



UNECE

Statistics on water abstraction and water use

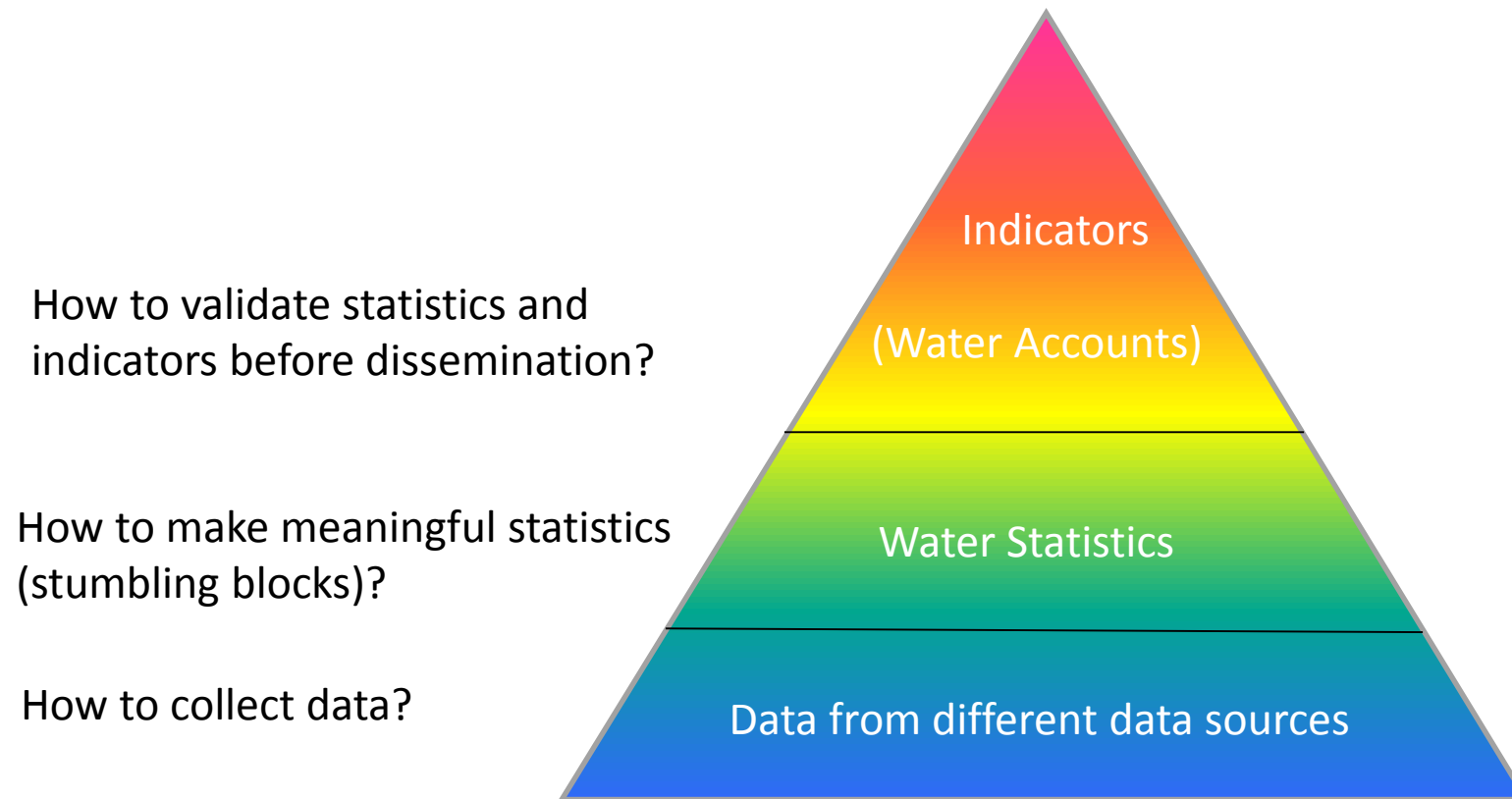
Data sources, stumbling blocks and simple data validation techniques

Michael Nagy (UNECE)

National Workshop on Shared Environmental Information Systems (SEIS) and Environmental Statistics for the Sustainable Development Goals (SDGs)

(Dushanbe, Republic of Tajikistan, 16-18 October 2017)

Presentation Outline



1. Data Collection

Example from SPAIN

See http://www.ine.es/en/inebmenu/mnu_medioambiente_en.htm

A. Annual survey on water supply and sewerage

- All units classified in NACE Divisions 36 or 37, excluding irrigation communities, for cities > 15 000 inhabitants
- Remaining units: sample
- Total coverage of about 85% of the total population

B. Annual survey on water usage in the agricultural sector

- All irrigation communities > 2 000 ha
- Samples for smaller irrigation communities
- Represents approximately 60% of the total irrigation area
- Total of ca. 750 samples for Spain

C. Annual survey on water usage in the industrial sector

- Manufacturing industries > 200 employees + samples
- From 2007-2010 included in Waste Generation in Industries Survey, now specific survey

SPAIN: A) Annual survey on water supply and sewerage - Variables

- **Water supply variables**

- Abstraction from fresh groundwater and surface water
- Water from desalination
- Water supplied to the public network
- water registered and distributed by type of user
- Volume of water non-registered:
 - Real losses
 - Apparent losses
- Total value of water invoiced

- **Sewerage variables**

- ...

SPAIN: B) Annual survey on water usage in the agricultural sector - Variables

- Income and expenses
- Water rights
- Estimated losses in the water transport networks
- Water abstracted from groundwater and surface water
- Water supplied and purchased water to and from other communities
- Distribution of water to agricultural holdings

SPAIN: C) Annual survey on water usage in the industrial sector - Variables

- Abstraction from groundwater and surface water
- Abstraction from other water resources
- Water supplied by means of public network
- Total amount of used water
- Treatment of wastewater

Overview on typical data sources

☐Public water supply and desalination:

- Municipal surveys
- Water Supply Association
- Census

☐Agriculture:

- Agrarian statistics
- Data from water authorities
- Data from farmers associations

☐Manufacturing industry:

- Industry surveys (specialised or combined)

☐Service industry:

- Municipal surveys (data from public water suppliers)
- Statistics about employment and tourism x water use coefficients

☐Self supply of households:

- Not connected households x water use coefficient
- In combination with data from water authorities and Water Supply Association

Gap filling via interpolation, extrapolation and use of water use coefficients

□(Linear) interpolation:

- E.g. Population connected to public water supply data only available from census data (2001 and 2011), then linear interpolation might help to calculate missing values (such as self-supply by households).

□Extrapolation from metered abstractors to non-metered abstractors:

- Precondition: Similarities between the sampled group and the non-sampled group are required

□Water use coefficients:

- E.g. range of typical household water use / capita (in Europe): ca. 90 l/day – 300 l/day
- Production specific water use coefficients
- Consult „Data Collection Manual for the OECD/Eurostat Joint Questionnaire on Inland Waters Tables 1 – 7“

Example for water use coefficients (manufacturing industries)

Table 8-3: Water use coefficients for different industry sectors (German example)

industry sector line of production	production device	Unit	water use/unit	Reference
food industry	cereals	1 t cereals	1.5 - 8 m ³	Hosang et al., 1998
	canned fruits or vegetables	1 t cans	4 - 14 m ³	Hosang et al., 1998
	candies	1 t product	6 - 26 m ³	Hosang et al., 1998
	sugar	1 t beets	10 - 30 m ³	Hosang et al., 1998
	meat and fishproducts	1 cattle and horses or 2.5 pigs	0.3 - 0.4 m ³	Hosang et al., 1998
	abbatoir			
	creamery (fresh milk)	1000 L milk	4 - 6 m ³	Hosang et al., 1998
	creamery	L milk	1 - 1.5 L	Mutschmann et al., 2002
	cheese dairy or butter production	1000 L milk	10 m ³	Hosang et al., 1998
	margarine	1 t margarine	20 m ³	Hosang et al., 1998
leather and textile industry	brewery	1000 L beer	5 - 20 m ³	Mutschmann et al., 2002; Hosang et al., 1998
	wine and liqueur distillery	1000 L corn	4 - 6 m ³	Hosang et al., 1998
	shoes	1 pair of shoes	5 L	Hosang et al., 1998
	leather, tannery	1 t of skins	40 - 60 m ³	Hosang et al., 1998
	woollaundry	1 t wool	20 - 70 m ³	Hosang et al., 1998
	bleachery	1 t product	50 - 100 m ³	Hosang et al., 1998
	dyeing factory	1 t product	20 - 50 m ³	Hosang et al., 1998
	synthetic fibre	1 kg product	200 L	Mutschmann et al., 2002

Recommendations and Guidance

- ❑ Data Collection Manual for the OECD/Eurostat Joint Questionnaire on Inland Waters
(http://ec.europa.eu/eurostat/ramon/coded_files/OECD_ESTAT_JQ_Manual_version_2_21.pdf)

- ❑ International Recommendations for Water Statistics
(<http://unstats.un.org/unsd/envaccounting/irws/>)

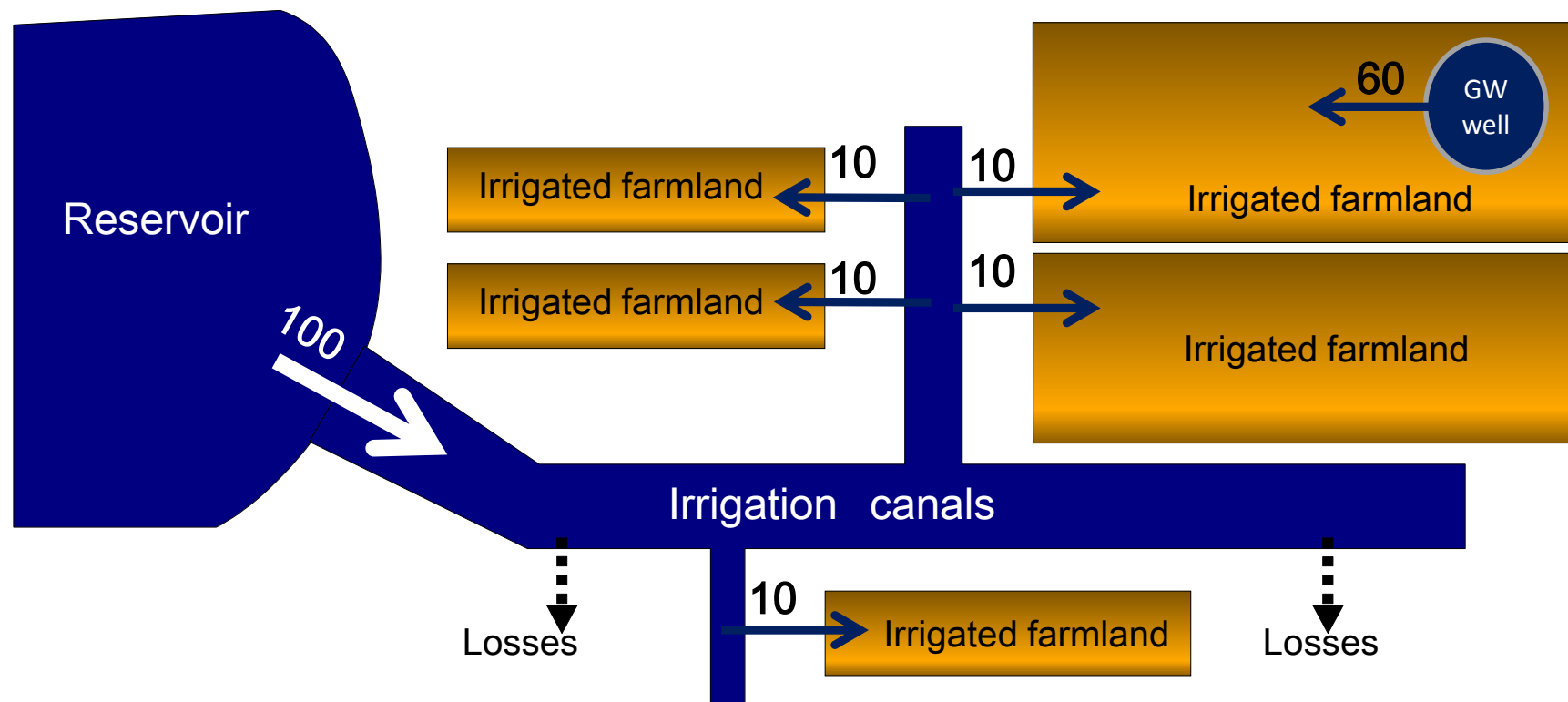


2. Stumbling Blocks

Be careful with system boundaries

- ☐ Irrigation canals
- ☐ Industry parks
- ☐ Water abstracted and used for cooling purposes
- ☐ Reuse and recycling of water

Irrigation canals



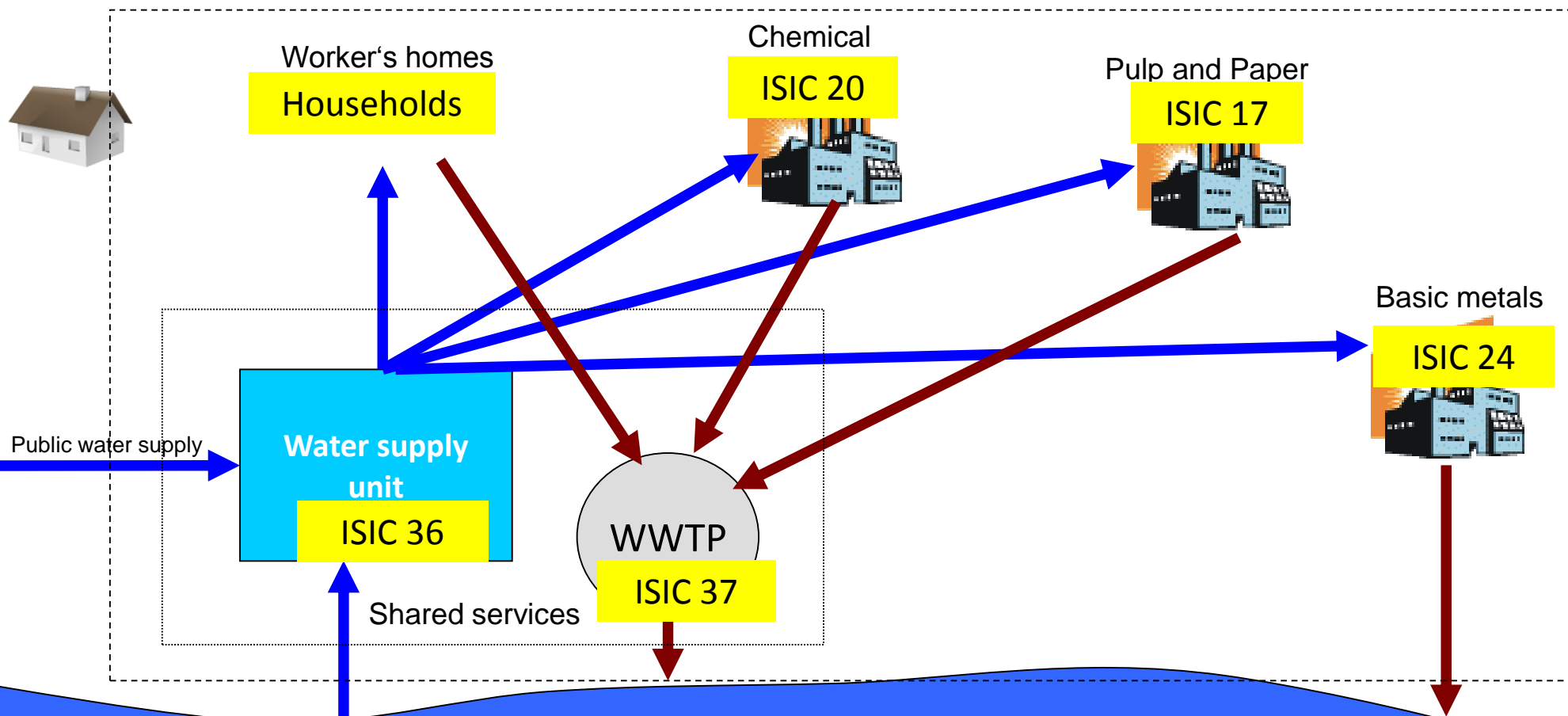
Questions:

How many units of water are abstracted by Agriculture (ISIC 01)? **60**

How many units of water are used by Agriculture (ISIC 01)? **110**

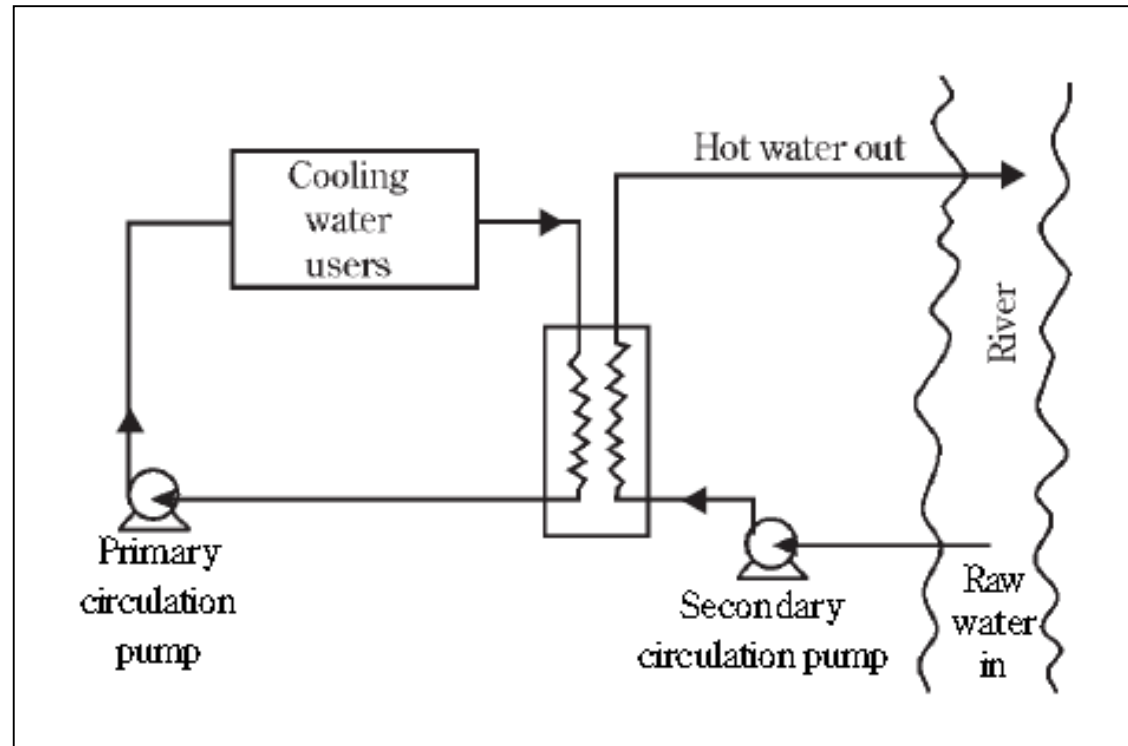
Note: Operation of irrigation canals is classified as ISIC 36 (water supply) (ISIC rev. 4.0)!

Industrial Parks



Note: Even if industries are organised in industrial parks with shared services, they have to be considered individually (according to their main activity).

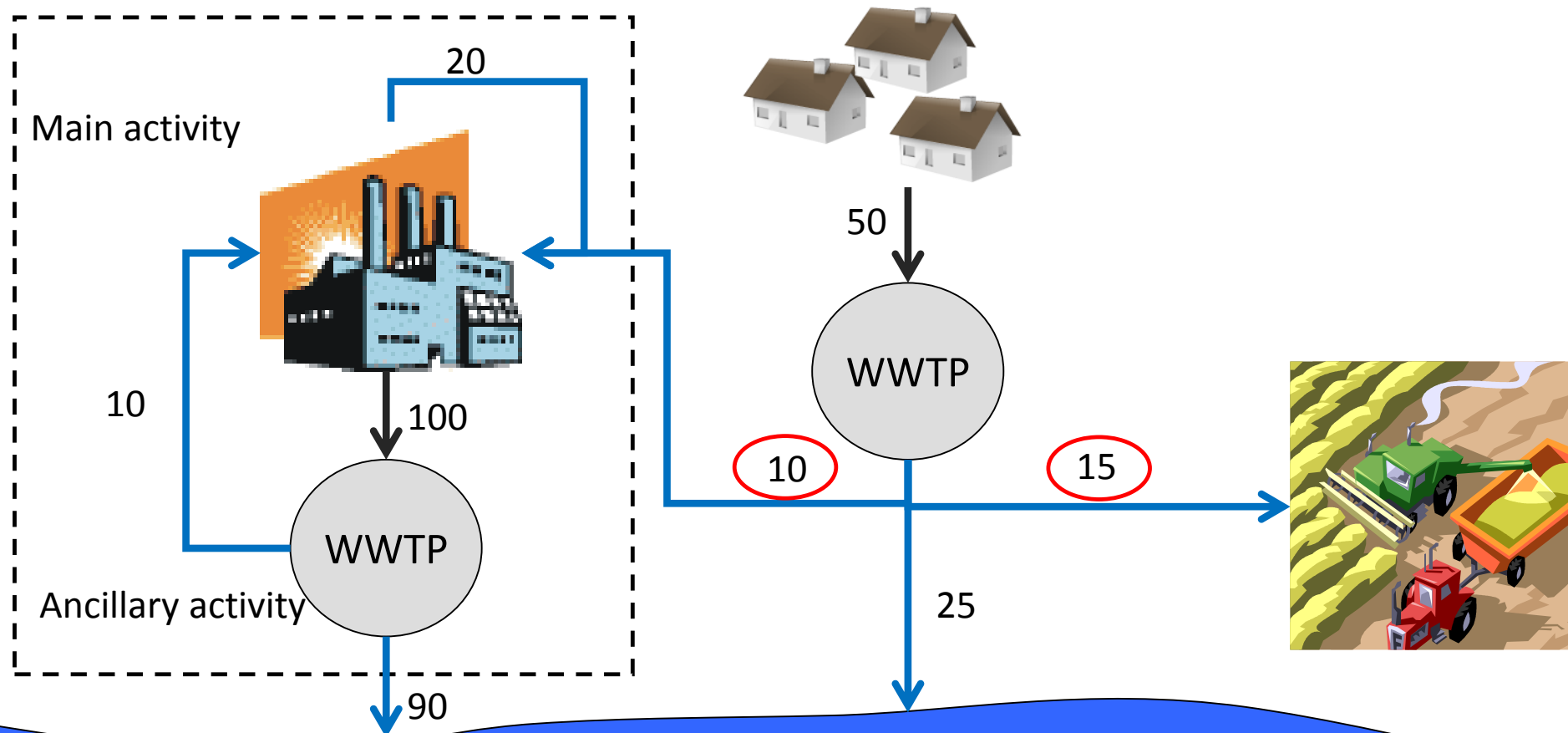
Cooling water



Cooling water could be the dominating water abstraction and use:
Electricity production, metal industry, oil industry, chemical industry, pulp and paper

Note: Cooling water is not separated from other water uses in C2 and C3. Keep it separately in your national records; suggestion to add it in C2 and C3 or make footnotes

Reuse and Recycling of Water



Question: How many units of water are re-used?

Note: Reused water is delivered directly to a user as reclaimed wastewater.
Recycling within industrial sites is excluded.

3. Simple Data Validation

Can the values be true?

What is questionable here, why?

Time series data on the indicators for 1990-2013, Table C-2 Freshwater abstraction:

		Unit	1990	1995	2000	2001	2002	2003	2004	2005	2006	2007
	Surface and groundwater abstracted											
1	Fresh surface water abstracted	million m ³		0	0	0		1000	0	1000	1100	N.A.
2	Fresh groundwater abstracted	million m ³	4790	5000	4714	4502	6390	3064	4072	3993	7112	N.A.
3	Freshwater abstracted											
4	Freshwater abstracted (Row 1 + row 2)	million m ³	4790	5000	4714	4502	6390	4090	4072	4993	8212	4913
5	<i>of which abstracted by</i>											
6	Water supply industry (ISIC 36)	million m ³		205	210	212	2215	220	222	225	228	230
7	Households	million m ³	110	105	104	100	95	120	90	98	95	93

NOTE:

- Avoid empty cells. Is it "0" or "N.A."?
- Look at time series. Consistent development or outliers?
- Abstraction by water supply industry usually develops continuously (e.g. increases continuously due to increased connection rate; reduction possible e.g. due to technical measures to reduce losses)
- Households' water abstraction usually develops continuously (e.g. reduces because increase of connection rate)
- Abstraction by manufacturing is strongly dependent from the economic situation and technical developments.
- Agricultural abstraction is strongly influenced by weather conditions in the growing season

C-3:Water use, validation techniques

1. Check if values for freshwater abstracted are identical with C-2
2. Check water balance of the table, e.g. total freshwater available minus losses = sum of water use by households and economic activities.
3. Check time series: Empty cells, outliers?

C-3:Water use, validation techniques (cont.)

4. Losses: Calculate losses in % of water abstracted by water supply industrie.
Check with water supply industry.
5. Water use by households and economic activities: Right order of magnitude?
Methods:
 - Re-calculate household water use per capita per day with population data. Check with indicators from water supply industry (typical range in Europe e.g. 90 – 300 l/capita/day)
 - Re-calculate irrigation water per irrigated area. Check with farmers association
 - Water use by manufacturing industry difficult to validate the aggregated data as cooling water and single producers may have a big influence. Check consistency of data of the biggest users.

Thank you for your attention!

michael.nagy@unece.org

