12th Meeting of the WENDWG

Interim Report on the development of S-101 ENC Scheming Guidelines

Agenda Item 4.2

WENDWG12, IHO Secretariat, Monaco - Hybrid Event, 22 – 24 February 2022

AGENDA

International Hydrographic Organization

- Background
- Scope of the Guidelines
- Key Drivers
- Global Common Grid Scheme
- Summary and Actions required for WENDWG12

DEFINITIONS

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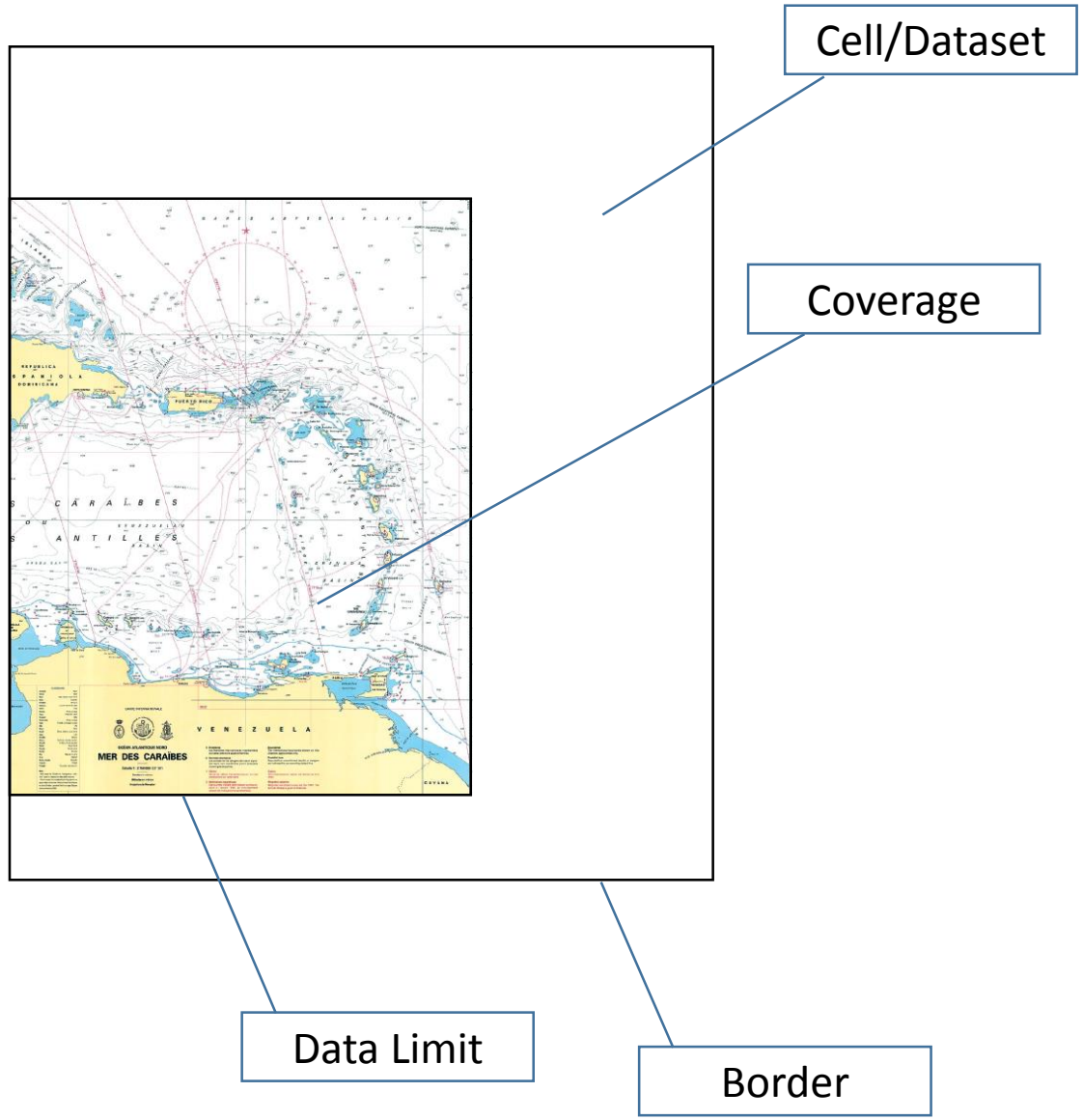
- Cell (S-57) and Dataset (S-101) mean the minimum unit for exchange of data
- Coverage means the area where data exists within Cell/Dataset (M_COVR with CATCOV=1 in S-57)
- Borders surround Cell/Dataset and Data Limits surround Coverage



BACKGROUND

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- This drafting group was established at WENDWG11 (Feb. 2021);
  - Colombia, Finland, France, Germany, Italy, Japan (Lead), UK, US
- Objective;
  - to consider technical options that might enable much better co-ordination, seamless coverage, harmonized production, elimination of significant overlaps under the S-100 framework, seamless coverage, harmonized production
  - to develop S-101 Scheming Guidelines as Annex to WEND-100 Principles toward WENDWG12
- Inquiry done from July to August;
  - 8 responses (7 members and Netherland)
- VTC meeting of the drafting group was held on 13th October
- Consensus has not reached yet

RELATED ACTIVITIES OUTSIDE THIS DRAFTING GROUP

- ARHC (Arctic RHC) discusses about its grid scheme (hexagonal grid is one option).
- MACHC (Meso American and Caribbean Sea HC) is also considering its grid scheme for Band 1 and so on (3 options are proposed).
- SAIHC (Southern African and Islands HC) refers to gridded ENC scheme to solve the existing overlapping issues .
- “Scales” Sub-Group under S-101PT has been established to provide extended guidance for HOs on how to organize their S-101 ENCs schemes.

SCOPE OF THE GUIDELINES (WHEN TO DO?)

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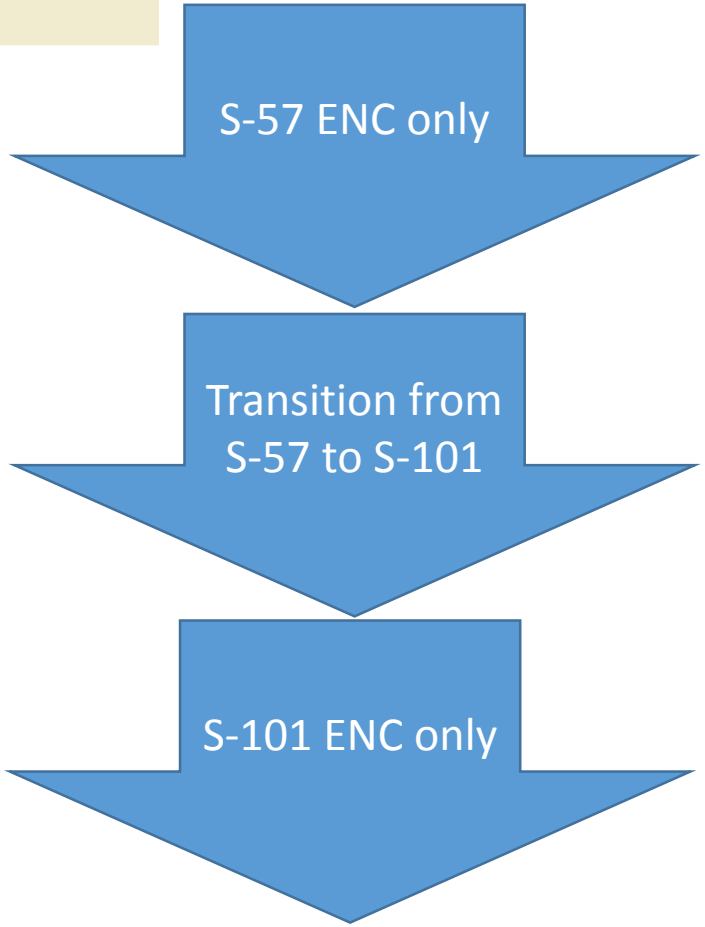
- Whatever the rescheming is, enormous workload wiould be inevidable.



Is rescheming possible in this step?

➢ No, because enough time for it is not left by the start of transition.

Is rescheming possible in this step?

➢ No, because transition itself requires a lot of workload, it will be difficult to do them at the same time and a lot of errors/problems would be predicted except HOs having enough resources.

Is rescheming possible in this step?

➢ Yes, but not immediately. A very long plan to achieve it would be necessary.

✓ The characteristics are quite similar to “SPI” in terms of aiming at the long-term goal.
✓ “How to achieve it” is out of scope.

KEY DRIVERS (1); GENERAL

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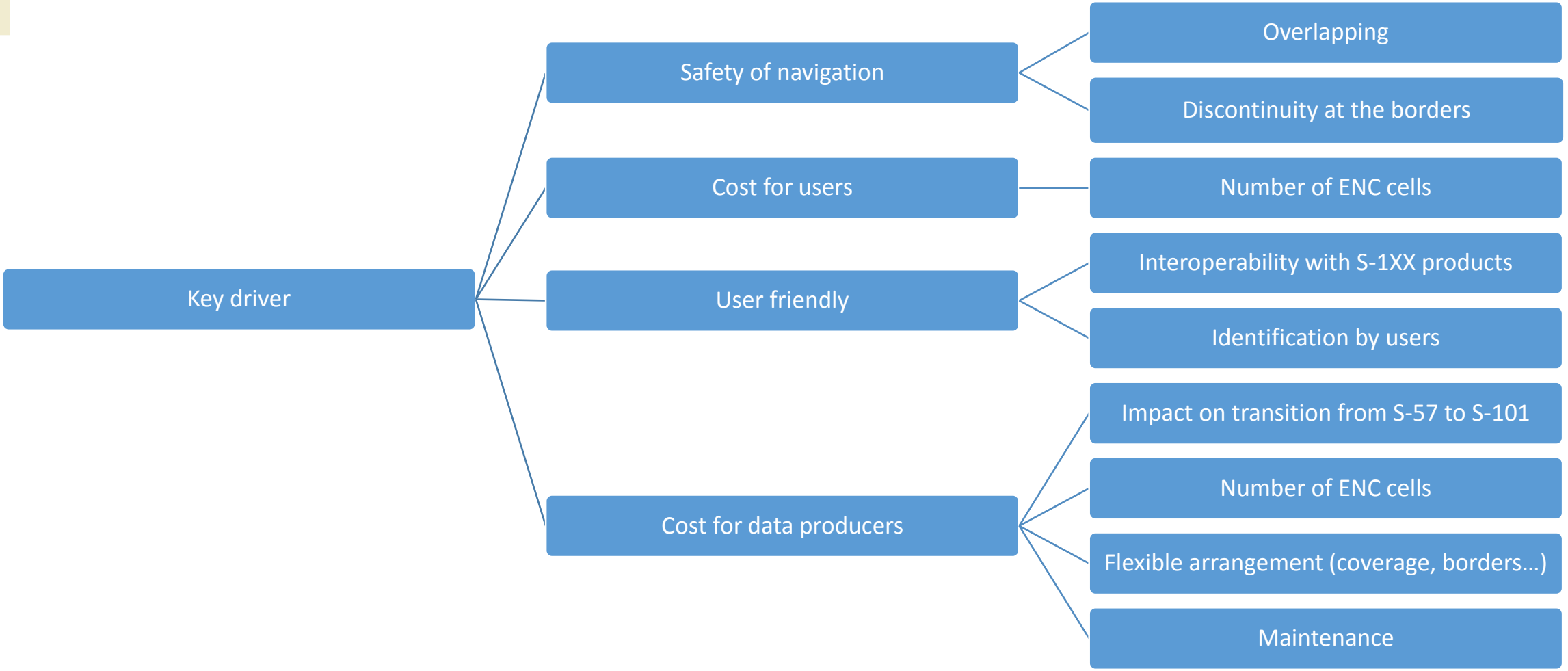
What key driver is taken into account now or at a later stage?



KEY DRIVERS (2); GENERAL (CONT.)

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What is the preferable order/priority?

How much does each scheme achieve the key drivers?

	Key driver	S-57 ENC schemes based on Grid	S-57 ENC schemes based on Paper Chart
Essential	Interoperability with S-1XX products	XXX	
	Less harm of overlapping	XXX	
	Discontinuity at the borders	XX	
Important	Less impact on transition from S-57 to S-101		XX
	Small number of ENC cells		XXX
	Flexible arrangement (coverage, borders…)		XXX
Nice to have	Easy maintenance	X	X
	Easy identification by users	X	

* “X” means degree of applicability

KEY DRIVERS (3); INTEROPERABILITY

- Flexibility in S-101 ENC will be required to achieve interoperability with a wide variety of S-1XX products
- Grid scheme is one of solution to achieve that flexibility

* This table is not authorized and used only for consideration to grab the image of that “diversity”. It was not intended to provide the “full picture”.

(Expected)

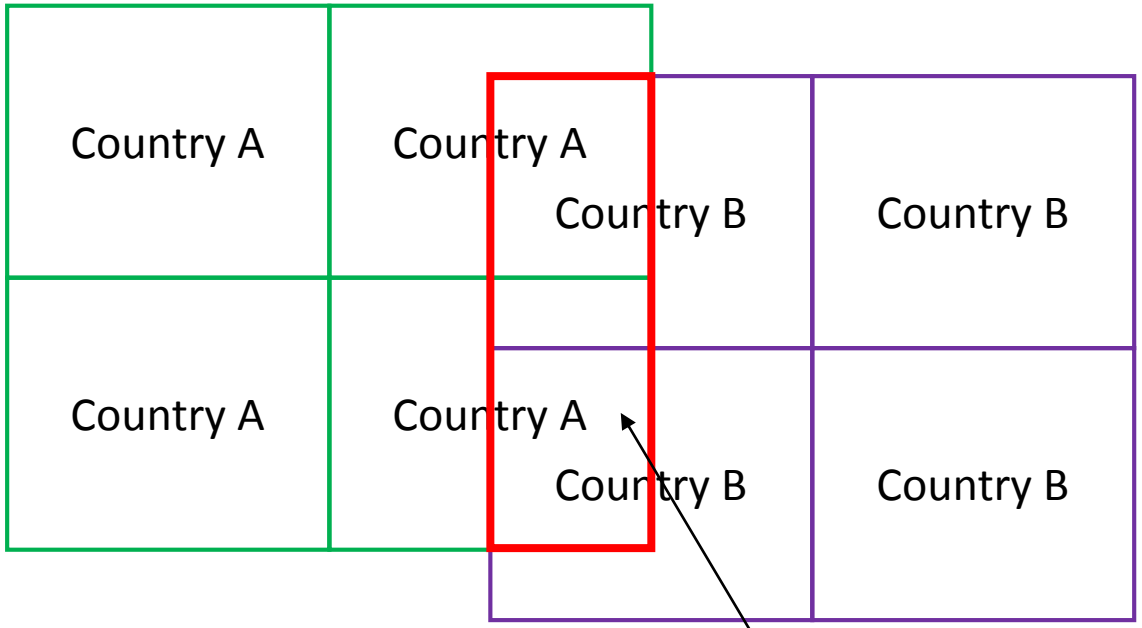
S-1XX products	Information	large scale	middle scale	small scale
S-102	Bathymetric Surface	X		
S-103	Sub-surface Navigation	X		
S-104	Water Level Information for Surface Navigation	X	X	
S-111	Surface Currents	X		
S-121	Maritime Limits and Boundaries		X	X
S-122	Marine Protected Areas	X	X	
S-123	Marine Radio Services		X	X
S-124	Navigational Warnings	X	X	X
S-125	Marine Navigational Services	X	X	
S-126	Marine Physical Environment	X	X	
S-127	Marine Traffic Management	X	X	
S-128	Catalogue of Nautical Products		X	X
S-129	Under Keel Clearance Management	X		
S-131	Marine Harbour Infrastructure	X		

* Underline means higher priority

KEY DRIVERS (4); OVERLAPPING

DIFFERENT scheme

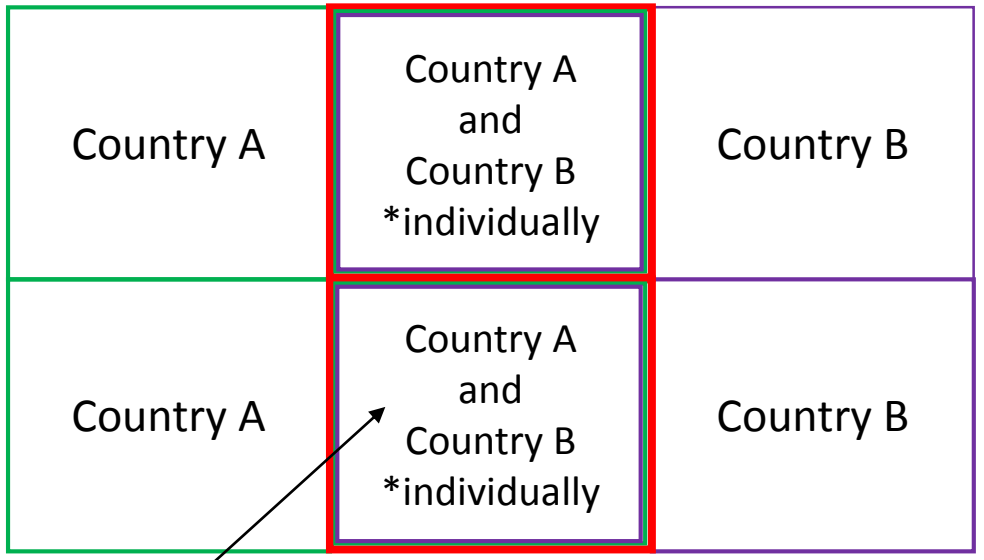
- If two adjacent countries set DIFFERENT schemes, overlapping still exists
- Coordination between two countries is required



Overlapping and users have to purchase <u>both</u> cells

COMMON scheme

- If COMMON scheme are established and overlapping can not be avoided, users can simply choose which cell to purchase, and then <u>harm of overlapping data on ECDIS will be reduced</u>

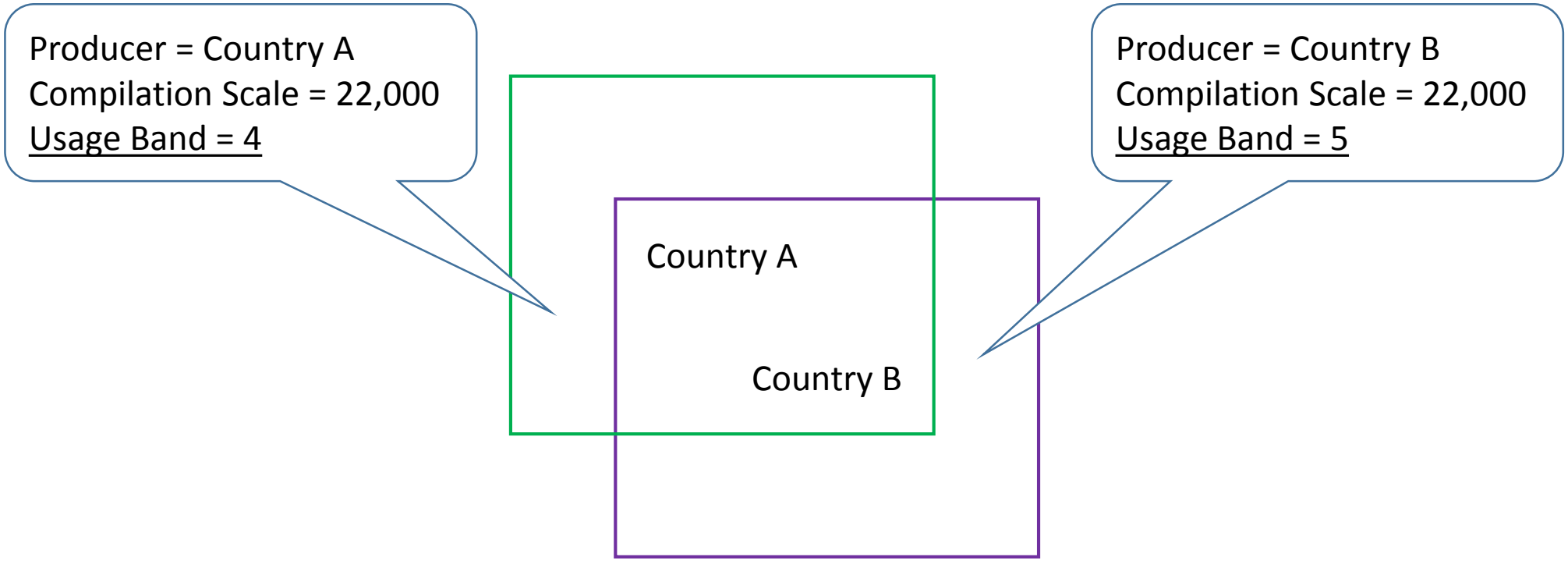


Overlapping but users can purchase <u>either</u> cell

No further “cost” for coordination

KEY DRIVERS (5); OVERLAPPING (CONT.)

- Overlapping issues sometimes become more complicated due to different Usage Bands.
- Compilation scales are the same, but Usage Bands are different.
- Scales should be taken into consideration to solve “inconsistency”.



GLOBAL COMMON GRID SCHEME (GCGS) (1)

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- "Global Common Grid Scheme" (GCGS) could be an appropriate solution against the prioritized key drivers

Global	Simple grid system does not always solve overlapping issues if each country establishes its own scheme.
Common	Users can simply choose which cell to purchase and then harm of overlapping data on ECDIS will be reduced (as the previous slide says).
Grid **S**cheme	Flexibility is required to achieve interoperability with S-1XX products.

The grid scheme is ideal, but a lot of cost (time, budget for HO and etc.) is required for transition.

* Some parts are already discussed at WENDWG11

GCGS (2); EXAMPLE - NGA ENC GRID SYSTEM

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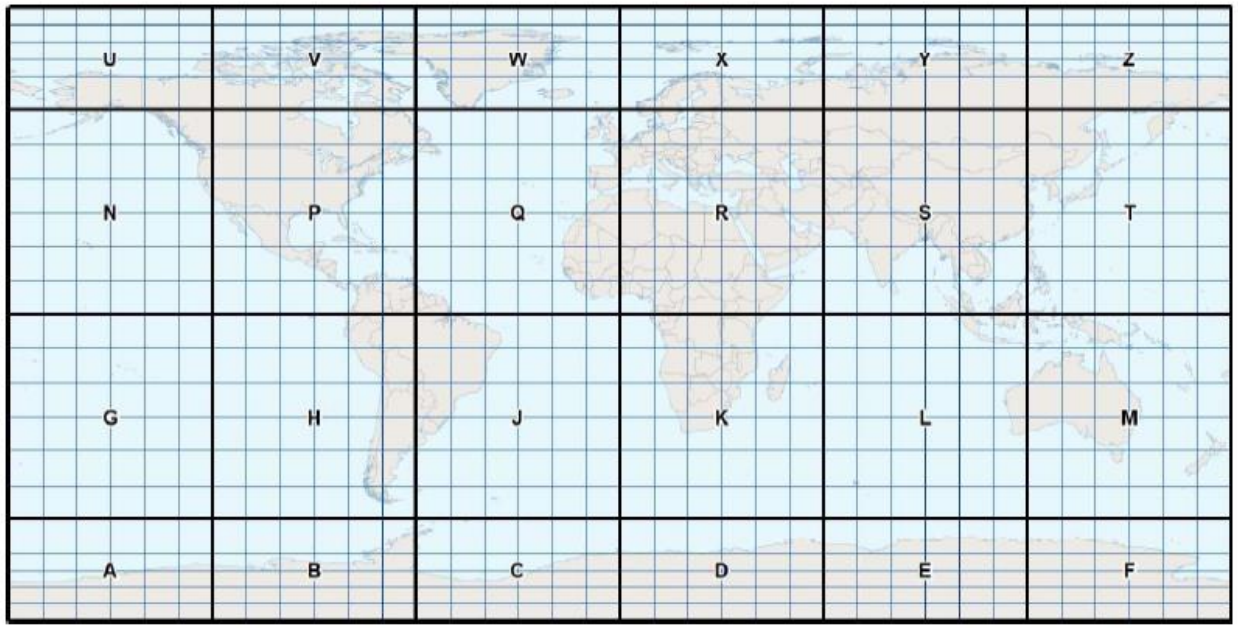
- NGA ENC grid divides world into 24 lettered regions
- Mid-latitude regions contain thirty-six 10° x 10° cells
- High-latitude regions contain six 10° x 10° cells and twenty-four 10° x 5° cells
  - All cells in polar regions (>70° N/S) are condensed vertically to avoid distortion issues near poles
- Subdivisions are 10 °, 5 °, 1 °, 1/2 °, 1/4 °



* Cited from the document from NGA

GCGS (3); EXAMPLE - S-57 VER. 2

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- S-57 Version 2 Annex D (published in 1992) defines the cell sizes.
- Cell sizes are 8°, 4°, 1°, 1/2°(30'), 1/4°(15'), 1/8°(7.5')

Scale Coding

Each cell must only hold data of one scale level.

Scale Code	Chart Scale	Cell Size	Chart Category
A	< 1:2,250,000	8°	World
B	1:300,001 - 1:2,250,000	4°	General Nautical
C	1:80,001 - 1:300,000	1°	Coastal
D	1:40,001 - 1:80,000	30'	Approach
E		15'	Approach (SE 15')
F		15'	Approach (SW 15')
G		15'	Approach (NE 15')
H		15'	Approach (NW 15')
I	1:10,000 - 1:40,000	15'	Harbour
J		7.5'	Harbour (SE 7.5')
K		7.5'	Harbour (SW 7.5')
L		7.5'	Harbour (NE 7.5')
M		7.5'	Harbour (NW 7.5')
N	> 1:10,000	15'	Plan
O		7.5'	Plan (SE quad 7.5')
P		7.5'	Plan (SW quad 7.5')
Q		7.5'	Plan (NE quad 7.5')
R		7.5'	Plan (NW quad 7.5')

Scale codes E to H and J to M are optional and are only used when the density of data in cells of scale codes D and I respectively is too great.

GCGS (4); EXAMPLE - UKHO

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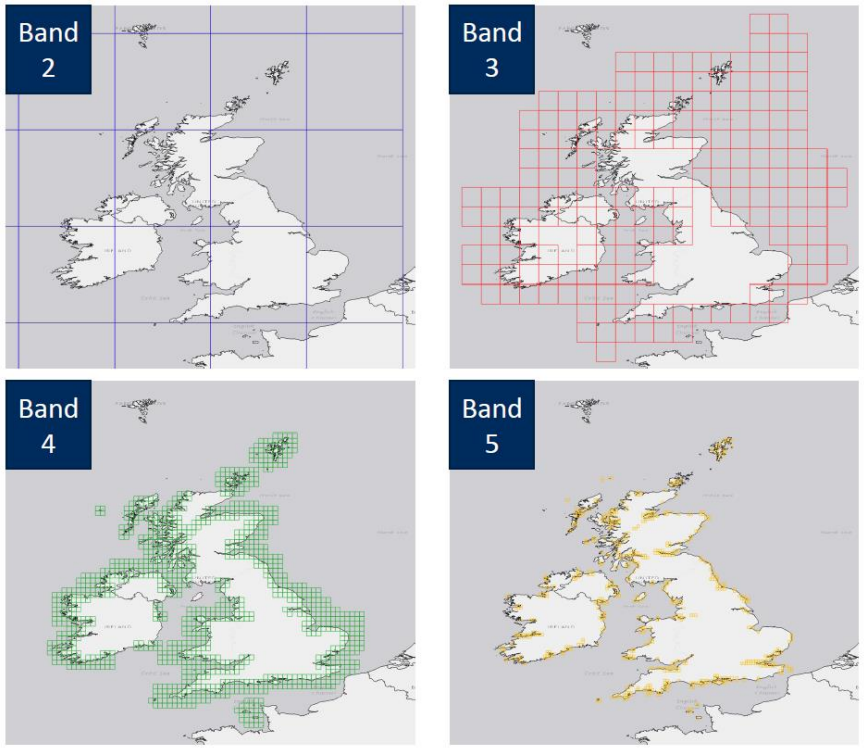
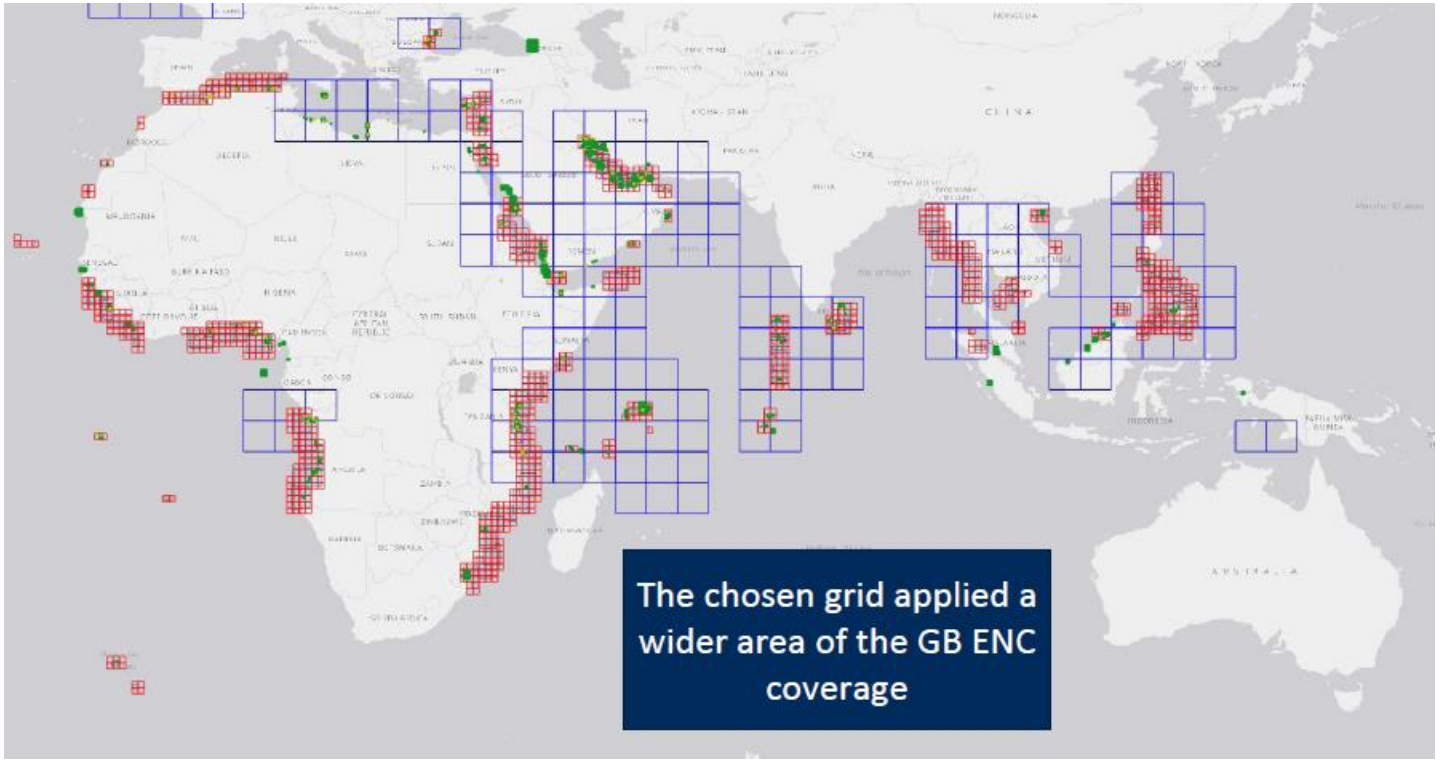
- UKHO started consideration of application of the gridded scheme to support the global coverage and the future S-1XX products.
- Cell sizes are 20°, 4°, 0.8°(48’), 0.2°(12’), 0.1°(6’), 0.05°(3’)





* Cited from the document of MACHC22 Meeting (2021)

GCGS (5); EXAMPLE - HEXAGONAL GRID

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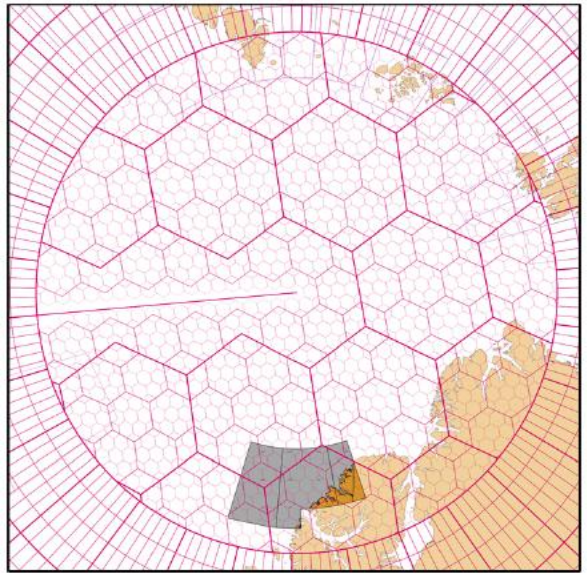
- The surface of the Earth is divided into hexagons
- Map-projection independent and applicable in polar areas (the limitation of Mercator and square shape)
- Uber implements for the service on land
- Combination of hexagonal grid and rectangular one is being discussed at Arctic RHC
- According to S-100, ENC coverage MUST be rectangular, within this rectangular coverage content can be provided by hexagonal grid (CATCOV=1)



* Cited from the document of ARHC Intersessional VTC-01 Meeting (2020)

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SUMMARY OF THE CURRENT IDEAS

- Rescheming is set as a long-term goal like SPI. The timing of rescheming (with or after conversion) depends on each HO's decision in terms of "cost-effective".

- Some key drivers should be considered for rescheming. Especially, interoperability and overlapping could be stronger among them.

- "Global Common Grid System" designed horizontally and vertically could be a possible and appropriate solution.

SOME COMMENTS FROM MEMBERS OF DRAFTING GROUP

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General

- The grid model has many disadvantages that increase the workload and slow down the processes.
- Currently we scheme our ENCs freely, based on the data we are presenting. We would call that data based scheming.
- We have not yet seen any concrete analysis that would explain or prove to us how regular grid is better compared to our current way of ENC scheming.
- No alternative options are presented for consideration.
- The transition to a regular grid scheme would be a major cost and a long-term action for HOs. Therefore, it is important to be sure of the benefits of such an operation.
- We consider it unrealistic to re-scheme during the DF period.

Overlapping

- Are both neighboring nations obligated to fill the whole cell with data even from the others territory? If they are, that would require a lot more cooperation and workload updating the data from the neighboring countries territories.
- We would like to emphasize that the extension of a data coverage of the same scale range has significance for the user, especially for mariners. The data coverage counts, more than the cell schemes of the products.

Interoperability

- We are not certain that S-1xx cell schemas could be defined according S-101 grids (e.g. the volume of the products is a constraint for the size).

ACTIONS REQUIRED FOR WENDWG12

- **Note** this report

- **Prepare** an interim report for consideration at IRCC-14

ACTIONS REQUIRED FOR WENDWG12 (CONT.)

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- **Consider** the following options for the next actions (if necessary, to be considered at IRCC-14);

✓ Option 1; Based on the current situation and various positions, no need for Guidelines, keep S-57 general framework "as is" in the transition to S-101 production, disband drafting group for now

✓ Option 2: RHCs (and RENCs?) Reps to report at WENDWG-13 on their views and general strategy about the transition from S-57 to S-101 (dual) production and also on their views on a long term objective for ENC re-scheming needs or not based on cost-effective analysis to speed up the implementation of the S-100 Roadmap in a consistent manner world-wide

* If option 2 is chosen, as a consequence, at WENDWG-13, reconsider the establishment of the drafting group based on outcome of option 2, to define a minimum common denominator for drafting guidelines

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Thank you