look at the overall structure of the indicators, assess the suitability of the dataset and explain methodological choices, e.g. weighting, aggregation, and the statistical methods applied.

5.5.5 Data Normalization

5.48 Normalization is required prior to any data aggregation as the indicators in the dataset often have different measuring units.

5.49 Several normalization methods are available[51]. Among them, the most common is standardization, which means converting all indicators to a common scale with an average of zero and a standard deviation of one.

[50] https://www.census.gov/srd/www/x13as/
[51] OECD (2008, p. 83)

5.5.6 Evaluation: performance, cyclical conformity and consistency

5.50 Cyclical conformity of the composite indicator and its reference series can first be assessed by looking at the distance between the turning points of the two series. Cyclical conformity can also be assessed by looking at cross-correlations, which puts less emphasis on turning points than the previous method. Both methods complement each other. Further details about reference series analysis are provided in Chapter 4.2.5.

5.51 It is important to note that the performance and the accuracy of the composite indicator have to be monitored over time. Structural changes or changes in source data may reduce the leading properties and it may eventually be necessary to introduce changes in methodology or e.g. in the choice of individual indicators to keep the composite indicator up to date and preserve its accuracy and cyclical properties.

5.52 Overall, the production of composite cyclical indicators should follow the quality standards applied by the statistical offices for its official statistics, or an amended version of the standards to take the specific features of composite indicators into account.

5.5.7 Weighting and aggregation

5.53 The choice of the weighting and aggregation method is important for composite indicator construction. When used in a benchmarking framework, weights can have a significant effect on the overall composite indicator and the country rankings. The choice of the weighting system should assure both the closeness to the reference series and need to be transparent.

5.54 While the weights to some extent may follow from the theoretical framework of the indicator, this is not always the case. A number of weighting techniques exist.[52] Weights may be assigned to component series in order to reflect their economic significance (coverage, reliability causality), statistical correlation, cyclical conformity and timeliness. In practice, also collection costs will have to be considered. Further methodological guidance on weighting is available in OECD (2008).

5.55 Commonly used methods for weighting include equal weighting and weight calculation based on statistical models:

- Principal components analysis
- Data envelopment analysis
- Regression analysis
- Unobserved components models

5.56 Many composite indicators rely on equal weighting, e.g. all variables are given the same weight. Equal weighting may be a suitable method, and in some cases the only option in the absence of statistical or empirical evidence or insufficient knowledge of causal relationships etc. Equal weighting does not imply “no weights” but implies that the weights are equal. When using equal weighting for series with a high correlation there is a risk of double counting. Weights may also be chosen to reflect the statistical quality of the data. Higher

[52] OECD (2008, p. 89)

weights are assigned to statistically reliable data with a broad coverage. Other weighting schemes reflecting expert evaluation or appreciation are not considered suitable in this context in order to reduce as much as possible subjectivity in the production of the statistics.

5.57 The literature of composite indicators offers several examples of aggregation techniques. The most used are additive techniques, which range from summing up ranking for each indicator to aggregating weighted normalized indicators. Yet, additive aggregations imply requirements and properties of the indicators and the associated weights, which are often not desirable and at times difficult to meet or burdensome to verify. To overcome these difficulties the literature proposes other and less widespread, aggregation methods such as multiplicative (e.g. geometric) aggregations or non-compensatory aggregations, such as the multi-criteria analysis. (OECD (2008, p. 102 ff.).

5.58 The additive method is useful when all individual indicators have the same measurement unit and if some statistical conditions are respected. Geometric aggregations are better suited if the constructer wants some degree of non-compensability between individual indicators or dimensions.

5.59 The composite indicator may be compiled in one step in which the individual indicators are weighted and aggregated into the composite indicator. The composite indicator may also be compiled in two steps: (1) from individual indicators to dimensions, and (2) from dimensions to a composite index.

5.60 In either case, the compiler will need to carefully consider the different options for weighting, including equal weighting and the use of statistical methods such as factor analysis and principal component analysis.

5.61 Finally, the selection of the appropriate weighting and aggregation procedures with reference to the theoretical framework should be evaluated and considerations should be made regarding the use of alternative methods.

5.62 It should be noted that the absence of an “objective” way to determine weights and aggregation methods does not necessarily imply that the composite indicator is not valid. However, the entire production process must be transparent. The objectives and the selection of models should be clearly explained in the theoretical framework and the indicator should be tested to see to what extent it fulfils the objectives.

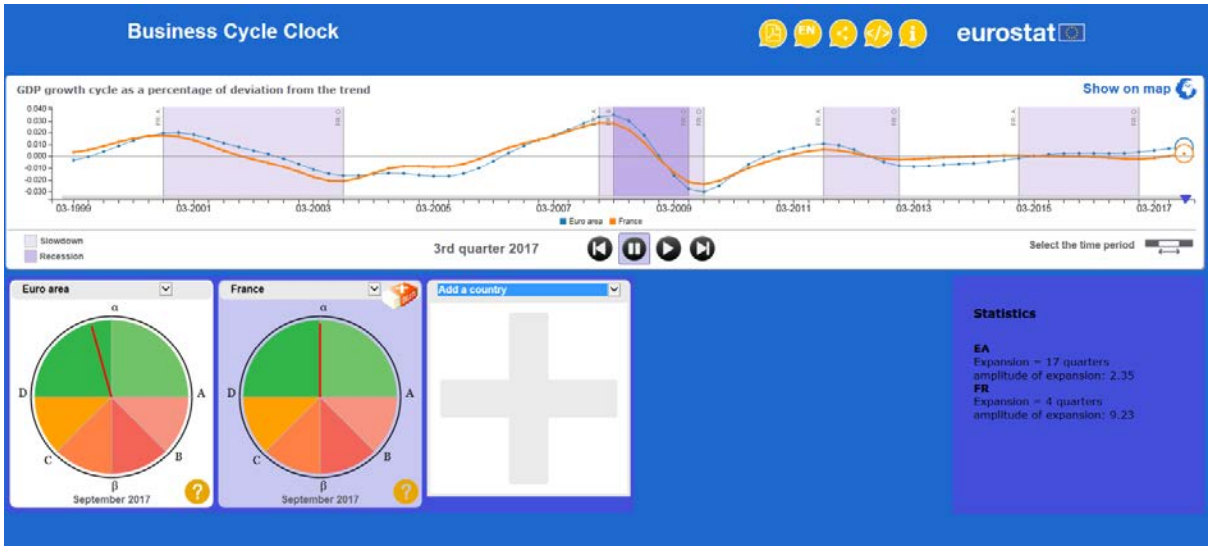
Box 5.4

The new Eurostat business cycle clock

The new Eurostat business cycle clock was released to the public in the last quarter of 2017. It aims at providing a clear and easily understandable picture of the current and past cyclical situation of the euro area and of its member countries plus the UK. The application is available at: http://ec.europa.eu/eurostat/cache/bcc/bcc.html

This online tool offers a friendly and easy way to illustrate complex phenomena such as the occurrence of turning points and the cyclical phases. It disseminates the outcome of two main set of cyclical indicators developed by Eurostat in the last years. The first one is constituted by a set of historical dating chronologies for the business, growth and acceleration cycles based on the α, a, b, β, c, d sequence developed by Anas and Ferrara (2004) and presented in EU and UNSD (2017, Chapter 21). In this sequence α and β represent respectively the peak and the trough of the acceleration cycle, a and d of the growth cycle and b and c of the business cycle. The second group of indicators is constituted by three cyclical composite indicators for the real-time detection of turning points of the acceleration growth and business cycle still following the α, a, b, β,c, d sequence. The structure of the online tool is presented below.

The new Eurostat business cycle clock



In the upper part of the application it appears a graphical representation of the quarterly GDP growth cycle highlighting the various cyclical phases as identified by the quarterly historical dating chronology. In the left corner of the down part there is a clock wise representation of the current cyclical situation based on the three composite indicators for the detection of turning points. The clocks is subdivided in 6 sectors delimitated by the 6 turning points α, a, b, β, c, d. On the right corner of the down part within a square box some relevant measures related to the cycles are displayed. In the application it is possible to display and compare up to 5 countries. The business cycle clock is presented in detail in Mazzi (2015) and in Eurostat and UNSD (2017, Chapter 21).

5.5.8 Robustness and sensitivity analysis

5.63 The robustness of composite indicators depends on the underlying assumptions and methods chosen. By using a combination of uncertainty and sensitivity analysis, the robustness of the CEIs can be gauged and transparency can be improved.

5.64 It is frequently argued that composite indicators are too subjective, due to the assumptions and decisions that have to be done along the process of construction. The assumptions can heavily influence the message conveyed by a composite indicator in a way that deserves analysis and validation. Sensitivity analysis is the study of how output variation in models such as a composite indicator can be related, qualitatively or quantitatively, to different sources of variation in the assumptions. In addition, it measures how the given composite indicator depends upon the information that composes it. Sensitivity analysis is closely related to uncertainty analysis, which aims to quantify the overall variation in the final results associated to the uncertainties in the model input. For a presentation of the Sensitivity analysis see Saltelli et al. (2004).

5.65 Sensitivity analysis is very useful also to measure the influence of each individual indicator on the final composite indicator together with the associated uncertainty.

5.5.9 Links to other statistics

5.66 Composite indicators often measure concepts that could be linked to well-known and measurable phenomena, e.g. productivity growth, entry of new firms. These links can be used to test the explanatory power of a composite indicator. Simple cross-plots are often the best way to illustrate such links. An indicator measuring the environment for business start-up, for example, could be linked to entry rates of new firms, where good performance on the composite indicator of business environment would be expected to yield higher entry rates.

5.67 Note that correlation analysis should not be mistaken with causality analysis. Correlation simply indicates that the variation in two data sets is similar. A change in one indicator does not necessarily lead to a change in the other composite indicator and vice versa. Countries with higher GDP might invest more in technology or more technology might lead to higher GDP. The causality remains unclear in the correlation analysis. More detailed econometric analyses can be used to determine causality, e.g. the Granger-causality test. However, causality tests require time series for all variables, which are often not available

5.5.10 Communication of the indicator

5.68 This last step in the construction process is also a very important step. It is crucial that the indicators are communicated in a clear form that meets users' needs and with sufficient documentation and explanation to facilitate correct interpretation and use of the indicators and avoiding misunderstandings. The communication should include a description of the applied methodology and the component series of the composite indicator. Communication of indicators is dealt with in more details in chapter 7, which also provides examples of visualization techniques. Dialogue with users and stakeholders is also useful to target the communication and avoid misinterpretation.

5.6 Structural composite economic indicators

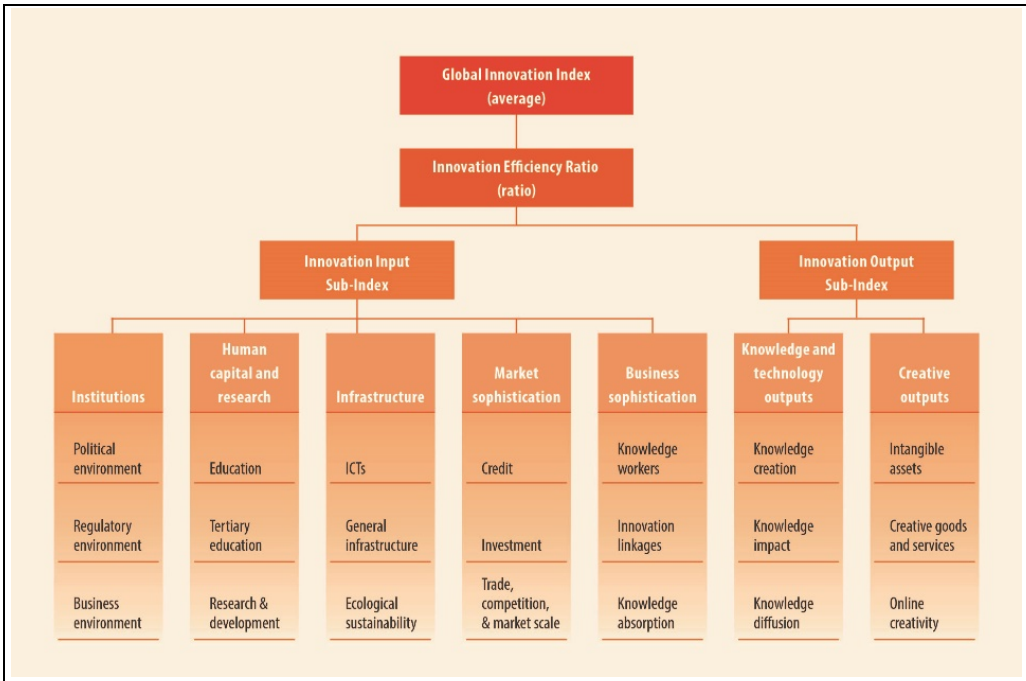
5.69 Structural, or non-cyclical, composite economic indicators are showing trend pattern in the economic development that are non-cyclical in nature. These indicators are found in areas such as measures for competitiveness, globalization, presence of macroeconomic imbalances, etc. Structural economic indicators do not usually have a reference series as they are usually measuring a complex or multidimensional phenomenon, which is not directly observed. Structural composite economic indicators can be useful tools in policy analysis to track signals of more structural changes in the economy.

5.70 One area where they have been used recently is the impact of innovation at sectoral and international level (see Box 5.5). These indicators are often used for comparing and benchmarking across sectors or countries. Structural composite indicators may also be used in microeconomic studies with the aim to show long-term or permanent structural changes in the economy.

Box 5.5
The Global Innovation index 2015

The Global Innovation Index (GII) is an evolving project that builds on its previous editions while incorporating newly available data and that is inspired by the latest research on the measurement of innovation. The GII relies on two sub-indices—the Innovation Input Sub-Index and the Innovation Output Sub-Index—each built around key pillars.
Five input pillars capture elements of the national economy that enable innovative activities: (1) Institutions, (2) Human capital and research, (3) Infrastructure, (4) Market sophistication, and (5) Business sophistication. Two output pillars capture actual evidence of innovation outputs: (6) Knowledge and technology outputs and (7) Creative outputs. Each pillar is divided into sub-pillars and each sub-pillar is composed of individual indicators (81 in total in 2017). Sub-pillar scores are calculated as the weighted average of individual indicators; pillar scores are calculated as the weighted average of sub-pillar scores.

The structure of the Global innovation index



The GII gathers data from more than 30 sources, covering a large spectrum of innovation drivers and results, privileging hard data over qualitative assessments (only five survey questions were included in the GII 2017). The framework is revised every year in a transparent exercise to improve the way innovation is measured. For more on the latest updates to the framework, see Annex 2 of the GII 2016.

Source: World Intellectual Property Organization

5.71 Two other examples should be mentioned. The *Global Competitiveness Index* (GCI) that is being produced by the World Economic Forum[53]. The index is based on 12 pillars of competitiveness, covering areas such as institutions, infrastructure, macroeconomic environment, health and education, market efficiency, technological readiness and innovation. Each pillar is measured by a number of individual indicators. The individual indicators are, in general, aggregated by the arithmetic mean, while for the higher levels of aggregation weights representing the estimated importance of the pillars are used. The weights of the pillars vary with the development of the countries.

5.72 The other example is the feasibility study on *Composite Indicators measuring structural change to monitor the progress towards a more knowledge-intensive economy in Europe*.[54] This study presents the theoretical framework underlying the proposed composite indicator to measure innovation and knowledge intensity and give detailed information about the individual indicators and dimensions. In Brief, the composite indicator is made up of five

[53] For more information about the GCI, see http://reports.weforum.org/global-competitiveness-index-2017-2018/

[54] See http://publications.jrc.ec.europa.eu/repository/bitstream/JRC70184/lbna25279enn.pdf. An update of this study is available from https://ec.europa.eu/jrc/en/publication/eur-scientific-and-technical-research-reports/update-composite-indicators-structural-change-towards-more-knowledge-intensive-economy

dimensions (R&D, skills, sectoral specialization, international specialization and internationalization). Indicators of the dimensions are calculated by taking the arithmetic average of the individual indicators. The overall composite indicator is calculated as the unweighted arithmetic or geometric average of the dimension indicators.

5.73 Structural indicator may aim to measure very different phenomena and may be composed to meet particular user needs. It is therefore difficult to recommend more detailed guidance on their production.

5.74 As for the other types of composite economic indicators it is advised to involve user groups and stakeholders in the development of structural composite indicators, which will often require expertise in particular areas.

5.75 The theoretical framework will have to be specified and individual indicators selected. Where possible, it is recommended to follow the construction steps presented earlier in this chapter. While the steps are focusing on the construction of cyclical composite indicators, some of the steps will also apply to structural indicators, including the steps related to selection of individual indicators, data analysis weighting and aggregation, validation and communication. Factor analysis and principal component analysis are more suitable for business cycle indicators and other macroeconomic Indicators, while the cluster analysis is more suitable for structural indicators. More information about cluster analysis can be found in e.g. OECD (2008).

5.76 It is recommended to specify the quality criteria for the production of structural composite indicators to ensure as far as possible the overall quality of the indicator. The performance of structural indicators will also need to be monitored over time. If the structural indicator does not have a reference series it may be compared with other relevant statistics that could provide information about the expected development of the composite structural indicator. It may, eventually, be necessary to introduce changes in methodology or in the choice of individual indicators to keep the composite indicator relevant and as accurate as possible.

5.7 International comparability

5.77 Composite economic indicators are often used for to compare economic development between different countries, either in time series or in a certain point of time. It is therefore very important that the construction of the indicators is comparable.

5.78 Heterogeneity in the development of composite indicators can be explained by the fact that some countries develop their own methodology, and even if internationally recommended methods are used, they may be applied in different ways. Composite economic indicators produced by international organizations are probably the most internationally comparable. This is the reason why these indicators are used among the examples in these guidelines.

5.79 Differences in available datasets, or structural differences between countries are other reasons that can make comparisons difficult, and a further harmonization of measures should be encouraged internationally. In this area, NSOs have an advantage as they can form task

forces and collaborate in developing composite economic indicators that also have comparability as a main task.

5.8 Recommendations

- To produce a composite economic indicator sufficient resources and expertise would need to be allocated to the development of the indicator and its maintenance
- User needs should be critically assessed. Eventually for the development of the composite indicator the right balance needs to be found between simplicity and transparency, on the one hand, and the ability to capture complex phenomena, on the other hand.
- The construction of composite economic indicators is recommended to follow a standardized model, e.g. the OECD model or the UN/Eurostat model mentioned in these guidelines. The theoretical basis should be carefully elaborated to form the most appropriate model for the composite indicator.
- The quality of the composite indicator depends on the methods applied and the Individual indicators that enter the composite indicator. It is therefore important to ensure that the individual indicators are of suitable quality. The timeliness of cyclical composite indicators is crucial for their usefulness. Hence, component series would also need to be timely and the production process should be set-up to facilitate timely production and release of the indicator.
- Weighting and aggregation of individual indicators into the component measure are crucial steps in the construction of the composite indicator CEIs and require methodological expertise. The weights should be in line with the theoretical framework and the purpose of the indicator.
- Overall, the production steps should be described and documented in detail to facilitate sound and efficient production and transparency. Suitable quality standards in line with those applied for other statistics should be applied.
- Before launching composite indicators, they need to be carefully tested and validated by performing multivariate analyses and sensitivity and robustness checks. The performance of the indicator should be assessed by comparing to the reference series and other relevant statistics.
- A process should be established to ensure that the performance of the composite indicator is critically evaluated over time as e.g. the leading properties of cyclical composite indicators may deteriorate over time. Hence, the indicator needs to be monitored and updated as time progresses to ensure that it maintains its properties.
- Communication and dissemination of the composite economic indicators should include a thorough analysis of the expected audience. Users with little knowledge of statistics need information that is easily understandable, such as pictures or graphs, while more initiated users, such as analysts or researchers, also need explanations on the underlying data and methods.

6 Composite socio-economic indicators

6.1 Introduction

6.1 There is a growing attention for non-economic indicators, whether it be social, socio-economic or environmental indicators. To a great extent this rise in attention is a result of the report on measuring economic performance and social progress (Stiglitz, Sen and Fitoussi, 2009), although the tradition of social indicators dates further back (cf. Boelhouwer (2010) & Noll (2011)). In this chapter the focus is on socio-economic and composite indicators.

6.2 As is the case with economic indicators, there is a wide variation in arguments for and against composite indicators and in methods of aggregation. Because of the lack of a common unit for measurement (as provided by monetary units for economic indicators), the way of combining and weighting socio-economic indicators provides an extra point of discussion. These discussions will be addressed in this chapter.

6.3 Section 6.2 provides a brief overview of composite socio-economic indicators, their construction and main features and the intended use. In section 6.3 different arguments in favour and against composite socio-economic indicators are summarized. Section 6.4 presents the successive steps to be taken to compile a composite indicator. Section 6.5 summarises the recommendations for the construction of socio-economic indicators.

6.4 Various documents and handbooks have been used for this chapter - the most important ones are compiled by the OECD[55] and Eurostat[56].

6.2 Background and overview of socio-economic composite indicators

Socio-economic concepts

6.5 Under the umbrella notion of 'socio-economic indicators' various concepts are to be placed. Examples are 'happiness', 'quality of life', 'well-being', 'living conditions' and 'life situation'; but also 'social capital', 'generalized and political trust' or environmental concepts (for example various (ecological) footprints). Other concepts used to describe this broad kind of indicators are Human Development (UNDP, 2010), 'Beyond GDP'[57], and How's Life? (OECD, 2017). An argument for using composites was given as long ago as the 1970s by the economist Drewnowski (1974) that combining social indicators into a single figure would deliver an equivalent alternative to set against GDP– itself also a combined indicator. Besides, GDP was also not easily established; it is most likely not obvious to everyone what indicators are used to measure GDP and its meaning is the subject of recent debate ('beyond GDP'). These are

[55] OECD (2008). Handbook on constructing composite indicators: methodology and user guide

[56] Eurostat (2014). Towards a harmonised methodology for statistical indicators. Part 1: Indicator typologies and terminologies

[57] "Beyond GDP" was discussed on a conference hosted by the European Commission, European Parliament, Club of Rome, OECD and WWF in 2007. For additional material visit http://ec.europa.eu/environment/beyond_gdp/2007_conference_en.html

the same arguments that are often used against a quality of life index, but still GDP is a widely used measure. Some concepts still need to be further developed or are under debate, such as the concept 'sustainable development', which might not only be based on indicators for the "here and now" such as subjective well-being, but also on "later" from the perspective of the capital approach (natural, human, social, economic), and on "elsewhere", referring to welfare's impact in one country on the welfare in other countries (UNECE et al., 2014).

Composite indicators

6.6 Typically, composite socio-economic indicators aim to measure complex, multidimensional phenomena, which cannot be measured directly. They are constructed by aggregating a number of individual indicators into one composite measure.

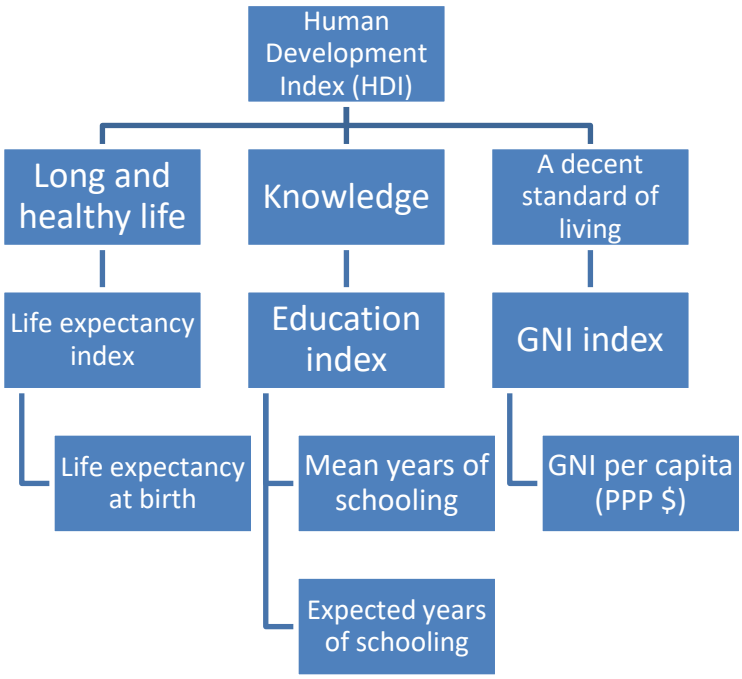
6.7 Most composite socio-economic indicators will be based on so-called *formative* models. In formative models the causality is assumed to go from the individual indicators to the composite indicator, which is then seen as a reflection of the developments of the individual indicators. The composite is a construct and does not exists as an independent entity or phenomenon in itself. Assume, for example that a composite indicator of socioeconomic status is constructed by use of four indicators covering education, employment, income, and neighbourhood. The indicators are the causes of socioeconomic status so the causality goes form the indicators to socioeconomic status. If, say, income increases, this will lead to an increase in the composite indicator. There is no causality from socioeconomic status to any of the indicators; an increase in socioeconomic status does not cause an increase in the individual indicators.

6.8 In *reflective models* the causality goes from the construct to the individual indicators. The construct is a *latent* variable that is assumed to be the common cause of the changes in the individual indicators and which exists independently of the individual indicators. One example is intelligence, which may be measured by a number of test scores (indicators). The causality goes from the latent variable, intelligence, to the indicators: if a person is more intelligent, he or she has a higher probability of getting the correct answer to a question in an intelligence test. It is not expected that there is a causality from the indicators to the construct.

6.9 As mentioned, composite socio-economic indicators will usually be formative, and the chapter only discusses this type of models.

6.10 A well-known and widely used composite indicators is the Human Development Index, HDI (UNDP, 2010), illustrated in Box 6.1. The HDI is constructed based on three dimensions of human development: to live a long and healthy life, measured by life expectancy at birth; the ability to acquire knowledge, measured by mean years of schooling and expected years of schooling; and the ability to achieve a decent standard of living, measured by gross national income (GNI) per capita. Minimum and maximum values are set in order to transform the indicators expressed in different units into indices on a scale of 0 to 1. The geometric mean of the resulting indices is then taken to form the HDI.

Box 6.1
The Human Development Index



For more information, see UNDP (2015) and UNDP (2016)

6.11 There is some resistance in national statistical offices to engage in producing composite socio-economic indicators. These may be considered out of scope of what the statistical office should engage in, the methods involved, in particular the weighting of individual indicators and dimensions into a composite measure may be considered controversial and statisticians may be 'unwilling to waste or hide information behind a single number of dubious significance' (Saisana, 2014). That might be truer for socio-economic composite indicators than for economic ones, as composite economic indicators to some extent are considered less controversial and are more widely produced by national statistical offices. Notwithstanding these reservations, a growing number of statistical offices engage in the production of composite socio-economic indicators.

6.12 One example is the composite index for social capital produced and published by Statistics Netherlands since 2009 (Van Beuningen and Schmeets, 2013). The index is based on a *social cohesion* framework consisting of two dimensions, participation and trust, and 17 individual indicators (Schmeets and Te Riele, 2010). Each of the two dimensions are further broken down in three sub-dimensions covering social, organisational and political aspects of the dimensions (see Box 6.2). The indicators were incorporated in the new survey on social cohesion and wellbeing (in 2009; redesigned in 2012). The operationalization and selection of the 17 indicators builds partly on Putnam's' social capital index (Putnam, 2000, p. 291) and various robustness checks. The six subdimensions and the overall index, consist of weighted averages of the indicators and are determined empirically. This enables calculation of composite indices for the sub-dimensions and the dimensions and for an overall index of social capital. Differences in social capital between subpopulations, e.g. immigrants and natives are reflected in an additional indicator of *Integrations*. A smaller gap in social capital

indicates more integration, and wider gaps less integration in society. Overall, higher levels of social capital and integration indicate more social cohesion.

Box 6.2
Composite index for social capital, the Netherlands

Participation	Trust
Social - 1. Contacts: family - 2. Contacts: friends - 3. Contacts: neighbours - 4. Informal help	Social - 10. Trust in Other People
Organizational - 5. Participation in organisational activities - 6. Paid Work - 7. Volunteering	Organizational - 11. Army; 12. Judges; - 13. Police; 14. Press; - 15. Large companies; - 16. Civil servants
Political - 8. Voting - 9. Political action	Political - 17. In national parliament

6.3 Arguments for and against composite socio-economic indicators

6.13 Other than statistical figures, an indicator may have a normative character (Michalos (2014), Boelhouwer (2010), OECD (2008)), especially when they are used for policy making or policy evaluation. In other words: "social indicators are […] statistics, statistical series, and all other forms of evidence – that enable us to assess where we stand and are going with respect to our values and goals, and to evaluate specific programs and determine their impact" (Bauer, 1966, p. 1). Combining indicators to construct a composite indicator has pros and cons. The following arguments for and against indices draw heavily on OECD (2008) and Boelhouwer (2010).

Pros of composite indicators:

- Can summarize complex, multi-dimensional phenomena in one measure. They facilitate the task of comparing social groups, countries or regions (with sufficient sampling).
- Are easier to interpret than a battery of many separate indicators.
- Make trends easier to interpret, especially when separate indicators point in different directions.
- Reduce the visible size of a set of indicators without dropping the underlying information base. Thus, make it possible to include more information within existing space.
- Facilitate communication with stakeholders (whether that be policymakers, journalists or the general public) and promote accountability.
- Help to construct/underpin narratives for lay and literate audiences.

- Enable users to compare complex dimensions effectively.
- From a methodological point of view, a composite indicator has the advantage of increased reliability, as measurement errors in separate indicators tend to balance out.

Cons of composite indicators:

- It may send misleading messages if the composite index is poorly constructed and/or misinterpreted.
- It may invite simplistic conclusions. Related: the use of rankings can be misleading and simplistic as it is often unclear what differences exactly mean. What does it mean if the difference in HDI (Human Development Index) score between Norway and Sweden is 0.037 in 2015 (ranks 1st and 14th)?
- Just like any statistical figure, a composite index may be misused, e.g. to support a desired policy, all the more so if the construction process is not transparent and/or lacks sound statistical or conceptual principles.
- It may disguise serious failings in some dimensions and increase the difficulty of identifying proper remedial action, if the construction process is not transparent or if dimensions of performance that are difficult to measure are ignored.
- The selection of indicators and weights may lead to criticism of the NSO and to political dispute.
- A composite indicator is not suitable as a means of answering specific (policy) questions: it cannot always provide the desired insight when analysing and explaining developments.

6.14 Furthermore, the absence of consensus regarding the following issues can be mentioned as drawbacks or objections:

- Selecting the individual indicators: it is not clear on what basis the indicators should be selected. Often a conceptual framework or theory does not exist, or is rather ambiguous.
- Aggregating the selected indicators: can one compare apples and oranges, i.e. combine them into one composite indicator? Does it make sense, for example, to aggregate an indicator for health and an indicator for income? Opinions differ on this conceptual issue.
- Weighting the indicators or dimensions: how should the weighting factors be determined?
- The treatment of missing observations. Eventually, it may not be possible to obtain data for individual indicators that enter the composite indicator (data source may dry out or there may be a delay in their production). There are no general agreed practices on how missing observations should be dealt with (e.g. by different ways of imputation) which may reduce the quality and comparability of the indicators.

Weighting the pros and cons

6.15 In short: a composite indicator makes clear at a glance in which direction the multidimensional concept being measured is moving (just as GDP does for the economy), is easy to communicate and simplifies comparisons between groups. On the other hand, a composite indicator is a simplification of developments in the different dimensions and there is no uncontroversial method for selecting and weighting the individual indicators, nor the dimensions. A composite indicator in general is not suitable for answering specific (policy) questions and cannot always provide the desired insight when analysing and explaining developments. It is therefore important to combine both worlds, that is, to present the composite indicator, as well as the individual indicators.

6.16 When it comes to weighting the different indicators into one component measure – another point of debate with regard to indices – there are different methods available that could be used by NSO's. This point is discussed in the next section and at large in OECD (2008), Handbook on constructing composite indicators.

6.17 Combining single indicators into a composite indicator does by no means imply that a composite indicator should include everything. It is feasible to encapsulate socio-economic, multidimensional phenomena with composite indicators, but including the well-being of here and now with the well-being of later and elsewhere makes less sense (cf. Stiglitz, Sen and Fitoussi (2009)). Besides, there is no need to choose between having one composite indicators or a multiple of individual indicators. Having them both might be combining the best of two worlds.

6.4 Steps for constructing composite socio-economic indicators

6.18 There are several steps to be taken in the construction of composite socio-economic indicators. In this section the construction of the indicator is divided in the following eight steps:

1. Establishing a conceptual framework
2. Selecting dimensions and component indicators
3. Data treatment
4. Multivariate analysis
5. Normalisation of data
6. Weighting and aggregation
7. Robustness and sensitivity
8. Indicator validity and links to other statistics

6.19 The following sections provides a brief explanation of each step. More detailed information can be found in OECD (2008), Land (2014) and Boelhouwer (2010), on which this section to a large extent is based.

6.4.1 Establishing a conceptual framework

6.20 The first step is to set up a conceptual framework of the composite indicator. Such a framework should include:

- The purpose of the indicator- what does the indicator aim to measure and for what purposes is it intended to be used.
- The dimensions that are part of it
- The underlying individual indicators and their distribution on the dimensions
- An analysis of the individual indicators – how are they interrelated and how are they related to the phenomenon they aim to measure in terms of correlation and causality.
- Decision on whether indicators should be produced both for the dimensions and across the dimensions into an overall composite indicator

- A description of related concepts or phenomena. For instance, a composite indicator on households' satisfaction with their housing situation may be compared with available quantitative statistics on housing or other information related to housing. If the composite indicator has a reference series this should also be defined and explained.

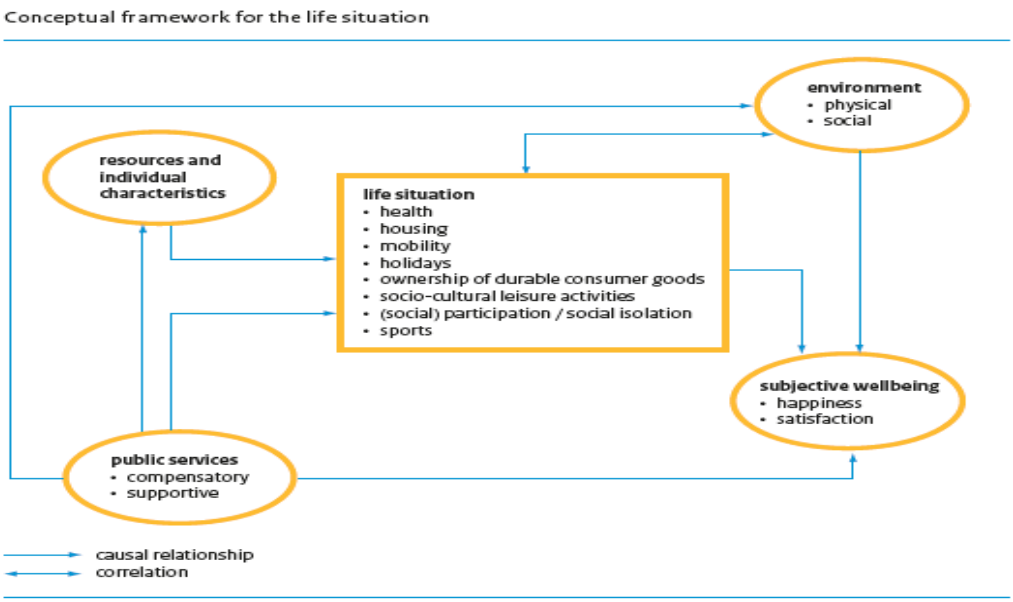
6.21 The Framework should be specified carefully with clear definitions and considerations of the relationships between the individual indicators and the dimensions since the framework in principle should provide the conceptual basis for the construction and compilation of the indicator. The framework may also indicate how the individual indicators should be weighted and, eventually, how indicators of the different dimensions should be aggregated into an overall composite indicator.

Box 6.3

Two conceptual frameworks in the Netherlands

The life situation index (Boelhouwer 2010)

In this conceptual framework the life situation takes centre stage (see figure). The life situation index combines the eight dimensions listed under 'life situation'. Each of the dimensions has at least two indicators, some of which contain more than one variable. The framework also includes determinants of the life situation: in addition to personal characteristics (such as age and household composition), also education, work, health and income (which we call 'resources' here). Environment also plays a role in the life situation of citizens. These include both a physical component (the city and neighbourhood a person lives in, is it safe?) and a social component (what is the demographic composition of the neighbourhood?). The life situation index itself includes indicators which relate to the actual state of affairs, not to an (individual) evaluation of it. In the broader conceptual framework, we look at both. We assume that people's life situation will affect their happiness and satisfaction. And finally, the conceptual framework includes the use of public services. The idea here is that the government helps to prevent social disadvantages from developing, and where these do develop, to compensate them as much as possible.



The SCP Life Situation index is based on a survey among 2000 respondents, based on a representative sample of the Dutch population, 18 years or older. The data are collected by the Netherlands Institute for Social Research in collaboration with Statistics Netherlands.

The composite subjective well-being index (Van Beuningen, Jol and Moonen (2015))

The model of composite subjective wellbeing consists of eight dimensions which are considered relevant for the quality of life. These dimensions, which are based on perceptions, such as satisfaction, are: (1) Material living conditions; (2) Education and work; (3) Economic risks; (4) Health; (5) Social relations; (6) Participation and trust; (7) Safety; and (8) Environment. These dimensions are based on the recommendations and the dimensions distinguished by Stiglitz, Sen and Fitoussi (2009).

The calculation of the Personal Wellbeing Index has 3 steps. In the first step each dimension gets a score: when there is only one indicator, the dimension-score and the indicator-score are identical. When there are more indicators, the dimension-score is the average score of the indicators. Each indicator is a number between 1 and 10. In the second step the dimension-scores are added into the index-score; thus, this index has a minimum of 8 and a maximum of 80. In the third step the index-score is divided by 8, to get a score between 1 and 10 again. All 8 dimensions are equally weighted when calculating the overall composite indicator.

The composite subjective wellbeing index has been compiled annually since 2013. The index uses data collected by Statistics Netherlands in the survey on Social Cohesion and Wellbeing (7.300 respondents), based on a representative sample of the Dutch population 18 years or older.

For more information see: https://www.cbs.nl/en-gb/our-services/innovation/project/happiness-meter

6.4.2 Selecting dimensions and component indicators

Concepts, dimensions and indicator variables

6.22 As shown, in a conceptual framework various theoretical concepts are included such as 'life situation', 'quality of life', 'well-being', or 'social capital'. Suppose we want to construct a composite indicator for the concept quality of life. Then each dimension must constitute a separate but substantial part of this concept. Such a distinguished part, the dimension, is a separate aspect of the quality of life concept. Examples of such dimensions of the quality of life are education, safety or health. For each dimension there may be one or more indicator variables, e.g. years of schooling, burglary figures or subjective health, respectively. Important in the selection of the indicator variables as well as the dimensions is that they have to be related to the concept and they have to be sensitive to change (of course, next to be valid and reliable). Moreover, the number of dimensions must be manageable and hence limited. If the goal is to measure progress or decline for the whole population, the chosen variables within the dimensions should apply to the whole population, and not to specific groups.

6.23 For example, if a composite indicator includes employment as one of the dimensions and this is measured by an indicator of employment conditions it should be reminded that this would exclude the part of the population not in employment. Of course, this is not a problem if the indicator aims to describe the changes in conditions of the population in employment.

Selecting dimensions

6.24 An important question is what dimensions to choose? A socio-economic composite indicator involves figures in several different dimensions. It is however important that the number of dimensions does not become too large, because otherwise there is a danger of losing the overall picture. The question of precisely which dimensions should be included under quality of life or well-being is often the subject of discussion. When comparing the different composite indicators that are available, it might seem at first sight that the range of dimensions is nearly endless. But when looked at more precisely, it becomes clear that there is a strikingly large correspondence between the content of the composite indicators that are around. The range of different dimensions included is relatively small. See table 6.1 for an overview. Although different wording is sometimes used, the content and indicators used frequently resemble each other closely. This gives an idea that, at a meta level, the most important socio-economic dimensions are agreed upon.

6.25 For NSOs that are considering developing a composite indicator for measuring well-being or quality of life, it could therefore be recommended to consider these dimensions for possible inclusion. This does not imply that all dimensions mentioned should necessarily be included – this also depends on the availability of suitable data –, or that variations – e.g. merging some of the dimensions – should be ruled out. The dimensions mentioned provide some guidance in developing a composite indicator, but to arrive at a meaningful composite indicator for a particular country, national circumstances and availability of suitable data sources should be taken into account, so this certainly allows for some flexibility.

Table 6.1. Dimensions covered by a selection of social reports

	Stiglitz, Sen, Fitoussi	OECD Better Life	France (Portrait Social)	Germany (Data Report)	Ireland (Measuring Irelands Progress)	Netherlands (Social State of the Netherlands)	Switzerland (Sozialbericht)	UK (Social Trends)
Income	X	x	X	x	x	x	x	x
Poverty / social exclusion			X	x	x	x	x	x
Employment/work	X	x	X	x	x	x	x	x
Health	X		X	x	x	x	x	x
Housing		x	X	x	x	x		x
Education	X	x	X	x	x	x	x	x
Sustainability (nature and environment)	X	x	X	x	x		x	x
Leisure time (culture, sports, social contacts)	X	x	X	x		x	x	x
Mobility / transportation			X	x	x	x	x	x
Safety	X	x	X	x	x	x	x	x

Taken and adapted from Noll and Berger (2014, p. 60)

6.26 In itself, this insight is not new. There was a good deal of consensus as long ago as the 1970s regarding the choice of dimensions in different countries: “I was very intrigued by the fact that “my” list was very similar to the lists developed in other countries, even if the political systems and cultures were very different. [...] I think that the lists also reveal a high degree of universalism in what is considered as social concerns in all countries.” (Johansson, 2002, pp. 25-26).

Selecting indicator variables

6.27 Some concepts are easier to measure than others: social participation is about activities people do, but social capital has to do with social networks and mutual norms and values, which is more difficult to measure. More in general: for personal characteristics and psychological abilities (like self-reliance or resilience) indicators must be sought that measure the concept in an indirect way, via latent constructs (see the example of social capital in section 6.2), as it is not possible to measure it by information based on survey questionnaires.

6.28 Another question that must be answered is what kind of variables are needed to measure the concept: input, output, outcome or a mix of these? Are objective indicators or subjective indicators to be chosen, or maybe a combination?

6.29 Though the OECD Better Life Index includes both objective and subjective indicators, the combination of both types in one composite indicator is disputed. That is because the nature, the determinants and the processes are very different, as it combines perceptions and facts (Boelhouwer (2010), Hagerty et al. (2001)). It can be relevant for policy purposes to keep them distinct, for example if we want to analyse what people are in (objective) good circumstances, but unhappy.

6.30 If the goal is to measure trends, variables should be chosen with which it is possible to tell about the direction of the development. Moreover, in that case creating a time series is necessary, to be able to monitor developments. In doing so, it is important to bear in mind that indicator variables should be consistent in time. Time series that are interrupted due to a change in method, like question wording, data editing or population redefinition, should be repaired in order to measure trends (chapter 3 in UN, 2016).

Disaggregating composite indicators

6.31 The possibility of disaggregating the composite indicator is another issue. To be able to do so, it is necessary that the constituent variables can be disaggregated by subgroups in society (such as male and female, younger and elderly, lower and higher educated), or by regions or other geographical units. Are the variables measured at the individual level (e.g. quality of life of individuals based on a survey) or at an aggregate (contextual) level (e.g. HDI, based on country level data)? Data based on person or household surveys data can be easily disaggregated into a variety of background characteristics, but limited sample size and sampling error prohibits disaggregation to small parts of the population. Register based data are not hampered by sampling error, but usually include less background information for dividing the whole population into subgroups.

6.4.3 Data treatment

6.32 A composite indicator should be robust to incomplete data or other data issues. One problem concerns the treatment of missing information. Missing observations will have to be estimated by imputation, e.g. by using the mean value of the variable or by applying a suitable regression model.

6.33 The possibility of outliers, which can disturb the picture, should also be considered. The treatment of outliers should be fully transparent and well documented. If outliers are disturbing, they should be treated separately. However, sometimes outliers can provide useful information. In the case of social exclusion for example, outliers could be the most socially excluded people.

6.34 Some individual indicators may correlate positively with the concept of the composite indicator, while others may have a negative correlation. For instance, a composite indicator on the quality of employment may include indicators of the employment rate, income and reported job satisfaction, which would correlate positively with the concept of quality of employment, and indicators of e.g. injuries during work and involuntary part time employment work, which would be negatively correlated. In such cases, it will be necessary to invert indicators that correlate negatively with the concept of the composite indicator. Inverting negatively correlated individual indicators so that a higher number always implies increases the value of the composite indicator also makes it easier to interpret correlations and other analyses.

6.35 When comparing countries or regions, indicators can have different definitions per country or region. In that case one can look for a cross-national study with a uniform definition or a strongly related indicator to derive internationally comparable figures.

6.36 These issues and treatments might lead to reconsidering the choice of dimensions and indicators. In that case, step 2 (section 6.4.2) must be reconsidered.

6.4.4 Multivariate analysis

6.37 Multivariate analyses should be conducted to examine the relations between the individual indicators and between the indicators and the dimensions. This should include an assessment of the direction of the impact of the individual indicators: do all indicators show the expected correlation with the composite indicator?

6.38 Results based on the statistical analysis may not always correspond to the conceptual framework. If that is the case, the individual indicators should be analyses and it should be assessed whether they are allocated to the right dimension, or whether the definition of dimensions should be changed or dimensions should be merged or split. For instance, when including indicators of leisure time activities, it could be that sport activities and cultural activities do not belong to the same dimension but should be included in two different dimensions.

6.39 A property of indicators which is of practical consequence, is whether all relevant indicators are available on the level of micro data. If all indicators stem from one single data source, such as a census or one single survey, all sorts of multivariate statistics may be applied to combine indicators to dimensions. Micro data have the advantage that cumulation can be dealt with: to what extent for example are the jobless and the poor the same people? Compared to the 1990's, nowadays much more microdata is available, based on surveys. This means that the possibilities for constructing composite socio-economic indicators based on micro data have grown enormously. However, if some indicators are not available on the individual level but only as an aggregate, like for instance the percentage jobless people, then this cumulation of disadvantages or prosperities cannot be examined. In this case still methods like time series analysis can be used to explore to which extent indicators belong to the same dimension. See the OECD (2008) *Handbook on constructing composite indicators* for a description of other weighting and aggregating techniques that can be used.

6.4.5 Normalisation of data

6.40 As socio-economic composites often don't have the same unit of measurement and can differ in scale, normalisation of data is necessary to make the variables comparable. The creation of z-scores, i.e. subtracting the average and dividing by the standard deviation, is the standard treatment, but may not always be appropriate. This is for example the case if the purpose is to compare findings based on multiple datasets, e.g. for various years and/or countries. A possible solution is to combine the datasets, which is however not always feasible and could also be very time consuming. In some cases, it may also be useful to take for instance logarithms to make differences at the lower end more important. After having created the merged dataset, one should be aware of skewed data and of extreme values. In general, it should be ensured that the normalization method respects the data properties.

6.4.6 Weighting and aggregation

6.41 Typically, a composite indicator will include two steps of aggregation: from individual indicators to dimensions, and from dimensions to a composite index. To some extent the weights may follow from the conceptual framework of the indicator or from the use for which

the indicator is constructed. However, in most cases weights will have to be estimated. The weights can be estimated by different methods. The most commonly used methods include:

- Equal weighting
- weights based on statistical methods
- Experts' judgement
- Public opinion

6.42 In the following the weighting methods are briefly presented, including their main advantages and disadvantages.

Equal weighting

6.43 Equal weighting can be applied at both levels of aggregation, when individual indicators are aggregated into a composite indicator of one dimension, and when dimension indicators are aggregated into an overall composite indicator. Equal weights may be applied if the individual indicators and/or the dimension can be considered equally important, based on the conceptual framework and the purpose of the composite indicator. Equal weighting will often be a suitable solution and perform well compared to other methods and has the advantage of being transparent and easy to explain to users.

6.44 Composite indicators may cover a broad range of dimensions, for example a composite indicator of well-being may include 8-10 dimensions that are different in nature and cover very different aspects of well-being. For such broad types of composite indicators, it may not be possible to estimate and apply explicit weights, or it could be argued that such weights would not make sense. Hence, at the level of the dimensions equal weighting may be the preferred option. It should also be noted that explicit weights of the dimensions, whether estimated by statistical methods, experts' judgments or public opinion, may be interpreted as value judgements about the relative importance of the different dimensions and raise criticism, which will be avoided by using equal weights.

6.45 An example of using equal weighting is the social exclusion composite index based on the 2010 EU-SILC survey conducted in the Netherlands, in which 42 indicators are included for four distinguished dimensions: (1) participation; (2) material deprivation; (3) access to basic rights; and (4) value orientations, which are equally weighted (Coumans and Schmeets, 2015). Eurostat's indicator "at risk of poverty or social exclusion" is another example. This indicator is based on 9 individual indicators included in EU-SILC 2010, distributed into three equally weighted dimensions: (a) at risk-of-poverty after social transfers, (b) persons severely materially deprived; and (c) persons living in households with very low work intensity. Most studies use equal weighting.

Weights based on statistical methods (factor analysis)

6.46 Statistical methods are suitable for weighting of individual indicators which are of similar type and to some extent correlated. Statistical methods include a range of different models. The two most commonly used methods are Factor Analysis and Principal Component Analysis, which are available in statistical software packages such as SPSS and STATA.

6.47 Factor analysis and principal component analysis can be used to group variables into one or more dimensions, the "factors" that are estimated in the models, based on the correlation between the variables. The factors (dimensions) are statistically uncorrelated but each factor will be linearly correlated with the variables that enter the factor. However, since

the grouping of the variables is only based on the statistical correlations, the factors (dimensions) that are proposed by the models may or may not be useful in the context of the composite indicator.

6.48 Factor analysis and principal component analysis also provide estimates of the contribution (the "loadings") of the individual variables on the factors (dimensions), which may be used for weighting the variables together into a composite indicator. The use of such statistical techniques may be seen as less normative and more objective since no a priori assumptions about the weights are required and the estimates are based on a purely statistical analysis of data (see Booysen (2002)).

6.49 In many cases the dimensions to be included in a composite indicated will be given by the conceptual framework of the composite indicator. Also, the individual indicators that are used to form the dimensions may be agreed upon based on the framework or the purpose of the composite indicator. In this case, factor analysis may still be useful as a tool to assess the a priori choice of individual indicators and their distribution on the dimensions of the composite indicator.

6.50 Factor analysis and principal component analysis are suitable for weighting individual indicators into a composite indicator when the individual indicators are correlated and of the same type. While individual indicators will refer to the same dimension, e.g. employment or health, they may still be very different in nature and include both quantitative and qualitative/sentiment indicators that are not related in any way. Factor analysis should not be used for estimation of weights for such heterogeneous sets of individual indicators.

6.51 Factor analysis are not suitable for estimating of weights for the different dimensions of a composite indicator. The dimensions will often cover very different aspects of society or life, be of different nature and may not be correlated. Hence, statistically and conceptually, factor analyses are not suited to weight and aggregate indicators of different dimensions into a common composite indicator, and are not recommended for this purpose.

6.52 In all cases it should be realised that Factor Analysis and Principal Component Analysis are based on a number of statistical assumptions and have their limitations. For instance, the estimation process assume that each individual indicator is normally distributed and that the estimated factors (dimensions) are linearly related to the individual indicators. The methods are not recommended for indicators with a highly non-normal distribution or where the relations are nonlinear.[58]

6.53 The quality of the provided factor solution should be carefully evaluated. This would include a critical evaluation of the estimated weights and the extracted factors, i.e. the dimensions, and their statistical properties. More detailed methodological information can be found in Booysen (2002) and OECD (2008).

Experts' judgements

6.54 Experts' judgement can be used to estimate weights both for individual indicators and for dimensions of composite indicators. The weights may be estimated based on expects' judgement about the relative importance of the individual indicators or the dimensions.

[58] Methods to address nonlinearity are available, e.g. optimal scaling techniques such as categorical principal component analysis and nonlinear canonical correlation analysis (Van der Burg et al., 1994). Partial Least Squares (PLS) may be used to deal with non-normal distributed data and multicollinearity between indicators.

Experts' judgement would include information from field experts and researchers. For composite indicators that cover a broad set of dimensions, it may be difficult to apply experts' judgement since this would require very broad expertise. A composite indicator of well-being, for example, may cover 8-10 dimensions each of which require special expertise and weighting these together in a composite indicator would require knowledge or expertise on their relative importance. For composite indicators with a more limited scope, e.g. composite indicators on health or social exclusion, there may be expertise or studies available that could be used to decide on the weights.

Public opinion.

6.55 Another way to establish weights it by "public opinion". In this approach weights are based on the outcomes of polls or surveys, where people are asked to express which areas matter to them most. Public opinion can be used to estimate weights for both individual indicators and for dimensions but is probably more suitable for estimation of weights of dimensions since estimation of weights for individual indicators usually will require more detailed knowledge. Obviously, the survey should be of sufficient quality to ensure that the weights are of sufficient precision and reliability. Two examples of deriving weights based on public opinions are included in Box 6.4.

Box 6.4

Selecting dimensions and indicators through societal debates

United Kingdom

The Office for National Statistics (ONS) undertook a national debate on 'what matters to you?' between 26 November 2010 and 15 April 2011. In total, ONS held 175 events, involving around 7.250 people. In total the debate generated 34.000 responses, some of which were from organisations and groups representing thousands more. The debate helped to identify the key areas that matter most and ensure that the measures used would be relevant not only to government but also to the wider public. This is crucial to allow for effective development and appraisal of policy for individuals to use information to identify ways of improving well-being, and to allow for assessment of how society is doing overall.

(ONS, 2011)

Italy

In December 2010, the Italian National Council of Economy and Labour (CNEL) and Istat committed themselves to provide the society with a measurement tool capable of identifying the underlying elements of well-being in Italy. This was achieved through the involvement not only of key experts in the various aspects which contribute to well-being (health, environment, employment, economic conditions, etc.), but also of the Italian population at large, through discussions and exchange of views with thousands of citizens, along with meetings held with institutions, social partners and NGOs. This is why BES indicators aim at becoming a sort of "Statistical Constitution", providing a constant and shared point of reference for the Italian society, capable of leading the way to achieve the progress which the society itself is looking for.

(CNEL/Istat, 2013)

6.56 While the public opinion approach may be feasible it should be noted that as opinions may change over time, this may warrant that not only the indicators but also the weights of the dimensions may need to be updated. Usually, it would be preferable to keep the dimension weights constant over time. However, if public opinion about the relative importance of the dimensions change significantly it may eventually be preferred to update the weights. Changing the weights, however, has the disadvantage of creating a break in the time series of the composite indicator, since the development of this will not only be the result of changes in the individual indicators but also in their relative weights.

6.57 Some composite indicators may be produced for different regions or different socio-economic groups of the population. When aggregating such indicators to an indicator for the whole country suitable weights should be applied. Usually, a weighted arithmetic mean would be the preferred solution. Depending on the purpose of the indicator a geometric or harmonic mean may be used, which would give more weights to those regions or socio-economic groups with lower scores.

6.58 In summary, all four methods may be used for estimation of weights of individual indicators. Statistical methods should only be applied for individual indicators that are correlated and of a similar type belonging to the same dimension. For aggregating indicators of different dimensions into one overall composite indicator it is recommended to use equal weighting or to estimate the weights based on experts' judgment or public opinion.

6.4.7 Robustness and sensitivity

6.59 Checks of the robustness and the sensitivity of the composite indicator should be carried out. This would include analysing how much the composite indicator changes in response to changes in the individual indicators and assessing whether the composite indicator can be considered sufficiently robust and whether the sensitivity to changes in the individual indicators appears reasonable and can be interpreted in the context of the conceptual framework of the indicator. Similarly, analysis on the effects of changes in the weights may be carried out.

6.4.8 Indicator validity and links to other statistics

6.60 The validity of the composite indicator should be carefully examined. This involves an assessment of the correlations between the individual indicators and the composite indicator and of the composite indicator itself. Observing the expected correlations between the individual indicators and the composite indicator would indicate a certain validity of the composite indicator. On the other hand, if individual indicators exhibit a different correlation than expected, and perhaps assumed in the conceptual framework, the selection of individual indicators, data sources and the construction of the composite indicator should be critically reviewed.

6.61 It is difficult to assess the validity of the composite indicator itself, does the indicator measure the phenomenon it is intended to measure? This is because composite socio-economic indicators often aim to measure complex and multidimensional phenomena, e.g. safety, well-being or quality of life, that cannot be observed directly, and where there will not be a reference series that the indicator could be compared to. Where possible it is

recommended to compare the indicator to other relevant statistics. For example, an indicator on well-being may be compared to statistics on personal or household income, education or employment situation, or to available subjective measures of the quality of life (see Boelhouwer (2010)). If the composite indicator behaves differently than expected when comparing with other related statistics, it should be reviewed. It should also be kept in mind that differences compared to related statistics may need to be explained when the composite indicator is published.

Experimental Statistics

As socio-economic indicators and composites are a relatively new terrain for most NSO's, some of them classify these new statistics as 'experimental'. This is for instance the case in Mexico, where measures of subjective wellbeing are presented, following the recommendations of OECD. Moreover, not only general life satisfaction, but also satisfaction with dimensions like family life, social life or health are reported.[59]

6.5 Recommendations

6.62 Drawing from the arguments presented in this chapter, we arrive at the following recommendations:

- The first and crucial step in developing a composite socio-economic indicator is to establish a conceptual framework, which defines the phenomenon to be measured, the dimensions and the individual indicators and how these are related. It is recommended to engage stakeholders, experts and user groups in developing the framework of the indicator to ensure that it meets user needs and to draw on their expertise. The conceptual framework should also refer to other relevant statistics, theoretical material, studies and research.
- The quality of the individual indicators should be validated and checked. It should also be ensured, as far as possible, that data will be available for future updates of the indicator.
- After forming the framework of the indicator and selecting dimensions and individual indicators data series and relation between series should be analysed. This would include imputation of missing observations, multivariate analysis and normalisation of data. It is important to keep in mind that choices in each step can have implications for next steps.
- Decide how weights should be constructed at the different levels of aggregation, from individual indicators to composite indicators of dimensions, and from dimensions to an overall composite indicator. The weights are crucial for the performance of the indicator and its interpretation. Hence, the choice of weights should be in line with the conceptual framework and the intended use of the indicator and should be justified and documented and explained to users.
- Carry out test of robustness and sensitivity tests to evaluate the stability of the composite indicator. Does the indicator behave as expected in response to changes in the individual indicator or in the weights and can the results be interpreted and explained? Depending

[59] For more information, see http://en.www.inegi.org.mx/proyectos/investigacion/bienestar/piloto/

on the results of the evaluation it may be necessary to go back in the process and implement changes, for instance in the selected individual indicators, in the normalisation of indicators or in the weightings.

- The indicator should be compared with available related statistics which can help to assess the quality and relevance of the indicator.
- The indicator should be published with sufficient documentation and explanations to facilitate correct understanding and use of the indicator. Both the composite indicator as well as the individual component series should be made available to users.
- Due to developments in society socio-economic composite indicators may be especially prone to changes. Following up with users and stakeholders can help to ensure the indicator maintains its relevance.

7 Communicating LCS indicators

7.1 Introduction

7.1 Leading, composite and sentiment indicators provide a powerful way of communicating. Indicators can be used to produce statistics on new areas, reaching out to new user groups and be used to support evidence-based decision making. However, there are also challenges in the communication of indicators. In particular, indicators are produced for specific purposes and in a specific context, which need to be communicated to users. At the same time, indicators produced by statistical offices must be based on the principles of official statistics and meet the quality requirements of official statistics.

7.2 Section 7.2 lists the main challenges associated with communicating LCS indicators. Section 7.3 presents the key quality criteria for communicating official statistics and provides recommendations on how to meet the quality criteria when communicating LCS indicators. Section 7.4 gives advice on how to present indicators in their right context to ensure proper understanding and the use of the indicators. Section 7.5 gives brief recommendations for targeting user groups. Section 7.6 gives a brief overview of means of communication and visualisation methods and provides examples of dissemination of composite economic indicators and composite socio-economic indicators. A summary of the recommendations for communicating LCS indicators is presented in section 7.7

7.3 The chapter draws in particular on *Towards a harmonized methodology for statistical indicators* (Eurostat, 2017) where more details about the communication of indicators can be found.

7.2 Challenges in communicating LCS indicators

7.4 LCS indicators should be disseminated and made available to users as other statistics produced by NSOs, according to the principles of official statistics. However, the communication of LCS indicators raises particular challenges for NSOs.

7.5 LCS indicators are developed for specific purposes and in a specific context. The indicator gets its meaning from its context in terms of the theoretical/conceptual model or framework that forms the basis of the indicator. The user of the statistics will interpret, or *decode*, the meaning of the indicator, based on the provided information and her/his specific context. Hence, there is a risk that the receiver's interpretation of the meaning of the indicator may deviate from the intended meaning.

7.6 Compiling and disseminating LCS indicators may raise criticism. The methods used and the validity of the indicators may be subject to political dispute and the impartiality of the NSOs could be questioned. Eventually, it could harm the general trust of the statistics produced by the NSO. Further, some indicators, for an example a composite indicator on health, personal security or standard of living, may include a normative interpretation of the statistics in terms of desired or favourable development of the indicators. This is different from the traditional situation, where the NSO is seen as the provider of bare statistical

information and where it is left to the users to make any judgment whether the development of the statistics is desirable or favourable.

7.7 Disseminating LCSs indicators may require use of presentation and visualisation methods that may not be familiar to the NSO. These may include interactive solutions, where the users can adjust the visualisation or even the underlying selection of data (f. e. by changing weights), as well as multi-dimensional visualization techniques. Nevertheless, simple visualisation methods can still have advantages over more sophisticated solutions in terms of usability[60].

7.8 Successful development and communication of LCS cannot be ensured through only one-way communication, but will require reaching out to and communicating with stakeholders and users.

7.9 There is a lack of international recommendations or agreed frameworks, on the basis of which LCS indicators could be compiled and disseminated. Hence, there is a lack of guidance on e.g. in which forms to disseminate data, what documentation should be provided and which quality criteria should be applied and how.

7.3 Quality criteria for communicating LCS indicators

7.10 Indicators produced by NSOs must meet user needs and at the same time be based on the quality requirements of official statistics. Several quality assurance frameworks for official statistics were mentioned in chapter 2. The frameworks cover Institutional environment, statistical processes and statistical output and list a number of criteria to be met to ensure the quality of the statistical production. The mentioned frameworks diverge to some extent and provide different levels of detail, but essentially cover the same criteria required to ensure that statistics produced are relevant, timely and accurate and comply with the principles of professional independence, impartiality and objectivity. While the production of the indicators should meet all criteria of the official statistics, the criteria of relevance, accuracy and reliability, coherence and comparability, accessibility and clarity and timeliness and punctuality should be met in the communication of indicators.

Relevance

7.11 The relevance of statistical information reflects the degree to which the information meets user needs. Relevance therefore refers to whether the statistics that are needed are produced and whether those that are produced are in fact needed. Assessing relevance is subjective and depends upon the varying needs of users. The statistical agency's challenge is to weight and balance the conflicting needs of current and potential users in order to produce statistics that satisfy the most important needs within given resource constraints.

7.12 LCS indicators can provide information about areas not covered by existing statistics and help reaching out to new user groups. In this way, LCS indicators have the potential to increase the relevance of official statistics. To ensure the relevance, potential users of the indicators should be consulted. Users will be able to give information on e.g. what they

[60] f. e. the ONS replaced their "Wheel of well-being" with interactive line charts for each indicator to increase usability, see https://blog.ons.gov.uk/2017/03/28/national-statistical-blog-reinventing-the-well-being-wheel/

consider more important, what documentation and additional explanations will be useful and in what form data may be released to serve user needs. Consultation with users may, for instance give information on what component series should be included in a composite indicator (and their relative importance) or which specific questions should be included in a survey based sentiment indicator.

7.13 Users can be consulted through reaching out to agencies, individuals or groups that are known to have an interest and knowledge in the area. Broader user groups can be reached through surveys.

Accuracy and reliability

7.14 Statistics should accurately and reliably portray reality. The accuracy of statistical information reflects the degree to which the information correctly describes the phenomena it was designed to measure, i.e. the degree of closeness of estimates to true values. Reliability concerns whether the statistics measure the reality that they are designed to represent consistently over time.

7.15 A distinction can be made between indicators with references series (a series that an indicator aims to approximate or predict) and indicators without reference series, as explained in chapter 3. The accuracy and the reliability of indicators with reference series can be illustrated and analysed in a simple way by comparing the indicator with the reference series in graphs or tables. Leading indicators, for instance an economic business cycle indicator, should be assed against its ability to anticipate turning points and periods of booms or recessions. While leading indicators aim to anticipate the development in a reference series, the GDP growth rate, for example, NSOs should be careful not to publish these as the NSO's forecast of the GDP growth.

7.16 For indicators without references series it is not possible to illustrate the accuracy or the reliability of the indicator by comparing to the reference series. However, providing time series of the indicator can give an impression of the reliability of such indicators, if they are moving in the expected directions compared with related statistics or indicators. For instance, sentiment indicators on households' subjective satisfaction with their economic situation, their health or their commuting time for work can be provided together with existing statistics on income, health or transport. While the indicators may not target these measures specifically, comparisons may be useful and give an indication of the accuracy and reliability of the indicators.

7.17 In general, it is important to inform about the uncertainty of the statistics and the associated limitations in their interpretation. If exact figures are published the uncertainty should be communicated, e.g. by providing confidence intervals or fan charts. Other options are to publish only intervals or magnitudes, rather than point estimates, or only the direction of the movement of the indicator. For detailed information readers are referred to the Handbook on Cyclical composite Indicators (Eurostat and UNSD, 2017).

Coherence and comparability

7.18 Coherence and comparability imply that statistics are consistent internally and over time and comparable over statistical domains and geographical areas. This also implies that the statistics should be produced using common standards with respect to scope, definitions, classifications and units.

7.19 Detailed communication of the scope, definitions, classifications and units of published statistics are essential to ensure their correct and efficient use.

7.20 Caution is needed if methods or practices concerning the choice or weighting of component series or survey questions for sentiment indicators are changed. This is due to the risk that changes of component series, and other changes in data sources or methodology, may be seen as an attempt to change the development of the indicator. Hence, such changes should be communicated and carefully explained to users, if possible in advance. Similarly, choices in survey questions that enter sentiment indicators may be changed, which should also be documented and communicated to users.

Accessibility and clarity

7.21 Statistics should be made available in a clear and understandable form, accessible to all users on an impartial basis in suitable and convenient formats. Documentation and supplementary explanation, which are necessary for the proper understanding of the statistics and the appropriate uses to which they can be put, should be made available by the statistical agencies. This information should normally cover the underlying concepts and definitions, origins of the data, the variables and classifications used, the methodology of data collection and processing, and indications of the quality of the statistical information.

7.22 Transparency is essential when communicating indicators, and users should be provided with the necessary explanations and documentation of data sources and methods to facilitate the correct use of the statistics and to avoid their misinterpretation or misuse. Not only the composite indicator should be provided but also component series should be made available to users. Questions, which are used in surveys, should also be made available. To ensure proper understanding and use of indicators the context of the indicators should also be provided and explained to users. This is dealt with in more detail in Section 7.4.

7.23 As part of the dissemination it needs to be considered how to present data. Is the key indicator a measurement of the development over time or a snapshot of the situation at a given point in time? Should only the raw, unadjusted indicator be provided or should also e.g. trends be published? If the indicator is sub-annual, it should also be considered whether data should be seasonally adjusted and if trends should be provided.

Timeliness and punctuality

7.24 Timeliness refers to how fast after the reference period data are released. Punctuality refers to whether data are released on the expected, preannounced dates. LCS indicators should be released according to international recommendations on timeliness and punctuality, which should not raise particular issues compared to the release of other official statistics.

Experimental statistics

7.25 It may be the case that an indicator does not meet the quality criteria that are applied by the NSO. In such cases, the NSO has the possibility to publish the indicator as "experimental statistics". When using this approach, it should be explained that the indicator does not meet the quality criteria of official statistics applied by the NSO. Dissemination as experimental statistics can be a useful way to collect feedback from users and experts and will allow the NSO to gain experience on the accuracy and reliability of the indicator. This can be used to improve the compilation of the indicator, which eventually could be disseminated with the stamp of official statistics once the quality criteria are met.

7.4 Presenting indicators in the right context

7.26 Indicators are context-specific, contrary to statistical data in general which can be used for multiple purposes. Depending on the specific context, indicators can convey different messages and support decision making. It is therefore of crucial importance that the context of the indicators is accurately and transparently communicated to provide the users with the right background. This allows them to correctly interpret and use the indicator.

7.27 A description of the context of an indicator should include documentation and explanations of the following issues:

- The purpose of the indicator
- How the indicator is compiled
- The intended use of the indicator

The purpose of the indicator

7.28 The purpose of the indicator has two aspects that should be explained to users: why it is being produced, and what the indicator aims to measure.

7.29 Indicators may be produced to shed light on particular phenomena or developments, such as the economic business cycle, well-being in general or particular dimensions of well-being or households' perception or expectations on their employment or health situation. The indicator may be produced in response to a general interest or with the purpose of providing statistical information to be used in social or economic programmes or for policy decision. Information about why the indicator is being produced is part of the context of the indicator and helps to ensure correct understanding of the indicator and transparency. The purpose of the indicator in terms of what it aims to measure should be presented in a clear and understandable way for the intended users.

How the indicator is compiled

7.30 Composite indicators and its component series provide the statistical frame for understanding the indicator. It is recommended, therefore, to publish not only the composite indicator but also the detailed component series should be made available to users. The indicator and its component series should be documented and explained in necessary details for users to understand the composite indicator, evaluate its relevance and quality and make correct use of the indicator.

7.31 The selection of the component series should be explained as well as their (expected) relationship with the composite indicator and the methods and weights used for their aggregation. It is also useful to explain if the component series are input or output measures compared to the composite indicator. For instance, a composite indicator on health may include a component series on the number of physicians, which will be an input measure, or a component series on self-assed health situation, which would be an output measure. The indicator and the component series should ideally form a consistent system of indicators that would facilitate communication in a coherent way and elaboration of appropriate story lines.

The intended use of the indicator

7.32 Presenting indicators in the right context and providing suitable documentation and explanation helps to reduce the misinterpretation and misuse of indicators. However, in addition to this it is useful to explain more explicitly the intended use of the indicator to guide users on the correct use of the indicators.

7.33 When looking at the way indicators may be used a distinction can be made between the instrumental and the conceptual use of the indicators. *Instrumental use* refers to the use of indicators 'as direct input to specific decisions'[61]. In this case, policy makers use them to steer policy along the different stages of the policy cycle. Indicators play a crucial role in monitoring and assessment of the impacts of existing policies on political decisions. For instance, indicators can help in the decision making stage to choose among several policy options, or in the policy assessment stage to identify strengths and weaknesses and provide recommendations for improvement. Examples would be a sentiment indicator showing households' satisfaction with public transport, which could feed into discussions and decisions about public transport, a leading economic indicator that could be used by businesses or policy makers, or a composite index of well-being that could be used to form socio-economic decisions and priorities.

7.34 *Conceptual use* is the use of indicators to shape conceptual frameworks for assessments and ways of thinking. It relates to the 'percolation of new information, ideas and perspectives into the arenas in which decisions are made'[62]. In this way, the use of indicators may help decision-makers to define a problem and to provide new perspectives and insights. The conceptual use differs from the instrumental use in the sense that it does not directly influence a decision, but provides a context for discussion and improves users' information base. As one obvious example a composite indicator on health may consist of a number of component series representing different aspects of health (e.g. mortality rates, life expectancy, and self-assessed health situation) which will then provide a frame for discussing health.

[61] Lehtonen (2008)
[62] Weiss (1999, p.471)

7.35 For composite indicators their particular virtue is that they can summarise the situation or the development of a multidimensional phenomenon in one measure. However, they cannot stand alone. To understand the development of the composite indicator it is necessary that also the component series are made available. Their development can help to explain which component series are the main drivers of the change. If composite indicators are used to inform political decision making it is even more important also to publish and explain the development in the component series. A composite indicator on the quality of employment may show an unfavourable development, but to be useful as input to the formulation of policy decision on how to improve the situation it is necessary to know how the component series developed.

Box 7.1
Problems associated with the use of indicators

Decontextualisation is a common risk in the use of indicators. It occurs when indicator information is taken out of context and interpreted in an incorrect way. In such cases other information that may be important for understanding the problem at hand might be ignored. Documentation that accompany an indicator can help to avoid decontextualisation, provided it clearly explains what the indicator aims to measure and how it should be interpreted and used.

Goal displacement happens when a measure becomes a target, in which case it may cease to be a good measure. When a goal is represented by a specific measure, stakeholders may start striving towards that measure and lose sight of the goal behind it. For example, if a country focuses on the 'number of physicians per thousand people' as an indicator of quality of health services, the target might be shifted towards increasing that number while neglecting the quality of the service provided by these physicians, the state of medical facilities and other essential elements of healthcare.

7.36 Composite indicators may be produced in a normative context in the sense that the indicator and its component series are associated with favourable or desired directions of development. Many users, including the media, would be interested in simple messages if developments are 'good' or 'bad'. However, most statistical offices would be cautious to publish interpretations or assessment of whether particular developments are 'good' or 'bad'. The NSO would not consider this as part of the role of official statistics but leave such interpretation of the statistics to the users.

7.37 The favourable or desired directions of development of the composite indicator and its components stem from the context of the composite indicator. If the composite indicator is based in a clear context with a clear purpose and with a coherent system of component series this will help to justify the selection of indicators and the desired developments. Explaining desired developments in the context of the indicator and the purpose it serves will help to prevent that these are seen as expressing the views or judgment of the NSO.

7.38 An example of providing favourable or desired directions of development is shown in Box 7.2. The example shows the quality of employment dimension of the Israeli Well-being, sustainability and national resilience indicators. The composite indicator of quality of employment is made up of eight component series, each of which are presented with a desired direction. For instance, an increase in the employment rate is desired and will add to

the composite indicator, while an increase in part time involuntary employment is not desired and will decrease the composite indicator.

7.39 In summary, NSOs need to find a balance between maintaining their impartiality and the general trust in official statistics while meeting user demands. To this end, the indicators should meet the quality criteria applied by the statistical offices and be carefully communicated to users and the public in general. This includes providing documentation of methods and data source and explanation of the purpose and the context of the indicator and guidance on its correct use and interpretation.

Box 7.2

Well-being, sustainability and national resilience indicators, Israel

Trends in Selected Indicators of Quality of Employment 2015

	Desired direction	% change compared with previous year	Direction of change compared with previous year	% change compared with base year2002	Direction of change compared with base year	
Employment rate	↑	0.5	↑	24.8	↑	
Rate of persons employed part-time involuntarily	↓	13.0	↓	72.7	↓	
Median gross income from work per household*	↑	2.6	↑	22.2	↑	
Satisfaction with work	↑	1.0	↑	8.5	↑	
Satisfaction with income	↑	-0.9	~	31.6	↑	
Rate of persons injured in work accidents*	↓	2.8	↓	50.7	↓	
Rate of prolonged unemployment (over six months)	↓	-4.8	↑	25.8	↓	
Average*	↑	3.5	↑	31.8	↑	

Source: CBS-IL (2015)

7.5 Targeting user groups

7.40 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 NSOs to reach a wider audience.

7.41 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:

7.42 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;

7.43 Citizens or the general public, i.e. people without or with limited statistical knowledge

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

7.45 The primary interest of **specialists** is to receive precise and detailed information, including exact methodological definitions, presentation of the statistical trends, coherent time series, detailed metadata, etc. In this regard, and given their familiarity with the topic and ability to analyse related data, they have less need for additional explanations for the correct interpretation and use of the statistics.

7.46 As regards **citizens,** which normally do not have specialist knowledge in statistics, their main need is easy accessibility to the content of the indicators and careful explanations on their use and interpretation. It is essential to use appropriate tools and channels to convey the relevant statistical information to the broader public of non-specialists, including also potential users of the indicators that may not be familiar with statistical information.

7.47 Composite indicators are 'media' friendly in the sense that they communicate the essence of a complex situation or development in one number. On the other hand, this is also one of the risks of composite indicators; they may lead to oversimplification and wrong conclusions. This underlines the need to explain the context of the indicator.

7.48 To appropriately address the communication needs of the 'general public', carrying out a detailed segmentation analysis of this broad group is useful. Thus, within the general public one could outline user groups such as policy-makers, youngsters, university students, pensioners, families, representatives of the civil society or 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.

7.6 Means of communication and visualization methods

7.49 LCS indicators can be communicated through the same channels as other statistics. Hence, they may be disseminated in the online database or on the webpage of the statistical office and through newsletters and on social media.

7.50 Web-based application or platforms can be important ways of communicating LCS indicators. Many users and analysts are active within the social Medias, such as Twitter, Facebook or Instagram, which may be used for the dissemination in addition to making the information available on the NSO's website. If possible, the indicators may be produced in formats that allow for communication through different platforms or applications and reaching out to different user groups.

7.51 Indicators can be presented in tables with their values and in various graphical forms. The value of the indicator or its development may also be presented by using simple symbols

or icons. The symbols can be used to indicate the direction of the development of an indicator, and for instance if the indicator has moved in a favourable direction or closer to some agreed target. Possible symbols that could be used would include arrows (up, down and horizontal) traffic lights and smileys, for instance, which easily catch the attention and communicate the message.

7.52 Additional guidelines on communicating and visualizing statistical can be found in indicators can be found in Eurostat (2017) 'Towards a harmonized methodology for statistical indicators - Part 2: Communicating through indicators', and in UNECE (2009-2014) 'Making Data Meaningful Part 1-4'.

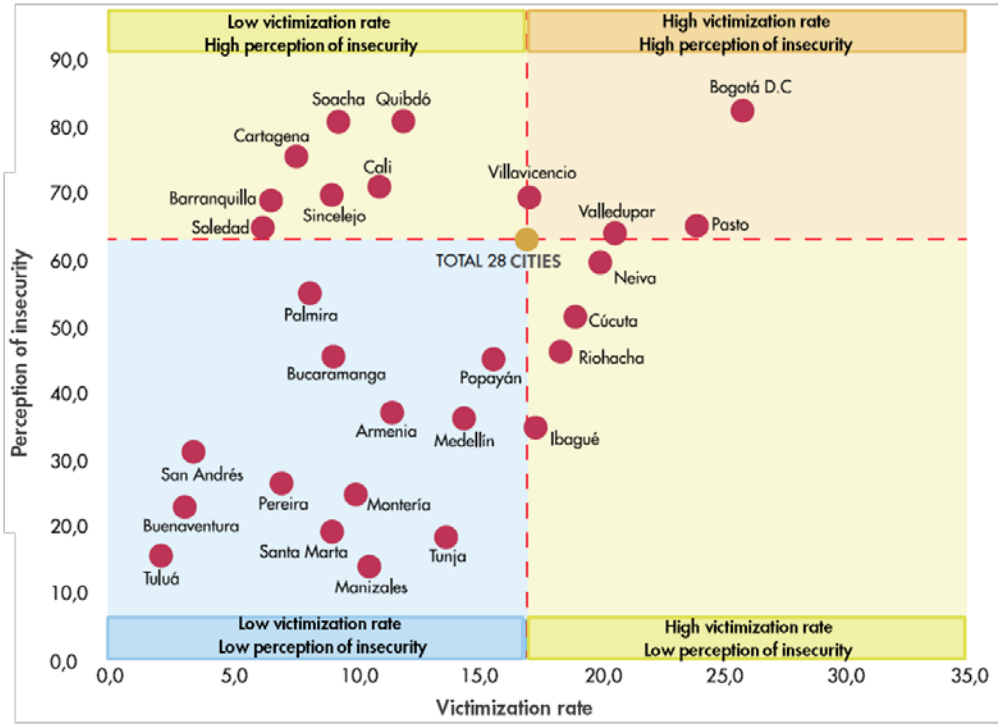
7.6.1 Sentiment indicators

7.53 Especially in the case of socio-economic sentiment indicators that have a topic-related series to compare to, one might be interested rather in the correlation between those two, as in their development over time. A simple yet powerful visualization method for this kind of exercise are scatter plots.

Box 7.3
Example: Colombia

In Colombia, the perception of insecurity (PIC) indicator reflects the percentage of the population over the age of 14 that feel insecure in the city where they live. The victimization rate of the same population can be seen as related series to the sentiment expressed in the PIC. Identifying clusters, if present, can help to improve the compilation of the indicator or to identify further needs.

Colombia Perception of insecurity and victimization rate



Note: The graphic shows how not always the perception of insecurity is defined by the victimization rate of a city. There are cities like Bogotá, D.C. and Pasto that have the highest rates of victimization and where people feel more insecure. However, cities like Barranquilla or Cartagena report high levels of perception of insecurity, even though they have low levels of crime.

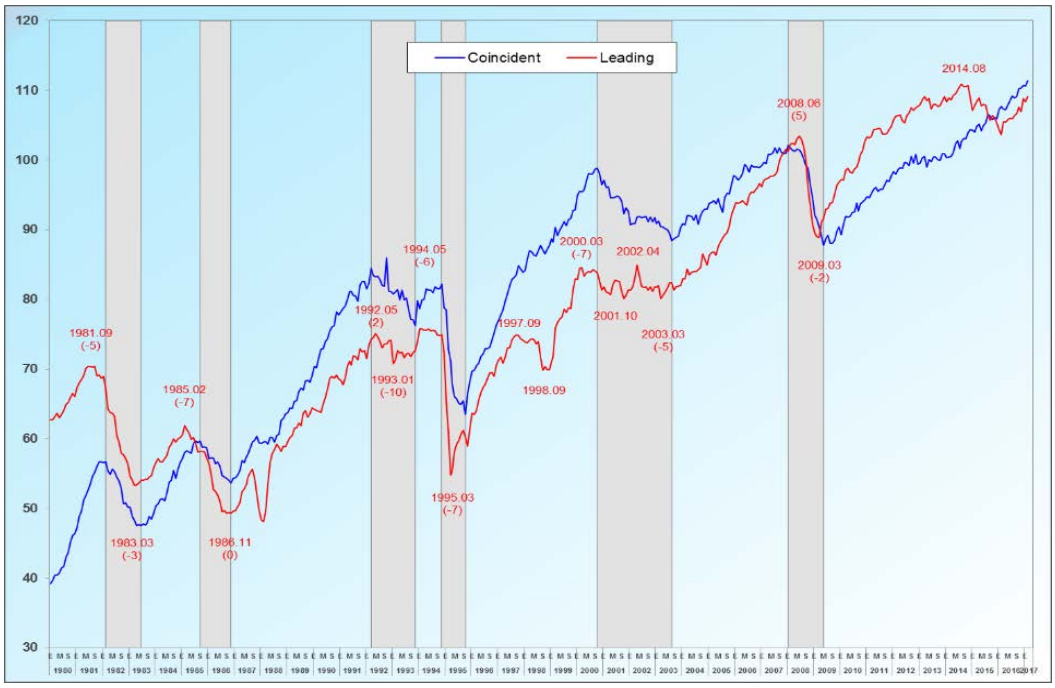
7.6.2 Composite economic indicators

7.54 Many composite economic indicators aim to estimate or anticipate the development in a reference series, for example of the GDP. It is therefore suitable to show these as time series in graphs.

Box 7.4
Example: Mexico

In Mexico, both the leading indicator and the reference series are composite indicators. The reference series include other indicators than those related to the goods and services production, e.g. indicators of the labour market, to improve the detection of turning points. The reference series, in turn, has itself a reference series, the GDP. A more detailed discussion of this example can be found in the Annexes.

Mexico Coincident and Leading Indicator Performance



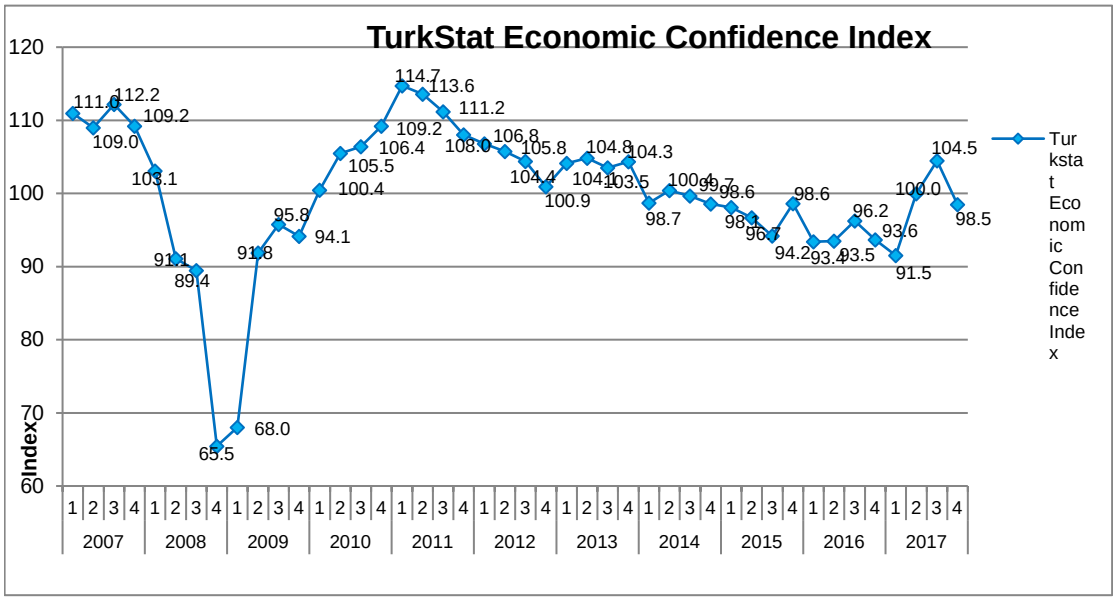
Note: Figures above the leading indicator graph refer to the anticipation of peaks and figures below the graphs refer to the anticipation of troughs.
(Business cycle, Base 2008 = 100)
Source: INEGI.

7.55 Some composite economic indicators do not have a reference series, such as, for example, composite indicators which aim to measure the general confidence of the economic development. Such series can also be shown as time series in graphs. Below is an example from Turkey.

Box 7.5
Example: Turkey

Economic confidence index of Turkey is a composite index, encapsulating the evaluations, expectations and tendencies of both consumers and producers on general economic situation. The index is weighted aggregation of sub-indices of consumer, manufacturing industry, services, retail trade and construction sectors confidence indices. It is a monthly index, though following graph indicates the quarterly averages.

Turkey Economic Confidence Index



Source: TurkStat

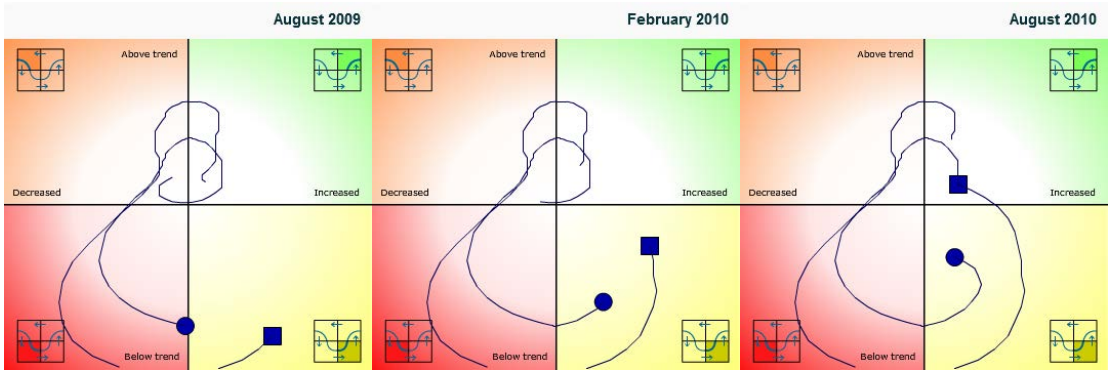
7.56 Indicators may also be presented in interactive video graphics.

Box 7.6

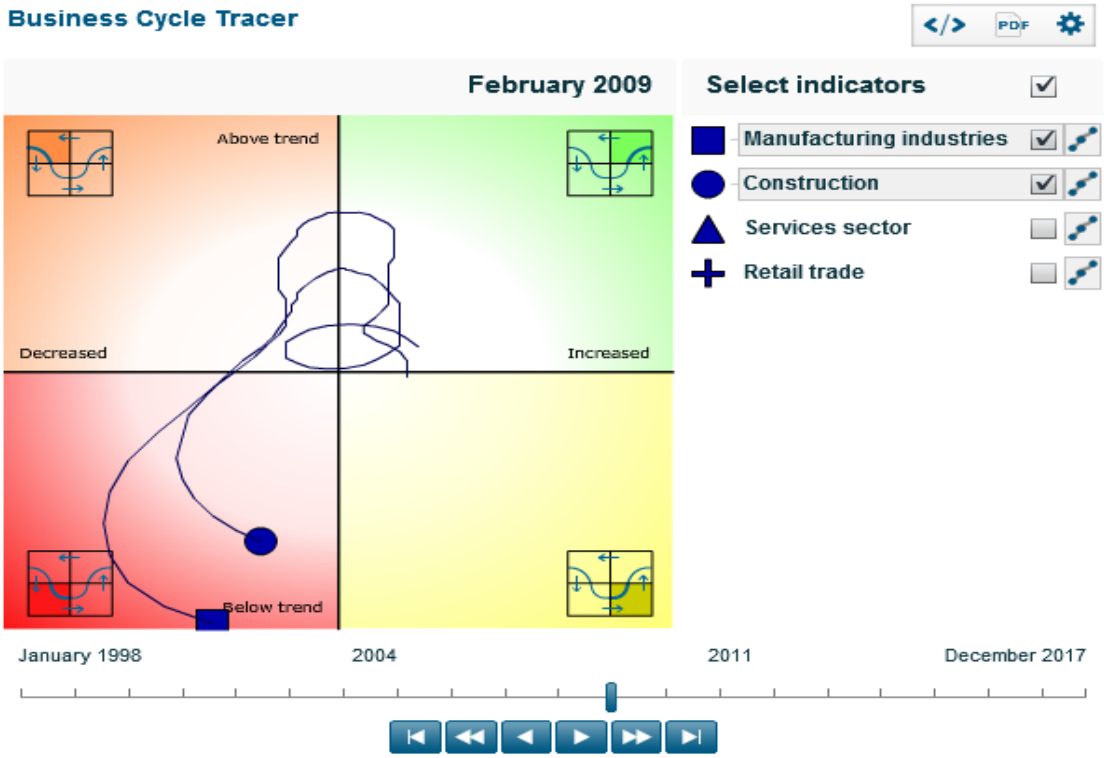
Example: Denmark

Interactive graph showing business tendency cycles

Along a timeline business tendency indicators move in cycles. In the graph the cyclical movements are transformed into circular movements which the user can display by selecting "play". Below you can see a sequence covering the period from August 2009 until August 2010.



Additionally, the user can set the trailing and the displayed indicators among other options. In the figure below you can see the interface as seen by the user. In the example, the indicators 'Manufacturing industries' and 'Construction' are selected with a trail length of 5 years.

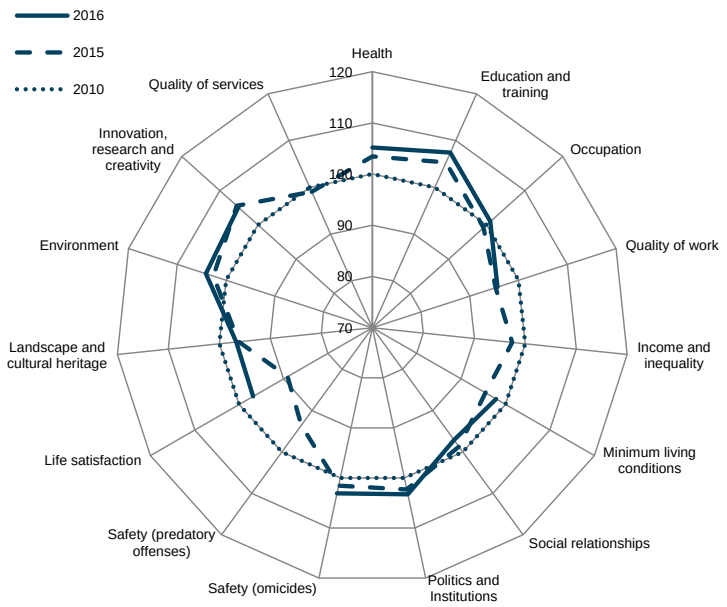


Source: Statistics Denmark, Business Cycles. Based on graph developed by Statistics Netherlands. See https://www.dst.dk/en/Statistik/emner/erhvervslivet-paa-tvaers/konjunkturbarometre/konjunkturcyklus

7.6.3 Composite socio-economic indicators

7.57 Visualization should include both the composite indicator as well as its components.

Box 7.7
Example: Italian Equitable and Sustainable Well-being



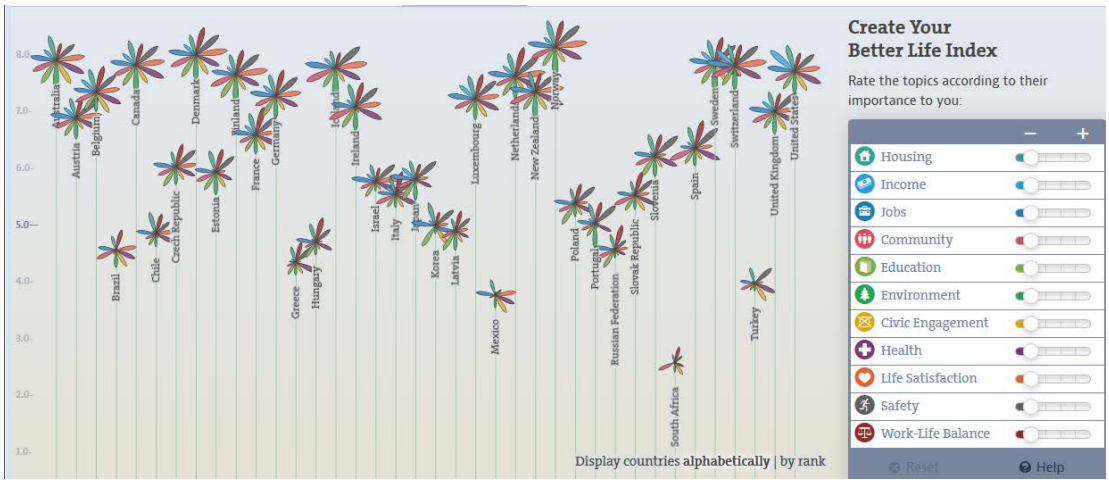
(a) Data referred to the first semester in 2016; (b) Data referred to 2016; (c) Italy 2008=100

Example of Italian BES: composite indicators for Italian well-being – years 2010, 2015-2016. Italy 2010 = 100

A spider web visualization is chosen in Italy. The 'Equitable and Sustainable Well-being' (Bes) developed by Istat consists of 130 indicators within 12 domains. For each domain a set of representative indicators has been identified in a way to give an image of the main attributes of the domain. The figure reports the evolution of the composite indicators for Italy for 2010 and 2015-2016 for a total of 15 composite indexes. Although the well-being domains considered in the BES framework are 12, for some of them two separate composite indexes have been calculated. A more detailed discussion of the composition of the indicator can be found in the Annexes.

Box 7.8
Example: OECD

Example. OECD Better life index



OECD Better Life Index (taken from http://www.oecdbetterlifeindex.org/ accessed January 2018, equal weights used)

An interesting example is the OECD's 'Your Better Life Index' which for each country aggregates several dimensions of well-being into a single composite indicator. The graph shows the ranking of the countries in the case where the dimensions are equally weighted. Website visitors can assign their own weights to the dimensions, according to the importance each dimension has for them. If, for instance, a user considers health and environmental quality as the most important aspects of 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 given more weight. The interactivity that is built into the dissemination of the indicator makes it possible to collect information about users' evaluation of the underlying dimensions of the indicator. This will give information about what matters to people, and may in turn be used to establish weights for the dimensions. This information is only sent if the user actively choses to share his index. Furthermore, by clicking on a certain country, the user has the possibility to access the specific country's site with a detailed presentation for each dimension.

7.7 Summary of recommendations

- It is up to the NSO to evaluate user needs and decide if the organisation should engage in the production of indicators. If an NSO decides to engage in the production of indicators, the following recommendations are provided regarding their publication and related communication. While communication might also be important in the process of production, those issues were addressed in chapter 2 already.
- Cooperation with stakeholders and users can help to ensure that the indicators are relevant and seen as legitimate; it is a way to capture expert advice, and it can help to

build a broader ownership of the indicators, to better ensure they are used, supported and promoted.

- The purpose of the indicator, data sources and methods should be made available to users. The context of the indicators should be carefully explained to ensure correct understanding and use, and avoid misunderstandings and misuse.
- Importance should be given to explain the selection of component series and their weights in a composite indicator. Questions used to form sentiment indicators should also be documented and made available to users. Desired or favourable developments of indicators should derive from the purpose and the framework of the indicator and not be published as expressing the views of the NSO. If indicators do not meet the quality criteria, they may be published as experimental statistics.
- Indicators can be disseminated through the channels used for other statistical output, including databases, websites and newsletters. It is helpful to target the communication to intended user groups, which may also include groups that are not familiar with using statistical information. In many cases it is helpful to illustrate indicators or their developments by use of icons, such as arrows, different colours or traffic lights.

Annex: Country examples

Example 1: Dissemination of the Mexican System of Cyclical Indicators[63]

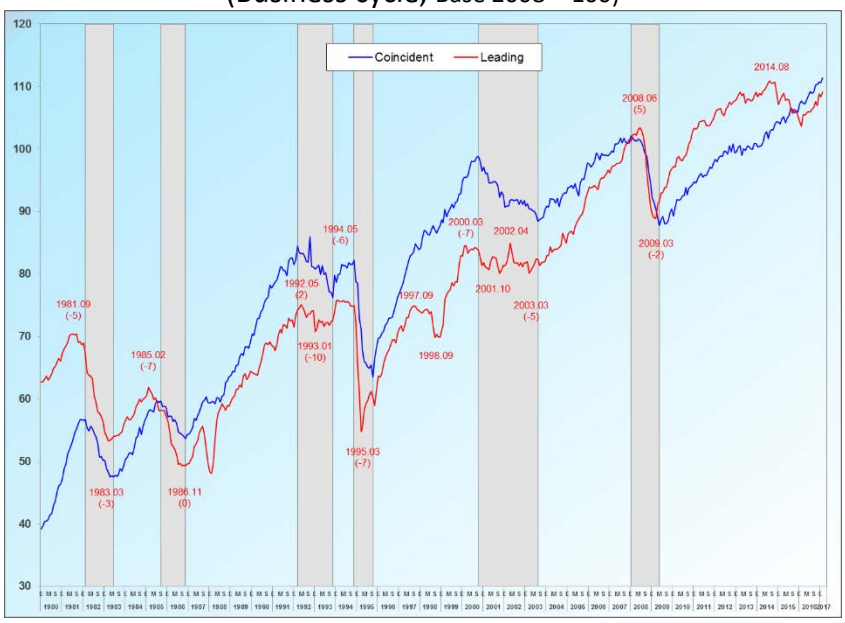
Background

In 1998 the INEGI began the construction of the first Mexican System of Composite Indicators (SCI_1) that was released in the year 2000. The system included the coincident and leading indicators. The coincident indicator reflects the general state of the economy while the leading indicator seeks to anticipate turning points (peaks and troughs) in the first one. The reference series is the coincident indicator.

Both indicators summarized and showed common patterns of economic trends and turning points in a clear way. The methodology used was based on that originally developed by the National Bureau of Economic Research. Until October 2010, the INEGI monthly disseminated coincident and leading indicators under the approach of classical or business cycle. It means that results were expressed in levels.

Coincident and Leading Indicator Performance

(Business cycle, Base 2008 = 100)



Note: Figures above the leading indicator graph refer to the anticipation of peaks and figures below the graphs refer to the anticipation of troughs.

Source: INEGI.

[63] Prepared by Yuriko Yabuta. National Institute of Statistics and Geography (INEGI), May 2017. The comments expressed in this paper are those of the author and do not necessarily reflect the view of the INEGI.

In general, from 1980 to 2008, the leading indicator fulfilled its function to anticipate the turning points of the coincident indicator, averaging 5.8 months on peaks and 5.2 months on troughs.

But, since the composite indicators were constructed (in 1998) taking into account the history of internal shocks or a combination of these and exogenous shocks, the leading indicator did not anticipate the beginning of the recessive phase in 2008[64], due to the fact that the recession came from abroad and was spread through a drop of Mexican exports, remittances by Mexican emigrants from the United States (U.S.) and the decline of foreign tourism[65].

This fact led us to think about the need to update the system reviewing their components and ask ourselves if it was necessary to give more weight to the last recession when constructing the new leading indicator.

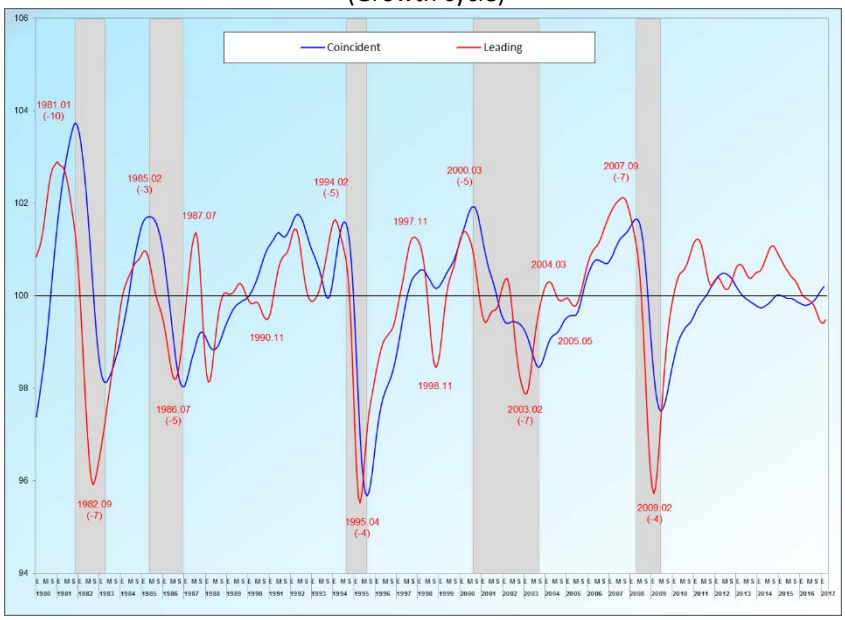
A new System of Composite Indicators

Because of our research activities on new tools to track the business cycle and considering international comparability it was decided to generate a new system of composite indicators using the same methodology as the OECD. This work began in the first half of 2010. The new name was: System of Cyclical Indicators (SCI_2). There was a change in the indicators composition, also.

The methodology was based on the "growth cycle" approach. This defines the economic cycle (the cyclical component) by deviations of the economy from its long-term trend.

System of Cyclical Indicators

(Growth cycle)



Note: Figures above the leading indicator graph refer to the anticipation of peaks and figures below the graphs refer to the anticipation of troughs.
Source: INEGI.

[64] Despite this fact, the analysis of many other economic indicators was showing that a recession was coming.
[65] Nevertheless, the leading indicator anticipated the recovery of the coincident one.

Five years later, by the end of 2014, a planned revision and update was carried out. The first results were released on April of 2015. Basically, the coincident and leading indicators components remained unchanged. The more important changes were: in one hand, the introduction of a sentiment indicator "Business confidence indicator: adequate time for investing" (fixed investment), which showed to be a leading variable and, in the other side, non-oil exports were dropped out from the leading indicator.

Components		
SCI_1	**SCI_2**	**Revised SCI_2**
December 2000	November 2010	April 2015
Coincident Indicator	**Coincident Indicator**	**Coincident Indicator**
An estimation of monthly GDP	An estimation of monthly GDP	Global indicator of economic activity
Industrial production index	Industrial production index	Industrial production index
Retail sales	Retail sales	Retail sales
Workers registered at the Mexican Institute of Social Security	Workers registered at the Mexican Institute of Social Security	Workers registered at the Mexican Institute of Social Security
Rate of partial employment and unemployment	Urban unemployment rate	Urban unemployment rate
Real wages in the Maquiladora Export Industry [1/]	Total imports	Total imports
Leading Indicator	**Leading Indicator**	**Leading Indicator**
Hours worked in manufacturing Average price of Mexican crude oil export	Manufacturing employment trend Non-oil exports	Manufacturing employment trend Business confidence indicator: right time to invest in manufacturing
Price index of the Mexican stock exchange	Price index of the Mexican stock exchange	Price index of the Mexican stock exchange
Real exchange rate	Real exchange rate	Mexico-USA real exchange rate
Interest rate	Interest rate	Interest rate
Industrial production index: construction component	Standard & Poor's 500 Index (USA)	Standard & Poor's 500 Index (USA)

[1/] It was included for the last time in March of 2007 because the Program of the Maquiladora Export Industry disappeared by government decree and, therefore, its statistics.

Dissemination adjustments

The monitoring began to indicate the need to make some adjustments in order to help users to understand the functioning of the cyclical indicators system.

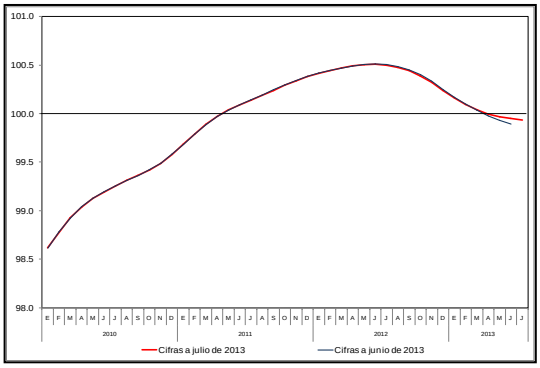
It was perceived that users should be aware that coincident and leading indicators may change as new data are incorporated. So, in October of 2013 it was systematically introduced the following bullet in the press release, which explained trend changes depending on the new information:
For example:

- With the new information the coincident and leading behaviour slightly improved their performance compared with that disseminated in the previous month (see the following graphics).

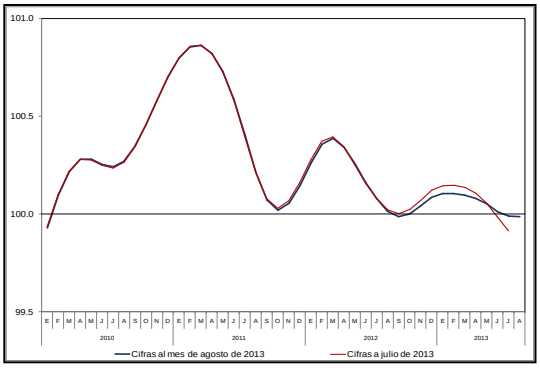
System of Cyclical Indicators

(Points)

COINCIDENT TO JUNE AND JULY 2013



LEADING TO JULY AND AUGUST 2013



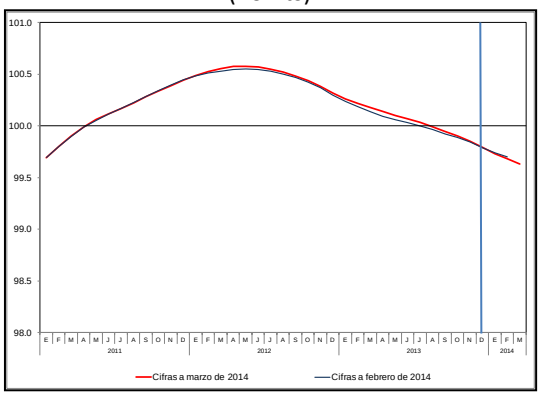
Note: Growth cycle approach.

Source: INEGI.

Around the same time, the question about if Mexico was in recession began to rise. Journalists and economic analysts said that "official statistics disseminated by INEGI were indicating that the country had entered into a recession". There were opinions expressed in this sense on TV and radio news shows, as well as on printed and electronic newspapers, and to a lesser extent on social media networks. The institute had to go out and explain it did not declared a recession had begun, but rather that we were growing below our long-term trend. The result for the coincident at that time is shown in the following graphic.

Coincident for February and March 2014

(Points)



Note: Growth cycle approach.
Source: INEGI.

It was clear that the INEGI had to deal with greater force with the misinterpretation. So, few months later the institute introduced some changes in the press releases:

- It was emphasized (even more) that "Coincident and leading indicators (that were being published) were built by the differences between cyclical components of the variables considered, with respect to their long-term tendencies, which are known as growth cycle".

- The following paragraph: "In order to contribute with further information for the economic cycle analysis, since this date the INEGI also offers to its users, in a graphic way, the Coincident indicator with the classic approach".
- A very simple definition of recession considering the classic approach and a graphic showing the difference with the growth cycle approach.

Also, an additional explanation was included in the press release.

"**Interpretation of the coincident indicator under the business cycle (classic) approach**"

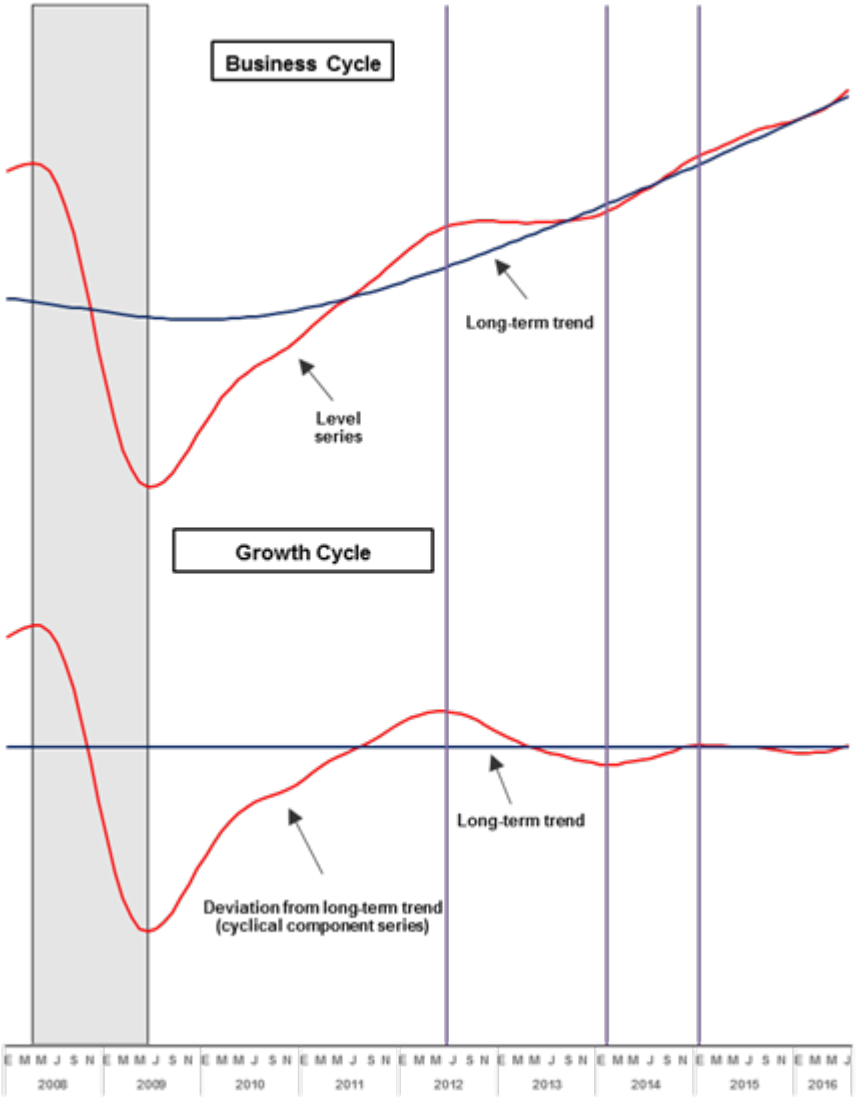
A time series since 1980 of Coincident Indicator was constructed, which allows to identify the recent business cycles of the Mexican economical history. Under this approach, a recession is a period between a peak and a through and an expansion a period between a through and a peak; moreover, a recession implies a significant and generalized drop of economic activity.

Coincident indicator under the two approaches (classic and growth cycle) is showed in the next graphic66:

Interpretation of the coincident indicator under the business cycle (classic) approach

[66] The graphic was based on Anas and Ferrara (2004)

Comparison between the growth cycle and the business cycle coincident in March 2014[67]



Source: INEGI.

With these changes concepts were clarified. But some aspects remained pending.

- A revision and updating process on the SCI2 began in December 2014. Two workshops took place. The first one was with users from the public sector and the other with economic analysts. They were informed that INEGI was initiating an updating process of the components of the composite indicators, since more than 5 years had passed. Also, they were invited to express their opinion about the variables to consider for the composite indicators.
- INEGI tried the time series proposed and it was determined that just a couple of changes were necessary to do. Results of the updating were presented to the same persons that attended the first meetings. In April 2015 the reviewed SCI2 was released.

[67] It should be noted that the different methods for calculating the date on which the coincident indicator is above or below the long-term tendency may differ between the two approaches. In the methodological note it is explained how the classic business cycle is constructed.
Source: INEGI.

Example 2: Composite Leading Indicator in Italy

Along with the production of statistical indicator, Istat carries out short-term economic analysis and forecasting activities, whose results are disseminated through different products. One of this product is the "*Monthly report on Italian economy*" released in the first week of the each month to draw a picture of the state of the economy in the previous month, according to the new information available, as well as the implication for growth in the next months. The leading indicator of Italian economy is one of the key methodological instruments to provide evidences in this direction together with the results from consumer and business confidence survey.

The methodology for the leading indicator calculation is based on the methodology described in the paper "*The Italian Business Cycle: Coincident and Leading Indicators and Some Stylized Facts"* (Altissimo, Marchetti and Oneto, 2000). Moreover in the recent month a revision of the methodology has been planned to update the leading indicator. However at the moment the system works on the basis of the identification of two composite coincident and leading indicators.

In the paper in order to identify these composite indicators a measure of economic activity is used and the results are obtained with three different reference variables (i.e. GDP, the industrial production index and the ISCO coincident indicator) characterized by a high degree of conformity with the co-movement with the aggregate cycle. The study provided an approach for constructing cyclical indicators on statistical basis through iterative steps, combining the use of traditional NBER methods[68] with that of other techniques of cyclical analysis. Within this approach a descriptive analysis of the co-movements of a large set of relevant Italian economic indicators (183 series were selected including real, monetary and international variables) and the main features of the business cycle in Italy are measured defining a system of cyclical indicators that includes both a composite coincident and leading indicator. All the available individual series were searched to assure the highest degree of coherence at business cycle frequencies. The first step of the analysis was to select a subset of time series to build a coincident indicator by comparing the timing of the turning points of the candidate indicators. The selected variables were aggregated to form a composite coincident indicator. In order to verify that such an indicator represents a satisfactory proxy of the Italian business cycle, its cyclical properties were reviewed against a proposed cyclical chronology based on the dating of the turning points of a set of selected indicators.

The coincident indicator is then used to build a composite leading indicator according to the NBER methodology. Firstly a broad set of variables that appear to be leading according to a number of co-movement statistics and tests of predictive power were selected. Then the timing of the turning points was checked following the approach in Stock and Watson (1991), for which a variable is considered leading if, among other properties, it helps to forecast the growth rate of the reference series, according to a number of different models. In such way a set of twenty-six variables was selected choosing the variables exhibiting a high peak of

[68] Refers to the classic definition by National Bureau of Economic Research (NBER) of a business cycle dived into expansion and recession periods.

correlation with a lead of at least three months featuring as well relatively high coherence and a good forecasting performance in relative terms.

The last step was to select a subset of about ten series to be included in the composite leading indicator on the basis of two criteria. The main criterion was clearly that of choosing the series that feature the highest correlation, longest lead and best forecasting properties but another criterion was guaranteeing as well the construction of an indicator balanced and diversified. In such way among labour market variables hours of Wage Supplementation Fund (ordinary) in manufacturing was chosen. With regard to measures of industrial activity, the survey data on manufacturing firms' production expectations and inventories of finished goods were selected because of the larger lead and better forecasting performance. A couple of demand indicators were selected to enter the composite indicator. The first is the level of domestic orders of consumer goods reported by industrial firms, whose leading properties appear marginally stronger than those of the other variables from survey data on orders. The second indicator of demand conditions is households' confidence climate. One credit variable was included in the composite indicator, bank deposits in real terms, and one premium spread of interest rates, namely the spread between the interest rate on bank loans and the rate on long-term government bonds. Among foreign trade indicators total merchandise imports was selected. Finally, with regard to international variables, the index of German industrial production was the best variable. Data on single components were transformed and aggregated using an aggregation procedure consistent with the traditional and heuristic NBER techniques. In such way the leading index synthesizes nine variables accounting for different economic determinants and sources of information.

Example 3: Tendency surveys in Mexico

In the INEGI´s work program[69], the Economic Tendency Surveys (ETS) have been well established throughout the last 15 years. The Institute recognizes the main benefits of their results: timeliness and usefulness, covering user demands in a timely and reliable fashion, providing data to support the analysis and assessment of the economic conjuncture; these data deliver early warnings, helping decision makers to minimize impacts of certain events or shocks. Particularly, the indicators have proved to be useful as tools to monitor trends and impacts for business cycle analysis.

Some of these indicators behave as leading indicators of some important variables for which hard data are collected later on. These can serve as a reference series and for some indicators the tendency predicts the hard indicator well for the following month. Especially the consumer confidence is rather too pessimistic, leading, when the economy is getting worse, but lagging when the economy is recovering.

ETS are conducted in both, businesses and households to collect the executives' and the consumers' point of view about the past developments, assessments on current developments of their businesses/households, as well as their opinions about the national economy and their plans and expectations for the near future. In short, about "their sentiments" on the relevant economic environment.

[69] INEGI: National Institute of Statistics and Geography.

The questionnaire asks respondents for qualitative answers, not for quantitative levels of output, sales, investment, and employment or household finance, for example. The results are used by different groups of users: businesses, analysts, commercial banks, professional associations, policy makers and the media.

Sentiment indicators are not a substitute for quantitative data, but they complement them.

The construction of these indicators is based on the data obtained by two tendency surveys: Monthly Survey on Entrepreneur Opinion (MSEO) and the National Survey on Consumer Confidence (NSCC). The following table shows the main characteristics of these surveys.

Main characteristics of the tendency surveys in Mexico

	MSEO	NSCC
Observation unit	Enterprises belonging to sectors of Manufacturing and Construction with more than 100 employees and Trade businesses with more than 50 employees.	Individuals selected within a given household (at least 18 years old).
Representativeness	National	National
Sampling frame	2,069 businesses from Manufacturing, Construction and Trade businesses sectors.	2,336 households.
Frequency	Monthly	Monthly
Data collection	During the first three weeks of the reference month.	During the first 20 days of the reference month.
Dissemination	The first working day of the month following the reference month.	The first week of the month following the reference month.
Sample design	Probabilistic and stratified random sampling. The number of employees defines four strata for Manufacturing and Construction: 100-250, 251-500, 501-1,000, and 1,001 and more. For trade businesses: 50-250, 251-500, 501-1,000, and 1001 and more.	Probabilistic, stratified and by clusters.
Calculation method for the confidence indicators	Producer confidence indicators for the three sectors mentioned above are calculated from the simple average of the answers to each of the following questions: Do you think this is the right time for investments to be made? How do you view the country's economic situation today compared to 12 months ago? How do you consider the economic situation of the country within 12 months, compared to the current one? How do you consider the economic situation of your company today compared to 12 months ago? How do you think the economic situation of your company will be within 12 months, compared to the current one? Each one of the five questions has different options of response with an attributed value (see below). Once the sum of weighted (with the values) percentages shares of responses is obtained for each question, producer confidence indicators	The consumer confidence indicator is calculated from the results of five questions: family economic situation (questions 3 and 4); macroeconomic situation (questions 5 and 6); possibility of purchasing durable goods (question 8). Each one of the five questions has different options of response with an attributed value (see below). Once the sum of weighted (with the values) percentages shares of responses is calculated for each question, the consumer confidence indicator is obtained from the simple average of their five components.

	are obtained from the simple average of their five components.	
Balance	Values for each response option are: For the producer confidence indicator: 1. Much better/yes= 1.00 2. Better = 0.75 3. Same = 0.50 4. Worse = 0.25 5. Much worse/no = 0.00	Questions 3, 4, 5 and 6 have five response options and their values are: 1. Much better = 1.00 2. Better = 0.75 3. Same = 0.50 4. Worse = 0.25 5. Much worse = 0.00 Question 8 has three response options and its values are: 1. Much Larger = 1.00 2. Same = 0.50 3. Much smaller = 0.00
Main results	- Producer Confidence Indicator (and its components) for Manufacturing, Construction and Trade Businesses. . - Manufacturing Orders Indicator (and its components). 2. - Indicators of tendency.	- Consumer Confidence Indicator (and its components) - other topics; possibilities to buy clothes, shoes, food, go on vacation, to save, to buy a car or a house, expectations about inflation and employment.
Seasonal adjustments and calendar effects	Yes, when series show seasonal pattern or calendar effects.	Yes, when series show a seasonal pattern or calendar effects.

Consumer confidence versus producer confidence

Statistics Netherlands publishes monthly figures on consumer and producer confidence. These figures reflect how consumers and producers in the manufacturing industry perceive the economic situation. In addition to describing the economic mood, the sentiment indicators also give a first indication for the development of other key economic indicators.

The figures are released on the same day and are often combined in the media to produce one item describing the national economic mood. The present article examines the two indicators in further detail, how they differ and what they have in common. It also looks at the European Commission's programme of economic sentiment indicators, which incorporates both these confidence indicators.

Quick gauge of sentiment

The two confidence indicators are released very quickly. They are published before the end of the month they review. Both indicators are predictive with respect to other key economic indicators. Consumer confidence gives a first indication of the direction consumption by households will take, while producer confidence is seen as the first indication for the development of production and investment in the manufacturing industry.

Method

Although both indicators are quick gauges of sentiment, they differ in important respects. These difference should be taken into account if the results are to be interpreted accurately.

Consumer confidence

Consumer confidence is based on a number of questions from the Consumer Confidence Survey. For this survey, every month about one thousand households are interviewed by telephone. The households differ every month. The survey is conducted during the first ten working days of the month.

Respondents are asked a number of questions. Five of these questions are used to calculate consumer confidence. These are questions about

- the general economic situation in the next twelve months
- the general economic situation in the previous twelve months
- the households' own financial situation in the next twelve months
- the household's own financial situation in the previous twelve months
- whether it is a favourable time to purchase expensive items (e.g. washing machines).

For the first four categories the answer options are:

- clearly worse;
- slightly worse;
- unchanged;
- slightly better;
- clearly better.

Consumers can answer the last question by reporting whether they think it is a favourable, time, an unfavourable time, or neither. All five questions can also be answered by "don't know".

To answer the questions, respondents consider the general economic situation in the country and the financial situation of their own household. For each component question, the percentage of consumers giving a certain answer is calculated. All consumers have an equal weight. Subsequently, for each component question the percentage of pessimists (respondents answering slightly or clearly worse) is subtracted from the percentage of optimists (respondents who think that the situation is slightly or clearly better). Consumers who answer neutrally or who don't know are not included in the calculation. The unweighted average of the net outcomes of the five questions is the consumer confidence score. Seasonal effects are removed from the figures.

Producer confidence

Producer confidence is compiled from answers to a number questions from the Business Sentiment Survey. This monthly survey is conducted by post or e-mail to a permanent panel of manufacturing companies. The questionnaires are sent out one week before the beginning of the month. The companies are asked to respond within two weeks. Companies who do not respond are sent reminders until about the fourteenth working day of the month (first by fax, then by telephone).

The survey asks questions on realisation of production, received orders, opinions on these two factors and expectations regarding production levels, employment and prices. The

companies take their own developments and developments on their markets into consideration when answering the questions. The answer options are:

- increase;
- unchanged;
- decrease.

The opinion questions can be answered by:

- good;
- satisfactory;
- poor.

For the indicator, the balance of positive minus negative answers is calculated. Producer confidence is composed of opinions on stocks of finished products, on orders received and expected production in the next three months. Large companies have a greater weight than small companies in this calculation. Weights are also assigned to the various sectors of manufacturing. In addition, a bias correction is also applied: this is a correction for respondents who consistently give answers that are too positive or too negative. Lastly, seasonal effects are removed.

Differences

The above-mentioned differences are summarised in the table below.

	Consumer confidence	**Producer confidence**
Survey method	Telephone	Written/e-mail
Respondents	Households	Companies in various branches of manufacturing
Number	Approx. 1,000	Approx. 1,600
Sample	Rotating sample	Permanent panel
Time of survey	First ten working days of the month	One week before the month up to the fourteenth workday
Weighting	Each respondent has the same weight	Large companies have larger weight than smaller companies
Periods to which opinions refer	Survey date, previous and subsequent twelve months	Previous month, subsequent three months
Aspects to which opinions refer	Own financial situation and general economic situation	Own company and market
Answer options	Clearly/slightly better/worse, unchanged, don't know. Favourable, unfavourable, neither, don't know	Increase, unchanged, decrease. Good, satisfactory, poor
Bias correction	No	Yes
Range of values measured	From +27 to -40 (since April 1986)	From +9 to -9,4 (since January 1985)

Producer confidence slightly ahead

In spite of the above-mentioned differences between the indicators for consumer and producer confidence, the two series have shown very similar developments since 1987. Two aspects should be taken into consideration, though:

- The fluctuations in consumer confidence are about four times as large as the fluctuations in producer confidence;
- Producer confidence often reacts a few months earlier to turning points in the business cycle than consumer confidence.

Possible explanations for the first aspect are the composition of the panel, the formulation of the questions and the answer options. The second aspect can be explained by the fact that because of the open economy in the Netherlands, Dutch companies are more internationally oriented and pick up signals from foreign markets before they are visible in the Netherlands. Consumers concentrate more on the situation in the Netherlands and pick up these signals later.

Both indicators showed a steady recovery in 2003-2004, followed by a stagnation in 2005 and recovery and acceleration in 2006. In October 2006 producer confidence reached a record value, while consumer confidence has not (yet) done so.

Example 4: The Export managers' index in Sweden

A Swedish case study of leading indicators

The purpose of the Export manager's index (EMI) was to create more attention to the Swedish exporting industry from the perspective of the Swedish economy. The EMI was first launched in 2007 and is published by Business Sweden. Statistics Sweden is contracted to gathers data from interviews and perform methodological work.

The EMI is also intended to provide greater attention to small and medium-sized enterprises and their relevance for the Swedish economy also in a regional perspective. How do the economic development of different regions of the world affect Sweden? How integrated are goods and services in the exporting industries?

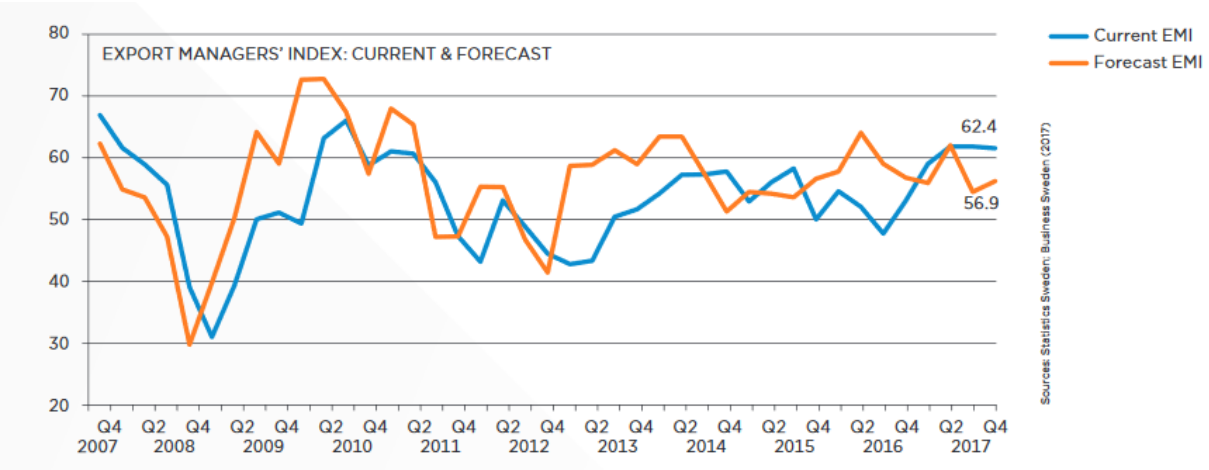
This is a survey-based index with data based on responses from export managers respondents in 225 Swedish companies divided into one half of larger (export revenue exceeding 250 million SEK) and smaller companies (export revenue 25-250 million SEK). The selection of companies in the EMI is based on information from the VAT register and thus covers exports of both goods and service. The surveys are done on a quarterly basis. Statistics Sweden has conducted the interviews. Analysis, presentation, and compilation are made by Business Sweden.

The study is based on seven questions to the respondents, as shown below;
1. How do you assess the company's export sales last 3 months?
2. How do you assess the size of the company's export order book?
3. How do you assess the profitability of export sales is at present?
4. How do you assess the demand for the export market will develop in the next three months?
5. How do you assess that export sales will develop in the next three months?
6. How do you assess the profitability of export sales will develop in the next three months?
7. How do you assess that the company's delivery times for exports will be developed over the next three months?

The answers to the first three questions form the sub-index EMI current situation. The answers to questions 4-7 form the sub-index EMI forecast. All seven questions are equally weighted. The index is set so that an overall neutral outlook is represented by the number 50, and numbers higher than 50 represent an optimistic bias. For the total aggregation of the index, the responses are weighted by the company's export revenues.[70]

The presentation of the data are made as a graphic analysis interpreted by Business Sweden. The datasets are also made public to other users that can make their own assessment[71].

[70] https://www.business-sweden.se/contentassets/14dc83efad744e47a871413393742c40/emi-q4-2017-eng.pdf
[71] http://www.business-sweden.se/Export/Inspiration/Rapporter-och-fakta/Exportchefsindex/Viktad-tidsserie-2015/



The graph displays both the EMI current and the EMI forecast, whose weighted average generate the total EMI

The EMI index has a high timeliness and transparency and is easy to understand for users. There are no revisions of data. One disadvantage may be an increasing shortfall of respondents chooses not to respond to the survey.

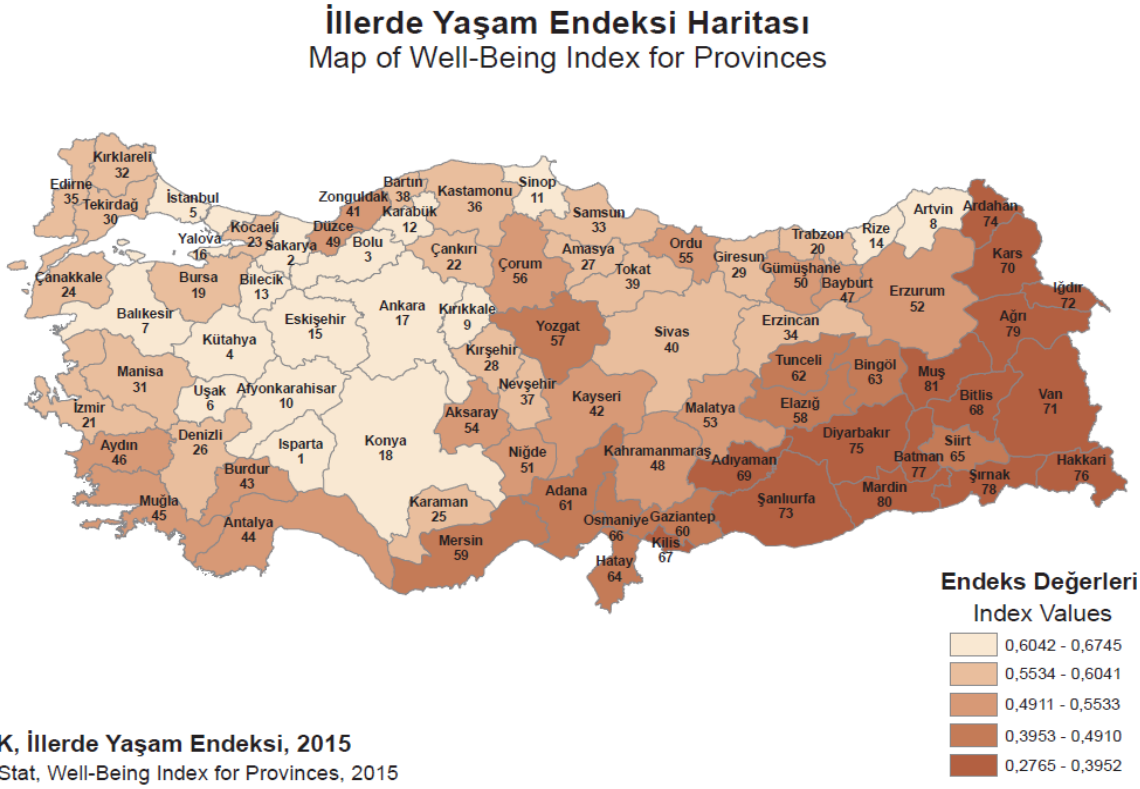
Example 5: Well-being index for provinces of Turkey

The Turkish Statistical Institute conducted a Well-Being Index for Provinces as a study on the province level, aiming to measure, compare and keep track in time of the well-being of individuals and households on distinct life dimensions, using objective and subjective criteria.

TurkStat started to work on regional well-being in 2012, which lead to the first life satisfaction survey on province level in 2013. From 2014 on the working group developed the index working together with stakeholders and the OECD and published the results in 2016.

Purpose of this study is to develop an indicator system to be a basis for monitoring the well-being of people with all aspects, in provinces. The main objectives of the Well-Being Index for Provinces are;

- to constitute individual, household and outcome based well-being indices,
- to measure life standard of residents in that province and monitor changes in time,
- to have a policy sensitive composite index, consisting of improvable indicators and
- to combine all quality of life dimensions within one index.



Well-being is a broad concept, which cannot be restricted to the benefits gained from goods and services consumption, as it covers persons' daily lives, whether they are able to act as they desire and whether they have the opportunities to do so. Hence, the Well-being Index for Provinces includes subjective perceptions, social life, life satisfaction, the environment we live and the material aspects of life as well.

The main data source for the subjective indicators of the index is the Life Satisfaction Survey by Provinces. Dimensions and indicators for the Well-Being Index for Provinces are determined considering the country specific conditions as well as the OECD Better Life framework. Indicators that comprise the index were selected in order to fulfil the criteria listed below:

- Appropriate to main target and outcome-oriented,
- Reflect the well-being of people residing in the province,
- Improvable through policy change,
- Reflect the distinctions between provinces
- Contribution direction (positive / negative) can be clearly identified,
- Comprehensible, robust and accurate
- Updated periodically

However, due to the challenges faced on the process of obtaining province level indicators, trade-offs between the indicator selection criteria were faced. When initially intended indicators (e.g. water quality, green areas, household financial wealth, assault rate) were not available, the best available proxy indicators for the related dimension were selected based on experts' opinions. When output oriented indicators are not available, indicators reflecting access to a certain good are prioritised. Moreover when a dimension is reflected in more than one available indicator, correlations between those indicators were taken into account and one of the highly correlated indicators is used.

Furthermore, for this indicator the dimensions of well-being are considered as equally weighted, significant and irreducible. For each dimension, the indicators were selected for being concentrated and functional. In this framework, the Well-Being Index for Provinces is composed of 11 dimensions, which are:

- Housing
- Work life
- Income and wealth
- Health
- Education
- Environment
- Safety
- Civic engagement
- Access to infrastructure services
- Social life
- Life satisfaction

and that consist of 41 indicators, which all have major effects on well-being. Therefore, for every province, 12 different index values, including a general index and sub-indices have been calculated for each of the well-being dimensions.

While the study involves indicators which positively affect life, also indicators that have negative effects on the index are covered. Only indicators whose direction was clear to all working group members were considered. Dimensions, indicators, direction of effect and the year of the data are included in the table below.

Calculation

The Well-Being Index for Provinces is a composite indicator representing 11 dimensions of life with 41 indicators. The composite indicator calculation process consists of the selection of the individual indicators, normalization of indicator values, their weighting and finally their aggregation.

In order to make the data sets that are obtained from different measures comparable, the values of indicators need to be normalized. For this indicator, the data was normalized according to the method of Min-max normalization. Min-max is a method that normalizes indicators at the range of 0 and 1. Indicators which have negative effects on the index (unemployment rate, murder rate etc.) were coded inversely at index calculation.

$$G_i = \frac{x_i - x_{min}}{x_{max} - x_{min}} \qquad \breve{G}_i = 1 - \frac{x_i - x_{min}}{x_{max} - x_{min}}$$

x_i: Value of indicator
x_{min}: Minimum value of indicator
x_{max}: Maximum value of indicator

The composite index is calculated according to the hierarchical equally weighting method, where dimensions and indicators within the same dimension take equal weights. Weights of dimensions and indicators according to this method are as follows;

$$\text{Number of dimensions (N)} \rightarrow w_B = \frac{1}{N}$$

$$\text{Number of indicators (n)} \rightarrow \quad w_G = \frac{1}{n}$$

Dimension score values are calculated by multiplying each normalized indicator value by the weight of the indicators within the dimension and aggregating these products. The aggregation method which is used to obtain dimension score values can be expressed as follows;

$$\text{Dimensions score value} = \sum(w_{Gi} * G_i)$$
$$w_{Gi} \quad = \text{Weight of indicator}$$
$$Gi \quad = \text{Normalized indicator value}$$

Overall score value is obtained from the multiplication of each normalized indicator value by the weight of dimension and indicator and the aggregation of these products. The aggregation method, which was used to obtain overall score values, can be expressed as follows;

$$\text{Overall score value} = \sum(w_{Bi} *_{W_{G_i}} * G_i)$$
$$w_{Bi} \quad = \text{Weight of dimension}$$
$$w_{Gi} \quad = \text{Weight of indicator}$$
$$Gi \quad = \text{Normalized indicator value}$$

Dimensions and indicators of well-being index for provinces

Dimensions	Indicators	Contribution Direction	Reference Year
Housing	Number of rooms per person	Positive	2013
	Toilet presence percentage in dwellings	Positive	2013
	Percentage of households having problems with quality of dwellings	Negative	2013
Work Life	Employment rate	Positive	2013
	Unemployment rate	Negative	2013
	Average daily earnings	Positive	2014
	Job satisfaction rate	Positive	2013
Income and Wealth	Savings deposit per capita	Positive	2014
	Percentage of households in middle or higher income groups	Positive	2013
	Percentage of households declaring to fail on meeting basic needs	Negative	2013
Health	Infant mortality rate	Negative	2014
	Life expectancy at birth	Positive	2013-2014
	Number of applications per doctor	Negative	2014
	Satisfaction rate with health status	Positive	2013
	Satisfaction rate with public health services	Positive	2013
Education	Net schooling ratio of pre-primary education between the ages of 3 and 5	Positive	2014-2015
	Average point of placement basic scores of the system for Transition to Secondary Education from Basic Education	Positive	2015
	Average points of the Transition to Higher Education Examination	Positive	2015
	Percentage of higher education graduates	Positive	2014
	Satisfaction rate with public education services	Positive	2013
Environment	Average of PM10 values of the stations (air pollution)	Negative	2014
	Forest area per km2	Positive	2012

	Percentage of population receiving waste services	Positive	2014
	Percentage of households having noise problems from the streets	Negative	2013
	Satisfaction rate with municipal cleaning services	Positive	2013
Safety	Murder rate (per million people)	Negative	2014
	Number of traffic accidents involving death or injury (per thousand people)	Negative	2014
	Percentage of people feeling safe when walking alone at night	Positive	2013
	Satisfaction rate with public safety services	Positive	2013
Civic Engagement	Voter turnout at local administrations	Positive	2014
	Rate of membership to political parties	Positive	2014
	Percentage of persons interested in union/association activities	Positive	2013
Access to Infrastructure Services	Number of internet subscriptions (per hundred persons)	Positive	2014
	Access rate of population to sewerage and pipe system	Positive	2014
	Access rate to airport	Positive	2015
	Satisfaction rate with municipal public transport services	Positive	2013
Social Life	Number of cinema and theatre audience (per hundred persons)	Positive	2014
	Shopping mall area per thousand people	Positive	2015
	Satisfaction rate with social relations	Positive	2013
	Satisfaction rate with social life	Positive	2013
Life Satisfaction	Level of happiness	Positive	2013

Example 6: Composite well-being indicators in Italy

The “Equitable and Sustainable Well-being” (Bes) developed by Istat consists of 12 domains and 130 indicators. The 12 selected domains are divided into 2 typologies, 9 of them are defined as outcome domains, and the remaining 3 as drivers of well-being. The domains are:

- Outcome: health; education and training; work and life balance; economic well-being; social relationship; security; landscape and cultural heritage; environment; subjective well-being;
- Driver: politics and institutions; research and innovation; quality of services.

For each domain a set of representative indicators has been identified in a way to give an image of the main attributes of the domain. For example, for health we have 10 indicators describing essential elements of the health profile of population, across the main dimensions: objective, functional and subjective health. Indicators describing potential risk factors for health are also proposed. Indicators are organized into three areas:

- global outcome indicators;
- specific indicators for lifecycle phases;
- indicators related to risk or health protection factors caused by lifestyles.

However, it is not easy to read at the same time the yearly development of 130 indicators. Hence Istat has adopted a composite index called MPI (Mazziotta Pareto-Index) 'which consists of an arithmetic mean adjusted by a function of variability that penalizes the geographical areas with an unbalanced distribution of the indicators. The underlying principle is that in order to obtain a high value of the index, all the individual indicators must assume high values, assuming that the variables themselves have equal importance'[72].

Although the well-being domains considered in the Bes framework are 12, for some of them two separate composite indexes have been calculated, for a total of 15 composite indexes.

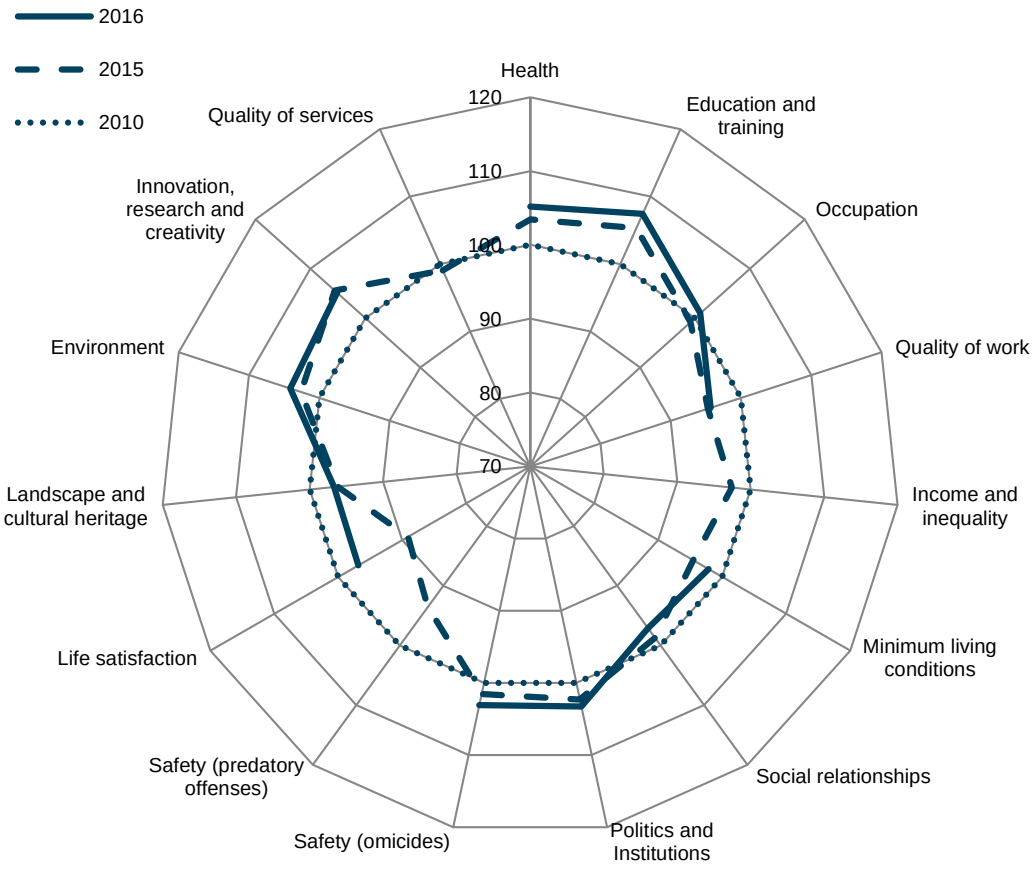
In particular, in the "work and life balance" domain two composite indexes are considered, one on Occupation and one on Quality of work; in the Economic well-being domain it was computed a composite index on Income and inequality and one on Minimum living conditions; two composite indexes were also calculated for the domain on Safety, one on Homicides, and one on Predatory offences.

The method used to calculate the composite indexes is the Adjusted Mazziotta Pareto Index (AMPI).[73]

It is important to stress that for each domain not all the indicators are eligible for inclusion in the composite and not for all the domain it is feasible to derive a composite indicator.
The figure below reports the evolution of the composite indicators for Italy for 2010 and 2015-2016. The economic crisis experimented in Italy between 2011 and 2014 have had also implications for well-being.

[72] See Mazziotta and Pareto (2013) and Istat, annual report on well-being, 2015, p. 49-54
[73] Mazziotta and Pareto (2015)

Composite indicators for Italian well-being – years 2010, 2015-2016. Italy 2010 = 100



(a) Data referred to the first semester in 2016

(b) Data referred to 2016

(c) Italy 20010=100

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