WHAT POLICIES TO MANAGE GROUNDWATER USE IN AGRICULTURE?

Lessons from a study of OECD countries

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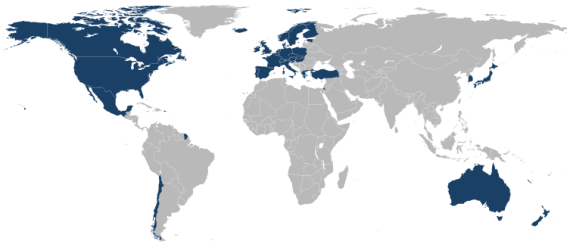
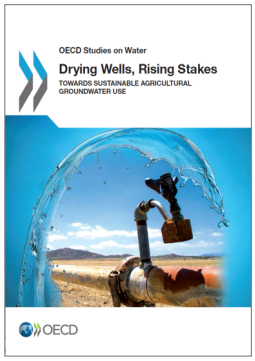
OECD
BETTER POLICIES FOR BETTER LIVES

The Organisation for Economic Co-operation and Development (OECD)



- International organisation, established in 1961, comprising of 34 member countries
- Compares and analyses data, economic and policies to foster international policy discussion on a wide range of issues (all areas except culture and defence)

Tackling the challenges of agricultural groundwater use



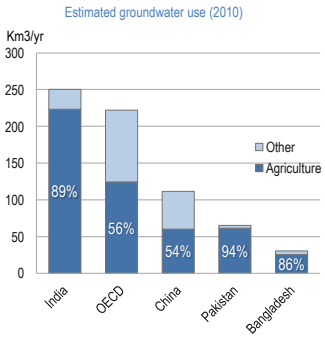
Source: OECD (2015)

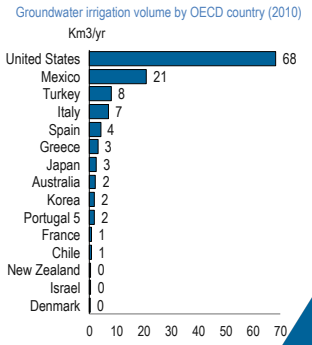
Outline of the presentation

1. Rapid overview of agricultural groundwater use and misuse in OECD countries
2. What policies exist and are employed to manage groundwater use in agriculture?
3. Towards sustainable groundwater use: a combination of management approaches

1. Agricultural groundwater use and misuse in OECD countries

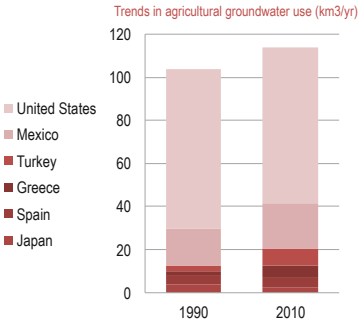
Groundwater is a key asset for agriculture in semi-arid regions in OECD countries. Agricultural groundwater use: 123.5 km3 over 23m ha (2010)





Source: OECD (2015); Margat and van der Gun (2013), Groundwater around the World: A Geographic Synopsis, CRC Press, Taylor and Francis, London

Increasingly used in leading groundwater irrigating OECD countries



Note: 1991 data is used instead of 1990 for Spain.

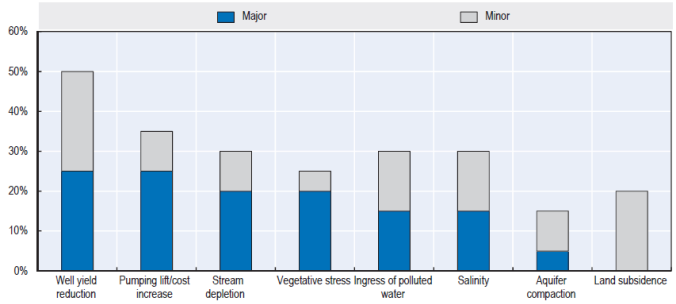
Trends in use for top 10 OECD groundwater irrigators (1990-2010)	
US ↑	Greece ↑
Mexico ↑	Japan ↓
Turkey ↑	Australia →
Italy ?	Korea ↑
Spain ↑	Portugal ?

Note: 1991-2013 for Spain.

Source: OECD (2015)

Intensive use leads to significant negative externalities at the regional level

Externalities reported in 20 OECD surveyed regions in 12 countries*



***20 Regions covered: Australia** : Murray-Darling Basin; **Denmark:** Western Jutland; **France:** Nappe de la Beauce, Departement de la Vienne; **Israel:** Western Galilee; **Italy:** Campania (Ufita); **Japan:** Kikuchi Heiya; Kinaguwa Seigu; Noubiheiya Seigu; **Korea:** Jeju volcanic Island; **Mexico:** Region Laguna; **Netherlands**: Gelderlan and Overjissel ; Limburg; North Brabant; **Portugal:** Tejo e Ribeiras do Oeste; **Spain:** Mancha Occidental; **USA:** Mississippi Alluvial Aquifer; Mountain and Pacific West; Northern High Plains Aquifer; and Southern High Plains Aquifer.

Source: OECD (2015)

2. A multiplicity of policy instruments to respond to these challenges

Reduce use

DEMAND SIDE

	Instruments	Advantages/ drawbacks	Conditions for success
Regulatory	Entitlements, quotas, zoning	(+) Control use (-) Costs and allocation	Design, expertise, flexibility
Economic	Taxes, subsidies, markets, transfers, retirements	(+) Cost-effective & flexible, (-) Acceptance (tax), results, costs (subsidies)	Expertise, transaction costs
Collective action	Voluntary programs	(+) Local adapted and lower costs (-) Adoption issues	Supported by regulations

Add or store water

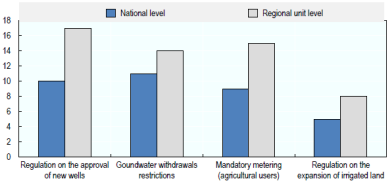
SUPPLY SIDE

	Instruments	Advantages/ drawbacks	Conditions for success
Alternative supplies	Rainwater harvesting, reservoirs, desalination	(+) Relieve water constraints (-) Costs, results, damages	Long term investment
Storage	Infiltration, ASR, banking	(+) Relieve constraints (-) Uncertain results	Expertise and financing

Source: OECD (2015)

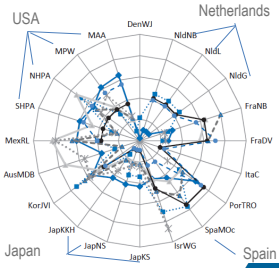
A wide diversity of policy instruments in OECD countries

Direct and indirect, intensive and extensive regulatory approaches



Policies are founded on different legal systems; they focus on the demand side, supply side or both, and use direct or indirect approaches to regulatory, economic or collective management.

Standardised indices of groundwater management approaches vary significantly across the 20 regions



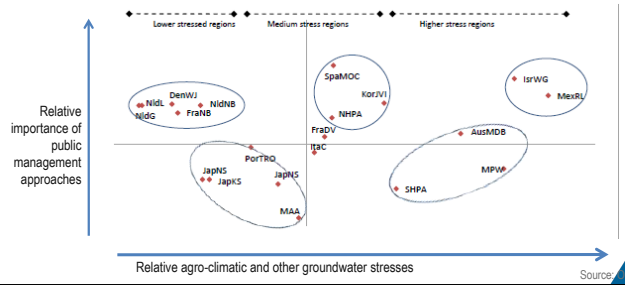
Indices: freedom to operate, regulations, economic instruments, collective management, other controls, supply side approaches, instruments in favour of consumption.

Source: OECD (2015)

Does this diversity reflect groundwater constraints?

Evidence based on 20 OECD agricultural regions

- **Systematic comparison and pairwise correlations *suggest*:**
  - Regions that exercise less control on groundwater <->higher use and demands
  - Economic and supply-side approaches <-> higher groundwater stress
- **Still no overall correlation between scope of management and importance of groundwater stresses**



Source: OECD (2015)

3. What should be done to move towards sustainable systems?

ALL GROUNDWATER IRRIGATION SYSTEMS
6 general conditions:

Robust information system	Favour demand-side instruments
Use groundwater conjunctively	Enforce existing regulations first
Favour use of direct approaches	Remove perverse incentives

REGIONS WITH INTENSIVE GROUNDWATER USE
A Tripod Approach

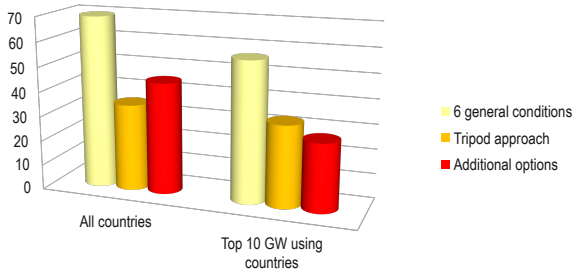
2. Economic instruments
3. Collective management
1. Entitlement systems and regulations

REGIONS WITH HIGH STRESS

A) Agronomic tools
B) Supply-side instruments

Source: OECD (2015)

Few surveyed countries apply these recommendations



65% of most groundwater stressed regions cannot report essential data,
80% do not use the tripod approach

Source: OECD (2015)

Main take-outs

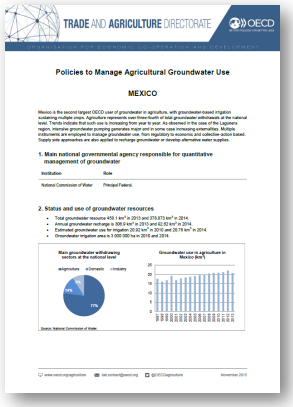
Utility poles tilt to the north, evidence of land subsidence, according to scientists with the United States Department of Agriculture, Natural Resources Conservation Service.

1. Groundwater is an increasingly important resource for irrigated agriculture in OECD countries
2. Intensive groundwater pumping for irrigation has a negative impact on farmers, other users, and the environment
3. Governments should improve information systems and apply a combination of management approaches to tackle these challenges

The stakes are rising: actions should be taken now to mitigate future problems.

Source: OECD (2015)

Thank you for your attention



TRADE AND AGRICULTURE DIRECTORATE

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Policies to Manage Agricultural Groundwater Use

MEXICO

Mexico is the second largest OECD user of groundwater in agriculture, with groundwater-based irrigation sustaining multiple areas. Agriculture represents over half of total groundwater withdrawals at the national level, and over 70% in some regions. Agricultural groundwater use has been on the order of 10% in some regions, intensive groundwater pumping generates major and in some cases increasing externalities. Multiple instruments are employed to manage groundwater use, from regulatory to economic and collective-action based. Supply side approaches are also applied to recharge groundwater or develop alternative water supplies.

1. Main national governmental agency responsible for quantitative management of groundwater

Institution	Role
National Commission of Water	Principal Federal.

2. Status and use of groundwater resources

- Total groundwater resource 455.1 km^3 in 2010 and 373.873 km^3 in 2014.
- Annual groundwater recharge is 309.6 km^3 in 2010 and 82.82 km^3 in 2014.
- Estimated groundwater use for irrigation 20.92 km^3 in 2010 and 26.78 km^3 in 2014.
- Groundwater irrigation area is 3 000 000 ha in 2010 and 2014.

Source: National Commission of Water

www.oecd.org/agriculture/ tad.contact@oecd.org @OECDAgriculture November 2015

- **Report**:
  OECD (2015), *Drying wells, rising stakes: Towards sustainable groundwater use in agriculture*, OECD Studies on Water, OECD Publishing, Paris.
  http://dx.doi.org/10.1787/9789264238701-en

- **Country profile**: **Groundwater management policies in 16 OECD countries:**
  http://www.oecd.org/tad/sustainable-agriculture/groundwater-use.htm

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