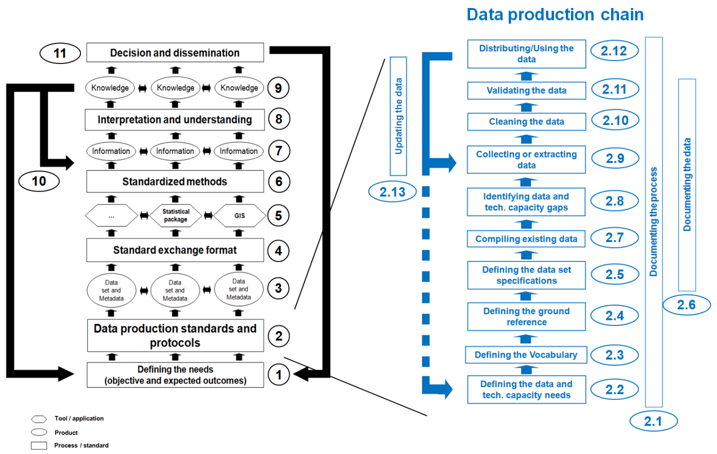
Department of Health of the Philippines

DOH GIS/GPS Guidelines and Standards

Version 1.0 (17.01.2014)



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1. Introduction

The Department of Health of the Philippines (DOH) has embarked itself in a process aiming at improving the integration of geography in its Health Information System (HIS) and at strengthening its GIS capacity in order for the all organization to benefit from the visualization and analytical power that this type of tool is offering.

The quality of GIS based products for decision making directly depends on the quality and accuracy of the Geospatial data being used. In addition to that, data being collected or produced by different units within the DOH needs to be compatible and documented in order to ensure their seamless and correct integration into these products.

Obtaining the necessary level of quality and accuracy as well as ensuring data compatibility and documentation among sources requires for a set of Geospatial standards and practices to be defined and used by all the divisions within the DOH.

The purpose of this document is to present and describe these standards and practices as defined in the course of the technical support provided to the DOH by the World Health organization over the August 2012-December 2013 period and to have this document used as a guideline for the creation and use of geospatial information and GIS within the DOH.

2. The data, information and knowledge chain

The data, information and knowledge chain presented in Annex 1 is an extended version of the one developed by Ebener et al. [1] to illustrate the different elements and steps to be considered in order to ensure data and information compatibility as well as system interoperability when implementing projects that use geography and GIS.

Even if passing from data to information and then from information to knowledge is not as linear as presented here, this way of looking at the all process is sufficient enough to ensure the production of GIS based data, information and knowledge of quality to support decision making.

This chain is actually a cycle, the data, information and knowledge life cycle, where the learning acquired during each loop do constantly improve the processes being used as well as the quality of the data, information and knowledge being produced.

Once the needs (objectives and expected outcomes) have been defined, step 1 from Annex 1, standardisation takes place at 3 levels along the chain, namely through the use of:

- Data production standards and protocols (step 2) to ensure the generation of data compatible among sources (step 3).
- Standard exchange formats (step 4) to ensure interoperability among systems and software (step 5).
- Standardised methods (step 6) to ensure the generation of reliable and compatible information among sources (step 7).

From there, the interpretation and understanding of the information by experts (step 8) is the process through which knowledge is being generated (step 9).

At this point, some additional information might be needed or even the initial needs might have to be rethought (back loop under step 10). If not then the knowledge which has been generated is disseminated and/or used for decision making (step 11).
Finally, new needs might emerge from the decisions being taken. This is what is illustrated by the other back loop (step 12).

It is important to note here that there is a process behind each of the box along this chain (step 1, 2, 4, 6, 8 and 11).

Among those processes, the data production chain (point 2.1 to 2.13) is crucial to ensure the production and use of accurate, quality and documented data to be used for decision making.

3. Guidelines and Geospatial data standards along the data production chain

This section describes the guidelines and geospatial data standards behind each of the steps of the data production chain.

3.1 Defining the data and technical capacity needs

The needs in terms of data and technical capacity directly depends on the overall objectives and expected outcomes to be set by the DOH when it comes to geographic information and GIS (step 1 in Annex 1).

At this stage, these objectives and outcomes remains to be clearly defined as part of DOH's GIS strategy currently under development but the overall vision could already be formulated as follow: "Have all the health data on a map and the capacity to analyze this data from a geographic perspective".

From a data perspective, this vision translates into making sure that the DOH can generate and/or obtain the necessary geospatial data to support its different programs, including but not limited to: disease surveillance, emergency management, maternal and child health, immunization,...

From a technical capacity perspective, reaching this same vision requires for a nucleus of professional to be trained and equipped in order to answer the needs of the different health programs mentioned here above.

While the technical capacity issue is to be handled as part of DOH's GIS strategy, the data component is the direct purpose of the present guidelines.

In this regards, and trying to be as comprehensive as possible, DOH's already identified needs in terms of Geospatial data is as follow and should cover the entire country:

- Location of all health facilities, and health related infrastructure (vector format),
- Administrative division boundaries down to the Barangay level (vector format),
- Location of schools (vector format),
- Road network and maritime routes (vector format),

- Hydrographic network (rivers and water bodies) (vector format),
- Land cover (raster format),
- Spatial distribution of natural hazard (vector or raster format),
- Digital elevation model (raster format).

Vector and raster formats are two different geospatial data models that can be used in a GIS. Please refer to Annex 2 for a definition of these models.

3.2 Defining the vocabulary

Making sure that all the people involved in the collection, maintenance and use of Geospatial data are talking the same language each other is critical to avoid any misunderstanding.

When it comes to GIS related terms, the most complete GIS dictionary currently available is the one maintained by Esri [2].

It is therefore recommended for the DOH to use this dictionary as the reference for GIS related terms in the course of its work.

This being said, this dictionary does not necessarily cover some of the terms used in the present guidelines.

The major GIS terms used in this document, and their corresponding definition, are therefore reported in Annex 2. The source for the definition being used is also indicated in this Annex.

3.3 Documenting the process

Combining Geospatial, and statistical, data coming from different sources, conducting spatial analysis and/or applying spatial models is not necessarily a straight forward process.

As an example, Geospatial data often needs to be adjusted in terms of projection or resolution, some editing work might need to be performed to comply with the specific needs of the project, codes might have to be added in the attribute table of some GIS layers in order to be able to join statistical data to it, etc...

It is therefore very important that any GIS project conducted within the DOH gets documented in such a way that someone could not only repeat the same work but also be in the position to apply it on another part of the country.

A good example of such documentation is the report presenting the geographic accessibility to Maternity Care Package (MCP) accredited facilities analysis recently conducted for Mindanao islands [6].

3.4 Defining the ground reference and dataset specifications

A map is a modeled representation of the reality in which we are living.

As such, it is important to be able measuring as precisely as possible the shift that might exist between this reality and the geospatial data being used to produce these maps.

This shift is what defines the level of accuracy of this same geospatial data and therefore indirectly its pertinence according to the context in which it is used.

In this regards, any geospatial data used for operational purposes, in the context of a response to a disaster for example, would require being as precise as possible in order to ensure that rescuers are being sent to the right place. In this case, the shift between the geospatial data and the reality should therefore be as small as possible.

The same would apply to any map that would look at the geography of a small area, a village for example, and this to ensure coherence between the different features (health facility, school, roads,...) appearing on the map.

When looking at the all country at once, such a level of accuracy would be less relevant as the features tends to be generalized in order to accommodate for the amount of information that can appear on such a small scale map.

There is therefore a direct relation between scale of work and accuracy. According to the United States National Map Accuracy Standards (issued by the U.S. Bureau of the Budget June 10, 1941 and revised April 26, 1943 and June 17, 1947) this relation is defined as follow: "requirements for meeting horizontal accuracy as 90 per cent of all measurable points must be within 1/30th of an inch for maps at a scale of 1:20,000 or larger, and 1/50th of an inch for maps at scales smaller than 1:20,000."

Table 1 provides the corresponding horizontal accuracy for selected scale of work when applying the above rule.

Scale	Corresponding horizontal accuracy (m)
1:25'000	12.7
1:50'000	25.4
1:100'000	50.8
1:250'000	127
1:500'000	254
1:1'000'000	508

Table 1 - Relation between scale and horizontal accuracy when applying the United States National Map Accuracy Standards

Looking at the programs that would mostly benefit from the use of geospatial data and GIS (see section 3.1), emergency management and disease surveillance in particular as they would require a higher level of accuracy, the recommendation is for the DOH to consider producing and using geospatial data presenting an horizontal accuracy equal or below 50 meters, which would correspond to a scale of 1:100'000.

Now that the scale of work and associated horizontal accuracy what will be considered as the "reality", or ground reference, as to be decided upon in order to be able measuring the above mentioned shift and therefore horizontal accuracy of any given geospatial dataset.
Mosaics of high resolution satellite images and orthophotos generally represent the best options in this regards. As the Philippines does not yet have its own mosaic of images/orthophotos covering the all country, tests have been performed on two other alternative mosaic freely available from the internet, namely:

- The Landsat ETM+ (Enhanced Thematic Mapper Plus) mosaic freely available from the Earth Science Data Interface (ESDI) at the Global Land Cover Facility [7].
- The mosaic of images directly accessible through google map [8]

These tests, as well as information found in the literature, have confirmed that both mosaics were presenting an horizontal error below 50 meters for the Philippines, making them suitable for the generation and control of geospatial data at a scale of 1;100,000. Both of them could therefore be used as ground reference by the DOH.

It is also important to mention here that these mosaics can, when applicable, be used to visually assess the level of completeness of a geospatial dataset. This is for example the case for roads and rivers when the vegetation cover is not too dense.

Another specification concerns raster format geospatial data: resolution. Here as well a direct relation exists between the scale of work and the appropriate resolution that the different raster layers should present and the rule set by Waldo Tobler in 1987 [9] can be used in this regards.

This rule states that the appropriate resolution for a given scale is obtained by: "dividing the denominator of the map scale by 1,000 to get the detectable size in meters. The resolution is one half of this amount."

Table 2 provides the corresponding expected raster resolution for different scale of work.

Scale	**Raster resolution (meters)**
1:250,000	125
1:100,000	50
1:50,000	25
1:25:000	12.5

Table 2 – Relation between raster resolution and scale [9]

The values reported in Table 2 can also be used to define the lowest resolution of the orthophotos or satellite images mosaic to be used as ground reference when measuring horizontal accuracy of a particular geospatial layer and perform the visual check for completeness.

Setting scale, horizontal accuracy and resolution (for raster layers) are not enough to ensure data compatibility between sources. Other dataset specifications also need to be defined. This concerns the use of a common:

- Coordinate system;

- Data exchange format;
- Set of registries to assess the level of completeness for certain layers (health facilities, schools and administrative divisions).

When it comes to projected coordinate system, a distinction needs to be done between data collection using GPS devices in the field, and the use of geospatial data in a GIS software.

For Data collection in the field, the World Geodetic System (WGS) Geographic Coordinate System (GCS) set in 1984 (WGS84) is the most appropriate system as it is the reference coordinate system used by the Global Positioning System (GPS).

The detail for this coordinate system in ArcGIS is as follow:
- Angular Unit: Degree (0.0174532925199432955)
- Prime Meridian: Greenwich (0.000000000000000000)
- Datum: D_WGS_1984
  - Spheroid: WGS_1984
    - Semimajor Axis: 6378137.000000000000000000
    - Semiminor Axis: 6356752.314245179300000000
    - Inverse Flattening: 298.257223563000030000

For data representation and analysis, the WGS 84 coordinate system can also be used but, in some cases, for spatial modeling or spatial analysis for example, it is important that the projection used be equal-area and the distances are measured in meters and not in decimal degrees like with the WGS 84 system.

In these cases, the Universal Transverse Mercator (UTM) projected coordinate system presents the advantage of being widely used in national and international mapping systems around the world. The other advantage is that the Landsat ETM+ mosaic mentioned earlier is projected according to this system as well.

In this system, the surface of the world is divided into 60 zones, the Philippines being covered by Zones 50, 51 and 52. As most of its territory is actually located in zone 51, this zone is generally used for the Philippines.

The detail for this coordinate system in ArcGIS is as follow:
- Projection: Transverse_Mercator
- False_Easting: 500000.000000
- False_Northing: 0.000000
- Central_Meridian: 123.000000
- Scale_Factor: 0.999600
- Latitude_Of_Origin: 0.000000
- Linear Unit: Meter (1.000000)

- Geographic Coordinate System: GCS_WGS_1984
- Angular Unit: Degree (0.0174532925199432955)
- Prime Meridian: Greenwich (0.000000000000000000)
- Datum: D_WGS_1984
  - Spheroid: WGS_1984
    - Semimajor Axis: 6378137.000000000000000000
    - Semiminor Axis: 6356752.314245179300000000

- Inverse Flattening: 298.257223563000030000

The datum used for this coordinate system is actually the one from the WGS 84 coordinate system, reason why this information is also appearing in ArcGIS.

When it comes to data exchange format:

- the shape file format developed by Esri is preferred over the geodatabase format when it comes to vector layers as, among other things, the former is independent from the ArcGIS version that has been used to create the dataset and lighter in terms of file size.
- the GRID file format also developed by Esri when it comes to raster layers

Registries are complete and up-to-date official list of geographic objects for a particular layer of information. The availability of such registries is often the only way to be able assessing the level of completeness of infrastructure based layers such as health facilities, schools or even roads. The same also applies to geographic objects that have not a physical existence on the ground such as administrative or statistical divisions.

In order to ensure data compatibility among sources each of these registries should be unique, standardized and maintained constantly updated by the institution in charge of them. In addition to that, each object should have its own unique ID.

In the case of the Philippines, the major registries of important for the DOH are:

- The National Health Facility Registry (NHFR) maintained by the DOH when it comes to health facilities;
- The Philippines Standard Geographic Code (PSGC) maintained by the National Statistical Coordination Board (NSCB) when it comes to administrative divisions;
- The registry of schools maintained by the Department of Education.

These registries, and more specifically the unique ID they contain, should be used not only as the reference for any GIS related project but for any information management activity within the health sector starting with the DOH and PhilHealth.

In addition to all the above, it is also good to ensure that any GIS layer created to cover all the country do present the following extent according to Universal Transverse Mercator (UTM), zone 51, projected coordinate system UTM 51 (decimal degrees for WGS 84 geographic coordinate system in between brackets):

- West Boundary: -245234.544372 (116.3° E)
- East Boundary: 977664.888132 (127.3° E)
- South Boundary: 465557.295525 (4.2° N)
- North Boundary: 2414684.051370 (21.7° N)

Last but not least, it is important to be aware of the time discrepancies that may exist between GIS datasets coming from different sources when creating maps or performing spatial analysis/modeling.

Users should for example avoid combining the location of actual health facilities with the road network as observed in the country 10 years ago and the hydrographic network as it was at the beginning of the century when looking at accessibility to health care.

When the above can't be avoided, because of lack of appropriate data for example, the discrepancy should at least be stated in the analysis or the map being created.

3.6 Documenting the data (Metadata)

Metadata, or data about the data, serves to describe and document its subject matter; how, when, where, and by whom the data was collected; availability and distribution information; its projection, scale, resolution, and accuracy; and its reliability with regard to some standard.

Among the different geospatial metadata standards available, the ISO 19115 [10] is a standard of the International Organization for Standardization (ISO). Being the current "best practice" standard for geospatial metadata, this standard is part of the ISO geographic information suite of standards (19100 series) and defines how to describe geographical information and associated services, including contents, spatial-temporal purchases, data quality, access and rights to use.

The metadata profile to be used for the documentation of any Geospatial data generated by the DOH (Annex 1) is therefore composed of the minimum set of fields extracted from the ISO 19115 standard so that users will be able, by looking at the profile, to determine whether the data will be of use to them and how to access the data.

In Annex 1, the fields are organized and described according to the structure of the metadata data capturing tool implemented in ArcCatalog.

Please refer to the DOH Geospatial metadata profile document for more information about the profile as well as explanation on how to fill it in both ArcGIS 9.3 and 10 [11].

3.7 Compiling the data

Compiling the data consists in obtaining the different geospatial and statistical data identified at the beginning of the process (Section 3.1) from available sources.

The important thing in this process is to obtain the metadata associated to the dataset. If the metadata is not available, the following key information should be obtained from the data provider/owner:

- Date of last update,
- Process followed to generate the dataset,
- Coordinate system,
- Access and use constraints,
- Contact information for any question related to the dataset

3.8 Identifying data and technical capacity gaps

Once the available data compiled, their relevance has to be assessed in order to see if they answer the needs set at the beginning of the process (Section 3.1).

Such an assessment will be looking at identifying the following:

1. For both statistical and geospatial data:
    - if the data has been updated recently and/or generates some time discrepancies among the different datasets being used;

2. For statistical data:
    - If the Philippine Standard Geographic Code (PSGC) [12] is included in the database;
    - Is complete by making sure there is a figure for each of the objects being listed in that registry;
    - We have a GIS layer containing all the objects for which there is a figure in the dataset being provided.

3. For geospatial data:
    - Is complete by comparing it to the corresponding registry or doing a visual check using the defined ground reference for geospatial data (Section 3.4) depending on when it applies. More precisely this would concern:
        - make sure that the database provided contains all the infrastructures listed in the registry (would for example apply to infrastructures such as health facilities or schools when the registry is available);
        - overlay the layer (road network for example) on top of the ground reference mosaic in ArcGIS to visually identify if all the objects in the mosaic are included in the database.
    - Present the appropriate scale and horizontal accuracy by assessing this using once more the defined ground reference when it applies. This will be done by overlaying the layer in question on top of the ground reference mosaic and measure the potential shift (in meters) between selected features (normally 90% of them as per the United States National Map Accuracy Standards, see Section 3.4) in the database and the location of the same feature in the dataset. This measure is then used to identify the horizontal accuracy of the dataset and therefore the corresponding scale as per Table 1;

      If it is not possible to use the ground reference, and when it is applicable, the feature is falling in the right administrative division and this down to the lowest level of desegregation possible (Municipality or Barangay level).

The result of this assessment should be documented and, if no other sources of information are available, the limitation regarding the use of the dataset(s) reported on the final products in order for the user to be aware of them when analysing these products.

The technical capacity gaps to be identified during this particular step of the process concerns the identification of particular skills that might be needed in order to fill some of the data gaps identified during the above mentioned data assessment. This could for example concern the need to:

- train a certain number of staff in the use of GPS devices in order to collect the location of missing health facilities;
- hire technical expertise in order to manually digitize missing road segments for an accessibility analysis.

3.9 Collecting or extracting data

The collection or extraction of new data mainly aims at completing gaps identified the previous steps.

In the case of the DOH, from a geospatial point of view, we can differentiate three types of data collection/extraction practices:

- The collection of statistical data or information through the use of a specific instrument (survey (paper or online), reporting system,...);
- The collection of a geographic coordinate using a GPS device;
- The extraction of geospatial data from another layer of information (paper map, google map,...)

When it comes to the collection of data or information through the use of a survey instrument or reporting system, there is a need to ensure that this data/information is contextualized from both a geographic and time perspective.

While the time component can be easily captured by including a time stamp in the data collection instrument capturing the geographic part is more complexes and requires the use of a large set of fields depending on the object to which the data/information is attached to. The first part of the DOH Geographic form for GPS devices (Annex 4) has been developed in this regards.

When the data/information is collected at the level of:

- an health infrastructure (for example a health facility, a pharmacy, an evacuation center,...), all the fields from section Q1 and Q2 needs to be integrated in the data collection instrument in order not only to unique identify the facility but also contextualize;
- an administrative division (Region, Province, Municipality/City, Barangay) then specific fields allowing to collect the official name of this administrative division as well as its corresponding Philippine Standard Geographic Code (PSGC) [12] have to be included.

Please note here that the DOH Geographic form developped for GPS devices (Annex 4) has been primarily developed to collect information relating to health facilities. The fields parts of section Q1 of the form might therefore have to be adjusted for other type of health infrastructures.

When a survey is also collecting the geographic location of an infrastructure using a GPS device, or when only this location is being collected in the field using the same type of device then the second part of DOH Geographic form for GPS devices (section Q3 in Annex 4) also needs to be integrated into the data collection process in order to collect all the elements that would allow estimating the quality of the GPS reading.

Two protocols have been developed to guide those in charge of filling the DOH Geographic form for GPS devices in the field, namely when using:

- The Garmin GPS MAP 60CSx device used by the DOH [13];
- An android device equipped with a GPS receiver [14].

When it comes to extracting geospatial data from another layer, two particular processes are of interest to the DOH, namely being able:

- locating an object in Google Map,
- digitizing features (for example a road) on the screen in ArcGIS.

The second process requires specific GIS skills and protocols that are beyond the purpose of the current guidelines. As a start users might want to look at the editing protocol created in the context of the Second Administrative Level Boundaries data set project (SALB) [15]. While developed for ArcGIS 9.3.1 the steps are very similar in subsequent version of this GIS software.

The process for locating an object in Google Map is easier. It requires for the user to have access to the internet and a Geographic form on which section Q3 has been modified compare to the form for GPS devices in order to accommodate for Google Map specificities (Annex 5).

A protocol has also been developed to guide those in charge of filling the DOH Geographic form for Google Map [20]. This protocol takes into account the differences in using Google map on a computer (desktop or laptop), an Android or iOS phone/tablet.

3.10 Cleaning the data

This step refers to cleaning the data collect during the previous step in the chain (See Section 3.9).

In the case of the DOH, this mainly concerns health infrastructure location collected through the use of DOH's Geographic form.

In this context, the cleaning process aims at ensuring that all the information provided back to the DOH is correct before being integrated into the corresponding registry. A specific data checking and cleaning protocol has therefore been prepared in this regards and should be used [21].

This protocol covers the checking/cleaning of all the sections contained in DOH's Geographic form. Only part of it might therefore be implemented depending on the data collection process that has been followed.

3.11 Validating the data

When talking about validation, a difference needs to be made between:

- The core fields that should be part of the different registries managed by the DOH;
- The attributes, or statistical information, collected by different entities within the DOH.

The purpose of the present guidelines focusing on geospatial data this section only talk about the geographically based elements reported in the above mentioned registries. The validation of attribute/statistical data is therefore not addressed here.

When it comes to registries, the present guidelines are principally concentrating on the National Health Facility Registry (NHFR) as the other registries are still under development.

Adjustments might therefore have to be made as these other registries are being developed. This being said, the concepts and process presented here could already be applied to them.

The implementation of the data collection and cleaning processes protocols developed does already provide a certain level of validation when it comes to:

- The official names and PSGC codes for administrative divisions,
- The location (latitude/longitude) of health infrastructures.

These represents the geographic elements of the NHFR.

At the same time, consistency is being ensured when it comes to the name and DOH code of these facilities but this information, as well as the other ones contained in the registry are not being validated through this process. These will therefore have to be taken care of through the implementation of a specific process that is out of the scope of the present guidelines. This process will therefore be addressed separately.

3.12 Distributing/using the data

The question of the accessibility of the geospatial data generated by the DOH will have to be addressed in the context of the DOH GIS strategy currently under development.

Few things should nevertheless be emphasized here and considered as generic guidelines by the DOH:

- Any geospatial data produced by the DOH should be documented using the geospatial metadata profile mentioned in Section 3.6;
- Data compatibility within the health sector will only be possible through the use of unique registries. These registries, starting with the National Health Facility Registry (NHFR), should therefore serve as the reference and unique entry points to access geographic information from the DOH. Any other database should therefore slowly be integrated into the these registries and data sharing policies adjusted in order to ensure that everybody can have access to this data for non-commercial use.

The implementation of these two guidelines will ensure not only an appropriate use of the geospatial generate by the DOH but also improve data quality and data compatibility within the DOH as well as reduce duplication of efforts.

3.13 Updating the data

A map, and therefore indirectly the geospatial data that has been used to create it, is like a picture. By the time you look at it, the information on it will have changed and this because we are living in a dynamic world. The only way to ensure that the information remains up-to-date is to regularly and constantly update it.

While the DOH depends on the update performed by other institutions when it comes to most of the geospatial information of interest to its work (see Section 3.1) there are two layers in particular that requires particular attention:

- the administrative boundaries (Regions, Provinces, Municipalities and Barangays);
- the location of all health facilities, and health related infrastructure.

While providing a complete and up-to-date administrative boundaries layers is not under the mandate of the DOH it is critical that the list of official administrative e division names and PSGC get updated in the HIS at least once a year in order to ensure a proper coding of all the health information/data being captured and therefore analysis.

The updating of the location of all health facilities, and health related infrastructure, does itself start by a regular update of the registries. It is only once the registries are up-to-date that it is possible to asses if the location of some of these infrastructures is still missing.

At the same time, as long as each facility would not have been located following the guidelines, standards and protocols presented here there will be some room for improvement.

An updating mechanism, based on the present guidelines, is therefore being developed and will be soon implemented for the NHFR. Similar mechanism will then have to be established and implemented for all the other registries under DOH's mandate.

4. Conclusion

The present document, and associated protocols, provides the necessary guidelines and standards for the Department of Health of the Philippines (DOH) to be able collecting, using and sharing Geospatial data of quality.

At the same time, implementing these guidelines and standards will improve data compatibility among sources, reduce duplication of work and allow for the DOH to make a more powerful use of the visualization and analytical capacities of Geographic Information Systems (GIS).

This being said, this document does not address the specific issues behind the development, maintenance and sharing of the different registries under the responsibility of the DOH nor the development and sustainability of its GIS capacity. These issues will therefore have to be addressed in the context of the different strategies and programs being currently developed by the DOH.

Last but not least, these guidelines and standards do only address a small component under the information management umbrella. These will therefore have to be completed by other similar guidelines and standards in order to obtain a comprehensive data model and information management strategy for the DOH.

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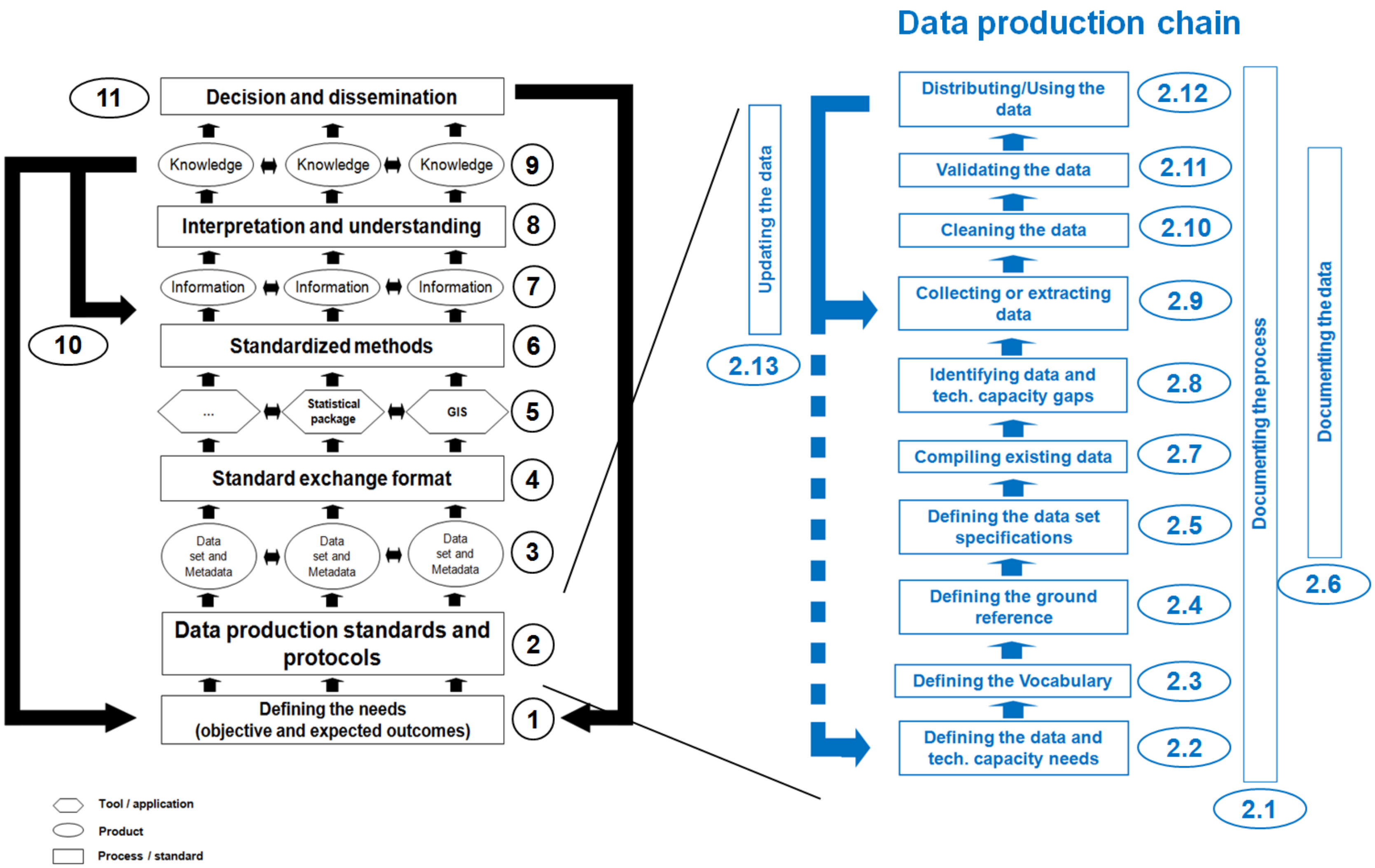
[21] Department of Health (2014): Protocol for the checking and cleaning of the data collected through the use of DOH’s Geographic Form. Version 1.0 (01.16.2014)

Annex 1 - Data, Information and Knowledge chain



Annex 2 - Glossary of terms

Accuracy [2]: The degree to which a measured value conforms to true or accepted values. Accuracy is a measure of correctness.

Coordinate system [2]: A reference framework consisting of a set of points, lines, and/or surfaces, and a set of rules, used to define the positions of points in space in either two or three dimensions.

Data completeness [3]: Represents the degree to which data values are present in the attributes that require them. Completeness can refer to both the temporal and spatial aspect of data quality, in the sense that completeness measures how much data is available compared to how much data should be available.

Feature [2]: A representation of a real-world object on a map

GPS [2]: Acronym for Global Positioning System. A system of radio-emitting and -receiving satellites used for determining positions on the earth. The orbiting satellites transmit signals that allow a GPS receiver anywhere on earth to calculate its own location through trilateration. Developed and operated by the U.S. Department of Defense, the system is used in navigation, mapping, surveying, and other applications in which precise positioning is necessary.

Geographic coordinate system [2]: A reference system that uses latitude and longitude to define the locations of points on the surface of a sphere or spheroid. A geographic coordinate system definition includes a datum, prime meridian, and angular unit.

Master table [4]: Reference table containing the complete and up-to-date list of objects for a particular layer of information (i.e. health facilities)

Metadata [2]: Information that describes the content, quality, condition, origin, and other characteristics of data or other pieces of information. Metadata for spatial data may describe and document its subject matter; how, when, where, and by whom the data was collected; availability and distribution information; its projection, scale, resolution, and accuracy; and its reliability with regard to some standard. Metadata consists of properties and documentation. Properties are derived from the data source (for example, the coordinate system and projection of the data), while documentation is entered by a person (for example, keywords used to describe the data).

Mosaic [2]: A raster dataset composed of two or more merged raster datasets—for example, one image created by merging several individual images or photographs of adjacent areas

Orthophoto [5] : an aerial photograph geometrically corrected ("orthorectified") such that the scale is uniform: the photo has the same lack of distortion as a ma

Projected coordinate system [2]: A reference system used to locate x, y, and z positions of point, line, and area features in two or three dimensions. A projected coordinate system is defined by a geographic coordinate system, a map projection, any parameters needed by the map projection, and a linear unit of measure.

Projection [2]: A method by which the curved surface of the earth is portrayed on a flat surface

Raster [2]: A spatial data model that defines space as an array of equally sized cells arranged in rows and columns, and composed of single or multiple bands. Each cell contains an attribute value and location coordinates. Unlike a vector structure, which stores coordinates explicitly, raster coordinates are contained in the ordering of the matrix. Groups of cells that share the same value represent the same type of geographic feature.

Resolution [2]: The detail with which a map depicts the location and shape of geographic features. The larger the map scale, the higher the possible resolution. As scale decreases, resolution diminishes and feature boundaries must be smoothed, simplified, or not shown at all; for example, small areas may have to be represented as points

Satellite image [5]: Photographs of Earth or other planets made by means of artificial satellites

Scale [2]: The ratio or relationship between a distance or area on a map and the corresponding distance or area on the ground, commonly expressed as a fraction or ratio. A map scale of 1/100,000 or 1:100,000 mean that one unit of measure on the map equals 100,000 of the same unit on the earth.

Vector [2]: A coordinate-based data model that represents geographic features as points, lines, and polygons. Each point feature is represented as a single coordinate pair, while line and polygon features are represented as ordered lists of vertices. Attributes are associated with each vector feature, as opposed to a raster data model, which associates attributes with grid cells.

Annex 3 - DOH Geospatial metadata profile

Tab	Field name	Field content description
Identification > General	Abstract	Short version of the title, date of creation, source, scale (i.e. Health facility location for Region I, Department of Health, 1:250'000)
	Purpose	Reason for which this layer has been created
	Language	Language(s) in which the information is stored in the attribute table of the GIS layer
	Access Constraints	Description of any limitation in accessing the data by third parties
	Use Constraints	Description of any limitation in the use of the data by third parties
Identification > Contact> Details	Primary Contact	Person or Organization (check box)
	Person	Name of the person of reference to contact regarding this layer
	Organization	Name of the organization where the contact person is working
	Position	Position of the contact person in the organization
	Contact Voice Telephone	Complete phone number, with country code, for the contact person (i.e. +63 2 521 1870)
	Contact Fax Number	Complete fax number, with country code, for the contact person (please put "NA" if none)
	Contact Email Address	Complete email address for the contact person
Identification > Citation > Details	Title	Full title of the dataset (i.e Health facility location for Region I)
	Originator	Complete name of the Institution who generated the dataset (i.e Department of Health)
	Publication Date	Date at which the dataset has been released (month- day-year format).
	Geospatial Data presentation form	Format of the data to be selected among the following options: raster digital data, remote-sensing image or vector digital data
Identification > Status	Progress	State of progress of the layer to be selected between the following options: Complete, In work, planned,...
	Update frequency	Frequency at which the layer is being updated. Select from the options in the scroll down list
Identification > Keywords	Theme> Keyword	Mention of the category, sub category and object
	Place> Keyword	"Philippines" when the data set covers the all country; the name of the sub national division (Region,

		Municipality/Barangay) when this is not the case. Please use the names as spelt in the PSGC.
Identification > Security	Security Classification	Security level assigned to a government document, file, or record based on the sensitivity or secrecy of the information to be selected from the available options
Data Quality -> Positional Accuracy	Horizontal Accuracy > Accuracy Report	Summary of the accuracy assessment with the indication of the mosaic used as ground reference.
	Value	Min; max and mean horizontal error (in meters) coming from the accuracy assessment
	Explanation	Explanation for horizontal error above 50 meters. Put “NA” if the horizontal error is below 50 meters
Data Quality -> Process steps	Process Description	Description of the process used to generate the dataset (GPS data collection, extraction from google map, on screen digitizing,...)
	Process software	Name and version of the GIS software used during the process
	Process Date	Date or period during which the process has been applied
Spatial Reference > General	All Tabs	Enter the information corresponding to the coordinate system in which the data set is being projected
Metadata Reference → General	Metadata Date	Date at which the metadata for that layer has been updated the last time (day-month-year format)
	Language	Language in which the metadata is filled (English)
	Contact	Complete contact information for the person who filled the metadata profile
	Metadata Standard Name	Name of the metadata standard used. In this case ISO 19115

Annex 4 - DOH Geographic form for GPS devices

Q1 NAME OF THE HEALTH FACILITY

Q1a. Official Name of the Health facility (including heath facility type)	
Q1b Official DOH Health facility code as per NHFR (leave blank if no code attributed for the moment):	☐ ☐ ☐ ☐ ☐

Q2 ADDRESS OF THE HEALTH FACILITY

Q2a. Building number and street name	
Q2b. Postal code	☐ ☐ ☐ ☐
Q2c. Official name of the Region as per the PSGC	
Q2d. Official name of the Province as per the PSGC	
Q2e. Official name of the Municipality/City as per the PSGC	
Q2f. Official name of the Barangay name as per the PSGC	
Q2g. Official Barangay PSGC code	☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐

Q3 FACILITY GEOGRAPHIC CO-ORDINATES

Q3a. Number of satellite signals received	☐☐
Q3b. Accuracy	☐☐ meters
Q3c. Latitude (Decimal degrees):	☐☐.☐☐☐☐☐
Q3d. Longitude (Decimal degrees):	☐☐☐.☐☐☐☐☐
Q3. Waypoint *(Circle one option)*	*1 In front of the main door of the health facility* *2. on the roof* *3. Nearby location (for example, a park or communal space)*
Q3f: Comments regarding the GPS reading:	

Annex 5 - DOH Geographic form for Google Map

Q1 NAME OF THE FACILITY

Q1a. Official Name of the Health facility (including heath facility type)	
Q1b Official DOH Health facility code as per NHFR (leave blank if no code attributed for the moment):	☐☐☐☐☐

Q2 ADDRESS OF THE HEALTH FACILITY

Q2a. Building number and street name	
Q2b. Postal code	☐☐☐☐
Q2c. Official name of the Region as per the PSGC	
Q2d. Official name of the Province as per the PSGC	
Q2e. Official name of the Municipality/City as per the PSGC	
Q2f. Official name of the Barangay name as per the PSGC	
Q2g. Official Barangay PSGC code	☐☐☐☐☐☐☐☐☐

Q3 FACILITY GEOGRAPHIC CO-ORDINATES

Q3a. Can not identify the health facility because the image is not clear enough (blurry, clouds,…)	☐
Q3b. Health facility clearly identified in Google Map	☐
Q3c. Scale at the moment of taking the coordinate (maximum: 50 meters)	☐☐ meters
Q3d. Latitude (Decimal degrees):	☐☐.☐☐☐☐☐
Q3e. Longitude (Decimal degrees):	☐☐☐.☐☐☐☐☐
Q3f: Comments regarding the reading in Google Map:	