Economic Incentive Structures for Groundwater Extraction in Yemen

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Yemen's water crisis

- Average renewable water resources are 125 cubic meters per capita, approximately 10% of the amount consumed by a Middle Easterner or North African, who use an average of 1,250 cubic meters each, and only 2% of per capita usage internationally, which is 7,500 cubic meters.

- “The total amount of water used annually is 3.5 billion cubic metres (cu.m.), of which 93 percent is used in agriculture, 6 percent in households and 1 percent by industry. The renewed fresh water is 2.5 billion cu.m. per year. The gap between used water and renewed fresh water is 1 billion cu.m. a year,”
- In urban areas water service coverage is 45% and sanitation is 10%
- In rural areas water service coverage is 20% and sanitation is zero
- Low domestic water service levels (once every 5 to 20 days)

- Domestic water tariffs are low and do not reach cost recovery.(it is subsidies)
- Over (30% - 50%) losses in domestic water supply networks.
- Low domestic water service levels (once every 5 to 20 days)
- In urban areas water service coverage is 45% and sanitation is 10%
- In rural areas water service coverage is 20% and sanitation is zero
- High population growth, 3.2% (expected to reach 40 million in 2025)

Water for irrigation is almost free.

- Sana'a, Taiz, Sa'ada and other aquifers are threatened .Abstraction exceeds recharge by about 80% (in Sana'a 200%) .
- 90% of water resources are used for agriculture out of which 50% goes for Qat.
- Inefficient irrigation techniques

Economic good

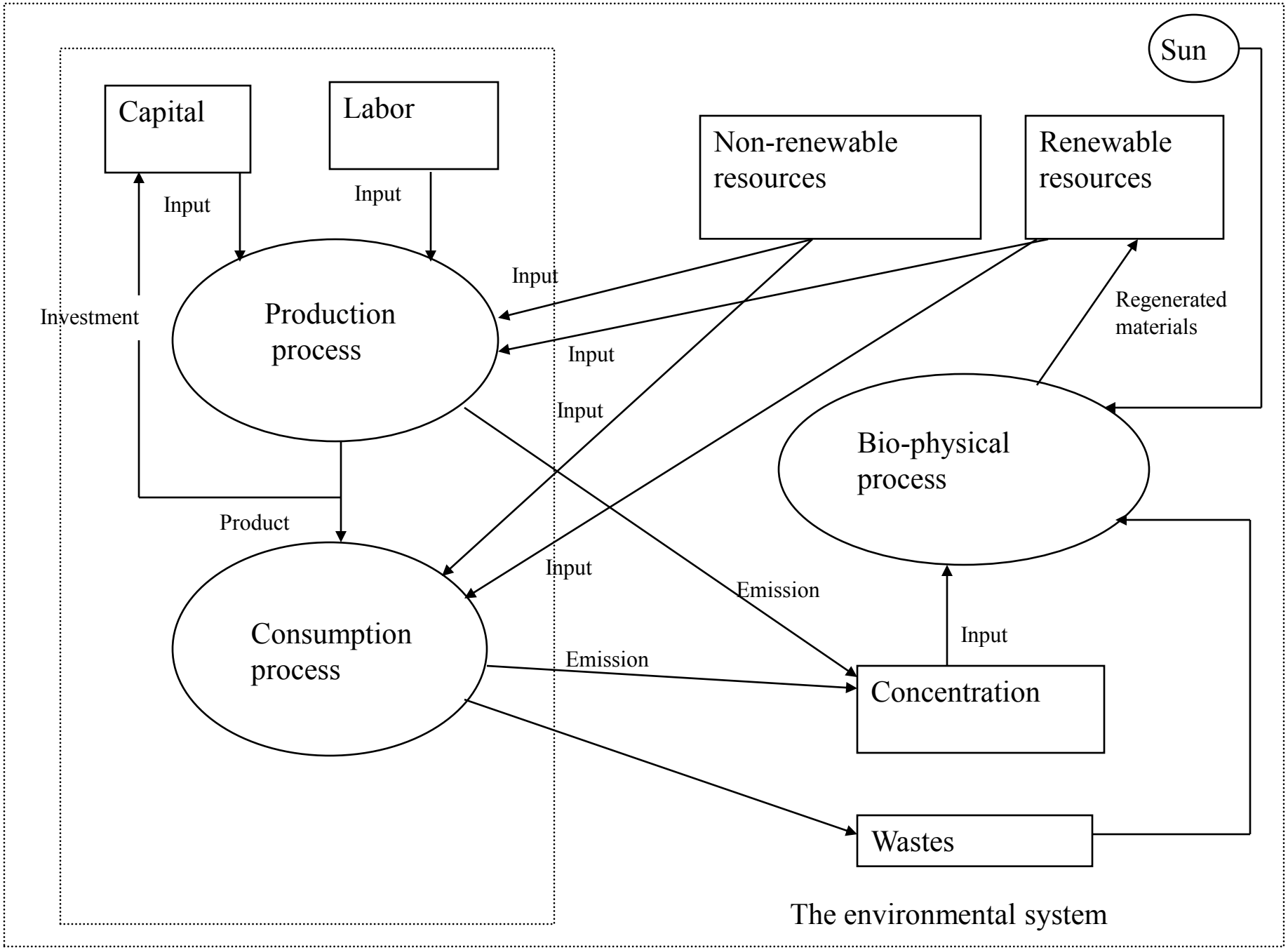
- Water has a value as an economic good as well as a social good.
- Many past failures in water resources management are attributable to the fact that the full value of water has not been recognised. In order to extract maximum benefits from available water resources, there is a need to change perceptions about the value of water.

Value and charges are two different things and we have to distinguish clearly between *valuing* and *charging* for water.

- The *value* of water in alternative uses is important for the rational allocation of water as a scarce resource, whether by regulatory or economic means.
- *Charging (or not charging)* for water is applying an economic instrument to support disadvantaged groups, (Poor) affect behaviour towards conservation and efficient water usage, provide incentives for demand management, ensure cost recovery and signal consumers' willingness to pay for additional investments in water services.

- Treating water as an economic good is an important means for decision making on the allocation of water between different water use sectors and between different uses within a sector.
- This is particularly important when extending supply is no longer a feasible option.

- In IWRM, economic valuation of alternative water uses gives decision makers important guides to investment priorities but it should not be the only consideration. Social goals are important too.
- In a water-scarce environment, would it be right, for example, that the next water resource developed should be assigned to a steel-manufacturing plant because the manufacturer can afford to pay more for the water than the thousands of poor people who have no access to safe water?
- Social, economic and environmental goals all play a part in IWRM decision-making



The environmental system

Basic needs: a traditional approach

Purpose	**Recommended minimum litres per person per day**
Drinking water	5
Sanitation services	20
Bathing	15
Cooking and kitchen	10
Total	50

Volumetric Charges

- Uniform price - all units of water billed at same price
- Block-type structures - two or more prices, each applies to use within a defined segment (block) of monthly use
  - Decreasing block - block price falls as use rises
  - Increasing block (IBT) - block price rises as use rises
    [Note: first block price usually set below cost]

Some Basic Tariff Options

- Single part tariff, consists of either:
  - Fixed charge (not based on measured water use)
  - Volumetric charge (based on measured water use)
- Two part tariff, includes **both** fixed and volumetric charges

Water Tariff In Sana'a 2008

Bulk (cub- m)	Water	Sewerage	Total	
0-5	35	28	63	***Domestic, and Mosques***
6-10	45	36	81	
11-20	80	64	144	
21-30	132	106	238	
31	160	128	288	
11	160	128	288	***Commercial , Industrial and Govt.***

(10%) is added to the total bill amount as a maintenance service charge
(03%) is added to the total bill amount as local consult fees
The Cost per Cubic Meter (M3)= 89 **(Sewerage) + 92 (cost and delivery)= 181**
Domestic water tariffs are low and do not reach cost recovery

HODEIDAH WATER & SANITATION TARIFF

Block (cu.m)	Water	Sewerage	Total	Domestic, Govt.and Mosques
0-10	20	15	35	
11-20	35	25	60	//
21-30	70	50	120	//
>30	100	70	170	//
Constant Fee	100	70	170	Commercial and Industrial

* Minimum chargeable consumption 5 cu.m
* (10%) is added to the total bill amount as a maintenance service charge
* Tariff in Yemeni Rial, 170YR= 1 USD

Concepts of Cost, Value and Price

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- COST
  - O&M costs
  - capital costs
  - opportunity costs
  - costs of economics and environmental externalities.
- VALUE
  - Benefits to users
  - benefits from returned flows
  - indirect benefits and intrinsic values.

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- VALUE
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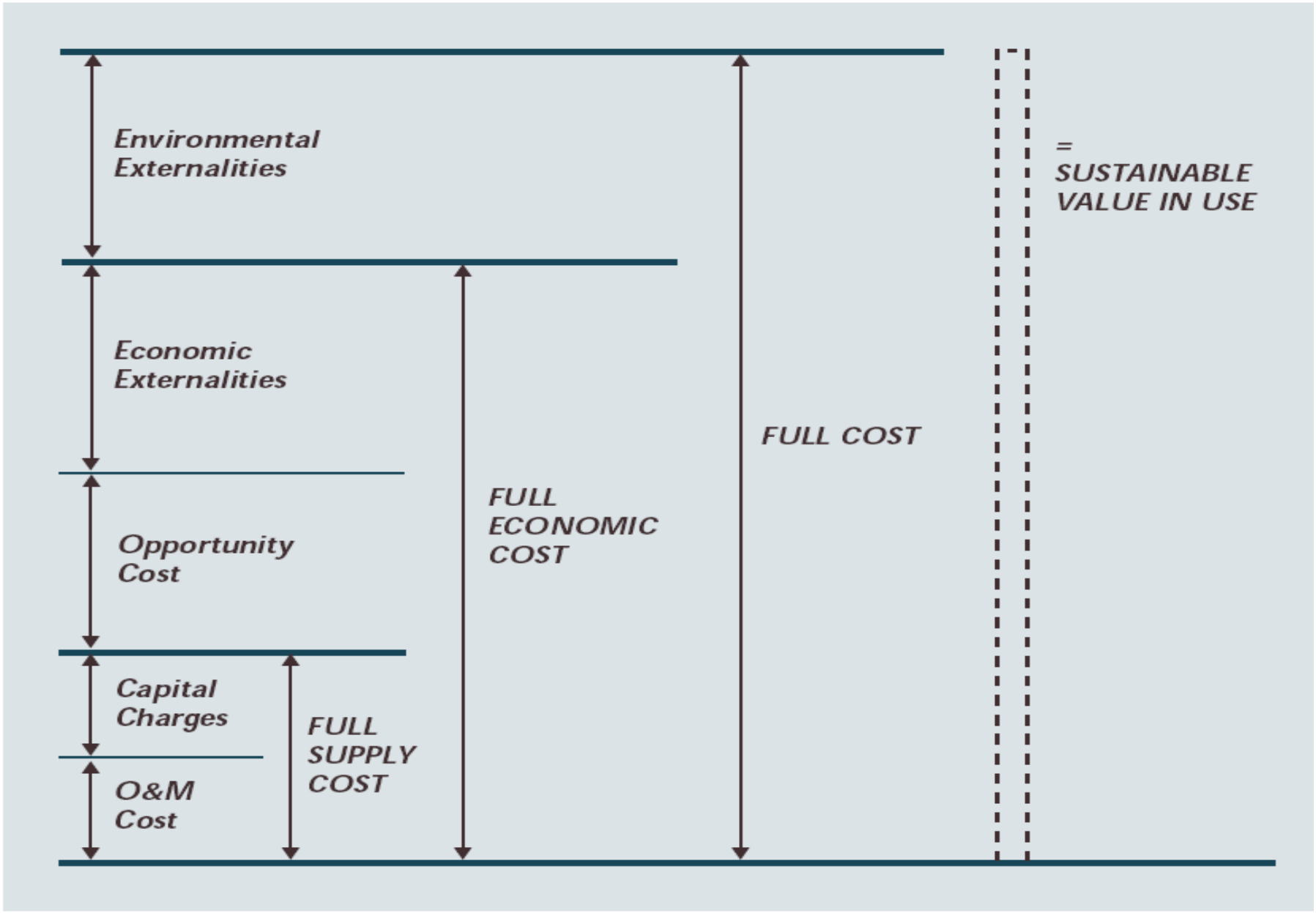
  - and intrinsic values.
- PRICE Amount set by the political and social system to ensure cost recovery, equity and sustainability. The price may or may not include subsidies. Prices for water are not determined solely by cost.

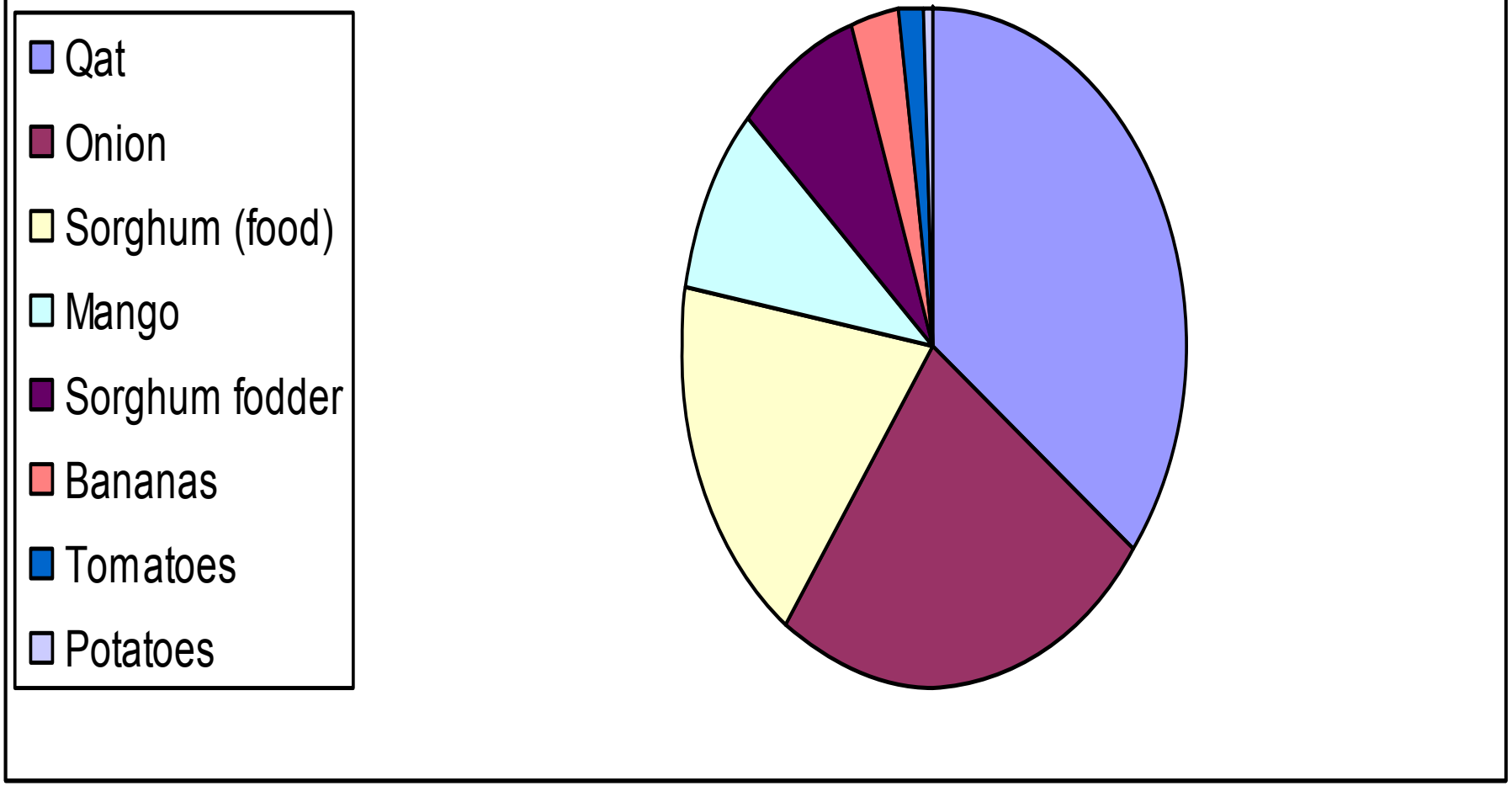
Figure 1. *General Principles for Cost of Water***.**



Irrigated area and actual irrigation water use in Taiz Basin in 2005

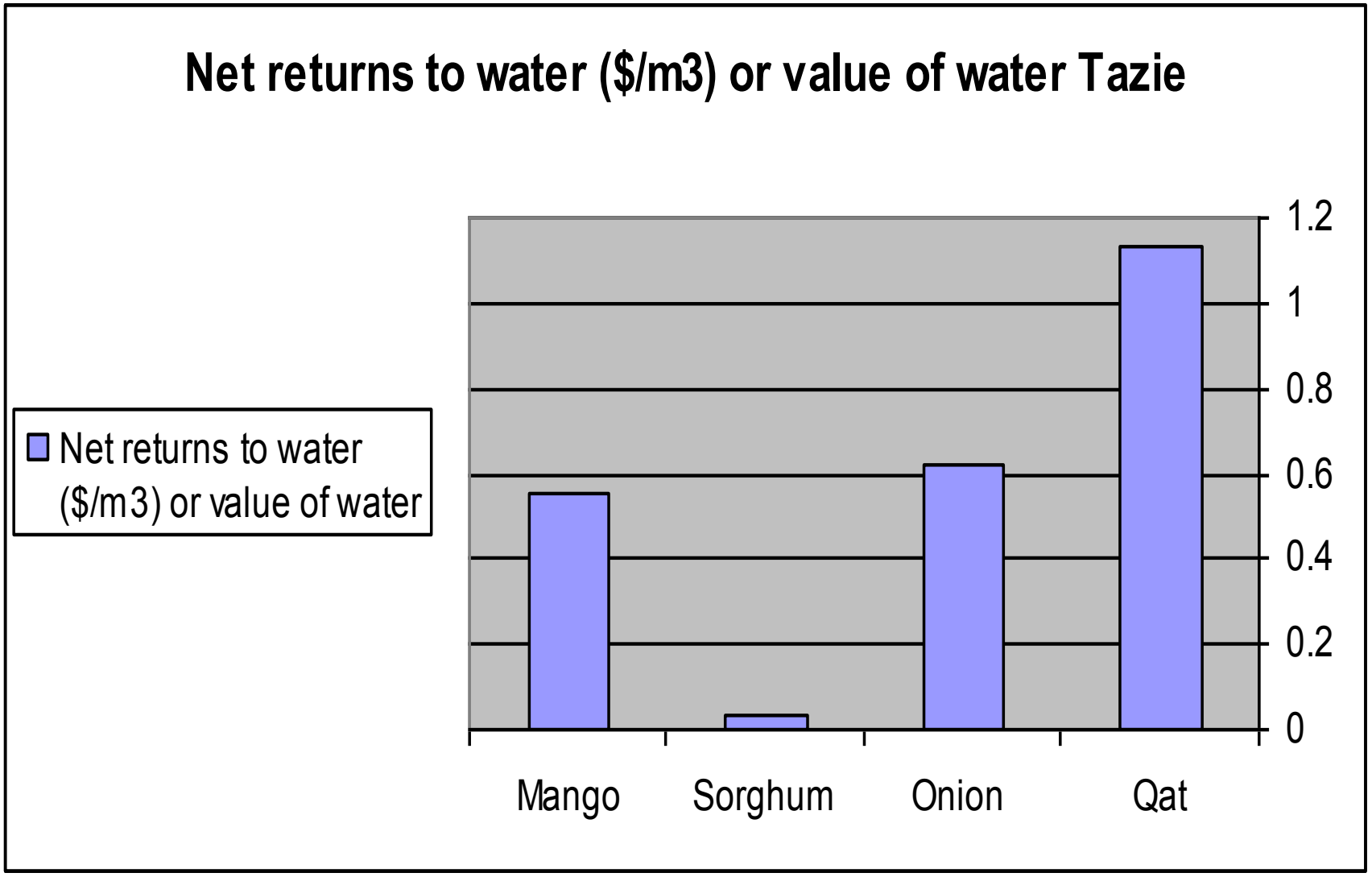
Irrigated crop	Irrigated area (ha)	Actual irrigation water use (m3/ha)	Total irrigation water use (MCM)	Share in total (%)
Qat	6,435	9,980	64.2	35.4
Onion	7,183	6,100	43.8	24.2
Sorghum (food)	4,888	6,700	32.7	18.1
Mango	867	18,800	16.3	9
Sorghum fodder	2,138	6,700	14.3	7.9
Bananas	375	16,800	6.3	3.5
Tomatoes	364	6,700	2.4	1.3
Potatoes	183	5,600	1	0.6
Total	22,433	8,080	181.2	100

Share in total (%) in Tazi



Crop budgets of qat, onions, sorghum and mango in Taiz Basin

	Qat	Onion	Sorghum	Mango
Gross production value ($/ha)	11,970	4,500	238	10,990
-yield (kg/ha)	700	15,000	720	15,700
-price ($/kg)	17.1	0.3	0.33	0.7
Costs of production ($/ha) excl. costs of water	680	720	30	680
-costs of fertilizer, pesticides, clay ($/ha)	354	387	13	354
-costs of labour ($/ha)	326	333	17	326
Net production value ($/ha) or net returns to land	11,290	3,780	208	10,310
Actual irrigation water applied (m^3/ha)	9,980	6,100	6,700	18,800
Net returns to water ($/$m^3$) or value of water	1.13	0.62	0.03	0.55
Cost/Value Ratio	01:08.7	01:04.8	01:00.2	01:04.2


Net returns to water ($/m3) or value of water Tazie
Net returns to water ($/m3) or value of water
1.2
1
0.8
0.6
0.4
0.2
0
Mango
Sorghum
Onion
Qat

Water Balance (2005) in million cubic meter (MCM) in Yemen and the three basins

	Domestic abstraction	Irrigation abstraction*	Industry abstraction	Total abstraction	Total Recharge	Water Balance
Yemen	265	3235	65	3565	2500	-1065
Sana'a	55.4	209.2	4.8	269.7	50.7	-219
Taiz	18.5	39.3	4.2	62	20	-42
Hadramout	40	360	0	400 (324)	150 (180)	-250 (-144)

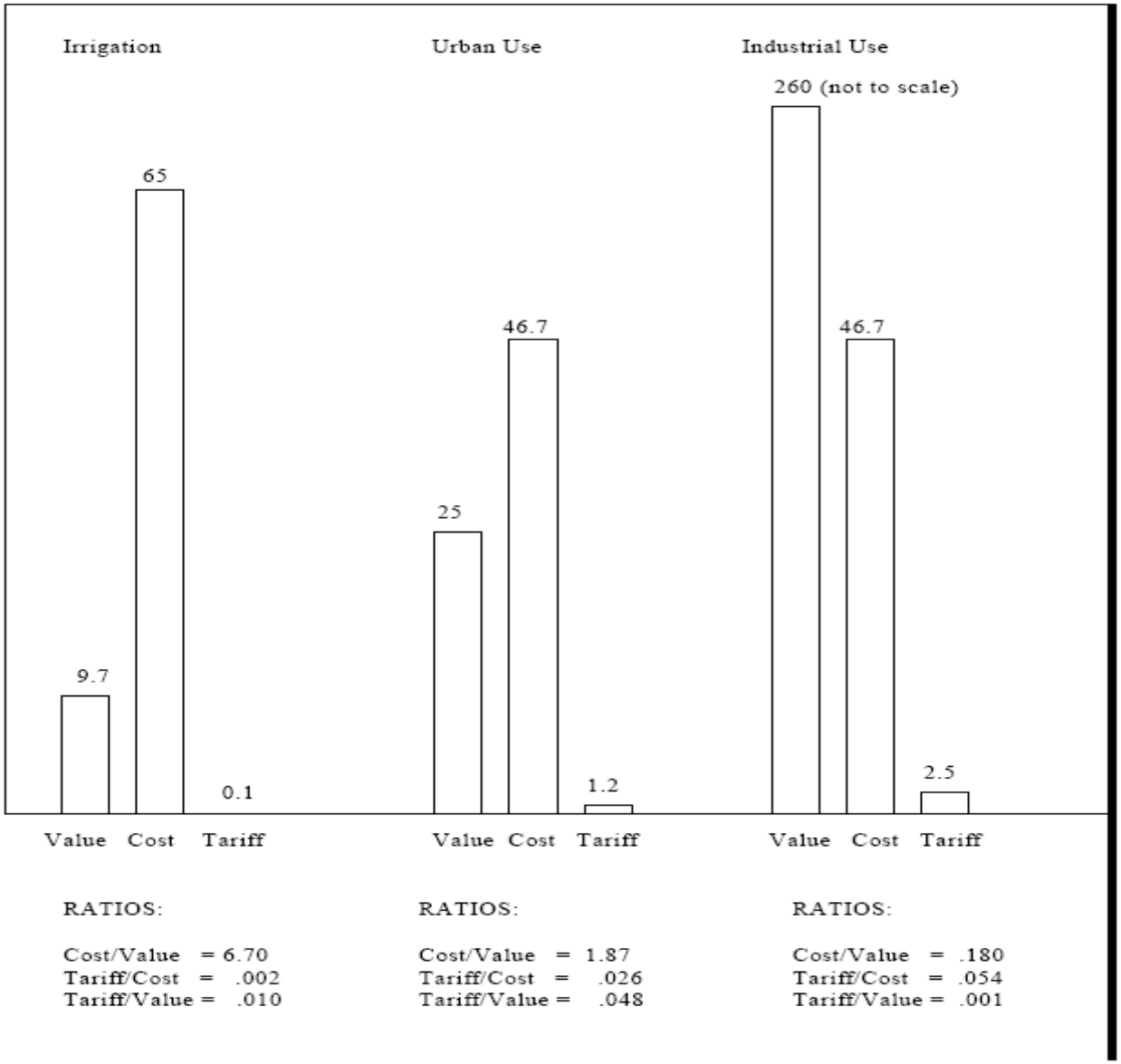
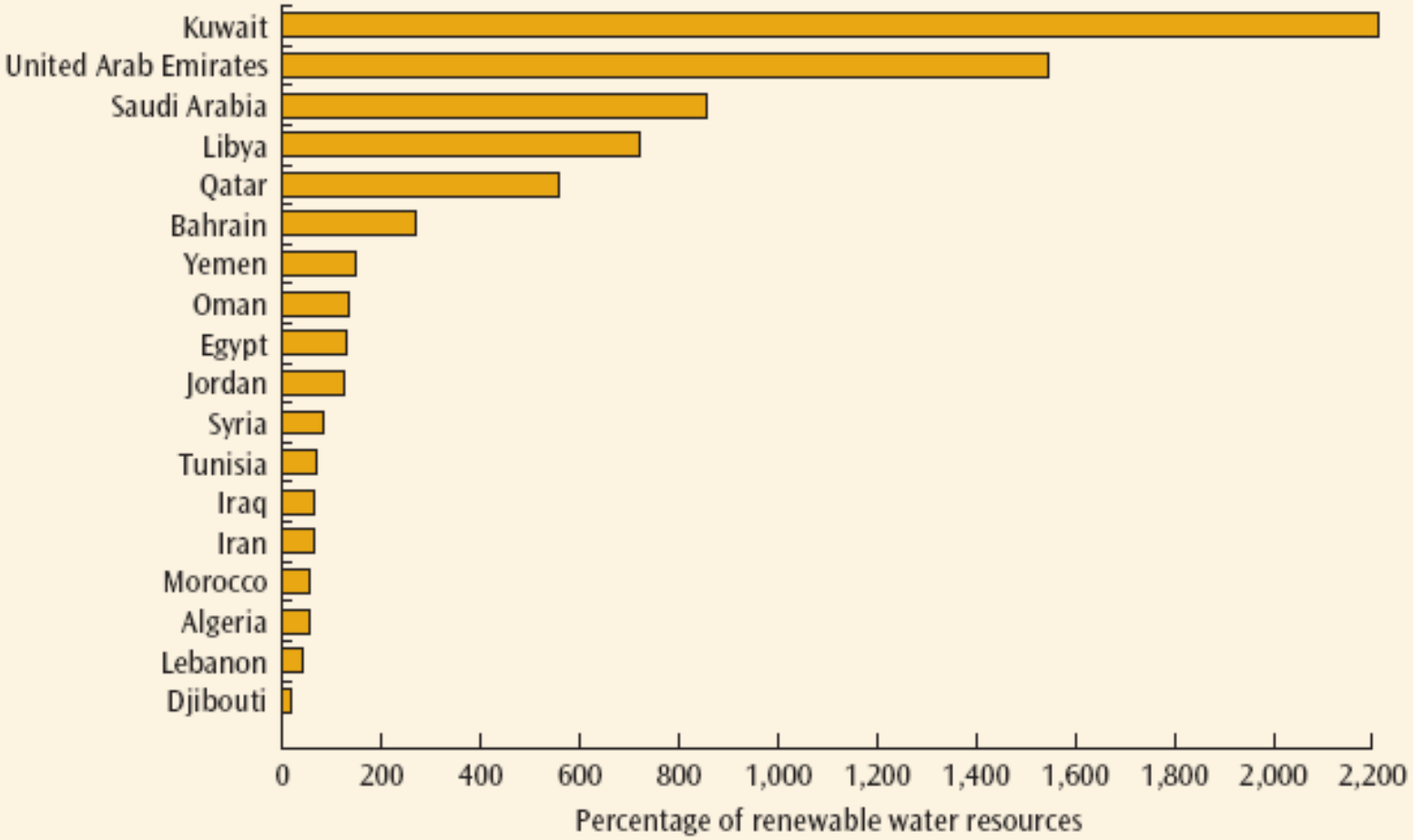


Fig. 4. Comparison of value-in-use, costs and tariffs for three sectors in Subernarekha River Basin, India (figures in cents/m^3). Tariffs are as follows: Agriculture 0.1 cents/m^3, urban households 1.2 cents/m^3, and industry 2.5 cents/m^3. Source: Rogers et al. (1998).

Total water withdrawal relative to renewable water resources, selected countries



Source: World Bank 2007b.

REFORM POLICY AGENDA

- **hat olice e shoul d .low ????**

- **ervices should be demand-driven…based on the users' willingness and ability to pay.**
- uman resources devel opment
- **ommunity participation**
- **rivate sector participation**
- **articipatory .onitoring & valuations**
- **.inancial and environmental sustainability.**

- **Thank you very much!**

Any questions?