THE NORDIC HYDROGRAPHIC COMMISSION

THE NORDIC WORKING GROUP FOR DEVELOPING IMPROVED DATA EXCHANGE THROUGH S-100

FINAL REPORT
2009

20TH MARCH 2009

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SWEDISH MARITIME ADMINISTRATION

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20TH MARCH 2009

Content

SUMMARY

There are two main aspects of improved data exchange between neighbouring countries. The first aspect is that of improved data quality as a result of timely and descriptive exchange of information regarding updates. The second aspect is that of improvement to the efficiency of the chart production process as a result of adding cartographic information to the exchange set.

A proposal has been put to The IHO Transfer Standard Maintenance and Application Development Working Group (TSMAD) regarding the inclusion of ten cartographic attributes in S-101. This proposal will be debated at the 18th TSMAD Meeting in May 2009.

We would like to make the following recommendations to the Nordic Hydrographic Commission:

1. National paper charts at a scale of 1:750 000 and larger that cover another nation's waters should be produced from the other nations ENCs.

2. Generalisation of the neighbouring countries ENC data should be kept to a minimum to ensure data quality and for more efficient updating.

3. Once the paper chart is based on ENCs the update should be done via ENC updates.

4. A Paper Chart Source Information List should be kept up to date by each Nordic Hydrographic Office.

5. NHC to decide which country would be responsible to administrate the Paper Chart Source Information Lists for all Nordic countries.

6. An ENC Update Query Web Service or an equivalent query function should be provided by each Nordic Hydrographic Office.

7. If no ENC Update Query Web Service is available then it should be possible to produce an ENC Update Report on request by another country.

8. To present the recommendations and the suggested methods in this report to the IHO Chart Standardization and Paper Chart Working Group.

9. Implementation plan:

    a. If not already available start then to collect administrative information for the ENC Update Report 1st Jun 2009.

    b. Each country should on request be able to produce an ENC Update Report from the 1st Dec 2009.

    c. Paper Charts should be based on the neighbouring countries ENCs according to the following time schedule.

        i. Chart with scale larger than 1:150 000 completed 1st Jan 2011.

        ii. Scale 1:150 000 – 1:400 000 completed 1st Jan 2013.

        iii. Scale 1:400 000 – 1:750 000 completed 1st Jan 2015.

    d. Each country to present the status of implementation at every NHC-meeting.

BACKGROUND

In the report from the Nordic Working Group on Harmonizing Paper Chart Regimes it was stated:

"The benefit of using chart data from a neighbouring country is to avoid duplication of work and hence create data in an area that has already been charted. In common geographical charting responsibility areas the need to store and update data in both countries could then be reduced."

The Nordic working group on Paper Chart Harmonisation concluded that there was a need to improve the data exchange between the Nordic countries. The working group suggested in its final report to the Steering Committee that a Nordic working group be established to develop and present an improved solution for handling cartography within S-100. At the 52nd Meeting the Nordic Hydrographic Commission decided that the Improved Data Exchange Working Group should be established.

TERMS of REFERENCE

The terms of Reference for the Nordic WG for developing Improved Data Exchange through S-100 (IDEWG):

Evaluate the present cartographic attributes and object classes within S-100 and identify the need for improvements.

Identify and analyze how 'cartography' (for paper chart production) is stored at respective Nordic HOs.

Identify what has been done elsewhere when handling cartography within S-57/S-100 in order to learn and gain experience from other HOs.

Identify existing data exchange within the Nordic countries using S-57 from PRIMAR with regard to using the data for paper chart production (new charts and updates).

Propose solutions and measures for enhancing data exchange within the Nordic countries using S-57 from PRIMAR for paper chart production (new charts and updates).

Report to the next NHC Meeting in April 2009 on the progress made.

Rules of procedure:

The Nordic members are strongly encouraged to participate and contribute to the work of the IDEWG

The work of the IDEWG should be carried out as far as possible by correspondence

The IDEWG should consult relevant CHRIS committees and its working groups as deemed necessary

The IDEWG should present a Progress Report to the next NHC Meeting in April 2009.

PARTICIPANTS and MEETINGS

Participants

Hans Engberg, Chairman	Swedish Maritime Administration
Magnus Wallhagen, Secretary	Swedish Maritime Administration
Mikko Hovi	Finnish Maritime Administration
Carsten Riise-Jensen	Danish Hydrographic Office
Lis Gram	Danish Hydrographic Office
Kjetil Wirak	Norwegian Hydrographic Service
Níels Bjarki Finsen	Icelandic Coast Guard

Meetings

1st IDEWG Meeting in Norrköping	2008-09-18
2nd IDEWG Meeting in Kastrup	2008-12-02
3rd IDEWG Meeting in Kastrup	2009-03-17

ANALYSIS

The focus of the analysis has been on geographical areas of common charting responsibility, i.e. the areas of the national paper chart that are covering another nation's waters.

The working group has concluded that there are sea areas of different interest and that the need for effective data exchange between countries differs. The Sound is a congested area of great importance which consequently means that the data exchange in general is of more importance between Denmark and Sweden than for example in the area of the North Sea were the data exchange between Norway and Denmark is not likely to be as critical.

Even though the work has been carried out on the direction of the Nordic Hydrographic Commission it has been important to find solutions and make recommendation that could be implemented by the wider IHO community.

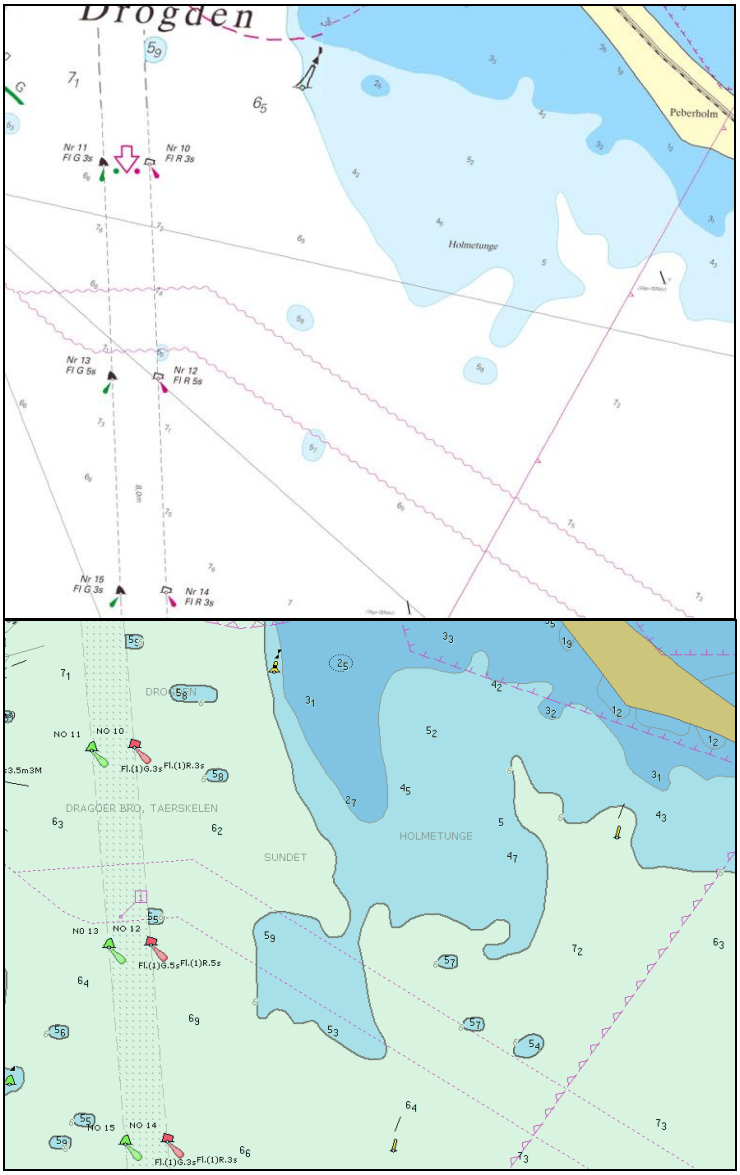
Data exchange within the Nordic countries

Paper chart production at present

When producing the first edition of a paper chart covering neighbouring countries waters the other nations ENCs are generally used. The printing nation makes a request for the ENC data or simply downloads the necessary ENC cells from the RENC database. The ENC data is then converted to the printing nations chart production data format. However, since the ENC data does not contain cartographic objects and attributes all cartography has to be created by the printing nation. This process is time consuming.

Paper chart updating

Updates are generally made from information published in the neighbouring country's NtM. It is impossible, however, to give a complete description of all updates in a notice. A new survey is one example of an update that could only be described in general terms. Hence, the method of keeping a neighbouring country's chart information updated solely through the NtM inevitably leads to the information becoming inaccurate.



Picture 1.
The Swedish chart SE8141 compared to the Danish ENC cell shows that the depth information differs as a result of the insufficient updating method.

Paper charts and ENCs

ENCs are continuously kept up to date by the producer nation and are always available at the RENC. This is a very good starting point for improved data exchange for paper chart production. However, today it is difficult to know exactly what information has been updated in an ER or EN without having to apply the ENC update. You must also keep in mind that only the latest edition and its updates are available at the RENC database. Furthermore, the occurrence of preliminary and temporary ENC

updates complicates matter since these updates should not be included in the printed chart.

There should be a process established within the HO making sure that once a paper chart is produced from ENCs of the neighbouring country, it is kept up to date through ENC updates and not simply through NtM.

Paper Chart Portfolios

Only a few paper charts covering neighbouring countries waters are currently produced from the neighbouring countries ENCs. It would be optimal that all subjected charts were produced from the neighbouring country's ENCs. This could be a long term goal, but in practice priority would have to be given to the production of the larger scale charts.

Generalisation levels

Consideration must be taken of the fact that the available ENCs of the neighbouring country may not always be at a corresponding compilation scale. This will lead to different generalisation levels in different areas of the paper chart. Here generalisation level is defined as selection of themes and objects, depiction and simplification of objects, e.g. coastline, depth contours and soundings.

In Norway the ENC and the paper chart have quite different generalisation levels. The consequences of this are difficult to overcome. The working group has chosen to disregard this particular problem for the purpose of finding a general improved solution for data exchange. The consequence of this difference between paper chart and ENC would be that a Swedish paper chart over Norwegian waters would be generalised according to the Norwegian ENC and not to a Norwegian paper chart. As the common chart area between these countries is relatively small the working group consider the problem as being of the same proportion.

It is important to recognize that ENCs in the border area will be used by the neighbouring country for paper chart production. If possible this should be considered in the compilation of the ENCs.

Vertical datums

The vertical datum differs from one country to another. Normally the vertical datum is tied to the tidal level in the area. In the Baltic Sea – Mean Sea Level (MSL).

As long as a note in the chart states to which vertical datum the depth information is given the WG finds it not substituting a hazard to safe navigation.

The handling of cartography at the Nordic HO:s

The Nordic HOs have different chart production systems. Denmark and Iceland have Caris, Norway has dKart from Jeppesen, Finland has an ESRI-system from T-Kartor and Sweden uses software from 1Spatial and Star-Apic. The result of this is that cartography is stored and handled in quite different ways. While Sweden has a database where almost all cartography is stored within the data, Finland has the application nSector which creates the cartography from settings and attributes when a chart is going to be printed. At present Denmark does not use a database for paper chart production. The data is stored as separate files. For Iceland and Norway the situation is basically the same.

The working group discussed possible exchange formats other than S-57, e.g. ESRI shape, AutoCAD dwg etc. A possible method could be to introduce a separate cartographic information layer. Such a file would demand thorough definition. It would also mean that a separate production line must be created at the HO for mapping the internal objects and attributes to that common definition. The cartographic exchange file could hardly be continuously available and would have to be requested. This was considered to be a great disadvantage compared to the ENC infrastructure already in place.

Cartographic attributes and object classes within S-100

The status of the cartographic feature classes and attributes within S-100 is currently the same as in S-57. Cartographic objects and attributes within S-57 were included in the standard at an early stage. The reason was to facilitate exchange of hydrographic data between HOs for paper chart production. However, the practical use of S-57 has only been the production of ENCs.

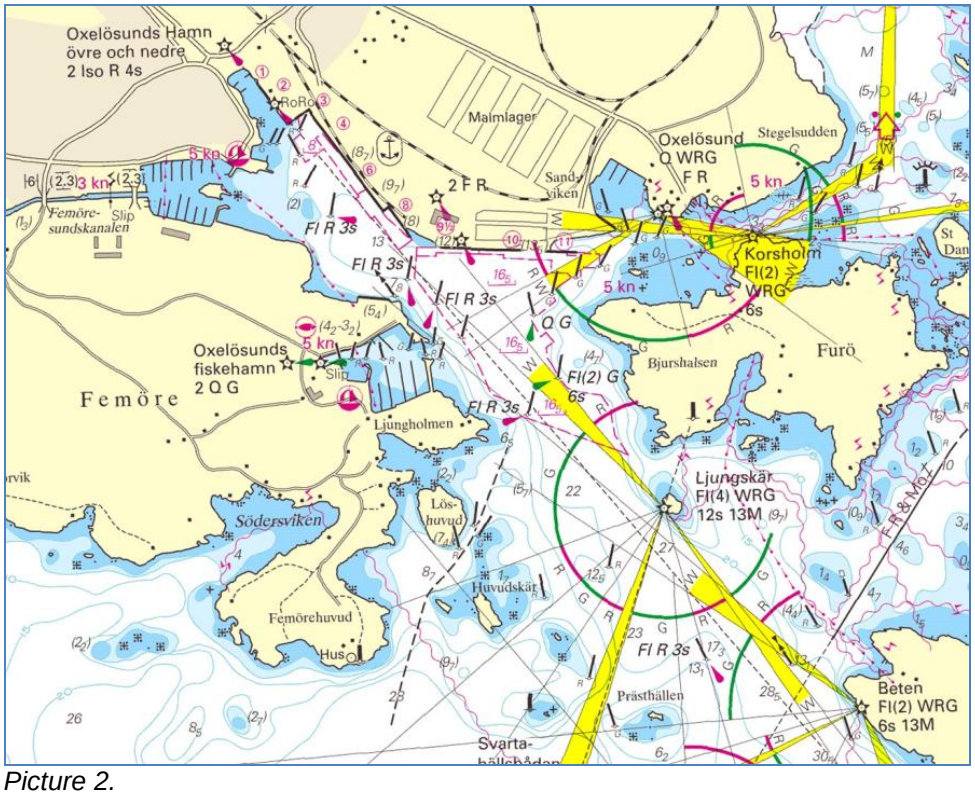
The present cartographic object classes and attributes within S-57 (See Annex 1) were analysed by the working group.

As the working group studied the cartographic object classes and attributes the conclusion was that this combination is not enough to fully reproduce a paper chart. ENC data being currently the most used exchange format the working group analysed the conversion process from ENC to paper chart and agreed that the cartography for texts was a major obstacle. The working group realized that an improved solution for text would give most benefit.

Since the presentation of text in ECDIS is less than optimal (Picture 2) the working group believed it would be suitable to introduce cartographic text attributes in the ENC Product Specification. This would improve the presentation in ECDIS and at the same time greatly improve the efficiency of data exchange for paper chart production.

The possible introduction of cartographic attributes in ENC:s would have the advantage that there would not be a need for a separate product specification for hydrographic data exchange and that the HO:s could utilize the ENC production system and the RENC-concept.

A proposal was put to The IHO Transfer Standard Maintenance and Application Development Working Group (TSMAD) regarding inclusion of ten cartographic attributes in S-101.



Picture 2.
Because no cartographic information is encoded in the ENC data the presentation is more cluttered in the ECDIS Display compared to the paper chart.

The handling of cartography within S-57/S-100 at other HOs

Some of the hydrographic production systems base their data model on S-57. To be able to produce paper charts from the model there are added features and functionality. Norway provided the working group with a description from Jeppesen to give us an example of how it has been implemented in dKart.

Since the Nordic Hydrographic Offices do not have the same hydrographic production system and are in different phases with regard to the existing production systems life cycles it would be difficult to agree on a common data model and a defined data format.

CONCLUSIONS

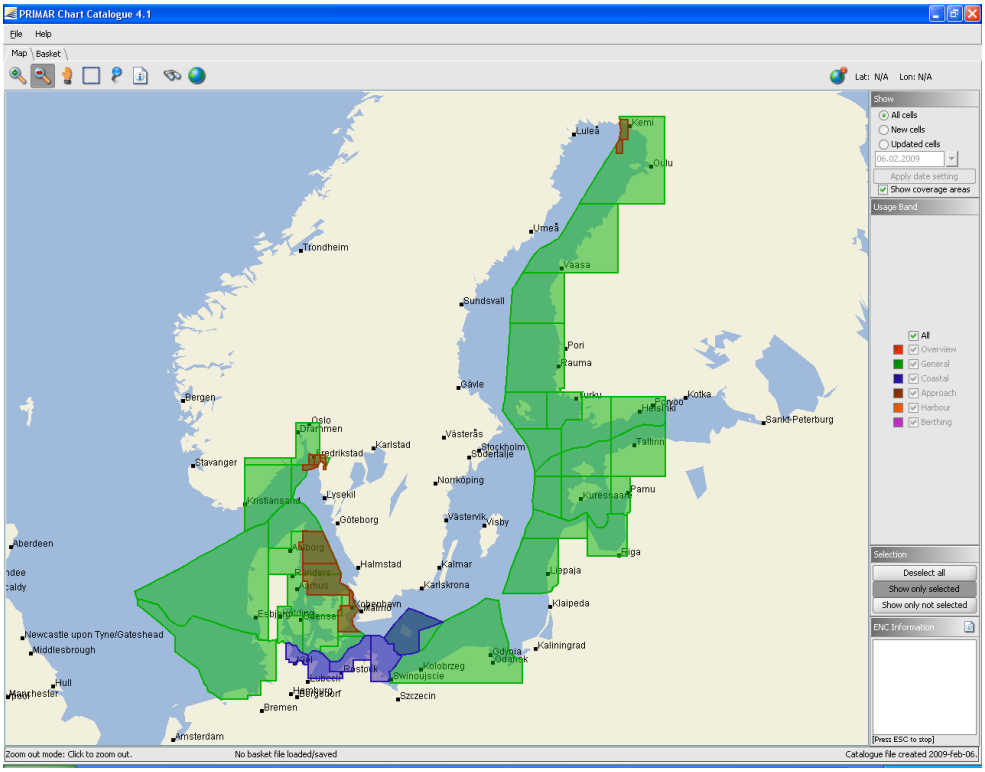
General

There are two main aspects of improved data exchange. The first aspect is that of improved data quality as a result of timely and descriptive exchange of information regarding updates. The second aspect is that of improvement to the efficiency of the chart production process as a result of adding cartographic information to the exchange set.

At present only a few paper charts in the national portfolios uses ENC as their source. It is assumed that this situation will change in the future, leading to an increasing number of paper charts produced from ENCs. The value and importance of the proposed improved data exchange will increase accordingly.

Paper Chart Source Information List

In order to use ENCs and the existing data infrastructure as a basis for data exchange, one needs to know which ENCs are of interest for each nation's paper chart production. Each nation has compiled a Paper Chart Source Information List (PCSIL) from which it is possible to see which foreign ENCs are sources for their national paper chart (See Annex 2 - 6).



Picture 3.
Primar Chart Catalogue view of the Swedish Paper Chart Source Information List.

Improved Data Exchange for new editions of paper charts

To improve the efficiency of the production of new editions of paper charts it is critical that the content of the paper chart is kept as close as possible to the content of the correspondent ENC source. Since any generalisation of the ENC data from a neighbouring country will have to be redone for each new edition the generalisation should be kept to a minimum. The correlation between the content of the paper chart and the ENC is also important with respect to data maintenance and quality.

The current situation in the Nordic Hydrographic Offices is that only a few paper charts are produced directly from the neighbouring countries ENC data. Although it is a more or less common practice to use the ENC data as a source for some of the information in the paper chart.

Improved Data Exchange for updates

The working group suggest that ENC data should be used for keeping national paper charts up to date. To make this process more effective it is suggested that each nation should be able to produce an ENC Update

Report (See Annex 7, ENC Update Report). The format of the ENC Update Report is secondary as long as the information content is according to the specification. Ideally this ENC Update Report should be available at any time through a Web Service. The Report should give information about all ENC updates between a selectable start date and end date, i.e. even if the updates were included in superseded editions of the ENC.

Process of ENC Update Report

The Update Report should be requested regularly from the neighbouring country, so that the data could be updated continuously. The frequency could differ from one country to another. Norway will start a print on demand service from 1st of January 2010. This will require that Sweden produces an ENC Update Report every second week for the ENC-cells affected. If more countries were to start with print on demand services the frequency of requesting this ENC Update Reports will increase.

If no automatically method of producing the ENC Update Report is available a temporary solution would be to ask for the Report according to a contact list.

Country	Contact Persons	E-mail
Denmark	Pia Marianne Rasmussen Gitte Iversen	pmr@kms.dk gi@kms.dk
Finland	Mikko Hovi Teppo Kuusijärvi	mikko.hovi@fma.fi teppo.kuusijarvi@fma.fi
Iceland	Níels Bjarki Finsen Árni Þór Vésteinsson	niels@lhg.is arni@lhg.is
Norway	Mette Karlsen Gro Johnsen	mette.karlsen@statkart.no gro.johnsen@statkart.no
Sweden	Magnus Wallhagen Bo Kullander	magnus.wallhagen@sjofartsverket.se bo.kullander@sjofartsverket.se

Cartographic objects and attributes

The working group made a proposal to TSMAD regarding 10 new cartographic attributes for inclusion in S-101. If the TSMAD agrees that these attributes could improve the display of ENC data in ECDIS the attributes would be registered in the S-100 Hydrographic Register. The attributes are suggested to be non-mandatory.

CFOFFB – Cartographic Feature Offset Bearing
CFOFFD – Cartographic Feature Offset Distance
CRLINE – Cartographic Reference Line
CJUSTH – Cartographic Horizontal Justification
CJUSTV – Cartographic Vertical Justification
CTSMIN – Cartographic Minimum Text Scale
CTSMAX – Cartographic Maximum Text Scale
CANGLE – Cartographic Angle
CFSCAF – Cartographic Feature Scaling Factor
CTSPRD – Cartographic Text Spread

CFOFFB, the bearing from the true position of the feature object to the cartographic feature measured in degrees.

CFOFFD, the distance from the true position of the feature object to the cartographic feature measured in mm on screen.

CRLINE, the line type of the cartographic reference line that is generated between the cartographic feature and the true position of feature object.

CJUSTH, the horizontal justification of text.

CJUSTV, the vertical justification of text.

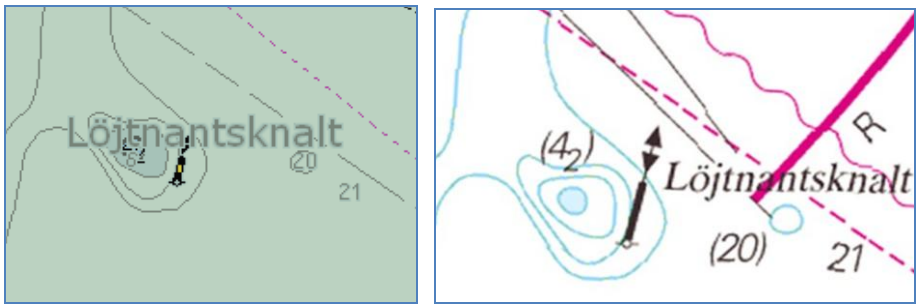
CTSMIN, the minimum scale for which the text should be displayed.

CTSMAX, the maximum scale for which the text should be displayed.

CANGLE, the angular distance in degrees measured clockwise from the default orientation of the cartographic point feature, i.e. the symbol or the text.

CFSCAF, the scaling factor of symbols and texts measured in percent of standard size.

CTSPRD, the value of the spread of text measured in percent of standard spread.



Picture 4.

The suggested cartographic attributes would give the producer of the ENC the ability to encode suitable text placements. This is an example where the automatic text placement in ECDIS makes the navigation more dangerous than in the paper chart since the text “Löjnantsknalt” covers both a critical depth and the top mark of the cardinal buoy.

RECOMMENDATIONS

1. National paper charts at a scale of 1:750 000 and larger that cover another nation's waters should be produced from the other nations ENCs.

2. Generalisation of the neighbouring countries ENC data should be kept to a minimum to ensure the quality and for more efficient updating.

3. Once the paper chart is based on ENCs the update should be done via ENC updates.

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    c. Paper Charts should be based on the neighbouring countries ENCs according to the following time schedule.

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ii. Scale 1:150 000 – 1:400 000 completed 1st Jan 2013.

iii. Scale 1:400 000 – 1:750 000 completed 1st Jan 2015.

d. Each country to present the status of implementation at every NHC-meeting.