

Groundwater management

Summary of inputs
Key questions

The INECO Case Studies on Groundwater Management

PEGEIA, CYPRUS

- Groundwater overexploitation linked to:
 - Rapid urbanisation
 - Increasing demand for tourism
- **Need for:**
 - Alternative water supply (desalination & greywater reuse in the home)
 - Incentives for water conservation & leakage control

TUNISIA

- Groundwater overexploitation linked to:
 - Agricultural water use
 - Limited acceptance of wastewater reuse
- **Need for:**
 - Alternative water supply (wastewater reuse)
 - Incentives for water conservation in irrigated agriculture
 - Choice of crops
 - Irrigation methods

Mitigating GW overexploitation

Policy Goals



Enhance supply

Doing more with more raw water

- Who bears the cost?



Increase productivity

Doing more with the same raw water

- Public subsidies vs. economic efficiency for low-value uses

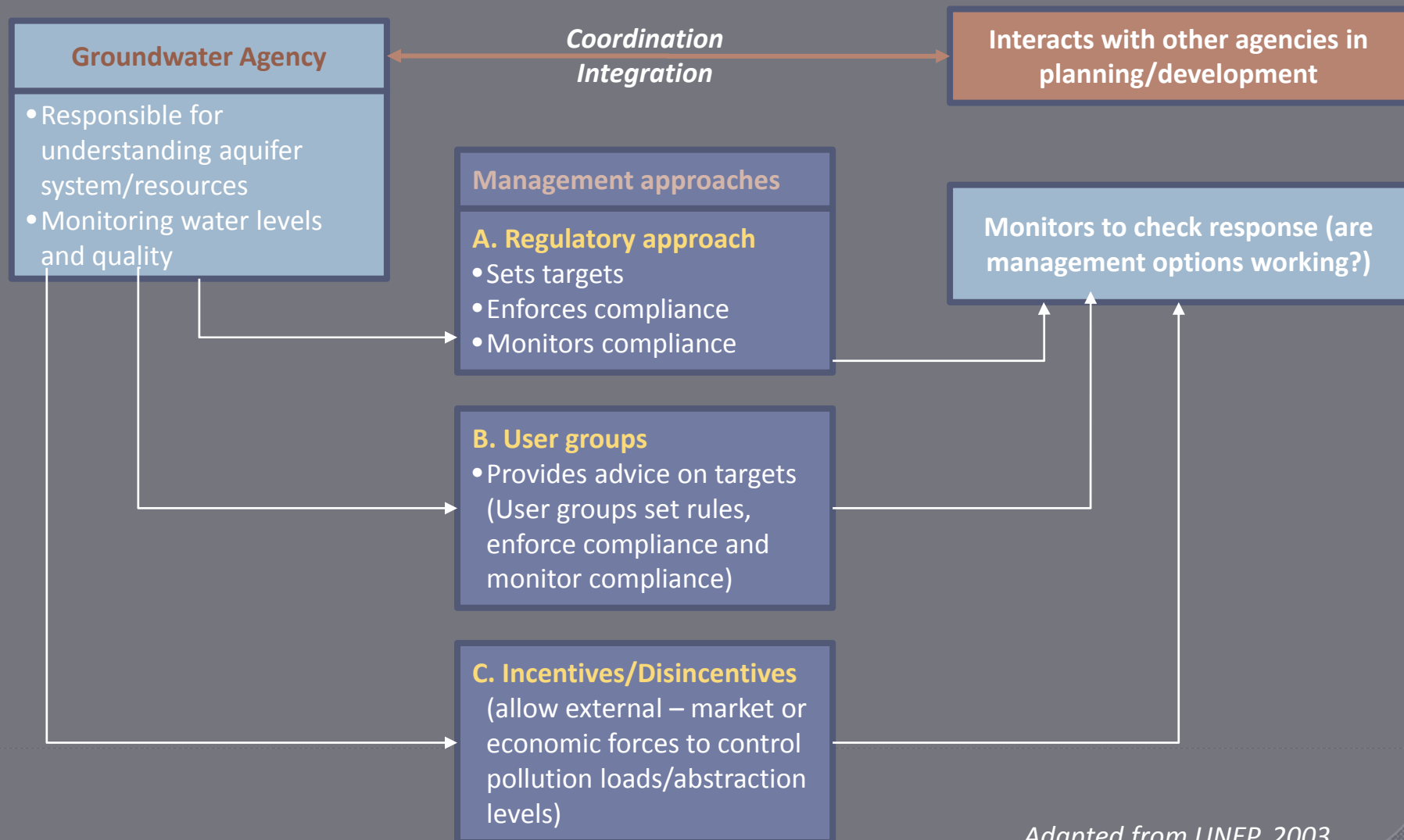


Phase out some uses

Doing less with the same raw water

- Often socially & politically undesirable
- Enforcement?

GW management approaches



Adapted from UNEP, 2003

The regulatory approach

● Prerequisites:

- Legislation on the public ownership of groundwater
- Strong public administration and political commitment

● Process: Granting of rights of use is regulated by state or governmental agencies

- Monitoring & assessment of aquifer status
- Preservation of aquifer-dependent ecosystems

● Problems:

- Monitoring and enforcement can be **difficult and costly**
- Coping with traditional access/exploitation rights
 - How to cope with the perception that GW is privately owned
 - Increase awareness so that enforcement becomes accepted by the society

● Experiences:

- Top-down level control has in many cases proven unfeasible
 - Several thousands of privately owned boreholes
 - How to meter abstractions

Collective management systems & Economic/regulatory instruments

- Establishment of collective management systems (bottom-up approach)
 - GW is perceived as a common property
 - Individual rights assigned on a customary base and enforced through **mutual control**
 - Associations ensure the allocation rights and the settlement of disputes
- Incentives/dicincentives and mixed economic/regulatory instruments
 - Abstraction charges (environmental taxation), possibly internalising part of resource costs (→ **increase the cost borne by users**)
 - Introduction of alternative supply sources (e.g. reclaimed water) in irrigation (→ **price should be lower than GW extraction cost**)
 - Voluntary agreements to reduce groundwater abstractions
 - Compensation for loss of income
 - Subsidies/training support to install water saving equipment

Summary of suggested options

PEGEIA, CYPRUS

- ◉ Subsidies & mandates for the installation of efficient water fixtures and appliances, esp. for new buildings
- ◉ Disincentives for excessive water use
 - Increase of water rates, especially for large residential consumers/hotels to cause shift to other supply sources
 - Application of seasonal water rates
- ◉ Groundwater abstraction charges internalizing resource costs
- ◉ Government subsidies for leakage reduction and control programmes
- ◉ Compulsory water audits for the large consumers
- ◉ Awareness & participation

TUNISIA

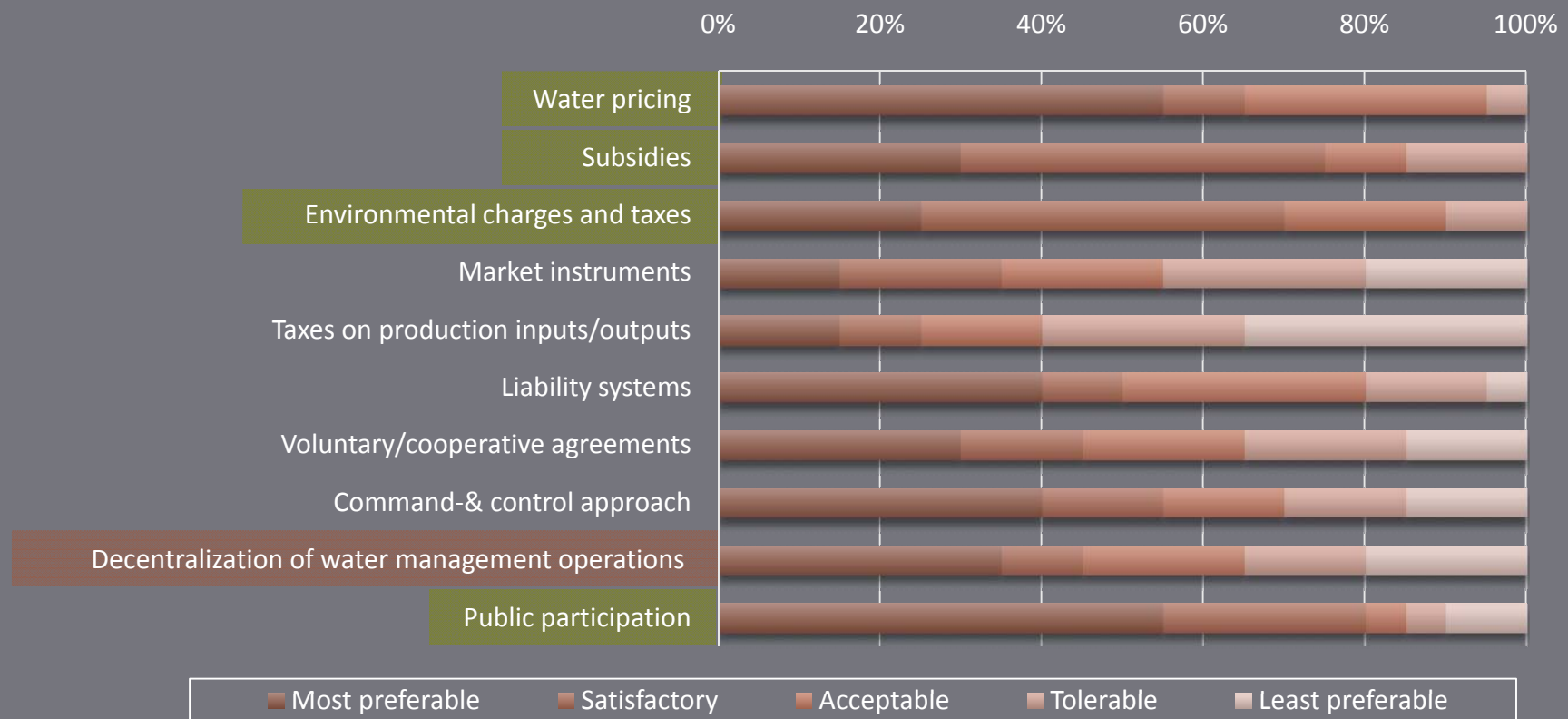
- ◉ Abstraction permits & enforcement
- ◉ Voluntary programmes for water saving/reduction in groundwater use targeted to farmers
- ◉ Pricing incentives
 - Lower price for treated wastewater than surface water and groundwater pumping costs
 - Abstraction charges for groundwater (public & private boreholes)
- ◉ Decentralization of activities in GW management – collective management schemes
- ◉ Awareness campaigning

Option Analysis: Cyprus

- ◉ Subsidies are in place for water saving in the domestic sector
 - Borehole drilling in urban areas for garden irrigation/toilet usage
 - Installation of greywater systems in homes/public buildings
- ◉ Voluntary agreements with farmers are available for vulnerable zones (Nitrates Directive)
 - Compensation is offered for the loss of production as a result of restrictions in fertilizer use
 - Limited potential for further improving irrigation efficiency
- ◉ The monitoring of groundwater extraction is limited to public water supply boreholes
- ◉ Abstraction charges are considered a potential instrument
 - Suggested process
 - Registration of public water suppliers (municipalities, irrigation divisions/associations), industrial plants, self-supplied farmers
 - Monitoring and registration of abstracted quantities
 - Setting of charge basis

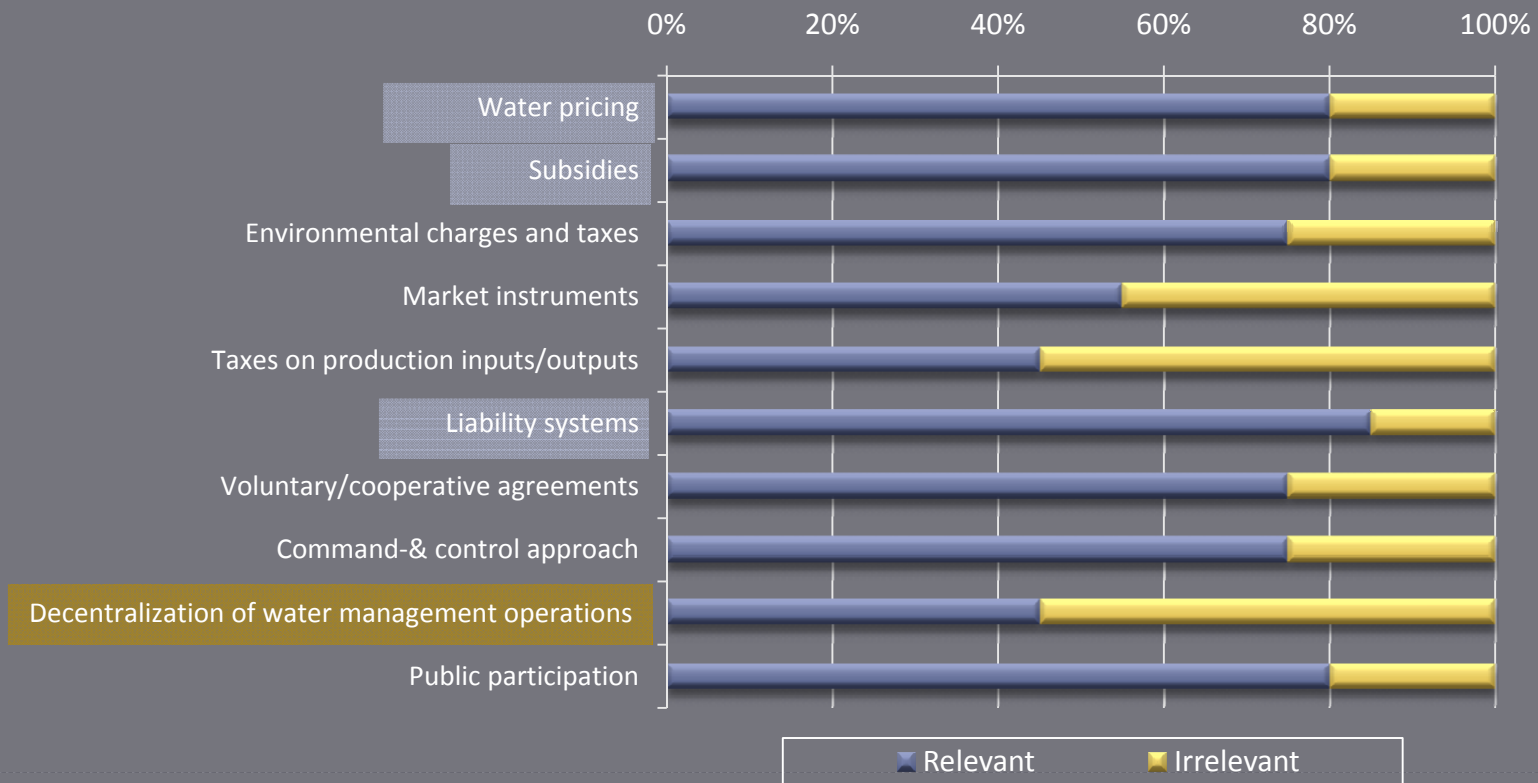
Evaluating instruments: Cyprus

A. Preference on options

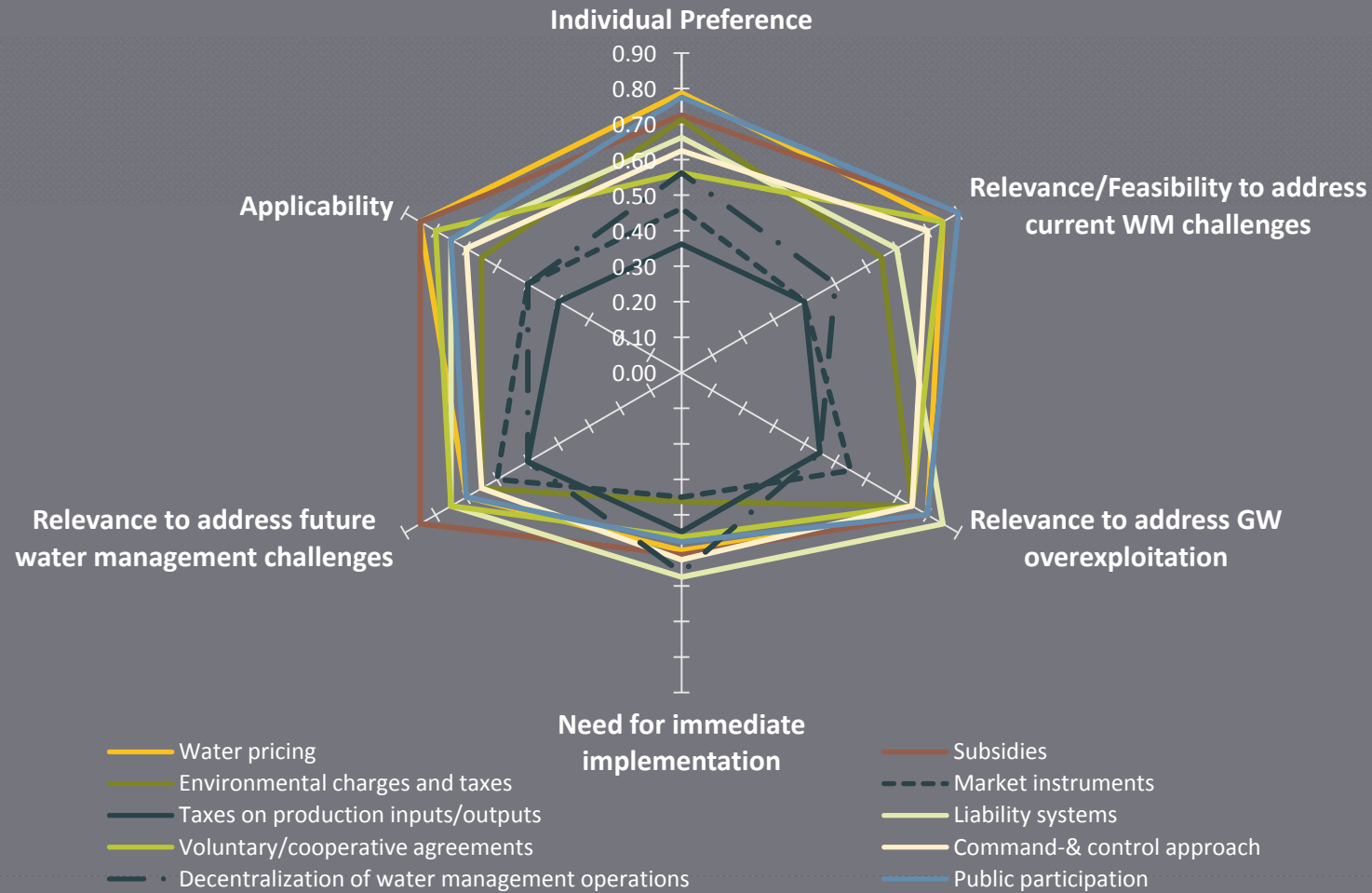


Evaluating instruments: Cyprus

B. Relevance to groundwater overexploitation in Pegeia



Overall Evaluation: Cyprus

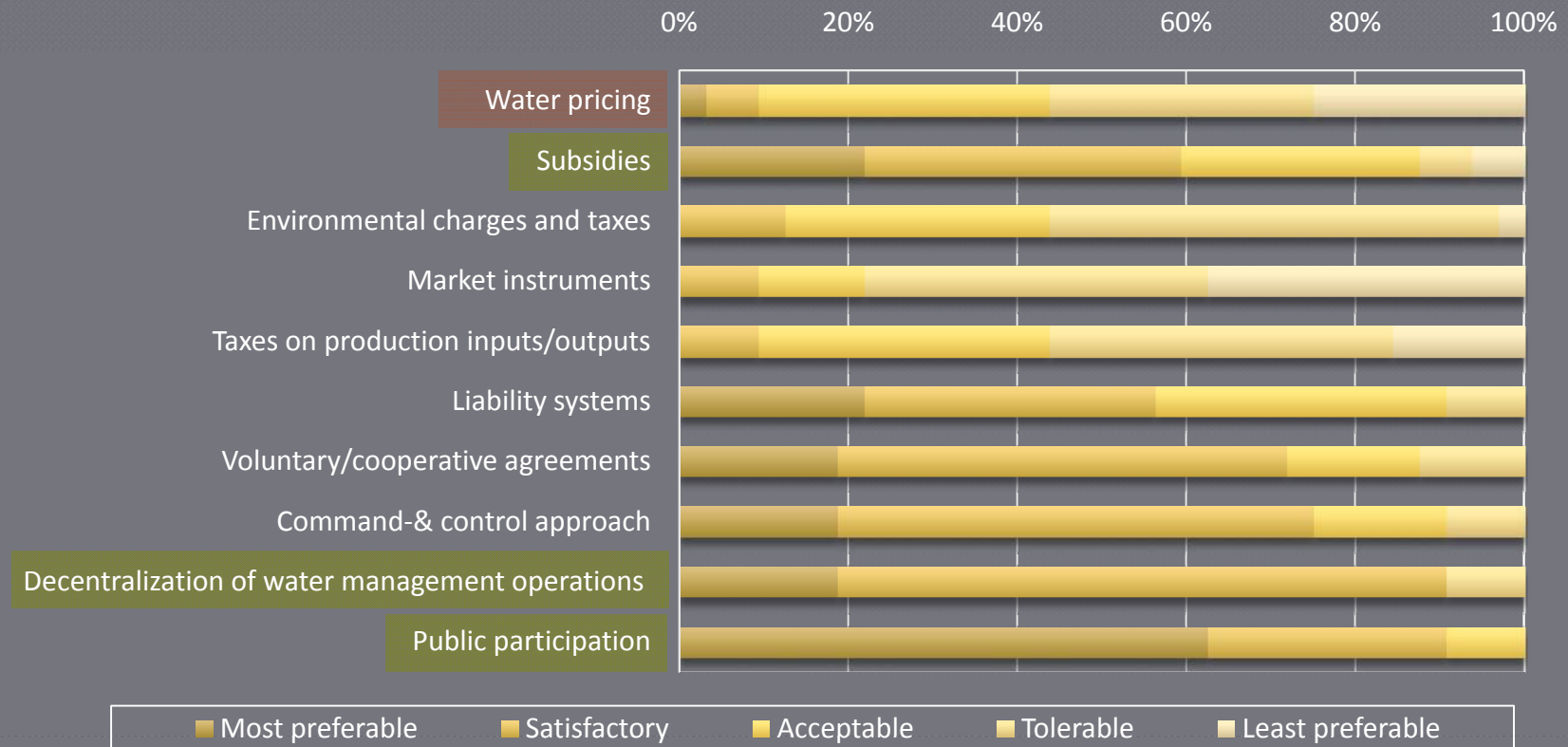


Option Analysis: Tunisia

- ◉ Increasing productivity in irrigated agriculture
 - Governmental support for cereals due to the prevailing global economic conditions and increased demand
 - Financial obstacles towards the adoption of efficient irrigation systems (soft loans are available but progress remains slow)
- ◉ Subsidies for wastewater reuse
 - Wastewater price 0.02 TD/m³ vs. 0.05 TD/m³ for Groundwater and 0.1 TD/m³ for Surface water
 - The State finances water reuse projects
 - However most farmers are not willing to use treated wastewater
 - Low quality of reclaimed water
 - Limited acceptance/lower prices of produce in the market
- ◉ Monitoring of groundwater abstractions
 - Monitorable by the Regional Department for Agricultural Development (CRDA)
 - No specific service to undertake the task
 - Compliance to permits checked mostly immediately after borehole drilling

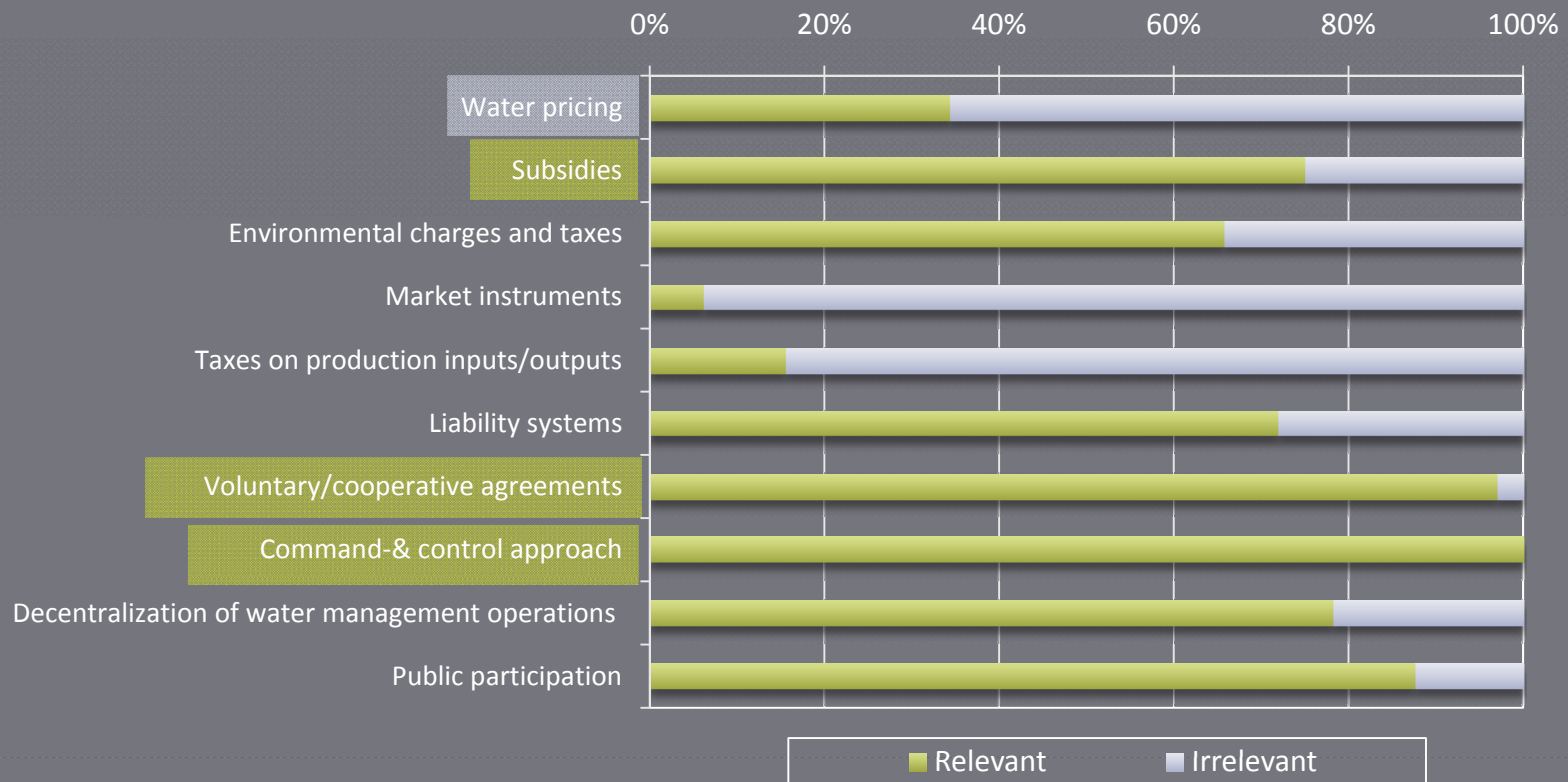
Evaluating instruments: Tunisia

A. Preference on options

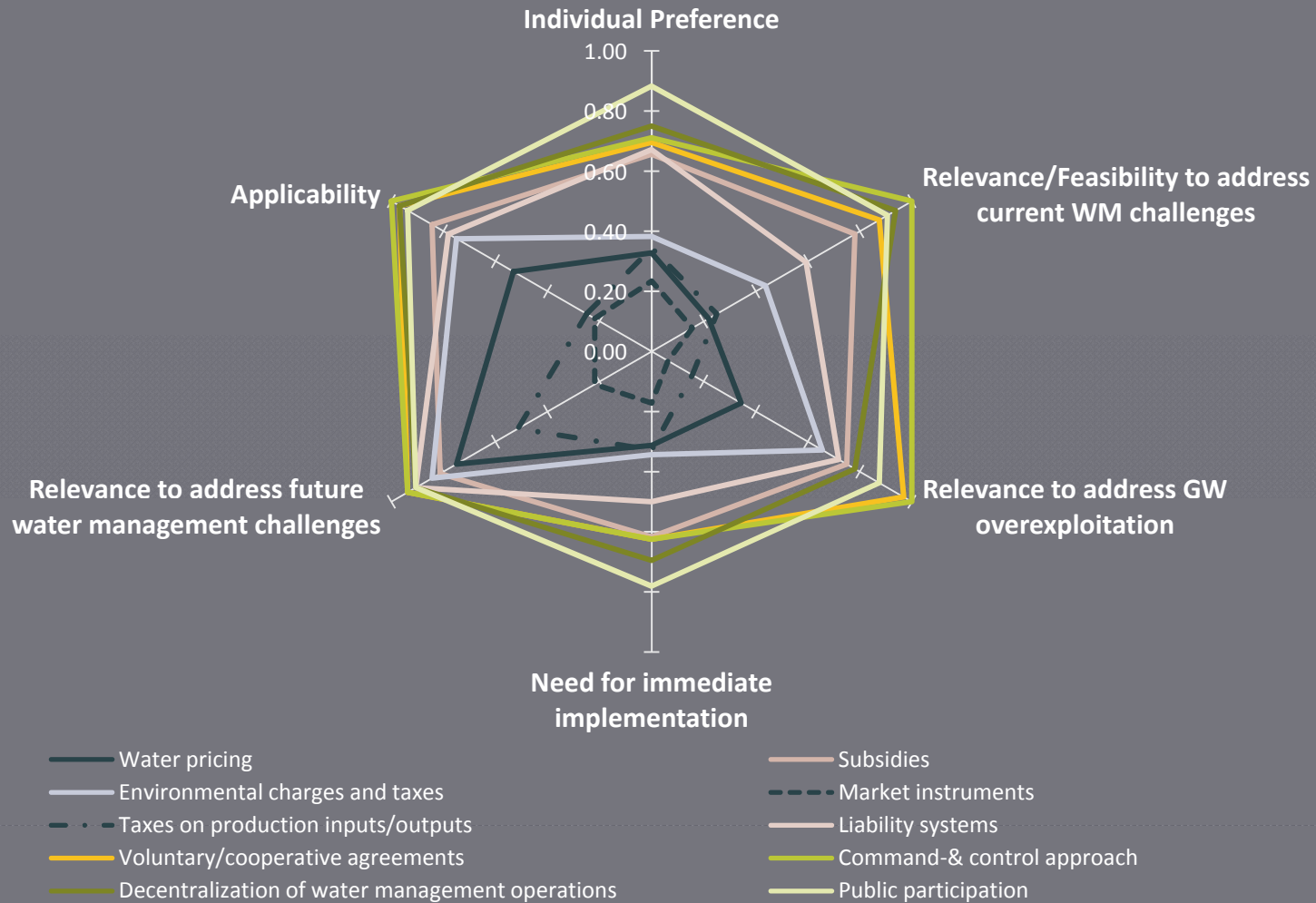


Evaluating instruments: Tunisia

B. Relevance to groundwater overexploitation in Tunisia



Overall Evaluation: Tunisia



Key Questions

- Public subsidies vs. economic efficiency for low-value uses
- Enforcement of groundwater abstraction metering vs. user group opposition
- Community management (bottom-up) vs. centralized management (top-down)
 - Feasibility, capacity, financing