Economic Instruments in Wastewater Management

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Economic Instruments in Wastewater Management

Objectives

1. Raise revenues and recover costs
2. Set incentives for water conservation and pollution prevention
3. Awareness raising and economic efficiency

Economic Instruments in Wastewater Management

Mechanisms

- Pollution charges
  - For discharge of untreated wastewater into the environment
- Fees for wastewater services/ user charges
  - For connection to and discharge of wastewater into the sewerage system

Other economic instruments:

- Indirect local taxes
- Discharge permits

Pollution Charges

- Charged for the environmental and social costs that result from disposing wastewater
- Usually imposed on operators of treatment plants and industrial dischargers
- Charges are generally calculated based on actual quantities and/or pollution loads of the effluent

Pollution Charges in Germany

- Effluent Charges Act (Abwasserabgabengesetz, AbwAG) implements polluter pays principle
- Calculation of charge:
  amount and harmfulness of discharged substances
  → pollution units (Schadeinheiten SE)
- Goal: create financial incentives for reducing waste water emissions
- Effluent charge is paid to states
  → spent on measures for conserving water bodies

Pollution Charges in Germany - Contaminants and pollution units/ Effluent Charges Act (AbWAG)

Rated contaminants and contaminant groups	**Measurements constituting one pollution unit**
Oxidizable substances in chemical oxygen demand (COD)	50 Kilograms Oxygen
Phosphorus	3 Kilograms
Nitrogen	25 Kilograms
Halogen compounds as adsorbable organic halogen compounds (AOX)	2 Kilograms Halogen as organic chlorine
Metals and their compounds:	*In grams metal:*
Mercury	20 grams
Cadmium	100 grams
Chromium	500 grams
Nickel	500 grams
Lead	500 grams
Copper	1000 grams
Toxicity to fish	3000 cubic meters of wastewater divided by the dilution factor GF, by which wastewater is no longer toxic to fish

Pricing of Wastewater Services - Requirements for setting wastewater service fees

Recover the costs

- Traditional approach:
  only financial costs of a project/ programme are recovered
  → operations and maintenance (O&M) costs, capital costs and possibly investments for future growth
- Wider economic perspective:
  includes opportunity and environmental costs (and benefits)
- whether part or all of these costs should be recovered from water users/ wastewater dischargers is a political decision

Price signals to users

- Relationship between water use and treatment costs or environmental damage
  → price should be high enough to set incentive to prevent pollution

Pricing of Wastewater Services – Requirements for setting wastewater service fees

Affordability

- Prices not too high to make access to sanitation affordable for everybody

Fairness and equity

- Fairness = wastewater bill not disproportional large share of a household‘s total income
- Equity = Polluter pays principle

Transparency and feasibility

- Easy to explain, understand and implement
- Financially feasible

→ Some objectives might conflict with each other, e.g.: Affordability - Recovery

Pricing of Wastewater Services – Tariff design options

Tariff = system of procedures and elements which determines the customer‘s total water/ wastewater bill

Charge = any part of water/ wastewater bill measured in

- Money per time (e.g. per month) or
- Money per volume or
- Money per unit pollution load.

Different types of tariff systems:

- Fixed Charge Tariff
- Constant Volumetric Tariff
- Increasing volumetric tariff
- Block Tariffs
- Two-part tariff (fixed + volumetric)

} Volumetric charges

Pricing of Wastewater Services – Tariff design options

Fixed Charge Tariff

- Consumers pay a certain amount independent of quantity and quality of wastewater produced
- Fixed charges can vary across households or discharger classes → depending on their characteristics:
  - different types of dischargers (industry, agriculture, households, etc.
  - property values (size of floor space)
  - number of people living or working in the connected building
  - different monthly fees depending on pipes' diameters used to connect the customer to the sewerage or distribution system

→ **Benefit**: Simplicity, no metering necessary

But: no incentives for water conservation/ pollution prevention

Pricing of Wastewater Services – Tariff design options

Fixed Charge Tariff in Uganda (set 1995)

- Water charges aim: recovering operations and maintenance costs, depreciation and capital costs, while providing for social equity
- Un-metered residential consumers paid flat rates → based on number of taps

Difference between metered and unmetered connections:

Number of Taps	**Amount Shillings**
1 Tap	3,696
2-4 Taps	11,088
5-8 Taps	18,480
Over 8 Taps	27,720
Metered (per m^3)	616

US$ 1 = 1,000 shillings

(1996)

Pricing of Wastewater Services – Tariff design options

Volumetric Tariffs

Base customers wastewater bills on

- amount of water used → consumption based charges
- amount and quality of wastewater produced → effluent charges

Require that

- Consumer has a metered connection
- Meter works reliably
- Meter is read on a periodic basis

Domestic wastewater → uncommon to bill services on effluent quality

Industrial wastewater → pollution load differs widely and is usually considered in wastewater bill

Pricing of Wastewater Services – Tariff design options

Volumetric Tariffs

- Constant Volumetric Tariff

  → All users pay same price per unit of wastewater discharged

- Increasing Linear Volumetric Tariff

  → Price per unit of water discharged increases continously as total amount of water used/ discharged by customer increases

- Block Tariffs

  → Users step-wisely pay different charges for different consumption levels

Pricing of Wastewater Services – Tariff design options

Two-part tariff

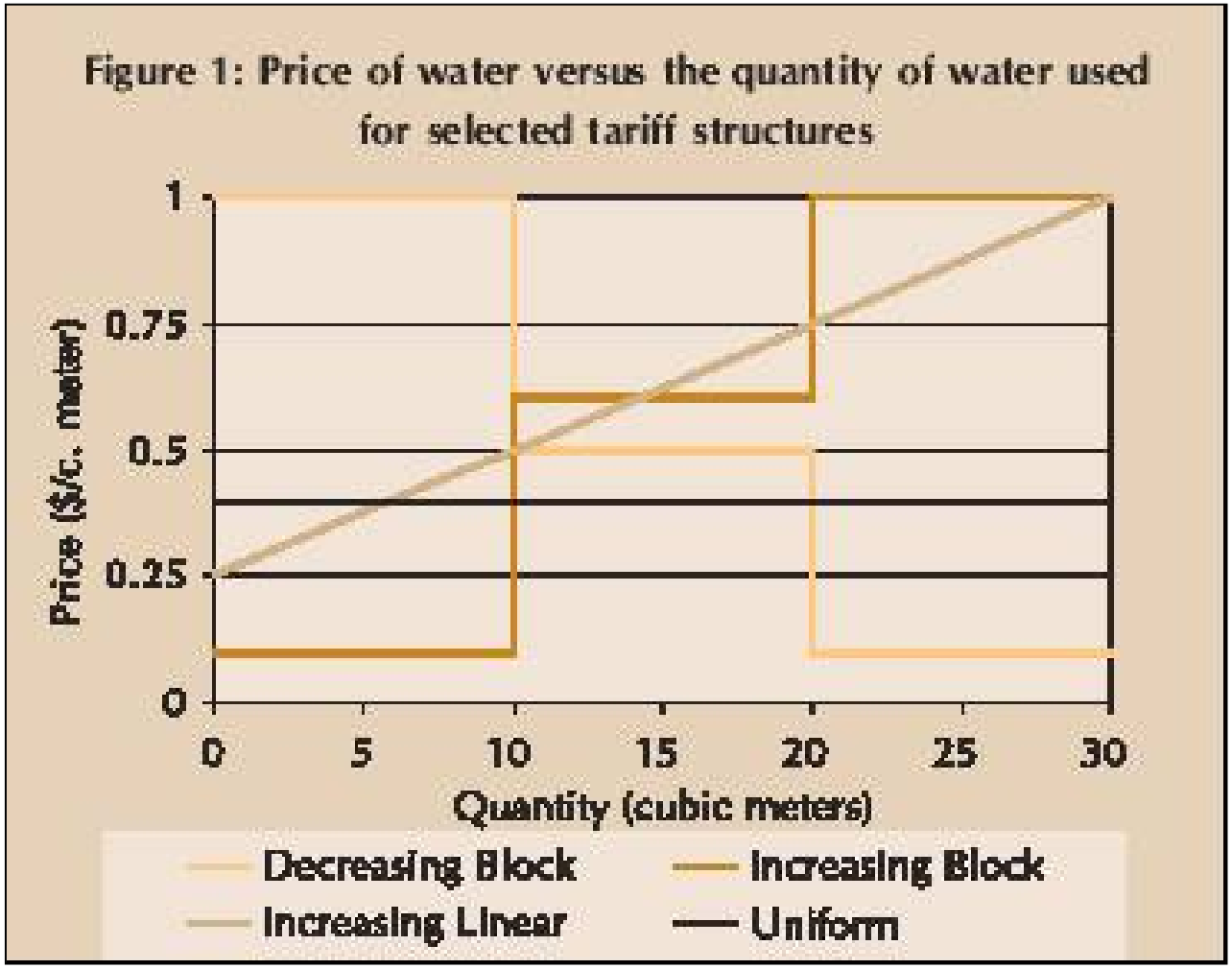
Usually consists of

(1) A *fixed* monthly service charge plus

(2) A *volumetric* charge that is based on the actual consumption/ discharge

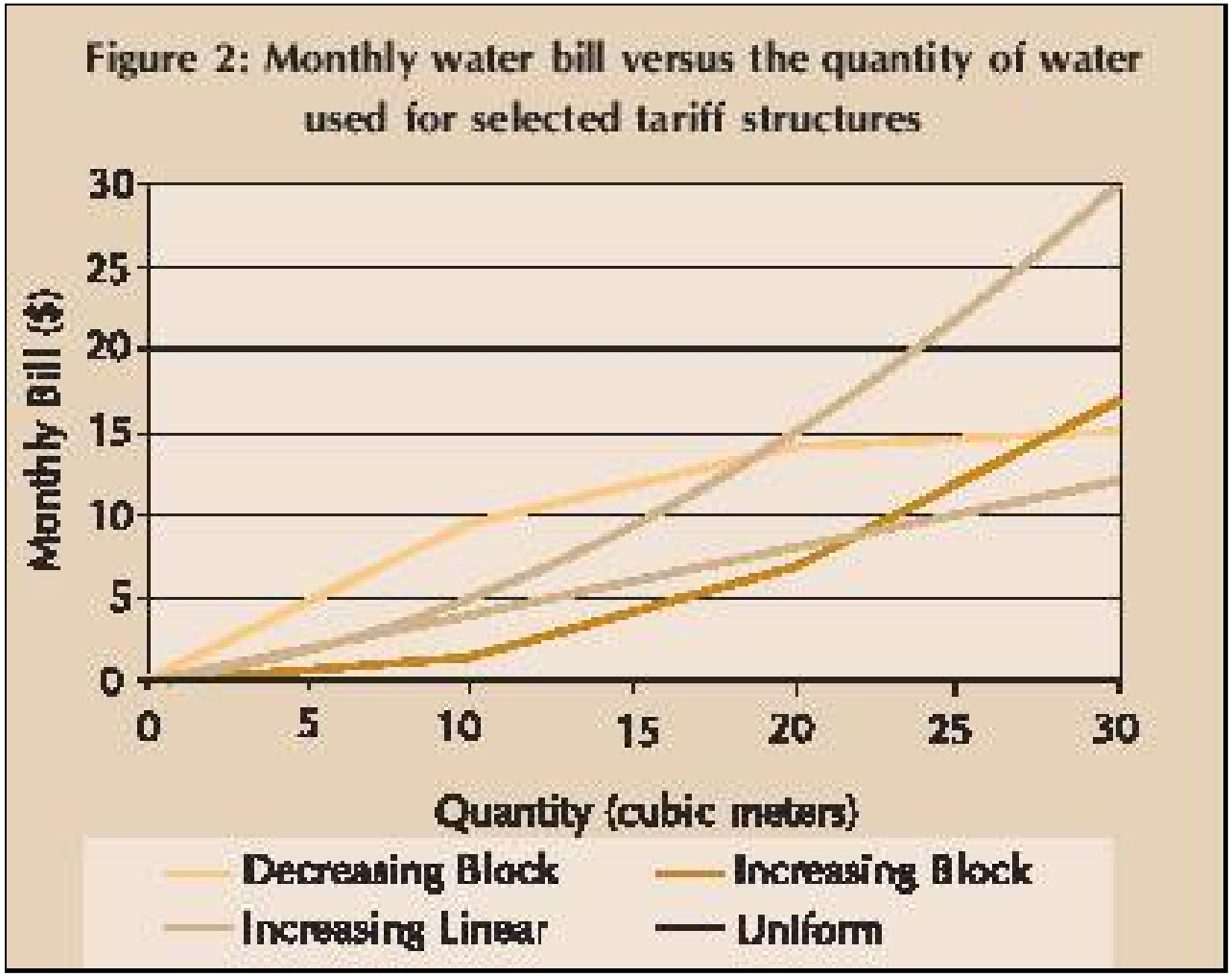
→ Many variations to put components together

Pricing of Wastewater Services – Tariff design options



Source: WSP 2002

Pricing of Wastewater Services – Tariff design options



Source: WSP 2002

Performance of tariffs against design objectives

Tariff Structure	Cost Recovery	Objectives		Affordability
		Economic Efficiency	Equity	
Fixed Charge	***Adequate*** Provides stable cash flow if set at appropriate level, but utility may be vulnerable to resale of water and spiraling consumption.	***Poor*** Does not send a message about the cost of use of additional water.	***Poor*** People who use large quantities of water pay the same as those who use little.	***Adequate*** If differentiated by ability to pay, but households are unable to reduce their bills by economizing on water use.
Uniform Volumetric Charge	***Good*** If set at appropriate level, moreover revenues adjust automatically to changing consumption.	***Good*** If set at or near marginal cost of water.	***Good*** People pay according to how much they actually use.	***Good*** Can be differentiated by ability to pay, and people can limit their bills by reducing consumption.
Increasing Block Tariff	***Good*** But only if the size and height of the blocks are well designed.	***Poor*** Typically little water is actually sold at marginal cost.	***Poor*** People do not pay according to the costs their water use imposes on the utility.	***Poor*** Penalizes poor families with large households and/or shared connections.
Decreasing Block Tariff	***Good*** But only if the size and height of the blocks are well designed.	***Poor*** Typically little water is actually sold at marginal cost.	***Poor*** People do not pay according to the costs their water use imposes on the utility.	***Poor*** Penalizes poor families with low levels of consumption.

Source: WSP 2002

Examples of Water Pricing in the MEDA Region

Lebanon

- Regional water authorities set and collect water tariffs for domestic and agricultural use
- Subscripition fees for domestic water supply vary among water boards

  → differences due to water availability and distribution costs

Examples of Water Pricing in the MEDA Region

Lebanon

- Most households: additional expenses for water consumption because
  - Frequent and periodic water shortages
  - Need to buy water from private haulers
- No installed water meters

  → price of water not affected by actual water consumption
- Users have no incentives to conserve water
  → wastage is common

Pricing of Wastewater Services – Tariff design options

Examples of Water Pricing in the MEDA Region

Palestine

- Municipalities and regional water authorities set and collect water tariffs for domestic use
- Water fees for domestic water supply vary among different localities
  → differences due to level of services, water availabilty and distribution costs
- Some localities: no installed water meters
  → price of water not affected by actual water consumption
- Users have no incentives to conserve water
  → wastage is much more common

Pricing of Wastewater Services – Subsidies

In poor areas of middle and low income countries:

- Subsidies are necessary to cover basic amounts of water usage and basic levels of sanitation service
- Different types of subsidies achieve different purposes:

  Government subsidies:
  - demand side subsidies → paid to the customer
  - Supply side subsidies → paid to the supplier

  Cross subsidies:
  - Some groups of customers are charged more – surplus is used to cover less expensive service provision to poorer groups

  Uniform surcharge on all customers' bills:
  - Use these resources to finance