FASTER

Farmers' Adaptation and Sustainability in Tunisia through Excellence in Research

2nd FASTER SPECIALIZED TRAINING

on Climate change effects on water & land management in the Mediterranean

22-26 March 2021 (ONLINE)

User conflicts and IWRM optimization

Water Challengies

- ✓ Water Availability
- ✓ Water Quality
- ✓ **User Conflicts**
- ✓ Water Treatment
- ✓ Water Governance

Water Cycle—Water balance! Easy said than achieved

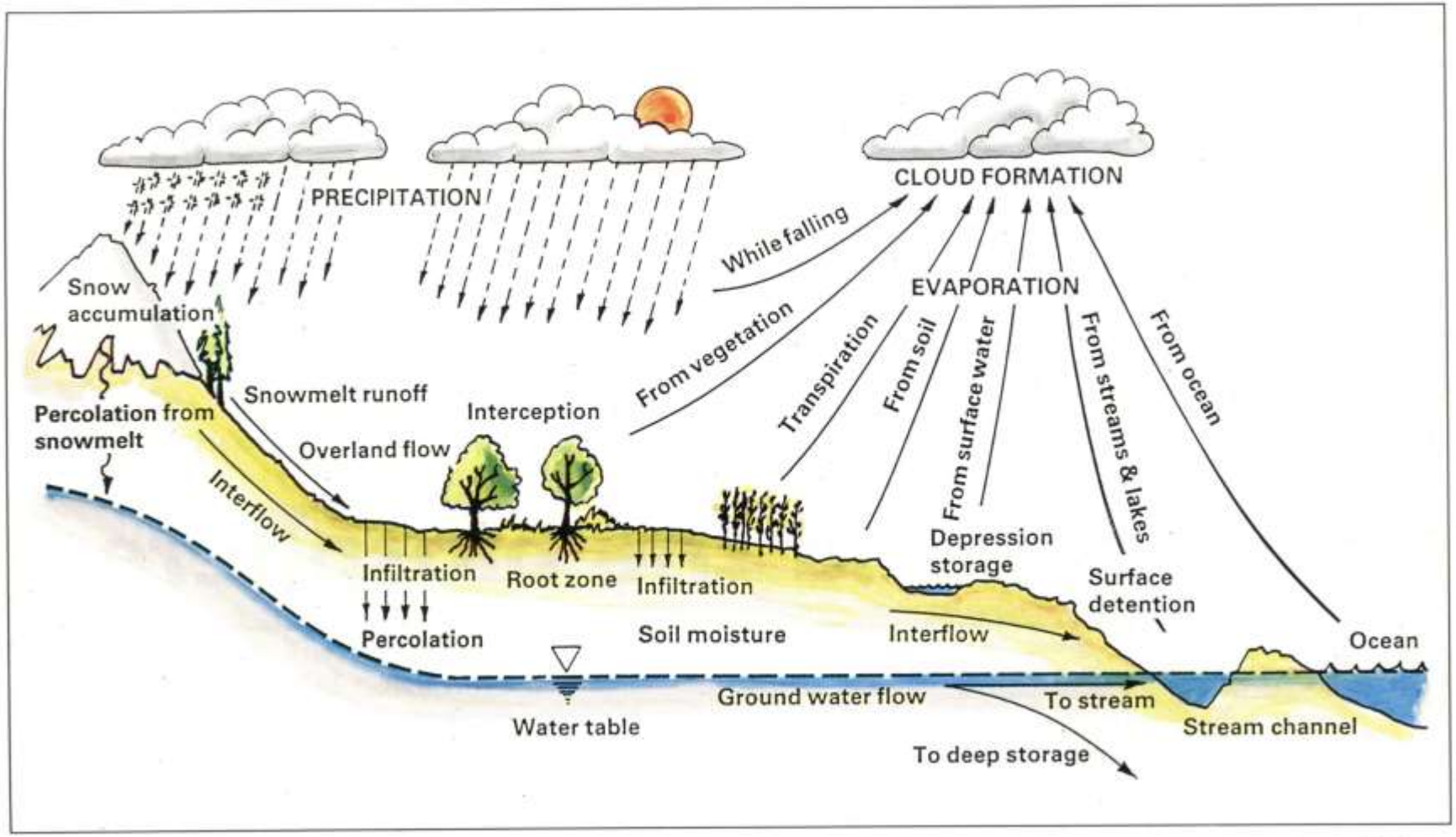
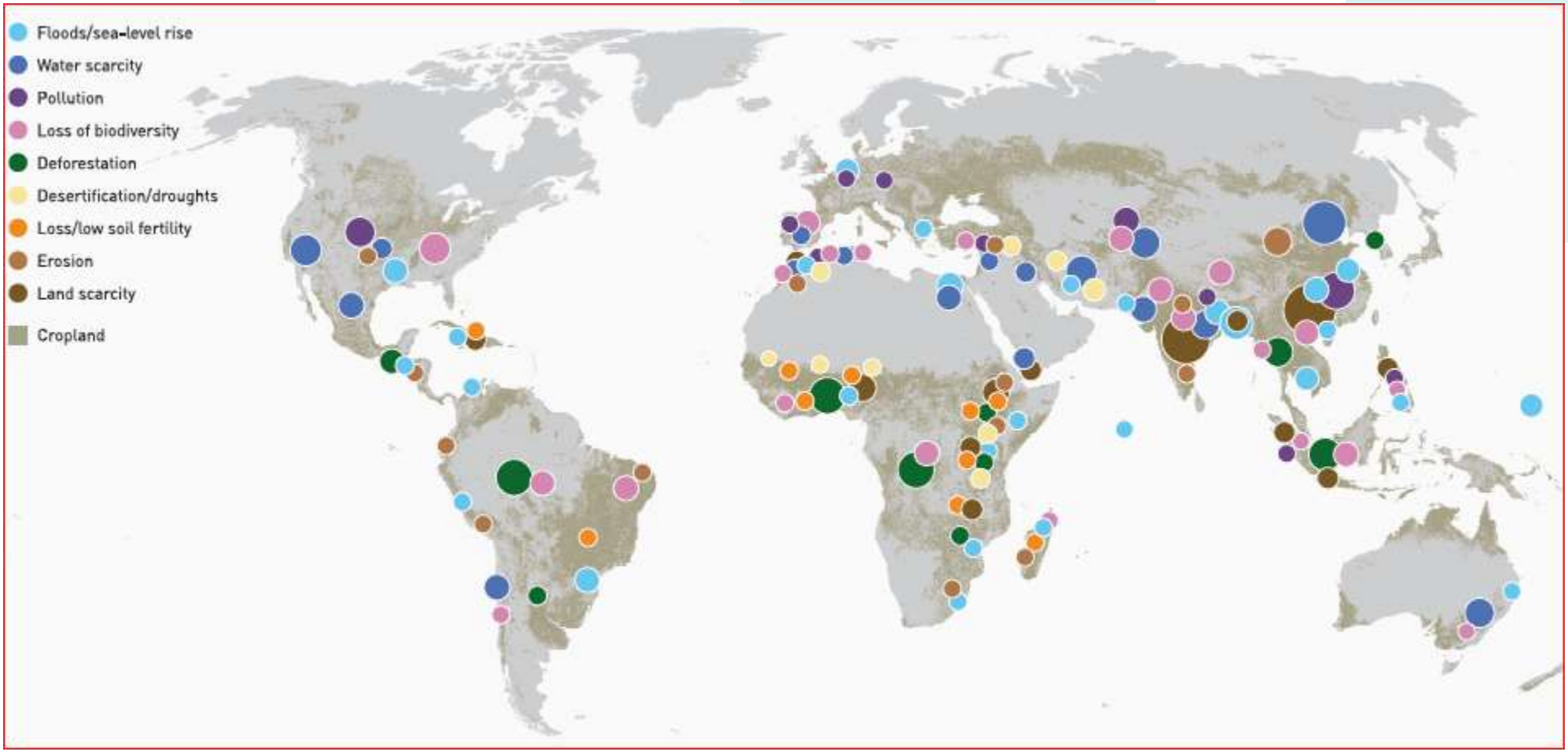


Figure 1 *Circulation of water through the hydrological cycle (National Aeronautics and Space Administration, 1984)*

Risk: human pressure on land and water



Water Availability

- Average renewable water: ca 2000 m^3/p/yr

Per person and year (Engelman, LeRoy, 1993)

Substantial part is used by ecosystems
Amount remained for human use: ca 1000 m^3/p/yr

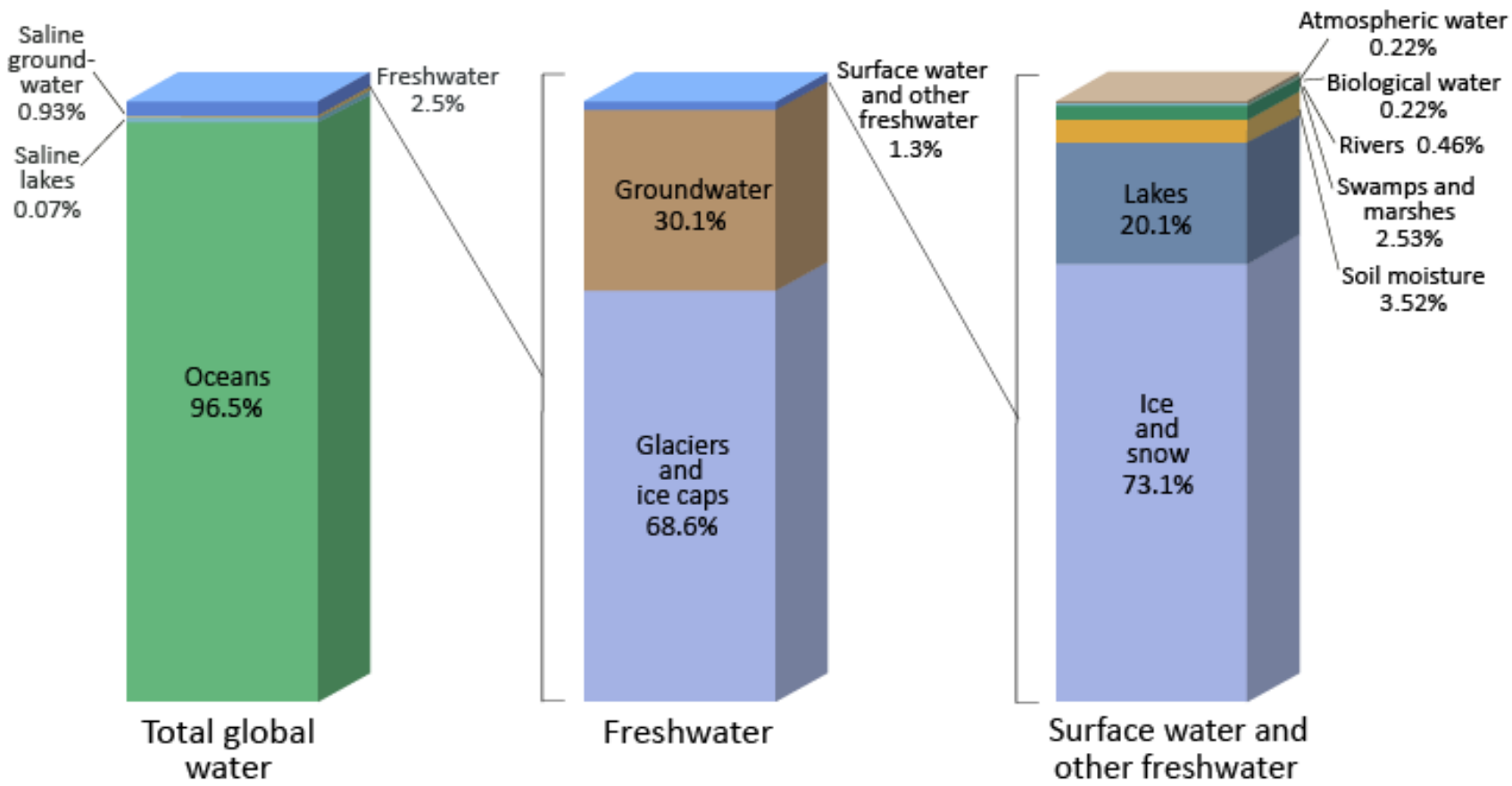
=1 000 000 L/p/yr = 2740 L/person/day

Of which:
69% is used for irrigation (- 1890 L/p/day)
23% is used by industry (- 630 L/p/day)

- Only 8% remains for household use:
(i.e. 220 L/p/day)

Average household consumption in Sweden: 200 L/p/day

Water Distribution on Earth

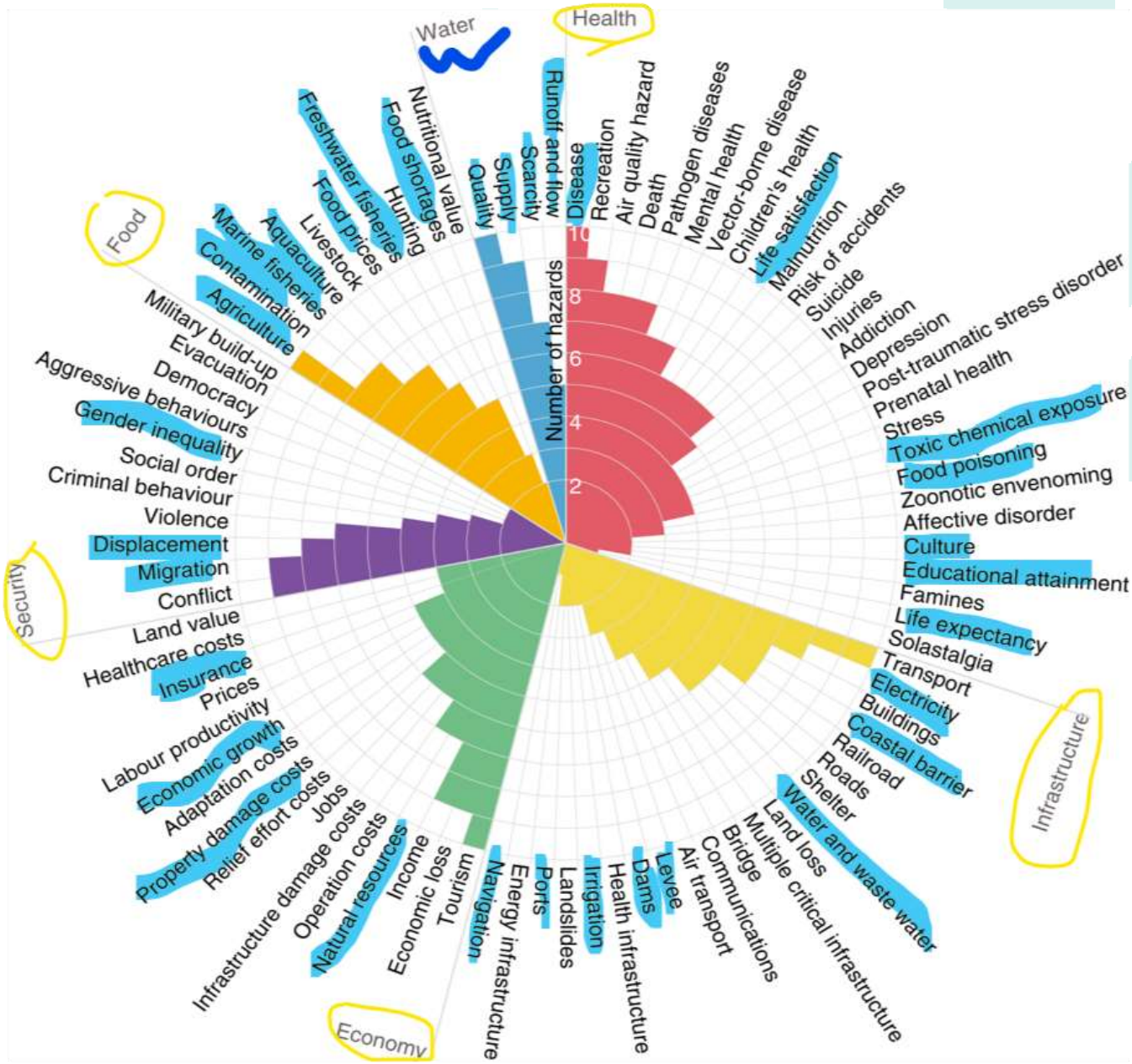


Source: Igor Shiklomanov's chapter "World fresh water resources" in Peter H. Gleick (editor), 1993, Water in Crisis: A Guide to the World's Fresh Water Resources.

WHAT we need to do to create a sustainable habitat for all

TODAYS WATER CHALLENGES

TODAYS CHALLENGES with WFE-Nexus

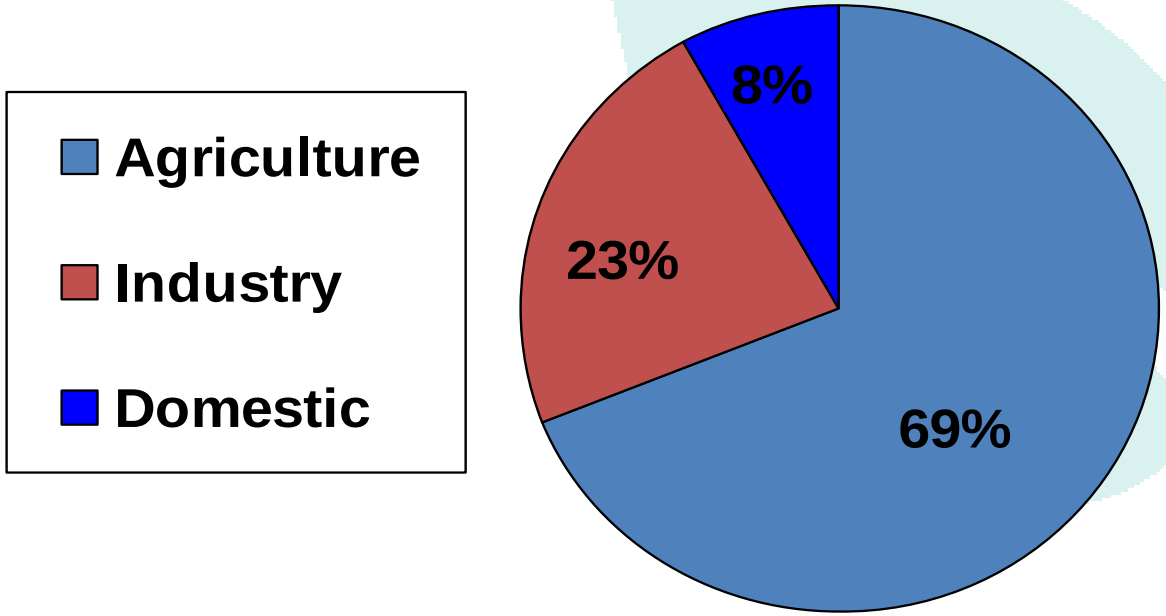


Nature Climate Change (2018) image by Mora et al.

User Conflicts

- Sectoral conflicts
- Environmental
- Geo-political
- Geographical
- Socio-economical

World Water Usage: sector



- USA: 700 L/p/day
- Sweden: 200 L/p/day
- Senegal: 29 L/p/day
- China: 160 L/p/day
- Nomad in Sahara: 5 L/p/day

Geographical Conflicts

Deforestation and overgrazing

Excessive use of water

Middle reach

Desertification & degradation

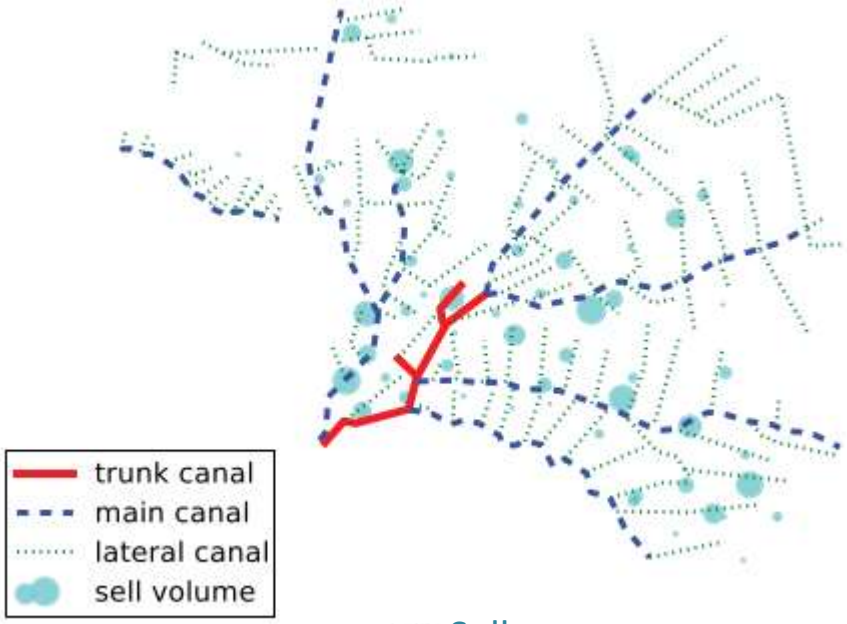
Down stream

(One) Solution example

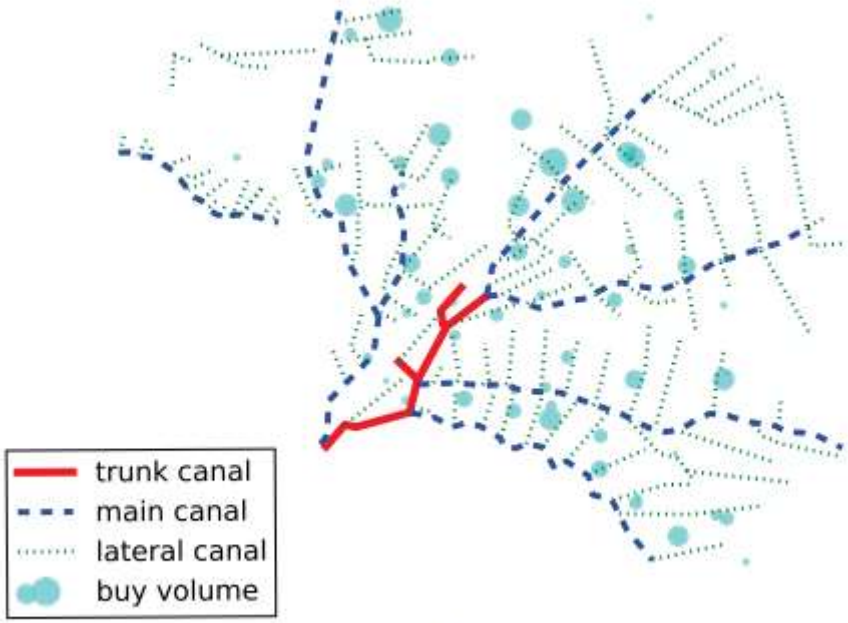
Water market and water rights:

- Policy support
- All stakeholders
- Justice based
- Water rights trade
- At different scales
- User Association?

(One) Solution example



(a) Sellers



(b) Buyers

Source: Xu T. et al., 2016. J. Water Resour. Plann. Manage.

(One) Solution example

Table 3. Basic Statistics of Water Trading Market

Statistic item of the water market	2008	2009	2010	2011	2012	2013	2014
Water rights[a]	266 485	253 556	225 774	226 033	213 309	213 308	214 116
Transaction volume[b]	2 847	942	4 445	2 912	7 189	4 006	6 853
Average price[c]	0.144	0.161	0.233	0.165	0.165	0.200	0.201
Number of transactions	55	47	50	31	68	41	57
Maximum volume[d]	200	80	310	340	465	550	400
Minimum volume[e]	5	3	7	10	15	5	13
Highest price[f]	0.20	0.25	0.30	0.40	0.28	0.20	0.23
Lowest price[g]	0.10	0.20	0.14	0.14	0.03	0.20	0.20

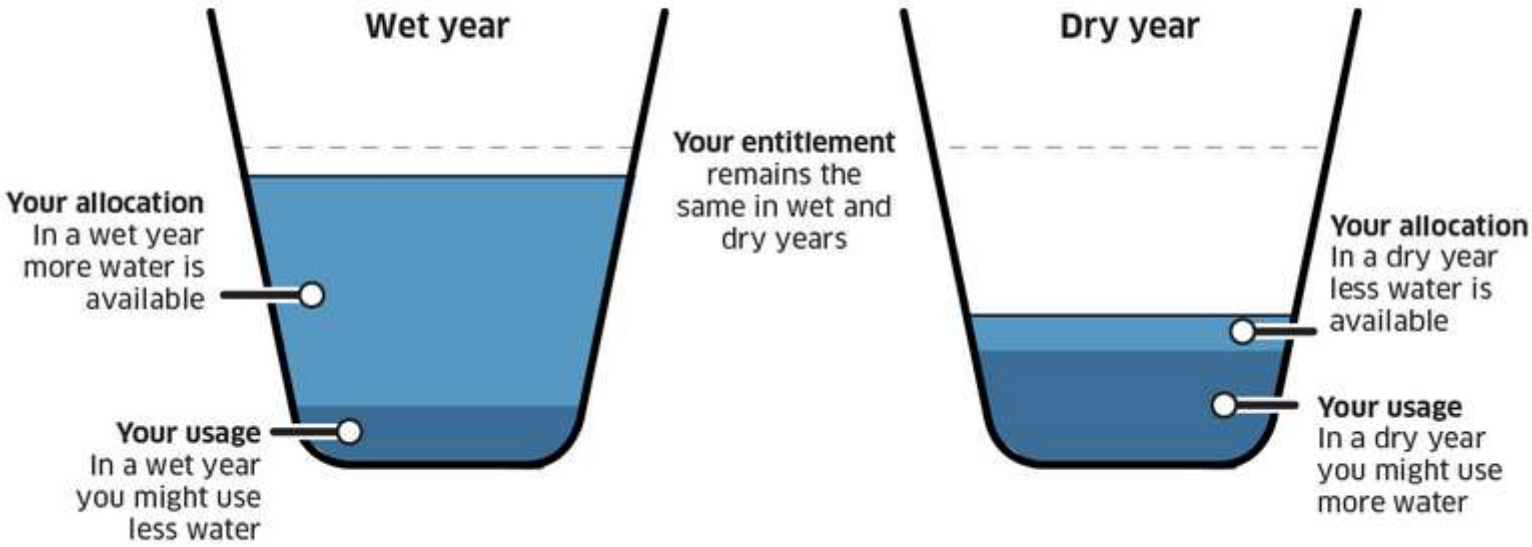
[a]Annual water volume that the irrigation district has the right to use ($\times 10^3$ m^3).
[b]Volume of water transaction across all the WUAs in the district ($\times 10^3$ m^3).
[c]Average price for a given year (CNY).
[d]Transaction volume that is the largest for the year ($\times 10^3$ m^3).
[e]Transaction volume that is the smallest for the year ($\times 10^3$ m^3).
[f]Highest water price for the year (CNY/m^3).
[g]Lowest water price for the year (CNY/m^3).

Source: Xu T. et al., 2016. J. Water Resour. Plann. Manage.

An Australian example

https://www.mdba.gov.au/water-management/managing-water/water-markets-trade

Water entitlements, allocations and usage



An Australian example

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Key Benefits

Water trading helps Murray-Darling Basin farmers to make more productive use of water and contributes to sustainable water management.

Irrigated agriculture in the Basin consumes about 60% of Australia's available water.

Water markets create incentives for water to be moved to higher-value uses.

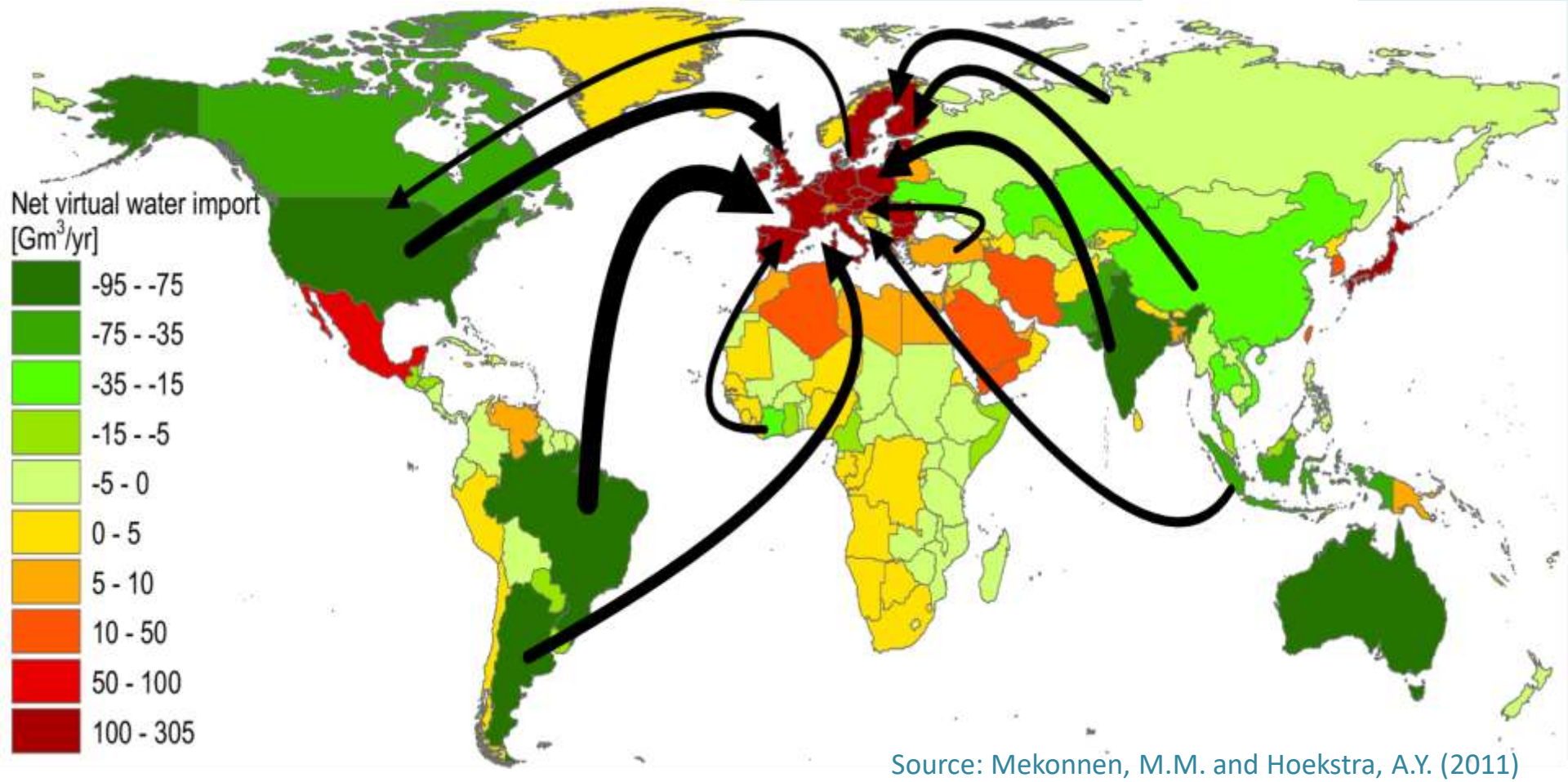
During the year, water is distributed (or 'allocated') against entitlements in response to factors such as rainfall and storage levels.

When water is allocated to an entitlement holder, they are able to use it as needed - this is their business decision to make.

There are more than 150 classes of water entitlement in the Basin.

Water trading in the Basin is worth about $2 billion annually.

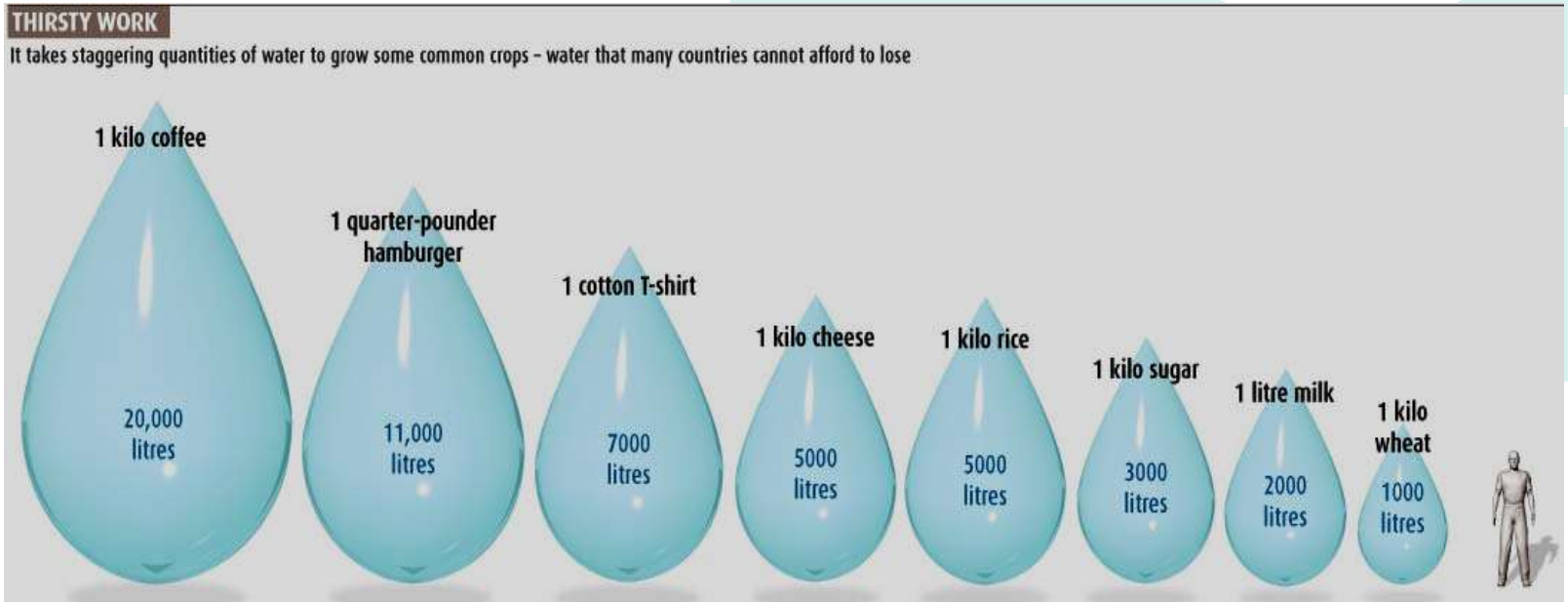
Virtual water imports into Europe



Source: Mekonnen, M.M. and Hoekstra, A.Y. (2011)

Key Issue: Increasing Water-Use Efficiency (WUE)

Water use in agri-production



$$\text{Sustainability}_{\text{Index}} = \text{WF}_{\text{Global}} + \text{WUE}_{\text{Local}} + \text{Drought Index}_{\text{Local}}$$

Questions for discussion

- Based on the stakeholder session earlier, please identify the most important water user(s) and analyse the inter-relations of stakeholder-user.

- How and in what steps do you propose to increase the overall WUE in irrigated agriculture?

- Are there any water rights trade market in your area? If not, is it possible to start in the near future?

Tasks for day 2

- Continue working in the designated groups and selected area/basin
- Describe using text and illustrations:

  The main stakeholders and water users in your area. Identify their respective interests in and influence on the water management, as well as relationship to the other identified actors.
- Summarize in 1-2 A4 pages per group and add to your final report
- Submit 1 document with all tasks to:

  ronny.berndtsson@tvrl.lth.se at latest 29th March.

Clarification on Task Day 2 and data

Task:

- Identify the main water users and associated stakeholders in your area. Identify their respective interests in and influence on water management in the area, as well as relationships to the other identified actors

Suggested data:

- Identify the largest water user groups in the selected are
- Use e.g. annual quantitative databases or annual government reports
- Identify the main stakeholders connected to each water user group e.g. government agencies, private companies, non-governmental organizations, international donors
- Use e.g. review reports of the respective water sectors
- Include around 10-20 stakeholders
- Describe the interests and influence of the main stakeholders
- Find stated objectives of respective stakeholder
- Give a rough estimate of their influence on water management in the area based on your own judgment (Low, Mid, High)

That´s all for now!

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