DEval
DEUTSCHES EVALUIERUNGSINSTITUT DER ENTWICKLUNGS-ZUSAMMENARBEIT

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FROM GIS TO M+E: EXTRACTING VALUE FROM GEODATA FOR EVALUATIONS

Summary

Are you one of those joggers who like to track and map their run and measure their distance, speed and altitude? And when was the last time that you used an atlas to navigate when driving? As these examples show, the use of geodata has become part and parcel of our daily lives as consumers – one that we can no longer imagine living without.

Geodata are not just used in developed countries, however. In developing countries and emerging economies, they are being increasingly used in scientific and analytical work and in implementing and evaluating public policy too. In this context, the evaluation of development cooperation (DC) measures can particularly benefit from the use of geodata and methods of geographical analysis. Indeed, increased expectations of DC in this, the era of the Sustainable Development Goals (SDGs) call for new and better ways of measuring the effectiveness of publicly financed programmes.

The analysis of geodata can be used as a basis for developing diverse approaches to address a range of different evaluation issues by, for example:

- using satellite images to measure the impact and effectiveness of large-scale DC measures such as irrigation programmes or measures to protect forests and mitigate global climate change (glacier retreat, desertification)
- observing and monitoring (spatial) changes over long periods of time, even before or after a DC project starts or finishes
- supplementing survey data or interviews by precisely mapping the living and environmental conditions of interviewees and developing new measurement concepts to assess poverty, for example
- visually representing the spatial distribution of both projects and beneficiaries on interactive or static maps

Geodata can also be used to compare results, thereby increasing the reliability of evaluation findings. Increased computational capacities, powerful open-source software and an increasing abundance of free geodata enable even small evaluation units and project executing organisations to use geoanalyses. This in turn allows decision-makers to implement fit-for-purpose evaluation findings to improve the efficiency of programme design, to limit personnel and financial resources and monitor activities in order to reliably track project progress and sustainability.

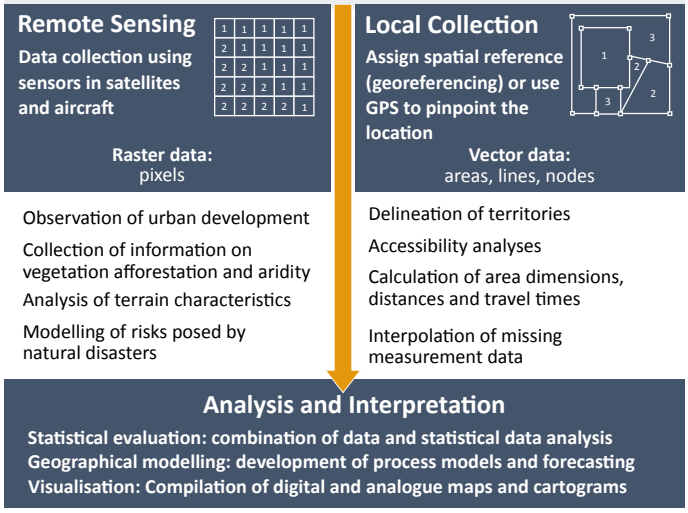
Using geodata to evaluate DC measures

Reliable data are key to successful evaluation. What can be done, however, if these data are not readily accessible? An unstable security situation in the country in question may jeopardise or in some cases even prevent organisations from collecting their own survey data. Interviewing the local population may sometimes also just take too long or be too costly. The scale of other issues such as urbanisation, deforestation, glacier retreat or desertification is so global that comprehensively collecting data on site would outstrip the resources of standard data collection methods. In such challenging contexts, **in particular, the use of geodata can play a key role in conducting robust, reliable and efficient evaluations**.

Geodata are data with a spatial component. They can be used to examine a number of different evaluation-related issues. Figure 1 provides an overview of the basic types of geodata along with examples of how they are used. Whereas gathering and evaluating these data was very costly up until just a few years ago,

sweeping developments in the collection of new geodata mean that this process is now much more affordable. In the area of public-sector service provision, the accessibility of geodata has also improved significantly thanks to the expanding **open data movement**. Furthermore, providers of commercial geodata are also making parts of their databases available more frequently at no charge, for example in the wake of natural disasters (the upside for them being that it raises their profile). The fact that the volume of reliable, high-quality, freely available data that can be used in an evaluation context is steadily increasing thanks to greater openness, especially in the research sector, is a particularly welcome development.

Geodata – types, collection and possible applications



Source: Authors' own diagram

Growing computational capacities, e. g. via **cloud computing services**, can help to process this increased volume of data cost-effectively and more rapidly. These improvements in data availability and computational performance help ensure that even small evaluation teams, which are often under pressure to keep down costs, are able to use geodata and geographical analysis methods too.

Scope of application, leveraging value

Geodata and geoanalytics can help **cast a new light on well-established evaluation issues**. They can, for example, help us to find alternative ways of measuring poverty. By interpreting satellite images of buildings and roads and their condition, computer algorithms can provide reliable information on poverty and prosperity. Although these new methods have not yet replaced established methods for measuring poverty, they can provide important added value in areas where traditional methods are pushed to the limit or where existing information has not been updated.

Other **issues**, some **new**, such as the inclusion of data on weather and climate phenomena in studies on migration or on financial transfers for smallholder farmers, enable innovative approaches to be developed to explain the impact of DC measures. For example, in addition to depicting visible phenomena, satellite imagery allows us to measure things such as plant growth, erosion, soil aridity and economic activity across large areas.

Combining this environment-related information with survey findings enables us to address complex evaluation issues in addition to taking an analytical stance. For instance, incorporating survey and satellite data allows us to not only visually represent and assess the scale of success of forest protection measures, it also enables us to explain the underlying rationale for the activities themselves and to quantify any increase in the area of arable land or higher yields brought about by irrigation programmes. As a result, evaluations that could previously only be conducted as case studies can now be scaled up into quantifiable, supraregional evaluations or can be incorporated into evaluations of specific sectors or country programmes.

Geographical analysis methods also create added value in terms of **providing additional background information on issues or enabling the triangulation of results**, which increases the reliability of any conclusions drawn. One particular advantage of using existing geodata is their availability over time, which allows studies to be conducted covering long periods. This means that geodata can be used to compile indicators, which allow changes to be measured over the project term. Current methodologies usually limit the degree to which evaluation teams can adopt a long-term perspective, as evaluation activities usually only kick in once a DC measure has started. Looking to the future, this long-term perspective will also help teams **to measure the durability** of projects once implementing organisations and donors have left the project region. This will make it easier to evaluate sustainability, which is difficult to track.

Thanks to their spatial nature, geodata help us to glean key contextual information, allow us to **better interpret existing results and view them from a different perspective**. This is

important, particularly in relation to the SDGs, which highlight the links between aspects such as environmental protection and poverty reduction. What does poverty mean for rural households for whom difficult terrain or lengthy travel times impede access to markets? How do particular aspects of climate change, such as rising sea levels, impact on the living conditions in slums? And what regional focus do DC measures need to adopt in order to maximise impact given the complexities of human interaction with the environment? Geocontextualisation ultimately enables decision-makers to obtain more transparent data, which can be used to design more efficient programmes and policies.

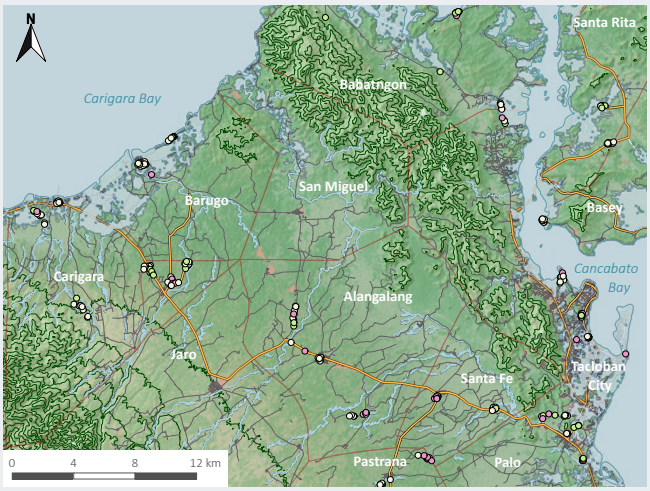
Future application trends

In order to be able to improve the precision of analyses conducted within the scope of evaluation in future, data that are primarily generated for purposes other than for analytic use can be incorporated into the evaluation of DC measures, provided that **data protection standards are observed**. These 'big data' (from tweets posted on Twitter, for example) are marked or can be linked back to information on the location and surroundings of users, and can therefore be incorporated into a geoanalytics application. Based on machine learning and automated pattern recognition methods, the integration of big data will enable even more precise evaluation of issues, for example in relation to the perception and use of DC projects and measures or to communications patterns and financial transfers. This may help us gain a better insight into the causal mechanisms within DC projects.

As regards the interpretation of aerial photography and satellite imagery, automation techniques can help make change more measurable, for example by enabling evaluators not only to see whether a refugee camp is used during humanitarian emergencies but also determine whether the structure and functions of the camp meet the actual needs of the beneficiaries.

Technical developments in the field of remote sensing also enable information to be collected on small-scale changes (in order to gauge the damage that earthquakes wreak on houses and public infrastructure, for example) using aerial photography. This rapidly provides decision-makers with key information on the situation and on any changes in times of crisis, when there tends to be a lot of confusion. In addition to existing methods such as satellite data and aerial photography, images taken by drones are playing an increasing role in this context too. Advantages primarily include increasing cost effectiveness and the collection of fit-for-purpose geodata.

Project example: Contextualisation based on geodata



Please note: The above map shows an analysis of natural hazards, using areas that are at risk of flooding on Leyte, in the Philippines, as an example. The dots depict the location of households where data were collected during a survey conducted in late 2016.

Source: Authors' own map based on NASA SRTM 1 & Open Street Map.

What results have ten years of interventions to improve land-use planning and disaster risk management achieved? DEval is taking a closer look at this issue in its evaluation of the impact of a technical cooperation measure implemented by the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH in the Philippines. The integration of geodata plays a key role in this context. In November 2013, the project area was battered by a devastating super typhoon. The subsequent disaster assistance and reconstruction measures are making it difficult to attribute results to the project. To address the problem, the evaluation team is using GIS data on the intensity and scale of the storm damage. Geoanalytical methods are also being used to identify the risk of natural disasters, and these risks are linked to the precise location of households and village and community centres.

Challenges

New technologies and opportunities present a number of new challenges too. As well as the **strict data protection and ethical standards** that need to be observed when using the data, some of which can be personalised to a high degree, evaluators will need to develop new skillsets in order to expertly use and analyse information. In addition to finely tuned **technical expertise and programming skills**, the ability to work and communicate flexibly as part of an interdisciplinary team plays a key role. As a result, challenges will also be faced on the human resources development front, as suitably qualified evaluators with the necessary methodological skills and DC background will be required.

Despite the wide range of opportunities that geodata offer, as described above, we must **not overrate them as a methodological blueprint for successful evaluation**. Geographical analysis methods cannot (and should not) replace surveys in an analytical context. Nor should they take precedence over other evaluation approaches across the board, e.g. for cost reasons. Instead, geodata should be regarded as a means of providing answers to new evaluation issues in areas where other methodological approaches are pushed to the limit. When used with other methods, viewing evaluation questions from a geographical perspective can help us gain a deeper insight into the inner logic of DC projects.

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The German Institute for Development Evaluation (DEval) is mandated by the German Federal Ministry for Economic Cooperation and Development (BMZ) to independently analyse and assess German development interventions. Evaluation reports contribute to the transparency of development results and provide policy-makers with evidence and lessons learned, based on which they can shape and improve their development policies.

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