THE STATUS OF TOPOGRAPHIC MAPPING IN THE WORLD

A UNGGIM - ISPRS PROJECT 2012 - 2015
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THE STATUS OF TOPOGRAPHIC MAPPING IN THE WORLD
A UNGGIM - ISPRS PROJECT 2012 - 2015

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Abstract
In December 2011 UNGGIM initiated a cooperative project with ISPRS to resume the former
UN Secretariat studies on the status of topographic mapping in the world conducted between
1968 and 1986. After the design of a questionnaire with 27 questions, the UNGGIM
Secretariat sent the questionnaires to the UN member states. 115 replies were received from
the 193 member states and regions thereof. Regarding the global data coverage and age the
UN questionnaire survey was supplemented by data from the Eastview database. For each of
the 27 questions an interactive viewer was programmed permitting the analysis of the results.
The authoritative data coverage at the various scale ranges has greatly increased between
1986 and 2012. Now a 30% 1:25 000 map data coverage and a 75% 1:50 000 map data
coverage has been completed. Nevertheless there is still an updating problem as date for some
countries are 10 to 30 years old. Private Industry with Google, Microsoft and Navigation
system providers have undertaken huge efforts to supplement authoritative mapping. For
critical areas on the globe MGCP committed to military mapping at 1:50 000. ISPRS has
decided to make such surveys a sustainable issue by establishing a working group.

1 Origins of the Project
In 1986 the Department of Technical Cooperation for Development of the United Nations
Secretariat has completed the last survey on the „Status of World Topographic and Cadastral
Mapping“. The results of the survey were published by the United Nations, New York 1990
in World Cartography, Vol. XIX. The text was submitted by the UN Secretariat as document
E/CONF 78/BP7 in 1986 prepared by A.J. Brandenberger and S.K. Ghosh of the Faculty of
Forestry and Geodesy at Laval University, Quebec, Canada. It referred to previous surveys
submitted by the Department of Technical Cooperation for Development of the United
Nations Secretariat in 1968 published in World Cartography XIV and in 1974 and 1980
published in World Cartography XVII.
The paper published in World Cartography XIX in 1990 summarized the progress made in topographic mapping across the globe between 1968 and 1980 in 4 scale categories:

range I; scales between 1:1000 and 1:31 680
range II; scales between 1:40 000 and 1:75 000
range III; scales between 1:100 000 and 1:126 720
range IV; scales between 1:140 000 and 1:253 440

These ranges represent the more recently standardized scales:

range I; scale 1:25 000
range II; scale 1:50 000
range III; scale 1:100 000
range IV; scale 1:250 000

While scale in the age of digital cartography has changed the meaning, the scale ranges nevertheless maintain their significance with respect to the resolution of mappable details.

The 1986 survey covered the following number of countries or territories:

| Region   | Countries | Territories |
|----------|-----------|-------------|
| Africa   | 53        | 4           |
| North America | 24     | 13          |
| South America | 12    | 3           |
| Europe   | 39        | 4           |
| Asia     | 40        | 3           |
| USSR     | 1         | 0           |
| Oceania  | 11        | 17          |

Antarctica was not included in the survey.

Source of the data obtained by the surveys were completed questionnaires, sent by the UN Secretariat to the UN member countries, plus additional surveys made directly by Laval University for UN member countries not having answered the questionnaires, for non-UN member countries and for territories under foreign administration. The result of the survey was for each region and for the different scale ranges:

| Region      | range I | range II | range III | range IV |
|-------------|---------|----------|-----------|----------|
| Africa      | 2.3%    | 29.7%    | 20.6%     | 86.8%    |
| North America | 41.3%  | 68.2%    | 8.0%      | 92.8%    |
| South America | 9.7%   | 29.0%    | 44.2%     | 50.4%    |
| Europe      | 92.5%   | 93.8%    | 81.3%     | 95.7%    |
| Asia        | 16.0%   | 62.7%    | 65.4%     | 92.0%    |
| USSR        | >5%     | >60%     | 100%      | 100%     |
| Oceania     | 13.3%   | 15.6%    | 36.1%     | 99.8%    |
The areas covered by the survey were:

| Region      | range I | range II | range III | range IV |
|-------------|---------|----------|-----------|----------|
| Africa      | 75.8%   | 100%     | 100%      | 100%     |
| North America | 90.7%  | 100%     | 100%      | 99.5%    |
| South America | 100%   | 100%     | 100%      | 100%     |
| Europe      | 98.0%   | 90.2%    | 97.25%    | 96.7%    |
| Asia        | 87.8%   | 90.9%    | 87.6%     | 90.2%    |
| USSR        | 100%    | 100%     | 100%      | 100%     |
| Oceania     | 94.1%   | 94.5%    | 94.3%     | 99.9%    |

World summary:

| Year        | range I | range II | range III | range IV |
|-------------|---------|----------|-----------|----------|
| area of survey 1986 | 90.1%   | 97.4%    | 97.0%     | 97.75%   |
| 1986 map coverage | 17.9%   | 49.3%    | 46.4%     | 87.5%    |
| 1980 map coverage | 13.3%   | 42.2%    | 42.2%     | 80.0%    |
| 1974 map coverage | 11.6%   | 35.0%    | 40.5%     | 80.5%    |
| 1968 map coverage | 7.7%    | 23.4%    | 38.2%     | 81.0%    |

Since the last survey in 1986 considerable progress has been made in data coverage:

| Year        | range I | range II | range III | range IV |
|-------------|---------|----------|-----------|----------|
| 2012 map coverage | 33.5%   | 81.4%    | 67.5%     | 98.4%    |

Chart 1: Percentages of total world area covered in each scale category, 1968-1974-1980-1986-2012
Chart 2: Area covered by topographic mapping on four scale ranges, by geographical region, 2012

**Area covered by topographic mapping**

- **Africa**
  - Scale 1: 99.8%
  - Scale 2: 99.7%
  - Scale 3: 47%
  - Scale 4: 25.9%

- **Europe**
  - Scale 1: 93.5%
  - Scale 2: 99.6%
  - Scale 3: 34.9%
  - Scale 4: 10.5%

- **Asia**
  - Scale 1: 100%
  - Scale 2: 80%
  - Scale 3: 37.6%
  - Scale 4: 99.9%

- **North America**
  - Scale 1: 99.9%
  - Scale 2: 94.9%
  - Scale 3: 62.3%
  - Scale 4: 18.8%

- **South America**
  - Scale 1: 96%
  - Scale 2: 76.6%
  - Scale 3: 96%
  - Scale 4: 99.2%

**Area for which no data are available**

- **Australia and Oceania**
  - Scale 1: 96%
  - Scale 2: 96.6%
  - Scale 3: 47%
  - Scale 4: 25.9%
While the surveys presented in 1986 did not concentrate on map revision on a global basis, they nevertheless derived an update rate for the four scale ranges:

|          | range I | range II | range III | range IV |
|----------|---------|----------|-----------|----------|
| update rate 1986 | 3.2%    | 1.8%     | 2.7%      | 3.6%     |

This points to the fact, that in 1986 the maps at the scale relevant to national planning operations 1:50 000 were hopelessly out of date.

Other aspects of the surveys conducted in 1980 were directed toward the existence of geodetic networks and their density. In 1980 there existed 3.67 M horizontal and 3.16 M vertical control monuments on the globe, but again their density varied from 2.66 km$^2$ per horizontal control monument and 3.61 km$^2$ per vertical control monument in Europe to 232 km$^2$ in Africa with an average of 42.5 km$^2$ per horizontal control monument to 46.4 km$^2$ per vertical control monument.

Today the GNSS technology makes control point densities irrelevant, except for the case, when old map data need to be referenced to a global datum.

In 1980 the national mapping agencies possessed 12 120 theodolites, 5790 precise leveling instruments and 1914 EDM devices, 162 airplanes for aerial photography, 267 aerial survey cameras and 3120 photogrammetric stereo plotting instruments. Disregarded in that survey are instruments owned by companies mapping for governments under contract.

Again, the availability of geodetic instrumentation is not of essence to judge progress any more. The attempts of 1980 to determine the existing manpower of the national mapping agencies for each region were based on few countries only (e.g. Algeria and Nigeria for Africa, the USGS in the USA, the Surveys and Mapping Branch in Canada, the IGN France in Europe). These data were used to extrapolate the requirements in other countries with the attempt to develop a budget of global expenditures, yielding a global sum of US$ 868 million, at that time 0.010% of the gross national product, while the global surveying and mapping activities at that time were estimated to be between 8 to 9 billion US$ per year. A program for
increasing the expenditures to 0.02% of the GNP was recommended in the report to meet the need for lacking mapping coverage and lacking map updates.

The financing of geospatial information is a very complex issue. To track progress these tasks should now be transferred to another UNGGIM Working Group.

The rather inaccurate and inconclusive results of 1986 may have discouraged the UN Secretariat in continuing the past surveys due to lack of a budget for this purpose.

2 The UNGGIM-ISPRS Project

The United Nations Regional Cartographic Conferences (UNRCC) for the Americas and for Asia and the Pacific nevertheless continued to recommend to the Secretariat to continue the studies on the global status of mapping. One of these resolutions of the UNRCC for the Americas in 2009 gave the mandate to the Secretariat for a new survey.

This happened at the time, when UNGGIM (United Nations Global Geospatial Information Management) was created as a new structure.

ISPRS approached the director of UNGGIM in 2011 to start a joint project on the survey of the status of topographic geospatial information,

- because the issue is of global interest
- because new technologies, such as GNSS (GPS, GLONASS), digital aerial mapping, high resolution satellites for mapping, digital photogrammetry and GIS have taken over as new mapping methodologies
- because large private organizations such as the navigation industry (HERE, TomTom), Google Earth and Microsoft Bingmaps have entered the mapping effort, which was previously the domain of the national mapping agencies.

The project was approved in December 2011 by Dr. Paul Cheung, director of UNGGIM at that time, who nominated Dr. Amor Laaribi as UNGGIM contact, and by Chen Jun, President of ISPRS, who nominated Prof. Gottfried Konecny of Leibniz University Hannover as ISPRS contact.

In January 2012 a questionnaire to the UN member states was designed, mutually discussed, translated to French, Russian and Spanish and mailed to the contacts of the UNGGIM Secretariat in the UN member states. Ms. Vilma Frani of the UNGGIM Secretariat sent the replies to Leibniz University Hannover, where they were placed in a database designed by Uwe Breitkopf for further analysis.

3 The Questionnaire

The jointly designed questionnaire consists of five parts including 27 Questions:

- PART A: Background Information
- PART B: National Topographic Mapping Coverage
- PART C: National Imagery Acquisition
- PART D: National Surveying and Cadastral Coverage
- PART E: Organization
See Appendix I for the original questionnaire.

Until June 2015 altogether 115 responses have been received from 193 UN member states or regions thereof. In addition, there are 51 non-UN member countries and territories, which are also covered by map data. These map data for 244 UN member states and regions were generated in UN member states, but these have in general no direct responsibility for mapping these territories.

Fig. 1 shows the 115 states or regions from where replies have been received, which have answered the UNGGIM-ISPRS questionnaire.

Answers were almost complete from Europe (with the exception of Belarus), they were satisfactory from the Americas (with the exception of Argentina) and in Oceania. In Asia India, Pakistan, Myanmar, Kazakhstan, some Central Asian countries and Indonesia did not participate in the survey. In Africa about half the countries did not share their information. Nevertheless the response by 115 member states and regions thereof from 193 UN Member States is considered a success by the UN.

![Map showing 115 countries that replied the Questionnaire until June 2015](image)

**Fig. 1: 115 countries have replied the Questionnaire until June 2015**

## 4 Content of the Database

While not all of the 27 questions need to be answered globally, this is, however, important for questions 1 and 2, since they characterize the global data coverage at the different scale ranges and their age of the data.

To assess the global status of map coverage the Eastview database is a fundamental component to answer these questions. Dr. Kent Lee, CEO of Eastview has kindly agreed to make the missing data available from their database.
The map sources at Eastview include locally produced (e.g. by national mapping agencies) as well as military map series, see Appendix II-13 and 14 as an example.

Besides Eastview other sources were analyzed to fill the gaps in the study and estimate global coverage. These include UN reports accompanying the questionnaires, internet portals for national mapping data, the cartographic database of the German State library of Berlin based in part on the Geokatalog of the map vendor ILH Stuttgart and others see Appendix II to IV for examples.

Regarding question 1 Fig. 2 to Fig. 5 show the global coverage in the scale ranges 1: 25 000 or greater, 1: 50 000, 1: 100 000 and 1: 250 000.

Europe, the Russian Federation, Turkey, Japan and the continental USA are well represented in the 1:25 000 scale range, as well as the Western part of China. In the remainder of the world that scale range only covers a small part of the countries.

The scale range 1:50 000 and larger, on the other hand covers the continents of Europe, North America, Asia and the Arab world, most of South America and New Zealand. Australia and Algeria are covered to about 40% to 60% and Mongolia to about 30%. Only in the desert areas of the Africa and South America the coverage is less than 15%.

Australia and Papua-Niugini are fully covered by 1:100 000 maps, as well as Latin America. With few exceptions the land areas of the globe are covered at the 1:250 000 scale range with the exception of Greenland with 45% and Antarctica with 4%.
Fig. 3: Map coverage at scale 1:50 000

Fig. 4: Map coverage at scale 1:100 000
With only 59% of the UN member states having answered the questionnaire, other sources had to be utilized to assess the global coverage. Chart 4 and Fig. 6 to Fig. 9 give the source of the metadata information for Fig. 2 to Fig. 5.

Concentrating on the globally important scale range 1:50 000 only 22% of the relevant information stems from the questionnaires received. 5.4% are added from country reports to UNGGIM, 2.9% from Internet portals. 12% of the metadata came from Eastview, 19.1% from the State Library Berlin plus 5.8% from other sources and 17.4% on what has previously been compiled by Laval University in the 1986 study, totaling 91% of the information.

![Chart 4: Data source for coverage per scale category]

**Fig. 5: Map coverage at scale 1:250 000**
Fig. 6: Source of Meta information for map coverage in range I - 1:25,000

Fig. 7: Source of Meta information for map coverage in range II - 1:50,000
Fig. 8: Source of Meta information for map coverage in range III - 1:100,000

Fig. 9: Source of Meta information for map coverage in range IV - 1:250,000
Fig. 10 to Fig. 13 shows the equivalent data to Fig. 2 to Fig. 5 for the year 1986, depicting the huge progress made through technology from 1986 to 2012. Also Fig. 14 highlights the change in map coverage between 1986 and 2012.
Fig. 12: Map coverage 1986 at scale 1:100 000

Fig. 13: Map coverage 1986 at scale 1:250 000
This answers question 2 at least in part.

The change map in Fig. 14 indicates where the most relevant changes have occurred between 1986 and 2012: most significantly in Latin America, in Sub-Saharan Africa, but also in China, Mexico, Iran and Turkey, as well as to a somewhat lesser degree in the Russian Federation, in Australia and in Canada.

The other 25 questions characterize the general global infrastructure for provision of map data. Fig. 15 to Fig. 39 give answers to the most relevant questions from 3 to 27 in the listed categories. They are summarized as follows:

1) Restricted access to data: While there are no restrictions in the Americas, in Europe, in most of Africa and in Oceania, restrictions to the data for the public exist in the Russian Federation and in most parts of Asia (e.g. China, Iran, Saudi Arabia). See Fig. 15.

2) Sale of data versus free of charge availability of data: In the Americas data are generally free of charge. They are sold to the public or to governmental users in Europe, Africa, Asia and Australia. See Fig. 16.

3) With the exception of most parts of Europe, South Africa, Iran, Saudi Arabia most other countries use satellite imagery for national data updating. See Fig. 19.

4) Crowd sourcing is only introduced in the USA, France, Spain, Poland and Finland. Fig. 20.

5) While mapping in the Russian Federation, in China, in Mexico and in France is done in-house by the national mapping agencies, in the USA, Canada Brazil, South Africa,
Australia, Japan and Iran mapping is also done by outsourcing or exclusively by outsourcing, like in Saudi Arabia and Namibia. See Fig. 21.

6) Almost all countries use ortho imaging as additional source to supplement mapping. See Fig. 26.

7) Interest in 3D mapping is prevalent in Europe, China, the Russian Federation, Australia and Brazil, while in North America, Scandinavia and South Africa governmental mapping agencies have no direct interest see Fig. 27.

8) National cadastral coverage is lacking in the Americas and in Saudi Arabia. See Fig. 28.

9) With the exception of Great Britain all national mapping agencies are funded by government. See Fig. 33.

10) Few countries have answered budgetary details. But for those, which answered, the funding per area is highest in Britain, France, the Scandinavian countries and in Japan. See Fig. 34.

11) The number of mapping staff per area is highest in China, Japan, Europe, Mexico and Kenya. See Fig. 35.

12) The delivery of map data via web services is practiced in North America, in most of Europe, in China and in South Africa. See Fig. 37.
Fig. 16: Question 4. Maps and/or digital data sold to the public or data free of charge

Fig. 17: Question 5. Cycle of map and data revision by complete mapping, i.e. revision of a national series or mapping of changed features
Fig. 18: Question 6. Methods of national data revision and map updating

Fig. 19: Question 6. Use of satellite imagery for national data revision and map updating
Fig. 20: Question 6. Use of crowd sourcing for national data revision and map updating

Fig. 21: Question 7. Mapping and map updating done in-house or by outsourcing
Fig. 22: Question 8: National aerial photography acquisition program

Fig. 23: Question 8. Using digital and/or analogue photogrammetry
Fig. 24: Question 9: National satellite imagery acquisition program

Fig. 25: Question 10. Acquiring and/or using other imagery types (such as LiDAR, RADAR, etc.)
Fig. 26: Question 12. Production of orthophotos and orthophotomaps

Fig. 27: Question 14. Production or intention to produce, 3D urban and rural landscape models and/or product visualization
Fig. 28: Question 16. National coverage of cadastral maps and/or data available

Fig. 29: Question 16. National Mapping Agency (NMA) responsible for surveying and/or land titles and cadastre
Question 18: Cadastral maps based on geodetic control

Question 19: Property boundaries monumented in the field

Fig. 30: Question 18. Cadastral maps based on geodetic control

Fig. 31: Question 19. Property boundaries monumented in the field
Fig. 32: Question 20. Update transaction of property maps and/or data

Fig. 33: Question 22. National topographic mapping, imagery acquisition, surveying and cadastral programs funded by your national Government
Fig. 34: Question 23. Annual mapping budget of the National Mapping Organization converted to million US$ per square kilometer of the country area.

Chart 5: Question 23. Average annual budget 2012 per continental region converted to million-US$.
Fig. 35: Question 24. Number of mapping staff in the Organization as hundreds of square kilometers of country area per person

Fig. 36: Question 25. Regulatory or institutional arrangements mandating the organization to fulfil its role as the lead mapping agency
Fig. 37: Question 26. Delivery of different map and data products via web services

Fig. 38: Question 27. Methods of archival for the national data sets
5 Mapping Contributions by Private Industry

As has been demonstrated, official and authoritative mapping by governments provides a reliable geospatial infrastructure, which is used for many public and private applications, but which is costly, difficult and slow to maintain. For that reason private enterprises have succeeded to launch several initiatives to provide faster update solutions in areas, which require fast update solutions. These are based on different cost and accuracy models for specific applications, which require fast updates. These applications do not replace official authoritative cartography, but they supplement it, as all such efforts utilize official cartographic products as a base to start their value added operations.

5.1 Google

Google’s prime aim is to provide a location based information system for uses of the public. What the general user wants is quick orientation about how to locate a specific object, such as a landmark, a store, a restaurant or a service provider and how to drive to it.

Geometric accuracy within the context of the neighborhood topography is of lesser importance than the addressability and the access by roads or pathways. In general, business advertising provides for the revenue to establish and to maintain the system.

Google Inc. operates by different projects, of which the following are the most important from the cartographic point of view.
5.1.1 Google Earth

Existing orthophotography coverage with ground sample distances between 0.1m and 0.5m as well as high resolution satellite imagery coverage with ground sample distances (GSD) between 0.5m to 2m and beyond provide the geometric background image information, which can be interpreted by the user with respect to the searched objects, such as buildings, roads, vegetation, water surfaces. While ortho images have a high geometric accuracy related to ground features commensurate with the GSD, this is not so for building tops and tree tops. Geometric accuracy even deteriorates more for high resolution satellite imagery, since most of these images have been acquired with inclinations with respect to the vertical, unless stereo imaging permitted the generation of ortho imagery. The coverage is global for all land areas.

Nevertheless, despite some of these shortcomings with respect to official cartography, Google Earth can easily satisfy the geolocation demands for the uses Google Earth has been designed for.

5.1.2 Google Maps

Google Maps is a product usually derived, wherever possible, from authoritative cartography. It has been designed to supplement Google Earth with a cartographic output containing place names, road names and building addresses. It serves the ideal function of superimposing images with line graphics. Even though Google Maps may be derived from authoritative cartography, the feature content is much less elaborate and reduced to the intended geolocation function. The 3 models for creating Google Maps are shown in Fig. 40: a) relying on authoritative data in North America, Europe, Australia as "Google Ground Truth", b) Map Maker outsourced, leaving the initiative of mapping using Google Earth to other companies (Africa, Middle East, India) and c) "Video Rental" model offering Google Earth imagery to other countries for mapping use (Russia, China).

![Fig. 40: Google Maps](image)

5.1.3 Google Street Map

Google Street Map has been developed as a tool to image buildings and streets with street furniture along urban roadways. This is done by vehicle based cameras, located by GNSS
signals. In some communities the imaging of building facades has met resistance by some members of the population, which did not wish to show them to the public on the web. Nevertheless Google has pursued street mapping for the sole reason to update the Google Maps content as an internal operation.

In this manner Google Street Map has proved to be an effective tool to quickly update the Google Maps content for buildings and roads. The update of these features can generally be done much faster than by the regular update intervals for authoritative mapping without a reporting system in operation and without a multitude of fast survey options, rather than by a centralized mapping procedure. For coverage see Fig. 41.

![Google Street Map Coverage](image)

**5.1.4 Google Ground Truth**

In the attempt not only to update the map content, but also to maintain a high level of geometric accuracy, the Google Ground Truth project has been launched for a number of countries in North America, Europe, Australia and South Africa, in which authoritative cartography has been merged with the results of high tech operations, such as Google Street Map, see Fig. 42.

![Google Ground Truth](image)
As Google regards the progress of these projects as a confidential matter, it is not possible to make a more detailed account of the progress made.

### 5.2 Microsoft Bingmaps

Microsoft considered Google to be their strongest competitor, while Bingmaps has the same objectives as the Google efforts. Therefore care has been taken to achieve a higher resolution and a more accurate geometry than Google Earth.

This was possible by limiting the area of interest to the continental USA and to Western Europe, where there were no flight restrictions. Furthermore, the imagery used for Bingmaps consisted solely of digital aerial imagery flown by the company owned Vexcel Ultracam cameras.

The coverage of the countryside for the USA and for Western Europe was completed at 30cm GSD, and the urban areas were imaged at 15cm GSD. Whether the originally foreseen updates of every 3 years can be achieved as planned, is still an open issue. See Fig. 43 (a,b,c,d).

There has been a recent announcement that Microsoft turned over Bing Maps technology to UBER.

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Fig. 43: a,b,c,d Bingmaps
5.3 Yandex

Another approach has been undertaken by Yandex in the Russian Federation, which was also applied in Turkey by the company Yandex.

Yandex has procured high resolution satellite imagery from Digital Globe for the entire territory of the Russian Federation at 0.5m GSD and at 1m GSD. The objects of interest were building blocks, single buildings, roads, creeks. They could be identified and mapped from the images. The geocoding of the mapped information was done by accuracy augmented GNSS code receivers with 2 to 3m accuracy on the ground. In this way Yandex succeeded to generate digital maps for about 300 urban conglomerations in Russia and Turkey.

Yandex, like international car navigation system suppliers, was also interested in car traffic routing, providing real time traffic congestion options for the agglomeration of Moscow.

5.4 HERE

When the Finish company Nokia bought Navteq, the global car navigation system efforts were continued by the subsidiary HERE.

HERE makes car navigation systems based on their own maps for 196 countries of the world, 116 countries of which have voice guided navigation and 44 countries of which with live traffic services.

Of interest are roads and points of interest. This also includes unidirectional restrictions of traffic flows.

In Europe 15% of the map’s content is updated every year, modifying or adding 1.1M km of roads, creating 700 000 new points of interest and adding 600 000 speed cameras.

In the Russian Federation 800 000 km of roads change after 6 months, and so do 120 000 street names, 22 000 turn restrictions, 3400 one way streets, 38 000 speed limits and 8700 directional street signs. See Fig. 44:

Fig. 44: HERE (formerly Navteq, left) and TomTom (right) Global Coverage
5.5 TomTom

TomTom has a road navigation coverage for 118 countries extending over North America, Brazil, Argentina, Europe, the Russian Federation, India, Indonesia, Thailand, Australia, New Zealand, West and South Africa (see Fig. 44).

6 Mapping by Military Organizations

Like it happened during the cold war period, when the US and the USSR military organizations considered it their goal to conduct mapping operations in what they considered to be crisis areas, this practice was recently revived by about 30 nations from Europe, North America, Australia, New Zealand, Japan, Rep. of Korea and South Africa, when they launched the Multinational Geospatial Co-Production Program MGCP. The goal of this program is to generate up-to-date 1:50 000 digital maps for potential crisis areas of the globe in Asia, Africa, the Middle East, the West Indies and the Pacific Ocean. Benefitting from this activity is the UN cartographic section, which utilizes these maps to create information for crisis mitigation.

![MGCP Mapping Coverage](image)

Fig. 45: MGCP Mapping Coverage

7 Other Mapping Efforts

- Open Street Map is the voluntary Crowd sourcing attempt to update map content by the public. It has been enthusiastically promoted in most parts of the globe but it must be integrated into authoritative mapping to guarantee quality control.

- Scan Map by Eastview is a new commercial venture to integrative authoritative mapping with population statistics.
8 Summary of Results

• 115 UN Member countries have responded to the 2012-2015 UNGGIM-ISPRS Survey. It has been shown, that nearly all reporting countries have modernized their facilities to adopt modern GNSS, digital imaging and GIS technology in their operations, which are still handicapped by lack of funding and staff shortages.

• While in 1986 the world was basically covered by 1:250 000 maps, progress in technology has now made it possible to state that topographic mapping of the globe at 1:50 000 scale, relevant to sustainable development, has been reached.

• There are still gaps in providing updated information in developing countries. These need to be closed with a goal of no data to be older than 5 years.

• New technologies, such as those used by Google and by Yandex could help to reach this goal in priority areas.

9 Future Activities

• ISPRS has created working group IV-2 to accompany the UNGGIM-ISPRS project.

• This working group has successfully provided the needed discussion forum for the task.

• It will be the future goal of this group to assure that the data collection and analysis will be sustainable by cooperating with UNGGIM and UN-GEO

• A near goal will be the expansion of the work to include global land cover mapping as a task.

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Appendix I

Original Questionnaire

1. I am not aware that may be affected on or off this data.

| Question | Answer Options |
|----------|----------------|
| 1. How many of your employees use this work and are they being | [] Yes □ No |
| asked to sign or  explosive information or certain information? | |
| [] Yes □ No | |
| 2. Do you make more or different data off the project? | [] Yes □ No |
| 3. Are you more diligent about the project | [] Yes □ No |
| 4. Are you more diligent about the project | [] Yes □ No |

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PART 2: INFORMATION ON THE PERSONAL DATA OF THE PARTICIPANTS

1. Date: [ ]

2. Name: [ ]

3. Email: [ ]

4. Phone: [ ]

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PART 3: INFORMATION ON THE CURRENT SITATIONS OF AGRICULTURE IN THE WORLD

1. What steps are being taken to achieve the goal of sustainable food production and biodiversity?

2. How can the participation of farmers contribute to achieving these goals?

3. What challenges do farmers face in implementing sustainable practices?

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PART 4: INFORMATION ON THE CURRENT SITUATION OF AGRICULTURE IN THE WORLD

1. How is the current situation of agriculture in the world affecting your community?

2. What steps are being taken to address these challenges?

3. What role can farmers play in promoting sustainable agriculture?
Appendix II  Maps from Reports

Appendix II-1: Bhutan - 1:50 000 map grid of Bhutan in black, 76 sheets and 1:25 000 map grid of Bhutan in red, 8 sheets

Appendix II-2: Cameroun - 1:50 000 mapping, completed sheets in blue (left) and 1:200 000 mapping, completed sheets in blue (right)
Appendix II-3: Costa Rica - 1:50 000 mapping, completed sheets (left) and 1:5 000 cadastre maps; completed sheets in green, not completed sheets in brown (right)

Appendix II-4: Cote d’Ivoire - 1:50 000 mapping; white: not available, yellow: in colour, grey: in black and white

Appendix II-5: Ecuador - 1:25 000
Appendix II-6: Egypt - 1:25 000 mapping of agricultural areas (Nile Delta) as example

Appendix II-7: Madagascar - 1:100 000 mapping, age of data: blue: 1-10 year old maps, dark brown: 71 to 81 years old

Appendix II-8: El Salvador - 1:25 000 mapping (complete)

Appendix II-9: Ethiopia 1:50 000

Appendix II-10: Fiji land register
Appendix II-11: Finland - 1:50 000 Thematic Maps of Finland and their age

Appendix II-12: Finland - 1:50 000 mapping, age of data between 2005 and 2012

Appendix II-13: Guatemala - 1:50 000

Appendix II-14: Italy - 1:25 000 and 1:50 000 mapping; age of data between 1965 and 2015
Appendix II-15: Mongolia - 1:200 000, paper map production, 1990

Appendix II-16: Nepal - 1:25 000 and 1:50 000 Mapping of Nepal, 1969 - 2001

Appendix II-17: Mongolia - 1:1 000 mapping of Ulaanbaatar, 2010 - 2011

Appendix II-18: Philippines - 1:50 000 Mapping of the Philippines, age of data: yellow: 1947 - 2007, green: 2008 - 2011, violet and red: since 2012

Appendix II-19: Korea (South) - 1: 25 000
Appendix II-20: South Africa - 1:50 000 mapping

Appendix II-21: South Africa - 1:10 000 Orthophoto Maps completed 2012

Appendix II-22: Uruguay - Map grid for 1:50 000, 1:100 000 and 1:200 000

Appendix II-23: South Africa - Aerial photographic coverage, 2008 - 2012
Appendix II-24: United Kingdom - content of master map, all updated within 6 months, dark green: 1:1 250, medium green: 1:2 500, light green 1:10 000

Appendix II-25: United Kingdom - Age of Imagery Layer of Master Map, 2008 - 2012

Appendix II-26: Sri Lanka - 1:10 000 mapping, brown: completed

Appendix II-27: Sri Lanka - 1:50 000 mapping completed with year stated
Appendix II-28: Sweden - Mountain area map 1:100 000

Appendix II-29: Sweden - Age of orthophotos 1:10 000 (2007-2011)

Appendix II-30: Sweden - Property map 1:5 000

Appendix II-31: Sweden - Mapping 1:50 000
Appendix II-32: Tunisia - 1:25 000 mapping

Appendix II-33: Tunisia - 1:100 000

Appendix II-34: Tunisia - 1:50 000 mapping
Appendix II-35: USA - Alaska
INSAR coverage

Appendix II-36: USA - Lidar coverage

Appendix II-37: USA - Topo updating of 24 000 year cycle
Appendix III  Maps from the Internet

Appendix III-1: Brazil - Continuous coverage of 1:250 000 database

Appendix III-2: Brazil - Updating of 1:250 000 from 2008 to 2011

Appendix III-3: Canada - GeoBase orthoimagery (2005-2010), accuracy between 10-60m
Appendix III-4: Canada - Arctic coverage of 1:50 000 maps

Appendix III-5: Czech Republic - Cadastral coverage of the ZABAGED database 1:1 000
Appendix III-6: Germany - Age of topo database 1:10 000 between 1 year (dark green) and 9 years (red)

Appendix III-7: Germany - Update cycle of 1:50 000 map sheets, brown: 1996 - 2003 to yellow 2002 - 2007
Appendix III-8: FYR Macedonia - 1:25 000 map coverage

Appendix III-9: New Zealand (North Island) - 1:50 000 mapping

Appendix III-10: New Zealand (South Island) - 1:50 000 mapping
Appendix III-11: Democratic Republic of the Congo 1:50,000 (IGN), example for a locally produced map series available at East View, screenshot geospatial.com

Appendix III-12: Somalia 1:100,000 (Soviet Military), example for a military map series available at East View, screenshot geospatial.com
Appendix IV  Maps from Staatsbibliothek Berlin

Appendix IV-1: Belgium - 1:10 000 mapping

Appendix IV-2: Belize - 1:250 000 mapping

Appendix IV-3: Israel - 1:50 000 mapping
Appendix IV-10: Czech Republic - 1:10 000 mapping

Appendix IV-11: Japan - 1:25 000 mapping

Appendix IV-12: Greenland - 1:250 000 coastal mapping
Appendix IV-13: Georgia - 1:50 000 mapping

Appendix IV-14: Indonesia - 1:25 000 mapping of Java, Bali, Lombok and Timor
Appendix IV-15: Thailand, 2006 - 1 - 50 000 mapping

Appendix IV-16: Yemen - 1:100 000 Mapping

Appendix IV-17: Kazakhstan 1:50 000 mapping

Appendix IV-18: Iran 1:50 000 mapping

Appendix IV-19: Norway, Svalbard 1:250 000 mapping
Appendix IV-20: Germany - 1:50 000 mapping

Appendix IV-21: Portugal-Acores - 1:25 000 mapping

Appendix IV-22: Solomon Islands - 1:50 000 mapping

Appendix IV-23: Zimbabwe - 1:25 000 mapping

Appendix IV-24: Ukraine - 1:100 000 mapping

Appendix IV-25: Venezuela - 1:100 000 mapping
Appendix IV-26: Sudan - 1:200 000 mapping

Appendix IV-27: Malaysia - 1:25 000 mapping (Malacca)

Appendix IV-28: Malaysia - 1:25 000 mapping (Sabah & Sarawak)
Various project results can be viewed online as an interactive map at:

http://www.ipi.uni-hannover.de/StatusOfWorldMapping

Declaration regarding content of this publication:

The designations employed and the presentation of country or area names in this list do not imply the expression of any opinion whatsoever on the part of the Secretariat of the United Nations as well as the ISPRS and the authors concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries.

Moreover the map used for illustrations of project results (Fig. 1 - 39) is only for the purpose of reference and the boundaries are not authorized by any organizations.

The source of the map is: http://www.naturaleartha.com
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