QUALITY GUIDELINES FOR THE DCF

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Edited by Carlos Moura

Ad hoc contract on Quality

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Rationale

The increasing importance of the information produced by the DCF regulation must necessarily be accompanied by an increased focus on the quality of that same information. The new DCF reflects that awareness by introducing the QACF. The QACF should be described by every MS in its work plan, although no details are made on what needs to be in the framework. In its life cycle, the DCR and its successor DCF defined only ad hoc concepts on quality which on many cases were not clearly defined and lead to a lack of standardization on its application by the different MS. On a broader level, there are no clear guidelines on how to evaluate the data collection as a whole, which should be essential for DGMARE to define its priorities and promote the improvement of the program. In order to setup the basis of the QACF and systematize quality and quality evaluation, and ad hoc contract was celebrated with the following objectives:

1 – Propose a model for Quality Assurance and quality control framework by setting the fundamental principles in equivalence with the ESS

2 – Establish statistical concepts, definitions and methods to be used for data collection on socioeconomic variables

3 – Compile and define quality indicators for socioeconomic data and for report evaluation

4 - Produce guidelines for the socioeconomic part of data collection.

The present document is the result the work done under the terms of the contract.

Introduction

Quality is a complex concept which can be defined in many ways. (ESS Quality Glossary) defines quality as the degree to which a set of inherent characteristics fulfils requirements, i.e, quality means fitness to use. (Montgomery, 2009) defines quality as inversely proportional to variability, while quality improvement is the reduction of variability in processes and products. Both of the definitions are important and should be taken into consideration on the QACF. Fitness to use can mean many things, depending on the user of the information. Quality is also defined by its dimensions, variable in number according to the different producers. We will use the European Statistical System (ESS) definitions and will adapt its Quality Assurance Framework and Code of Practice to the specifics of the EUMAP. There are many reasons for the use of these documents, being the first of all the high quality and reliability of the ESS and the amount of time and expertise dedicated by many people to the construction of the document and to the fact that such use complies with the best practices.

The ESS QAF is based on principles of the ESS Code of Practice which can be transposed to the DCF dimension. The principles are divided into three main categories: Statistical processes, statistical outputs and Institutional environment. The rationale behind this groups is explained on (Handbook on improving quality by analysis of process variables): "*There is a need to distinguish between different types of quality. Product quality is the quality of the output. In the case of a statistical organization this is the quality of the data and services provided. These products are generated by an underlying process or sequence of processes, and so the product quality is likely to be affected by the process quality. In theory, good product quality can be achieved through evaluations and rework.*

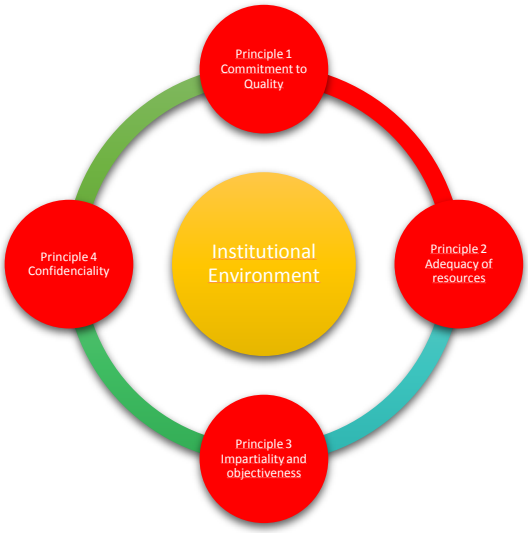
However, this is not a feasible approach since it is costly and time-consuming. Instead, it is believed that product quality will follow from improvements in process quality. So improving process quality is a key aim." Process quality is linked to the principles of sound methodology, appropriate statistical procedures, cost effectiveness and non-excessive burden on respondents. **Improvements on process quality will reflect on the quality of the statistical outputs**. Principles relating to the statistical output are relevance, accuracy and reliability, accessibility and clarity, timeliness and punctuality and coherence and comparability. Underlying all these principles is the commitment to quality.

It is worth noting that the EUMAP QAFC is a quality assurance and quality control framework. A quality assurance framework "*have the objective to establish, in a specific organization, a system of coordinated methods and tools guaranteeing the adherence to minimum requirements concerning the statistical processes and products*. *Any quality assurance framework builds on the results from product quality measurement and provides inputs to the strategic planning system and improvement projects. Quality control is limited to controlling whether the products meet the quality requirements.*" (Handbook on Data Quality Assessment Methods and Tools). Under quality control, the prime purpose is to serve those who are directly responsible for conducting operations – to help them regulate current operations (*MS*). Under quality assurance, the prime purpose is to serve those who are not directly responsible for conducting operations but who have a need to know – to be informed as to the state of affairs, and hopefully, to be assured that all is well *(DGMARE, End users)*

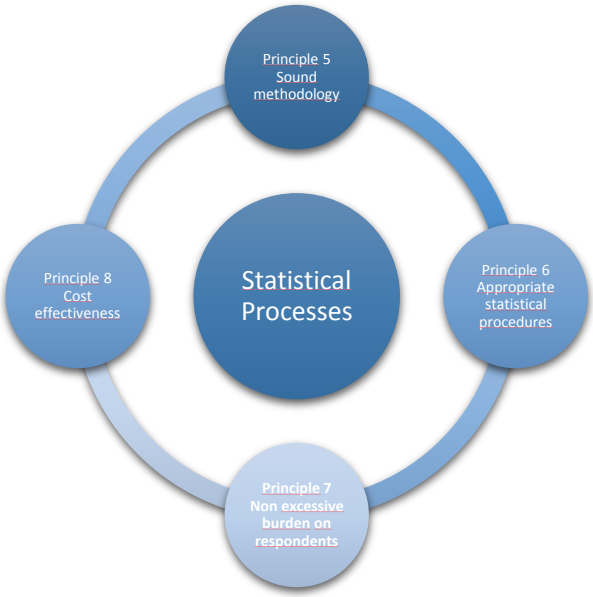
The current guidelines for quality encompasses, in a first part, the adaptation of the Quality Assurance Framework and the Code of Practice of the European Statistical System to the Data collection regulation (DCF), bearing in mind its different specificities and context. In a second part they deal with quality concepts and methodologies of the socioeconomic data collection and in a third part reporting is dealt with focus on producer and user oriented reports.

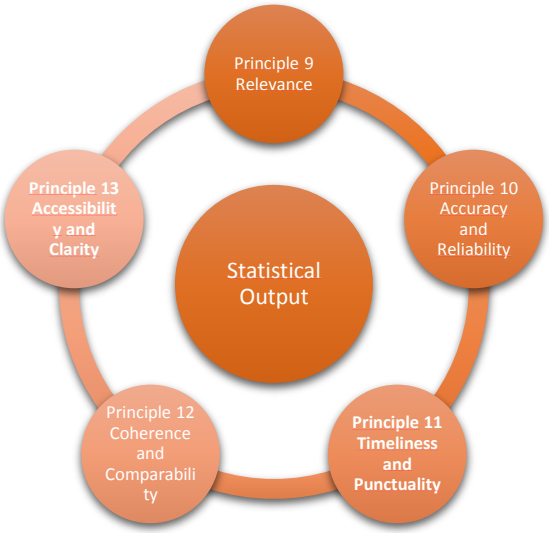
Part I – The Quality Assurance and Quality Control Framework

The current proposal for the QAFC is an adaptation from the European Statistical System (ESS) Quality Assurance Framework and its Code of Practice (CoP). The ESS QAF it's a high level document that can provide guidance at all levels of implementation and provide a common language for all the DCF on statistical issues. It begins by setting up the principles for which all parts on the DCF should abide in order to achieve high quality data.



The principles are divided into three categories: The institutional environment, ensuring that the partners are committed to quality, are objectives and effective and have adequate resources available. The statistical process focuses on international standards, guidelines and good practices in the processes used to organise, collect, process and disseminate data. Statistical output concerns the extent to which the data are relevant, accurate and reliable, timely, coherent, comparable across regions and countries and meet the necessities of the end users.





2 principles covered in the European Statistics Code of Practice were not considered for the EU MAP, due to the different nature of the frameworks and the specific nature of the statistical institutions. They are: Professional Independence and Mandate for data collection.

The ESS QAF vs EU MAP QAFC equivalence principles

Dimension	*ESS QAF*	*EU MAP QAFC*
Institutional Environment	Principle 1 – Professional Independence	Not applicable
	Principle 2 – Mandate for data collection	Not applicable
	Principle 3 – Adequacy of resources	Principle 2 – Adequacy of resources
	Principle 4 – Commitment to Quality	Principle 1 – Commitment to Quality
	Principle 5 – Statistical confidentiality	Principle 4 - Confidentiality
	Principle 6 – Impartiality and objectiveness	Principle 3 – Impartiality and objectiveness
Statistical Processes	Principle 7 – Sound methodology	Principle 5 – Sound methodology
	Principle 8 – Appropriate statistical procedures	Principle 6 – Appropriate statistical procedures
	Principle 9 – Non-excessive burden on respondents	Principle 7 – Non-excessive burden on respondents
	Principle 10 – Cost effectiveness	Principle 8 – Cost effectiveness
Statistical Outputs	Principle 11 – Relevance	Principle 9 – Relevance
	Principle 12 – Accuracy and reliability	Principle 10 – Accuracy and reliability
	Principle 13 – Timeliness and Punctuality	Principle 11 – Timeliness and Punctuality
	Principle 14 – Coherence and Comparability	Principle 12 – Coherence and Comparability
	Principle 15 – Accessibility and Clarity	Principle 13 – Accessibility and Clarity

Quality Assurance and quality control Framework

Dimension	*Principles*	*Indicators*
Institutional environment	**Principle 1 – Commitment to Quality** The authorities are committed to quality. They systematically and regularly identify strengths and weaknesses to continuously improve process and product quality	1.1: Procedures are in place to plan and monitor the quality of the statistical production process. 1.2: Product quality is regularly monitored, assessed with regard to possible trade-offs, and reported according to the quality criteria adopted at regional or European level. 1.3: There is a regular and thorough review of the key statistical outputs using also external experts where appropriate.
	Principle 2 – Adequacy of resources The resources available to authorities are sufficient to meet data collection requirements	2.1: Staff, financial, and computing resources, adequate both in magnitude and in quality, are available to meet current needs.
	Principle 3 – Impartiality and objectiveness Authorities develop, produce and disseminate data respecting scientific independence and in an objective, professional and transparent manner.	3.1: Data are collected on an objective basis determined by statistically sound considerations. 3.2: Choices of sources and statistical methods are informed by statistically sound considerations. 3.3: Errors discovered in published data are corrected at the earliest possible date and publicised. 3.4: Information on the methods and procedures used is publicly available. 3.5: Data requests dates and times are pre-announced. 3.6: Advance notice is given on major revisions or changes in methodologies.
	Principle 4 – Confidentiality The privacy of data providers (enterprises, administrations and other respondents) and the confidentiality of the information they provide are absolutely guaranteed.	4.1: Confidentiality is guaranteed in law. 4.2: Staff sign legal confidentiality commitments. 4.3: Guidelines and instructions are provided to staff on the protection of confidentiality in the production and dissemination processes. The confidentiality policy is made known to the public. 4.4: Provisions for the disclosure of relevant data subject to confidentiality rules are in place. 4.5: Physical, technological and organisational provisions are in place to protect the security and integrity of databases. 4.6: Strict protocols apply to users accessing primary or detailed data for research or scientific purposes.

Statistical processes	**Principle 5 – Sound methodology** Sound methodology underpins data quality. This requires adequate tools, procedures and expertise.	5.1: The overall methodological framework used for data collection and estimation follows international standards, guidelines, and good practices. 5.2: Procedures are in place to ensure that standard concepts, definitions and classifications are consistently applied throughout the DCF partners. 5.3: The register and the frame for population surveys are regularly evaluated and adjusted if necessary in order to ensure high quality. 5.4: Detailed concordance exists between national classifications systems and the corresponding European systems. 5.5: Co-operation with the scientific community is organised to improve methodology, the effectiveness of the methods implemented and to promote better tools when feasible.
	Principle 6 – Appropriate statistical procedures Appropriate statistical procedures, implemented from data collection to data validation, underpin quality data.	6.1: When data is based on administrative sources, the definitions and concepts used for administrative purposes are a good approximation to those required for DCF purposes. 6.2: In the case of statistical surveys, questionnaires are systematically tested prior to the data collection. 6.3: Survey designs, sample selections and estimation methods are well based and regularly reviewed and revised as required. 6.4: Data collection, data entry, and coding are routinely monitored and revised as required. 6.5: Appropriate editing and imputation methods are used and regularly reviewed, revised or updated as required. 6.6: Revisions follow standard, well-established and transparent procedures. 6.7: Agreements are made with owners of administrative data which set out their shared commitment to the use of these data for DCF purposes. 6.8: Authorities co-operate with owners of administrative data in assuring data quality.
	Principle 7 – Non-excessive burden on respondents The reporting burden is proportionate to the needs of the users and is not excessive for respondents. The authorities monitor the response burden and set targets for its reduction over time.	7.1: The range and detail of DCF requirements is limited to what is absolutely necessary. 7.2: The reporting burden is spread as widely as possible over survey populations. 7.3: The information sought from businesses is, as far as possible, readily available from their accounts and electronic means are used where possible to facilitate its return. 7.4: Administrative sources are used whenever possible to avoid duplicating requests for information. 7.5: Data sharing within partners is generalised in order to avoid multiplication of surveys. 7.6: Authorities promote measures that enable the linking of data sources in order to reduce reporting burden.
	Principle 8 – Cost effectiveness Resources are used effectively.	8.1: Internal and independent external measures monitor the authority's use of resources. 8.2: The productivity potential of information and communications technology is being optimised for data collection, processing and dissemination. 8.3: Proactive efforts are made to improve the statistical potential of administrative data and to limit recourse to direct surveys. 8.4: Authorities promote and implement standardized solutions that increase effectiveness and efficiency.

Statistical output	**Principle 9 – Relevance** Data meet the needs of end users.	9.1: Processes are in place to consult end users, monitor the relevance and utility of existing data in meeting their needs, and consider their emerging needs and priorities. 9.2: Priority needs are being met and reflected in the work programme. 9.3: User satisfaction is monitored on a regular basis and is systematically followed up.
	Principle 10 – Accuracy and reliability Data accurately and reliably portray reality.	10.1: Source data, intermediate results and statistical outputs are regularly assessed and validated. 10.2: Sampling errors and non-sampling errors are measured and systematically documented according to the European standards. 10.3: Revisions are regularly analysed in order to improve statistical processes.
	Principle 11 – Timeliness and punctuality Data are released in a timely and punctual manner.	11.1: Timeliness meets European and other international release standards. 11.2: The periodicity of data collection takes into account end user requirements as much as possible. 11.3: Divergence from the dissemination time schedule is publicised in advance, explained and a new release date set. 11.4: Preliminary results of acceptable aggregate accuracy can be released when considered useful.
	Principle 12 – Coherence and comparability Data are consistent internally, over time and comparable between regions and countries; it is possible to combine and make joint use of related data from different sources.	12.1: Data are internally coherent and consistent (i.e. arithmetic and accounting identities observed). 12.2: Data are comparable over a reasonable period of time. 12.3: Data are compiled on the basis of common standards with respect to scope, definitions, units and classifications in the different surveys and sources. 12.4: Data from the different sources and of different periodicity are compared and reconciled. 12.5: Cross-national comparability of the data is ensured within the EUMAP through periodical reviews at regional and European level. Methodological studies are carried out in close co-operation between the Member States and DGMARE
	Principle 13 – Accessibility and clarity Data are presented in a clear and understandable form, released in a suitable and convenient manner, available and accessible on an impartial basis with supporting metadata and guidance.	13.1: Data and the corresponding metadata are presented, and archived, in a form that facilitates proper interpretation and meaningful comparisons. 13.2: Dissemination services use modern information and communication technology and, if appropriate, traditional hard copy. 13.3: Custom-designed analyses are provided when feasible. 13.4: Access to microdata is allowed for research purposes and is subject to specific rules or protocols. 13.5: Metadata are documented according to standardised metadata systems. 13.6: Users are kept informed about the methodology of statistical processes including the use of administrative data. 13.7: Users are kept informed about the quality of statistical outputs with respect to the quality criteria adopted at regional or European level.

Activities, Methods and Tools on Principles/Indicators

The recommended activities, methods and tools used to support each indicator are identified at the institutional and product/survey levels, where applicable, reflecting the level of adoption and use. They evolve from a general into a more concrete and detailed description. As some indicators are themselves recommendations, the supporting activities, methods and tools can be more detailed and of a more specific nature in order to facilitate the implementation of the indicator.

The nature of the recommended activities, methods and tools may lead to their multiple use in support of different indicators. In fact one given activity/method/tool may provide support to all the indicators associated with one principle. In order to assist the implementation of each recommended activity, method and tool, relevant reference documentation is identified in the annex, leaving room for each authority to add its specific documentation.

The QACF is a guiding tool to assist the implementation of a high quality system for data collection at national, regional and European levels. The open and flexible nature of the QACF allows the specific selection of recommended activities, methods and tools that better fit the context of a specific agency.

Principle 1 – Commitment to Quality

1.1: Procedures are in place to plan and monitor the quality of the statistical production process.

a. Procedures are in place to monitor the quality of different stages of the statistical production, e.g. according to a quality assurance plan
b. Regular expert group meetings.
c. Quality assurance plan.

1.2: Product quality is regularly monitored, assessed with regard to possible trade-offs, and reported according to the quality criteria adopted at regional or European level.

a. Internal procedures
b. Annual report
c. User oriented report (EU level compiled from MS annual reports)

1.3: There is a regular and thorough review of the key statistical outputs using also external experts where appropriate.

a. A plan for implementing Quality Reviews (such as Auditing and Self-Assessment)
b. **A structure for Quality Reviews**. An appropriate structure for carrying out Quality Reviews is in place for internal audits and self-assessments (e.g., for evaluating the Annual report)
c. **Reference documentation**. Quality reviews have as reference documentation:
   - Quality guidelines/quality assurance plan, or a similar scheme;
   - Producer oriented quality reports and/or user oriented quality reports;
   - Self-assessment questionnaires filled by producers;
   - Reports from audit interviews;
   - Questionnaires completed by respondents and/or users;
   - Any other satisfaction survey.
d. **Action plans**. The findings of the quality reviews result in action plans.
e. **Feedback from users**. Feedback from different users is used as input to action plans

f. **Benchmarking**. Benchmarking on key statistical processes with other partners is carried out to identify good practices.

Principle 2 – Adequacy of Resources

2.1: Staff, financial, and computing resources, adequate both in magnitude and in quality, are available to meet current needs.

a. Include number and expertize of staff
b. Database technology used
c. Primary and aggregated data repositories at National and EU level

Principle 3 – Impartiality and Objectiveness

3.1: Data are compiled on an objective basis determined by statistical considerations.

a. Methodologic documentation

3.2: Choices of sources and statistical are informed by statistical considerations.

a. Methodologic documentation

3.3: Errors discovered in published data are corrected at the earliest possible date and publicised.

a. Revision policy at EU level

3.4: Information on the methods and procedures used is publicly available.

a. Methodologic documentation
b. Quality assurance and quality control framework
c. DCF website (national and EU level)

3.5: Data calls release dates and times are pre-announced.

a. Predefined calendar for data calls

3.6: Advance notice is given on major revisions or changes in methodologies.

a. Work plan
b. Annual report

Principle 4 – Confidentiality

4.1: Confidentiality is guaranteed in law.

a. **DCF regulation** – DCF regulation have provisions for confidentiality and treatment of confidentiality.

4.2: Staff sign legal confidentiality commitments.

a. **Standard confidentiality document** – A standard confidentiality declaration exists and is signed for all the staff and external personnel (e.g., auditors) who have access to primary or detailed data within the national DCF bodies.

4.3: Guidelines and instructions are provided to staff on the protection of confidentiality in the production and dissemination processes. The confidentiality policy is made known to the public.

a. **Confidentiality policy** – A confidentiality policy exists and is publically available.
b. **Guidelines and instructions on the protection of confidentiality** – Guidelines exists with instructions for the treatment of confidentiality and the confidentiality policy are provided to the staff.
c. **Procedures for the treatment of confidentiality** – The treatment of confidentiality in specific statistical operations is clearly described and procedures for its implementation are integrated in the methodological documents.

4.4: Provisions for the disclosure of relevant data subject to confidentiality rules are in place.

a. **Procedures for the disclosure of data subject to confidentiality rules** – Procedures exists to reduce the amount of confidential data, especially in the cases where the non-disclosure of the information introduces significant bias.
b. **Explicit consent of the owners of the data** – The disclosure of data subject to confidentiality rules can be made only with the explicit and written consent of the owners of the data. The owners of the data must be informed of the reasons for the request of disclosure, the uses of the data and the possibility of identification of individual units.
c. **Authorization for disclosure of data subject to confidentiality rules –** A standard document exists containing the general relevant information, the identification of the owners of the data, the data subject to confidentiality rules to be disclosed, the uses of the data and an explicit consent for the disclosure.

4.5: Physical, technological and organisational provisions are in place to protect the security and integrity of databases.

a. **Procedures to ensure integrity of databases** – Procedures are in place to ensure the integrity and security of the databases and relevant documentation exists.
b. **Access to databases** – Access to databases is restricted to specific staff and protected with passwords.

4.6: Strict protocols apply to users accessing primary or detailed data for scientific purposes.

a. **Protocols for access of primary or detailed data by DCF partners** – Protocols are in place specifying the terms of access and uses of the primary or detailed data (e.g., administrative data, biological data) for the each partner of the DCF. The protocols must also contain provisions for ensuring the confidentiality of the information. Partners with access to the primary data must enforce a confidentiality policy equivalent to that of the owner of the original database where the primary or detailed data is available.
b. **Protocols for access of detailed data for scientific purposes** – Protocols exists specifying the terms of access of detailed data for scientific purposes by external users other than DCF partners. Protocols must also include provisions for the possible uses of the data and enforce confidentiality. Access of detailed data must be conditional to the signing

of a confidentiality document by the user. The user must be aware of the confidentiality policy of the owner of the detailed data resides.

Principle 5 – Sound methodology

5.1: The overall methodological framework used for data collection and estimation follows international standards, guidelines, and good practices.

a. **A standard methodological document**. The methodological framework and the procedures for implementing statistical processes are integrated into a standard methodological document and periodically reviewed.
b. **Explanation of divergence from international recommendations**. Divergence from existing European and international methodological recommendations are explained and justified.

5.2: Procedures are in place to ensure that standard concepts, definitions and classifications are consistently applied throughout DCF partners.

a. **Concepts, definitions, and classifications**. Concepts, definitions, and classifications are defined by the DCF partners, are applied in accordance with European and/or national legislation and are documented.
b. **A methodological infrastructure**. A methodological infrastructure (e.g. units, expert groups) is in place which defines statistical methods, monitors their implementation and validates the results. In particular, it defines and makes available standard tools for every stage of the business process model (e.g. sampling, collecting and processing data, etc.).
c. **Views of relevant experts and users**. Surveys or statistical processes benefit from the views of relevant experts and users where appropriate.
d. **Methodological documentation**. Methodological documentation is elaborated for each statistical process containing all pertinent information on metadata, namely concepts, methods, classifications, and is made public at least in a summary form.
e. **Attendance of seminars and workshops**. Staff attend seminars and workshops at a national or international level on the application of standards, classifications, etc

5.3: The business register and the frame for population surveys are regularly evaluated and adjusted if necessary in order to ensure high quality.

a. **A procedure to update the business register**. For the business register, there is an updating procedure on all relevant changes in the population of businesses (i.e. change of activity, new entries, exits,…). This update is performed continuously.
b. **Quality assessment of the business register**. The business register is subject to a regular follow-up survey on quality and/or quality indicators are calculated and evaluated.
c. **Use feedback from surveys**. Information gathered during the conduct of surveys is used to assess and improve the quality of the frame, especially its coverage.

5.4: Detailed concordance exists between national classifications systems and the corresponding European systems.

a. **Consistency of national classifications**. National classifications are consistent with the corresponding European classification systems.
b. **Correspondence tables**. Correspondence tables are documented and kept up-to-date.

5.5: Co-operation with the scientific community is organised to improve methodology, the effectiveness of the methods implemented and to promote better tools when feasible.

a. **Contact with the scientific community**. There is regular contact, e.g. through conferences, workshops, task forces, with the scientific community to discuss methodological, IT and innovation developments.
b. **Collaboration with colleagues at international level**. Staff collaborates on methodological issues with colleagues at international level.
c. **External evaluation**. Evaluations/assessments/audits of the methods used are requested from external experts where appropriate.

Principle 6 – Appropriate Statistical Procedures.

6.1: When data are based on administrative sources, the definitions and concepts used for administrative purposes are a good approximation to those required for statistical purposes.

a. **Documentation about administrative and statistical processes**. Documentation exists describing the differences between administrative and statistical processes in terms of definitions, concepts, coverage, etc.
b. **Studies about differences in concepts and measures to deal with it**. Differences in concepts are thoroughly studied and measures to deal with these differences are taken, when appropriate.

6.2: In the case of statistical surveys, questionnaires are systematically tested prior to the data collection.

a. **A procedure to assess and validate questionnaires**. A procedure is in place to assess and validate questionnaires.
b. **Testing of questionnaires**. Prior to data collection, survey questionnaires are tested by appropriate methods (questionnaire pretest, pilot in real situation, in depth - interviews, focus groups, interviewer support, etc). The response time (the interview length) is estimated at this stage, if necessary.
c. **Use of the test results**. The test results are taken into account in the process of implementing the final questionnaire, and documented in a report.

6.3: Survey designs, sample selections and estimation methods are well based and regularly reviewed and revised as required.

a. **An organizational structure for guidelines, methodologies and examination of the methods used**. An appropriate organizational structure provides guidelines, recommends appropriate methodologies and periodically examines the methods used for survey sampling, sample selections and estimation methods.
b. **Reporting on methods**. Authorities reports publicly on sample selection and estimation methods when they occur.
c. **Compliance of survey designs and sample selections with standards**. Survey designs and sample selections are developed according to standard methods.
d. **Renewal of sample designs**. Sample designs are periodically renewed for recurrent surveys.
e. **Comparable methods for calculating accuracy**. Methods for calculating the accuracy of statistical data allow for the accuracy of data at EU level to be compared.
f. **Measurement and reporting of sampling precision**. Estimations of sampling precision are properly measured and adequately reported.

g. **Methodological rules applied in estimation**. Estimation methods, including the correction of non-response, data calibration and seasonal adjustment follow transparent methodological rules

6.4: Data collection, data entry, and coding are routinely monitored and revised as required.

a. **An organizational structure for guidelines, methodologies and examination of the methods used**. An appropriate organizational structure provides guidelines, recommends appropriate methodologies and periodically examines the methods used for data collection, data entry and coding.
b. **Optimization of data collection**. Data collection is optimized in order to reduce costs and response burden, to improve accuracy and to reduce non-sampling errors
c. **Provision of documents to respondents**. Respondents are provided with all necessary documents (i.e. letters, questionnaires, leaflets, especially in the case of self-administrated questionnaires and feedback if possible). These documents are reviewed regularly.
d. **A procedure to monitor data collection techniques**. Data collection techniques are periodically monitored.
e. **Training courses for interviewers**. When applicable, for each survey, an interviewer manual/handbook exists and the accompanying interviewer procedures are implemented.
f. **A procedure to follow-up non-response**. Follow-up procedures are in place and implemented in the case of non-response.
g. **Data coding methods**. The data coding methods are documented and stored.
h. **Revision of automatic coding methods**. Automatic coding methods are periodically reviewed and revised if necessary.
i. **Quality indicators related to data collection and coding**. Quality indicators related to data collection and coding are produced and analysed according to a quality assurance plan or any other similar scheme.
j. **Support to respondents**. Respondents are given support with filling in the questionnaires (help on-line, free toll number, support from personnel). Procedures are in place to answer to respondents' requests and complaints.

6.5: Appropriate editing and imputation methods are used and regularly reviewed, revised or updated as required.

a. **An organizational structure for guidelines, methodologies and examination of the methods used**. An appropriate organizational structure provides guidelines, recommends appropriate methodologies and periodically examines editing and imputation methods.
b. **Promotion and sharing of procedures for editing and imputation**. Procedures for editing and imputation techniques are promoted and shared in order to encourage their harmonization.
c. **Analysis of the editing and imputation**. Analysis of the effect of editing and imputation is undertaken as part of assessing quality of the data collection.
d. **Compliance of editing and imputation techniques with standards**. Editing and imputation techniques follow standard methodological rules and are documented.

6.6: Revisions follow standard, well-established and transparent procedures.

a. **Guidelines and principles related to revisions**. Guidelines and principles relating to the revision of published data exist, are routinely applied and made known.

b. **Promotion of methodological improvements**. Methodological improvements are promoted through regular and permanent actions (i.e. seminars on methodology, expert meetings, self assessments, audits etc).
c. **Explanations and publication of revisions**. Revisions are accompanied by all necessary explanations and made available to users.
d. **Quality indicators on revisions**. Quality indicators on the revisions made are regularly calculated in accordance with current standards and made known to users.

6.7: Agreements are made with owners of administrative data which set out their shared commitment to the use of these data for EUMAP purposes.

a. **Arrangements with owners of administrative data**. Arrangements between partners and owners of administrative data are in place to facilitate the use of administrative data for DCF purposes.
b. **Documentation about administrative data**. Documentation about the contents of the administrative data and the production process of the data (such as a methodological document, concepts and definitions and populations) is available to the partners.
c. **Joint agreements with the owner of administrative data**. Joint agreements concerning the security of the data, the provision of files of individual data and the delivery deadlines are jointly developed by the EUMAP partners and the owner of administrative data

6.8: Authorities co-operate with owners of administrative data in assuring data quality.

a. **Informing the administrative data owner**. The administrative data owner is kept informed about the way administrative data are used for statistical purposes, and related quality issues.
b. **Assessment of administrative data quality**. Authorities makes sure that arrangements are in place and, where possible, provide tools to assess the quality of the administrative data, while respecting confidentiality

Principle 7 – Non-excessive burden on respondents.

7.1: The range and detail of EUMAP requirements is limited to what is absolutely necessary.

a. **Priorities for EUMAP**. Priorities for EUMAP are set at an EU/regional level taking burden on respondents into account.
b. **Verification of the response burden and level of details**. Analysis of data calls and EU/regional requirements is undertaken in order to verify the response burden and level of details of variables foreseen by the requests.
c. **Assessment of the work programme**. The content of the work programme is assessed to eliminate duplication or redundancy across the partners.
d. **Measurement of response burden**. Response burden is measured periodically.
e. **Justification of each collected variable**. Each collected variable is duly justified.
f. **Consideration of alternative data sources**. To minimize data collection there is explicit consideration of alternative data sources, including the availability and suitability of existing survey and administrative data.

7.2: The reporting burden is spread as widely as possible over survey populations.

a. **Reviews of reporting burden**. Reviews of reporting burden are undertaken on a regular basis.

b. **Action plans for simplification/modernization**. Action plans for simplification/ modernization to decrease burden on respondents are developed, implemented and monitored.
c. **Use of statistical sampling methods**. Statistical sampling methods are used to ensure the reporting burden does not fall on particular categories of respondents unnecessarily.
d. **Reduction of reporting burden**. Reporting burden is reduced by appropriate sampling design, using for example coordinated sampling.
e. **Calculation of the reporting burden**. The reporting burden is calculated for the time needed: to answer the questionnaire, to retrieve the required information, to obtain internal or external expertise and to handle sensitive information.
f. **Limitation of questions**. Questions used to collect information which will not be published are limited and justified.

7.3: The information sought from businesses is, as far as possible, readily available from their accounts and electronic means are used where possible to facilitate its return.

a. **Manuals and technical tools**. Manuals and technical tools (e.g. software) are developed to increase electronic means for data collection.
b. **A plan for electronic data collection**. A plan for implementing electronic data collection exists.
c. **A web site for data collection**. A common web site for data collection is in place.
d. **Cooperation with the business community**. Survey managers aware of potential difficulties in obtaining information, work together with the business community in order to find adequate solutions.
e. **Informing the businesses of the survey results**. To give thanks for their participation in surveys and to promote their importance in the Statistical System, businesses are kept informed of the results of surveys.

7.4: Administrative sources are used whenever possible to avoid duplicating requests for information.

a. **Tools to increase the use of administrative sources**. EU/regional planning develop tools to increase the use of administrative sources.
b. **Plans to explore and use administrative sources**. Planning actions at national level are developed in order to explore and use administrative sources for EUMAP needs (e.g. appropriate arrangements, development of modules to be used in a coordinated way reducing/limiting response burden, national legislation or agreements if necessary).
c. **Legal obligation to provide administrative data**. Legal access to the administrative sources is granted and the administrative authorities have the obligation to provide the administrative data if requested.
d. **Guidance on the availability and quality of administrative sources**. Guidance on the availability and quality of administrative sources is available to survey managers.
e. **Applications for the collection of administrative data**. Applications for the collection of administrative data to be used for statistical purpose are developed and implemented

7.5: Data sharing within partners is generalised in order to avoid multiplication of surveys.

a. **Technical tools for data sharing**. Technical tools for data sharing within National/Regional/EU system (e.g. formal agreements, web services, common data bases) exist.
b. **Documentation of repositories for data**. Documentation of repositories for production and archived data exists.
c. **Sharing of data archives**. Data archives are shared within partners when useful and in compliance with confidentiality policies.

7.6: Authorities promote measures that enable the linking of data sources in order to reduce reporting burden.

a. **Key variables to be shared**. The EU/regional/national authorities define the key variables that need to be shared between data processes in accordance with confidentiality rules.
b. **Documentation on the data file structures and transmission formats**. Documentation is available on the data file structures and transmission formats required for linking data sources.

Principle 8 – Cost effectiveness.

8.1: Internal and independent external measures monitor the authority's use of resources.

a. **Allocation of resources to statistical processes**. Accounting systems allow allocation of resources to statistical processes.
b. **Reviews of IT infrastructure**. IT infrastructure is reviewed regularly.
c. **Procedures to calculate ex-ante costs**. Ex-ante cost calculation procedures are available for statistical processes.

8.2: The productivity potential of information and communications technology is being optimised for data collection, processing and dissemination.

a. **IT architecture and strategy**. An appropriate IT architecture and strategy exists and is regularly updated.
b. **Policies, procedures and tools to promote automatic processing techniques**. Policies, procedures and tools exist to promote automatic techniques for data capture, data coding and validation.
c. **Review of the use of automated processing techniques**. The use of automated processing techniques is regularly reviewed.

8.3: Proactive efforts are made to improve the statistical potential of administrative data and to limit recourse to direct surveys.

a. **Assessment of possible administrative data sources**. An assessment of possible administrative data sources is carried out prior to launching any new survey.
b. **Data linking and integration methods**. Data linking and integration methods are pro-actively pursued subject to data security considerations.
c. **Quality indicators to improve the use of administrative data**. Quality indicators are developed and compiled to improve the methods for using administrative data for statistical purposes.

8.4: Authorities promote and implement standardized solutions that increase effectiveness and efficiency.

a. **Standardization programmes and procedures for statistical processes**. Standardization programmes and procedures are defined and implemented in the main stages of statistical production areas, for example sampling, registers, data collection and data exchange, according to the business process model.
b. **A strategy to adopt or develop standards**. There is a strategy to adopt or develop standards in various fields e.g. quality management, process modelling, software development, software tools, project management and document management.
c. **A statement in the methodological documentation**. A statement explaining steps taken to move gradually towards or to comply with standardization is part of the reference metadata.

Principle 9 – Relevance.

9.1: Processes are in place to consult end users, monitor the relevance and utility of existing data in meeting their needs, and consider their emerging needs and priorities.

a. **Users' consultation activities**. Regular and structured activities for the consultation of users are in place focusing on both, the content of the statistical programme and the product quality of the data.
b. **A classification of users**. A classification of users of a given product is regularly updated and made available.
c. **A list of key users and their data uses**. A list of key users and their data uses, including a list of unmet user needs, are regularly updated and made available.
d. **Users' consultation procedures**. Procedures for user consultation on the data are in place.
e. **Relevance measurement and assessment**. Quality indicator(s) on relevance are regularly assessed.

9.2: Priority needs are being met and reflected in the work programme.

a. **Work programme priorities**. Procedures are implemented to prioritise between different users' needs in the work programme.
b. **Strategic goals and programme plans**. Strategic goals and programme plans are elaborated and published regularly.
c. **Agreements with most important users**. Service level agreements or similar arrangements are established with the most important users.
d. **Evaluation of the work programme**. Periodic evaluation of the work programme is carried out to identify negative priorities and emerging needs.

9.3: User satisfaction is monitored on a regular basis and is systematically followed up.

a. **User satisfaction surveys**. User satisfaction surveys (including e.g. compilation of quality indicators on user satisfaction) or similar user studies are carried out and assessed regularly with an office-wide scope.
b. **Improvement actions arising from the user satisfaction surveys**. Improvement actions arising from the user satisfaction surveys are defined and scheduled for implementation.
c. **Assessment of satisfaction of key users**. Measures to assess satisfaction of key users with particular products are in place (e.g. specific user satisfaction survey/indicators on product level).

Principle 10 – Accuracy and Reliability.

10.1: Source data, intermediate results and statistical outputs are regularly assessed and validated.

a. **Systems for assessing and validating data.** Systems for assessing and validating source data, intermediate results and statistical outputs are developed, implemented and managed.
b. **Procedures and guidelines for data quality assessment**. Internal procedures and guidelines for data quality assessment exist and address accuracy and reliability issues.
c. **Comparison of results with other sources**. Results are compared with other existing sources of information in order to ensure validity

10.2: Sampling errors and non-sampling errors are measured and systematically documented according to the European standards.

a. **Procedures and guidelines to measure and reduce errors**. Internal procedures and guidelines to measure and reduce errors are in place and may cover activities such as these examples:
    - Identification of the main sources of error for key variables;
    - Quantification of sampling errors for key variables;
    - Identification and evaluation of main non-sampling error sources in statistical processes;
    - Identification and evaluation in quantitative or qualitative terms of the potential bias;
    - Special attention to outliers as well as their handling in estimation;
    - Quantification of potential coverage errors;
    - Quantification of potential measurement errors (comparison with existing information, questionnaire design and testing, information on interviewer training, etc.);
    - Quantification of non-response errors, including systematic documentation for technical treatment of non-response at estimation stage and indicators of representativeness;
    - Quantification of processing errors;
    - Analysis of the differences between preliminary and revised estimates.
b. **Quality reporting on accuracy**. Periodic quality reporting on accuracy is in place (serving both producer and user perspectives).
c. **Recommendations on quality reporting**. Quality reporting on accuracy is guided by EU/regional recommendations.
d. **Methods and tools for preventing and reducing errors**. Methods and tools for preventing and reducing sampling and non-sampling errors are in place

10.3: Revisions are regularly analysed in order to improve statistical processes.

a. **A Revision Policy**. A Revision Policy stating principles and procedures is spelled out in writing and made public.
b. **Explanations on revisions**. The timing of revisions, their reasons and nature are explained publicly.
c. **Compliance of the Revision Policy with standard procedures**. The Revision Policy follows standard and transparent procedures in the context of each survey.
d. **Information on the size and direction of revisions for key indicators**. Information on the size and direction of revisions for key indicators is provided and made public.
e. **Use of analysis of revisions**. Regular analysis of revisions is used to improve the statistical process, incorporating lessons learnt to adjust the production cycle.

Principle 11 – Timeliness and Punctuality.

11.1: Timeliness meets European and other international release standards.

a. **Compliance with international standards on timeliness**. There is compliance with international standards on timeliness.
b. **Publication of a release calendar**. A release calendar is published covering all data, for which timeliness standards are established within European regulations or agreements at international level.
c. **A procedure to monitor and follow-up divergences from timeliness targets**. Divergences from European and international timeliness targets are regularly monitored and an action plan is developed if these targets are not met.
d. **Quality indicator(s) on timeliness**. Quality indicator(s) on timeliness are regularly calculated and published.

e. **Analysis and assessment of quality indicator(s) on timeliness**. Quality indicator(s) on timeliness are regularly analysed and assessed to improve the statistical process, if relevant.

11.2: The periodicity of data collection takes into account end user requirements as much as possible.

a. **Consultation of users on periodicity**. Authorities consults users regularly on periodicity.

11.3: Divergence from the dissemination time schedule is publicised in advance, explained and a new release date set.

a. **Publication of a release calendar**. A release calendar is regularly published.
b. **A procedure to monitor and assess punctuality**. Punctuality of every data call is regularly monitored and assessed.
c. **Divergences from the deadlines, the reasons for divergence and a new deadline**. Divergences from the deadline are informed in advance, the reasons are explained, and a new deadline is set.
d. **A procedure to calculate, monitor and disseminate quality indicators on punctuality**. Quality indicator(s) on punctuality for preliminary and final results are regularly calculated, monitored and disseminated.

11.4: Preliminary results of acceptable aggregate accuracy can be released when considered useful.

a. **Review of the possibility of using preliminary results**. The possibility of using preliminary results is reviewed regularly taking into account the data accuracy.
b. **Reporting of the quality of preliminary results**. When preliminary results are used, appropriate information is provided to the user about the quality of the results.
c. **A policy for scheduled revisions**. Key outputs, or groups of key outputs, which are subject to scheduled revisions have a published policy covering those revisions.

Principle 12 – Coherence and Comparability.

12.1: Data are internally coherent and consistent (i.e. arithmetic and accounting identities observed).

a. **Procedures and guidelines to monitor internal coherence**. Procedures and guidelines to monitor internal coherence are developed and carried out in a systematic way. Where appropriate they should deal with consistency between preliminary and final data (i.e. continuity), between microdata and aggregated data, between annual, quarterly and monthly data and also with non-deterministic consistency (e.g. consistency between economic growth and employment, also called plausibility).
b. **Procedures and guidelines to ensure combination of outputs from complementary sources**. Process specific procedures and guidelines ensure that outputs obtained from complementary sources are combined so as to assure internal coherence and consistency.

12.2: Data are comparable over a reasonable period of time.

a. **Changes to concepts**. Significant changes in reality are reflected by appropriate changes to concepts (classifications, definitions and target populations).
b. **Identification and measurement of changes in methods**. Changes in methods are clearly identified and their impact measured to facilitate reconciliation.

c. **Explanation of breaks in time series**. Breaks in the series are explained and methods for ensuring reconciliation over a period of time made available.

12.3: Data are compiled on the basis of common standards with respect to scope, definitions, units and classifications in the different surveys and sources.

a. **A mechanism to promote coherence and consistency**. A common repository of concepts or a mechanism to promote coherence and consistency is used.
b. **Assessment of compliance with standards**. Periodic assessments of compliance with standards on definitions, units and classifications are carried out and reflected in quality reporting.
c. **Explanation of deviations from standards.** Deviations from standards on definitions, units or classifications are made explicit and the reasons for deviating are explained.

12.4: Data from the different sources and of different periodicity are compared and reconciled.

a. **Comparison of statistical output with related data**. Statistical outputs are compared with other statistical or administrative data that provide the same or similar information on same domain/phenomenon.
b. **Identification and explanation of divergences**. Divergences originating from different sources are identified and reasons clearly explained.
c. **Reconciliation of statistical outputs**. Statistical outputs are reconciled whenever possible.

12.5: Cross-national comparability of the data is ensured within the EUMAP through periodical reviews at regional and European level. Methodological studies are carried out in close co-operation between the Member States and DGMARE

a. **Institutionalization of assessment of comparability**. Periodic assessments of comparability are institutionalized.
b. **Collaboration in methodological studies**. Methodological studies are conducted in collaboration between Member States and DGMARE.
c. **Assessment at EU level of the comparability of data**. Assessment of the comparability of data from the quality reports requested from Member States.
d. **Analysis of asymmetries**. An analysis of asymmetries is carried out where possible and reports on mirror data between Member States are made available.
e. **Identification and corrections of discrepancies in mirror data**. Discrepancies in mirror data are identified and corrected whenever possible.

Principle 13 – Accessibility and Clarity.

13.1: Data and the corresponding metadata are presented, and archived, in a form that facilitates proper interpretation and meaningful comparisons.

a. **A Dissemination Policy**. A Dissemination Policy, defining dissemination practices, is in place and is made public. Procedures are in place to review the standards for the dissemination of statistical results.
b. **Consultations of users about dissemination**. Users are consulted about the most appropriate forms of dissemination (e.g. Focus groups, Customer Satisfaction Surveys) on a regular basis.
c. **A policy for archiving data and metadata**. A policy for archiving data and metadata is in place.

d. **Comparisons included in publications**. Meaningful comparisons are clearly included in publications, when appropriate.

13.2: Dissemination services use modern information and communication technology and, if appropriate, traditional hard copy.

a. **Website and statistical databases' conformity with universal guidelines**. The website and statistical data bases conform so far as it is possible to universal web content accessibility guidelines.
b. **Website, statistical data bases and self-tabulation**. The website and statistical data bases are the main means for disseminating statistical results and facilitate self-tabulation in the most appropriate formats (e.g. XLS, HTML).
c. **Facilitating re-dissemination**. Statistical results are disseminated using tools and formats that facilitate re-dissemination by the media by means of, for example press releases, readymade tables, charts, maps connected to data, metadata.

13.3: Custom-designed analyses are provided when feasible.

a. **Communication about the possibility and terms of custom-designed analyses**. The possibility and terms of custom-designed analyses are clearly communicated.
b. **Provision of custom-designed outputs**. Custom-designed outputs are provided on request.

13.4: Access to microdata is allowed for research purposes and is subject to specific rules or protocols.

a. **Publication of the rules or protocols to access microdata**. The rules or protocols to access microdata are made publicly available.

13.5: Metadata are documented according to standardised metadata systems.

a. **Dissemination of statistical results and metadata**. All statistical results are disseminated together with the respective metadata allowing for a better understanding of the results.
b. **Metadata linked to the statistical product**. Metadata are available and, if separate to the statistical product clear links are presented.
c. **Metadata independent of the format of publication**. Metadata of statistical results are available independently of the format of publication (e.g. web, hard copies).
d. **Procedures to update and publish metadata**. Metadata is regularly updated and procedures to ensure the updating are available.

13.6: Users are kept informed about the methodology of statistical processes including the use of administrative data.

a. **Planning of the production of quality reports**. The regular production of standardized quality reports and methodological documents are planned in the work programme.
b. **Publication of quality reports and methodological documents**. User-oriented quality reports and methodological documents are made available.

13.7: Users are kept informed about the quality of statistical outputs with respect to the quality criteria adopted at regional or European level.

a. **Publication of quality reports**. User oriented quality reports are made available.
b. **Compliance of quality reports with standards and guidelines**. User oriented quality reports are defined according to standards and guidelines for quality reporting.

Part II – Quality reporting

Guidelines for preparing quality reports

The ESS has quite good documentation on quality reporting. Those documents will be the base for the present guidelines. Taking into account that a lot of effort was put by DGMARE in providing a structure of the Annual report, the guidelines will focuses on the principles of the QAFC and what information should be there in order to assess the quality of the data collection. They will also focus on the different types of reporting, namely the scope of the report and the level of detail considering if is producer or user oriented.
The **ESS handbook for quality reports** defines the headings for detailed quality reports as the following:

1. Synthesis of the quality report, introduction to the statistical process and its outputs – an overview to provide the context of the report;
2. Relevance, assessment of user needs and perceptions – an output quality component;
3. Accuracy and reliability- an output quality component;
4. Timeliness and punctuality - output quality components;
5. Accessibility and clarity - output quality components;
6. Coherence and comparability - output quality components;
7. Cost and burden – process quality components;
8. Confidentiality – a process quality component; (Not applicable)

In line with the last five QACF Principles, output quality is assessed in terms of the following quality criteria:

Relevance: outputs, i.e. results meet the needs of users.
Accuracy and Reliability: outputs accurately and reliably portray reality.
Timeliness and Punctuality: outputs are released in a timely and punctual manner.
Coherence and Comparability: outputs are consistent internally, over time and comparable between regions and countries; it is possible to combine and make joint use of related data from different sources.
Accessibility and Clarity: outputs are presented in a clear and understandable form, released in a suitable and convenient manner, available and accessible on an impartial basis with supporting metadata and guidance.

Statistical outputs are the result of the statistical processes and the visible face of the statistical operations. Moreover, they define the usual dimensions on quality. For the EUMAP, in parallel with the ESS, quality is defined by 6 dimensions, of which Principle 10 (Accuracy and Reliability received the most attention in the past. With the change to a multidimensional concept of quality it's important to further develop each of the dimensions. Principle 12 defines 2 data quality dimensions: Coherence and Comparability. EUROSTAT considers that "*It is difficult to measure most of these output quality dimensions, but it is possible to relate some process variables to the dimensions.*" And also that "*it is difficult to establish target levels of product quality in customer terms. Desirable features - for example, range of products or timeliness - that lead to customer satisfaction are difficult to identify due to the wide variety of unknown and potential customers. The impact of defects (i.e. errors) leading to customer dissatisfaction are hard to asses because the magnitudes of errors are often unknown (due to their multiplicity), as are their impact on customers (due to the wide range of uses).*

It follows that the appropriate allocations of resources across products and across process steps for a given product are difficult to determine because the effects of changes to these allocations cannot be easily measured in terms of the output quality"

Output quality is always achieved through process quality. In general terms, process quality has two broad aspects:

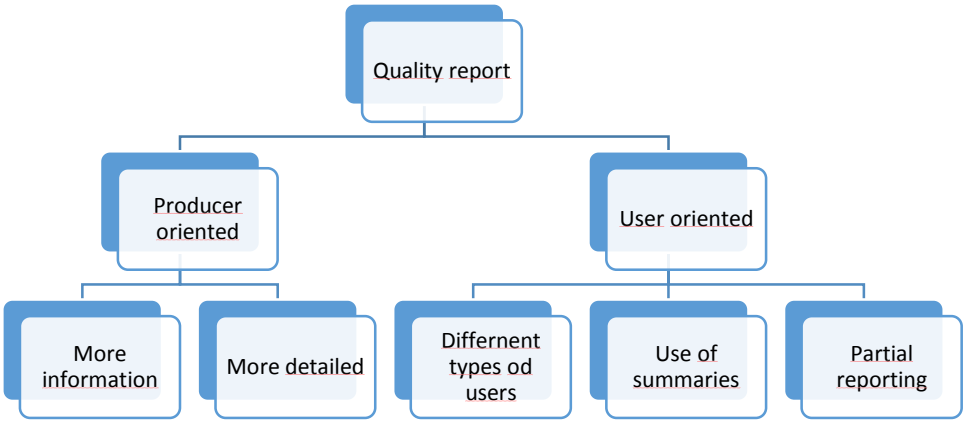
- **Effectiveness**: which leads to the outputs of good quality; and
- **Efficiency**: which leads to their production at minimum cost to the NSO and to the respondents that provided the original data.

In the context of the EUMAP and in line with the principles of the QACF, the quality criteria of the statistical processes are as follows. Some of the quality criteria of the statistical processes also concern the institutional environment – these criteria have a dual applicability.

- **Sound methodology**: sound methodology, including adequate tools, procedures and expertise, underpins quality data.
- **Appropriate statistical procedures**: appropriate statistical procedures, implemented from data collection to data validation, underpin quality data.
- **Non-excessive burden on respondents**: the reporting burden is proportionate to the needs of the users and is not excessive for respondents. Authorities monitor the response burden and sets targets for its reduction over time.
- **Cost effectiveness**: resources are used effectively.

Orientation of report (User/Producer)

A quality report may be user-oriented, producer oriented or both. The following guidelines are producer-oriented with focus on the statistical processes besides the quality outputs and on the quality assurance of the EUMAP data collection. User oriented quality reporting is much less detailed and focuses on the output quality, providing summaries, charts and concise tables rather than extensive detailed information.



Types of statistical processes for data collection

1. **Sampling survey** – This is a survey based on a, usually probabilistic, sampling procedure involving direct collection of data from respondents. For this kind of survey there is an established theory on accuracy that allows reporting on well-defined accuracy components (sampling and non-sampling errors).
2. **Census** – This can be seen as a special case of the sample survey, where all frame units are covered.
3. **Statistical process using administrative sources** – This sort of process makes use of data collected for other purposes than DCF. An example is where sales notes and logbook data collected under Control Regulation are used to report on landings and effort.

If, on the other hand, a questionnaire is sent by a DCF partner to a sample of (or all) auctions asking for information on sales notes, discards etc., this is considered to be a survey (census) regardless of how, or from what, administrative sources the institutions retrieve the information. The key point here is that the questionnaire, including the definitions of the variables, is designed by or agreed with the DCF partner.

4. **Statistical process involving multiple data sources** – In some cases, measurement problems are such that one unified approach to sampling and measurement is not possible or suitable. For example, for landings values, information for sales notes may only cover landings of fresh fish on auctions. Information for landings of frozen products or landings/transhipments on foreign ports may be collected through questionnaires, sampling schemes and/or other survey procedures.
5. **Price or other economic index process**. – The reasons for distinguishing economic index processes as a special type of statistical process can be described as altogether fourfold: (i) there is a specialised economic theory to define the target concepts for economic indexes; (ii) their error structure involves specialised concepts such as quality adjustment, replacement and re-sampling; (iii) sample surveys are used in several dimensions (weights, products, outlets), mixing probability and non-probability methods in a complex way; and (iv) there is a multitude of these indexes playing a key role in the international statistical systems.
6. **Statistical compilation** – This statistical process assembles a variety of primary sources, including all of the above, in order to obtain an aggregate, with a special conceptual significance.

Introduction

- General description of the process and its outputs
- A brief history of the statistical process and outputs in question.
- The broad statistical domain to which the outputs belong; related statistical outputs.
- The boundary of the quality report at hand and references to related quality reports.
- An overview of all output produced by the statistical process.
- References to other documentation, especially on methodology.

Relevance

Any assessment of relevance needs to consider:
• who are the current and potential users of the data;
• what are their needs (Uses for which users want the outputs.);
• how well the output meets these needs (completeness).
In DCF context possible indicators can be:

- % response data call
- % response data call after deadline
- % filled items per year as, (total filled items in year) / (number of items in all data calls in year)

Accuracy and Reliability

Accuracy can be split into sampling error and non-sampling error. Sampling errors, are applied only to sample surveys; they arise because only a subset of the population is selected, usually randomly. Non-sampling errors are applied to all statistical processes and may be categorised as:
• coverage errors - divergence between the frame population and the target population.

• non-response errors - non-response errors occur when the survey fails to get a response to one, or possibly all, of the questions.
• measurement errors - measurement errors are errors that occur during data collection and cause recorded values of variables to be different from the true ones.
• processing errors - the error in final data collection process results arising from the faulty implementation of correctly planned implementation methods.
• model assumption errors - Model assumption errors are not considered an independent type of error. Usually models are used precisely in order to reduce other errors.

General topics for all statistical processes

In order to get an idea of the impact of the various errors on the final estimates it is important to understand the nature of errors. Variable errors are due to random effects (e.g. these errors cancel out when averaging a series of values affected by them) while systematic errors are due to particular causes, that tend to be in the same direction with respect to the true value (these errors do not cancel out when averaging a series of values affected by them). To understand the impact of these errors it is necessary to consider the collection of final estimates as obtained over many hypothetical repetitions of the process under essentially the same conditions. In general, when the interest is in population means, totals, proportions (linear estimates) variable errors determine the variability, i.e. random fluctuations of the final estimates around the true unknown value from implementation to implementation of the statistical process; the systematic errors introduce bias into the final estimates (the average of the possible values of the data from implementation to implementation is not equal to the true value; the bias of an estimator equals the difference between its expected value and the true value).
There is a grey zone between certain relevance problems and accuracy. This occurs when the definitions most appropriate for users are modified so as to fit the practical measurement circumstances, with the consequence that the statistical outputs become less relevant to the users. To avoid ambiguity, accuracy as defined here refers to the difference between the estimates and the true values as defined in the practical situation.
To report on accuracy it is necessary to evaluate accuracy, i.e., to acquire the relevant information about accuracy. Note there is a distinction between quality control (meaning ensuring quality of output) and evaluation (meaning acquiring information about the quality of output). The methods and approaches for evaluation are less well defined than variance estimation used for evaluating sampling error, for which there is a solid statistical theory. One approach is to make a comparison with another source. Consistency studies can be used when there are known relations between different parameters.

Sampling errors - Probability Sampling Survey

The variability of an estimator around its expected value may be expressed by its variance, standard error, coefficient of variation (CV), or confidence interval.
The coefficient of variation (CV) is defined as the standard error divided by the expected value of the estimator. It is the standard error in relative (percentage) terms. It is the most suitable sampling error statistic for quantitative variables with large positive values, which are common in economic statistics. It is not recommended for proportions, for estimates that are expressed in percentage terms or for changes, where it could easily be misunderstood. It is also not usable for estimates that can take on negative values such as profits, the net export/import value etc.
The confidence interval is defined as an interval that covers the true value with a certain probability. In most cases where it is reasonable to assume the estimator follows a normal distribution, the interval that results from taking ± 1.96* estimated standard error from the point estimate results in a 95 % confidence interval. Taking instead ± 1.96* estimated CV expresses the interval in percentage terms.

Where CV thresholds are included in regulations, a comparison between estimated CVs and the relevant thresholds should be included.
Non-response should be taken into account, i.e., the sample size should be the effective sample, after deduction of non-response.
The quality of sample designs is measured also by means of a design effect (deff). This is a general measure to compare the variance of simple random sample (SRS) with the variance of complex samples of equal size, where two variances are compared for the same variable. In general, stratification in comparison to SRS sampling decreases, while multi-stage sampling increases the sampling error.

Sampling errors - Non Probability sampling

When non-probability sampling is applied, random error cannot be estimated without reference to a model of some kind. Furthermore, sampling biases may well be significant and need to be assessed as well.
One type of non-probability sampling that is frequently applied in economic surveys and therefore needs special attention is the use of a cut-off threshold. Units (businesses, enterprises, establishments) below a certain size threshold, although belonging to the target population, are not sampled at all; there is a term cut-off sampling for such a procedure.
Technically this situation is similar to under coverage (further discussed below under coverage errors) but with the distinctive feature that the cut-off is intentional and there is register information for the excluded units, which gives a better opportunity for model-dependent estimation. Two of the reasons for a cut-off threshold are reduction of the response burden for small units and considerable contributions to the errors (sampling and non-sampling) of the design-based estimator.
The introduction of a cut-off threshold results in a different situation than probability sampling, including a bias (according to the design-based survey sampling paradigm) due to the sampling probability being zero. On the other hand, if, by definition, the target population refers only to the sampled portion of the population, then instead of an accuracy problem there is a relevance problem for those users who are interested in properties of all units and not just of those above the threshold. When the population below the threshold is included in the target, a model-based estimator is natural. A cut-off threshold is often combined with probability sampling above the threshold and in this case can be called sampling with cut-off as opposed to census with cut-off where all units above the threshold are included.
For reporting on sampling with cut-off the most suitable approach is two-fold. For the sampled portion of the population, random sampling error may be presented as above. For the non-sampled portion a discussion about the (explicit or implicit) model used in the estimation process should be included. Often this model simply assumes that the units cut off behave similarly to those in the sampled portion. This assumption should be analysed as far as possible. Such an analysis is useful also where the cut-off is considered as a relevance problem rather than contributing to sampling error. If the accuracy has been evaluated on an intermittent basis by sampling in the cut-off portion this should be reported.
For other forms of non-probability sampling, it may be reasonable to apply standard error estimators as if the sample is effectively random, using an assumption for the design or some model based approach. This approach has, however, to be complemented with a discussion of possible sampling bias and of possible limitations in the sampling model used. For example, it can often be determined whether (and why) the estimates of sampling error thus derived are “conservative” (i.e., upper limits) relative to the real errors.
It is not enough just to declare that a sample is “purposive” or “subjective” without providing more information. Technical details on how the sample was selected should always be reported. The rationale for not using probability sampling should be stated as well as an assessment of how the sampling procedures can affect the estimates.

Census

The objective of a census is to collect data from all units according to an agreed definition. Three important categories of census are:
Population census - the units are enterprises or individuals;
Economic census - the units are enterprises and local units (a producing unit of an enterprise with a physical address) or other intermediate units (kind-of-activity units, local kind of activity units.)
By definition, there is no sampling error in a census but what is said on non-sampling errors in "for all statistical processes" is relevant also for a census.
The error profile of a census may be very different from a sample survey, however, and may also vary greatly depending on type of census and type of approach used. This affects the relative emphasis that should be put in the quality report.

Non - sampling Errors

a) Coverage and Other Frame Errors

The target population is the population for which inferences are made. The frame (or frames, as sometimes several frames are used) is a device that permits access to population units. The frame population is the set of population units which can be accessed through the frame and the survey data really refer to this population. The frame also contains sufficient information about the units for their stratification, sampling and contact.
The concept of a frame is traditionally used for sample surveys, but applies equally to censuses. For some other types of statistical process, the concept may also be useful but has to be defined in each case.
Coverage errors (or frame errors) are due to divergences between the frame population and the target population. Three types of coverage error are distinguished:

- **Under coverage**: there are target population units that are not accessible via the frame (e.g., persons without a phone will not be listed in a telephone catalogue);
- **Over coverage**: there are units accessible via the frame which do not belong to the target population (e.g., non-existing vessels still in the register);
- **Multiple listings (duplication)**: target population units are present more than once in the frame (e.g., persons with two or more telephone connections).

Quality and Performance Indicators:

- **Over-coverage – rate**: proportion of units accessible via the frame that do not belong to the target Population.
- **Common units proportion (for the case of using both survey and administrative sources):** proportion of units covered by both the survey and the administrative sources in relation to the total number of units in the survey.

b) Measurement Errors

Measurement errors are errors that occur during data collection and cause the recorded values of variables to be different from the true ones. Their causes are commonly categorized as:
Survey instrument: the form, questionnaire or measuring device used for data collection may lead to the recording of wrong values;
Respondent: respondents may, consciously or unconsciously, give erroneous data;
Interviewer: interviewers may influence the answers given by respondents.
The term "measurement" here refers to measurement at the unit level, for example the monthly income of a person or the annual turnover of a company. The result of a measurement may be viewed as comprising the true value plus an error term that is zero if the measurement is correct.

This implies that a true value exists, which is sometimes subject to debate. Measurement errors can be systematic or random.

c) Non-response errors

Non-response is the failure of a sample survey (or a census) to collect data for all data items in the survey questionnaire from all the population units designated for data collection. The difference between the estimates computed from the collected data and those that would be computed if there were no missing values is the non-response error.
There are two types of non-response:

- **unit non-response** which occurs when no data are collected about a population unit designated for data collection, and
- **item non-response** which occurs when data only on some but not all the survey variables are collected about a designated population unit.

The extent of response (and accordingly of non-response) is measured in terms of response rates of two kinds:

- **unit response rate**: the ratio of the number of units for which data for at least some variables have been collected to the total number of units designated for data collection;
- **item response rate**: the ratio of the number of units which have provided data for a given variable to the total number of designated units or to the number of units that have provided data at least for some data items.

Other ratios are sometimes used instead of, or as well as, these ratios of counts. They are:

- **design-weighted response rates**, which sum the weights of the responding units according to the sample design;
- **size-weighted response rates**, which sum the values of auxiliary variables multiplied with the design weights, instead of the design weights alone.

Imputation

Imputation is a response to deficiencies in the data received. In a sample survey or census the reasons for imputation could be non-response (usually item non-response) or to correct values affected by measurement or processing errors.
The extent to which imputation is used, the reasons for it, and the imputation procedures should be described in the quality report. Where imputation is associated with a particular source of error, it is best to include its description under the relevant heading (for example non-response or measurement error).
Imputation is a part of data processing and thus may itself cause processing error. Normally this can be assumed to be a minor problem compared with the error sources that created the need for imputation in the first place and, if so, need not be dealt with explicitly.
Imputation can also affect the calculation of sampling error. In particular if imputation based on replacement by stratum mean is used the result will be to introduce some underestimation of the real sampling error. This should be noted where sampling errors are presented unless special methods have been applied to deal with this.
After imputation the data should normally only contain plausible and internally consistent data records.
Quality and performance indicator:

- Imputation rate: The ratio of the number of replaced values to the number of values for a given variable.

What should be included in the quality report?

Overall Accuracy

In the overall Accuracy it should be included:

- Identification of the main sources of error for the main variables.
- If micro-data are accessible for research purposes, it may be necessary to make additional comments to assist such uses.
- A summary assessment of all sources of error with special focus on the key estimates.
- An assessment of the potential for bias (sign and order of magnitude) for each key indicator in quantitative or qualitative terms.

Sampling Errors (Sampling Surveys)

Always applicable

- Where sampling is used there should be a section on sampling errors.
- As far as possible sampling error should be presented for estimates of change in addition to estimates of level. If necessary, reasonable assumptions can be used.
- If the estimators include adjustments for non-sampling errors, for example non-response, this should be explained and included also in the accuracy assessment.

If probability sampling is used:

- There should be a presentation of sampling errors calculated according to formulas that should also be made available.
- The most appropriate presentational device should be chosen, normally CVs, ranges of CVs, or confidence intervals.
- If outliers have received special treatment in estimation, this must be clearly described.

If non-probability sampling is used:

- For sampling with cut-off an assessment of the accuracy due to the cut-off procedure should be included in addition to the presentation of sampling error for the sampled portion of the population.
- For other forms of non-probability a sampling model can be invoked for the estimation of sampling error. A motivation for the chosen model and a discussion of sampling bias should be included.

Non sampling errors

Coverage Errors

Quantitative information on over coverage and multiple listings.

- An assessment, preferably quantitative, on the extent of under coverage and the bias risks associated with it.
- Actions taken for reduction of under coverage and associated bias risks,
- Information on the frame: reference period, updating actions, and references to other documents on frame quality.

Measurement errors

- Identification and general assessment of the main risks in terms of measurement error.
- If available, assessments based on comparisons with external data, re-interviews, experiments or data editing.
- The efforts made in questionnaire design and testing, information on interviewer training and other work on error reduction.
- Questionnaires used should be annexed (if very long by hyperlink)

Non-response errors

- Non-response rates according to the most relevant definitions for the whole survey and for important sub-domains.
- Item non-response rates for key variables.
- A breakdown of non-respondents according to cause for non-response.
- A qualitative statement on the bias risks associated with non-response.
- Measures to reduce non-response.
- Technical treatment of non-response at the estimation stage.

Processing errors

• Identification of the main issues regarding processing errors for the statistical process and its outputs.
• Where relevant and available, an analysis of processing errors affecting individual observations should be presented; else a qualitative assessment should be included.

Model Assumptions and Associated Errors

- Models related to a specific source of error should be presented in the section concerned. This is recommended also in the case of a cut-off threshold and model-based estimation.
- Domain specific models, for example, as needed to define the target of estimation itself, should be thoroughly described and their validity for the data at hand assessed.

Accuracy for a Census

- An evaluation/assessment of undercoverage and overcoverage.
- A description of methods used to correct for undercoverage and overcoverage.
- A description of methods and an assessment of the accuracy if a cut-off threshold is used.
- An evaluation/assessment of measurement errors.
- An evaluation/ assessment of non-response errors.
- An evaluation/assessment of processing errors.

Imputation

- Information on the extent to which imputation is used.
- • A short description of the methods used and their effects on the estimates.

Timeliness and Punctuality

An assessment of timeliness and punctuality should consider the following:
• data production time;
• frequency of release; and
• punctuality of release.
In the EU MAP context possible indicators may be:

- Submission on time / submission after deadline / no data submission for the data call
- Time-lag: Number of days/months/years between the last day of the reference period and the publication of the first/final results
- Metadata completeness rate

Accessibility and Clarity

Accessibility and clarity refer to the simplicity and ease, the conditions and modalities by which users can access, use and interpret data, with the appropriate supporting information and assistance.

Specific areas where accessibility and clarity may be addressed include:

- needs of analysts;
- assistance to locate information;
- clarity;
- dissemination format.

In the EU MAP context possible indicators can be:

- Existence of methodological documents in Data Collection Portal
- Data calls are disseminated with a predefined format and in a modern information technology

What should be included in the quality report?

- A description of the conditions of access to data: media, support, pricing policies, possible restrictions, etc.
- A summary description of the information (metadata) accompanying the data (documentation, explanation, quality limitations, etc).
- The description should refer to both less sophisticated and more advanced users and how their needs have been taken into account.
- A summary of user feedback on accessibility, clarity and dissemination format.

Coherence and Comparability

Coherence measures the adequacy of data to be combined in different ways and for various uses.

Comparability is a measurement of the impact of differences in applied statistical concepts, measurement tools and procedures where data are compared between geographical areas or over time.

Coherence should be addressed in terms of coherence between:

- data produced at different frequencies;
- other data in the same socio-economic domain;
- sources and outputs.

Comparability should be addressed in terms of comparability over:

- time;
- spatial domains (e.g. sub-national, national, regional, international); and
- domain or sub-population (e.g. industrial sector, gear, vessel length, distant water fleet,…).

What should be included in the quality report?

General

- Brief descriptions of all conceptual and methodological metadata elements that could affect coherence/ comparability.
- An assessment (preferably quantitative) of the possible effect of each reported difference on the output values.
- Differences between the statistical process and the corresponding European regulation/ standard and/or international standard (if any).

Comparability – geographical

- A quantitative assessment of comparability across regions based on the (weighted) number of differences in metadata elements.
- At EU level, a coherence/comparability matrix summarizing by region the possible sources of lack of comparability relative to a specified standard.
- Mirror data: Assessment of discrepancies (if any).

Comparability – over time

- Reference periods at which series breaks (if any) occurred, its reasons and treatments.

Internal Coherence

- Any lack of coherence in the output of the statistical process itself.

PART III – Best practices

- **The sampling schemes should be at least as efficient as simple random sampling.**
  Sampling can be made on many different ways, from the simple random scheme to more elaborate schemes (stratified, PSS, balanced,…). When using complex sampling the rationale should be the efficiency of the sampling, which can be usually seen as a reduction on variability when compared with the simple random sampling. This is also called by "design effect" (or estimate of unit variance). The design effect can be calculated as the ratio between the variance achieved through the chosen sampling scheme over the expected variance of the simple random sampling scheme.

- **Non random sampling should be duly justified**
  Randomness is the basis of the statistical theories and methods for estimation. Non random sampling can be used to collect data but estimates cannot be derived using statistical tools, unless there is a good knowledge of the population and usually the help of some modelling. The downside of the non-probability sampling method is that nonprobability samples cannot depend upon the rationale of probability theory. This entails that the sample may or may not represent the entire population accurately. Therefore, the results of the research cannot be used in generalizations pertaining to the entire population.

- **Sample size: Sample size is key to achieve high quality data.**
  A sample size too small will not yield valid results, while a sample size too large will result in wasting money and time. Sample size can be calculated by some formulas although some rule of thumbs is sometimes used. Some will consider a minimum of 30 units should be used (as this translates in a good approach for samples from a non-normal population). Others will use a number of 10 units per variable to be measured. For example, if we want to measure 5 variables (Income from fishing, other income, variable costs, non-variable costs, crew costs), we should use 50 as a minimum sample size.
  Sample size depends on the variability of the population. High variability (heterogeneous population) implies bigger sampling size. High number of variables to be measured implies bigger sampling size. A large sample size is more representative of the population, limiting the influence of outliers or extreme observations. A sufficiently large sample size is also necessary to produce results among variables that are significantly different. For example, fleet segments are known to be highly heterogeneous due to different levels of activity, use of different gears (eg, polyvalent), different levels of income….

For the purpose of data collection, it is recommended that the minimum sample size is to be set at 30 for any given segment. Segments with less than 30 units are recommended to be collected by census.

- **Sample size should be defined by setting quality targets** (setting the confidence interval and error level). Higher precision and accuracy implies bigger sampling size. How much quality do I need? There are 4 factors influencing sample size:
    1) **Population size - N**
    2) **Variance of the population – V (or defined by the standard deviation – V = σ^2)**
    3) **Margin of error (confidence interval) – e**
       The margin of error describes how closely the answer your sample gave is to the true value of the population. The smaller the margin of error is, the closer you are to having the exact answer at a given confidence level.
       For example, a fleet segment with an average estimated income of 10 000 eur and margin of error of 5% will produce an interval of confidence between 9 500 eur and 10 500 eur (10 000 – 5%x10 000 and 10 000 + 5%x10 000)
    4) **Confidence level – $1 - \alpha$**
       The confidence level is related to the number of interval within the margin of error that contain the true value of the population. Eg, for a level of significance $\alpha = 5\%$, 95% of the intervals of confidence will contain the true value of the population. In other words, using the previous example, 95% confidence means that there is a 95% chance of the true average income per vessel being between 9 500 eur and 10 500 eur.

For finite populations and without replacement (the usual for fleet and aquaculture), sample size can thus be calculated as:

$$n = \frac{n_0 N}{n_0 + (N-1)}, \text{ where } n_0 = \frac{Z^2 \sigma^2}{e^2},$$

Where z is the z-score, the number of standard deviations a given proportion is away from the mean. Common values for z are given in the table.

Desired Confidence Level	z-score
80%	1.28
85%	1.44
90%	1.65
95%	1.96
99%	2.58

Example of using targets:
Population:

Gear	Vessel length	Population (N)
HOK	VL0010	504

In 2014 a sample was made and repair and maintenance costs collected. (Let's suppose that there are no bias)
Results:

n	average	std dev (s)	e	e(%)
12	1394	2612	1462	105%

With and average costs of 1394 eur per vessel and a standard deviation of 2612 eur, it's clear that the data is not very useful. The sampling error is 105% (assuming that the distribution is normal. For such small number of answers and with a most likely non-normal distribution of costs, the sampling error will be greater – using the student distribution),

meaning that the true average at 95% confidence level is something between 0 and 1394+1462= 2856 eur.

If we talk about total estimator, the repair and maintenance costs can be something between 0 eur and 2856*504 = 1 439 424 eur. MS will report total repair costs of 1394*504 = 702 576 eur.

It's clear that information is not useful at all and is in serious need of improvement.

The next big question is how much quality do we need? As so many thing in statistics, there are no unique answers. We can define a target by making a balance between sample size and sampling error.

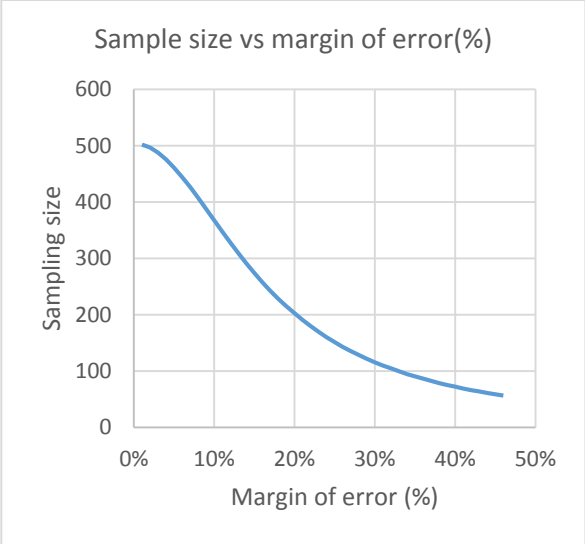
For the 2015 data it will be used a different approach by setting a target sampling error of 5% (using 2014 data as estimates of the population, the sampling error is 5%x1394 = 69.7 eur, which is an affordable value).

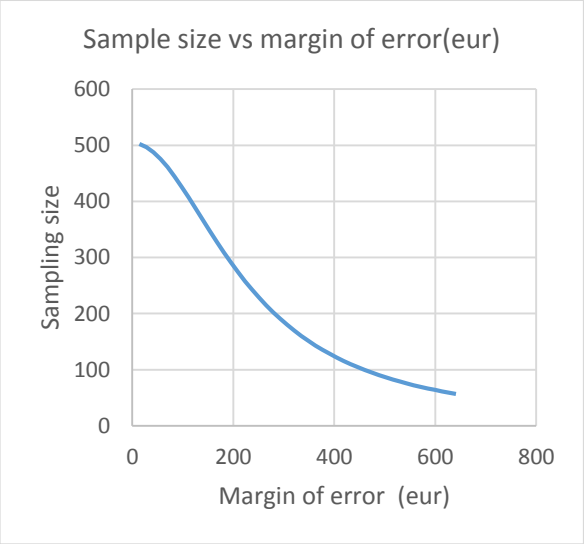
According to the formulas, we will need to sample 462 vessels:

$n_0 = \frac{1.96^2 \times 2612^2}{69.7^2} = 5395$ and $n = \frac{5395 \times 504}{5395+503} = 461.02$

n	n0	N	s	$\bar{x}$	e	z
461.02	5395	504	2612	1394	69,7	1,96

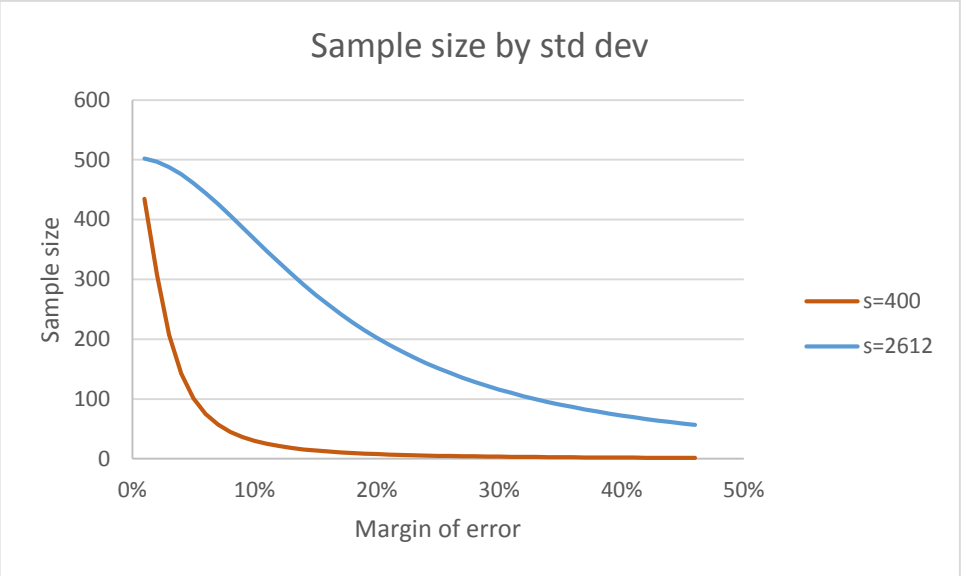
If the number of vessels is too big, we can reduce the sample size, by increasing the error to a comfortable value.





The above charts represent the relation between sample size and sampling error.

It should be noticed that the sample variability highly influences the sample size. More homogeneous segments will have smaller variances and thus the sample sizes will be much smaller. For comparison, if in the previous example we will achieve a standard deviation of 400 eur, the chart will have a different curve:



While, for a 10% margin error a sample size of 367 is needed for the original standard deviation, for the second case the sample size is only 30. It may, therefore, be useful to further segment the sample in order to achieve better results with lower sampling intensities.

For socioeconomic data several variables are collected from the same sample survey. Sample size can be calculated for each variable and the biggest sample size considered. Alternatively, sample size can be calculated for the variable with the biggest variance.
The previous analysis was made taking into consideration a response rate of 100%. If non-response is expected, then a raise to the sample size can be considered. For example, if sample size is 100 and non-response rate is expected at 30% then the sample size can be inflated by 30% to 130.

- **Further segmentation (stratification) can be used in order to achieve more homogeneous segments and thus smaller sample sizes**.
  Such further segmentation can consist, but not limited to: specific gears (LLS and LLD inside HOK), subdivision of lengths (VL0007 and VL0710), segmentation by level of activity or income…
- **Questionnaires are key to achieve high quality data and response rates.**
  The questionnaire should be carefully designed and tested. A poorly constructed questionnaire can increase the nonresponse error (e.g., respondent fatigue) and the response error (dubious interpretation of the questions), therefore introducing bias. Testing is important to evaluate the quality of the questionnaire before it's sent and therefore reducing the non-sampling errors. The time of the year and the length of the collection period should be defined from experience to obtain the best response rates.
  Example of guide: https://www.surveygizmo.com/wp-content/uploads/2015/07/survey-design-ebook-download.pdf
- **Surveys should be planned from the beginning to the end**
  There are several steps requiring attention when designing a survey. Statistics Canada, on his "Surveys methods and practice" identified 11 steps.

Each of the steps brings challenges in order to achieve a successful completion of the statistical operation. In order to achieve high quality with a survey every step need to be carefully planned and sources of error controlled. The control routines/checks must be described in the relevant documentation.

Step	Source of error
Formulation of the Statement of Objectives;	Coverage; precision
Selection of a survey frame;	Coverage
Determination of the sample design;	Coverage; Precision
Questionnaire design;	Response error; Measurement error
Data collection;	Measurement error
Data capture and coding;	Processing error
Editing and imputation;	Processing error
Estimation;	Processing error; model assumption
Data analysis;	Model assumption
Data dissemination;	Not applicable
Documentation.	Not applicable

- **Email survey should be complemented by web survey and vice-versa in order to increase the response rate.** There are several techniques to improve the response rates of questionnaires. Response rates can be increased by planning a survey in waves. A first wave with the initial contact, consisting of a cover letter explaining the purpose of the survey, questionnaire and stamped, self-addressed return envelope. A second wave, following in about a week, consisting of a reminder postcard. The third wave consisting of a letter and a replacement questionnaire. A fourth contact may be unproductive and generate hostility among non-respondents.
  Some example guides can be found here:
  http://www.pra.ca/resources/pages/files/technotes/rates_e.pdf
  http://www.statcan.gc.ca/pub/12-587-x/12-587-x2003001-eng.pdf

- **Sampling surveys with high non-response rates should be dealt as non-probability surveys**
  Non-response introduce bias. The higher the non-response rate, the higher the probability of having considerable bias. Unless there are some knowledge on the response and non-response population, bias will be very difficult to measure. Also randomisation will be lost and with it the reliability of estimates on the whole population. As so non-response should be avoided by the implementation of a carefully designed sample plan which allows for the control of non-response.

- **Reproducibility –** The ability to reproduce a research is a major step in the quality assurance. Steps should be made in order to register all the steps of the statistical operation, from the definition of the framework, passing through the sample definition, coding, data collection, data cleaning, inference procedures to the final estimates and aggregation of final data. This will allow others to validate the achieved results and, in cases of personnel changes, that the new persons in charge of the operation can understand the work already done. Examples of this are the creation of a book and software program in order to achieve full reproducibility of the results.
  Article on reproducible research:

http://journals.plos.org/ploscompbiol/article?id=10.1371/journal.pcbi.1003285

- **Use of administrative data and modelling**
  Fisheries are one of the most regulated and controlled activities, with the fisheries administration possessing a large amount of information on the activity of the vessels. This information can be used as a proxy to estimation (avoid burden on respondents) and as auxiliary information for data validation and modelling (e.g. ratio estimators).

- **Databases**
  Primary data, estimates and metadata are to be kept in databases. This will allows better accessibility inside the bodies in charge of the data collection and historical data preservation. Databases can improve consistency, quality control routines and reducing human error of handling data. Database design can be harmonized to a certain point in working groups at EU/regional level, achieving normalization, compliance and cost reduction.

- **Statistical calendar**
  A pre-defined calendar with the data calls dates setup at EU level and discussed between partners will allow for better planning of the data providers (e.g. MS) while avoiding bottlenecks resulting from an excessive amount of work (e.g., concurrent data calls) to be done in a small part of the year. This can improve the quality of the information by allowing resources to be allocated more effectively over the year.
  On EU level a calendar can be defined with all the time frames for each statistical operation, allowing for better programming and assuring the quality of the procedures.

- **Reporting**
  Reporting is an essential part of the quality assurance as it provides the end users with a detailed/concise view of the statistical processes. The annual report is highly detailed but difficult to read and evaluate. The information contained in the report should be standardized. Tables should have only codes and not allow for free text (e.g., gear designations: HOK instead of “passive gears: Vessels using hooks”). The text document should be limited and more restrictive on the content. All the text and tables should be put on databases. A database oriented report will allow for the construction of an automatic checking routine and to the compilation of summaries with qualitative and quantitative information that improve the quality of the evaluations. At the same time will allow for the construction of sub reports with different orientations (producer/user oriented reports).

- **Protocols between DCF partners** – Protocols between DCF partners must be made to ensure the access and quality of relevant administrative data between partners.

- **Confidentiality** – Protocols between DCF partners should include the enforcement of confidentiality.

- **DCF website** – A DCF website at EU level must be created containing all the pertaining information regarding DCF and including links to the national DCF websites.

- **Standards and guidelines** – Standards, guidelines, best practices and definitions should be made available in the DCF website at EU level.

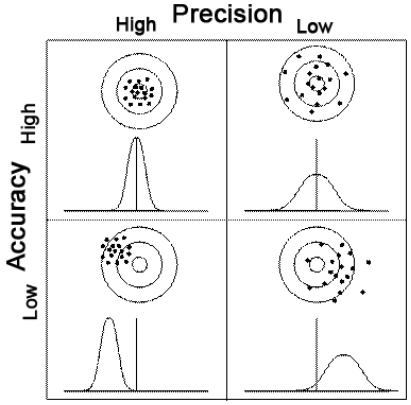
- **Data calls calendar** – A calendar with the data calls deadlines and other relevant dates should be pre-defined in a timely manner in order to allow for the planning of activities by the MS.

- **Availability of documentation (accessibility and clarity)** – Relevant documentation [eg, methodological reports] should be made publicly available and in a common language.

- **Set of minimum requirements on quality for socioeconomic data** – Precision [and accuracy] of the available socioeconomic data from data calls should be analysed and assessments made to set the minimum requirement levels on quality that allow for a reliable analysis of the economic performance [applicable to fleet and aquaculture].

Definitions:

Accuracy – Description of systematic errors, a measure of statistical bias. It measures the closeness of the estimates to the exact or true value that the statistics were intended to measure.



Bias of an estimator – Difference between this estimator's expected value and the true value of the parameter being estimated.

Census – Statistical operation that includes all the unit of a selected population.

Coding – Process of assigning a numerical value to responses to facilitate data capture and processing in general.

Coefficient of variation of an estimator – Ratio between the standard deviation and the actual value of the estimator.

$$CV(\hat{\theta}) = \frac{\sqrt{V(\hat{\theta})}}{\hat{\theta}}$$

The CV is a relative (dimensionless) measure of the precision of a statistical estimator, often expressed as a percentage. More specifically, it has the property of eliminating measurement units from precision measures and one of its roles is to make possible comparisons between precision of estimates of different indicators.

The coefficient of variation is suitable for quantitative variables with large positive values. It is not robust for percentages or changes and is not usable for data estimates of negative values, where they may be substituted by absolute measures of precision (standard errors or confidence intervals).

The confidence interval is usually the precision measure preferred by data users. It is the clearest way of understanding and interpreting the sampling variability.

Coherence – Adequacy of data to be reliably combined in different ways and for various uses.

Comparability – Measurement of the impact of differences in applied statistical concepts, measurement tools and procedures where data are compared between geographical areas or over time.

Completeness – The extent to which all data that are needed are available.

Complex design – Any design which significantly differs from simple random sampling. This happens when units are selected with unequal probabilities, or when sampling design includes several stages.

Confidence Interval – An interval that covers the true value of a population with a certain probability.

Confidence level – Refers to the percentage of all possible samples that can be expected to include the true population parameter. For example, if every time we collect a sample we construct the confidence interval, a confidence level of 95% implies that of all the possible samples that we can take from a population, 95% of the intervals will include the true value of a population.

Confidentiality – A property of data indicating the extent to which their unauthorized disclosure could be prejudicial or harmful to the interest of the source or other relevant parties.

Confidentiality - data treatment – Rules applied for treating the primary, detailed and aggregated data to ensure confidentiality and prevent unauthorized disclosure.

Coverage error – Divergence between the frame population and the target population.

Coverage rate – Divergence between the frame population and the target population

Data analysis – Involves summarizing the data and interpreting their meaning in a way that provides clear answers to questions that initiated the survey.

Data collection – Systematic process of gathering data.

Data compilation – Operations performed on data to derive new information according to a given set of rules.

Data subject to confidentiality rules – Detailed or aggregated data for which confidentiality cannot be assured and therefore needs to be classified as confidential or aggregated with other data (e.g. economic data for a fleet segment with vessels corresponding to less than 3 enterprises).

Data validation – Process of monitoring the results of data compilation and ensuring the quality of the results.

Design Effect – Concept to measure the gain or loss of sampling efficiency resulting from the use of a complex design. The design effect *Deff* is the ratio of the variance of an estimator $\hat{\theta}$under the actual sampling design to the variance that would have been obtained from a hypothetical simple random sample without replacement of the same size:

$$Deff = \frac{Var(\hat{\theta})}{Var_{SRSWOR}(\hat{\theta}^*)}$$

$\hat{\theta}^*$ is an 'equivalent' estimator of θ under simple random sampling without replacement.

Editing – The application of checks to identify missing, invalid or inconsistent entries that point to data records that are potentially in error.

Estimate – The value of the estimator using the data from the realised sample.

Estimation – The means by which the statistical agency obtains values for the population of interest so that it can draw conclusions about that population based on information gathered from only a sample of the population.

Estimator – Formula by which an estimate of the parameter is calculated from the sample

Finite population correction – Formulas used to compute standard errors are based on the idea that the samples are taken from infinite populations or are selected with replacement. In many surveys these assumptions are not true but they don't present big problems when the sample size, n, is much smaller than the population size, N. However, when the sample size is larger (usually more than 5% of total population), is best to apply a correction to the formulas. This correction is known by the finite population correction or fpc and it's calculated as:

$$fpc = \sqrt{\frac{N-n}{N-1}}$$

Frame – The frame consists of previously available descriptions of the objects or material related to the physical field in the form of maps, lists, directories, etc., from which sampling units may be constructed and a set of sampling units selected; and also information on communications, transport, etc., which may be of value in improving the design for the choice of sampling units, and in the formation of strata, etc.

Frame population – The set of population units which can be accessed through the frame. The frame also contains sufficient information about the units for their stratification, sampling and contact.

Imputation – Process used to determine and assign replacement values to resolve problems of missing, invalid or inconsistent data.

Item non-response – Failure in obtain all the responses to a particular item.

Margin of error – Statistic expressing the amount of random sampling error in a survey's results. It can be expressed as half the width of the associated confidence interval. It establish how much an estimate is likely to be to the real value of the population. The margin of error is usually defined in percentage but can be used in absolute value.

Measurement error – An error that occur during data collection and cause recorded values of variables to be different from the true ones.

Non-sampling error – The error in survey estimates which cannot be attributed to sampling fluctuations.

Parameter – Population characteristic that the client or data user is interested in estimating.

Population variance – The variance of the population can be estimated using sample data, by the formula:

$$V = \frac{\sum(X-\bar{X})^2}{n-1}$$

Where n is the sample size, $\bar{X}$ is the sample average and X is the score to measure.

Precision – Description of random errors, a measure of statistical variability.

Processing error – The error in final data collection process results arising from the faulty implementation of correctly planned implementation methods.

Punctuality – Time lag between the actual delivery of the data and the target date when it should have been delivered.

Quality assessment – Overall assessment of data quality, based on standard quality criteria.

Quality assurance – All systematic activities implemented that can be demonstrated to provide confidence that the processes will fulfil the requirements for the statistical output.

Quality documentation – Documentation on procedures applied for quality management and quality assessment.

Quality management – Systems and frameworks in place within an organization to manage the quality of statistical products and processes.

Questionnaire (or form) – Group or sequence of questions designed to obtain information on a subject from a respondent.

Register – Administrative document or table containing information on characteristics of a certain population. E.g., the fleet register, a business register.

Relevance – The degree to which data meet current and potential needs of the users.

Reliability – Closeness of the initial estimated value to the subsequent estimated value (e.g., an estimate is reliable if several estimates of the estimator are approximately the same)

Sample variance - The variance is a measure of the spread of scores within a set of data. The standard deviation is calculated using the formula:

$$V = \frac{\sum(X - \bar{X})^2}{n}$$

Where n is the sample size, $\bar{X}$ is the sample average and X is the score to measure.

Sampling error – The part of the difference between the parameter and an estimate derived from a random sample due to the fact that only a subset of the population is observed. The sampling error can be expressed in relative terms (by the standard-error or by the CV) or in terms of confidence interval.

Simple random sampling – Subset of individuals (a sample) chosen from a larger set (a population). Each individual is chosen randomly and entirely by chance, such that each individual has the same probability of being chosen at any stage during the sampling process, and each subset of k individuals has the same probability of being chosen for the sample as any other subset of k individuals.

Source data – Characteristics and components of the raw statistical data used for compiling statistical aggregates.

Standard deviation – Corresponds to the square root of the variance.

$$V = s^2$$

Standard error of the estimator – The square root of the variance of the estimator.

$$S.E. = \frac{s}{\sqrt{n}}$$

Target population – Is the population for which inferences are made.

Timeliness – Length of time between data availability and the event or phenomenon they describe.

Unit non-response – Failure in obtain information or not usable information to the total number of in-scope (eligible) units.

Variance of the estimator – The variance of an estimator (V_E) can be estimated from the sample by using the formula:

$$V_E = \frac{s^2}{n}$$

Where s is the sample standard deviation and n is the sample size.

Obs: Depending on the methodology used, variance calculation can assume different formulas

Variance of total estimator – When using a total estimator instead of an estimator of the average, some careful should be made when calculating the variance.

$$V(\hat{\theta}) = N^2 \times V\left(\hat{\bar{\theta}}\right)$$

Where N is the population total.

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http://www.istat.it/it/files/2013/12/Handbook_questionnaire_development_2006.pdf

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