GSS Quality Strategy

Improving statistical quality across the GSS,
2019 to 2021

Best Practice and Impact

Government Statistical Service

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Foreword

Quality is fundamental to building trust in government statistics. The responsibility for producing high quality statistics lies with everyone working in the statistical system. Data and statistics are rapidly changing with the introduction of new methods and complex data sets. As our data increases in complexity it becomes harder to assess the quality and we are in a position where producing high quality statistics is more important than ever. This strategy aims to improve statistical quality across the Government Statistical Service (GSS) to produce statistics that serve the public good.

This strategy has been developed through consultations with statisticians across numerous government departments to identify the key priorities and challenges faced by the GSS. It sets out what we should be doing to improve the quality of our statistics and manage the processes surrounding the production of our statistics. It will ensure that we are compliant with the quality requirements of the Code of Practice for Statistics. High quality statistics and knowledge about quality will lead to better decisions, contributing towards the Better Statistics, Better Decisions strategy.

I encourage you all to use this strategy to ensure that we are delivering high quality statistics that are trustworthy and inform sound policy decisions.

John Pullinger
National Statistician
June 2019

Introduction

This is a two-year strategy for the Government Statistical Service (GSS). The strategy sets out realistic actions to address key quality challenges and improve quality across the GSS. While there are pockets of good practice across the GSS, this strategy identifies areas in which we can improve the quality of statistics produced by the GSS. For example, to reduce inefficiencies and improve the reproducibility of statistics, the strategy recommends implementing Reproducible Analytical Pipelines and automated processes. According to the Code of Practice, quality means that statistics fit their intended uses, are based on appropriate data and methods and are not materially misleading (quality is further defined in Appendix B). This strategy focusses on statistical quality but many of the principles still apply to quality in other disciplines such as modelling or management information. This strategy aligns with the core objective of the National Data Strategy; to foster a cross-government approach to better data use. The strategy is beneficial across all analytical professions in the GSS and aligns with the 2018-2019 Analytical Function Strategy.

The strategy has been developed by the GSS Quality Centre through collaboration with the GSS. The team, situated in the Best Practice and Impact (BPI) Division, supports the GSS in meeting its requirements to maintain, improve and report on quality under the Code of Practice for Statistics. Further information and contact details for the team are detailed in Appendix A.

Our Aim

As stated in the Better Statistics, Better Decisions strategy, we want to see our statistics enabling sound policy decisions and providing a firm evidence base for decision making, in and out of government. Improving the quality of statistics across the GSS will increase trustworthiness in the statistics and in us as producers. Thereby ensuring our statistics serve the public good.

Therefore, the aim of this strategy is to:

Improve statistical quality across the GSS.

The GSS will achieve this through four goals:

1. We will all understand the importance of our role in producing high quality statistics.
2. We will ensure our data is of sufficient quality and communicate the quality implications to users.
3. We will anticipate emerging trends and changes and prepare for them using innovative methods.
4. We will implement automated processes to make our analysis reproducible.

This strategy supports the GSS People Plan which captures the work happening across the GSS to build capability.

Each goal is underpinned by a set of deliverables that build towards achieving that goal. The strategy's deliverables are split between BPI and the GSS and we are all responsible for its success. The GSS Heads of Profession and Quality Champions are responsible for delivering on behalf of the GSS. How we will deliver the strategy and monitor progress is detailed in the Delivering the Strategy section. We are all accountable for delivering against the goals in the strategy but recognise the environment we work in will change. We welcome your ongoing input into the strategy and how we achieve this together.

Our Goals

To improve statistical quality across the GSS we have set out four goals (as described in Our Aim). The goals are in no particular order. They are equally important and rather than being completed sequentially, we should aim to work towards them collectively.

1. We will all understand the importance of our role in producing high quality statistics.

We are all responsible for the quality of statistics we produce. Quality needs to be built into the whole process and at the forefront of analysts' minds to produce high quality statistics.

Clear quality management, structures and practices should be implemented in each department to monitor, measure and improve statistical quality and ensure all those involved in producing statistics understand how their role directly impacts on quality. Roles and responsibilities on quality differ by level and it is important to distinguish between these.

Quality Management: Management Level

Effective quality management should ensure the right checks and processes are in place so that the product is fit for purpose and we understand its impact on the European Statistical System's (ESS) quality dimensions.

Some examples of processes to support quality management are as follows:

- Process maps: a map of the processes for each statistical release and the quality assurance (QA) required at each stage.
- Decision flow chart: a flow chart outlining the processes for who is responsible and accountable for what decision in different scenarios.
- QA documentation: accurate and up-to-date records of what QA has taken place through the process.
- User consultation: consultation with users to ensure statistics are relevant and fit for purpose.

Quality Structures: Team Level

For everyone in the GSS to understand the role they play in ensuring quality in government statistics, quality should be embedded into the culture of the department.

This can be done using:

- Internal guidance documents: relevant guidance on quality tailored to your department.
- Quality discussion group: an internal group/committee set up with the intention of providing a platform to discuss quality, lessons learned and share best practice (see Welsh Government case study below).
- Peer reviews: review system among colleagues.
- Curiosity panels: these are used at the Office for National Statistics (ONS) and chaired by a Deputy Director, they are an opportunity for the whole team to sense-check the results, agree the main messages, and place the findings in context.

Quality Practices: Desk Level

Analysts play a crucial role in maintaining and improving quality, their responsibilities are:

- Input checks: understand and check the quality of the source data. We build on this in goal 2.
- Process checks: transform the source data into statistical figures and tables. Use different approaches to see if the results are the same, perform aggregation checks and checks against the source data.
- Output checks: checks on the final published outputs. Sense-check results, check for consistency within the final statistical bulletin, final check of figures and presentation.

Deliverables

Deliverable	Details	Owned by
1.1 Facilitate the quality champions network	The quality champions network aims to improve the quality of statistics produced by the GSS. The Quality Centre will facilitate this network through organising quarterly meetings, creating agendas and providing support to quality champions.	Quality Centre
1.2 Create a platform for sharing examples of quality guidance across departments	Many departments have already produced their own internal quality guidance documents. It would be beneficial to have a platform to share these across the quality champion network for creating and reviewing quality guidance documents.	Quality Centre
1.3 Produce new quality guidance for the GSS	The existing quality guidance on the GSS website is currently out of date. The Quality Centre are undertaking a review of the current guidance and will evaluate and update our guidance offer to the GSS to reflect the updated Code of Practice for Statistics. We will work with international partners such as Eurostat and the UN to develop the guidance.	Quality Centre
1.4 Identify and engage with wider networks focussing on quality	Understanding and improving the quality of data, analysis and models is a cross-government priority, and is not confined to official statistics. The GSS and Quality Centre should identify and engage with networks both within and across departments, and internationally. These include the UN Expert Group on National Quality Assurance Frameworks, and the Working Group on QA of Government Models (contact: tim.knight@dwp.gov.uk).	Quality Centre & GSS
1.5 Produce and document a clear structure for quality management	Some departments have a structure in place for quality management. Departments should aim to have clear governance and accountability for the quality of their statistics. It should cover the whole process from data collection to the statistical release. This should be documented and promoted within departments so that everyone understands the importance of quality and their role in producing high quality statistics.	GSS

1.6 Participate in the quality champions network	For the quality champion network to be effective, quality champions should participate in the activities of the network. This includes attending meetings, sharing best practice, being a point of contact on quality matters for their department and helping implement this strategy. If they have not done so already, departments should nominate a quality champion to represent them at the quality champion network.	Quality champions

Case Study: Welsh Government

Welsh Government have clear processes and procedures in place when it comes to their quality management. This approach is set out in their Statistical Quality Management Strategy.

One aspect of their quality management is their Statistical Quality Committee that meets quarterly and is chaired by the Head of Profession. The terms of reference for this committee sets out the purpose and role of the committee. This includes reviewing Quality Incident reports, updates on training, sharing best practice and any other quality related business. Having this framework in place not only provides a structure for quality management but is a method for getting quality on the agenda and bringing it to the forefront of colleagues' minds.

2. We will ensure our data are of sufficient quality and communicate the quality implications to users.

The quality of a statistical product is underpinned by the quality of the data itself. High quality data are not sufficient to ensure high quality statistics but is a fundamental pillar of this.

Data quality should be managed through data management processes and analysts being curious about the data they are working with.

Curiosity about Data

It is important for statistical producers to be curious about data and not take it at face-value. If there are values that look inaccurate they should be investigated and verified. Producers should understand the full data journey and be able to identify steps that are vulnerable and could introduce errors. A robust quality management system as described in goal 1 fosters an environment that supports this curiosity.

As set out in the Quality Assurance of Administrative Data (QAAD) toolkit (principles apply to both admin and survey data), statistics producers should **investigate** the way in which the data are produced, **manage** relationships with data collectors and suppliers and **communicate** effectively with them:

- **Investigate**: Examine the types of checks carried out by data collectors and suppliers, operational circumstances, coverage issues and potential sources of bias.
- **Manage:** Establish clear processes for data provision and managing change, maintain regular quality assurance checks of the data and use other data sources to corroborate findings where possible. Document what you find, and the decisions taken.
- **Communicate:** Work closely with data collectors, data suppliers and other statistical producers to ensure a common understanding of any quality issues and the reasons for any decisions made.

The guidance also includes five top tips on page 10 of the toolkit that are helpful to think about when assessing the quality of data. Communicating the quality of statistics to our users is a key part of QAAD and important for ensuring our statistics are not misinterpreted or misused.

Data Management

Data quality is dependent on the data management processes of the organisation. If data are managed properly this results in high quality data. These data management processes include metadata management, data standardisation, data principles etc. In particular, using metadata, understanding the strengths and limitations and communicating this to users is important to quality. The Code of Practice for Statistics states that we should apply best practice in the management of data and data services. These standards should apply to both the department and any organisations collecting data on their behalf.

In the ONS, the data management processes are mapped out in the ONS Data Strategy and is governed through various structures already existing in ONS along with a few new structures covering the gaps. The strategy is underpinned by a principles-based data management framework, comprising a set of data and security principles and a set of data standards. While other departments may not have the same resource to dedicate to a full data framework, the ONS example provides the key messages that should be included for effective data management.

Deliverables

Deliverable	Details	Owned by
2.1 Deliver training courses on quality	The Quality Centre deliver the QAAD workshop, Quality Statistics in Government course and the Communicating Quality, Uncertainty and Change course. The principles taught in these courses communicate and reinforce the key points made above.	Quality Centre
2.2 Foster relationships with data collectors and suppliers	Build and manage relationships with data collectors and suppliers through regular communication with them. If communication is managed by a separate team, terms should be set for what this communication entails. Use these relationships to establish an understanding of the QA checks required and undertaken by the supplier, thus improving the quality of our data.	GSS
2.3 Identify if your department could benefit from undertaking BPI training courses	The training courses run by BPI are free and available to everyone in the GSS. They can also be tailored to each team depending on what the key priorities and challenges are.	GSS
2.4 Communicate the quality of data to users	The Code of Practice emphasises the importance of communicating the quality of statistics to users. This should be done by following the guidance produced by the Quality Centre on how to communicate quality, uncertainty and change. BPI run a training course on this.	GSS

2.5 Participate in the Cross-government Data Architecture community	Data Architecture in ONS facilitate this community to share best practice in data architecture and data management. Participation in this community fosters collaboration on data management across the GSS. For information on how to get involved, please contact data.architecture@ons.gov.uk.	GSS

Case Study: Department for Digital, Culture, Media and Sport

The Department for Digital, Culture, Media and Sport produce statistics on National Museum visitor numbers.

DCMS have been working to improve their relationships with each museum. This has included investigating their methods for collecting this data, introducing regular communication with them and logging the quality assurance procedures. This was not only done for the upcoming release, but they went back several years which revealed several inaccuracies that have now been resolved. While there is still some work to be done, this investigation has revealed where the QA processes need to be at their most robust and the relationships built have helped to implement improvements.

3. We will anticipate emerging trends and changes and prepare for them using innovative methods.

At the rate that the world of data and technology is changing, there will be new and unfamiliar opportunities and challenges emerging for analysts. The detail, volume and frequency of data collected are rapidly increasing and as are the requirements for innovative methods, tools and techniques. The GSS needs to be prepared in this changeable environment to efficiently produce high quality statistics that reflect user needs.

National Statistician's Quality Review (NSQR)

National Statistician's Quality Reviews produced by the Quality Centre cover thematic topics of national importance conducted on behalf of, and for, the GSS. These are future facing reviews that ensure the methods used by the GSS are keeping pace with changing data sources and technologies. They complement existing quality assurance practices, providing an additional tool to make sure methods are – and remain – fit for purpose and among the best in the world. They provide an opportunity for experts outside the GSS to contribute to the continued improvement of the methods and support the GSS in identifying what good practice looks like for these methodologies as well as identifying opportunities for further development and investment.

The Quality Centre produced an NSQR on Privacy and Data Confidentiality Methods. New legislation, namely the General Data Protection Regulation (GDPR) (Data Protection Act in UK law) and Digital Economy Act (DEA) 2017, have brought about major changes in the way organisations process and share personal data across organisational boundaries. These developments presented an opportunity to innovate with data. This NSQR brought together world leading experts from across academia, the private sector, the GSS and leading National Statistics Institutes (NSIs) by preparing the GSS for the future and identifying opportunities to improve and innovate privacy and confidentiality methods.

The next NSQR will focus on data linking methods, with work commencing in June 2019.

How is this being supported?

ONS has established the Admin Data Methods Research Programme to address some of the key challenges of administration and transaction data set out by Professor David Hand in his 2017 paper. A work plan has been developed to take this work forward, working collaboratively across ONS, the GSS, academia and private research organisations. This programme of work will develop a statistical framework for advancing the use of administrative and transactional data.

The Office for Statistics Regulation (OSR) produce systemic reviews to examine cross-cutting statistical issues or improve the public value of a set of statistics. OSR examines these issues across the system to influence how the statistical system responds collectively to maximise quality and public value. They can be used to highlight good practice and innovation in elements of public value, with the goal to share lessons across the GSS.

Deliverables

Deliverable	Details	Owned by
3.1 Produce National Statistician's Quality Reviews (NSQRs)	The Quality Centre is responsible for producing NSQRs once a year. As such, in the GSS, we should be horizon scanning for any emerging topics. Proposed topics are agreed by the National Statistics Executive Group (NSEG) and Heads of Profession to ensure that they are topical and sufficiently important for the GSS. The NSQR is then produced on the agreed topic.	Quality Centre
3.2 Facilitate the Methodology Advisory Committee (MAC) and Methodology Advisory Service (MAS)	To provide support for quality in methodology, the Quality Centre will facilitate both MAC and MAS. MAC is a free methodological advice service with access to a pool of experts spanning academia, the private sector, the GSS and NSIs. MAS is a free service providing methodological advice and guidance.	Quality Centre
3.3 Engage with the development of NSQRs and take on board recommendations	The NSQRs outline next steps for the GSS, and understanding new development is crucial. Outcomes from the reviews inform further developments in methods used and identify where to build capability across the GSS. Task and finish groups are set up for some NSQRs to help implement next steps. For more information on these, email gsshelp@statistics.gov.uk.	GSS
3.4 Ensure there is space within departments to horizon scan for upcoming issues or opportunities	It is tempting to get caught up in the routine of producing statistics with little time to look at the wider picture. The implementation of Reproducible Analytical Pipelines (RAPs) (in goal 4) may free up statistical producers' time to innovate. An example of horizon scanning can be seen in the case study below.	GSS
3.5 Regularly review publications	The Code of Practice is explicit about the need to regularly review statistics to identify if they should be maintained, changed or dropped (practice V1.6). Review the strengths and limitations (practice Q3.5) through consultation with users and review who our users are.	GSS

Case Study: UK House Price Index (HPI)

Each month, the UK HPI presents a first estimate of average house prices in the UK based on the available sales transactions data for the latest reference period. The first estimate is then updated in subsequent months as more sales transaction data become available. In March 2017, there was a large increase in the number of revisions between first and subsequent estimates. This negatively affected some users' confidence in UK HPI. After investigating, ONS established that they were being driven by volatility in new build property prices, compounded by an operational backlog in HM Land Registry registering new build sales transactions. Steps were taken to improve the methods by changing the calculation for the first estimate to reduce its sensitivity to the impact of new build transactions. The approach was developed by GSS methodologists, and several options were tested before a final one was chosen.

As a result, the scale of revisions to the first estimate of UK HPI annual change to average house prices has reduced and is more stable over time. This is an example of where an external change called for innovative methods to be developed to improve the quality of the statistics. Further information on this case study can be found in the Code of Practice for Statistics: Q2 case study.

4. We will implement automated processes to make our analysis reproducible.

We should be implementing Reproducible Analytical Pipelines (RAPs) or other automated processes in our statistics to reduce risk, improve auditability and take steps towards making our analysis reproducible.

Reproducible Analytical Pipelines

Producing statistics in an accurate and timely manner can be a meticulous, time consuming process. With open source software becoming more widely used, there is a range of tools and techniques that can be used to reduce errors and production time, whilst maintaining and even improving the quality of publications. A Reproducible Analytical Pipeline is a recreation of part of the statistical production process so that it can be easily reproduced, tested and audited. The key feature of RAPs is that they are reproducible; in the future we should be able to look back at anyone's work and accurately reproduce every step in the process.

The potential time savings for analysts are substantial, greater automation of statistical production frees up their time to focus on the interpretation of the results. Another benefit of implementing RAP is building a process that is completely transparent, auditable and verifiable. Overall, this eases the quality assurance process, reduces risk and improves quality. More detailed information on the benefits of RAP can be found on the Reproducible Analytical Pipelines Data in government blog.

Finding the Balance

Implementing even a few RAP techniques can benefit the timeliness, auditability and quality of statistics. However, these approaches should not act as a replacement for an analyst overseeing the full end-to-end process. Automated processes should not be implemented and forgotten, once they are in place they will need to be consistently reviewed and quality assured. Automation is about people, we still need analysts that are knowledgeable about both coding and statistics to be effective. The human aspect is equally important, as an analyst would be able to identify issues that the code

may not pick up. RAP should not be used as a method to produce minimal commentary in releases, this is another aspect where the human element is so important.

Finding this balance is the key to implementing RAP successfully. This balance is likely to differ between teams depending on the level of interaction and interpretation needed for the data.

Deliverables

Deliverable	Details	Owned by
4.1 Facilitate the RAP champion network	The RAP champion network has been set up to provide expert advice and monitoring for implementing RAP across the GSS. It looks to build relationships, share best practice and lessons learnt. This will be facilitated by the Best Practice and Impact (BPI) Division.	BPI
4.2 Provide training and support in RAP implementation and coding	To implement RAP, we need to have the appropriate training in place. There is free training available that has been produced by the GDS. This goes hand in hand with the RAP companion. Along with a base knowledge of R and the free training course, producers should be able to start implementing RAP themselves. Further support is available through the RAP champion network. We will also provide resource support through BPI's data science offer to provide technical support for RAP implementation. For further information, contact gsshelp@statistics.gov.uk.	BPI & GDS
4.3 Have further RAP/automated processes than are currently implemented	In the consultation phase of developing this strategy, it became clear that different departments are all at different stages in implementing RAP. Departments should make an effort to increase the level of automation where possible and helpful through the lifetime of the strategy. In particular, departments should look to identify areas of vulnerability or risk (e.g. where there is a surplus of manual processes) and look to implement in these areas.	GSS
4.4 Nominate a RAP champion	To stay up to date on the latest methods and establish a cross-GSS support system for implementing RAP. If they have not done so already, departments should nominate a RAP champion to represent them at the RAP champion network.	GSS

Case Study: Department for Transport

The Department for Transport (DfT) highly encourage implementing RAP into their processes. They have set a target of 2020 for each team to have RAP implemented in at least some part of their processes. Statisticians build this capability through training courses, the RAP champion network and a coffee and coding club. If they can identify a piece of work or project that would benefit from the use of automated processes they are supported to get the relevant training. The coffee and coding club is an informal setting in which colleagues can discuss coding and any challenges they are having. These were originally run monthly but were so popular they now run weekly.

The data for Search and Rescue Helicopter statistics are produced by aggregating monthly spreadsheets from the Maritime and Coastguard Agency. These were checked by hand to identify any discrepancies. These checks have recently been automated using R, with a report produced by R Markdown including maps, counts and tabulations. This makes it quicker and easier for the person carrying out QA to spot discrepancies. Further information on this example is in the Code of

Delivering the Strategy

We have outlined the goals we have set to improve statistical quality across the GSS. An integral part of achieving this is how we put this into practice. Both the GSS and the Quality Centre will monitor progress of the strategy.

Monitoring Progress

- Each department should draw up an action plan outlining what steps they will take through the lifetime of the strategy to achieve the GSS deliverables across the four goals. These should be produced by the Quality Champion and Head of Profession through consultation with all GSS members in their department. A template and example action plan is available on the GSS Quality Strategy web page.
- Quality champions will work with their Head of Profession to provide biannual updates on the agreed actions to the Quality Centre. This will enable progress of the strategy to be measured.
- The Quality Centre will produce biannual updates for the Statistical Policy and Standards Committee (SPSC) on overall progress on implementing the strategy.

After the two-year lifetime of the strategy, the Quality Centre will review the deliverables and update the strategy. We will be flexible on delivery as the environment changes and welcome input and feedback into the strategy.

Appendix A – Who is Involved?

The GSS Quality Centre

Who we are

The GSS Quality Centre, situated in the Best Practice and Impact Division (BPI), supports the GSS in meeting its requirements to maintain, improve and report on quality under the Code of Practice for Statistics. The team provides mentoring, expert advice, consultancy, training and guidance on the quality of official statistics. In addition to this, the Quality Centre provides strategic direction on quality across the GSS. We work closely across our division to deliver a quality service to the GSS.

The GSS Quality Centre supports the whole GSS community but is not restricted only to the GSS, we can and do support other government professionals. We are happy to meet with other statistics producers to discuss the services and support we offer and the best ways we can meet their needs. To get in touch please contact us at: qualitycentre@statistics.gov.uk.

Our vision: Where do we want to be?

- Take a leading role in identifying and addressing emerging quality challenges faced by the GSS.
- Become widely known across the GSS and wider as a centre of expertise.
- Have a measurable impact on the quality of government statistics.
- Build knowledge and capability in the team and across the GSS.
- Work flexibly and collaboratively across the team and wider division (BPI) and celebrate success.

Our vision ties into the collective strategy for official statistics set out in Better Statistics, Better Decisions and the Code of Practice for Statistics.

Best Practice and Impact (BPI) Division

BPI has been created to support the GSS to improve government statistics. The division brings together the GSS Quality Centre, GSS Good Practice Team, GSS Harmonisation Team and Methodology Advisory Service across our division to deliver a quality service to the GSS.

We provide a range of services to all those working in statistics across government. The division works towards this through seven themes: providing strategic direction, sharing best practice, consultancy, building capability, tools and standards, assessment and monitoring and one GSS voice. Under these themes, BPI supports the GSS through advice, consultancy and training.

To find out more about how BPI can support what you're trying to achieve in your department please contact us at: gsshelp@statistics.gov.uk.

The Government Statistical Service (GSS)

The GSS is a cross-government network, spread across a whole range of public bodies, including components of the devolved administrations and UK government departments. Led by the National

Statistician, it includes statisticians, researchers, economists, analysts, operational delivery staff, IT specialists and other supporting roles. The GSS community works together to provide the statistical evidence base required by decision-makers and support democratic debate, publishing around 2,000 sets of statistics each year, and providing professional advice and analysis to decision-makers.

The Statistical Policy and Standards Committee (SPSC)

The Statistical Policy and Standards Committee (SPSC) assist the National Statistician in promoting and safeguarding the quality of official statistics. They develop and promote statistical policy and drive improvement in statistical methodologies, standards and classifications. SPSC reports to the National Statistics Executive Group (NSEG) providing biannual updates to agree objectives and priorities for statistical policies and standards.

Appendix B – What is Quality?

Quality Definition

There are several definitions for quality, it is most usefully defined in terms of how well outputs meet user needs, or whether they are 'fit for purpose'. The Code of Practice states that quality means that statistics fit their intended uses, are based on appropriate data and methods and are not materially misleading. This definition is a relative one allowing for various perspectives on what constitutes quality depending on the intended use.

Quality Dimensions

In order to determine whether outputs meet their needs, we measure quality in terms of the five quality dimensions of the European Statistical System (ESS):

- **Relevance** – The degree to which statistics meet current and potential user needs in both coverage and content.
- **Accuracy and Reliability** – Accuracy is the closeness between an estimated result and the (unknown) true value. Reliability is the closeness of early estimates to subsequent estimated values.
- **Timeliness and Punctuality** – Timeliness is the time gap between the publication and the reference period of the estimate. Punctuality is the gap between planned and actual publication dates.
- **Accessibility and Clarity** – Accessibility is the ease with which users can access the data. Clarity is the quality and sufficiency of the metadata, illustrations and accompanying advice.
- **Coherence and Comparability** – Comparability is the degree to which the data can be compared over time and domain. Coherence is the degree to which data that are derived from different sources or methods, but refer to the same topic, are similar.