NATO AML Handbook

Additional Military Layers

Information superiority in the maritime environment

Produced and issued under the direction of NATO's Geospatial Maritime Working Group on behalf of NATO

Edition 5 March 2022

NATO AML Handbook

Additional Military Layers

Foreword
by Captain Richard Kennedy US Navy, Director Maritime Safety Office, National Geospatial-Intelligence Agency

The foreword in the previous Additional Military Layers (AML) Handbook describes the need for relevant, timely information and the intelligence derived from it being critical enablers to success in conflict or its prevention. These are enduring principles and still fundamental to success in operations. Information Superiority, if well managed and exploited, is a domain which enables smaller forces to deliver a much greater effect – it is the ultimate force enabler. Maritime geospatial information (GI) is vital to all levels of warfare from strategic decision making through operational planning to the tactical conduct of operations. As part of the NATO Recognised Environmental Picture (REP), it is crucial that an authoritative, assured source of maritime GI is available. In financially constrained times it is also optimal that maritime GI is considered within co-production agreements following clear guidelines and protocols to ensure efficiency in coverage, resolution, and interoperability. The NATO Geospatial Maritime Working Group (GMWG) plays a vital role in establishing policy and guidance over AML to ensure decisions and operations are conducted on the same maritime GI product, increasing situational awareness and decision-making effectiveness of forces operating in the maritime environment.

The AML concept which was created specifically to support interoperability in a digital era has come of age. AML supports the full spectrum of maritime operations whether from the sea, on the sea, under the sea or over the sea. It supports a broad customer-focused requirement covering objects, features, attributes, and scale to deliver a variety of effects. Additionally, the concept drives away the need to refer to a host of legacy products from numerous sources, often in books and via paper overlays.

AML has been created to support both digital navigation and command and control systems to provide the best situational awareness available as intelligent vector and gridded products. AML significantly contributes to all maritime operations.

This new edition of the handbook will help the reader to understand the concept of AML but will hopefully also inspire the reader to engage with the AML producers to drive forward the concept to better support maritime GI and enable the successful conduct of operations. As Allies move towards a data centric concept for maritime GI support, the lessons derived from AML will be vital. This edition also includes details of how a Spatial Data Infrastructure (SDI) is emerging with the advent of NATO NGIF and how the AML concept will transition towards this more contemporary approach.

Comments and/or feedback are encouraged and should be directed by email to GMWGSecretariat@ukho.gov.uk.

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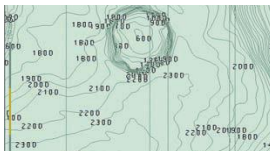

NATO AML Handbook

Additional Military Layers

This NATO AML Handbook provides general information about AML, including a brief explanation of the products and benefits to users. It is produced and issued under the direction of NATO's Geospatial Maritime Working Group on behalf of NATO and replaces the AML Handbook which was last revised in January 2016.

The Handbook is held, maintained, configuration controlled, published and distributed in digital format. Users are welcome to produce hardcopy versions for own use and for wider distribution but should be aware that such hard copies will not be updated.

Your contributions and comments are valued. To make contributions or comments on the Handbook, or to request further information, please email GMWGSecretariat@ukho.gov.uk

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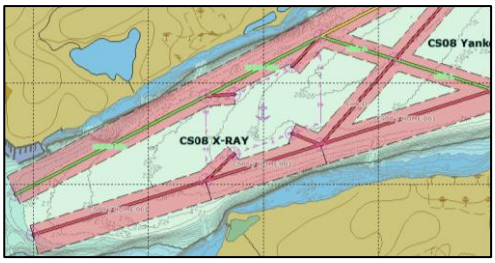


1. Introduction

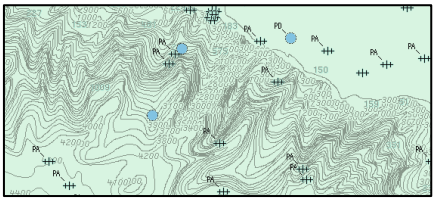
Specialist maritime geospatial information for Defence has been provided in the form of a wide range of paper overlays or modified charts for many years. With the move to digital products, AML has been designed to provide this maritime geospatial information to the defence user in an efficient and standardised digital format. AML provides defence customers with a unified, interoperable product for the enhancement of situational awareness and operational effectiveness. **AML is not a navigation product** and all navigation decisions must be made with reference to the primary navigation product such as an Electronic Navigational Chart (ENC), however, the picture AML conveys greatly enhances understanding of the maritime operational environment.

AML is defined in NATO STANAG 7170 (AGeoP-19 Edn B) as:

"...a unified range of digital geospatial data products designed to satisfy the totality of NATO non navigational maritime defence requirements".[1]

This handbook provides an overview of the AML concept and layers. It highlights the benefits of AML, how they are used, the types of datasets and other important details. This handbook does not provide detailed technical information on AML Product Specifications or AML production. This information can be found at https://www.ukho.gov.uk/Defence/AML/Pages/Home.aspx

[1] STANAG 7170 – AML Edition 4 (Feb 2022)



2. Why AML?

AML enhances knowledge of the maritime and littoral environment increasing operational effectiveness and the probability of success in military operations and humanitarian missions.

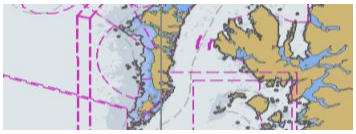
AML displays a range of features which can be selected for the specific mission in hand. This negates the need to consult environmental information provided in a variety of books, paper charts and overlay products.

2.1. AML Advantages

- Delivers enhanced operational effectiveness through information superiority
- Supports the planning and decision making process
- Provides a tactical advantage by enabling better exploitation of the environment
- Delivers attributed and searchable data – a large volume of information about maritime features is available but a limited selection can be displayed when the user needs it, reducing clutter on the screen
- Allows efficient production leading to faster availability and delivery of digital data through network enabled capabilities
- Provides selected data that can be rapidly displayed with navigational data and other user data sets
- Provides environmental maritime (geospatial, meteorology, oceanography) and operational information to deliver value added information in support of tactical decision making and the COP (Common Operational Picture)
- Delivers non-system specific data
- Provides assured data governed by NATO endorsed standards delivering improved interoperability both nationally and with key NATO allies
- Usable in the NATO standardised navigation and situational awareness system WECDIS, Command Systems and Tactical Decision Aids (TDAs) both ashore and across a wide range of platforms
- Relatively low data volume enables dissemination via signals

AML production gives significant benefits over paper chart production as follows:

- The AML concept is that each feature is published only once. This contrasts with paper products where it is necessary to repeat the publishing of the same features in different products with combinations of features to suit specific missions
- Much more information can be made available to the user but not necessarily displayed on the screen simultaneously. This reduces the need to publish a large range of paper sheets to ensure clear visibility of features
- Updating and promulgation of the updated information is quick and efficient



3. AML Description

3.1. Design and Standards

AML is a unified range of digital geospatial data sets designed to meet the needs of all users. It is not tied to any specific software, manufacturer or proprietary exchange standards therefore maximising interoperability within NATO and other collaborative organisations.

The International Hydrographic Organization's (IHO) S-57 Transfer Standard for Digital Hydrographic Data is currently used for vector data sets. GRIB and NetCDF formats are used for gridded data.

AML consists of groups of feature types collated into specific datasets.

Developments in standards within various bodies have led to a new initiative to develop AML in line with contemporary IHO, Defence Geospatial Information Working Group (DGIWG) and Open Geospatial Consortium (OGC) standards all based on the underlying ISO (International Organization for Standardization) 19100 series. These developments are described in section 11.

3.2. Vector Products

In vector data, objects are represented by points, lines, or areas. Each object is described in terms of a feature class indicating the object type, its attributes, and a geographical position. Appropriate application software enables users to manipulate the data in a variety of ways, for example:

- by selecting and displaying a subset of the feature classes in the product
- by making selections based on the attribution of certain feature classes

This helps to reduce clutter, emphasising the features that are important to the user.

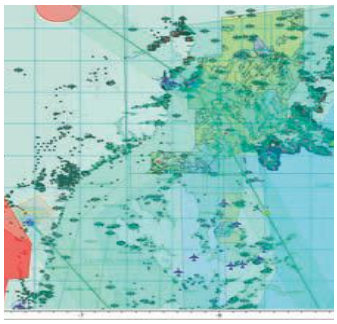


Fig 1.0

Here information from RAL, LBO and ESB is displayed together resulting in a cluttered picture that is difficult to interpret. *(Viewer – Tenet HUGIN Chartlink)*

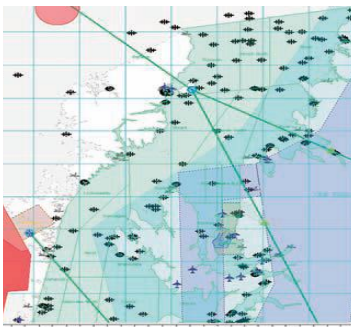


Fig 1.1

Removal of ESB and some elements of RAL that are not of current specific interest results in a much clearer view. *(Viewer – Tenet HUGIN Chartlink)*

Features can contain links to additional text and picture files which enables a great deal of additional information to be accessed as required without permanently cluttering the screen.

All vector data is delivered conformant to the IHO's S-57 Transfer Standard for Digital Hydrographic Data, generally known as the S-57 (.000) format.

3.3. Gridded Products

Gridded AML products show the spatial and sometimes temporal variation in an environmental feature. For instance, gridded products can represent many observations collected over a long period giving the user information about the environmental parameters that may be expected at a particular time of year. Gridded information may be presented to the user in a variety of ways, including isolines derived from the grid and colour banding. Alternatively, the data may be used by a specific system for computational purposes without directly representing the data to the user through a Graphical User Interface (GUI).

4. NATO Approved Product Specifications

Vector - Version 1.0 (November 2001) and Version 2.1 (November 2005)

- Contour Line Bathymetry (CLB)
- Environment, Seabed and Beach (ESB)
- Large Bottom Objects (LBO)
- Maritime Foundation and Facilities (MFF)
- Routes, Areas and Limits (RAL)
- Small Bottom Objects (SBO)

Vector - Version 3.0 (August 2008). This version combines the 6 vector specifications into a single product specification. Version 3.0 also extends the content of AML in the following areas:

- Additional land features and attributes from Vector Map VMAP
- Ice features and attributes from World Meteorological Organization (WMO) ECDIS Ice Objects v4.0
- Additional air features and attributes
- Incorporates changes made to IHO S-57 3.1.1
- Generic attributes SCAMIN and SCAMAX
- Extra attribution on Marine Management Areas

AML v3.0 identifies certain layers or data themes that represent logical groupings of data types, but these are not explicitly defined in the Product Specification. The identified layers are:

- **AML** Additional Military Layers – Generic
- **TSB** Territorial Sea Boundaries
- **FAI** Flight Aeronautical Information. This can be broken down into:
  - **CFI** Civil Flight Information
  - **MFI** Military Flight Information
- **PEA** Practice and Exercise Areas
- **MMA** Marine Management Areas
- **QRT** Q-Routes
- **SBO** Small Bottom objects for MCM Mine Counter Measure
- **LBO** Large Bottom Objects for ASW and MCM
- **CLB** Contour Line Bathymetry for different users/warfare scenarios
- **AMP** Amphibious Warfare Data
- **ICE** Ice Data
- **MTD** Mine Tactical Data
- **SED** Sediment
- **LND** Land Background Data
- **NCD** Nautical Chart Background Data
- **MNI** Military Nautical Information of relevance to navigation scenario

While the product specifications and their annexes define the content and structure of AML products, determining the final detailed nature of a product involves a detailed interpretation of the product

specifications. For example, the CLB product specification does not specify the contour interval to be used. To ensure that products produced by different agencies within the coalition are consistent, an example Production Specification has been written.

This document along with the specifications for all versions and a summary of the differences between version 1 and 2.1 can be found at https://www.ukho.gov.uk/Defence/AML/Pages/Home.aspx For additional information please contact your NATO National Maritime Representative.

Gridded

- Atmospheric and Meteorological Climatology (AMC) - Version 1.0 (November 2004)
- Integrated Water Column (IWC) - Version 2.1 (June 2006)

5. Product Descriptions (as defined in AML v1.0 and v2.1)

5.1. Contour Line Bathymetry - CLB

CLB is a vector scaled product. It includes spot soundings, depth areas and more depth contours than those shown on standard navigational charts.

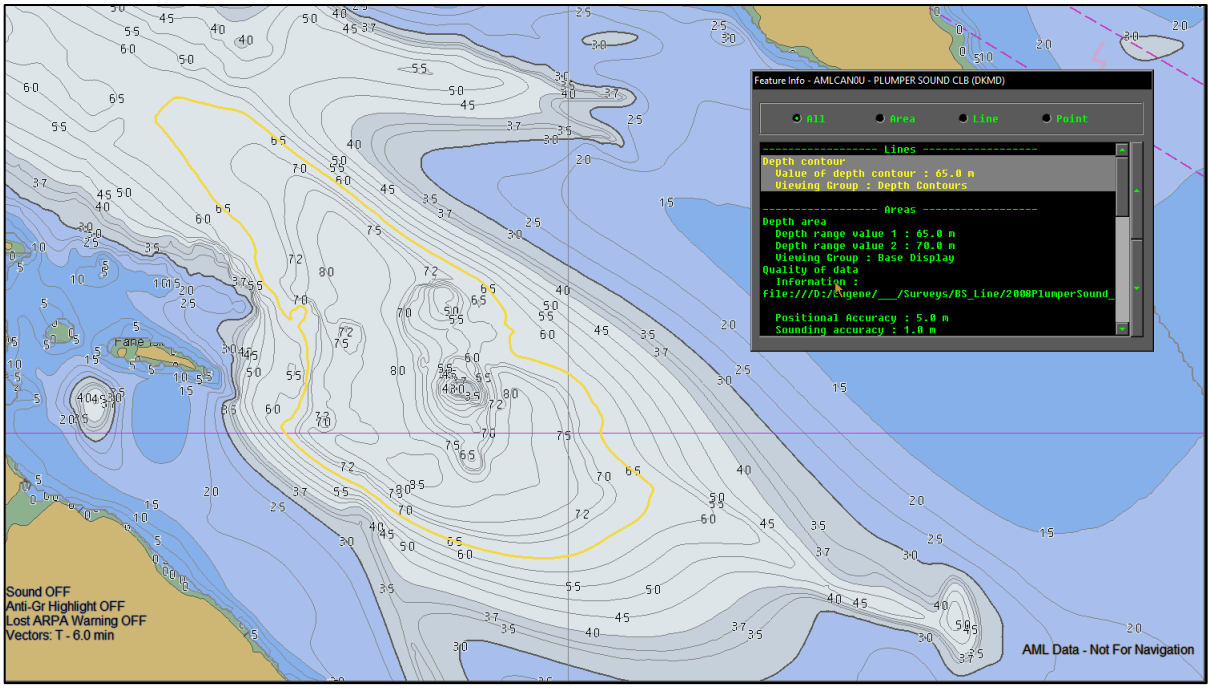


Fig 2.0
Contour Line Bathymetry compiled at survey scale for tactical use
(*Viewer - OSI ECPINS v6.2)*

5.2. Environment, Seabed and Beach – ESB

Designed to provide the user with information about the seabed and beach areas, ESB is of particular value in support of mine counter-measure activities and amphibious operations. It is a vector scaled product including:

- Composition and thickness of multiple sediment layers including bedrock
- Acoustic/physical properties
- Slope
- Mine Counter Measures (MCM) areas
- Sand waves
- Trawl scours
- Vegetation
- Beach – full map/chart at very large scale, or as an overlay to standard mapping/charting
- Low resolution seabed information to support Anti-Submarine Warfare (ASW)

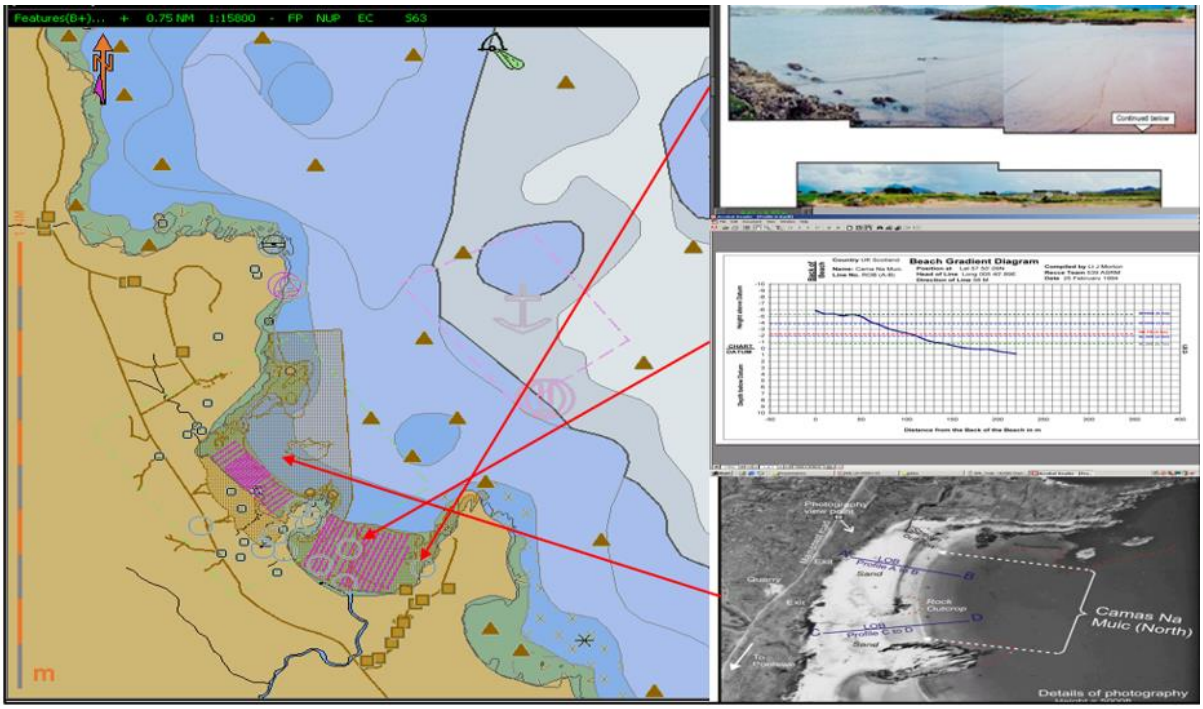


Fig 3.0
Beach information from ESB. Embedded and linked photography and beach gradient profile external files also displayed.
(Viewer - OSI ECPINS v6.2)

5.3. Large Bottom Objects – LBO

LBO is an un-scaled vector product showing all objects on the seabed 5m or larger in any dimension. LBO includes:

- Wrecks (charted and uncharted)
- Rocks
- Obstructions
- Seabed installations

Each bottom object includes full attribution beyond that shown on a standard chart making the data useful for submarine and anti-submarine operations and for mine warfare applications.

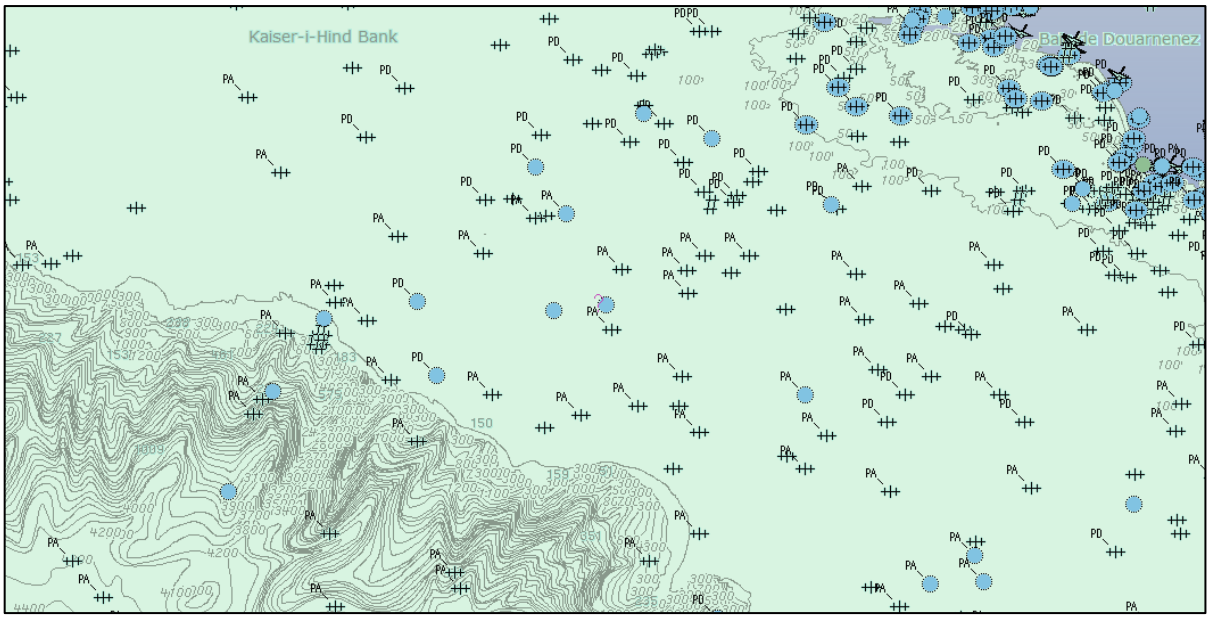


Fig 4.0
Features from LBO displayed alongside CLB
(Viewer – SevenCs SeeMyENC)

5.4. Maritime Foundation and Facilities – MFF

MFF is a vector scaled product designed to provide a suitable reference background and context where standard electronic products such as ARCS (Admiralty Raster Chart Service) or ENC (Electronic Navigational Chart) are not used. Features included in MFF are:

- Coastline
- National land boundaries and major cities
- Main ports, harbour locations and facilities
- Major lights and buoyage
- Magnetic information
- Tidal information

Tactical Information included in MFF is:

- Radar reflective entities such as offshore platforms, buoys, beacons
- Communication facilities and coverage
- Pipeline and cable information
- Fishing activity
- Oil, gas, and mineral production information
- Ice limits
- Search and rescue information
- Miscellaneous seabed obstructions that cover a significant area

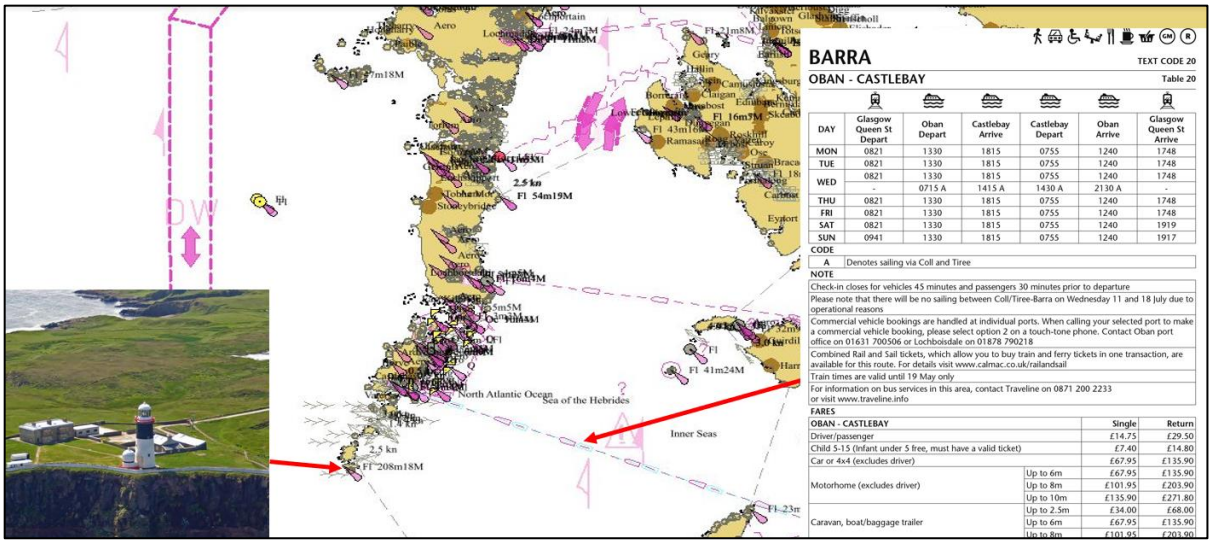


Fig 5.0
Example MFF, comprising of coastline and critical navigation features.
(Viewer – CARIS S-57 Composer 3.1)

5.5. Small Bottom Objects - SBO

The SBO vector dataset is useful for Mine Countermeasures, Amphibious and route lead-through operations. It is un-scaled and includes all known bottom contacts that are smaller than 5 metres, i.e., mines and mine-like contacts.

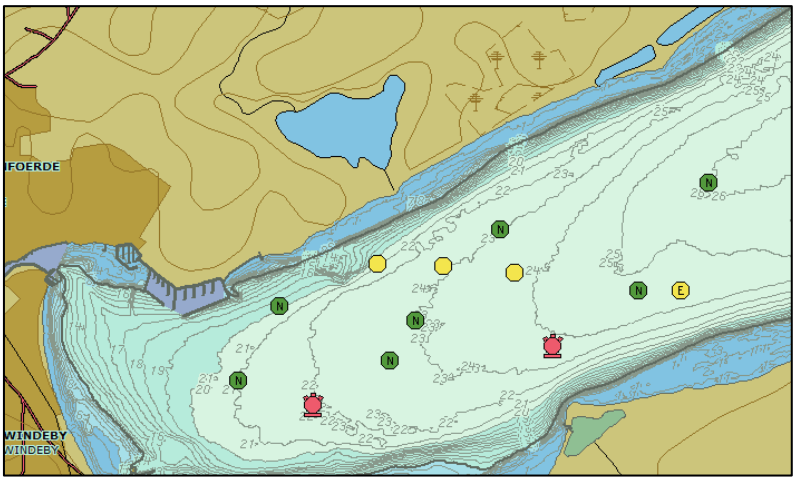


Fig 6.0
Fictitious sample Small Bottom Objects displayed alongside Land Background Data (LND) AML displayed according to the AML Portrayal Specification v3.0.1.
(Viewer – SevenCs SeeMyENC)

5.6. Routes, Areas and Limits – RAL

RAL, an un-scaled vector product, contains features useful for a wide variety of planning and operational purposes. It includes the following type of features:

- Territorial Waters Limits – EEZ (Exclusive Economic Zone), fishery limits, contiguous zone, continental shelf areas, straight territorial baselines, and territorial sea areas
- Military Practice Areas – danger areas, PEXA (Practice and Exercise Area), safe bottoming areas, testing and evaluation ranges
- Q routes
- Restricted areas e.g., historic wrecks, minefields, safety zones
- Submarine transit lanes
- Swept areas
- Waypoints/reporting/calling-in points - NAVAIDS, helicopter reporting points, rendezvous locations, reporting/radio calling-in point

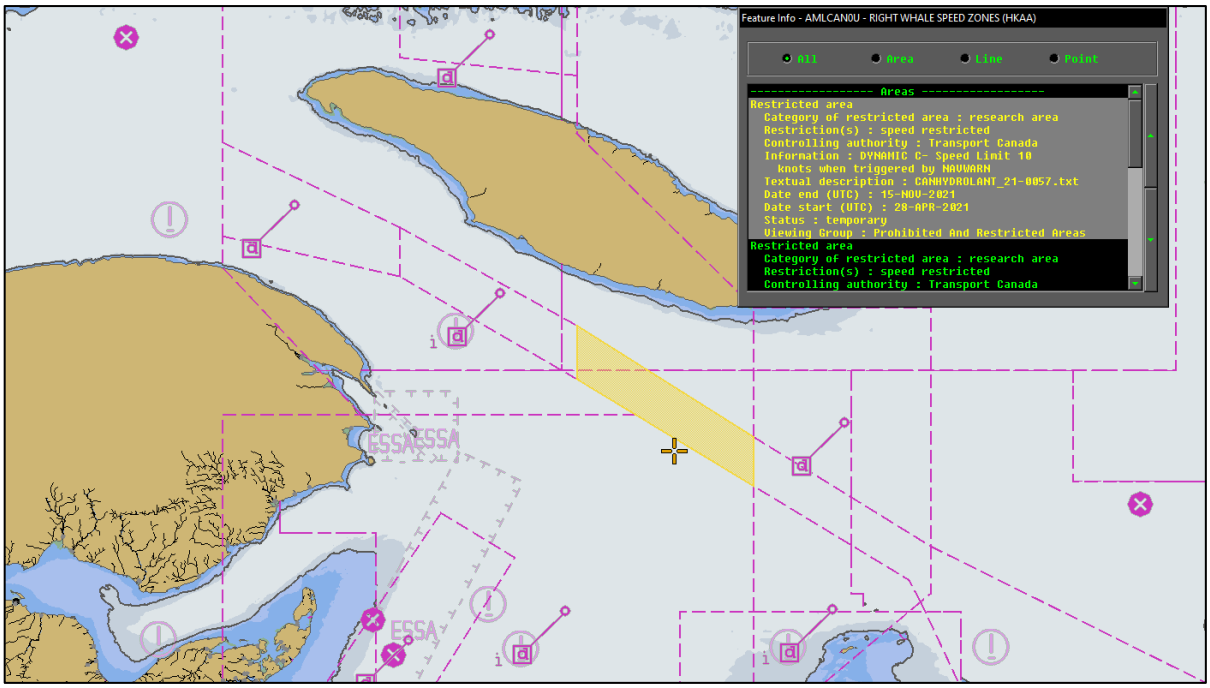


Fig 7.0
RAL with a restricted area highlighted and its attributes displayed.
(Viewer – OSI ECPINS).

5.7. Integrated Water Column – IWC

The purpose of IWC, a gridded dataset, is to provide marine climatological data to describe the likely conditions found within the water column. Information includes:

- Temperature and salinity
- Ocean Current distribution
- Marine mammal distribution

IWC is delivered in the NetCDF format.

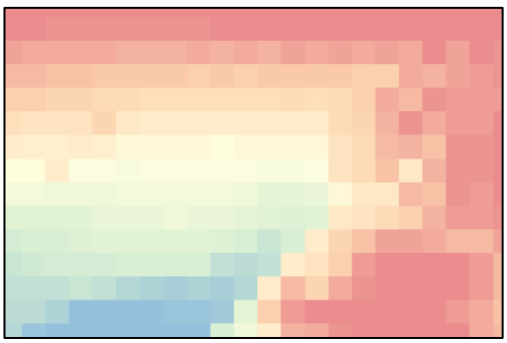


Fig 8.0 IWC Marine Mammal distribution

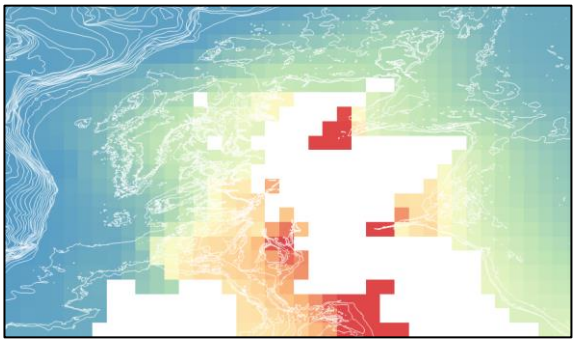


Fig 9.0 IWC Salinity including CLB for context (viewer - QGIS (formerly Quantum GIS))

5.8. Atmospheric and Meteorological Climatology – AMC

AMC data describes the meteorological and climatological conditions to assist with operational planning. It is a gridded dataset including the following historical information:

- Wind speed, direction, and frequency
- Air temperature
- Relative humidity
- Dew point
- Pressure
- Cloud cover
- Visibility
- Probability of meteorological phenomena

AMC is delivered in the GRIdded Binary (GRIB) format

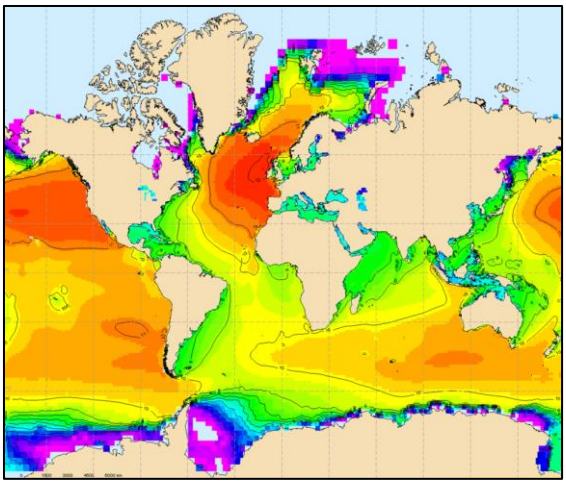


Fig 10.0 AMC January Average Swell Period

5.9. Gridded Sediment - Environment Seabed and Beach - GS-ESB

The GS-ESB product contains geo-acoustic properties of the sediment layer in a gridded form.

It is currently a draft product specification only implemented within UK systems.
It is a draft specification which is not endorsed by NATO however it is used by some nations.
GS-ESB is delivered in the NetCDF format.

6. Cell Naming

Versions 1.0 and 2.1 of AML use an 8-character cell name followed by a 3-character extension. The name of the AML cell conveys some information about the contents, but the catalogue is useful to identify its location.

The first two characters identify the producer nation.
The third identifies the product type i.e., C = CLB, E= ESB etc.

The fourth is the scale band i.e., 1-9 (0 for un-scaled products).[2]
The fifth is the classification i.e., U = Unclassified, R = Restricted.
The remaining 3 characters can be composed of any valid character and ensure the uniqueness of the cell name.

Cell Name example:

NOC6RA3B.000

- This is a Norwegian produced cell (**NO**)
- Contains Contour Line Bathymetry (**C**)
- Has been produced at Scale Band six (**6**)
- Has a classification of Restricted (**R**)
- Has the unique designator **A3B**
- Is a base cell (**000**); future updates will be numbered sequentially (001, 002…)

Version 3.0 of AML is not constrained to 8 characters and has a greater flexibility in terms of its content.

In all versions the 3-character extension signifies the update number of the cell in the same way as an ENC.

7. Portrayal of AML

Although the use of any particular symbolisation standard for AML products is not mandated in STANAG 7170, to support consistent display in WECDIS systems, portrayal guidance, through the preparation of an AML Portrayal Specification, has been developed using APP-06(C) and IHO S-52.

The Specification defines symbols and rules for the display of vector AML datasets and supports AML 1.0, 2.1 and 3.0 vector products. It builds on the IHO S-52 Edition 6.1 standard and the Preslib 4.0. It is aimed primarily at WECDIS systems and provided as a S-52 .DAI file. However, this does not prohibit implementation of the specification in other systems including web services.

At the time of publication, the latest version of the AML Portrayal Specification is version 3.0.1, this was formally ratified by the GMWG in Nov 2018.

8. Metadata

Metadata is information about data, for example describing the protective marking, source, reliability, scale or use constraints of the data. In AML this is described at two levels:

- Dataset Level – this is the general information describing a data product as a whole (i.e., type of product, classification as included in the header file)

- Feature Level – this is meta information encoded within the data as meta features or meta information attributes. For example, ‘Data Coverage’ is a meta feature that defines the geographical area covered by the product. ‘Sounding Accuracy’ is a meta attribute which enables each depth to be tagged with an estimated error.

8.1. Data quality

It is important to understand that AML contains data from many different sources which will have different quality criteria. Users must make use of the metadata to understand the origins of the underlying source data and therefore any limitations in the appropriate use of AML products. Metadata within AML products can be found on individual features or on Meta features such as M_QUAL and M_COMP, these define information such as completeness or source data quality for a defined area. A set of recommended verification checks have been developed from the IHO S-58 standard and should be used to ensure that AML Products conform to the Product Specifications.

9. Scale

9.1. Vector Scale Bands

Some Vector AML products (LBO, RAL, and SBO) can be considered as being un-scaled because they contain only features that are points or regular geometric shapes. CLB, ESB and MFF contain features such as coastlines and contours which are generated in a more generalised way at smaller scales. These products are therefore prepared for use within a range of scale bands intended for different purposes. For example, CLB can be produced in several different scale bands for different levels of application:

- Tactical and Strategic Planning
- Ocean Operations
- Detailed tactical operations e.g., mine counter measures and amphibious operations

The table below summarises the AML scale bands and the typical scale range they are intended to be displayed at.

AML Scale Band	Data Scale	Range of Intended Data Display Scales
1	1:100,000,000 or smaller	<1:40,000,000
2	1:25,000,000	1:10,000,000 to 62,500,000
3	1:5,000,000	1:2,000,000 to 12,500,000
4	1:1,000,000	1:400,000 to 2,500,000
5	1:250,000	1:100,000 to 625,000
6	1:50,000	1:20,000 to 125,000
7	1:10,000	1:4,000 to 25,000
8	1:2,500	1:1,000 to 6,250
9	1:600 or larger	>1:1,500

In practice, products are typically produced in two or three scale bands.

9.2. Gridded Scale Bands

There can be a variation in the spatial grid interval for gridded products, which depends on the purpose of the dataset or the density of the source data. Some gridded AML products include values that vary throughout the year, and specifications for these products make provision for data to be presented at a number of temporal intervals e.g., quarterly, or monthly.

Scale Band	Data Computation Grid Size	Data Usage Grid Size
1	20° or coarser	8° or coarser
2	5°	2° to 12.5°

3	1°	24’ to 2.5°
4	30’	12’ to 1.25°
5	6’	2.4’ to 15’
6	1’	24’’ to 2.5’
7	30’’	12’’ to 1.25’
8	6’’	2.4’’ to 15’’
9	1’’ or finer	0.4’’ to 2.5’’ or finer

Grid sizes are given in Degrees (°) Minutes (’) and Seconds (’’) of arc.

10. AML Production within NATO

Several NATO and Partner nations have the capability to produce AML, other nations are in the development phase.

NATO Nations are producing AML of national waters for their own force and NATO exercise purposes. Additionally, the AML Implementing NATO and Partner nations collaborate in a NATO AML Co-Production Programme (NACPP) to provide NATO and NATO Command Structure (NCS) with AML in areas of NATO operational interest. See Section 10.3 for more details.

10.1. AML Versions across NATO

It was originally intended that all producers of AML would adhere to the same product version across NATO, however, this has proved impractical. For example, UK has remained with version 1.0, but other nations are producing in both 2.1 and version 3.0. Largely this reflects the need to support a wide range of end user systems**.**

10.2. Allied Command Operations (ACO) Geospatial e-Catalogue

ACO’s Geospatial e-Catalogue is maintained by SHAPE. NATO AML producing nations are requested to provide details of national AML available for NATO use direct to SHAPE via email (J3SPOPSMET@shape.nato.int) for inclusion in ACO’s e-catalogue.

10.3. NATO AML Co-Production Programme (NACPP)

This collaborative programme generates AML products to the requirements of SHAPE and Maritime Command (MARCOM). Activities are co-ordinated by the NATO AML Co-ordinator within Terms of Reference provided by the NATO Geospatial Maritime Working Group (GMWG).
Process documents describing these collaborative activities in some detail can be accessed through the GMWG Secretariat. An NACPP Technical Panel meets periodically to review requirements, progress, and plans.

11. Current AML Developments

Currently work is in progress to develop a new generation of AML product specifications. This reflects wider developments and the limitations of the current specifications. Importantly the new standards being developed should be more flexible and work in harmony with Commercial off-the-Shelf (COTS) software and enable delivery via Web Services. This work is conducted by the GMWG Technical Panel within the GMWG and in liaison with DGIWG, the IHO and other bodies.

11.1. Wider developments

Reflecting developments in geospatial technologies such as Web Services, various activities within civil and military standards bodies are underway to develop contemporary standards for geospatial information largely building on the ISO TC211 19100 series of standards. These follow the shift from traditional products towards vector data and delivery via web services. Additionally, based on lessons

learned from direct application of current AML product specifications, next generation AML product specifications should shift from a data type to mission-specific focus.

These developments include those within the IHO, developing the S-100 standard to provide a contemporary and flexible framework for hydrographic information. The Open Geospatial Consortium (OGC) develops and drives standards which geo enable the web. Within NATO, the NATO Geospatial Information Framework or NGIF has been published and is being further developed to realise NATO geospatial policy using these new standards.

11.2. Defence Maritime Exchange Model (DMGEM)

The Defence Maritime Exchange Model (DMGEM) is a framework developed by the GMWG to address the need for a contemporary set of standards and specifications aligned with IHO and NATO Geospatial Information Framework (NGIF). DMGEM as defined in NATO STANAG 6503…

'addresses the interoperability requirements specific to geospatial information in the maritime environment'[3]

DMGEM will provide the mechanism in which subordinate product specifications that support situational awareness within maritime navigation and C2 systems can exchange and interoperate data between those systems as well as leveraging NGIF support wider C2 systems to include delivery via web services.

[3] STANAG 6503 – Defence Maritime Geospatial Exchange Model Embracing S-100 and NGIF Developments Edition 1 (May 17)

11.3 Next generation AML – the S-500 Series

The IHO S-100 Universal Hydrographic Data Model provides a contemporary data framework for the development of the next generation of Additional Military Layer (AML) products. As the registered defence domain expert within the IHO Geospatial Information (GI) Registry, NATO GMWG have been allocated the S-500 series (S-501 – 525) of product specifications in which to develop the next generation of AML.

As the hydrographic community transitions to utilizing the IHO S-100 framework the GMWG TP is beginning to work with the IHO GI Registry to provide its content for data concepts, data types, metadata, portrayal, and product specifications. Based on user feedback and lessons learned from AML S-57, the GMWG TP is using the transition as an opportunity to reflect updated user requirements and new concepts afforded in S-100, to ensure that future product specifications adequately serve NATO maritime forces today.

11.4 NATO Geospatial Information Framework (NGIF)

NGIF is a major piece of work being led strategically by NATO's Joint Geospatial Standards Working Group (JGSWG) and technically through the DGIWG (which is working in support of NATO) to deliver a set of common geospatial information standards across NATO.

NGIF is intended to realize the principle of 'operating off the same map' by developing a common data model from which digital and hardcopy products can be created. NGIF also serves as the interoperability model in which data can be exchanged between all NATO supporting production offices. It will ensure that products can be delivered across the NATO Networked Enabled Capability (NNEC) utilising a Service Oriented Architecture (SOA) approach. NGIF provides an opportunity to exploit maritime geospatial data alongside other domains (i.e., air and land) to present one unified view to the NATO Warfighter.

12. AML and the Recognised Environmental Picture (REP)

The Recognised Environmental Picture is defined as a “complete and seamless depiction of geospatial, oceanographic and meteorological information designated for the planning and conduct of joint operations in a specific area at a specific time and which supports the unity of effort throughout the battle space”. Each operation will have its own designated REP, specific to the operating area. This concept seeks to provide seamless, accurate, relevant, coherent and timely environmental information for decision superiority, enabling cross system interoperability between nations and NATO.

The REP will be the complete assemblage of environmental information needed for the war fighter to plan and conduct operations. This will include all geospatial, oceanographic and meteorological data. From these data fields, only the most relevant at the time will be viewable and displayed on the NCOP or used by systems to drive a process or for command decision making. Thus, each REP will be unique, and although the products available for display may be from a standard list, that which is used for decision making depends on the situation and dynamic developments in the operation. The REP combines dynamic data with a foundation of static and quasi-static data. Data may be unmodified from geospatial or METOC sources or a fused product combining several sources of information into a new product. In the maritime domain, AML data contributes towards the REP along with ENCs, ARCS and imagery.

For every NATO led operation, a NATO Common Operational Picture (NCOP) is developed to provide NATO commanders and their staff with a shared situational awareness on which to base operational decisions during the life cycle of the crisis. This consists of a range of components including logistics, fire control, intelligence and the dynamic operational environment within a geospatial framework. The REP will be a component of the NCOP and is defined in NATO policy document MC 0632.

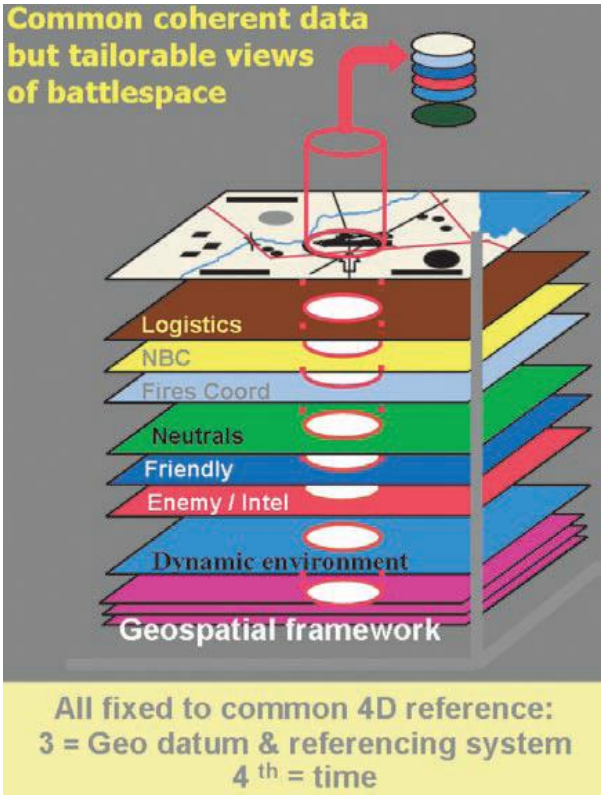


Fig. 11.0
The Common Operational Picture

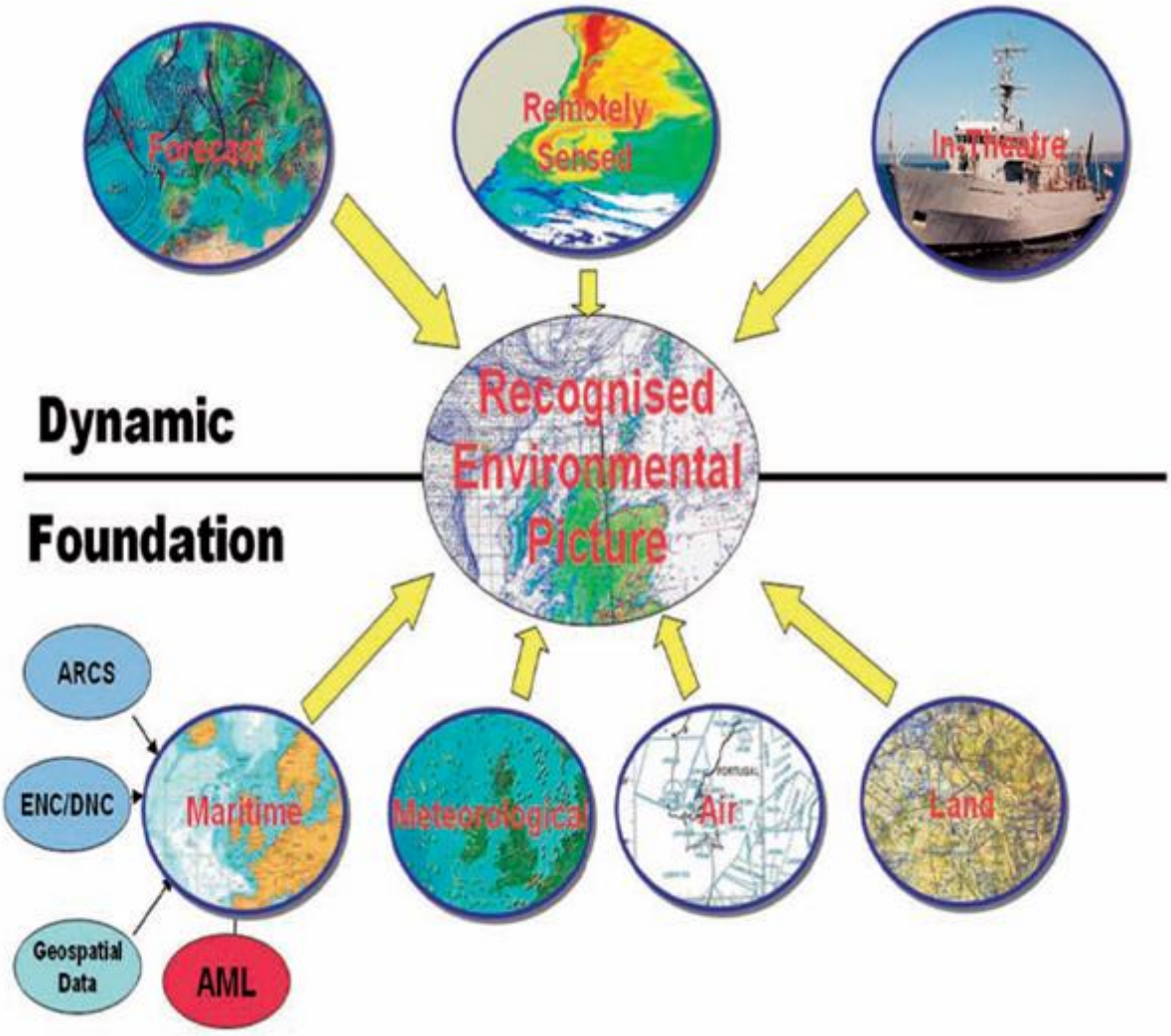


Fig. 12.0
Components of the Recognised Environmental Picture