

TRAINING ACTIVITY ON CLMS BIO-GEOPHYSICAL VARIABLES

National Geographic Institute of Spain



GEOGRAPHICAL REFERENCE INFORMATION ON HYDROGRAPHY IN SPAIN

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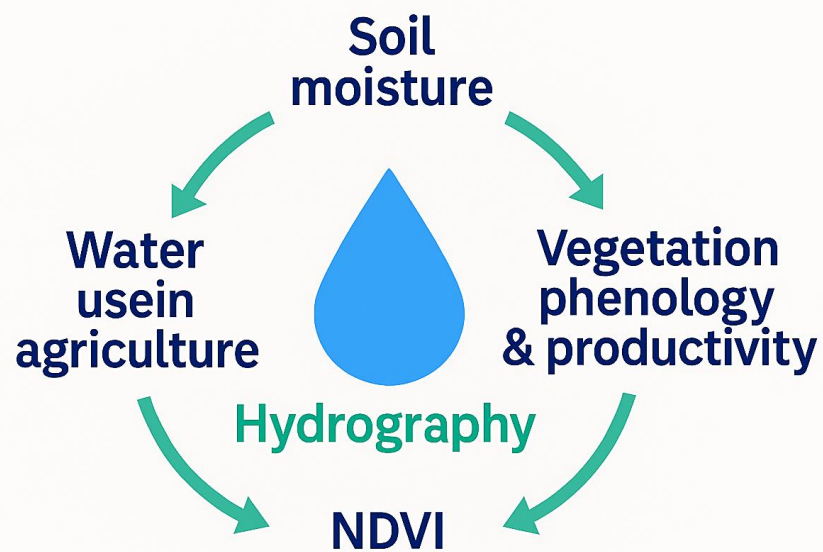
HOW TO PRODUCE A GRI HYDROGRAPHIC NETWORK?

USE CASES

GRI HI DATA ACCESS

NEW EU-HYDRO – XY ACCURACY

BIO-GEOPHYSICAL VARIABLES & HYDROGRAPHY



Water availability

Hydrography



Vegétation productivity

(Soil moisture, NDVI, ecosystem functioning)

Surface water dynamics



Land cover change

(Erosion, sediment transtporting, soil formation)

Water bodies

Flow accumulation



Climate variables

(Local humidity, evapotranspiration, energy balance)



Rivers & lakes

Biodiversity patterns



Biodiversity patterns

(Habitats, species distribution)

Hydrological regime



Biogeochemical cycles

(Carbon, nitrogen, nutrient transport)

*AI generated image

❖ WHAT IS A GRI?

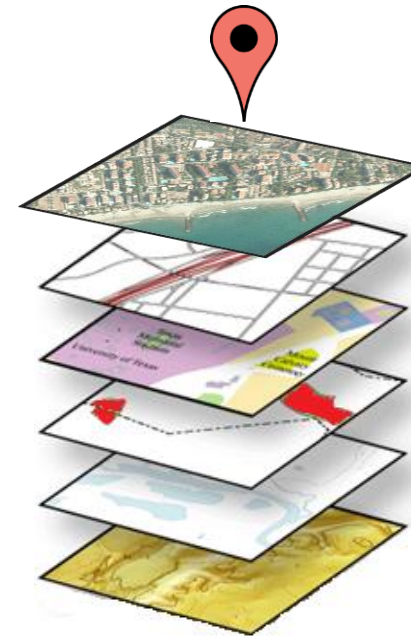
GRI: Official territorial information from which any user or application can reference their data

GRI Key Aspects:

- ✓ Provides ***precise location*** without ambiguities
- ✓ Enables **data interoperability and combination**
- ✓ Must have a clearly established **maintenance process**
- ✓ ***Official: must be produced and published by a competent authority***

GRI CORE

Basic and fundamental framework of geographic data



- Ortho images
- Transportation
- Land Cover & Use
- Settlements
- **Hydrography**
- Elevation Models

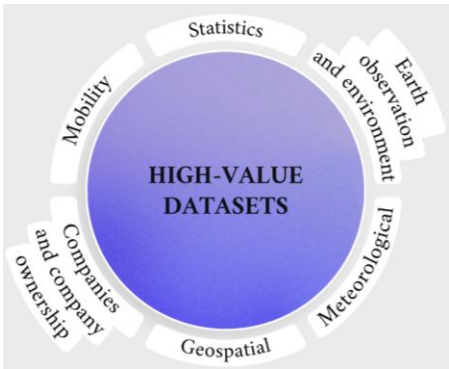
Fully Interoperable

❖ WHY TO GENERATE A GRI ON HYDROGRAPHY?

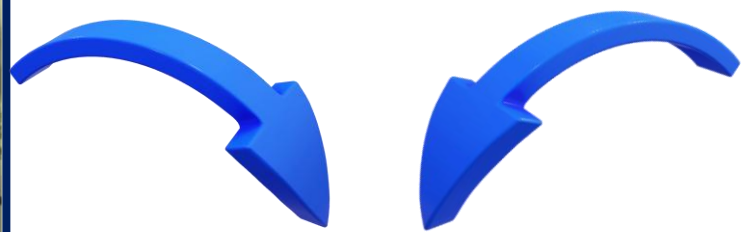
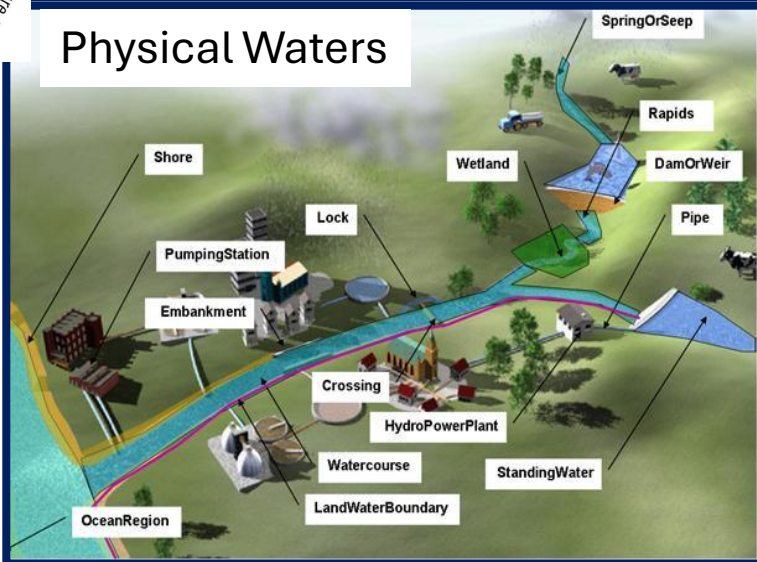
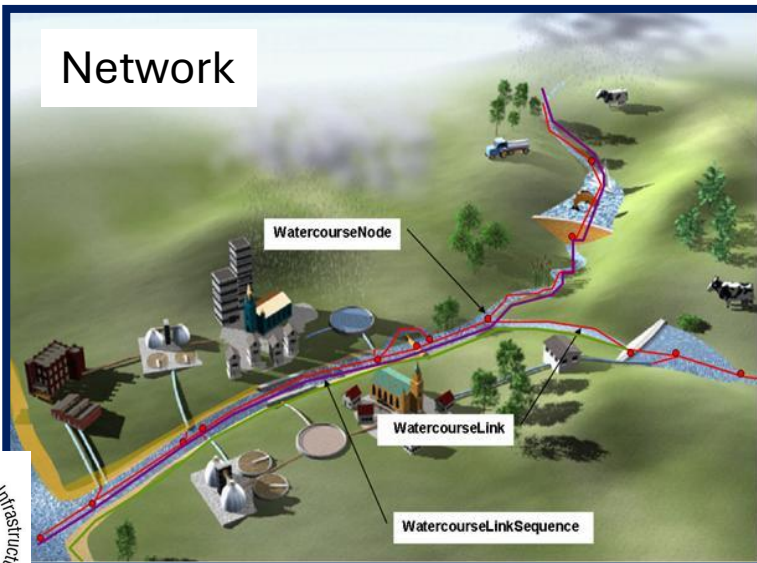
Themes most relevant to SDGs

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Addresses				*		*	*		*		*						
Bldgs and Settlements	*		*	*		*	*		*		*	*	*				
Elevation and depth	*	*	*			*	*				*		*	*	*		
Functional Areas	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Geographical Names	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Geology and Soils		*	*			*	*	*	*		*	*	*	*	*		
Land Cover/Land Use	*	*	*		*	*	*	*	*		*	*	*	*	*		
Land Parcels	*	*		*				*			*						
Orthoimagery		*				*		*			*		*	*			
Physical infrastructure			*	*		*	*		*		*						
Population distribution	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Transport Networks		*	*					*	*		*						
Water		*	*			*	*		*		*	*	*	*	*		
Global Geodetic Reference Framework		*				*	*	*	*	*	*	*	*	*	*	*	*

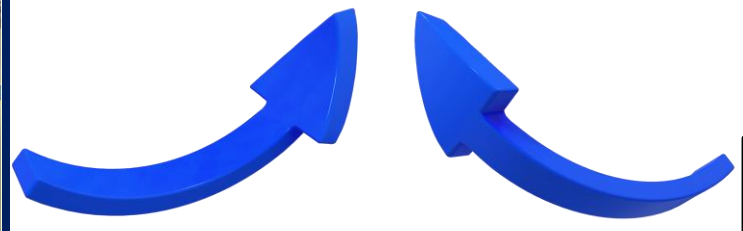
Requirements group	CEMS		CLMS			CSS			Occurrence by Theme
	Mapping	Early Warning	Local	Pan EU	Global	Border Surveillance	Maritime Surveillance	Support to External Action	
Settlements	x	x	x	x	x	x		x	7
Hydrographic network	x	x	x	x	x	x		x	7
Land cover	x	x	x	x	x	x		x	7
Digital Elevation Model	x	x	x	x	x	x		x	7
Transportation network	x	x	x	x		x		x	6
Administrative boundaries	x	x	x	x		x		x	6
Aerial Ortho-imagery	x		x	x					3
Industry and Utilities	x	x				x	x	x	5
Large scale population information	x	x						x	3
Physiography	x	x				x	x	x	5
Meteorological forecast data		x			x		x		3
Toponyms	x					x		x	3
LPIS data		x	x	x					3
Oceanographic data and forecast						x			1
Vessel Identification and tracking (LRIT, AIS, S AIS)						x	x		2
Vessel database						x	x		2
Occurrence by Service	11	11	8	8	5	12	5	10	



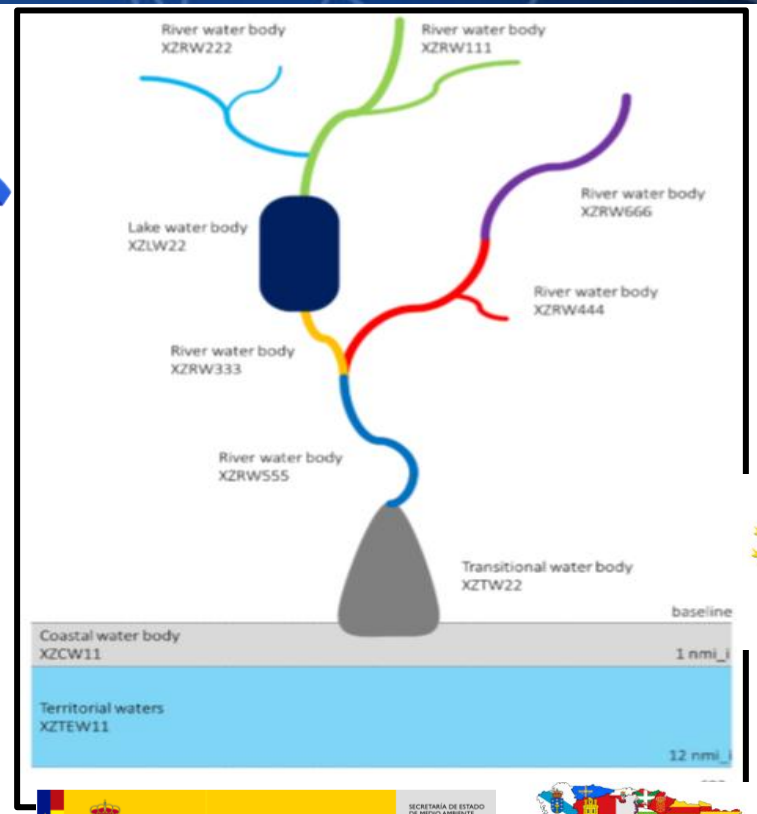
❖ HOW TO PRODUCE A GRI HYDROGRAPHIC NETWORK



GRI HYDROGRAPHY
DATA MODEL



NETWORK
SEGMENTATION



GOBIERNO DE ESPAÑA | MINISTERIO PARA LA TRANSICIÓN ECOLÓGICA Y EL RETO DEMOGRÁFICO | SECRETARÍA DE ESTADO DE MEDIO AMBIENTE | DIRECCIÓN GENERAL DEL AGUA

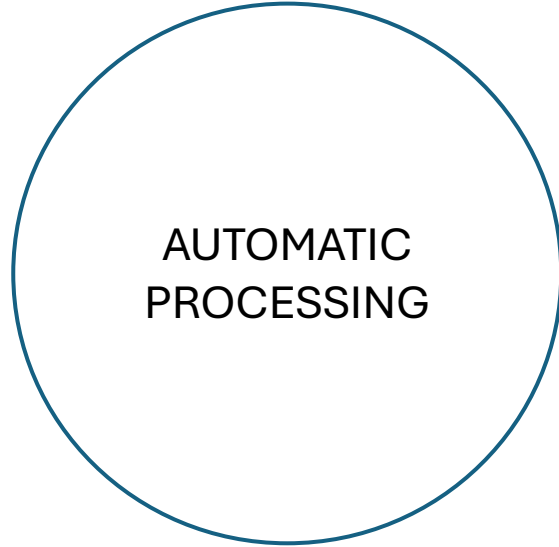
100 AÑOS | CONFEDERACIONES HIDROGRÁFICAS | 1926 - 2026

ANY OTHER USERS'
REQUIREMENTS

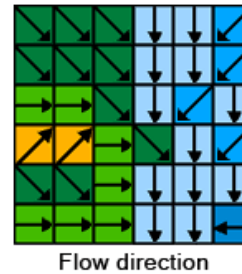
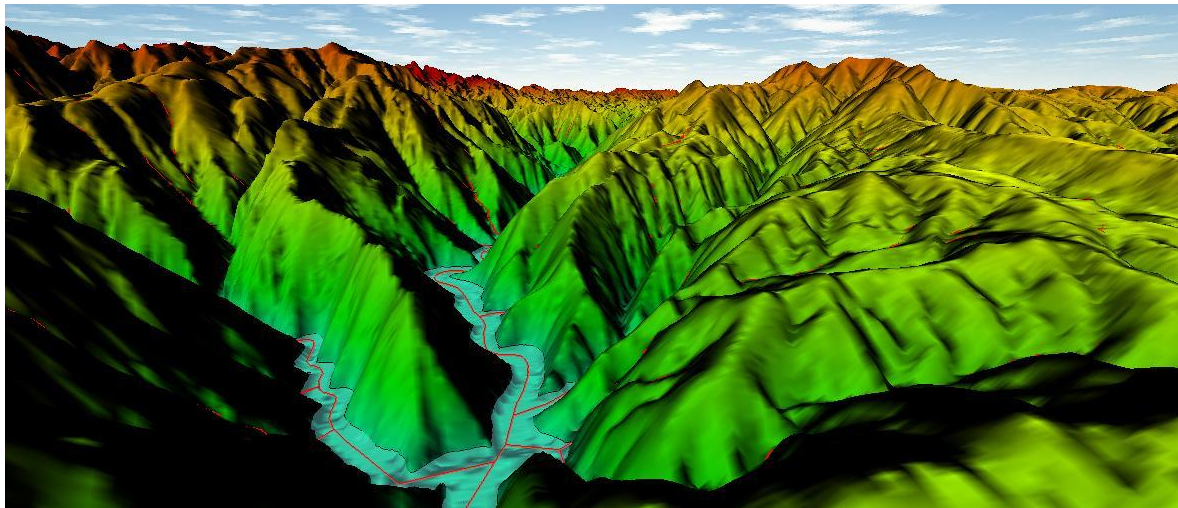
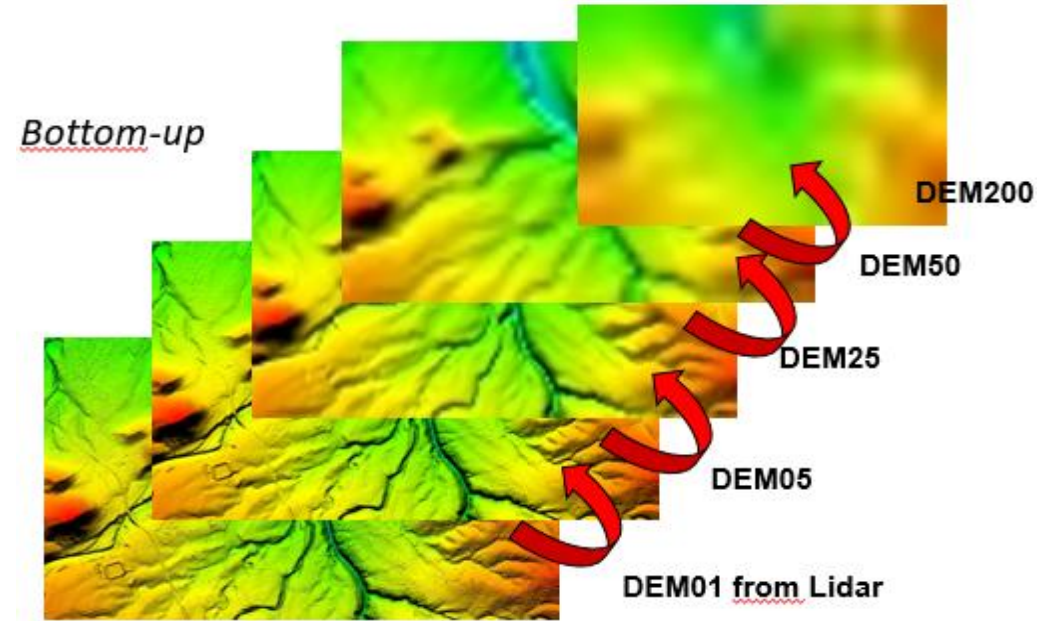
❖ HOW TO PRODUCE A GRI HYDROGRAPHIC NETWORK

DESIRED CHARACTERISTICS

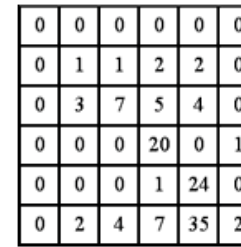
- ✓ Interoperability
- ✓ Very High Precision
- ✓ Uniqueness
- ✓ Objectivity
- ✓ Altimetric consistency
- ✓ Up to Date
- ✓ Usefulness



DTM



Flow direction

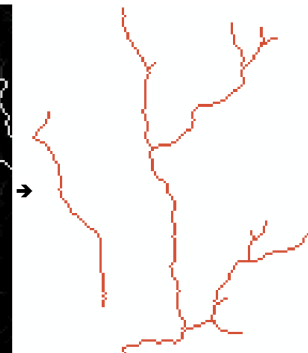
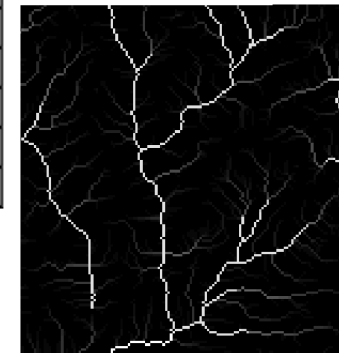


Flow accumulation



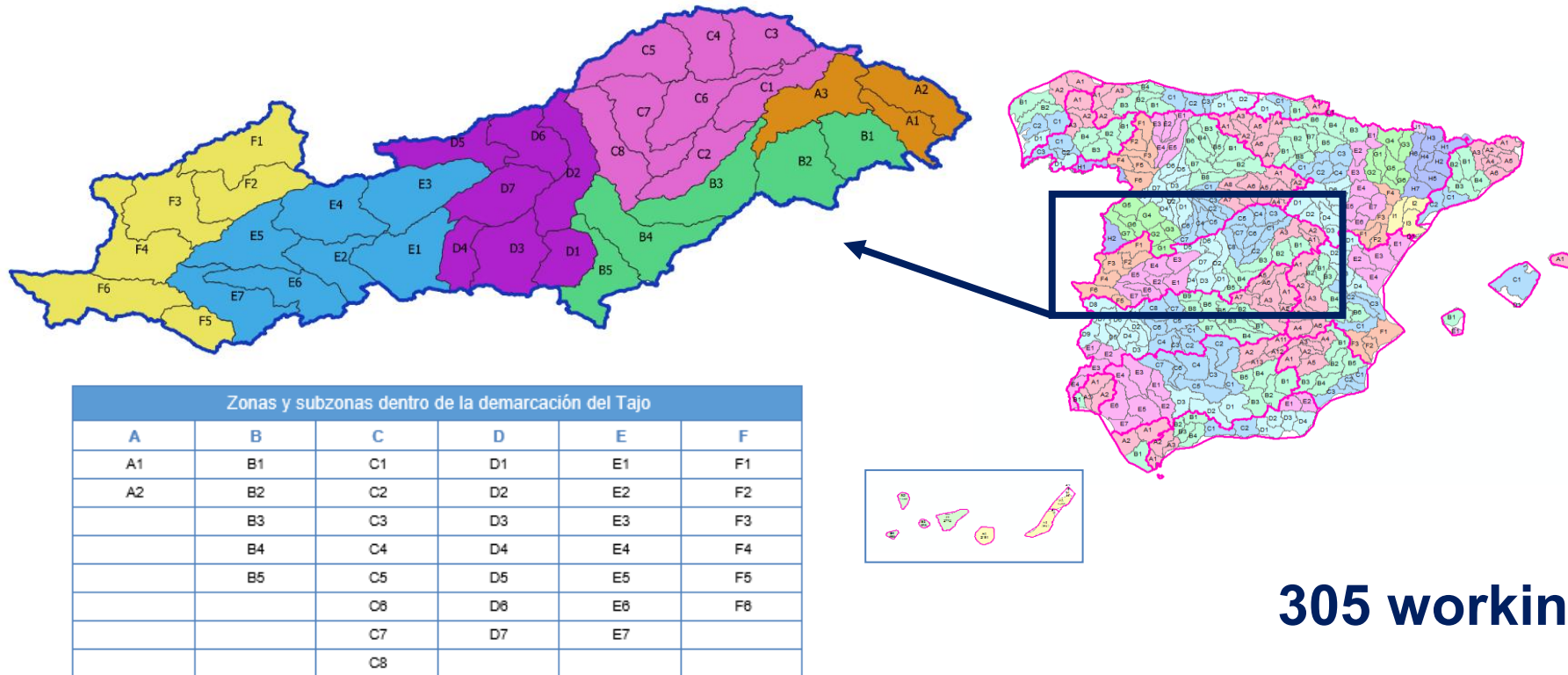
Direction coding

CEDEX
CENTRO DE ESTUDIOS
Y EXPERIMENTACIÓN
DE OBRAS PÚBLICAS



❖ HOW TO PRODUCE A GRI HYDROGRAPHIC NETWORK

① The hydrological working units are organized

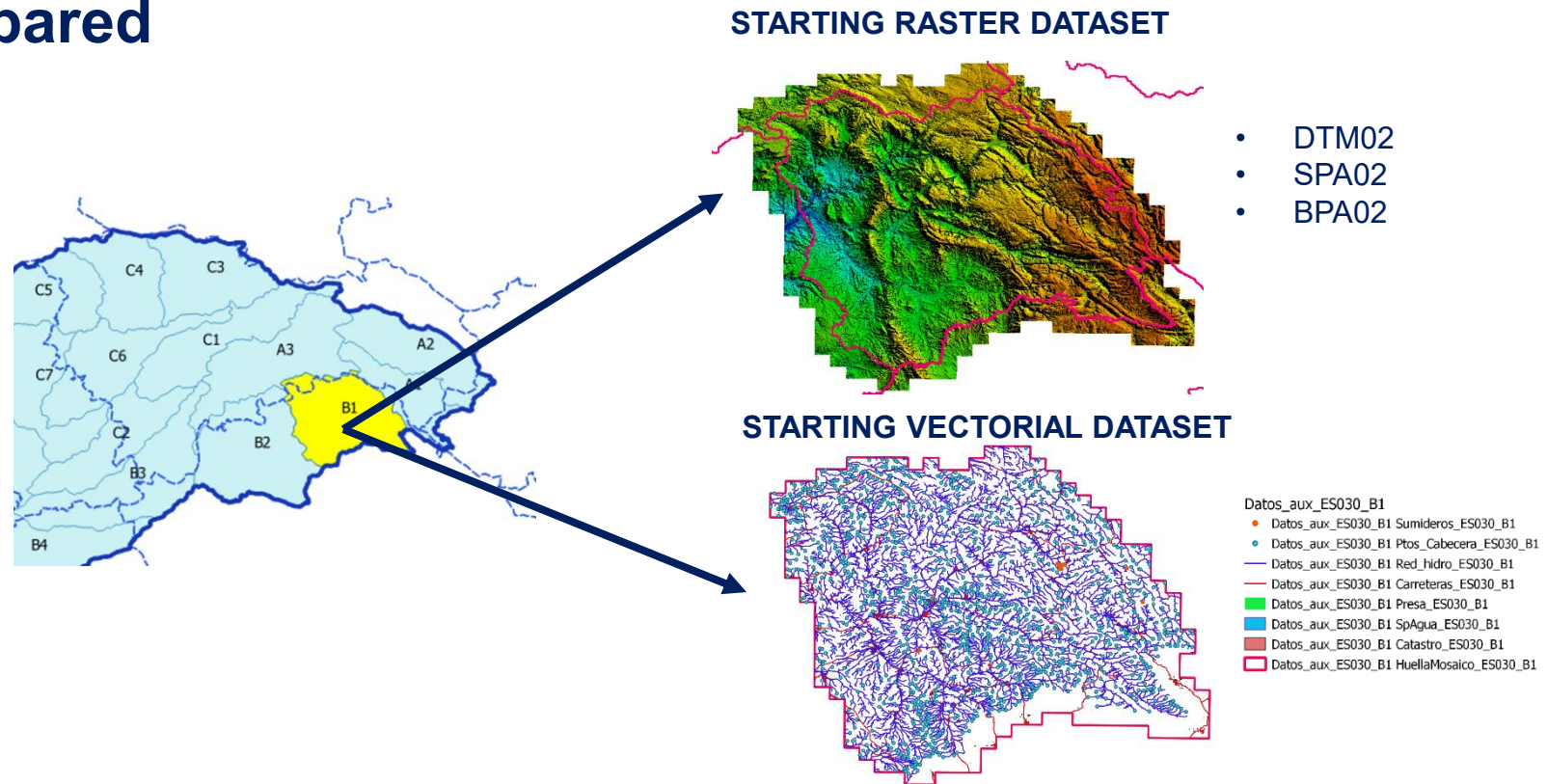


305 working units!!

❖ HOW TO PRODUCE A GRI HYDROGRAPHIC NETWORK

2

For a single working unit, the DTM mosaics and the input vector data are prepared



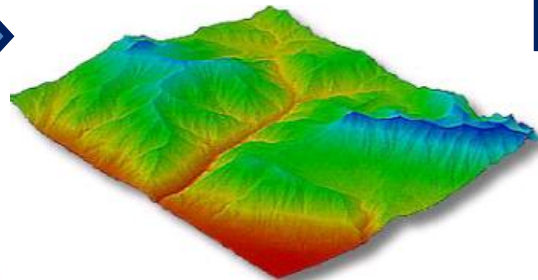
The initial hydrographic network is used to guide the production

<https://www.int-arch-photogramm-remote-sens-spatial-inf-sci.net/XLI-B8/365/2016/isprs-archives-XLI-B8-365-2016.pdf>

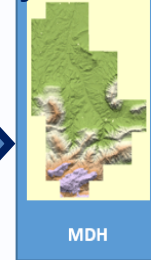
❖ HOW TO PRODUCE A GRI HYDROGRAPHIC NETWORK

③ The DTM is automatically “corrected” to obtain the Hydro DTM

Automatic “Correction” by Road Cross



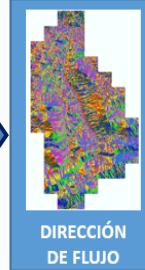
Hydro DTM



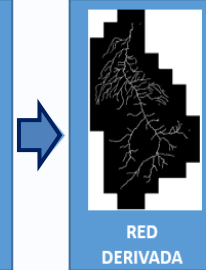
MDH

MDH

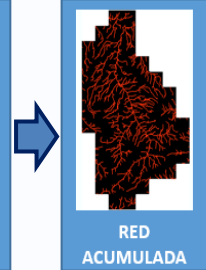
MDH



DIRECCIÓN DE FLUJO

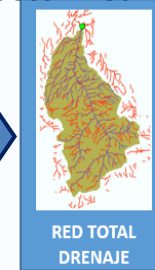


RED DERIVADA



RED ACUMULADA

Vector Network



RED TOTAL DRENAJE



④ Derivation of the Hydrographic Network



Puzzle is done joining working units → National Coverage Data Base

<https://www.int-arch-photogramm-remote-sens-spatial-inf-sci.net/XLI-B8/365/2016/isprs-archives-XLI-B8-365-2016.pdf>

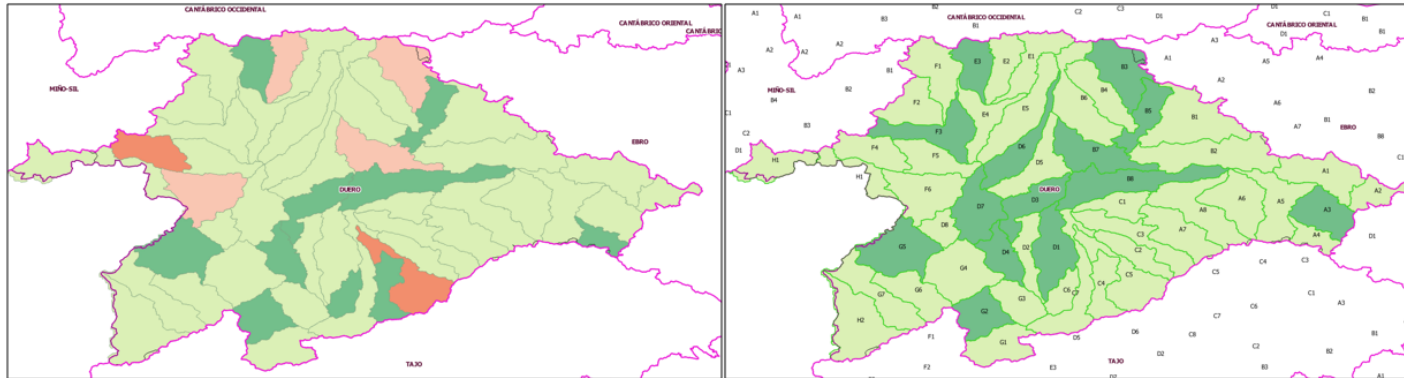
❖ HOW TO PRODUCE A GRI HYDROGRAPHIC NETWORK

5

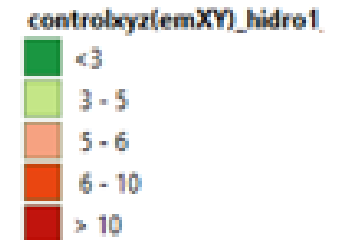
Revision, Quality Control and Validation

2018

2019



Validation of positional accuracy



- **Geometric Control:** Continuity, Downstream flow, Self-intersection, ...
- **Topology Control:** Segmentation, Overlaps, Gaps,
- **Attribute Control:** Attribute Continuity, Incoherences, ...

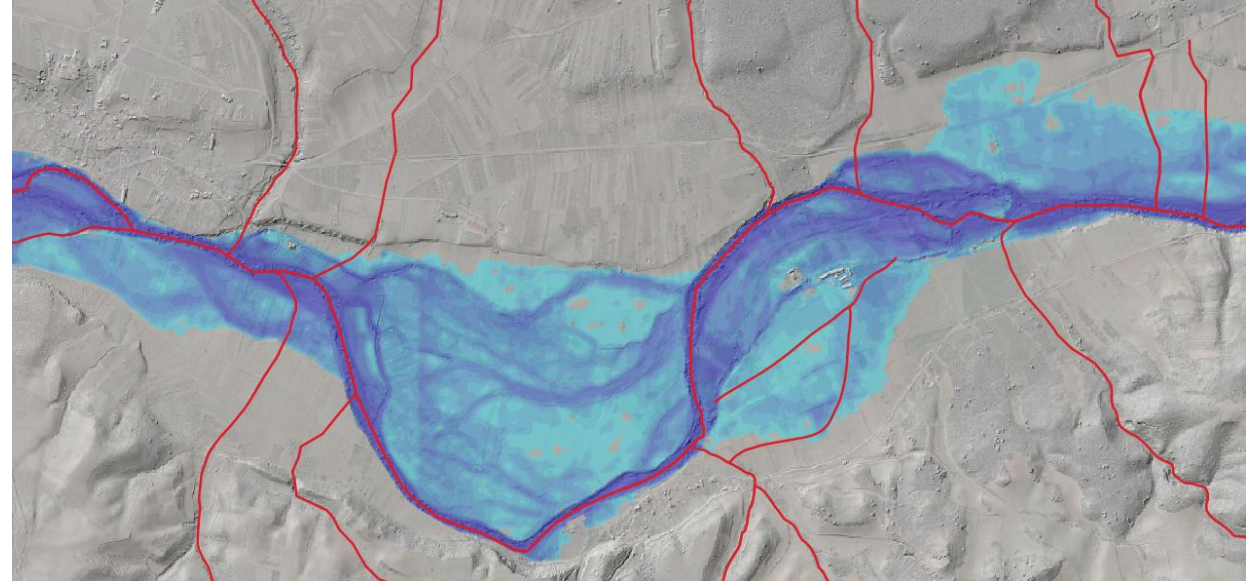
VALIDATION FROM COMPETENT AUTHORITIES:

DGA, CC.HH. , CC.AA., ...

CURRENTLY ~90.000 km of network + WFD Reservoirs and lakes

<https://www.int-arch-photogramm-remote-sens-spatial-inf-sci.net/XLI-B8/365/2016/isprs-archives-XLI-B8-365-2016.pdf>

- **Management of the WFD Water Bodies**
- **GIS analysis in relation to other information datasets**
- **Maps and official cartography**
- **Cartography of flooding hazard areas+**
- **Geolocation of hydrographic features**
- **Management of the public water domain**
- **Pressure Estimations**
- **Discharges**
- **Emergency Management**
- **Citizen Information Services**
- **Others...**



❖ NEW EU-HYDRO – XY ACCURACY



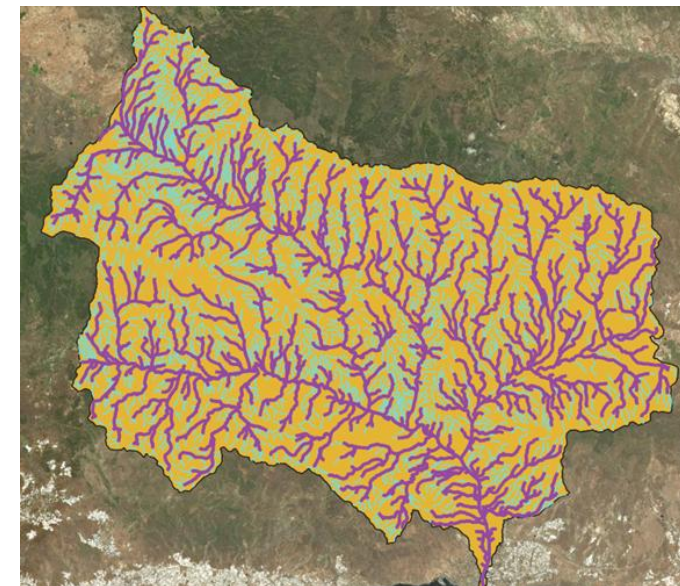
EU-Hydro



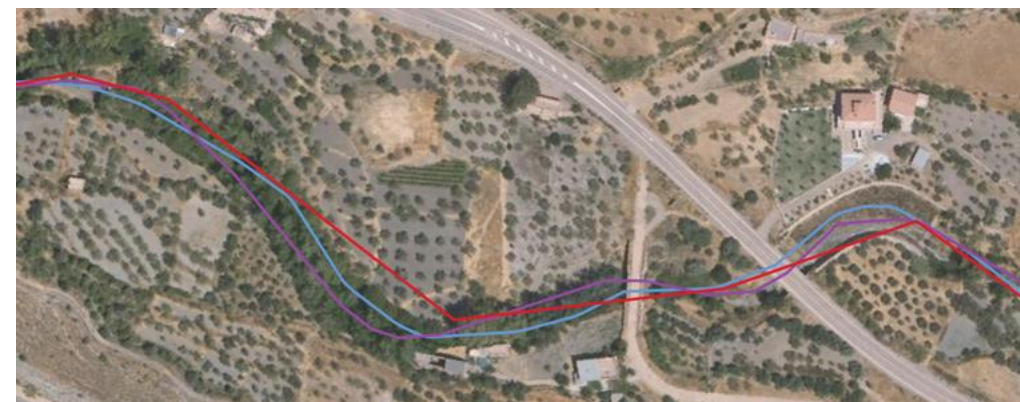
XY ACCURACY TEST

SIMILAR METHODOLOGY AS GRI HI

**TEST CATCHMENT AREA AT SPAIN
PRELIMINARY RESULTS
D2&D3 WU**



HYDROGRAPHIC NETWORK	WU D2 Em_{xy} (m)	WU D3 Em_{xy} (m)
NEW EU-Hydro	7.75	7.63
EU-Hydro	8.32	17.53
GRI HI v1	3.31	2.58





**GRI-HIDROGRAPHY
THANK YOU FOR YOUR
ATTENDANCE**

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