Data generation on water abstraction and water use

صباح اخير

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Contents of the presentation

- Who is Michael Nagy?
- UNSD Questionnaire's tables W2-W4A
  - Tables
  - Water Schemes
  - Terminology
- Austrian examples
- Conclusion

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Who is Michael Nagy?

- Since 1999 working for the Austrian Umweltbundesamt (Federal Environment Agency)
- Fields of work related to this Workshop:
  - Austrian UWWTP database + related data politics
  - Preparation of national water data for international statistics (Eurostat)
  - Drafting of national reports for reporting under the UWWT-Directive (91/271/EEC)
  - Consultant of EC (DG ENV) for implementation of UWWT-Directive
  - Project manager in PHARE project for waste water statistics

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Country comparison


Country	SYRIA	AUSTRIA
Area	185,180 km²	83,858 km²
Population	15.7 mio.	8.0 mio.
Population dens.	~ 85 / km²	~ 125 / km²
Coast	193 km	No sea
Av. precipitation	~ 225 mm (Damascus)	~ 1170 mm
Av daily water cons. / person	~ 159 l	~ 145 l
Irrigated land	12,130 km² (6.6 %)	~ 157 km² (0.2 %)
UWWTPs	?	1,495

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Table W2: Water Abstraction by Source

Priority	Category	Unit	1990*
!	**Total fresh surface water abstracted (1)**	mio m^3/y	
!	*by:* Public supply (ISIC 41)	mio m^3/y	
!	Agriculture, fishing and forestry (ISIC 01-05)	mio m^3/y	
	of which for Irrigation	mio m^3/y	
!	Manufacturing industries (ISIC 15-37)	mio m^3/y	
	Production of electricity (ISIC 40)	mio m^3/y	
	Other economic activities	mio m^3/y	
	Households	mio m^3/y	
!	**Total fresh ground water abstracted (2)**	mio m^3/y	
!	*by:* Public supply (ISIC 41)	mio m^3/y	
!	Agriculture, fishing and forestry (ISIC 01-05)	mio m^3/y	
	of which for Irrigation	mio m^3/y	
!	Manufacturing industries (ISIC 15-37)	mio m^3/y	
	Production of electricity (ISIC 40)	mio m^3/y	
	Other economic activities	mio m^3/y	
	Households	mio m^3/y	
!	**Total gross fresh water abstraction (3)=(1)+(2)**	mio m^3/y	
	Water returned without use (4)	mio m^3/y	
	Imports of water (5)	mio m^3/y	
	Exports of water (6)	mio m^3/y	
	Desalinated water (7)	mio m^3/y	
	Total reuse of fresh water (8)	mio m^3/y	
!	**TOTAL fresh water available for use (9)=(3)-(4)+(5)-(6)+(7)+(8)**	mio m^3/y	
	Non-fresh water abstraction	mio m^3/y	

Total fresh surface water abstracted

Total fresh ground water abstracted

Total freshwater available for use

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Table W2: Water Abstraction by Source – Water Scheme

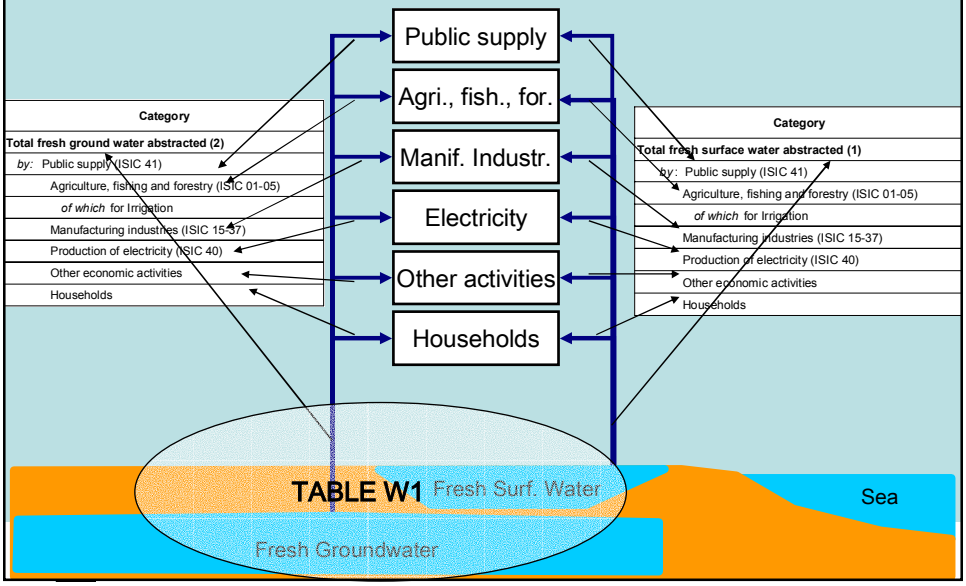

Table W2: Water Abstraction by Source – Water Scheme

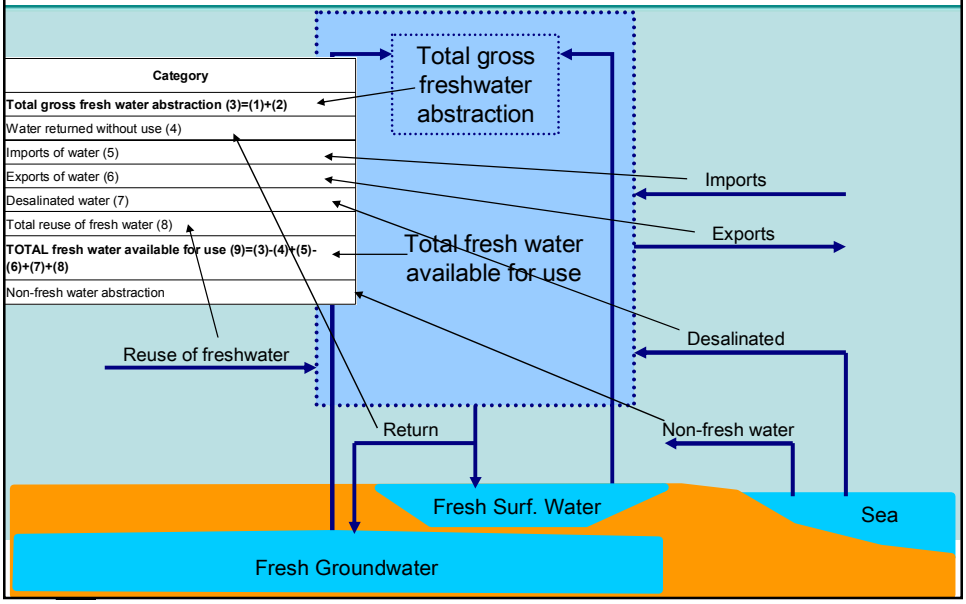

Table W2: Water Abstraction by Source – Definitions, Clarifications

- **Fresh surface waters:**
  - Includes bank-filtration
- **Fresh ground water:**
  - Includes springs
- **Water returned without use:**
  - Discharges into fresh waters without use
  - Primarily during mining and construction activities
  - Discharges into the sea are excluded
  - Not identical with water losses during transport
- **Imports and exports:**
  - Does not include bottled water

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Table W3: Water Use by Supply Category and Activities

Table W2 - ABSTRACTION

Priority	Category	Unit
!	**Total gross fresh water abstraction (3)=(1)+(2)**	mio m^3/y
	Water returned without use (4)	mio m^3/y
	Imports of water (5)	mio m^3/y
	Exports of water (6)	mio m^3/y
	Desalinated water (7)	mio m^3/y
	Total reuse of fresh water (8)	mio m^3/y
!	**TOTAL fresh water available for use (9)=(3)-(4)+(5)-(6)+(7)+(8)**	mio m^3/y
	Non-fresh water abstraction	mio m^3/y

Total freshwater available for use (W2)

- Water losses during transport (W3)

Total water supply (W3)

Total water supply

Water losses during transport

Table W3 – WATER USE

Priority	Category	Unit
!	**Total public water supply (ISIC 41) (1)**	mio m^3/y
	of which used by: All economic actitivites	mio m^3/y
	Agriculture, forestry, fishing (ISIC 01-05)	mio m^3/y
	of which for irrigation	mio m^3/y
	Manufacturing industries (ISIC 15-37)	mio m^3/y
	Production and distribution of electricity (ISIC 40)	mio m^3/y
	Other economic activities	mio m^3/y
	Households	mio m^3/y
	Self-supply (2)	mio m^3/y
	Other supply (3)	mio m^3/y
	Total water supply (4) = (1)+(2)+(3)	mio m^3/y
	Water losses during transport	mio m^3/y
!	Population connected to public water supply	%

Table W3: Water Use by Supply Category and Activities – Water Scheme

Table W2:

Total freshwater available for use

Table W3

Public supply

Self supply

Other supply

Losses

Agri., fish., for.

Manif. Industr.

Electricity

Other activities

Households

Category	Unit
Total public water supply (ISIC 41) (1)	mio m^3/y
of which used by: All economic actitivites	mio m^3/y
Agriculture, forestry, fishing (ISIC 01-05)	mio m^3/y
of which for irrigation	mio m^3/y
Manufacturing industries (ISIC 15-37)	mio m^3/y
Production and distribution of electricity (ISIC 40)	mio m^3/y
Other economic activities	mio m^3/y
Households	mio m^3/y
Self-supply (2)	mio m^3/y
Other supply (3)	mio m^3/y
Total water supply (4) = (1)+(2)+(3)	mio m^3/y
Water losses during transport	mio m^3/y
Population connected to public water supply	%

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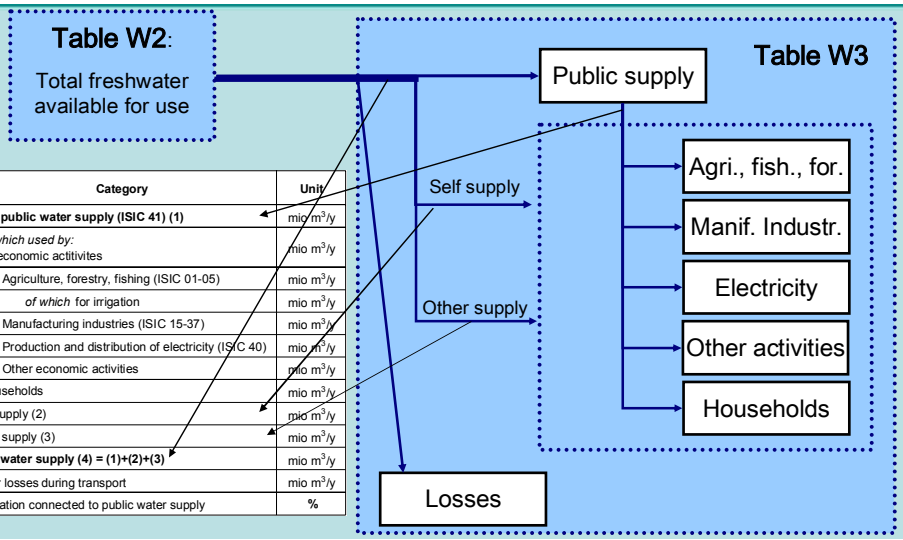
Table W3: Water Use by Supply Category and Activities – Water Scheme



Category	Unit
Total public water supply (ISIC 41) (1)	mio m^3/y
of which used by: All economic actitivites	mio m^3/y
Agriculture, forestry, fishing (ISIC 01-05)	mio m^3/y
of which for irrigation	mio m^3/y
Manufacturing industries (ISIC 15-37)	mio m^3/y
Production and distribution of electricity (ISIC 40)	mio m^3/y
Other economic activities	mio m^3/y
Households	mio m^3/y
Self-supply (2)	mio m^3/y
Other supply (3)	mio m^3/y
Total water supply (4) = (1)+(2)+(3)	mio m^3/y
Water losses during transport	mio m^3/y
Population connected to public water supply	%

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Table W3: Water Use by Supply Category and Activities – Definitions, Clarifications

- **Total public water supply:**
  - Includes desalted sea water
  - Excludes system operation for agricultural purposes
  - Excludes deliveries of public water supply to another
- **Self supply:**
  - Includes water drawn from village wells
- **Other supply:**
  - e.g. supplies from commercial and industrial establishments
  - e.g. reusable water

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Table W4A: Waste Water Generation

Priority	Category	Unit	1990*
!	**Total waste water generated**	1000 m^3/d	
	by: Agriculture, forestry and fishing (ISIC 01-05)	1000 m^3/d	
	Mining and quarrying (ISIC 10-14)	1000 m^3/d	
	Manufacturing Industries (ISIC 15-37)	1000 m^3/d	
	Production and distribution of electricity (ISIC 40)	1000 m^3/d	
	Construction (ISIC 45)	1000 m^3/d	
	Other economic activities	1000 m^3/d	
	Households	1000 m^3/d	

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Table W4A: Waste Water Generation – Definitions, Clarifications

- **Total waste water generated:**
  - No further immediate value
    - quality
    - quantity
    - time of occurence
  - Cooling water is included
  - Not identical with water returned without use (W2)

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Austrian Example – Administrative Background

- **Statistics**
  - 1 National Statistical Institute (Statistik Austria)
  - No direct surveys on water use and water abstraction
  - Connection rates to public water supply, etc.
- **Water Management**
  - 1 National Water Act
  - 9 Provinces administrate the Water Act (enforcement)
- **Calculation and presentation of national water data**
  - Federal Environment Agency: National and international reporting obligations
  - Austrian Gas- and Water Supply Association (AGWSA): Public water supply - voluntary

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Austrian Example – Key players for data management

- **Statistik Austria** – Focal Point for ESTAT, National Surveys (connection rate to PWS, Agrarian Statistics, Material Input Survey, Energy Statistics...)
- **Ministry of Agriculture, Forestry, Environment and Water Management** – Water Act, Hydrographic Information
- **9 Provincial authorities** – Enforcement and regional data collection
- **Federal Environment Agency** – National data collection
- **Austrian Gas- and Water Supply Association (AGWSA)** – Public water supply

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Austrian Example – Background and assumptions for data calculation

- Water losses only considered in public water supply
  - Big supply networks and long water pipes
  - Data of good quality available at AGWSA
- Water consumption / person connected to PWS = water consumption / person not connected to PWS
- Cooling water is not considered as waste water (not valid for UNSD Questionnaire!)
- Waste water generated = water abstraction – consumptive use – cooling water

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Austrian Example – Priorisation of available data

- **1. Metering** of water abstraction / supply
  - Accuracy
  - Data flow to national institutions
- **2. Calculated** with use factors
  - Derivation of factors
  - Calibration of factors
- **3. Estimation** / calculation based on enforcement data
  - Permitted uses
  - Surveillance monitoring (is the permitted use exceeded?)

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Austrian Example – Data availability / Sector (situation 1999)

- **PUBLIC WATER SUPPLY (ISIC 41):**
  - Annual reports based on metered volumes (AGWSA statistics)
  - ~ 65 % of population covered by reports
- **DOMESTIC SECTOR:**
  - Population connected to PWS 1981 and 1991 (Statistik Austria)
- **MANUFACTURING INDUSTRY:**
  - Annual data from survey until 1994 based on measurements and "plausible estimations" (Statistik Austria)
  - Cooling water included
- **PRODUCTION OF ELECTRICITY (ISIC 40):**
  - Cooling water is not measured
  - Information about produced electricity available from national reports
- **IRRIGATION:**
  - Data on irrigated area 1994 and 1999 (Statistik Austria)
  - Crop-specific irrigation volumes (studies, Farmers Assoc.)

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Austrian Example – Public Water Supply

Available data:

- Abstraction, supply and losses of most of the water works (AGWSA)
- Population supplied by AGWSA water works (AGWSA)
- Population connected to PWS (Statistik Austria) – every 10 years

Calculation:

Step 1: data collected in AGWSA statistics were assigned to provinces

Step 2: water pumpage and supply figures were grossed up on the basis of inhabitants connected to the public water supply

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Austrian Example – Public Water Supply

Region of Upper Austria 1996

STATISTIK AUSTRIA data

a) Inhabitants: 1.381 mio.

b) Population connected to PWS: 74.4 % ≈ 1,027 mio. people

AGWSA data

c) Pumpage by AGWSA water works: ~ 50 mio. m³

d) Population supplied by AGWSA water works : 689,180 ≈ 67.1% of inhab.

Final calculation: $\frac{c)}{d)} = \frac{50 \text{ mio. m}^3}{67.1\%} = 74.5 \text{ mio. m}^3$

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Austrian Example – Self Supply of Households

- **Assumptions:**
  - Water consumption / person connected to PWS = water consumption / person not connected to PWS
  - No losses during transport (→ abstraction = use)
- **Data sources:**
  - Statistik Austria: Total population and population connected to PWS
  - AGWSA: Average annual water consumption / person
- **Calculation:**
  - (Total population – population connected to PWS) x average water consumption

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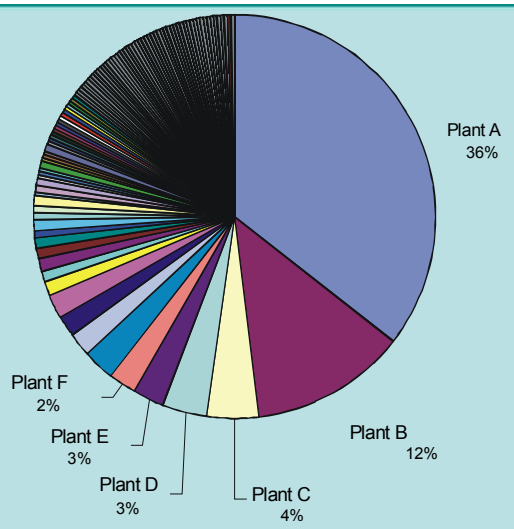
Austrian Example – Industrial Water Use

6 industrial plants cover 60 % of water use



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Austrian Example – Industrial Water Use

- Individual information about dominating users from annual questionnaires
- + grossed up representative samples of „typical users / sector" (Industry Statistics)
- Probably full survey every 6 years in the future

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Austrian Example – Irrigation

Available data

- Metered data
  - only from water cooperatives available
  - available only on regional level
- Irrigated area from Agrarian Statistics
- Climatic information
- Crop specific irrigation volumes
- Studies
- Regional Farmers Associations

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Austrian Example – Irrigation

Calculation

Objectives of the calculation

- **Taking into account regional and system-specific differences**
- **Taking into account actual climatic conditions**

Calculation - "mixed approach"

Step 1: Collection of metered data

Step 2: Assessment of climatic conditions for each year and region

Step 3: Calculation of region-specific irrigation value/ha by using national data (irrigated area, crop- and climate specific volumes)

Step 4: Final calculation:

$$(\sum metered \quad volumes\ ) + remaining \quad area \times region \quad specific \quad irrigation \quad value$$

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Austrian Example – Cooling Water in Caloric Power Plants

Available data

- Electricity produced by caloric power plants for each region and year (Energy Statistics of Statistik Austria)
- Estimated or measured use of cooling water of a few plants

Calculation

(Average m³/GWh) x produced electricity

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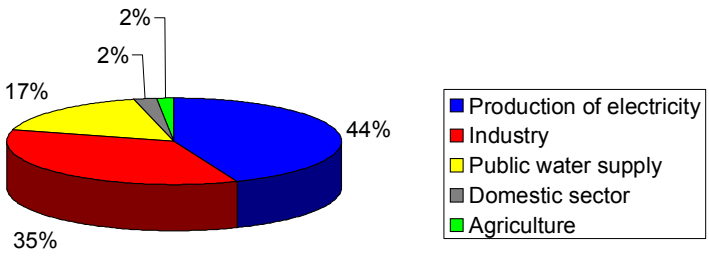
Austrian Example – Total National Supply



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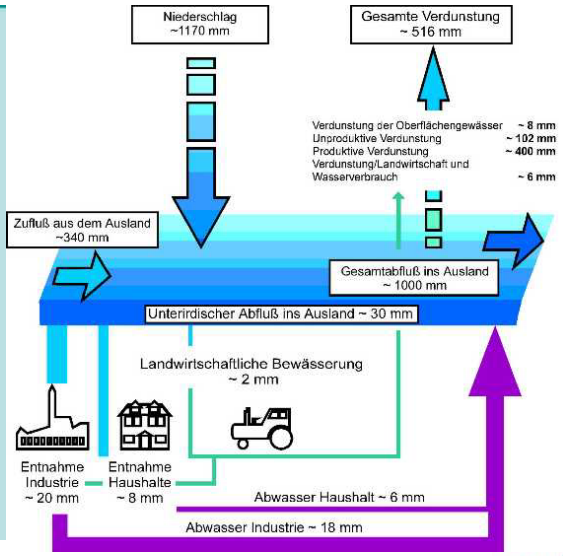
Austria – Long Term Average Water Balance



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Conclusion

Data on water uses is often a by-product

- Economic needs (e.g. acounting of actually used water of water cooperatives)
- Material input statistics
- Enforcement (surveillance monitoring of the authority, self-monitoring of the operator)
- ...

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Conclusion

Usually there are many national partners involved

- Authorities
- National Statistical Institutes
- Professional associations or cooperatives
- Environment Agencies
- Universities
- ...

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Conclusion

Consistency of data requires

- Agreed terminology (glossary, water flow schemes)
- Defined data flows (law, bilateral contracts etc.)
- Duplicable calculation methodologies
- ...

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Thank you very much for your attention!

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