GOBIERNO DE ESPAÑA
VICEPRESIDENCIA CUARTA DEL GOBIERNO
MINISTERIO PARA LA TRANSICIÓN ECOLÓGICA Y EL RETO DEMOGRÁFICO
ESPAÑA PUEDE.

Water and Environment Support
in the ENI Southern Neighbourhood region

Regional training on Water Accounting / RW-2-REG

Water balances in Spain: Experiences using Water Accounting

14/10/2020, online

Presented by: Conchita Marcuello, Spanish Water Directorate General

LDK Consultants Engineers & Planners SA

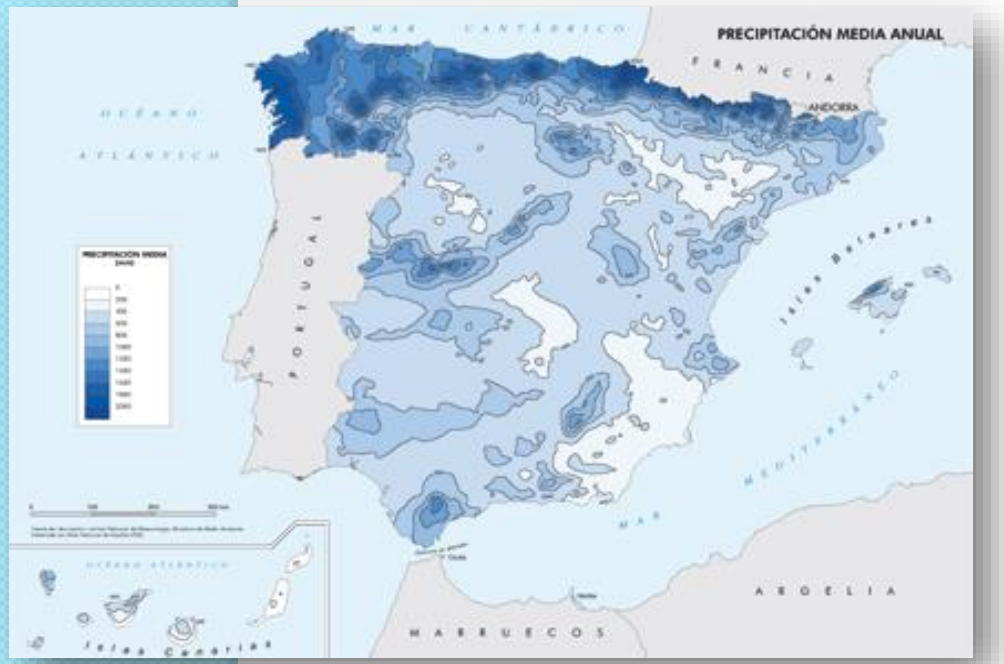
This Project is funded by the European Union

Some facts and figures:

Surface area: 504.000 km2

Mean annual precipitation ~ 650mm

Vol Reservoirs: 55.622 hm3 (42% hydropower)



Complex institutional settings

Well-based legislative body (complex?)

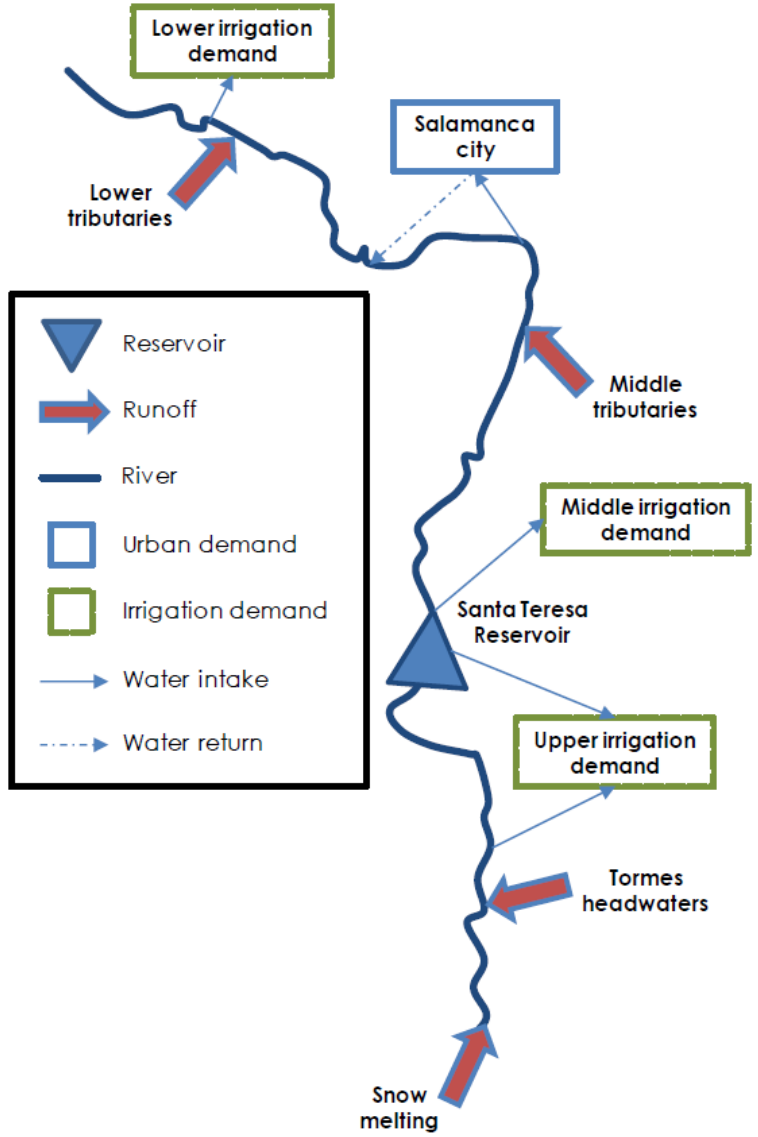
Water law: 1879 -> 1985 -> 2001 (current)

RDL 1/2001 and by-laws: fully transposes EU WFD principles

RBMPs (every six years): Quantity (exploitation systems) + Environmental Objectives (water body level) + Programme of Measures

RBMPS:
Water balance -> allocation for uses

Demarcación Hidrográfica	Asignaciones de recursos recogidas en los planes hidrológicos (hm³/año)			
	Uso urbano	Uso agrario	Uso industrial	TOTAL
COR	226,92	2,33	36,12	265,37
COC	246,54	64,36	173,28	484,18
GAL	222,30	30,59	84,91	337,81
MIÑ	97,96	195,66	11,47	305,09
DUE	405,53	3.422,98	152,74	3.981,25
TAJ	994,03	1.911,53	96,26	3.001,82
GDN	254,21	2.022,20	82,15	2.358,56
TOP	55,99	359,17	52,69	467,85
GDQ	398,65	3.126,61	66,55	3.591,81
GYB	117,33	287,85	8,58	413,76
CMA	278,74	770,49	50,79	1.100,02
SEG	288,20	1.231,20	0,00	1.519,40
JUC	319,10	1.928,70	43,20	2.291,00
EBR	614,05	7.678,54	85,40	8.377,99
CAT	530,50	377,30	100,00	1.007,80
BAL	106,20	45,46	51,12	202,77
MEL	4,74	0,00	0,00	4,74
CEU	2,95	0,00	0,00	2,95
CAN (*)	214,20	210,73	30,27	455,20
SUMA:	**5.378,15**	**23.665,70**	**1.125,53**	**30.169,38**



Balance -> Natural inflows (natural water resources assessment) / Demands y Returns / Reuse / Envir. objectives/ Restrictions: Env Flows

AQUATOOL System (WEAP-type): Reliability supply criteria for all uses (simulation mode)

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Water balance -> allocation for uses

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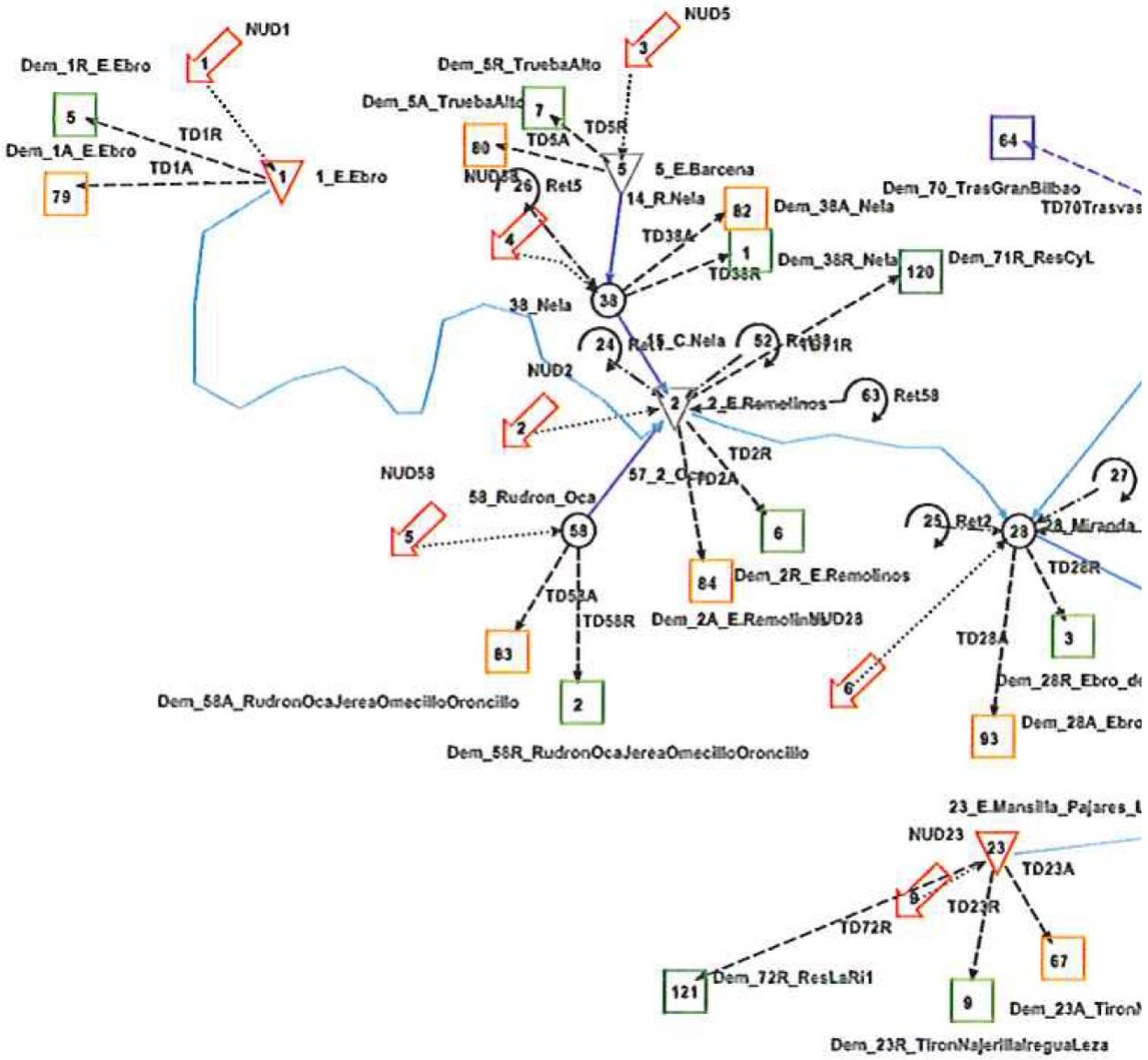

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objectives/ Restrictions: Env Flows
AQUATOOL System (WEAP-type)

RBMPS:
Water balance

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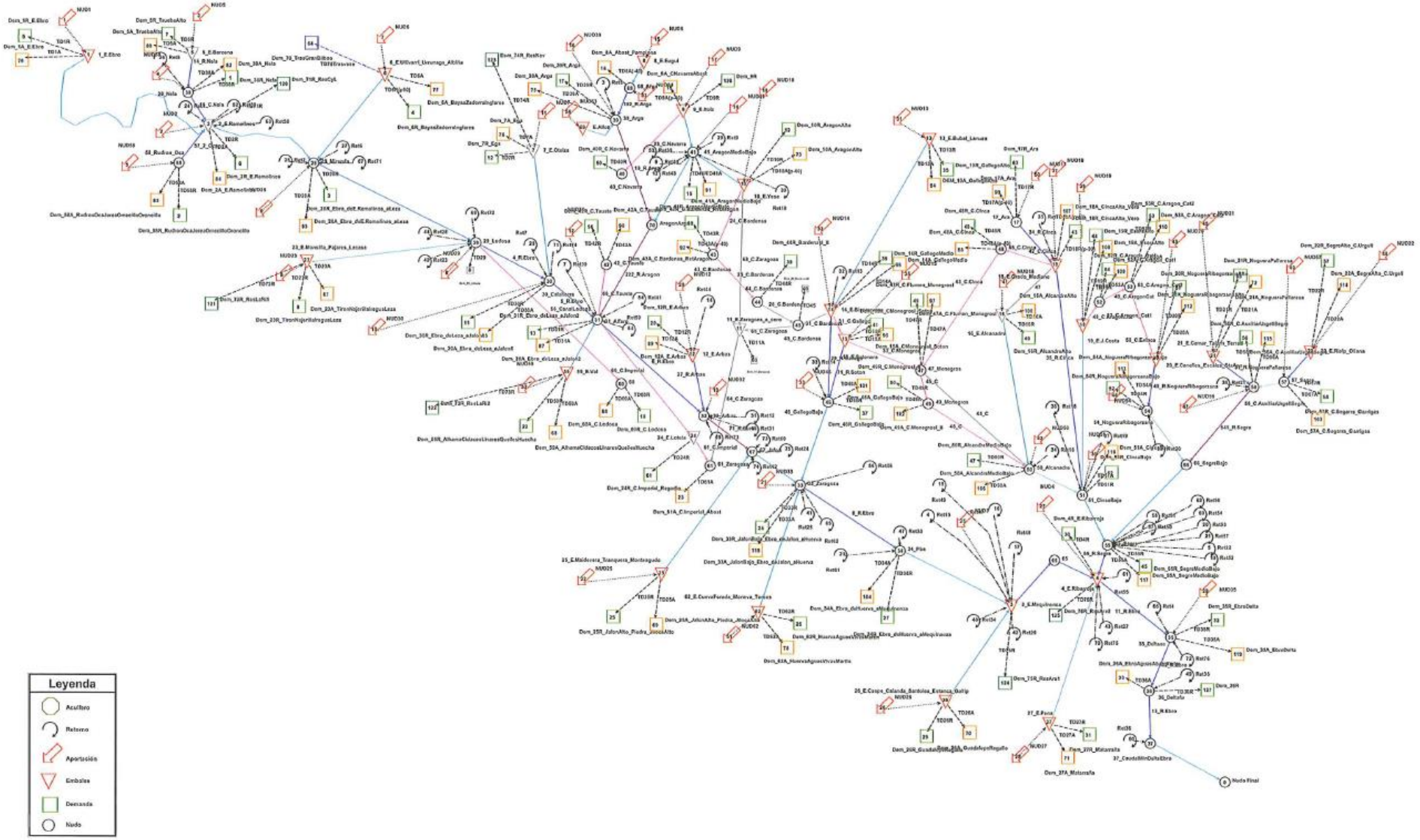

RBMPS:
Water balance -> allocation for uses

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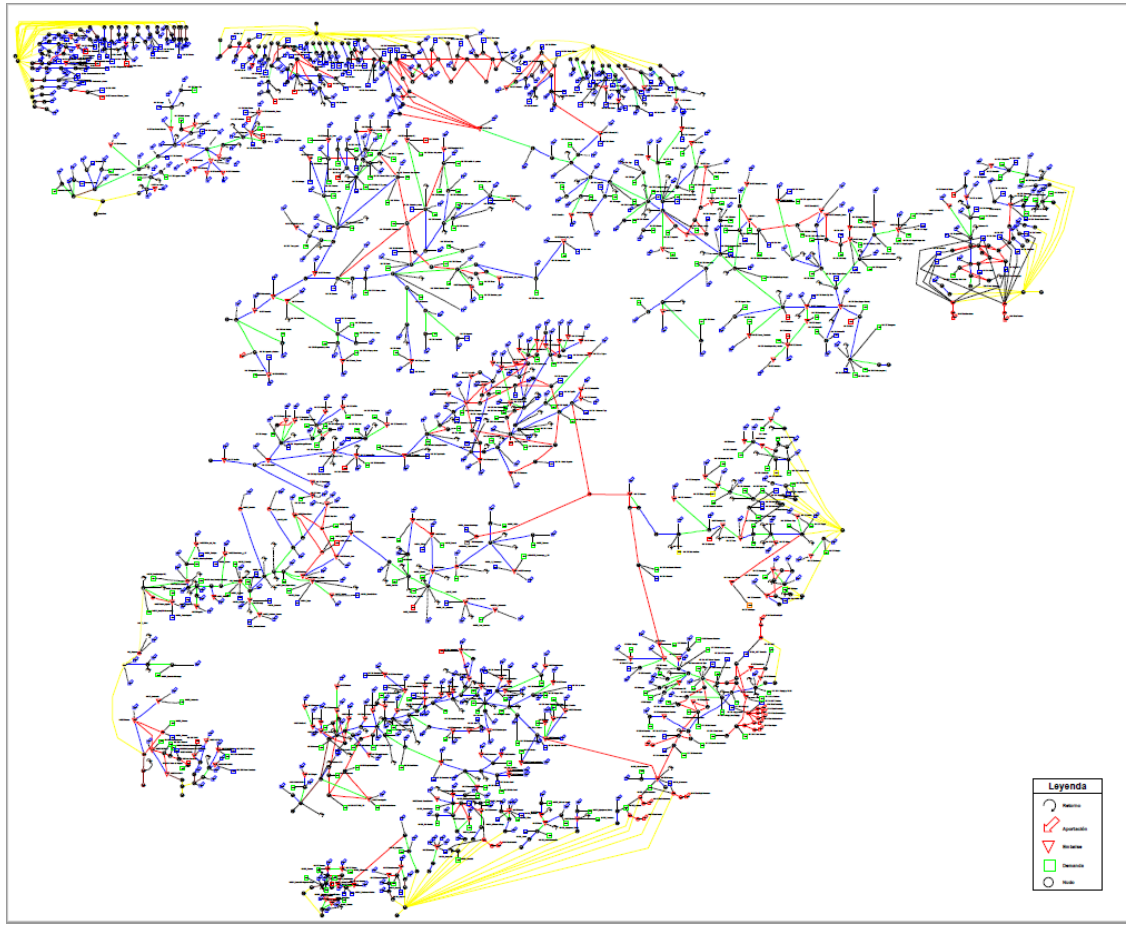

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AQUATOOL System (WEAP-type): Reliability supply criteria for all uses (simulation mode)

SEEA-Water: Practical examples

* Use of the RBMP water balances for implementing water accounting
* Water accounting for computing indicators: WEI+

Use of the RBMP water balances for implementing water accounting

EU Commission´s Water balances and water resources management targets

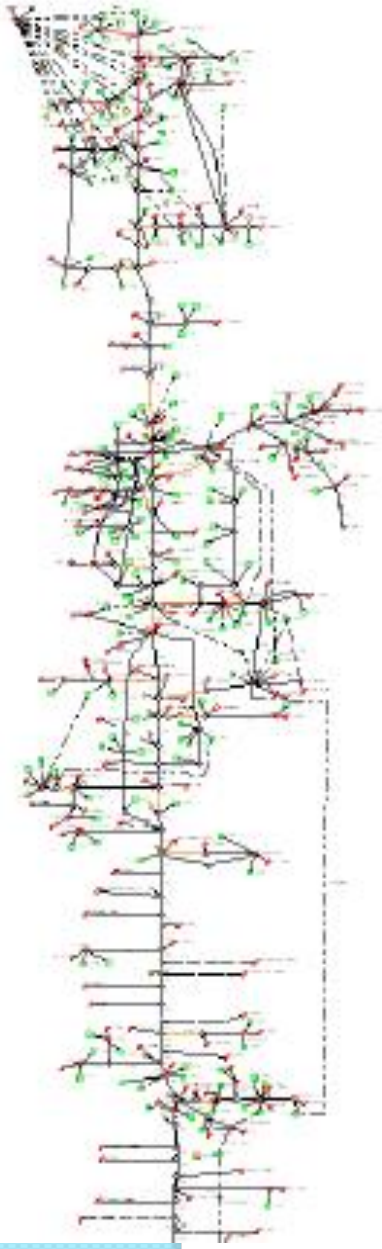
To establish some common ground on the development of water accounts, a drafting group was created on 2014 with MS and stakeholder representatives within the Common Implementation Strategy (CIS) of the Water Framework Directive (WFD). The group produced a Guidance on Water Balances.

The group also acknowledged the conclusions of seven projects funded by EU Commission on the building of water balances at the local level. Six out of these projects were developed in Spanish river basins, and one in the Arno basin in Italy.

The Commission awarded **7 beneficiaries** and the following projects received financing:

- New developments in Water Accounts Implementation in Guadiana river basin (GUASEEAW+)
- Accounting System for the Segura River and Transfers (ASSET)
- Duero River Basin: Water resources, water accounts and target sustainability indices (DURERO)
- Pilot Arno Water accounts (PAWA)
- System of Water Accounting in the Guadalquivir River Basin (SYWAG)
- Water accounting in a multi-catchment district in Mediterranean Andalusian basins (WAMCD)
- Water balances in the Tagus River Basin (PROTAGUS)

Guadiana basin hydraulic scheme



Basin water resources balance in altered flow regime

Intermediate inflows

Demands

Consumptive

Urban

Agricultural

Non Consumptive

Fish farms

Hydroelectric power station

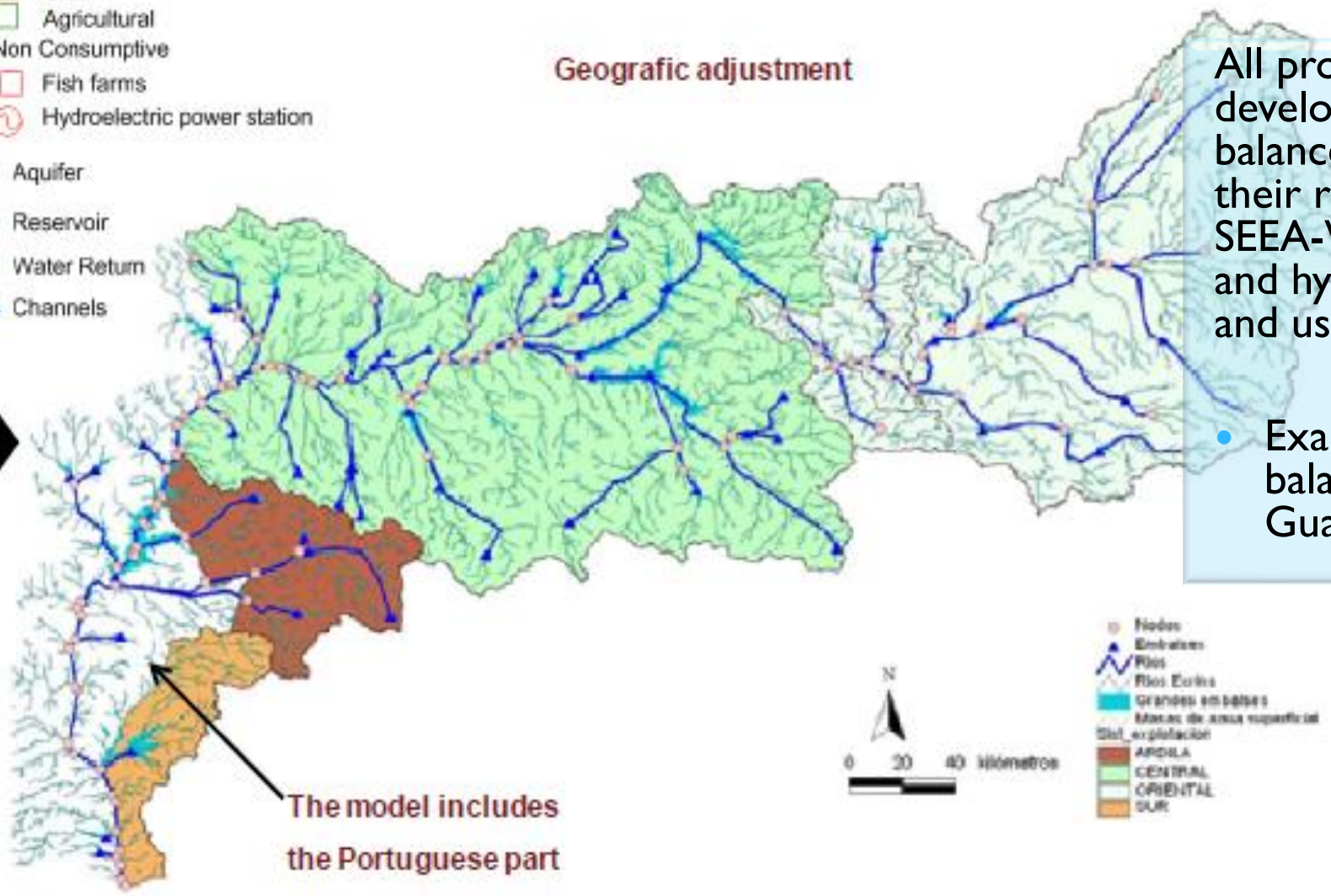
Aquifer

Reservoir

Water Return

Channels

Geografic adjustment

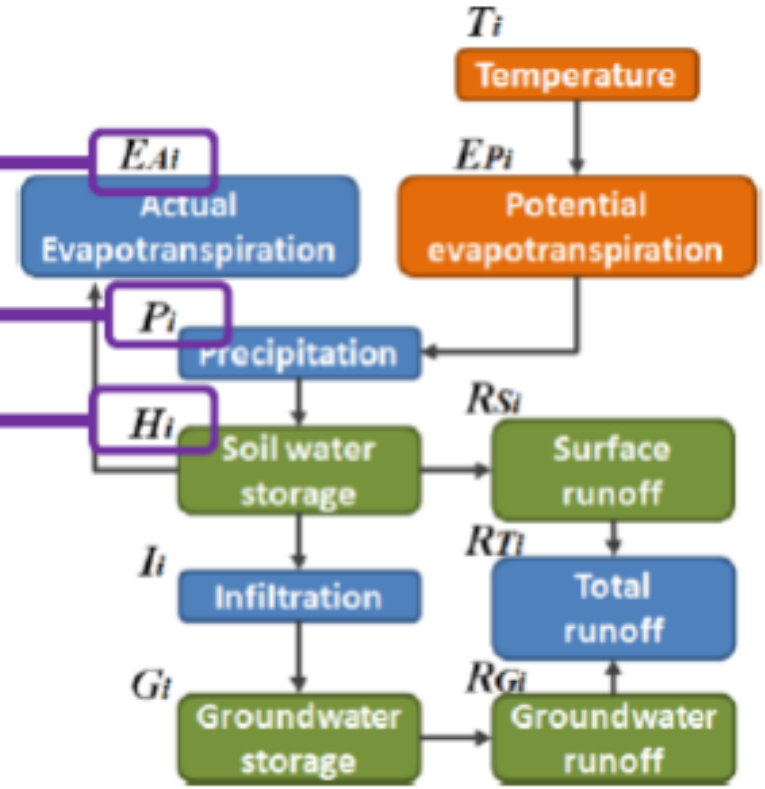


All projects developed water balances, translated their results into SEEA-Water asset and hybrid supply and use tables.

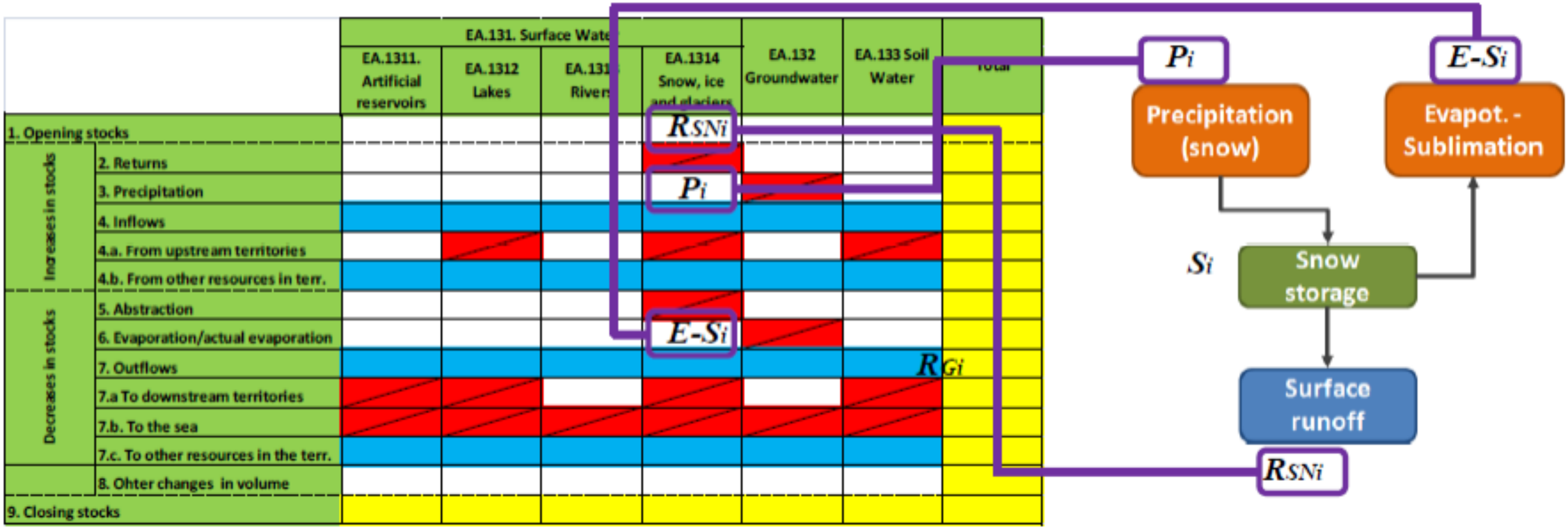
- Example of water balance for the Guadiana project

Population of Table VI.I – hydrological variables
Source: Project for the Duero basin

		EA.131. Surface Water				EA.132 Groundwater	EA.133 Soil Water	Total
		EA.1311. Artificial reservoirs	EA.1312 Lakes	EA.1313 Rivers	EA.1314 Snow, ice and glaciers			
1. Opening stocks							H_i	
Increases in stocks	2. Returns							
	3. Precipitation						P_i	
	4. Inflows							
	4.a. From upstream territories							
	4.b. From other resources in terr.							
Decreases in stocks	5. Abstraction							
	6. Evaporation/actual evaporation						E_{Ai}	
	7. Outflows							
	7.a To downstream territories							
	7.b. To the sea							
	7.c. To other resources in the terr.							
	8. Ohter changes in volume							
9. Closing stocks								

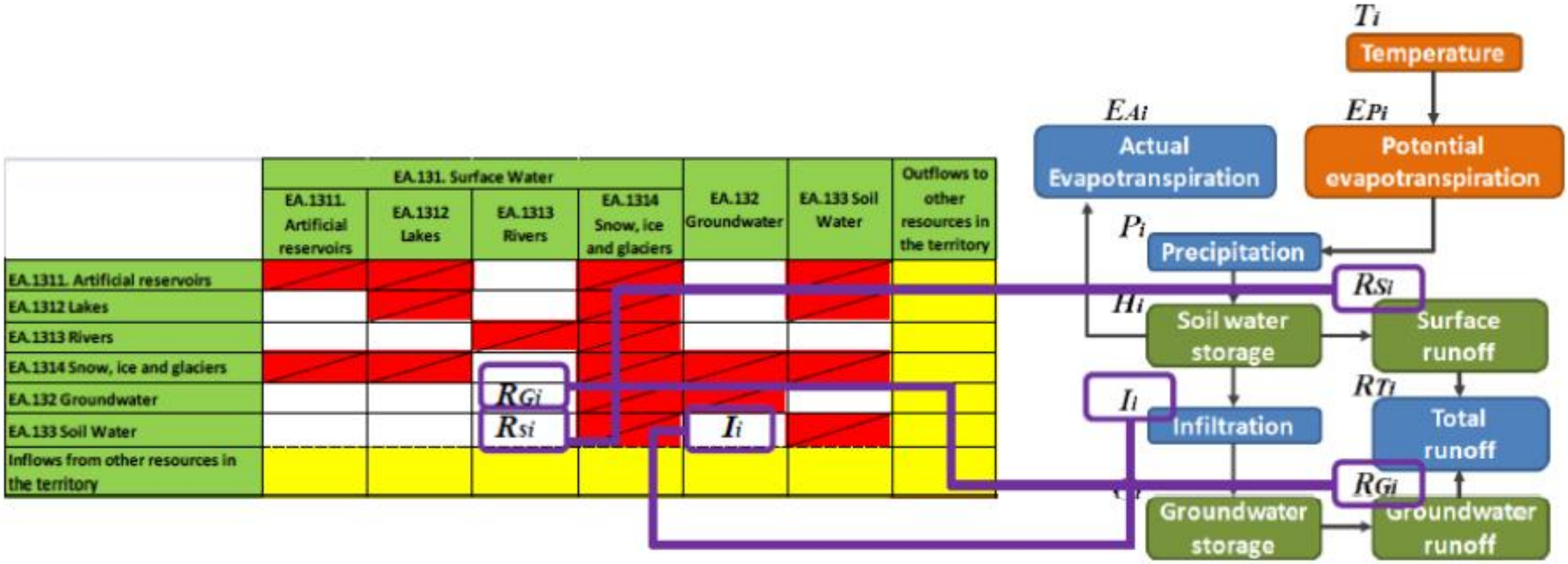


Population of Table VI.I – hydrological variables (snow)
Source: Project for the Duero basin



Population of Table VI.II – hydrological variables
Source: Project for the Duero basin

	EA.131. Surface Water				EA.132 Groundwater	EA.133 Soil Water	Outflows to other resources in the territory
	EA.1311. Artificial reservoirs	EA.1312 Lakes	EA.1313 Rivers	EA.1314 Snow, ice and glaciers			
EA.1311. Artificial reservoirs							
EA.1312 Lakes							
EA.1313 Rivers							
EA.1314 Snow, ice and glaciers							
EA.132 Groundwater			R_{Gi}				
EA.133 Soil Water			R_{si}		I_i		
Inflows from other resources in the territory							



Physical use and supply tables
Project for the Mediterranean Andalusian Basins

Table III.1. Standard physical supply and use tables for water

A. Physical use table (millions of cubic metres)		Industries (by ISIC categories)							Households	Rest of the world	Total
		1-3	5-33, 41-43	35	36	37	38,39, 45-99	Total			
From the environment	1. Total abstraction (1.a+ 1.b = 1.i+ 1.ii)	4.193,61	3,63	2.996,78	385,32	169,34	19,42	**7.768,10**	8,32		**7.776,42**
	1.a. Abstraction for own use	4.193,61	3,63	2.996,78	10,82	169,34	19,42	**7.393,60**	8,32		**7.401,92**
	1.b. Abstraction for distribution	0,00	0,00	0,00	374,50	0,00	0,00	**374,50**	0,00		**374,50**
	1.i. From inland water resources:	4.172,92	2,87	947,12	362,74	169,34	19,42	**5.674,41**	8,32		**5.682,73**
	1.i.1 Surface water	*386,10*	*0,00*	*947,12*	*228,07*	*169,34*	*1,11*	**1.731,74**	*1,69*		***1.733,43***
	1.i.2 Groundwater	*377,79*	*2,87*	*0,00*	*134,67*	*0,00*	*18,31*	**533,64**	*6,63*		***540,27***
	1.i.3 Soil water	*3.409,03*	*0,00*	*0,00*	*0,00*	*0,00*	*0,00*	**3.409,03**	*0,00*		***3.409,03***
	1.ii. Collection of precipitation	20,68	0,00	0,00	0,00	0,00	0,00	**20,68**	0,00		**20,68**
	1.iii. Abstraction from the sea	0,00	0,76	2.049,66	22,59	0,00	0,00	**2.073,01**	0,00		**2.073,01**
Within the economy	2. Use of water received from other economic units	59,67	36,80	6,86	17,89	198,58	61,52	**381,31**	184,60	33,14	**599,05**
	of which:										
	2.a. Reused water	*11,73*	*0,00*	*5,29*	*0,00*	*0,00*	*9,10*	**26,12**	*0,00*	*0,00*	**26,12**
	2.b. Wastewater to sewerage	*0,00*	*0,00*	*0,00*	*0,00*	*198,58*	*0,00*	**198,58**	*0,00*	*0,00*	**198,58**
3. Total use of water (= 1 + 2)		**4.253,27**	**40,43**	**3.003,65**	**403,21**	**367,92**	**80,94**	**8.149,41**	**192,92**	**33,14**	**8.375,47**

B. Physical supply table (millions of cubic metres)		Industries (by ISIC categories)							Households	Rest of the world	Total
		1-3	5-33, 41-43	35	36	37	38,39, 45-99	Total			
Within the economy	4. Supply of water to other economic units	0,00	14,37	0,00	339,84	26,12	38,45	**418,77**	137,60	42,68	**599,05**
	of which:										
	4.a. Reused water	*0,00*	*0,00*	*0,00*	*6,10*	*20,02*	*0,00*	***26,12***	*0,00*	*0,00*	***26,12***
	4.b. Wastewater to sewerage	*0,00*	*14,37*	*0,00*	*8,17*	*0,00*	*38,45*	***60,99***	*137,60*	*0,00*	***198,58***
To the environment	5. Total returns (= 5.a + 5.b)	232,55	16,57	2.595,98	60,99	341,80	9,25	**3.257,14**	7,48		**3.264,62**
	5.a. To inland water resources (= 5.a.1 + 5.a.2 + 5.a.3)	225,74	1,04	947,14	60,99	69,70	8,54	**1.313,14**	7,48		**1.320,63**
	5.a.1. Surface water	*50,60*	*1,00*	*947,14*	*9,46*	*69,70*	*0,56*	***1.078,46***	*1,22*		***1.079,67***
	5.a.2. Groundwater	*39,04*	*0,01*	*0,00*	*14,06*	*0,00*	*2,21*	***55,32***	*1,80*		***57,12***
	5.a.3. Soil water	*136,09*	*0,03*	*0,00*	*37,47*	*0,00*	*5,78*	***179,37***	*4,46*		***183,83***
	5.b. To other sources (e.g. sea water)	*6,81*	*15,53*	*1.648,85*	*0,00*	*272,10*	*0,71*	***1.943,99***	*0,00*		***1.943,99***
6. Total supply of water (= 4 + 5)		232,55	30,94	2.595,98	400,83	367,92	47,70	**3.675,91**	145,08	42,68	**3.863,67**
7. Conssumption (= 3 - 6)		4.020,73	9,48	407,67	2,38	0,00	33,24	**4.473,50**	47,84	-9,54	**4.511,80**

Common issues so far:

- SEEA-Water is "**accountability**" -> Meaning that each item needs be clearly defined, with clear metadata and disaggregation methodology.
- Items from differing areas must be **comparable**
- Requires modelling for water balance
- Data disaggregation should be useful at river basin scale: Env data vs. Econ. data
- Indicators can be easily derived from tables, all of them having the same meaning for everyone

- *SEEA-Water Tables help to have common understanding of water resources management and decision taking.*

Using the tables: Common understanding of indicators
Project for the Mediterranean Andalusian Basins

	2009	2015	2021	Units	From	Comments
A) Water resource availability						
A1. Renewable resources	1,660.49	1,681.05	1,660.49	hm^3/year	Table VI.1	From WEI+Definition (7. Outflows + 5. Abstraction - 2. Returns + 1. Opening Stocks [EA.1311 Artificial Reservoirs] - 9. Closing Stocks [EA.1311 Artificial Reservoirs]. Soil water not accounted for.
A2. Percapita renewable resources	636.26	607.14	579.81	m^3/res.year	Table VI.1	(A1-a + A1-b) / Population (residents)
A3: Consumption index	56.70%	56.63%	57.18%	dimensionless	Table III-3 & Table VI.1	Equivalent to WEI+ Rain fed agriculture and forestry as well as direct abstraction of irrigated agriculture from soil are not accounted for. Transfers from the rest of the world not included.
A4: Exploitation Index	114.59%	113.97%	116.13%	dimensionless	Table III-3 & Table VI.1	Abstractions / Renewable resources Includes abstraction for non-consumptive uses
A5: Use of renewable vs. non-renewable water resources	34.48%	34.04%	19.60%	dimensionless	Auxiliary Table	Overexploitation / Sustainable exploitation. Not directly extracted from SEEAW but from intermediate elaborations (GW balances) [e-flows (eventually not met) are not considered]
B) Water use for human activities						
B1-a: Water use per unit produced. ISIC I-3	1.24	1.30	1.28	m^3/€	Table III-3 & Table V.1	Water use [III-3] / Total output at basic prices [V-1]. ISIC 1-3 has been segregated to avoid its distorting effect overall.
B1-b: Water use per unit produced. (rest of human activity)	0.04	0.04	0.04	m^3/€	Table III-3 & Table V.1	Water use [III-3] / Total output at basic prices [V-1]
B2-a: Water Productivity Ratio. ISIC I-3	0.81	0.77	0.78	€/m^3	Table III-3 & Table V.1	Recirpocal ratio of B1-a
B2-b: Water Productivity Ratio. (rest of human activity)	26.69	26.48	26.13	€/m^3	Table III-3 & Table V.1	Recirpocal ratio of B1-b
B3: Water pollution per person		53.371	54.692	Kg COD/res.year	Table IV-2	Only ISIC 37. Includes connected activities
B5: Decontamination ratio		79.73%	83.76%	dimensionless	Table IV-2	Only ISIC 37

Example WEI+ indicator for water-stress:

WEI+ = Abstraction – Returns / Outflows + Abstraction – Returns + Δ Artificial Storage

SEEA-Water in the mid-term

It is an essential part of the UN Environmental Accounts

Increasing pressure for introducing natural capital accounting into the national economic accounts

Water Accounts must be part of the natural capital accounting