



E-learning Course on Water Security Asia and the Pacific

Module-1 -Wastewater Management & Sanitation, promoting Decentralized Wastewater Treatment Systems (DEWATS) in South-East Asia

Contents of Module 1

1. Introduction

- Objectives of the Module 1
- Need for wastewater management in South-East Asia
- Household water security in Asia and Pacific
- Quiz

2. Overview Wastewater Management

- Basic process flow charts of centralized and decentralized wastewater management
- Benefits of decentralized wastewater management systems (e.g. DEWATS)
- Quiz

3. Stepwise Focus Areas (FA) to Implement DEWATS Process Cycle

- FA1-7: Policy Instruments
- FA 8: Framework for financing sustainable sanitation services and market opportunities for DEWATS
- FA 9-10: Exit Strategy and Sustainability of Wastewater Treatment Systems
- Quiz



Section 1 - Introduction



Objectives of Module 1 on Wastewater Management and Sanitation, promoting DEWATS in South-East Asia

- **Guide national and local policy makers and experts on pro-poor policies, strategies, legal, institutional, social, environmental, and financial frameworks for the sustainable sanitation services (3S).**
- **Advocate DEWATS for 3S in South-East Asia.**
- **Suggest solutions and options for reforms aimed at delivery of 3S in relation to the Millennium Development Goals (MDGs) and the post- 2015 development agenda.**

Household Water Security

Human Rights / Equity

Water Supply

Sanitation

Health

Means / Instruments / Tools

Policy

Technologies

Legal Aspects

Institutional
Aspects

Wastewater
Issues

Financial
Instruments

Status of
MDG Targets

Data
Collection,
Monitoring

Climate
Concerns

Technology

Management
and
Coordination

Financing
and
Investment

Capacities,
Networks

Household Water Security Index of 2012

Countries

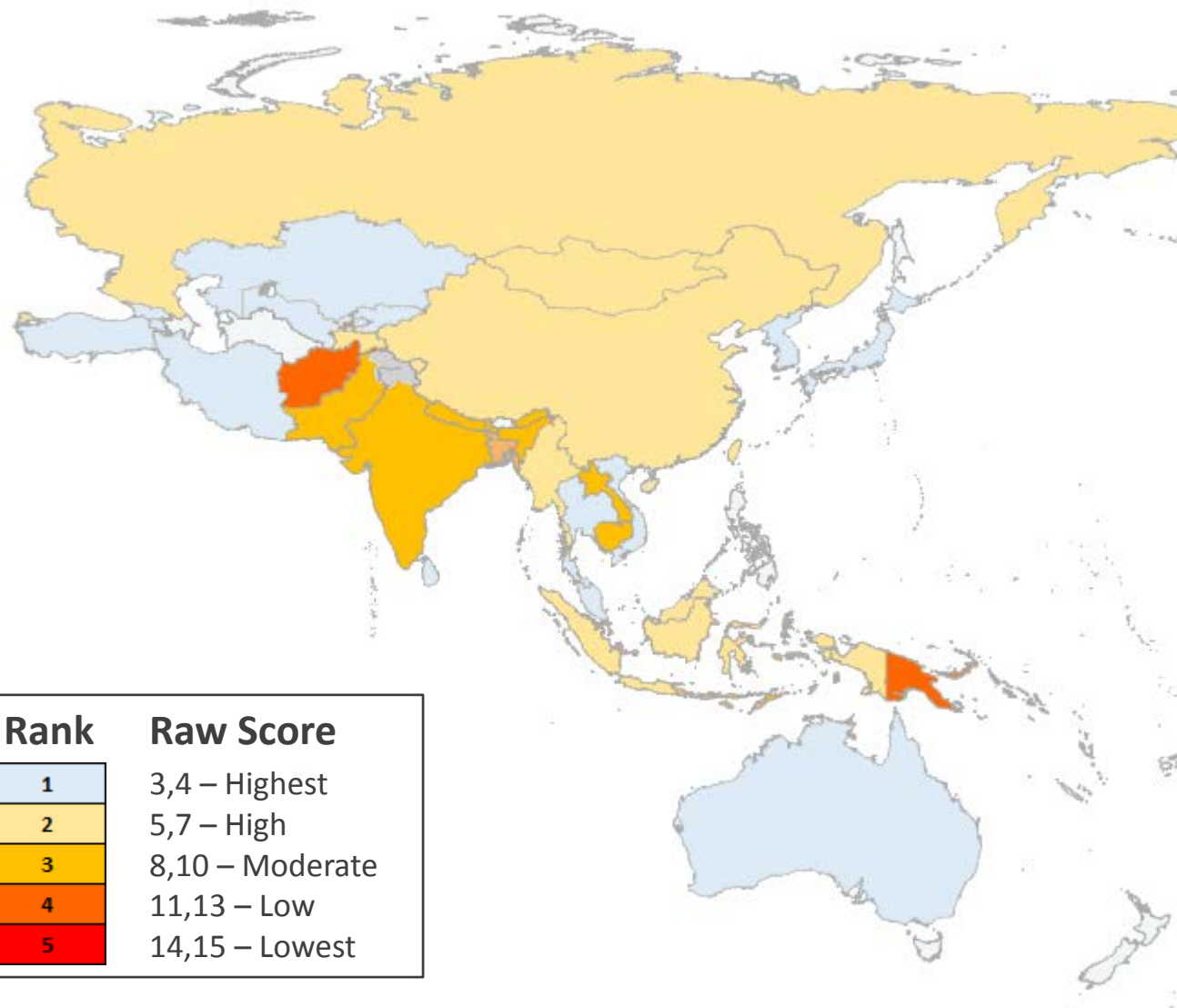
Georgia, Armenia, Samoa, Tonga, Malaysia, Thailand, Iran (IR), Maldives, Sri Lanka, Turkey, Cook Islands, Niue, DPR Korean, Uzbekistan, Kyrgyzstan, Viet Nam,

China, Vanuatu, Micronesia (F.S), Tajikistan, Myanmar, Indonesia, Bangladesh

Pakistan, Solomon Islands, Lao PDR, India, Nepal, Kiribati, Timor-Leste, Cambodia

Papua New Guinea, Afghanistan

Data Not Available, 2010 Data used
Japan, R. Korea, Australia, Singapore, Palau



**The correctness of the map is subject to the availability and accuracy of data in access to improved water supply and DALYs attributable to water, sanitation, and hygiene.*

Why do we need of Wastewater Management and Sanitation in South-East Asia?

- **176 million people have no access to improved sanitation in South-East Asia**
- **In Cambodia only 36.8% of the population has access to improved sanitation.**
- **29% of the population in the south of Lao PDR still practice open defecation**
- **An average 1,774 people die each year in Viet Nam because of inadequate access to clean water and poor sanitation and hygiene.**

Quiz– 1/3

Multiple questions and answers



Section-2 Overview of Centralized and Decentralized Wastewater Management

What is Wastewater Management?

Wastewater management is the process of taking wastewater and managing to reduce the contaminants to acceptable levels before discharging it back into the environment.

There are effectively two basic types of wastewater treatment:

- Centralized wastewater treatment
- Decentralized wastewater treatment

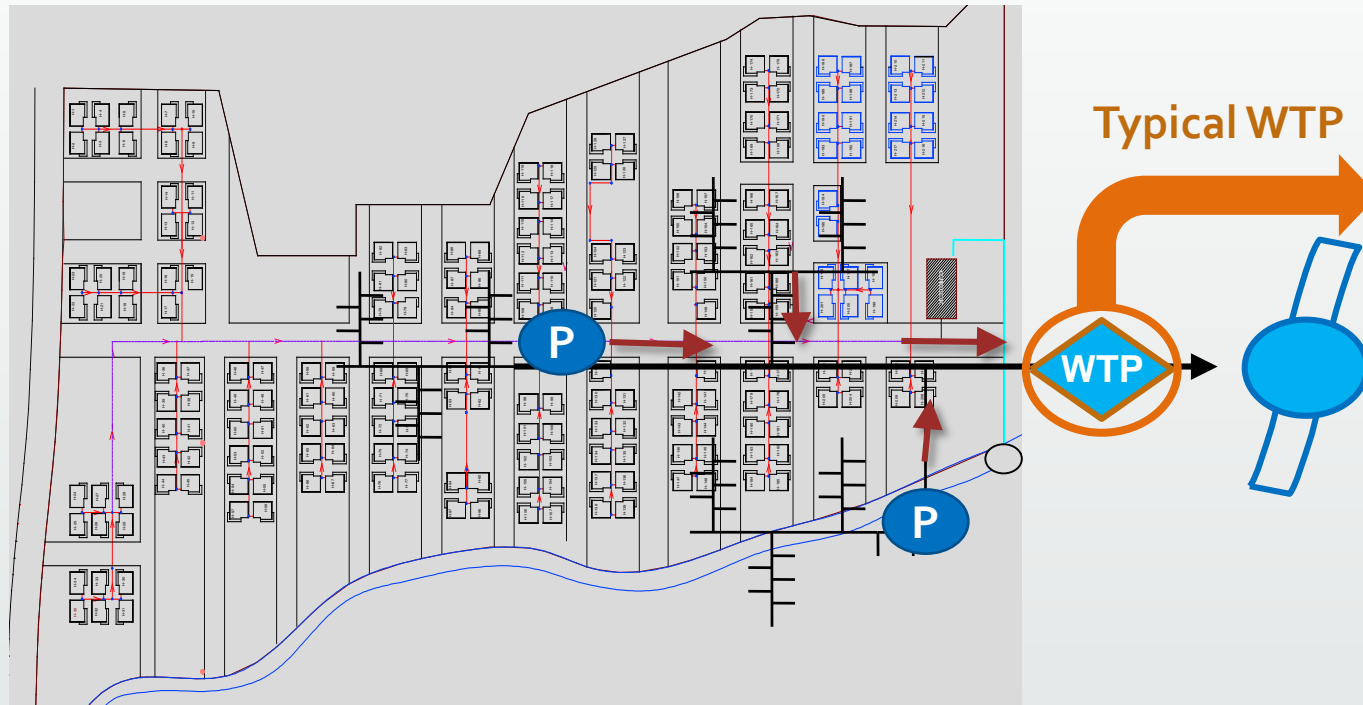


Centralized



Decentralized

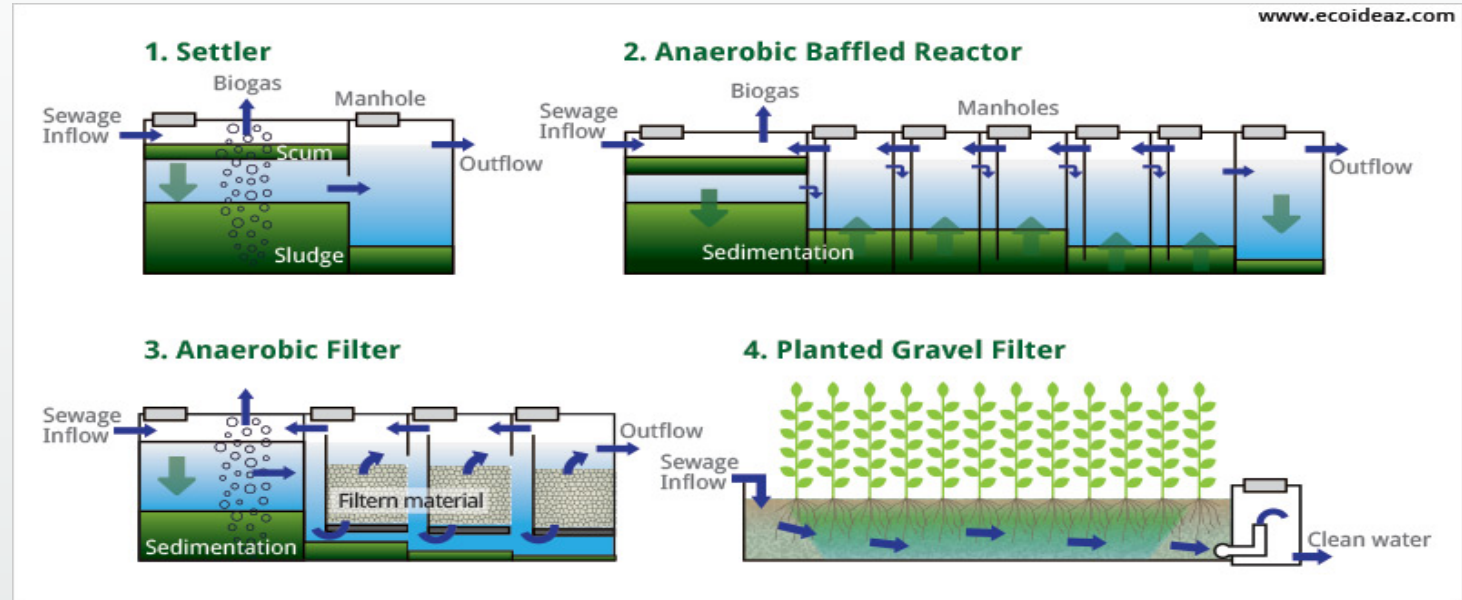
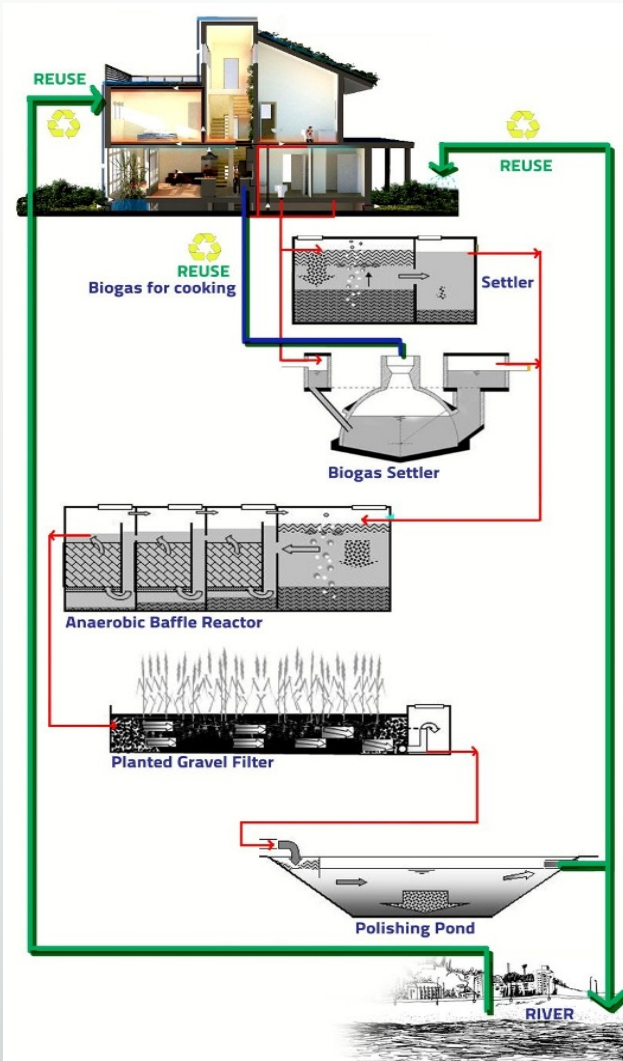
What is Centralized Wastewater Management?



Collection of wastewater from community at one place and then treated.

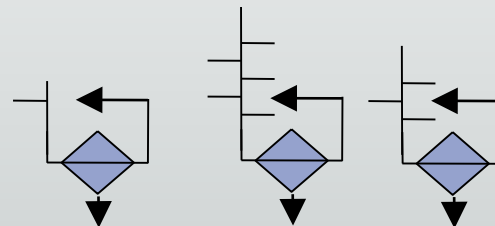
- **Advantages:** Just one treatment facility need which is easy to maintenance with less treatment infrastructures.
- **Disadvantages:** Expensive to make infrastructure including long size sewer pipelines, pumping stations, and treatment plants. If the system failures, it affects entire area.

What is Decentralized Wastewater Management

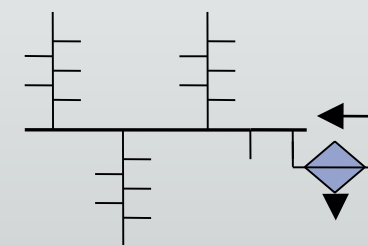


DEWATS is the treatment of wastewater within the house premises.

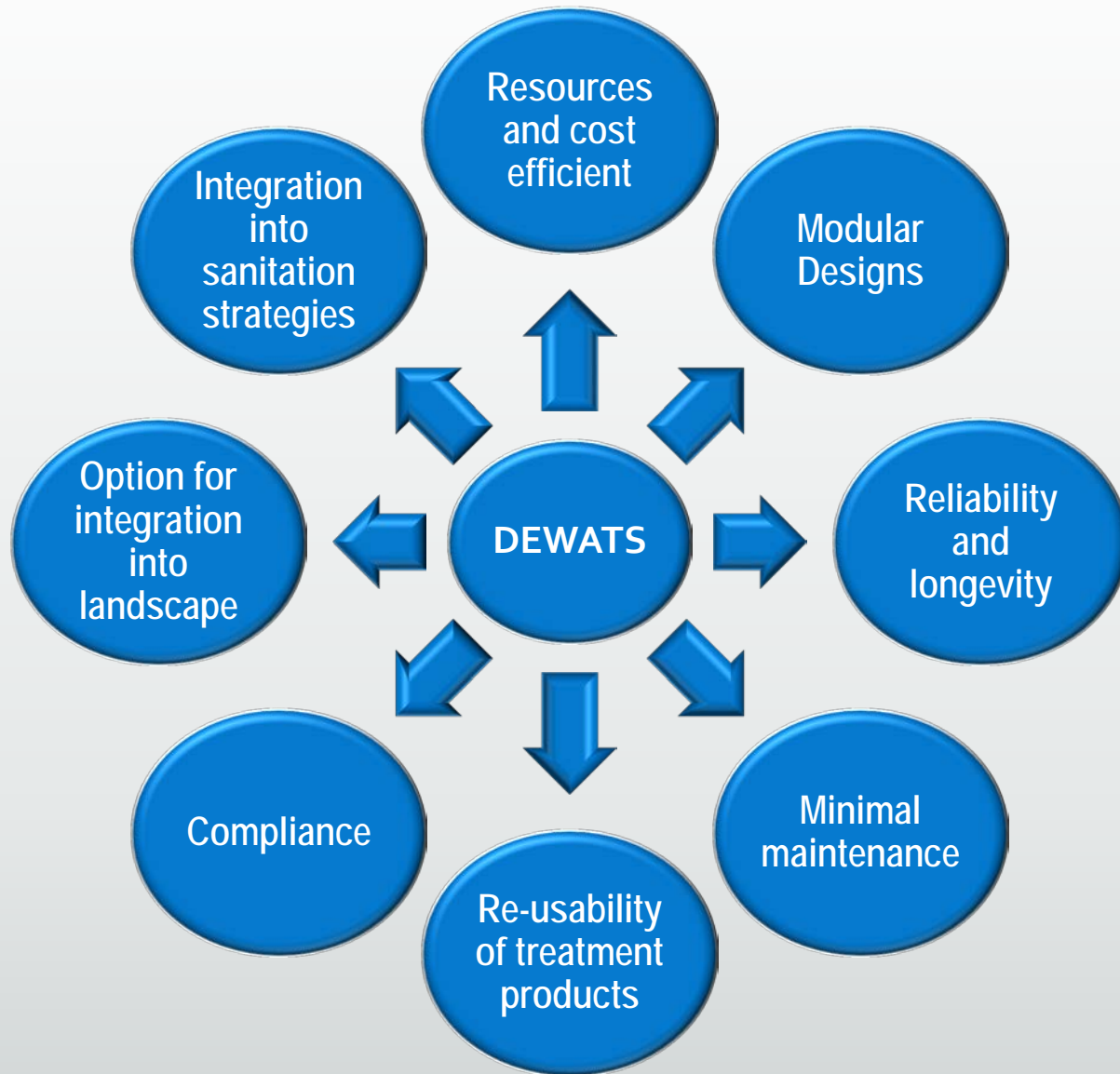
Single Houses



Housing Colony



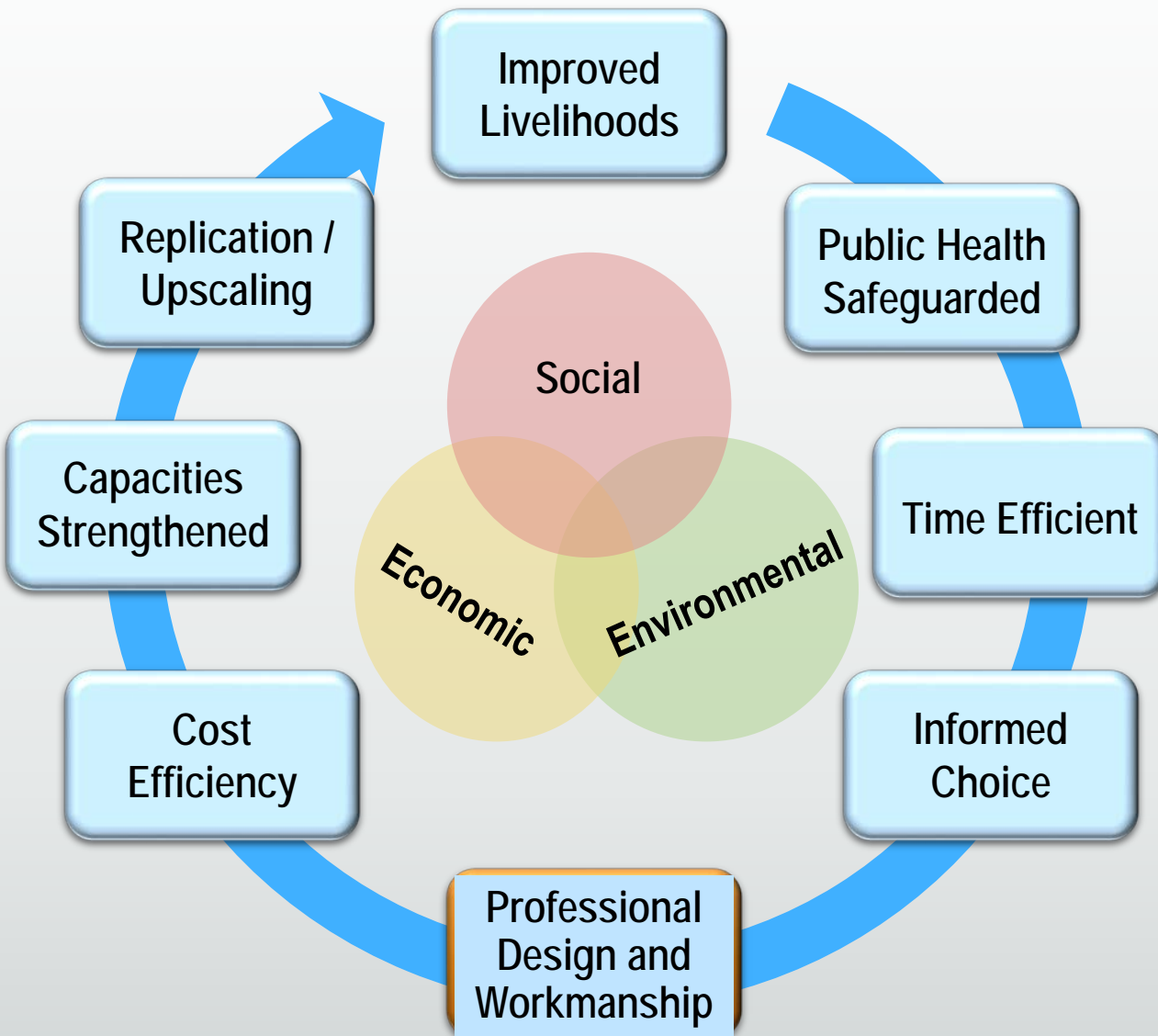
What are the reasons for choosing DEWATS ?



DEWATS:

- NO wastewater transport
- TECHNOLOGICAL options
- ADAPTABLE discharge requirements.
- reduces the RISK
- increases REUSE opportunities.
- Opportunities development and INVESTMENT
- All kind of TREATMENT for water
- taken into ACCOUNT the economic and social situations.
- INTEGRAL part of wastewater and sanitation strategies.
- Source of RENEWABLE energy

Benefits of DEWATS



Economic

- Low investment
- Design works in multiple settings
- Incremental growth
- Sustainable revenue source



Social

- Improved hygiene
- Opportunity for PPP
- Opportunities for local to invest.
- DEWASTS provide low-cost solutions



Environmental

- water quality improvement
- Reduces water needs
- Adaptable to discharge standards
- Water reuse opportunities

Photo credit: BORDA

Quiz– 2/3

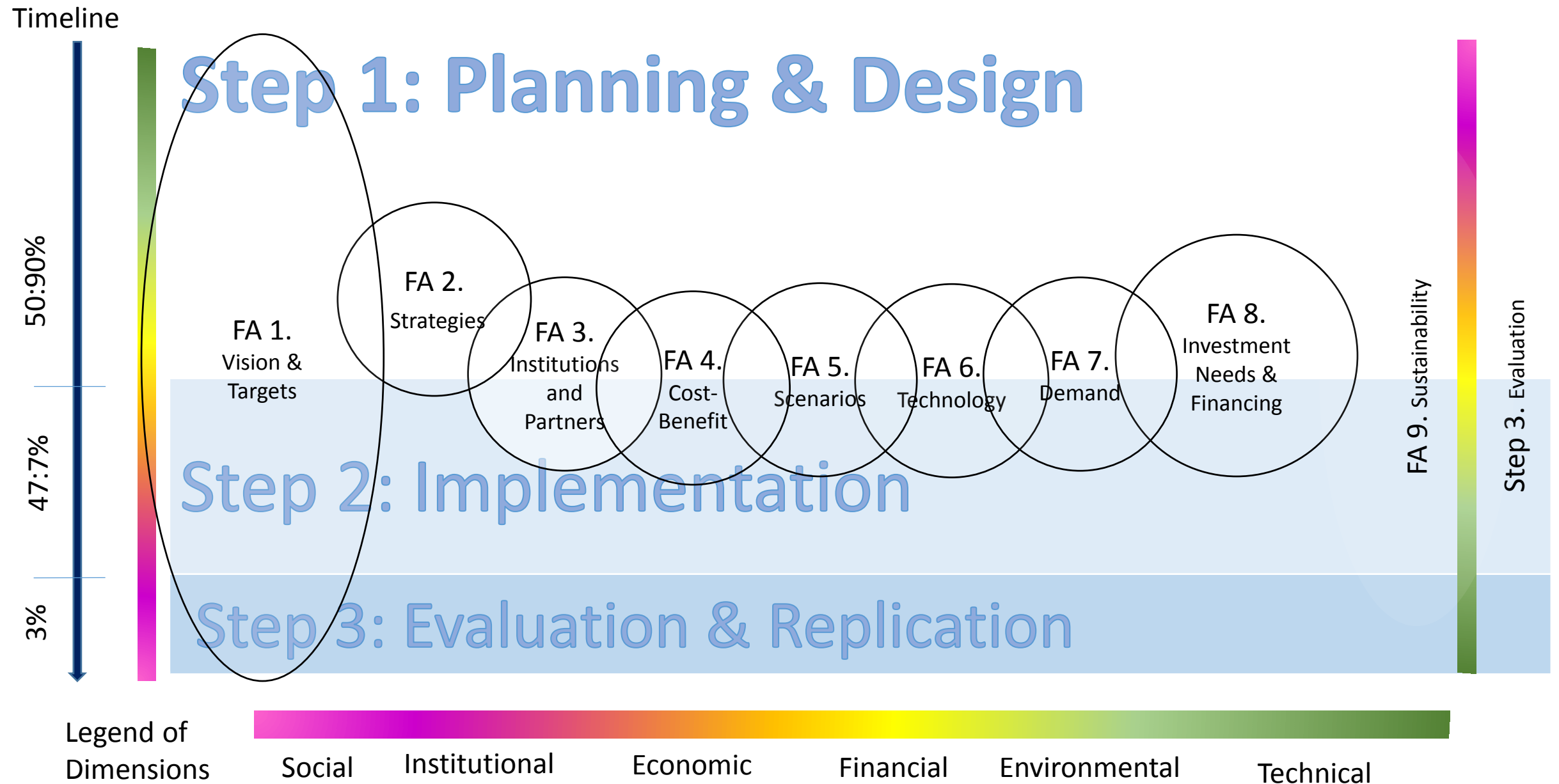
**Multiple Questions and Answers to comply
for Course Certificate**



Section 3 - Stepwise Focus Areas (FA) to implement DEWATS



Focus Areas within the Process Cycle for DEWATS



Vision and Target Setting for Sanitation [FA 1]



Links between national and city visions

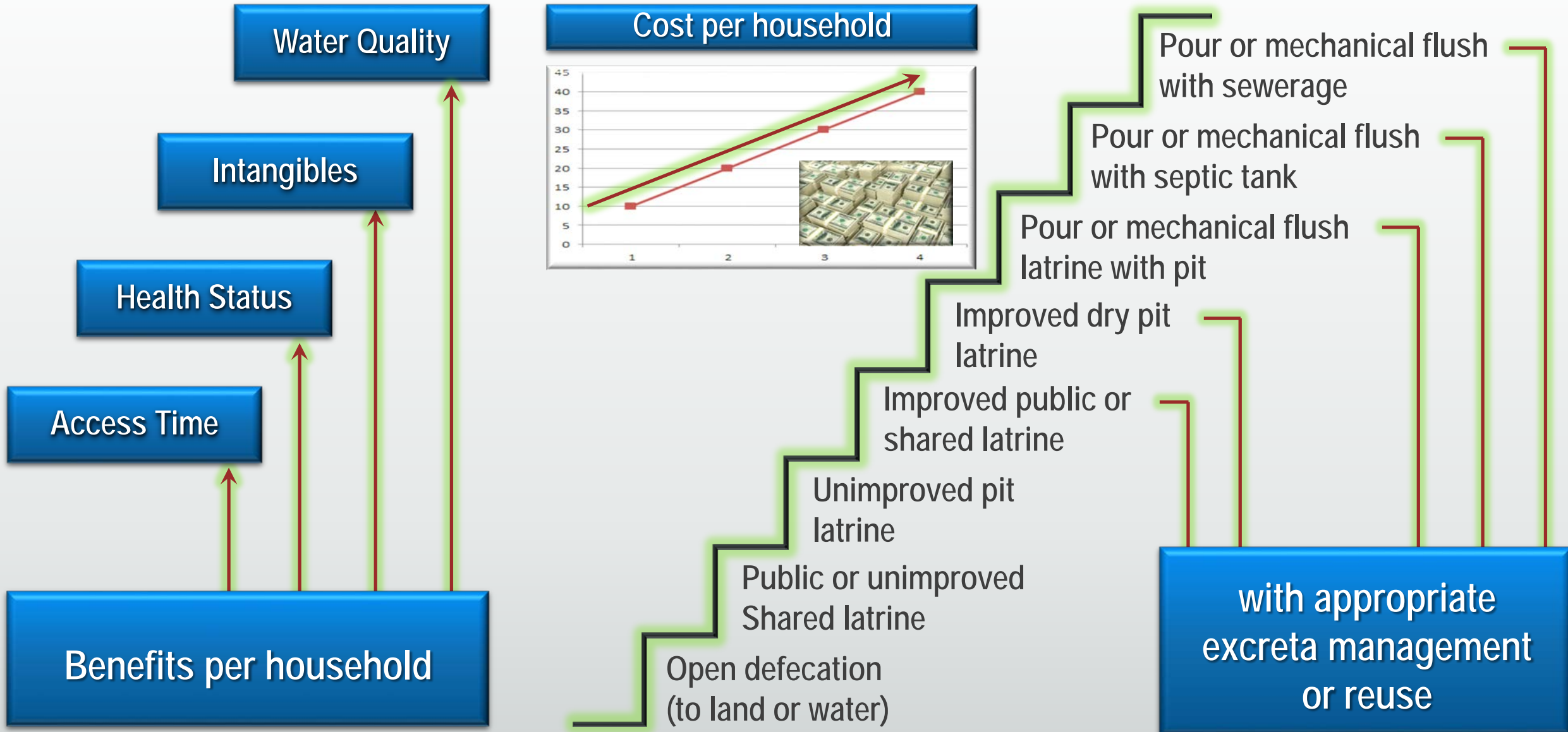


Vision and criteria for total sanitation services

The Sanitation Ladder



The Sanitation Ladder



Assessment of Sanitation Strategies and Socio-economic Impacts [FA-2]

- Quantitative assessment of current policies and strategies in terms of costs and benefits.
- Assessment of cost-efficiency and cost-effectiveness of current policies, strategies and economic decisions on investments and operations.
- Cost-benefit analysis of current DEWATS projects in terms of planning, construction, financing.
- Assessment of social impact in terms of social consequences that are likely to follow specific policy and government actions.
- Assessment of environmental benefit by examining positive outcomes for the society.
- Assessment of economic incentives and cost recovery.

Integrated Water Resources Management [FA-2]

Integrated Water Resources Management (IWRM) is process which promotes the coordinated development and management of water, land, and related resources in order to maximize economic and social welfare in an equitable manner without compromising the sustainability of vital ecosystems.

IWRM is internationally accepted as the best approach to water resources management

Following 4 principles are derived from the Dublin principles:

Principle 1

- Fresh water is a finite and vulnerable resource, essential to sustain life, development and the environment

Principle 2

- Water development and management should be based on a participatory approach, involving users, planners and policy-makers at all levels

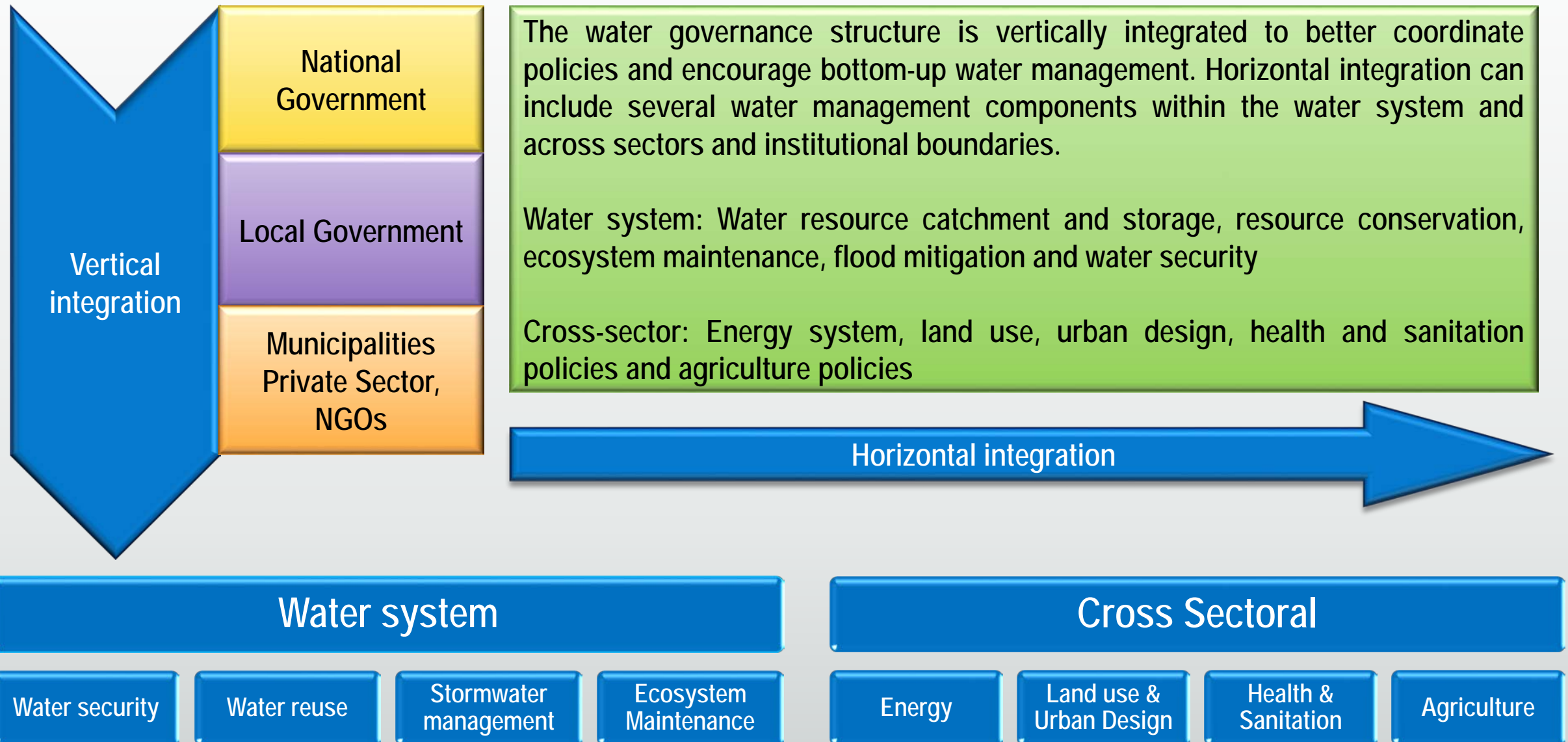
Principle 3

- Women play a central part in the provision, management and safeguarding of water

Principle 4

- Water has an economic value in all its competing uses and should be recognized as an economic good

Integration in Water Resource Management [FA-2]



Policy Instruments: Governance Structures & Economic Instruments [FA-2]

Integrated water resource management	<ol style="list-style-type: none">1. Integrated water resource provision and a water treatment system2. Optimizing water infrastructure3. Promoting an environment-friendly water cycle system
Distributed wastewater management system	<p>Has 3 main objectives:</p> <ol style="list-style-type: none">1. Public health improvement2. Energy and water conservation3. Environmental protection
Reuse and recycling	<p>Minimize freshwater demand and reduce wastewater treatment needs. The following treatment technologies can be used: membranes, wetlands, sand filters and waste stabilizing ponds.</p>
Low impact development (LID)	<p>Local and decentralized measures, mitigate development impacts to land, water and air by: mimicking natural drainage, using small-scale practices, managing storm water at source, using simple and natural practices and making landscape and infrastructure multifunctional</p>
Water pricing	<p>Increase of block tariffs, providing subsidies to the lower-income households, etc.</p>

Analysis of Institutions and Partners for the Sustainable Sanitation Services (3S) [FA-3]



- By identifying stakeholders for Sustainable Sanitation Services (3S)
- By establishing a suitable mechanism for collaboration

Steps for organizing a successful 5P for 3S [FA-3]

Step 1

- **Develop a National Programme (NP) to implement the 3S strategy**

Step 2

- **Ensure Government commitment towards enabling policy on PPP for 3S**

Step 3

- **Outreach/Negotiate with the philanthropists to create 5P environment**

Step 4

- **Encouragement of SMEs and Private Sector to act as Service Providers**

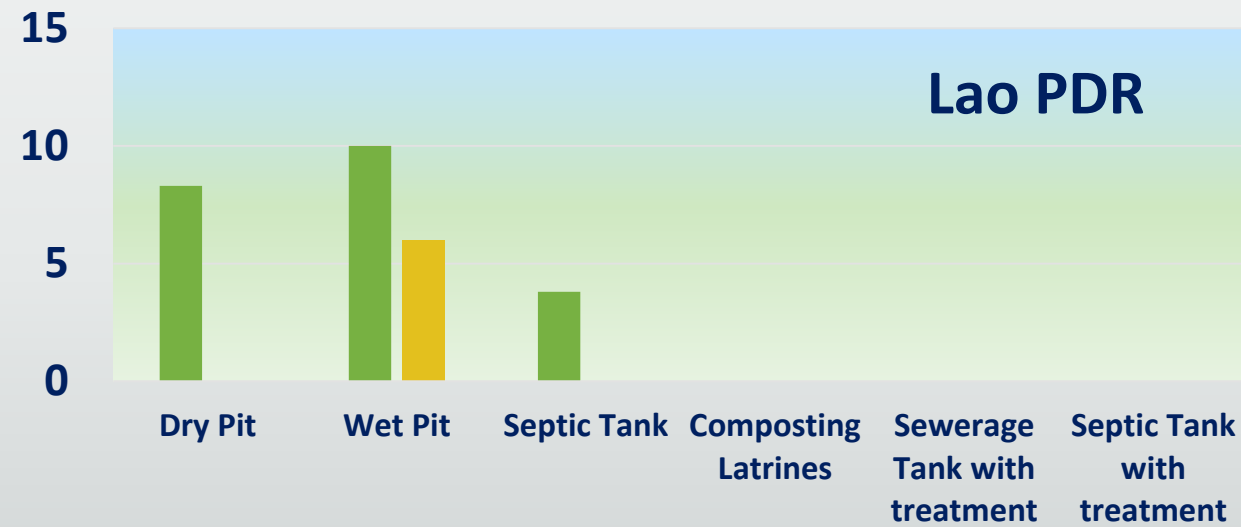
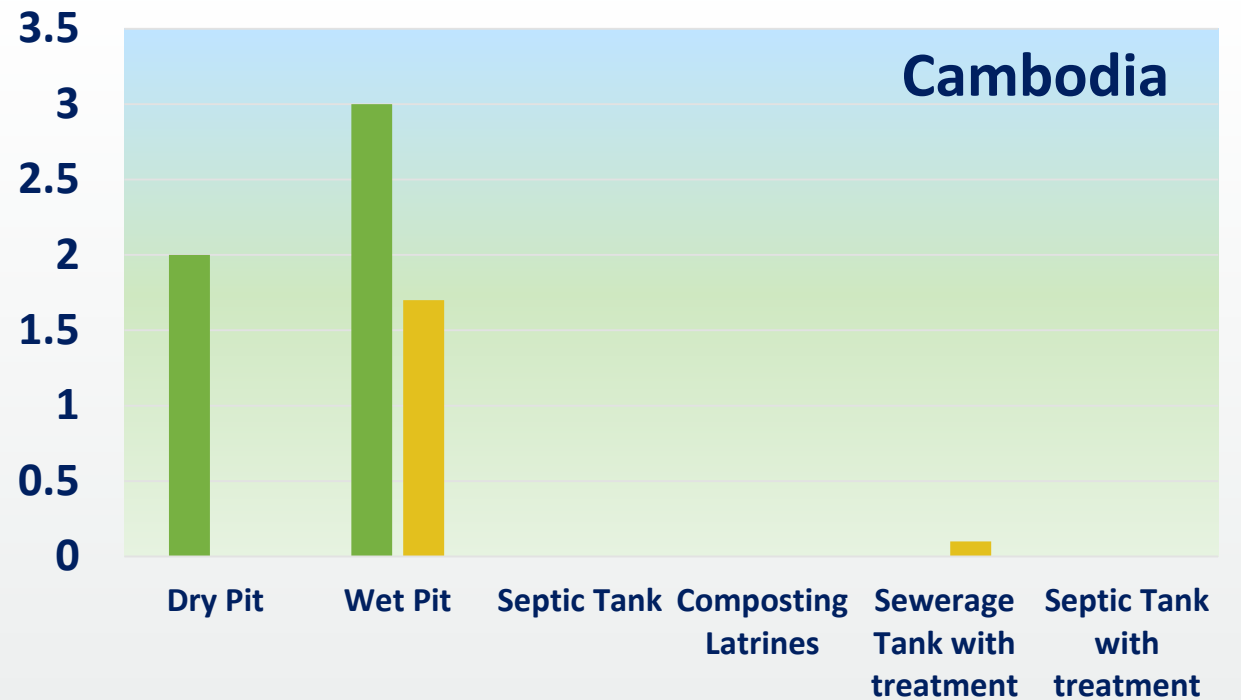
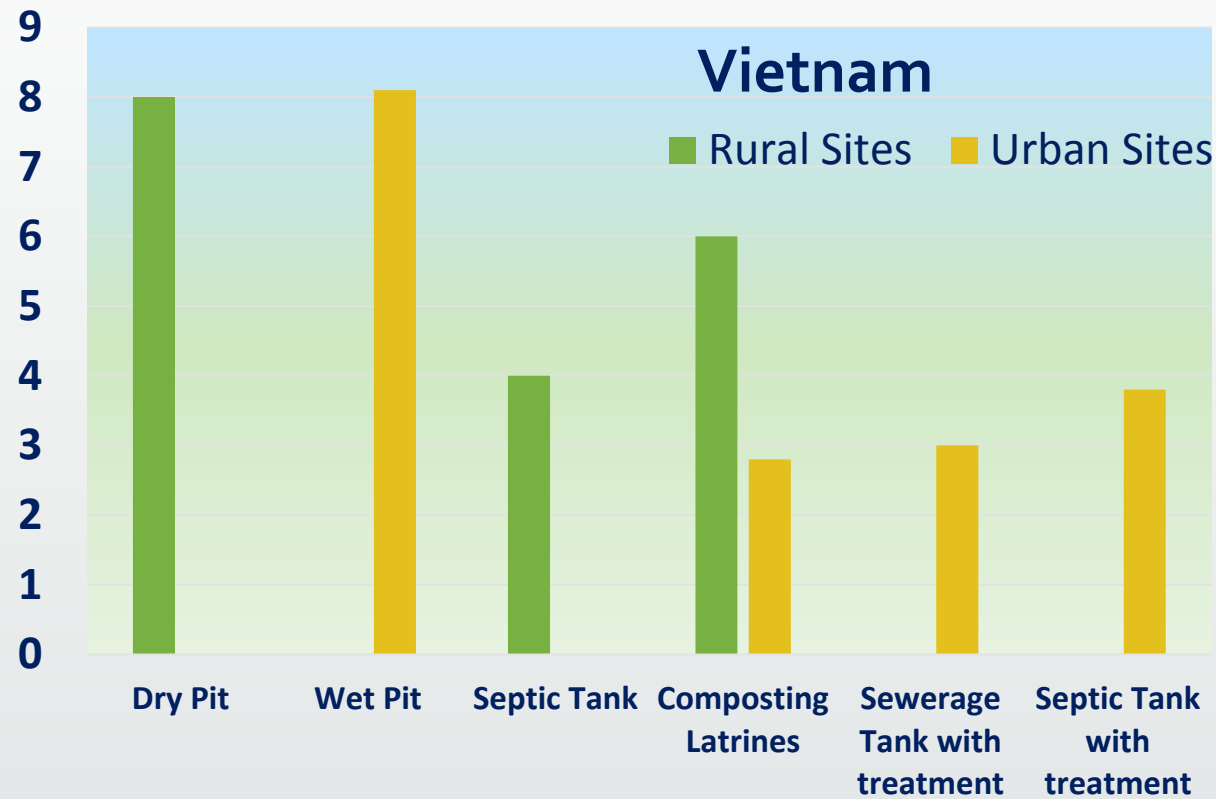
Step 5

- **Develop the detailed tripartite (multi-stakeholder, multi-philanthropist) MoUs, Contracts, Agreements for PPP**

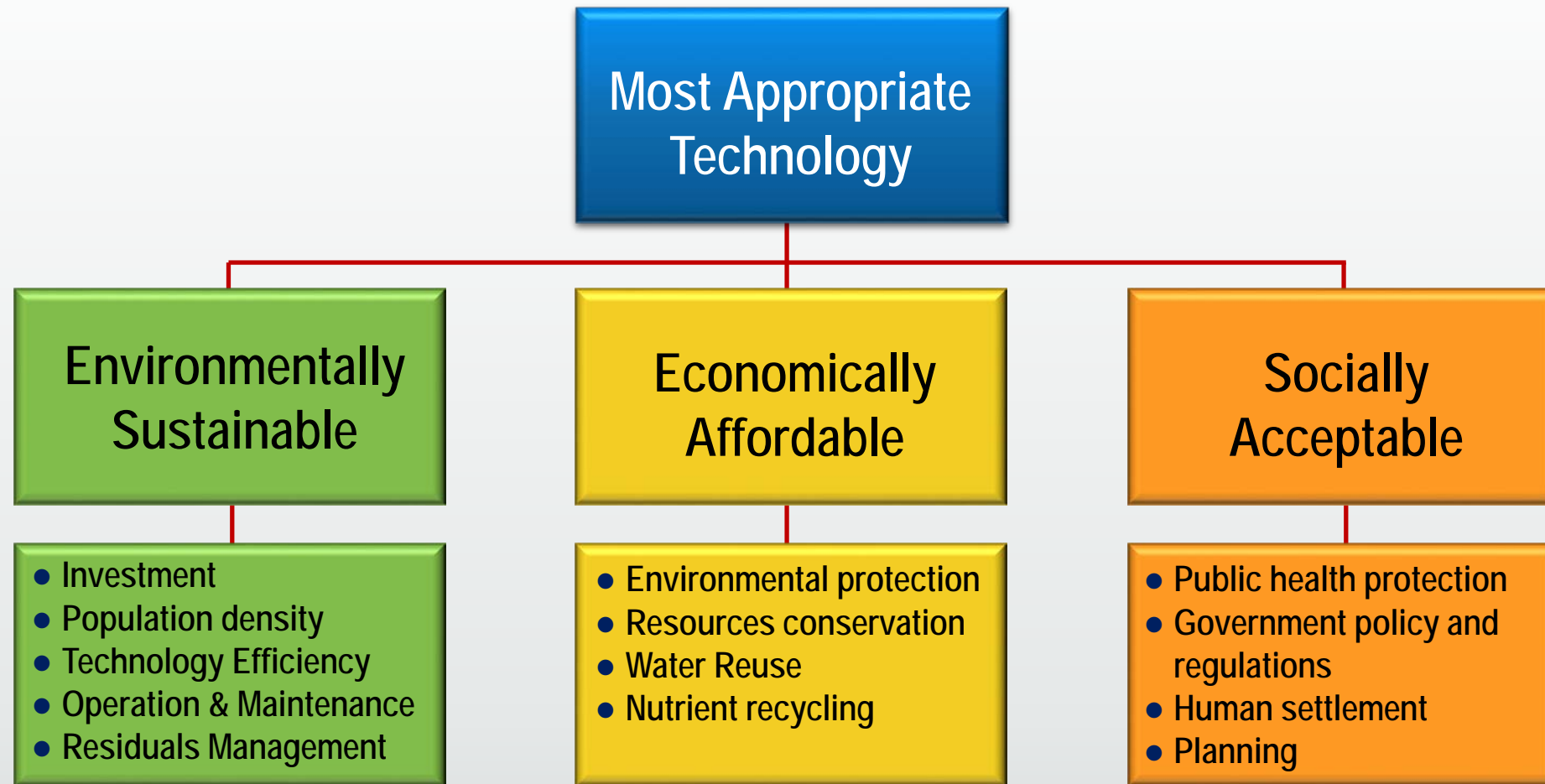
Analysis of Cost and Benefits of DEWATS [FA-4]

BENEFIT CATEGORY	POPULATION WITH UNIMPROVED SANITATION	POPULATION WITH IMPROVED SANITATION	BENEFIT ESTIMATED
HEALTH	Data on health risk per person, by age category and socioeconomic status	Generic risk reduction, using international literature	Averted health care cost, reduced productivity loss, reduced deaths
WATER	Data on water source and treatment practices	Observe changes in practices in populations with improved sanitation	Reduced water sourcing and water treatment cost
ACCESS TIME	Data on water source and treatment practices	Observed reductions in time to access toilet	Opportunity cost of time applied to time gains
INTANGIBLES	Attitudes and preferences of householders to sanitation	Benefits cited of improved sanitation	Strength of preferences for different sanitation aspects and willingness to pay
REUSE		Practices related to excreta reuse	Value gained, based on sales or own use

Regional trends in Cost-Benefit Analysis [FA-4, 5]



Selection of Technology for DEWATS [FA-6]



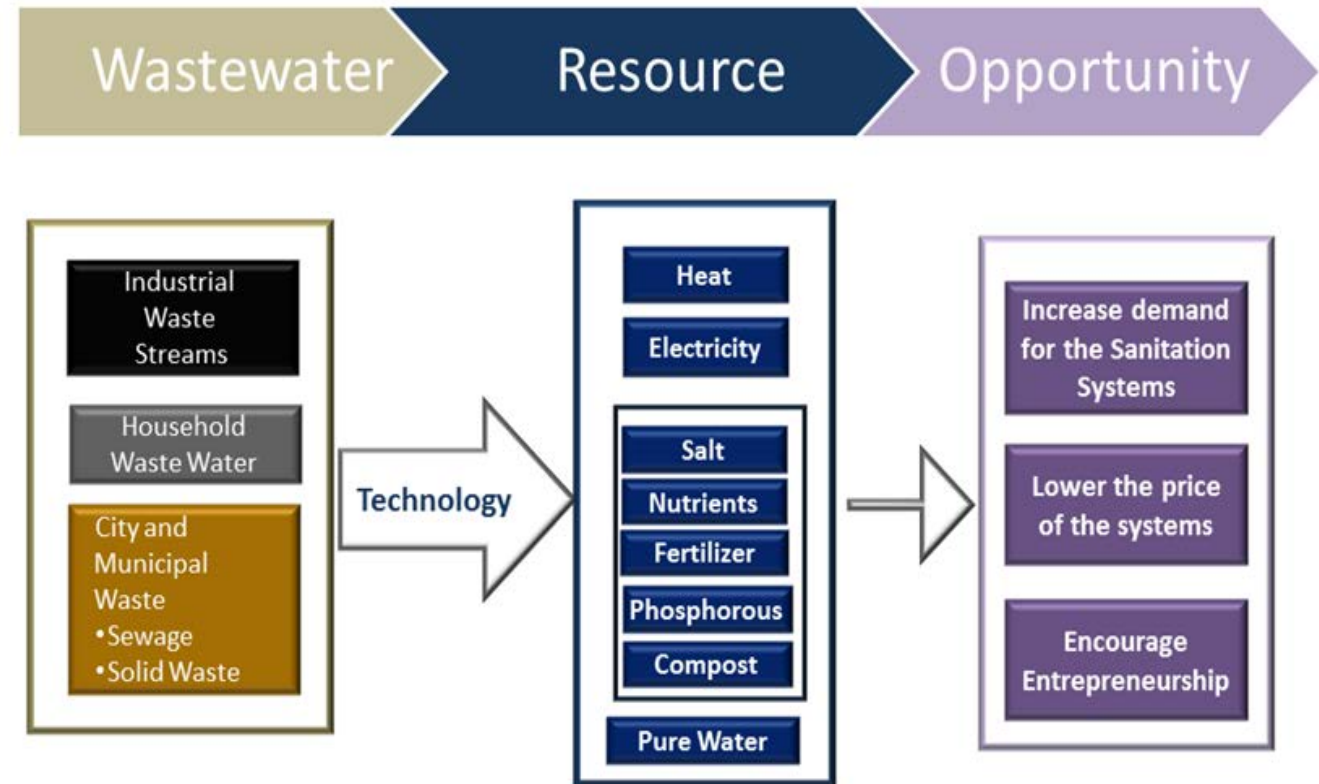
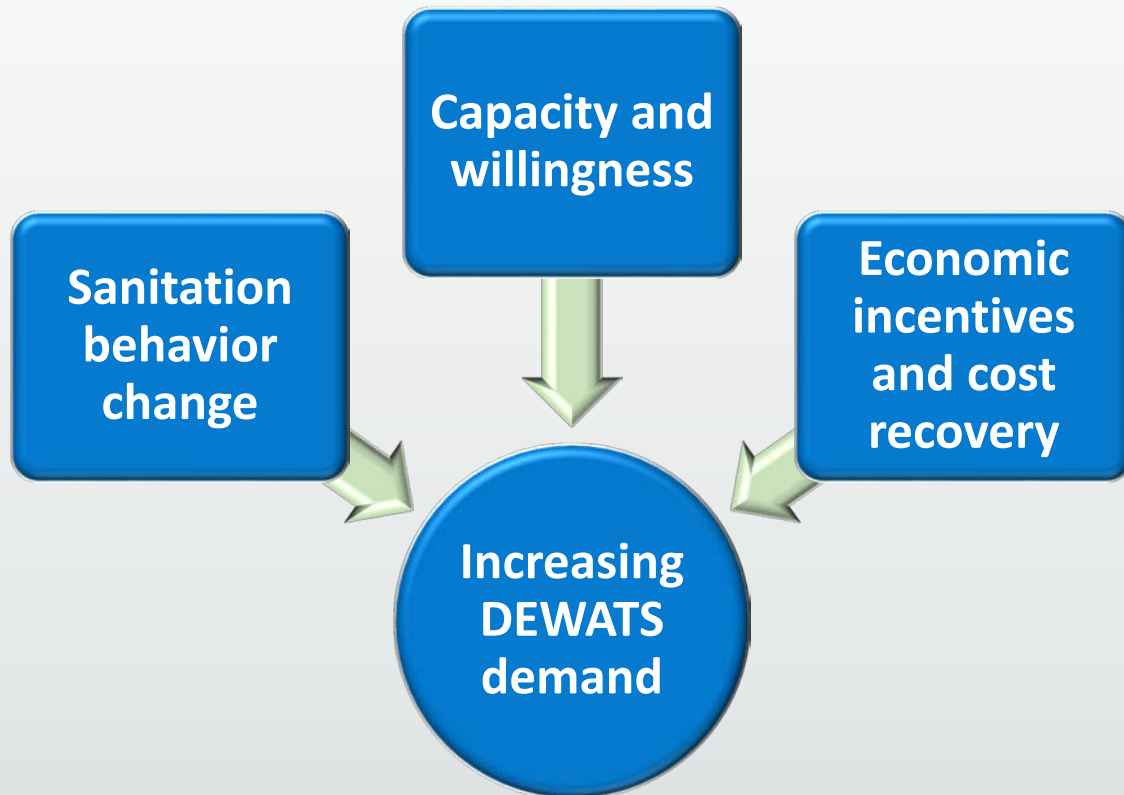
Reference case studies for technology selection:

- Biodigesters in Cambodia: <https://www.youtube.com/watch?v=ZKdruWBIHck&feature=youtu.be>
- Pro- Phosphorus PPP (5P) by Sweden and Australia: <https://vimeo.com/13365354>

Pros and Cons of the DEWATS Technologies [FA-6]

Type	Treatment	Wastewater type	Advantage	Disadvantage
Septic Tank	sedimentation, sludge stabilization	wastewater of settleable solids	simple, durable, underground	low treatment efficiency
Imhoff Tank	sedimentation, sludge stabilization	wastewater of settleable solids	simple, durable, underground	need regular de-sludging
Aerobic Filter	anaerobic degradation of SS and DS	pre-settled industrial and domestic wastewater with narrow COD/BOD ratio	simple, durable, underground, high treatment efficiency	costly, filter blockage
Baffled Septic Tank	anaerobic degradation of SS and DS	pre-settled industrial wastewater with narrow COD/BOD ratio	simple, durable, little permanent space, high treatment efficiency, relatively cheaper compared to anaerobic	required large space, less efficient compared to anaerobic
Horizontal Grave Filter	aerobic facultative, anaerobic degradation of SS and DS, pathogen removal	suitable for domestic and weak industrial wastewater when SS and DS already removed	high efficiency, no nuisance, no wastewater on ground	need permanent space, required intensive maintenance with expertise, relatively costly
Anaerobic Pond	sedimentation, anaerobic degradation, sludge stabilization	strong or medium industrial wastewater	simple in construction, little maintenance required with flexible degree of treatment	occupy open land , can be a nuisance due to odour and mosquitoes
Aerobic Pond	aerobic degradation, pathogen removal	pre-treated industrial and domestic wastewater	simple in construction, reliable in performance, pathogen removal, appears natural pond, fish farming possible	occupy large permanent space, can be a nuisance due to odour and mosquitoes, algae can raise BOD level

Increasing the Demand for DEWATS [FA-7]



Policy Instruments for Enabling Business [FA-7]

Regulatory Instruments

Target Setting	National or sector targets for greenhouse gas emissions, carbon intensity, energy intensity, etc
Standards	Performance standards, technology standards, ambient standards, bans and limitations, etc
Environmental Regulations	Mandatory assessments (such as an environmental impact assessment)

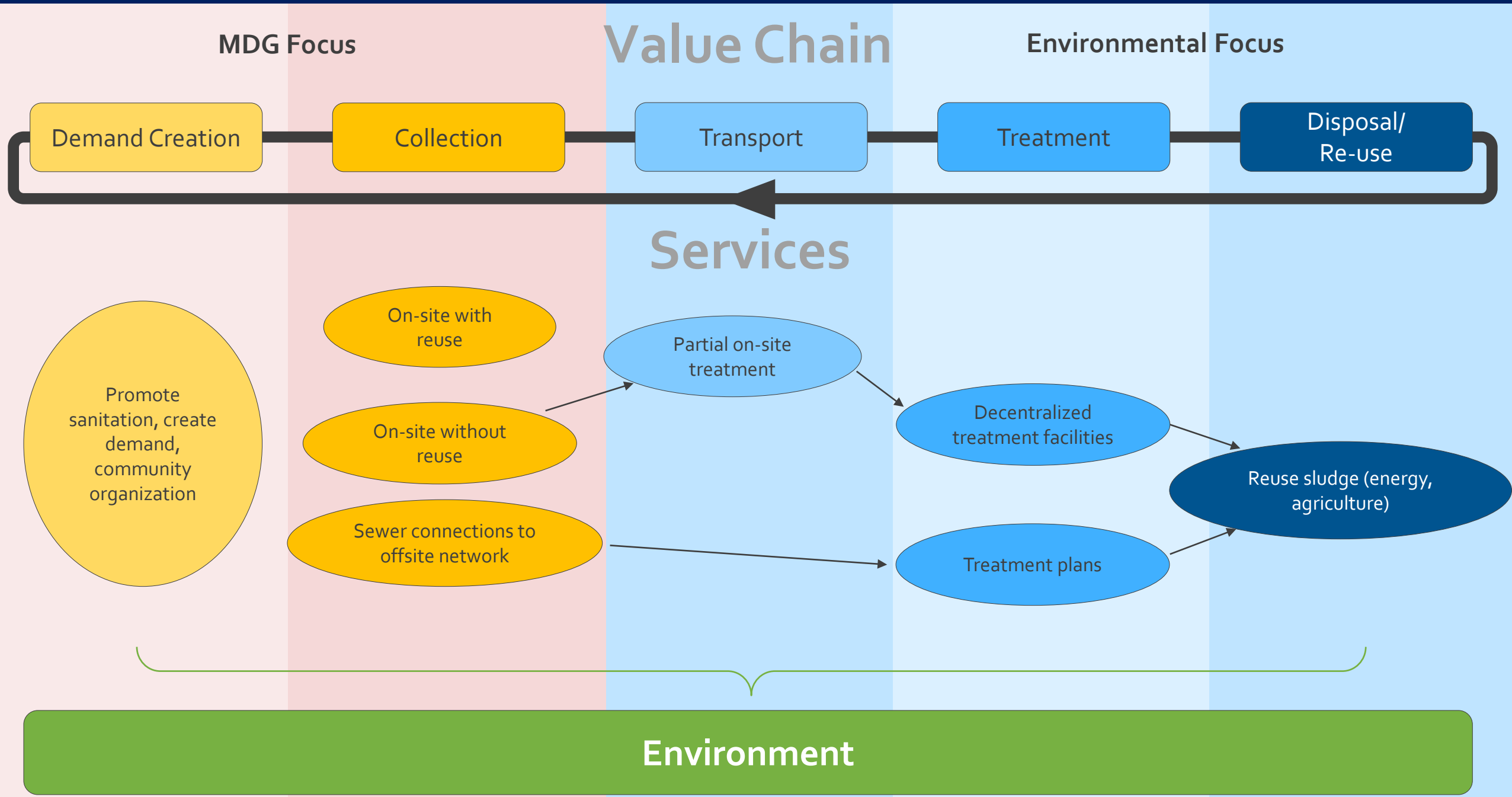
Economic Instruments

Fiscal instruments	Taxes, subsidies
Charge systems	Pollution charges, Product charges, user charges, etc.
Market creation	Tradable emission permits
Financial mechanisms	Grants, soft loans, funds and green Procurement

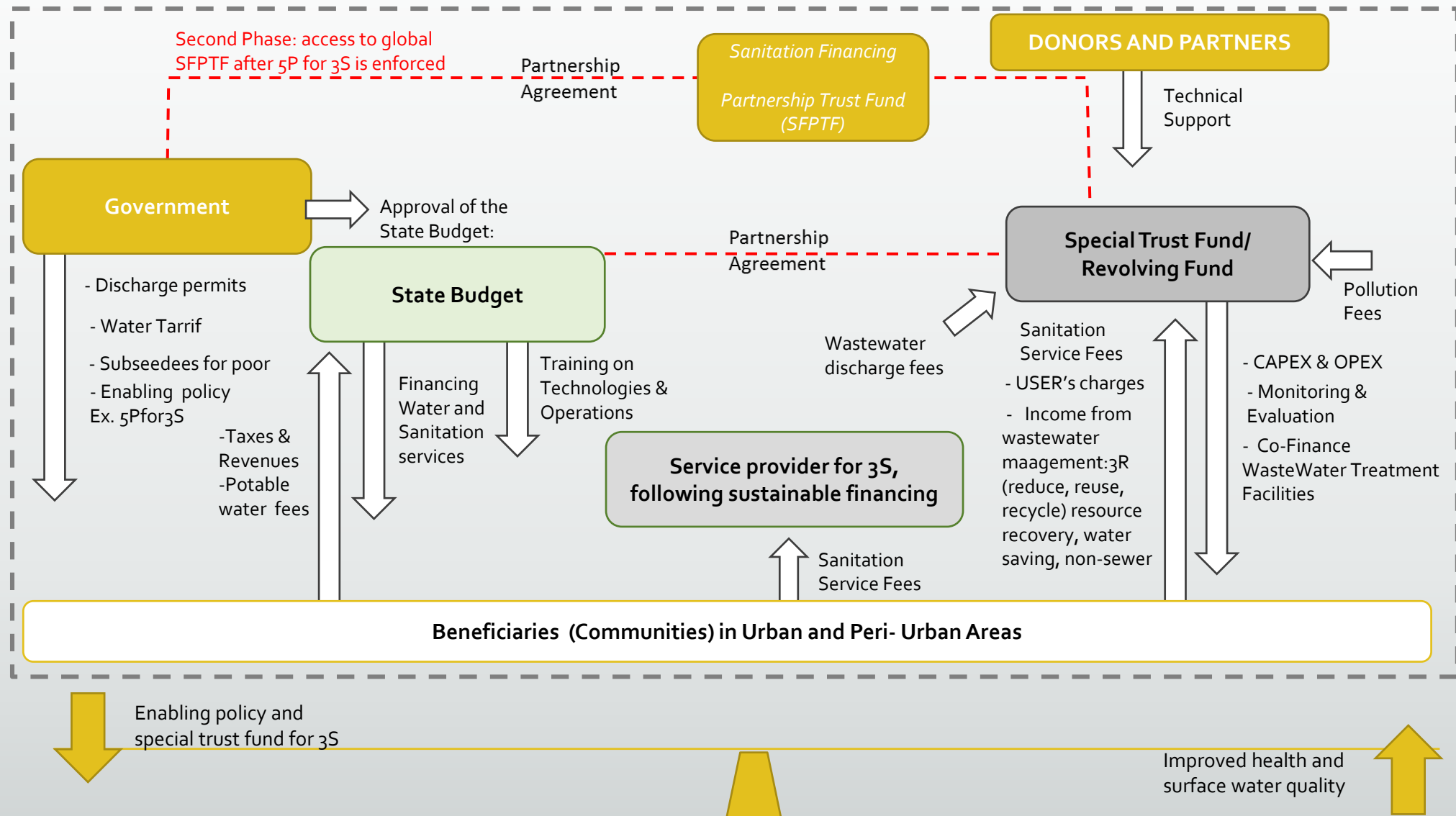
Information Instruments and tools to engage the private sector and civil society

Eco-labelling	Mandatory or voluntary labelling for various products – general or impact-specific (such as energy labels)
Voluntary agreements	Voluntary agreements with specific industries, for example on greenhouse gas emissions reductions or energy efficiency, eco-industrial parks
Corporate Social Responsibility (CSR) and environmental reporting	Voluntary for overall CSR, partially mandatory agreements with environmental reporting, such as the amount of greenhouse gas Emissions
Partnerships	Partnerships with research institutes and private sector for R&D in key sectors or Technologies
Education and training	Education for sustainable development, awareness campaigns or awards

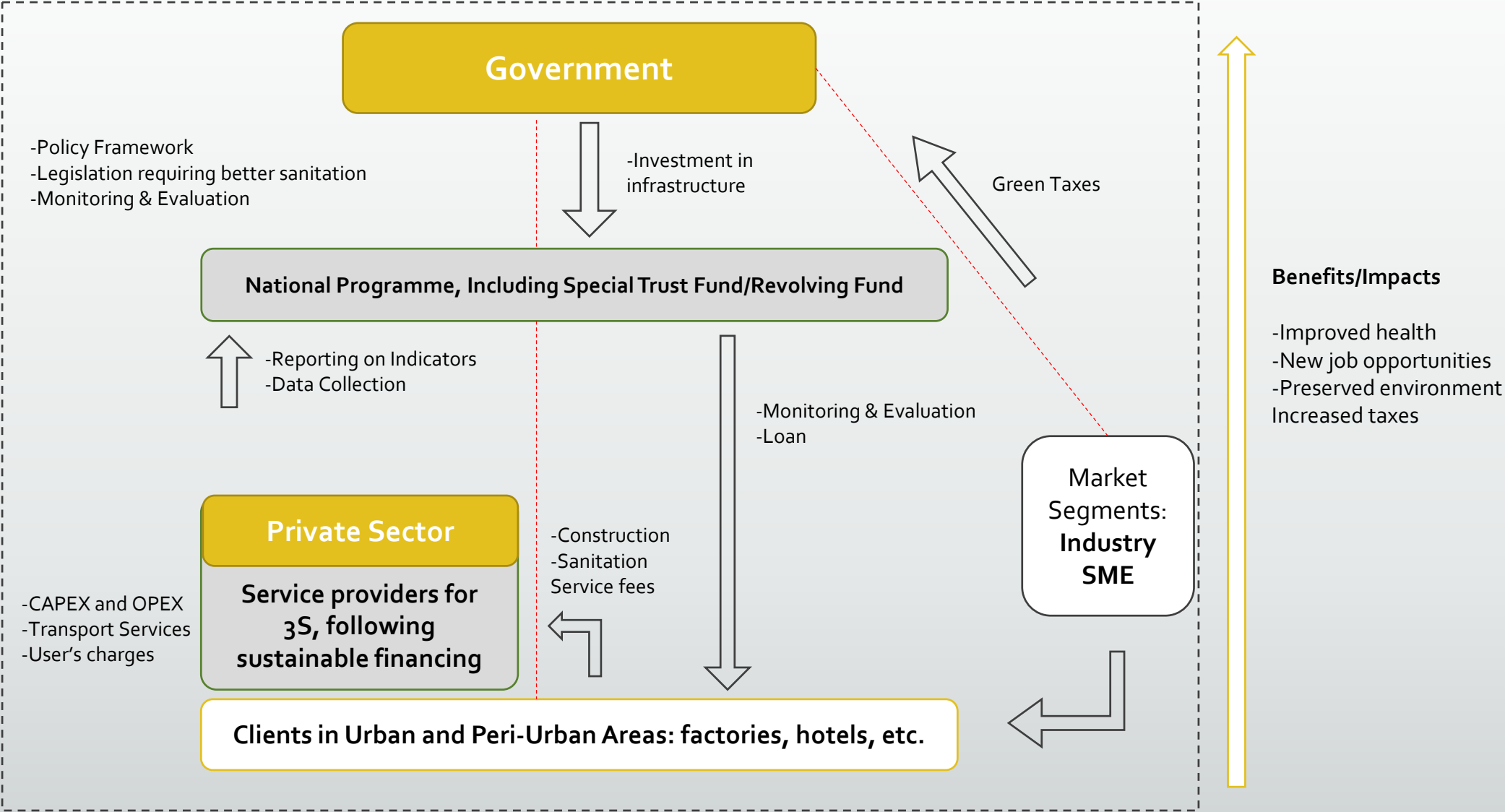
Ensure Financial and Investment Climate from Government, Donors and Entrepreneurs[FA-8]



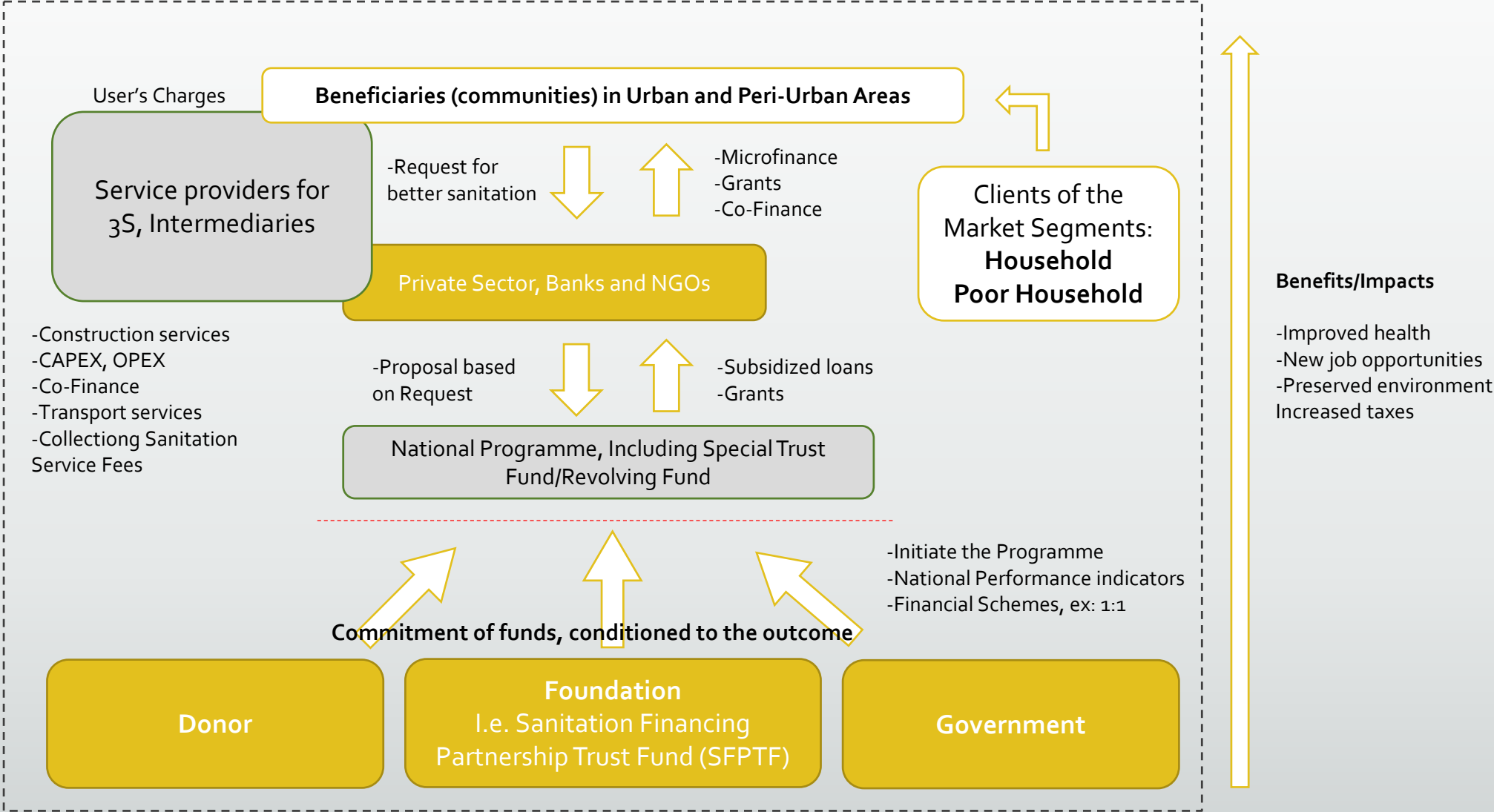
Framework for Financing Sustainable Sanitation Services (3S).



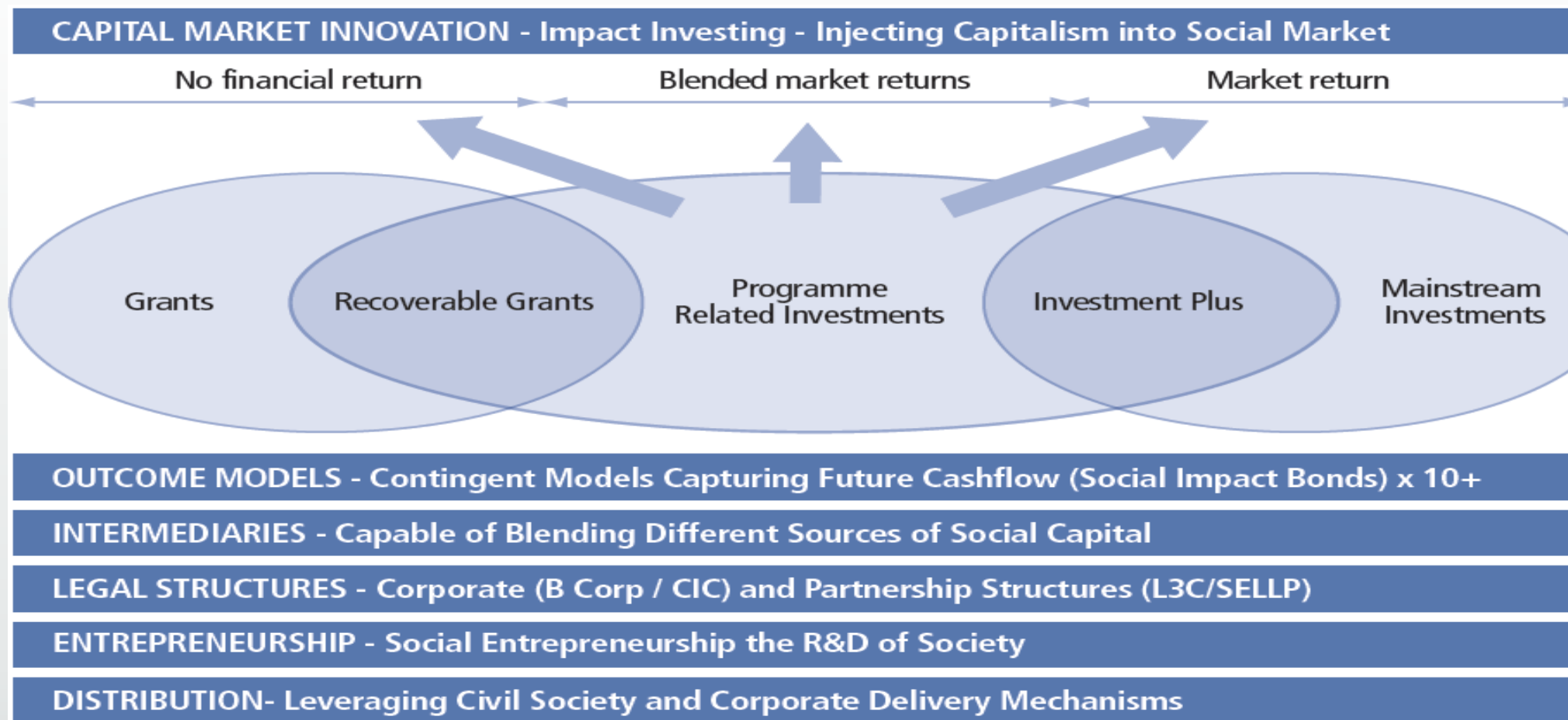
Financial framework for Industry and SMEs



Financial Framework for Households



The COILED Method



Reference:

Development Financing for Tangible Results: A paradigm shift to impact investing and outcome models

<http://www.unescap.org/resources/development-financing-tangible-results-paradigm-shift-impact-investing-and-outcome-models>

Ensure Exit Strategy and Sustainability [FA 9]

Governments can use several sustainability frameworks using basic five sustainability elements, i.e. FIETS model:

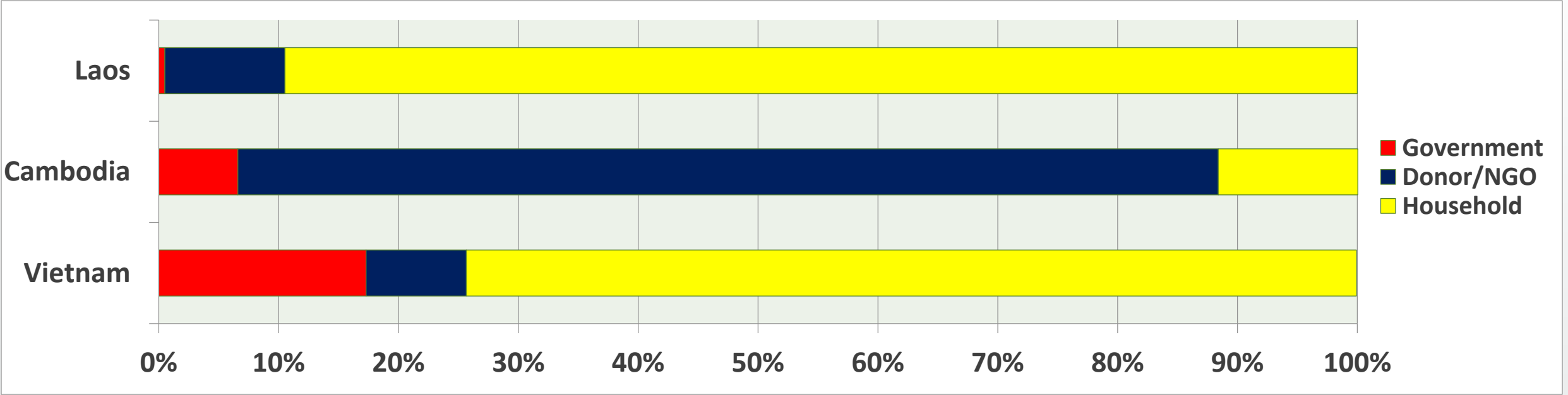
- **Financial:** continuity of DEWATS through local financing.
- **Institutional:** sustained and functional local DEWATS systems with capable institutions, policies and procedures.
- **Environmental:** sustainable management of water and waste for clean natural environment and climate.
- **Technical:** operation and maintenance of hardware, by local people, that preserves not depletes natural resources .
- **Social sustainability:** demand-driven, inclusive, gender equal, culturally sensitive and needs-based approach to WASH

Evaluation of Implementation [FA 10]

Evaluation of DEWATS implementation can be done as follow:

- **Evaluation of effectiveness of the planning process** of national and city sanitation strategy and development framework.
- **Evaluate** the progress and level of achievement of sanitation development activities. T
- **Assessing the benefits of sanitation development** programs against trends in sanitation conditions and environmental conditions, and behaviour of the community, public health conditions, and environmental health risk.

Financing Sources for Sanitation in Lao PDR, Cambodia and Vietnam



Grant Maker foundations	Recipient	Years	Purpose	Country	Amount(\$)
Gates Foundation, Bill & Melinda	East Meets West Foundation	2012	Basic sanitation	Vietnam, Cambodia	10,900,000
Gates Foundation, Bill & Melinda	East Meets West Foundation	2012	Drinking water supply and sanitation	Vietnam, Cambodia	10,892,820
Gates Foundation, Bill & Melinda	International Development Enterprises	2011	WASH research	Cambodia	3,987,717
Stone Family Foundation,	iDE Cambodia	2012	Education and training in water supply and sanitation	Cambodia	2,132,433
Vanguard Charitable Endowment Program	Splash	2011	Basic drinking water supply	Cambodia, China, Ethiopia,	1,200,650

Key Message

- **Policies and strategic government investments may spark the private sector as strong financial contributor and support households.**
- **3S coordinates DEWATS with conventional centralized treatment systems**
- **DEWATS have numerous potential financing opportunities**
- **DEWATS have a high Benefit-Cost Ratio**

Quiz– 3/3

**Multiple Questions and Answers to comply
for Course Certificate**