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Institutional and Economic Instruments for Sustainable Water Management in the Mediterranean Region

Economic and institutional instruments for enhancing sustainable water management in the context of the WFD implementation

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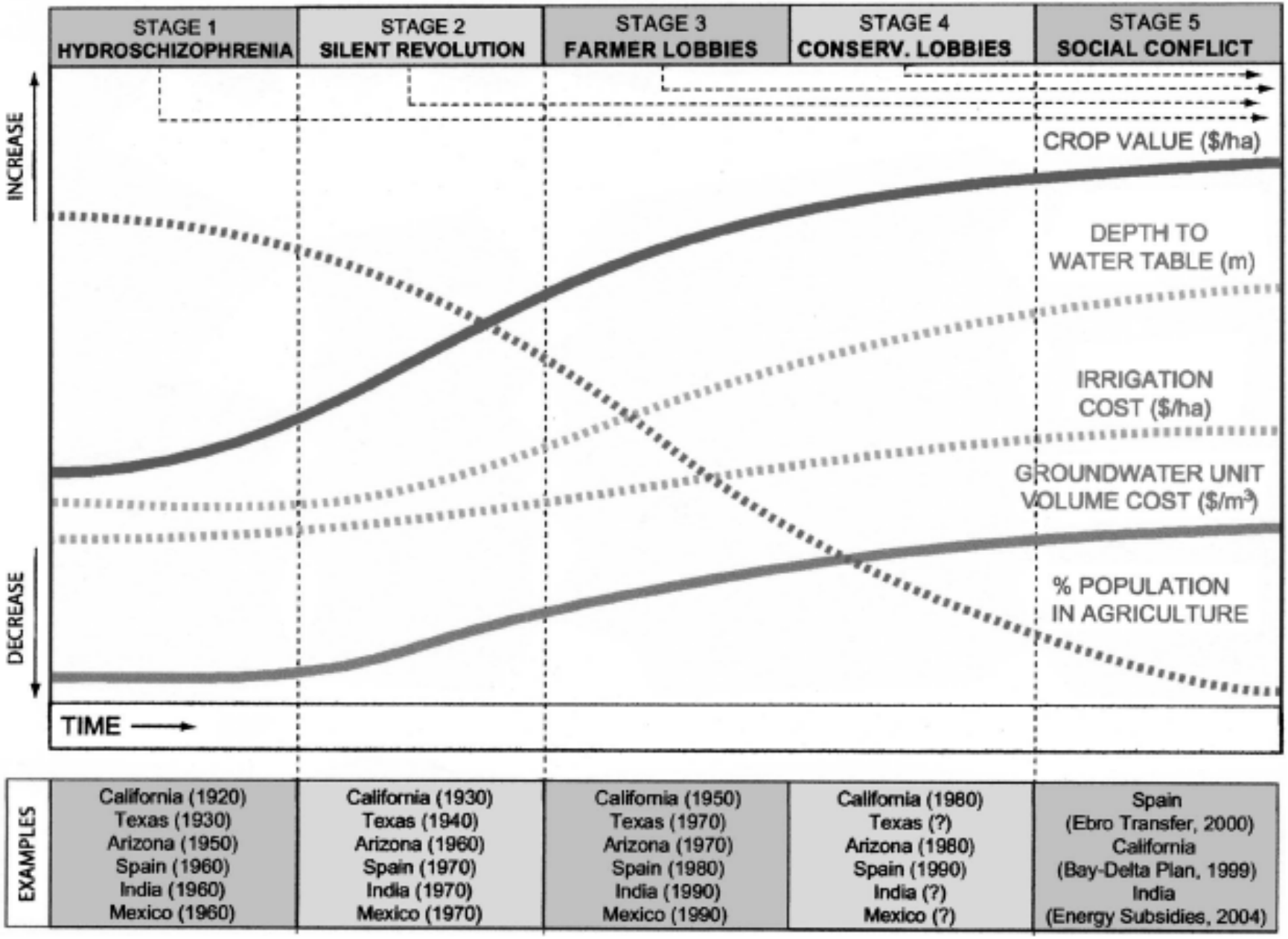
The “silent revolution” of groundwater

- According to Llamas (2005):
  - 50% of urban supply in the world relies on GW
  - GW is the cheapest and quickest way to reach MDG
  - cheap pumping + efficient irrigation techniques allow GW to compete successfully with big irrigation projects
  - in many LDC intensive use of GW has allowed significant improvements of agricultural yields and farmers’ welfare
    - India: > 50M he irrigated by GW; 20M wells ⇔ despite 100% population growth, has become a net exporter
  - in arid countries with poor surface resources and irregular flows, represents the main usable resource
  - a “silent revolution” is taking place: from big waterworks + strong involvement of governments to individual/local self-supplied systems

ROUGH (GROUND)WATER POLICY TRENDS IN ARID AND SEMI-ARID COUNTRIES



The importance of groundwater

- Available on demand 365 d/y, even in times of drought
- Distributed more evenly throughout the territory
- Does not require heavy capital investment ⇔ affordable for small communities and individual users
- Cost = mostly marginal cost (pumping) ⇔ prerequisite for efficient use, since it is not worth for low-value crops
- Cost is declining thanks to innovative technologies (digging boreholes + pumping)

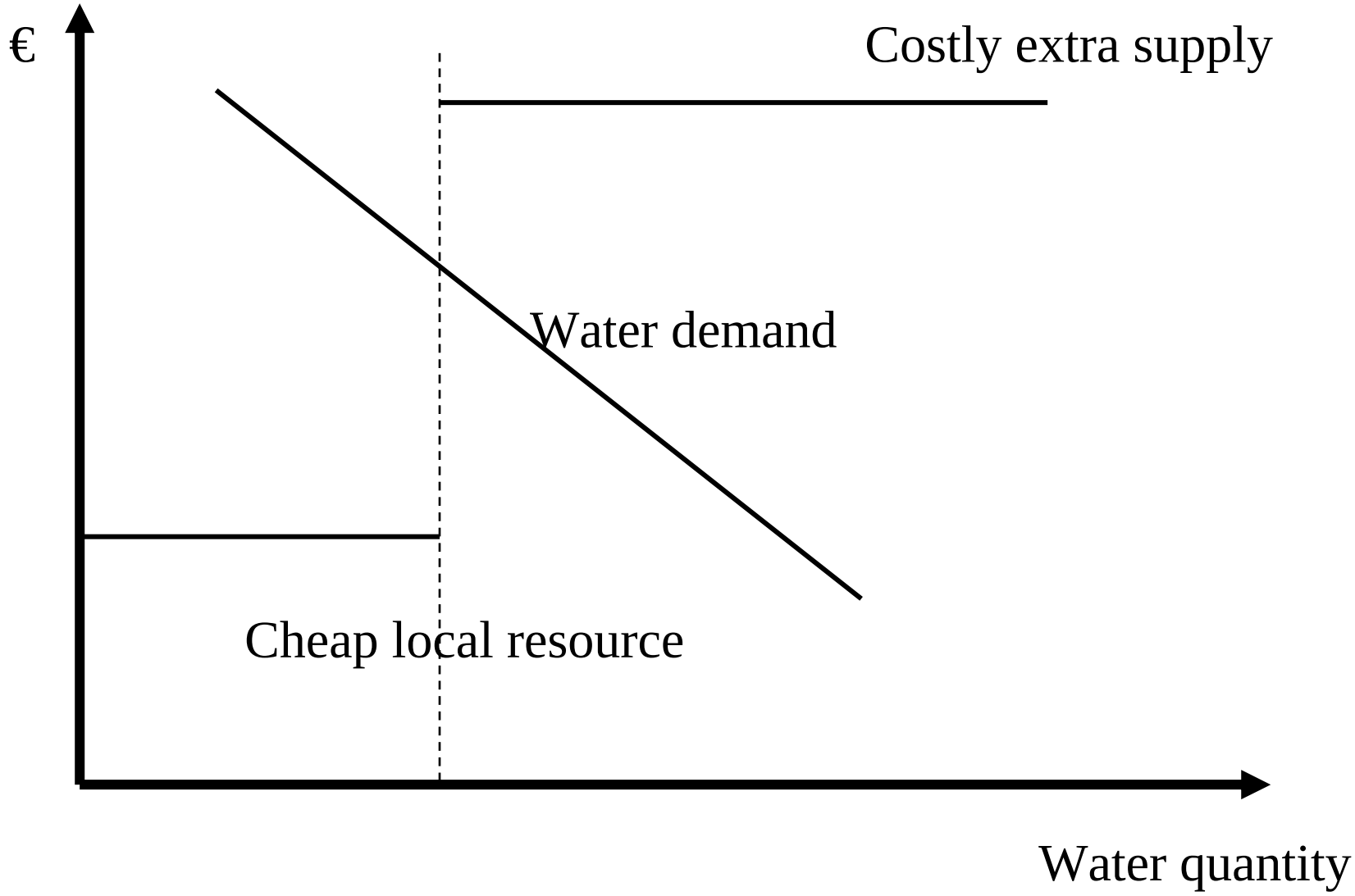
Issues concerning groundwater use

- Intensive use of groundwater may lead to:
  - lowering of water table, involving:
    - higher costs of pumping and need for deeper wells
    - saline intrusion
    - disruption of wetlands
    - soil subsidence
    - low flows in rivers
  - increased competition among uses
    - downstream uses penalized
    - appropriation by high-value uses
- Intensive use of groundwater ≠ overexploitation, if:
  - appropriate rules, adequately enforced, or
  - accepted rules for sharing water + burdens, mutual cooperation, social learning
  - improved management techniques

Examples of problems concerning groundwater

- Valuing
  - lowering costs of pumping have made intensive GW use affordable to many users
  - Resource cost = 0 until pumping < recharge; intensive use may lead to the appearance of RC
  - excess GW demand due to failure in taking RC into account
  - excess pressure on GW due to failure to account for GW depletion (eg pesticides, fertilizers)
- Governing
  - diffused sources of pollution / diffused abstractions
  - tragedy of commons: difficult to establish and enforce property rights on GW: from “no-one’s property” to “common property”
- Sharing
  - misallocation of resources among sectors ⇔ failure to achieve an agreement about property rights and priorities
  - territorial dimension: GW perceived as a “local” good
  - GW use perceived as a customary right
  - emerging new demands entailing a (potentially higher) value but being perceived as “foreign” by the already established community
  - perception that water policymakers have “children and stepchildren”

The overexploitation dilemma



The overexploitation dilemma – way out

- expand supply ⇔ doing more with more raw water
  - very costly, most of the times inefficient,
  - often not affordable if FCR (and not even for the state)

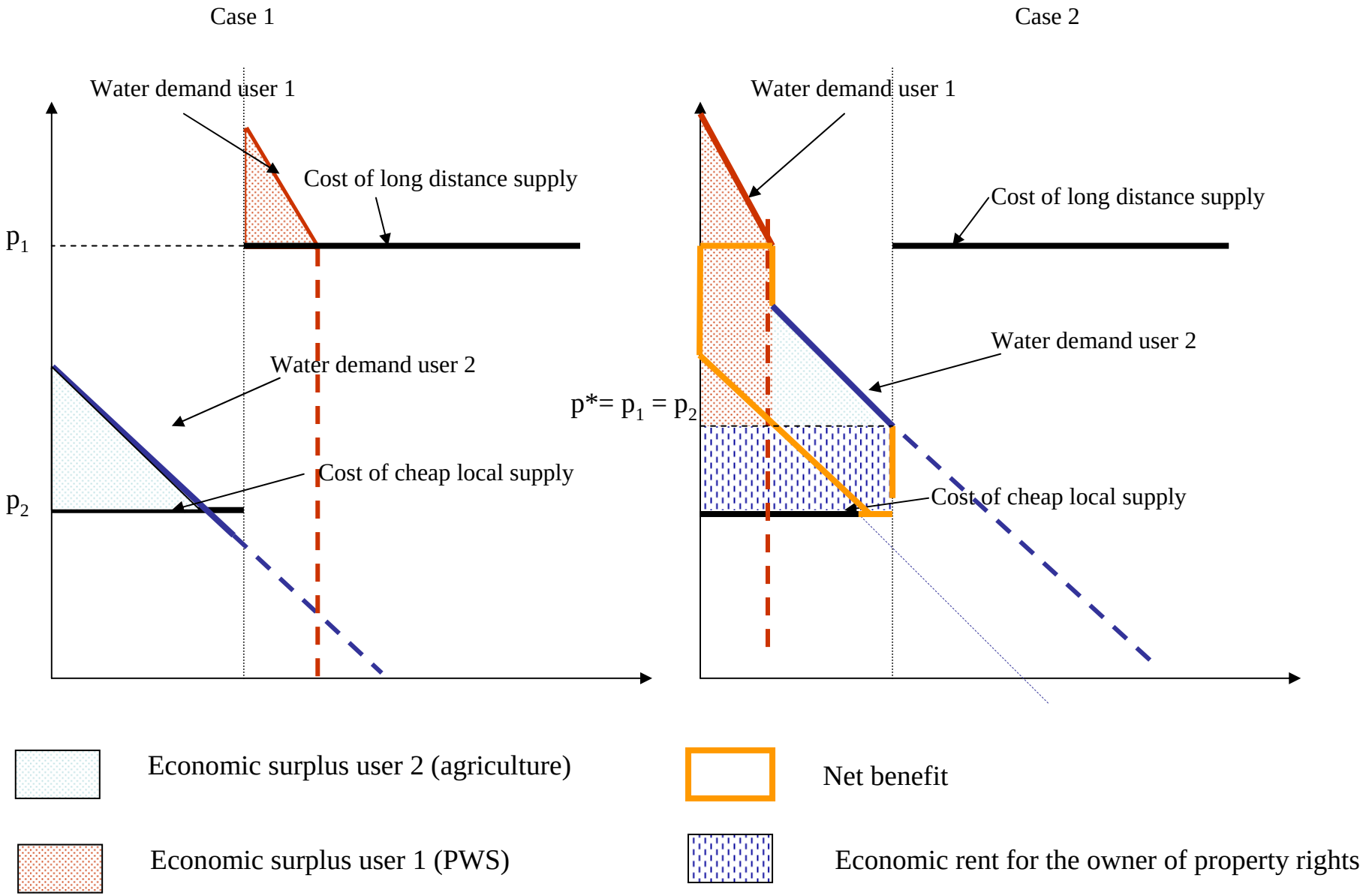
- increase productivity ⇔ doing more with the same raw water
  - not affordable for all uses; necessary to ensure that low-value uses do not carry on wasting resources
  - need for public subsidies at least in the initial phase
  - not necessarily economically efficient

- phase-out some uses ⇔ doing less with the same raw water
  - socially or politically difficult; enforcement problems if based on C&C
  - “irrigar los turistas vale mas que irrigar los campos”
  - compensation can alleviate political opposition

Traditional solutions

- New infrastructure for meeting demand
  - Redirect high-value uses to high-cost supply systems (eg dams, transfers, desalination)
  - Problems:
    - high financial cost
    - inefficient allocation of (economic) resources
    - unfeasible without strong government involvement (FCR not affordable)
- Command & control
  - define and enforce state ownership
  - licensing system + control & enforcement
  - Requires a strong public administration + political commitment
  - Problems:
    - enforcement difficult and costly (non-point sources)
    - very unpopular; fierce opposition of owners of traditional customary access rights
    - … and we are not in China …

An example of the inefficiency of traditional solutions



Establishing public property rights (Spain, Italy)

- The problem and the background
  - rich aquifers (but competition with ecosystems' services)
  - intensive GW use by agriculture leading to excess exploitation of aquifers (saline intrusion, land subsidence, low flows, disappearence of wetlands)
  - existing water rights system based on land ownership (free possibility to drill at one's own expenses)
  - Some millions of boreholes ⇔ impossible to control
- The mainstream traditional solution (and its failure)
  - permission required for all new boreholes
  - existing boreholes receive a 50 years concession in exchange for the installation of meters and some control
  - Largely insufficient !! census of existing use rights still in course after 10-20 years; data is unreliable and uncontrolled

European policy for Groundwater

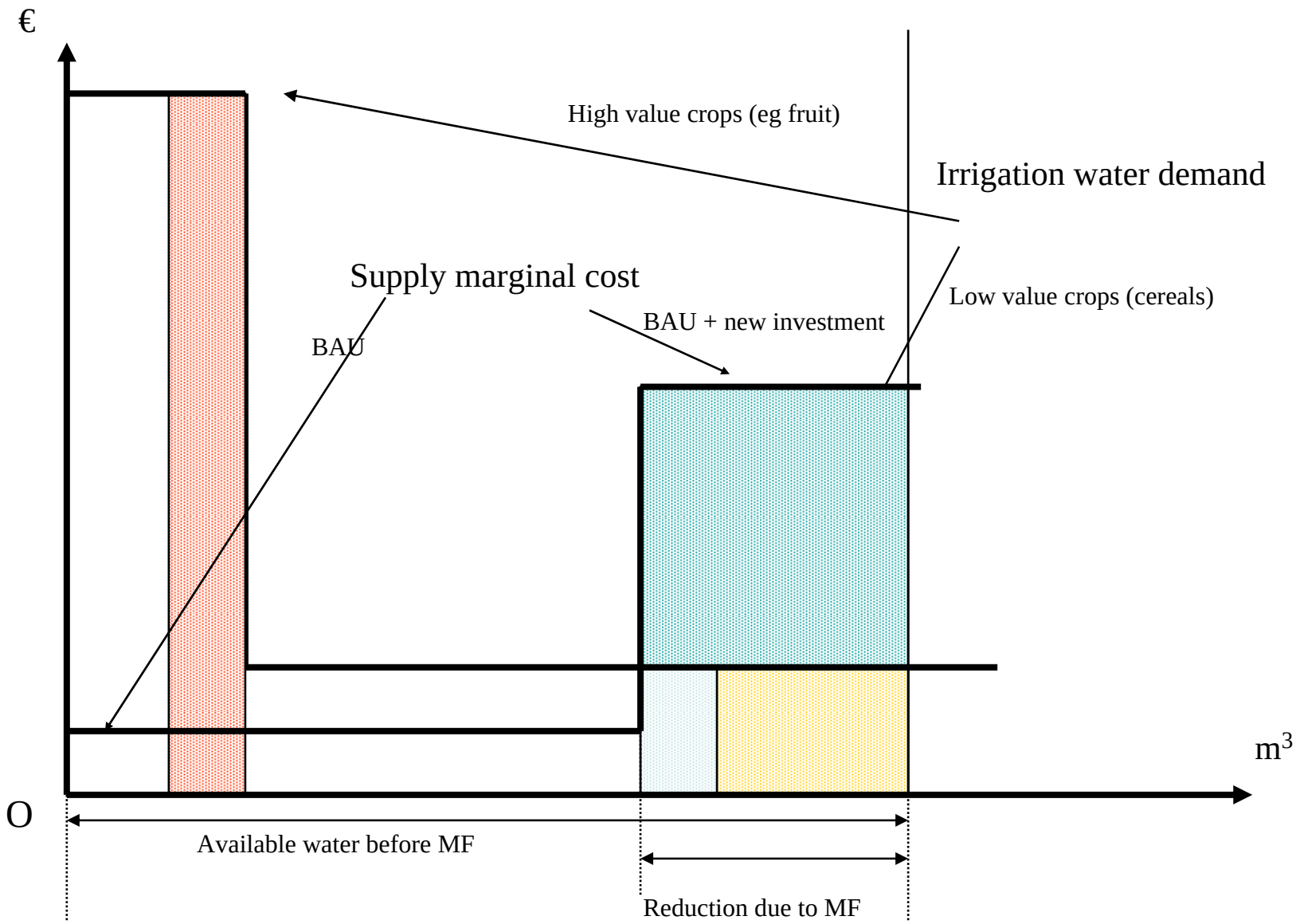
- WFD, GWD (and EUWI) concept about GW
  - GW is acknowledged as a key strategic resource
  - what is scarce is not “water”, but rather “cheap and easily accessible water”
  - GW issues as typical non-point issues requiring a dedicated approach ⇔ collective action problem and not simply a management one
- WFD targets concerning GW:
  - preserve aquifers in a pristine state
  - avoid overexploitation and any form of irreversible contamination
  - stop and possibly invert trends of deterioration
- WFD strategy about GW
  - Resource and environmental costs ⇔ basis for using economic instruments
  - Addressing drivers of GW demand better than end-of-pipe
  - Encourage awareness and mutual cooperation through PP
  - Search for integrated solutions
  - Reform of Rural Development Policy: MS are allowed to force the change of agricultural practices in designated water protection zones; compensations can be paid without violating the EU principle of equal treatment

How economic instruments can help

- Valuing
  - Taxation on abstractions
  - Full-cost recovery as a way to implement efficient water uses and phase out inefficient ones (eg irrigation of cereals)
  - “virtual water trade” as a way to avoid “raw water trade”
- Governing
  - Addressing drivers of demand
    - patterns of urban development
    - agriculture / cropping choices
  - “segregation + compensation” of low value uses
- Sharing
  - establish collective management systems ⇔ WS&S from “free individual access” to “public utility”

An example: managing the impact of water shortage in agriculture in Northern Italy

- Background
  - Existing irrigation systems allocate water among farmers on a per-he base, regardless what they actually do with water
  - Usually high-value and low-value crops coexist in the same area; reallocation of water is problematic
  - Water charges are low and far from FCR; tariffs are based on surface, no metering
- The problem
  - In the process of implementing the WFD, new requirements for minimum flows are being introduced and substantial reductions of abstraction rights is envisaged
  - In the existing system, this would entail a proportional reduction for all farmers (total cost = red + yellow area)
  - An eventual investment for increasing the productivity of raw water (eg transforming open-air ditches into pipelines) would have a cost that is much higher than the farmers' WTP (green area)
  - A reallocation of use rights from low- to high-value crops would minimize the total loss (yellow + blue area), but would concentrate it onto farmers producing low-value crops ⇔ compensation required for equity reasons


€
High value crops (eg fruit)
Irrigation water demand
Supply marginal cost
Low value crops (cereals)
BAU + new investment
BAU
m3
O
Available water before MF
Reduction due to MF

How institutional innovation can help

- Valuing
  - social right vs. economic good ⇔ a new principle for allocating water use rights and discourage valueless demand
  - direct bargaining as a way to favour agreements that are mutually convenient among sectors
- Governing
  - Public participation as a way to increase mutual awareness and understanding
  - Integrated management as a way to benefit from trading rights and encourage direct bargaining among users
- Sharing
  - Reuse of wastewater
  - Voluntary agreements
  - Collective institutions ⇔ GW as a “common property”

Wasserpfennig (Germany)

- The problem and the background:
  - control contamination of GW due to agriculture
  - existing legislation is severe, but not enough to avoid the requirement for costly treatment
  - tight regulation required in DW catchment areas, but useless outside it; regulatory authority do not know where catchment areas are located
- The solution
  - PWS&S allowed to bargain with farmers and pay compensation for further reductions of pesticides and nitrated in catchment areas
  - cost of agreement entirely passed though on tariffs (much cheaper than removing pollutants afterwards)
- Drivers of success
  - “rule of reason” > “ideological principle” ⇔ PPP is not adopted
  - bargaining occurs among those actors that hold relevant knowledge; mediation of public authority useless
  - action is discretional and punctual ⇔ risk of abuse, requires trust
  - established tradition of subsidiarity

Collective water systems (Carpi, Italy)

- The problem and the background:
  - intensive GW pumping for meeting industrial requirements (textile industry)
  - evidence of soil subsidence and low flows in the main river
- The solution
  - creation of a collective water management system for industry supply
  - incentives for individual companies to join + penalties for exceeding pumping quotas
  - the system fosters intensive wastewater reuse and manages collective effluent treatment facility
- Drivers of success
  - understanding the nature of the problem as a collective problem
  - strong incentives to join the collective WMS system; initially with low charges
  - institutions involved as facilitators of cooperation (and not C&C)
  - fundamental role of regional institutions in the setting of specific knowledge and experimentation of technical solutions
  - tradition of cooperation among companies and with institutions
  - gradual policy: carrot until a majority of companies had joined, stick afterwards

Centralizing water supply systems (Italy)

- The problem and the background
  - more than 13,000 individual water supply systems
  - mostly supplied by GW and springs
  - low-tech, poor management capabilities
  - very vulnerable; increasing signs of contamination
  - not affordable for Las tp manage the system with innovative solutions required
- The solution
  - force the creation of collective entities representing LAs and holding responsibility for service supply (90 management units aimed at sharing resources, problems, solutions and costs)
  - interconnect supply system in order to concentrate abstraction, monitoring, treatment and protection (“reserve zones” to be identified in each management unit)
- Drivers of success / key issues
  - very slow implementation
  - difficult to achieve LA consensus and achieve a proper way of sharing problems ⇔ still no “community” has been created
  - importance of PP ⇔ key of success cases, crucial deficiency in cases of failure

Segregation of touristic demand (Sicily)

- The problem and the background
  - very poor performance of the water supply system; many areas still receive irregular supplies
  - water system in very bad conditions (eg leakage = 40-50%)
  - fast growing demand for tourism; tourism represents the main and more fastly growing economic sector; WTP estimates many times higher than baseline household demand
- The solution (eg. Palermo)
  - extraordinary effort for modernizing the system: investment for reducing leakage, wastewater reuse etc
  - separate water bills for first and second houses; special water bill for hotels and touristic resorts
  - concentrate price increase on touristic demand + hotels
- Drivers of success / key issues
  - very strong negative reaction of hotels and economic interests linked to tourism led to abandon the project (even if extra-cost < 1€/m3…)
  - once again, failure to perceive that traditional solutions (state-geared investment) are not practicable

Bottom-up solutions (Spain)

- In some Spanish coastal areas, bottom-up cooperative institutions have been established a long time ago and provide a case of sound and effective management of collective rights
- In some cases, user associations can be created and users be compelled to join
- Individual rights are assigned on a customary base and enforced through mutual control
- Open bargaining among users (“quasi-market”)
- Associations ensure the definition of allocation rights and the settlement of disputes

A case-study: Low Llobregat & Cubeta S.Andreu

- Background
  - Location: Catalonia
  - Users: mainly industrial and PWS; some farmers
- Organization
  - compulsory affiliation for all users
  - controls all wells and abstractions
  - uses GW models that are shared and transparent to users
  - carry out restoration and artificial recharge programmes
  - represents all users in the political bargaining with the Autonomous Community of Catalonia (eg concerning low flows, programmes for limiting saline intrusion)
- Factors of success
  - few users with strong technical expertise and high-value demands
  - illegal overexploitation (no previously established use rights)
  - understanding of a common problem
  - aquifer allows alternative management strategies (eg artificial recharge)
  - good management can actually solve problems (no conflictual demands)

Conclusions – best practices on GW

- Solutions normally entail:
  - demand management (easier and more effective if drivers are addressed)
  - reserve traditional systems for baseline demand and address marginal peak demand to high-MC solutions
  - segregation of low-value uses (normally unfeasible without compensation, but may not be too costly)
  - establishement of management systems with adequate technological capabilities ⇔ private sector involvement (?)
  - bottom-up regulatory institutions
  - investment in knowledge ⇔ aquifer modeling, stakeholder analysis
  - social and political context matters (eg importance of the food security issue; cultural and traditional aspects of agriculture, landscape etc)
  - pay attention to “status” issues ⇔ building a community vs. “civil wars”

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Thank you !!

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