New Geospatial Data Guidelines – impact on research and education

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Since the Indian government launched New Geospatial Data Guidelines on 15 February this year[1] there have been a lot of discussions on how this is going to impact the industry and that how a market worth one lakh crore for geospatial data is going to unfold over the next decade. However, one aspect that is not being discussed equally is the impact of this new guideline on education and research, which is important as it will decide how the stakeholders, i.e. students, researchers, universities, policy makers and funding agencies should respond.

The new guidelines are based on two basic pillars – (i) freedom to Indian entities for geospatial data collection and dissemination and (ii) access to public-funded geospatial data to Indian entities. The guidelines are bold and open opportunities for Indian researchers and academicians.

In hindsight, the regulations governing the collection and use of geospatial data in India were highly ambiguous, illogical, irrelevant and restrictive. This led to irreparable damage to geospatial education and research, particularly in the domain of high-resolution technologies. The scene is better for lower resolution data due to India being home to excellent remote sensing programmes and fewer restrictions on their use.

It may be noted that barring a few places, no university in India teaches comprehensive courses in aerial sensing technologies like photogrammetry or LiDAR, while these technologies are key to all engineering projects and disaster management which require high accuracy, resolution and speed. The main reason for this was unavailability of aerial survey data for hands-on practices. Further, as no research was being done in aerial mapping technologies, no good teaching was possible as good research leads to good teaching. The scene around the Western countries is very different where aerial photogrammetry is being taught and researched extensively since the Second World War and has been a primary source of large-scale mapping. In India there were a few campaigns on aerial photogrammetry, primarily by NRSC and Survey of India, but data could not become available for teaching and research due to restrictions associated with data sharing. If data were available with some institution, the same would be shared with students after tens of restrictions thus marring the excitement of learning. It may be noted that India is home to back-office processing of high-resolution data of the world. This, though produced many trained individuals in data editing, failed to build core expertise on project management, data capture, sensor integration and calibration, error management and application development.

Restrictions on high-resolution aerial sensing also impacted research in these technologies both at hardware and software level. A few researchers who work in this area use data from international sites which lack Indian characteristics and are beyond reach for ground truth collection. No research could be done for developing solutions for solving problems specific to India, e.g. slum development, flood management, urban growth modelling, urban utility management, precision forest mapping, cadastral mapping and land consolidation, etc. Any research involving collection of aerial LiDAR or photographic or hyperspectral data would get entangled more on seeking permissions rather than the core research. The author took over two years to collect one such data for research purpose after several visits and calls to authorities. Data collected by a few researchers or national organizations could not be shared with other researchers due to restrictive policy.

In contrast to the past practice, the new guidelines (DST, 2021)[1] mention that, 'Indian Entities, whether in Government or outside, will be free to acquire, collect, generate, prepare, disseminate, store, share, publish, distribute, update, digitize and/or create Geospatial Data, including Maps, of any spatial accuracy within the territory of India…', which is a quantum leap. The guidelines[1] further mention that, 'All Geospatial Data produced using public funds, except the classified geospatial data collected by security/law enforcement agencies, shall be made easily accessible for scientific, economic and developmental purposes to all Indian Entities and without any restrictions on their use…. Such access shall be given free of any charges to Government agencies and at fair and transparent pricing to others.' Both the above guiding principles will become the key to open research and teaching opportunities in high resolution geospatial technologies in India.

As we move with the new guidelines it is right time for all stakeholders to understand the opportunities available and work towards realizing the innovation and research potential. A few pointers to the way forward can be:

(1) Academic institutions should start courses on high-resolution technologies covering basic physical principles of sensors, sensor integration, data generation principles, error propagation in data and its treatment, processing algorithms for information extraction using ML/DL and application development.

(2) Concerted efforts should be made by MHRD/AICTE/DST to popularize education on high-resolution geospatial data leading to more capacity generation to cater to the expected high demand from government and private sectors in coming times.

(3) Government along with autonomous organizations should design mechanisms to create a layer of chartered professionals in geospatial data generation and processing thus ensuring quality of services.

(4) A vision document should be generated with the help of academic institutions and industry working in high-resolution technologies to assess the research directions for the future.

(5) DST, which is the primary funding agency and leading the geospatial policy development, should come out with mechanism for sharing of public-funded data including the historical data.

(6) A platform should be developed listing all metadata of the public-funded projects, so researchers can search, view, evaluate and download the data. This will also avoid duplicity of efforts in data collection and save resources.

(7) There should be concerted efforts to change the mindset, so data sharing becomes a reality among researchers. This may even require strict guidelines from DST with minimum timeframes for data sharing.
(8) The public-funded geospatial data must adhere to a certain quality standard which should be the responsibility of a PI thus enabling confidence in shared data.
(9) DST should fund network projects and some benchmark sites where aerial LiDAR, camera and other sensor data along with ground truth should be collected and shared with all researchers involved. It may be noted that LiDAR and other high-resolution data once collected for a site can be utilized in multiple research and development projects catering to different application areas, thus maximizing the investment put on data generation.
(10) Startups should be promoted to work in geospatial data, specially high-resolution, thus tapping the potential of developing technologies in India. Startups should be provided free access to public-funded data.

With the possibilities that new data policy offers, the onus now lies on the stakeholders as to how they take advantage of the new regime and produce technologies and solutions for solving the problems faced by India.

1. DST F.No.SM/25/02/2020 (Part-I), dated 15 February 2021.

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COMMENTARY

Food and nutrition security: analytical fallacies and way forward

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Food and nutrition security (FNS) being a key priority area in development planning, requires good predictive models for holistic analysis of the concept, representative of the multi-dimensional linkages associated with the complex phenomenon. The present article discusses the conceptual dissents, and the popular proxy measures from which FNS is being most often inferred in practice. We suggest possible integration of the measures within the scope of a multifaceted framework in light of the limitations and potential risks in using them in isolation.

Food and nutrition security (FNS) is a key priority area in development planning, and has therefore been attached the highest priority, especially in the impoverished parts of the world. It is estimated that one in every nine (820 million) people in the world suffers from hunger. The prevalence of undernourishment has virtually remained unchanged over the years (slightly below 11%). It is quite worrisome that the total number of undernourished over the years produces a slowly inclining trend[1]. The FAO has recently shared its concern over the extreme inadequacies lying with present FNS drives to achieve Zero Hunger by 2030, and has estimated that more than 840 million people (9.8% of the total global population) may get affected by hunger-related issues by the year 2030 (ref. 2). This is quite an alarming situation even if we keep aside the potential impacts of the present COVID-19 pandemic which is expected to have worsened the overall prospects of FNS. In order to achieve the goal of FNS, it is imperative to have sound policy interventions such that limited resources can be allocated more efficiently. The same requires good predictive models which holistically analyse the subjective concept of FNS. The Sustainable Development Goals (SDG) framework of the United Nations lays emphasis upon two FNS indicators for monitoring the SDG target – (i) prevalence of undernourishment and (ii) prevalence of moderate to severe food insecurity[1].

Food (and nutritional) (in) security is a multi-dimensional, social concept that has dramatically evolved over a period of time. Traditionally, the concept of FNS was restricted only to food availability, and the measurement framework had been rooted in the Malthusian theory which suggests that the growth rate of food production should not be lower than the population growth rate for maintaining a food security balance. The earlier concepts of FNS have been extensively used as household level welfare measures, and do hardly encompass nutrition security. However, individual household level nutritional outcomes to a great extent depend upon a set of non-food factors like, hygiene and sanitation, water quality, disease and infection, and access to primary health care services, and therefore these should also be accounted for in FNS measures[3,4]. Near about 45% of child mortality in the world can be attributed to maternal and child under nutrition however, about 50% of malnutrition is associated with unsafe water, poor hygiene and inadequate sanitation[5]. The inadequacies of the traditional concepts can also be explicitly found out in the work of Drèze and Sen[6]. The entitlement approach in understanding FNS in a more comprehensive manner, the underlying relationship between food intake and nutritional achievement, the role of access to different complementary inputs other than age, sex, pregnancy, metabolic rates, climatic conditions, and activities in determining nutritional outcomes offer new perspectives to the existing FNS framework.