Response to the National Geospatial Strategy – call for evidence
October 2018

The National Physical Laboratory (NPL) is the UK's National Metrology Institute and is at the heart of both the National Measurement System and UK's leadership in the international system of measurement that underpins UK and international trade.

Q1. Is our view of the geospatial data types accurate? If not, what should be included or excluded from this?

1. NPL agrees that the view of geospatial data types within the strategy are accurate. However we believe that temporal data should also be included. **Accurate timestamping of all types of geospatial data will increase traceability of the data, facilitate comparisons across locations, increasing the confidence in the data.** Temporal information should also extend where possible to historical time series to enable climate or other changes to be evaluated.

Q2. In addition to current government policy, what are the areas of geospatial skills where the commission could best focus, to help ensure the necessary capability within the UK for the future?

2. NPL supports the Government's inclusive approach to improving UK citizens' digital skills, including life-long learning opportunities, as addressed through the digital strategy[1]. It is important that all citizens have the skills needed to access, interpret and make use of digital data and this applies to geospatial data.

3. To increase the UK's capability in the geospatial sector, the Government needs to continue to invest in embedding mathematical skills at all stages of education and upskilling the workforce. This should include **basic knowledge of uncertainties in all stages of data processing**, with these skills being further developed and extended into all postgraduate geo-spatial skills training. Continual professional development opportunities are needed to support capabilities within the workforce covering uncertainty analysis, quality assurance (QA) and communicating this information. This could significantly enhance the strength of geospatial data and it would ensure that the maximum number of datasets can be meaningfully utilised.

---

[1] UK Digital Strategy, Department for Digital, Culture, Media and Sport (2017)

Q3. What are the geospatial skills needs and gaps in your organisations, how can these be most effectively addressed, and how can careers in the sector be best promoted?

4. It should be noted that NPL is largely an added value enabler of geospatial information rather than a user and so our needs are usually met by selected recruitment.

5. Within NPL we have identified **uncertainty analysis of imagery particularly at per pixel level as a specific skills gap**. We have been addressing this through developing tools and specialist training packages for the community.

6. The geospatial sector is expanding and new applications and uses of geospatial data are continuing to emerge. For young people starting school today, there will be new opportunities and careers in the sector which may not even exist yet. To ensure that we have a pipeline of skilled people to work in the sector in the future, the Government needs to continue to promote the uptake of Science, Technology, Engineering and Maths (STEM) academic and technical qualifications. There will be a role for the **new technical pathways and science apprenticeship**s to help deliver the skills required for the sector.

Q4. Are there any publicly or privately-held geospatial datasets that are currently challenging to access or use or of insufficient quality, but which you or your organisation would find valuable if these issues could be resolved? Please explain why this would be of value, and how access/quality could be improved?

7. All data starts with measurement and it is essential that **good measurement practice is followed when data is gathered** for these geospatial data sets. This is vital at all stages of the process, and enables scientists to better understand the uncertainty associated with data sets.

8. In order for publicly accessible or privately held data sets to be utilised effectively and to improve the confidence in the data sets held, the methods of data collection and interpretation processes must be valid and there must be **clear traceability of the data including timestamping**.

9. Additional metadata must be made available to include information about the **sensors used to gather the data and information about when the instruments were last calibrated and to what standard, which will provide quality assurance (QA)**. We believe that at present it is still quite rare for any dataset (including that of major space agencies) to have all the necessary metadata to provide the QA information on the data set. Enabling this is something that the UK Government could do for the UK geospatial community as a whole and in doing so ensure the national derived information becomes extremely valuable to government and commerce and an exemplar for the world.

Q5: Do you anticipate that any changes will be needed to the both address data and the wider address ecosystem, to support emerging technologies? Please provide evidence of value to support any proposed changes.

10. NPL believe that the **accurate timestamping of data will improve the comparability and traceability of data generated**. The addition of robust quality metrics on the data sets, and in particular the means to remove biases and enable harmonisation and interoperability, will be fundamental to enable the exploitation through data processing software (i.e. data cubes) and machine learning environments. The provision of analytical tools near to the data sources (avoiding transference of large data volumes) and the incorporation of socio-economic data will open many new applications.

Q6: How should the commission be looking to develop the UK's capability in Earth observation data, both technologically and to support an effective market?

11. The UK should be working towards **standardising the infrastructure for the provenance of data**. To do this, it is essential that underpinning interoperable ontologies, architecture and analytical tools are developed. Quality assurance is required throughout the data generation process, starting with ensuring that the sensors meet the appropriate standards required, to have confidence in the initial data inputs. It will be important to coordinate the UK's resources to continue to build on networks that are already in place.

12. **New methods for distributed calibration and validation of instruments and methods to remove biases under different environmental and observational conditions before ingestion into data hubs will revolutionise the exploitability of Earth Observation (EO) data**. This will facilitate full usage of the new space providers into the mainstream information systems.

13. The commission should build from the Climate and Environmental Monitoring from Space (CEMS) JASMIN[2] facility **and establish a national database and analytical processing system together with an appropriate QA architecture as a tool for the community**.

Q7. Which new technologies should the commission focus on to provide new opportunities to process and exploit geospatial data for economic growth?

14. The commission should focus on **Artificial Intelligence**, machine learning and the means to enable and establish robust interoperability and the provision of 'fit for purpose' quality metrics.

Q8. How can geospatial data and applications be used to support enhanced roll-out of future technologies?

15. Geospatial data can be used to **improve ground conditions monitoring from space**, including: changes in ground infrastructure over time, civil infrastructure movement and identifying landslips and flood damage.

---

[2] http://www.jasmin.ac.uk/what-is-jasmin/

16. It can also be used to inform the **creations of digital twins** for use in city planning, transport systems and Connected and Autonomous Vehicle simulation testing. Other applications include: pollution monitoring, agri-tech applications including the monitoring of crop diseases, planning for forestry management and estimating carbon stores.

Q10: What areas of the underpinning geospatial infrastructure such as positioning technologies, including GPS and indoor positioning systems, and geodetic networks and frameworks to support them, should we be prioritising the development of, in order to support the emerging requirements for geospatial data?

17. The UK needs to ensure that there are **adequate calibration and validation sites** to provide data to validate satellite observations under a range of conditions.

Q12. Do you face challenges when working with geospatial data from across the public sector? If so, what are they and how could value be better released? Are there any technical remedies or standards that could be adopted to improve the interoperability of geospatial data? Please provide supporting evidence of what these remedies could help to accomplish.

18. NPL is an enabler rather than user of geospatial data. We believe that **interoperability is and will become increasingly an issue**. Our research programmes are looking at how to make interoperable similar datasets such as datasets from Landsat 8[3] and Sentinel 2[4] as well as more complex linkages to Sentinel 3[5] and Sentinel 1[6]. **New standardised methods for scaling, spectrally and spatially are required.**

Q13. How can the Geospatial Commission act as a more effective customer for geospatial data on behalf of the public sector?

19. When considering the maximum reuse of data and wide range of potential users the UK should seek to ensure **that high quality information is provided as the default**. Customers such as the Geospatial Commission need to be requesting quality data with uncertainty information as part of the procurement process.

Q15: How can we best develop a single UK strategy, ensuring alignment between the individual strategies across the UK while still allowing for national variations?

20. **A coordinating body** with a vision and regular meetings to build a **common comprehensive architecture for storing and exploiting data** could maximise the value of investments and facilitate maximum growth for the UK economy whilst ensuring all users are well served with comprehensive timely and trustable data.

---

[3] https://landsat.usgs.gov/landsat-8
[4] https://sentinel.esa.int/web/sentinel/missions/sentinel-2
[5] https://sentinel.esa.int/web/sentinel/missions/sentinel-3
[6] https://www.esa.int/Our_Activities/Observing_the_Earth/Copernicus/Sentinel-1

Q18: Are there any other areas that we should look at as a priority?

21. We believe that high risk sectors such as **finance, the energy sector** and other areas that are sensitive to climate change should be looked at as a priority.

Q19: What are the main potential private and public sector innovations that will rely on the use of geospatial data to rollout, and are there corresponding regulatory challenges?

22. The main potential private and public sector innovations that will rely on the use of geospatial data to rollout include **smart integrated transport systems across road, rail, marine and air**. These will increasingly incorporate systems for managing traffic (and therefore lanes/airspace) and the use of automated and eventually autonomous technologies both at the network and at the individual vehicle level. These will rely on a range of data including geospatial which must be trusted and traceable.

23. **Autonomous vehicles** will rely heavily on being able to access accurate geospatial data, making decisions based upon understanding their precise location and the location of other vehicles and objects in their vicinity.

24. Within agriculture there is the potential to use geospatial data to enable **automated farming**, capture data and inform the distribution of land use grants, monitor areas and inform risk mitigation processes and the costing of insurance.

25. There is the potential to utilise UK innovation platforms and concepts, to support developing nations, using additional data sets to improve the **targeting of aid**, mitigation of disease and monitoring of carbon accountancy sinks and emissions.

Q20: How best can we make the UK's presence in the international geospatial world more visible?

26. We can make the UK's presence more visible in the international geospatial world through the development of an innovative **data hub and analysis platform with quality assurance (QA) to deliver trusted products**. The ability to have full interoperability and encourage global datasets through UK architecture by providing interoperability/QA metrics alongside the data will place UK at the forefront of innovation. There are many data hubs and analysis platforms in existence or under development, so to make the most of the opportunity the UK has to develop something unique and act quickly to lead in this arena.

Q21: Where should the UK be looking for points of comparison overseas? Who are the other international exemplars? What best practice is being modelled overseas that we can learn from?

27. Australia has made a major global impact with the export of data cubes and is creating a digital Australia. They are also starting to look seriously at data quality assurance and interoperability as part of this process.

28. The US and US Geological Survey in particular have good platforms as increasingly do many in the private sector.

Contact:
Sarah Dalmedo
Policy Officer
National Physical Laboratory
Sarah.dalmedo@npl.co.uk