

**International Conference: Sustainable Development and
Management of Water in Palestine, 26-29 August, 2007**

InterContinental Hotel, Amman - Jordan

The need for Integrated Water Resources Management (IRWM) in Palestine

Enda O'Connell

School of
Civil Engineering and Geosciences



**Newcastle
University**

Outline

1. The water crisis in Palestine
2. IWRM: concept and goals
3. Progress with implementing IWRM
4. Institutional frameworks for IWRM
5. Towards IWRM in Palestine: the SUSMAQ Project
6. Future challenges

Palestinian Water Crisis

- The population of Palestine in 2003 was around 3.7 Million compared to about 1 million in 1967.
- 90% of the population are connected to pipe networks, and 40% are connected to sewage networks
- Water supplies do not run 24 hours a day
- Raw sewage disposal on the ground surface is the cause of severe health risks.

Palestinian Water Crisis

- In 1994 and 1997, Gaza Strip faced outbreaks of Cholera and viral Meningitis respectively.
 - It was found that the reason was related to contact with water contaminated with sewage.
- Although the current unfulfilled Palestinian water demand amounts to about 350 Mcm/yr, and although Article 40 was and is limiting the Palestinian Water Sector by allocating 80 Mcm/yr during the interim period (1995-2000), only 30 Mcm/yr of water has been added to the domestic water sector.

Palestinian Water Crisis

- Lack of access to water (the human right to water) is the ongoing and continuing crisis and disaster in Palestine.
- Quality is also a factor limiting the available potable water supply.
- The serious impacts of the Israeli reoccupation to the West Bank after the Intifada Sep 2000 proved that the Palestinians moved to agriculture and water for their survival
 - The percentage of workers in agriculture increased from 12.7% of the total workers in the year 1999 to 16.5% as was officially reported in 2003.

Palestinian Water Crisis

Therefore:

- Palestinians need legal and internationally recognised water rights
- Inequitable share of available water resources
- Impacts of Occupation: An obstacle in developing the Palestinian water sector
- Impacts of the Separation Wall: A human disaster and a World Water Day Disaster
- Impacts of the diversion of the Jordan River: both a human and an environmental disaster
- Impacts of desalination plants

Water and Disaster in Water-Scarce Countries

- Natural and human-made disasters (drought and war) have a devastating impact.
 - Floods, hurricanes, droughts, civil conflicts or wars affect many people, their homes and their economic prospects.

Human-made Disasters: The Palestinian Case

- No water rights
- Inequitable share of available water resources
- Impacts of the occupation
- Impacts of diversion of Jordan River on shrinking of Dead Sea: both a human and an environmental disaster
- Impacts of the Separation Wall: a human disaster

Human-made Disasters: The Palestinian Case

- Impacts of Israeli Desalination Projects
 - Plants to desalinate water from South of Haifa and deliver it to Jenin (and then distribute it to the whole West Bank)
 - Red sea-Dead sea canal project

Human-made Disasters: The Palestinian Case

- Overall, an unparalleled human-made disaster
- What is the World doing about the Palestinian human-made disaster?
- What can the Palestinians do to heighten awareness and perception and to generate responses in the world community?
Battle for minds!

Outline

1. The water crisis in Palestine
2. IWRM: concept and goals
3. Progress with implementing IWRM
4. Institutional frameworks for IWRM
5. Towards IWRM in Palestine: the SUSMAQ Project
6. Future challenges

A New Paradigm: IWRM

- The extent of the global crisis in water resources management is well documented (WWAP Reports), but how to deal with it is much more difficult
- 'A Crisis of Governance': World Water Assessment Report (2006)
- If effective, long-lasting solutions to water problems are to be found, a new water governance and management paradigm is required.
- Such a new paradigm is encapsulated in the IWRM concept

A Paradigm

“A set of rules and regulations that:

- (i) establish boundaries
and
 - (ii) provide solutions to problems within those boundaries.
-
- Paradigms filter incoming experience, and affect judgement and decision-making by influencing one’s perceptions”

The Paradigm Shift: from the traditional to IWRM

Origins in

- The Brundtland Report (1987)
- The Dublin principles (1992)

Additional momentum added by need to achieve the Millenium Development Goals (MDGs)

Brundtland Report (1987)

Sustainable Development:

“A development which meets the needs of the present without compromising the ability of future generations to meet their own needs”

The Dublin Principles (1992)

- Water is a single, finite resource
- Water management and development should include stakeholders
- Water is an economic good
- Women play a central role in management and conservation of water

The Dublin Principles have served as a guide for the global water dialogue

Integrated Water Resources Management (IWRM)

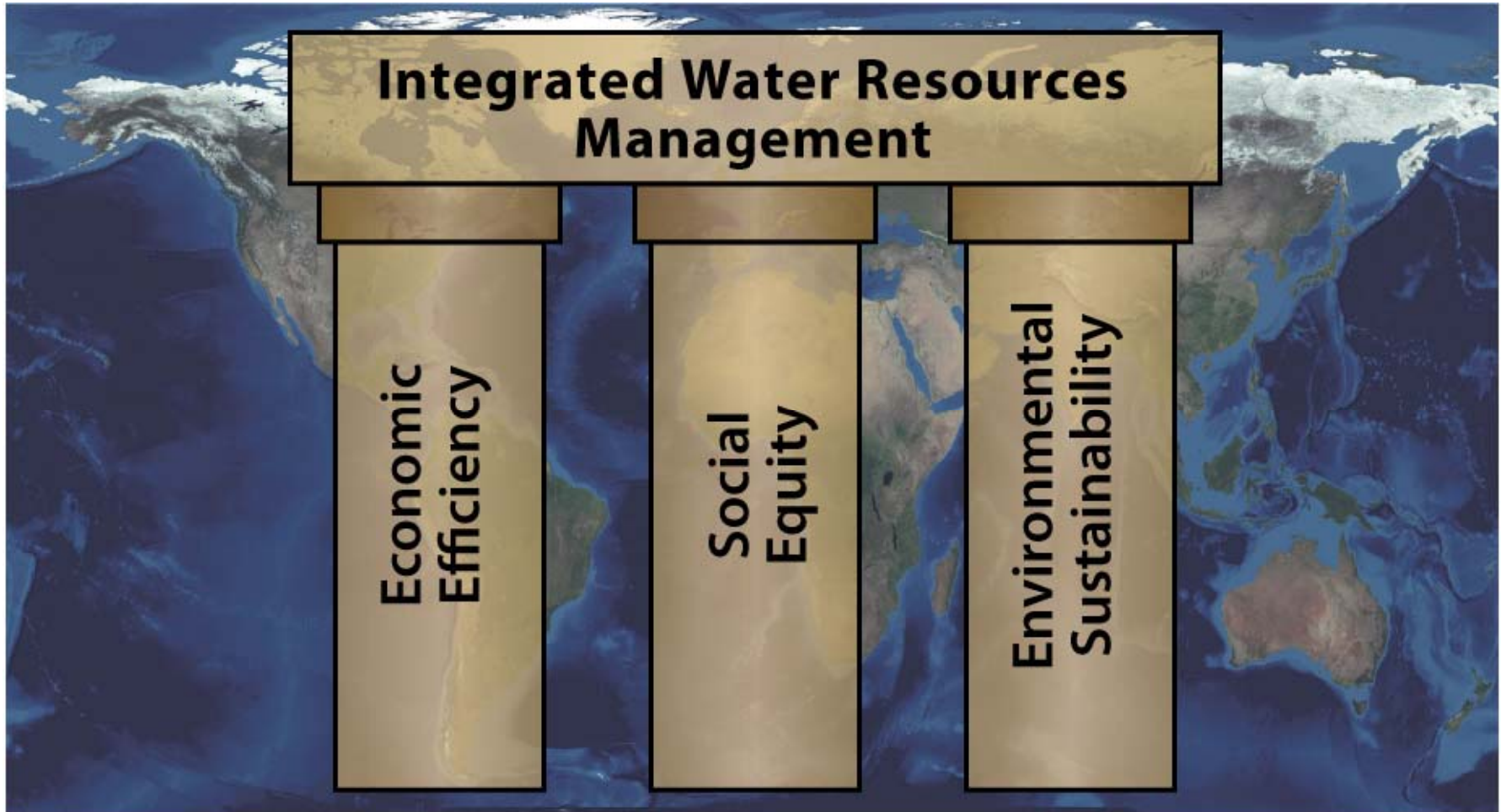
‘A process which promotes the coordinated development and management of water, land, and related resources, in order to maximise the resulting economic and social welfare in an equitable manner without compromising the sustainability of vital ecosystems.’

(Global Water Partnership)

Goals of Integrated Water Resources Management (IWRM)

- **EQUIT(ABILI)TY:** to distribute the costs equitably among all user sectors.
- **ENVIRONMENTAL PROTECTION AND SUSTAINABILITY:** through the enforcement of regulations and the mitigation of impacts.
- **ECONOMIC EFFICIENCY:** through the recovery of the Direct, Opportunity and Environmental Costs of water provision

The 3 pillars (goals) of IWRM



Where Are We Heading?

- Decreasing per-capita availability
- Degrading water quality
- Increasing competition/conflict within sectors and within society
 - Urban versus agriculture
 - 'Haves' versus 'Have-nots'
 - Upstream versus downstream
 - National versus international
- Increasing competition/conflict with the environment

IWRM

- IWRM explicitly challenges conventional water development and management systems.
- It starts with the recognition that traditional top-down, supply led, technically based and sectoral approaches to water management are imposing unsustainably high economic, social and ecological costs on human societies and on the natural environment.
- Business as usual is neither environmentally sustainable, nor is it sustainable in financial and social terms

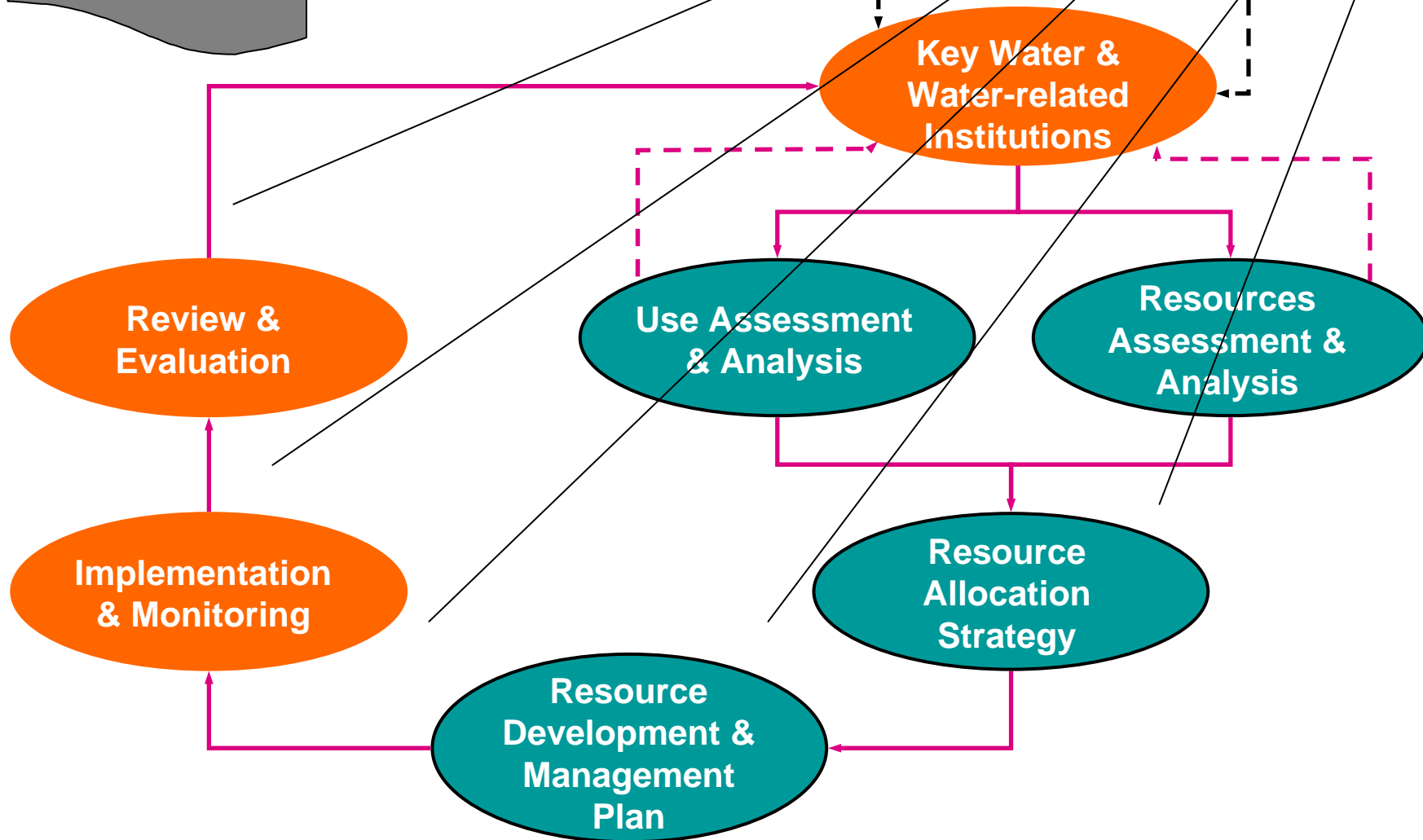
Integrated Water Resources Management

- A systematic process for linking water and water-related policy, objectives, and uses to improve decision making in:
 - ◆ operation and management of natural resources and environmental systems;
 - ◆ design and implementation of programs and policies.
- A coordinating framework for integrating sectoral needs, water and water-related policy, resource allocation, and management within the context of social, economic, and environmental development objectives.

Schematic of the IWRM Process

- Stakeholder Input
- Donor Input
- Other Input

Country
Development
Objectives



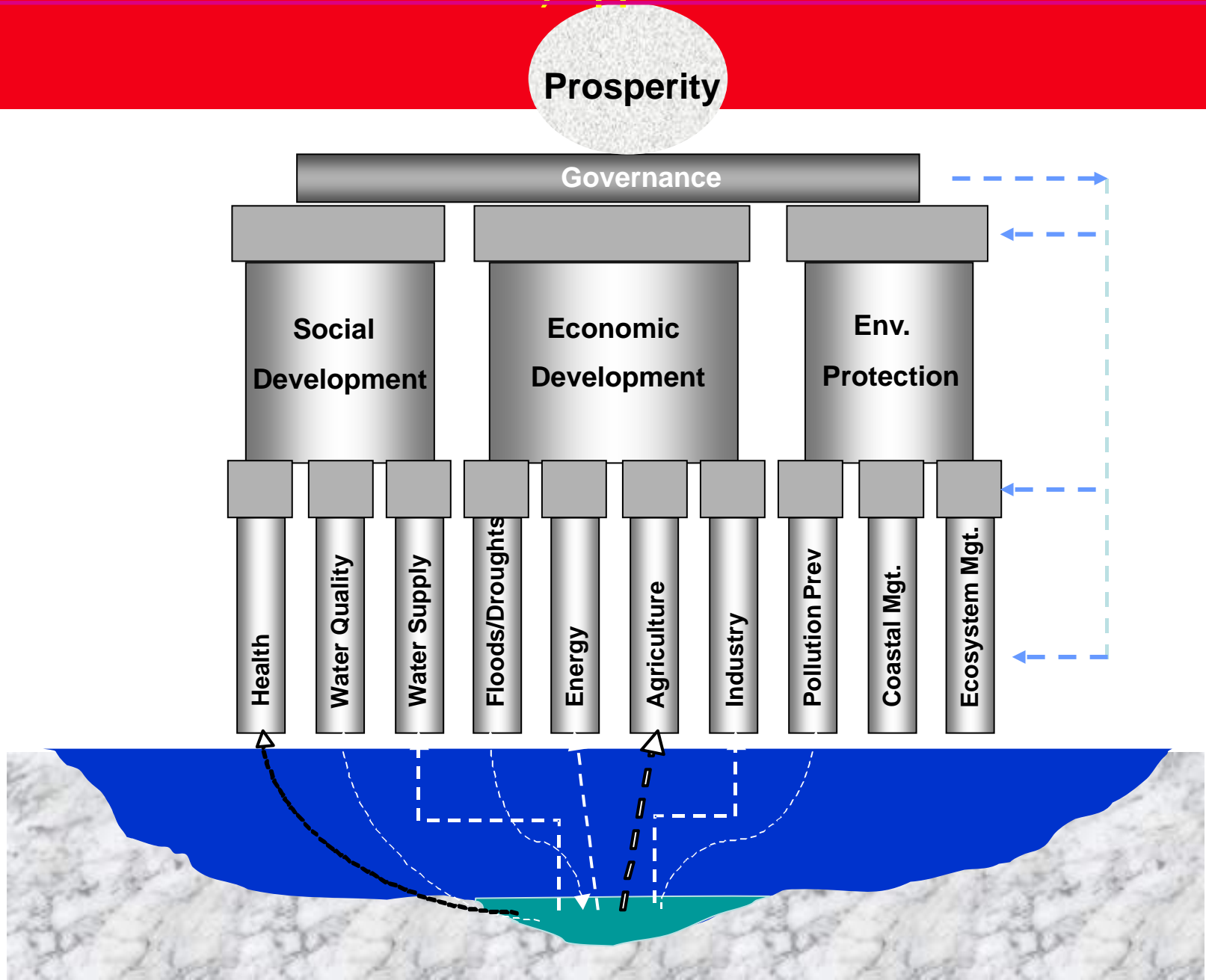
Why IWRM?

- Globally accepted and makes good sense.
- Key element in national water policy.
- Incorporates social and environmental considerations directly into policy and decision making.
- Directly involves the stakeholders.
- Provides a basis for optimizing investments under a tight financing climate.

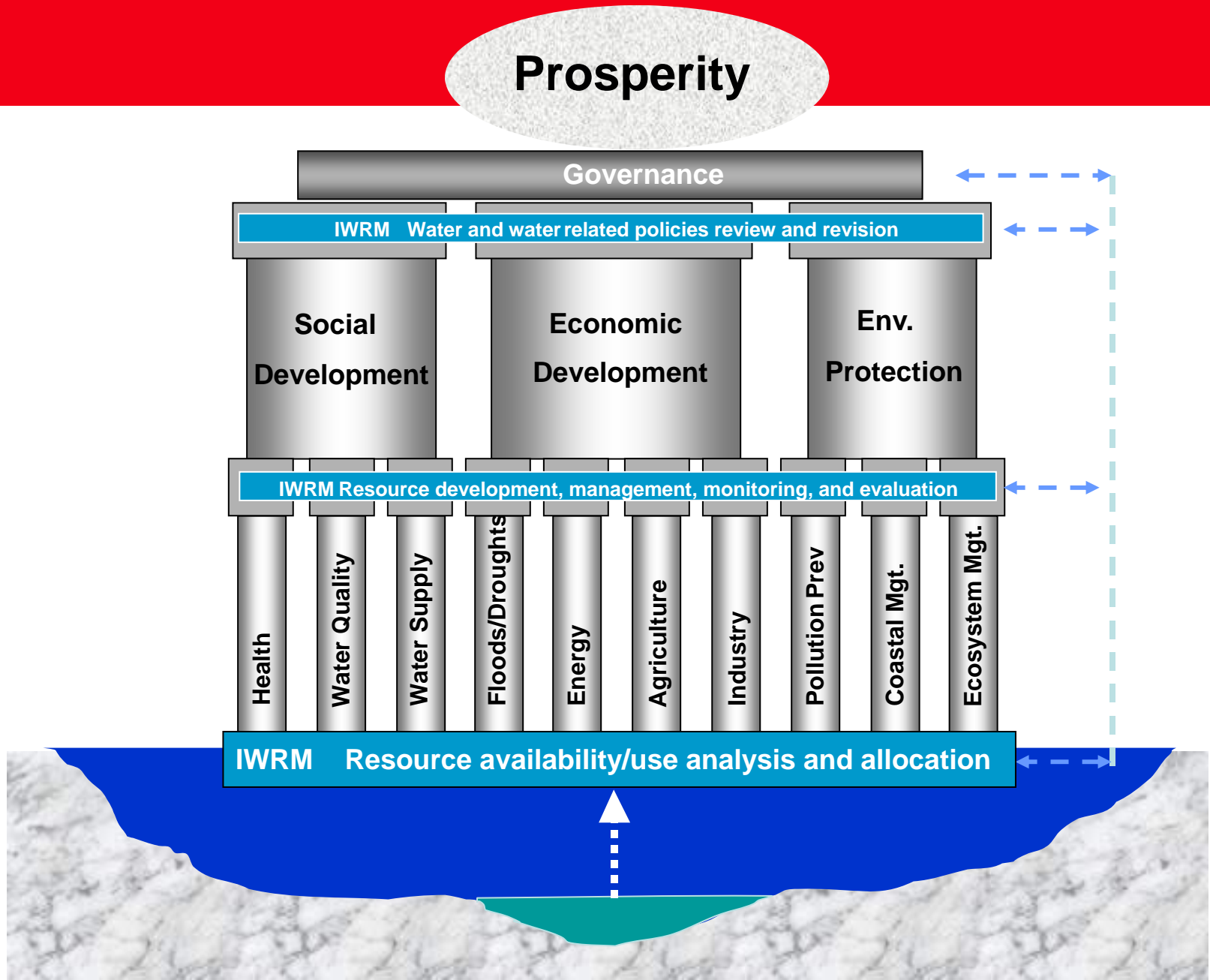
IWRM can be characterized as:

- A process, not a product
- Scale independent - applies at all levels of development
- A framework for self assessment and program evaluation
- A framework for policy, planning, and management
- A mechanism for evaluating competing demands, resource allocation, and tradeoffs

The Water Resources Development Process: Traditional Sectoral (or Use) Approach



Water Resources Development : The IWRM Process



Outline

1. The water crisis in Palestine
2. IWRM: concept and goals
3. Progress with implementing IWRM
4. Institutional frameworks for IWRM
5. Towards IWRM in Palestine: the SUSMAQ Project
6. Future challenges

Progress made by countries in implementing IWRM

- WWF (2006) Mexico
- *Report: Implementing Integrated Water Resources Management. the Inclusion of IWRM in National Plans,*
- 2 different statistical surveys by Japan Water Forum (JWF) and GWP:
- Up to 28% have made good progress but some 28% are in their initial stages of Integrated Water Resources Management (IWRM).

Key WWF recommendations for future development of IWRM

5 themes:

- (1) Institutional and Legal Framework
- (2) Stakeholder Participation
- (3) Socio-economic
- (4) Capacity-building
- (5) Environmental Sustainability

What next?

- Research is required on linking technical analytical methods and participation (social learning) approaches (Pahl-Wostl, 2002).
- For IWRM to be effective, a tripartite alliance between policy maker, stakeholder and engineer (scientist) is required (Schulz et al, 2004).

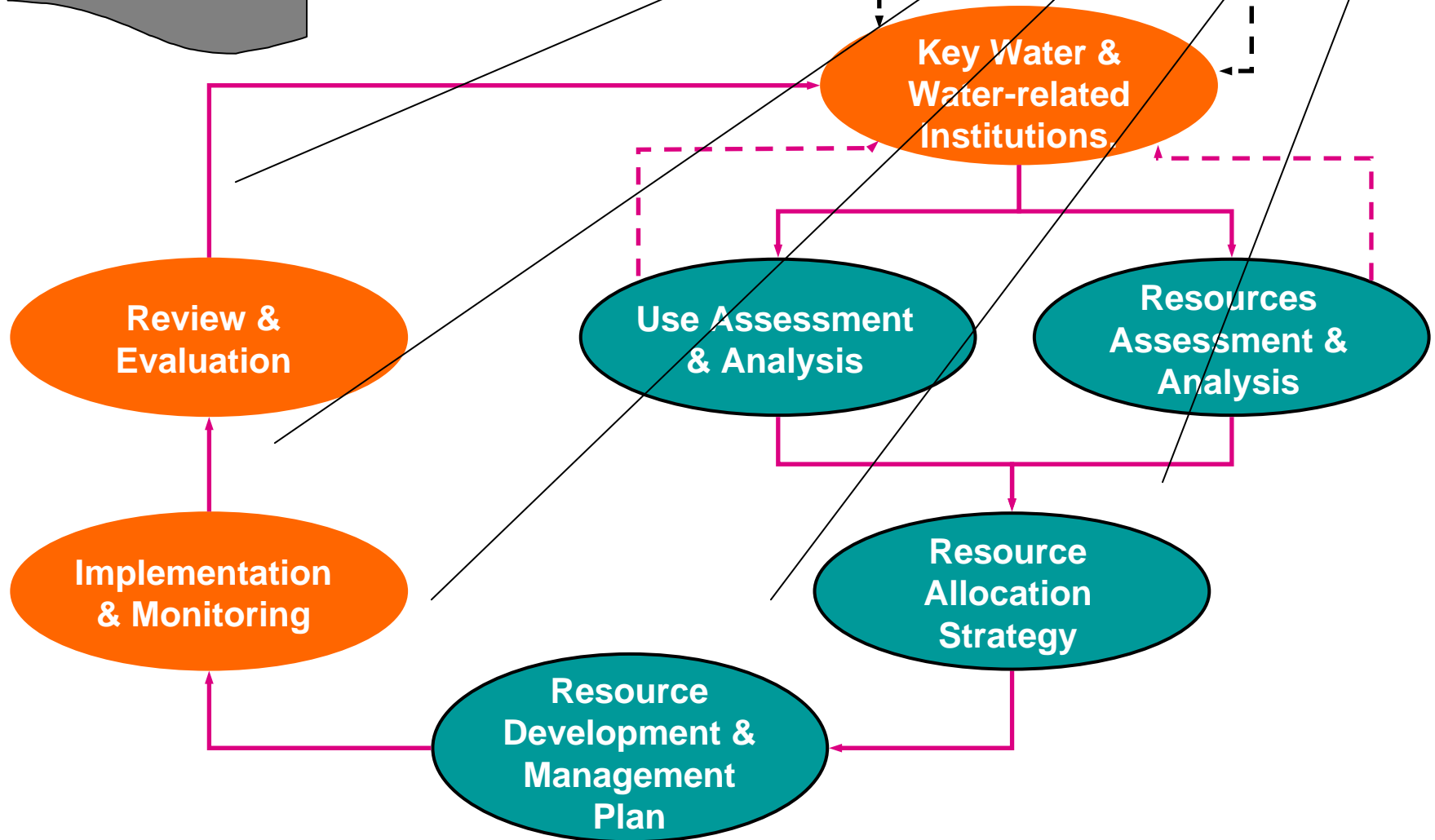
Key Questions

1. How to bring the social learning/ stakeholder participation and institutional change together with the preferred technical/engineering solution into an IWRM framework?
2. How can these can be interlinked on a decision making platform through case studies so as to implement the paradigm?

Schematic of the IWRM Process

- Stakeholder Input
- Donor Input
- Other Input

Country
Development
Objectives



Outline

1. The water crisis in Palestine
2. IWRM: concept and objectives
3. Progress with implementing IWRM
4. **Institutional frameworks for IWRM**
5. Towards IWRM in Palestine: the SUSMAQ Project
6. Future challenges

What is a Water Institution?

A mixture of several components:

- Policies and objectives and guidelines
 - ◆ Operational plans and procedures
- Laws (which can be formal and informal), rules, regulations and conventions.
- Administrative structures (organisations), their bylaws and core values.
- Political structures and processes
 - ◆ Accountability mechanisms
- Economic and financial arrangements
 - ◆ e.g. incentive mechanisms.
- Norms, traditions, practices and customs.

Institutional Analysis Framework

- Institutional Decomposition Analysis (IDA) Framework : Saleth and Dinar (2004): Institutional Economics of Water (World Bank)
- Focus on economic performance of institutions
- Does not deal with change
- Does not deal with actors/cultural dimension

Institutional Decomposition Analysis (IDA) Framework

3 components:

- Water Policy
- Water Law
- Water Administration

Methodology

4 steps:

- 1- The Conceptual Framework is defined to set the broad contours and analysis for the water sector, water institutions and water sector performance.
- 2- The Water Institution and Water Sector performance are conceptually decomposed to identify their different aspects and sub-components.

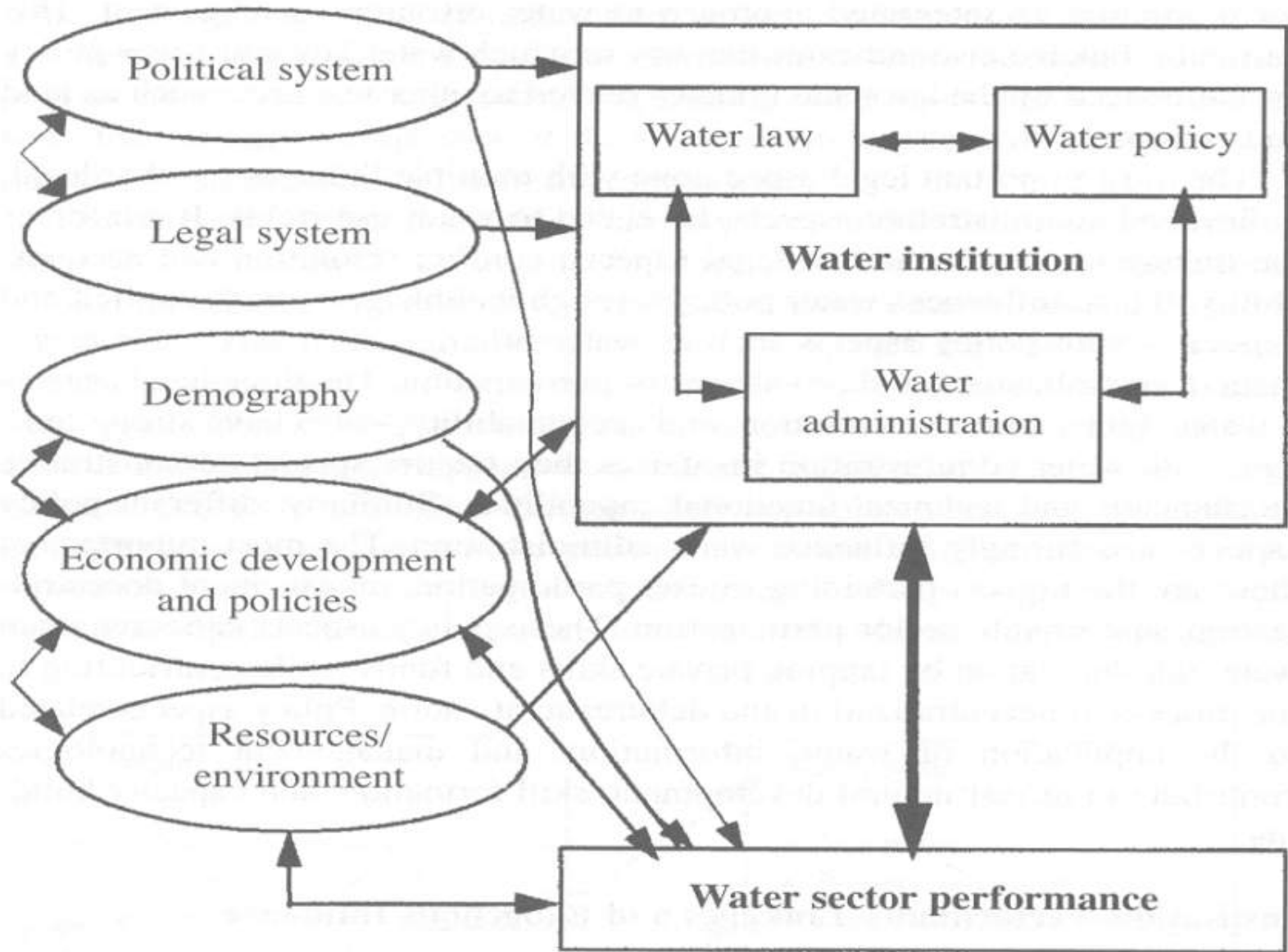


Figure: Exogenous influence on institution-performances interaction (S &D, 2004)

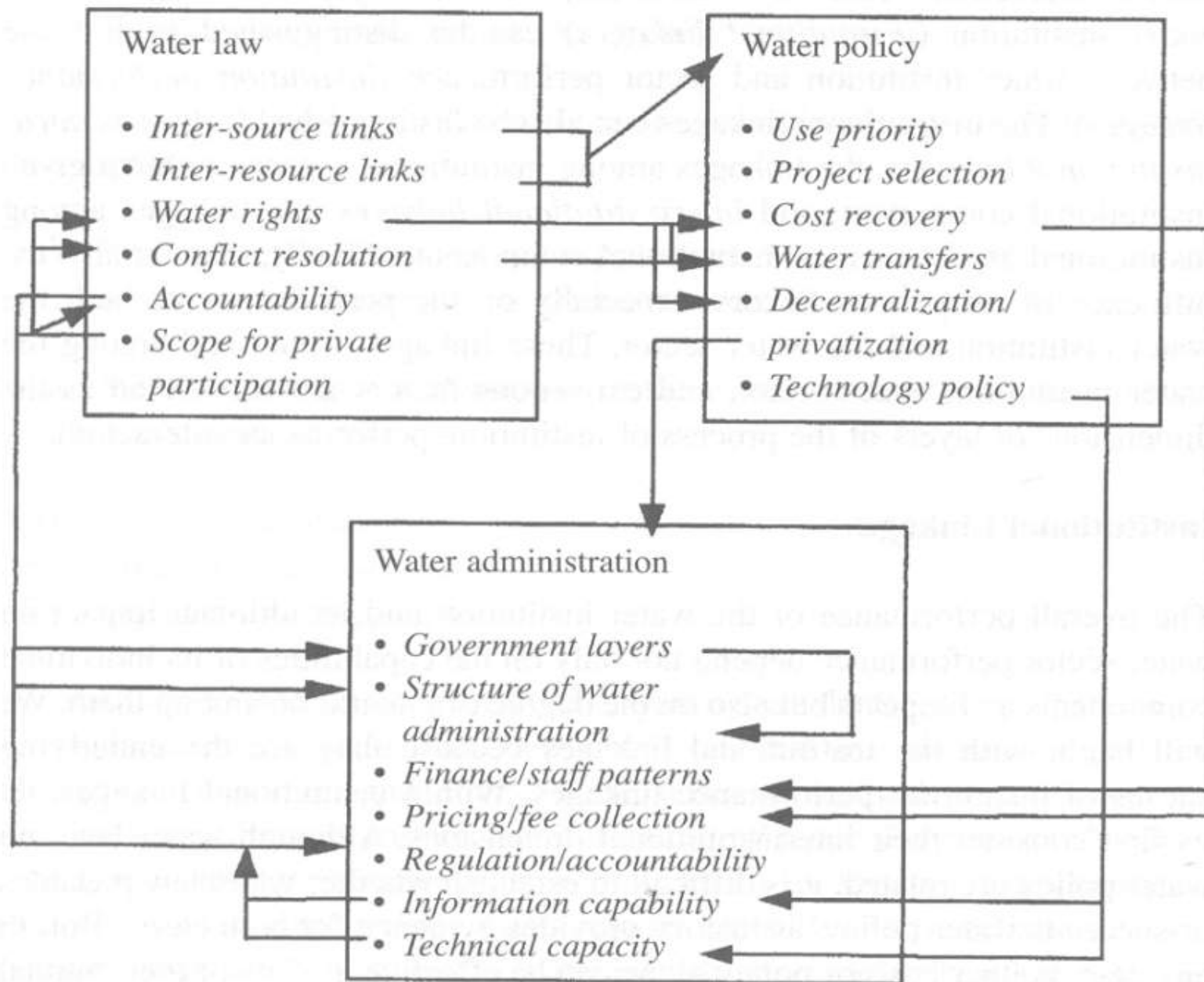


Figure: Institutional Linkages within a water institution (Saleth & Dinar, 2004)

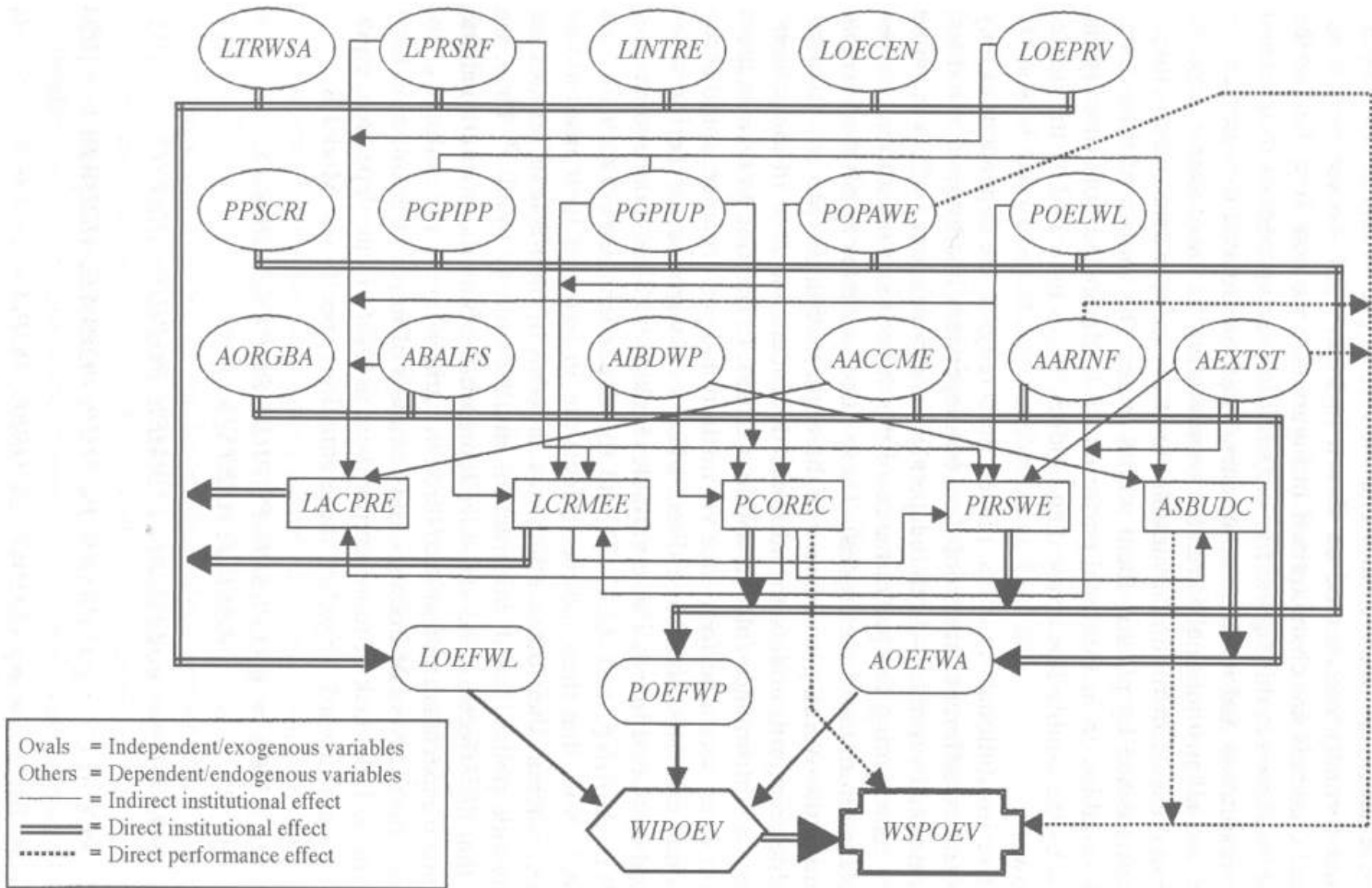


Figure: Institutional-performance interaction: layers of linkages and channels of impact transmission.

Methodology

- 3- The analytical linkages among different institutional subcomponents are demonstrated
 - (a) using the decomposition framework and component variables
 - (b) defining the exogenous factors affecting institution-performance interactions within the water sector.

Methodology

4- A set of empirical models is built:

- by transforming /translating into variables the exogeneous factors and the major layers of institution-performance interaction and their impact-transition channels
- by relating the water sector performance to these variables and choosing the best model

Outline

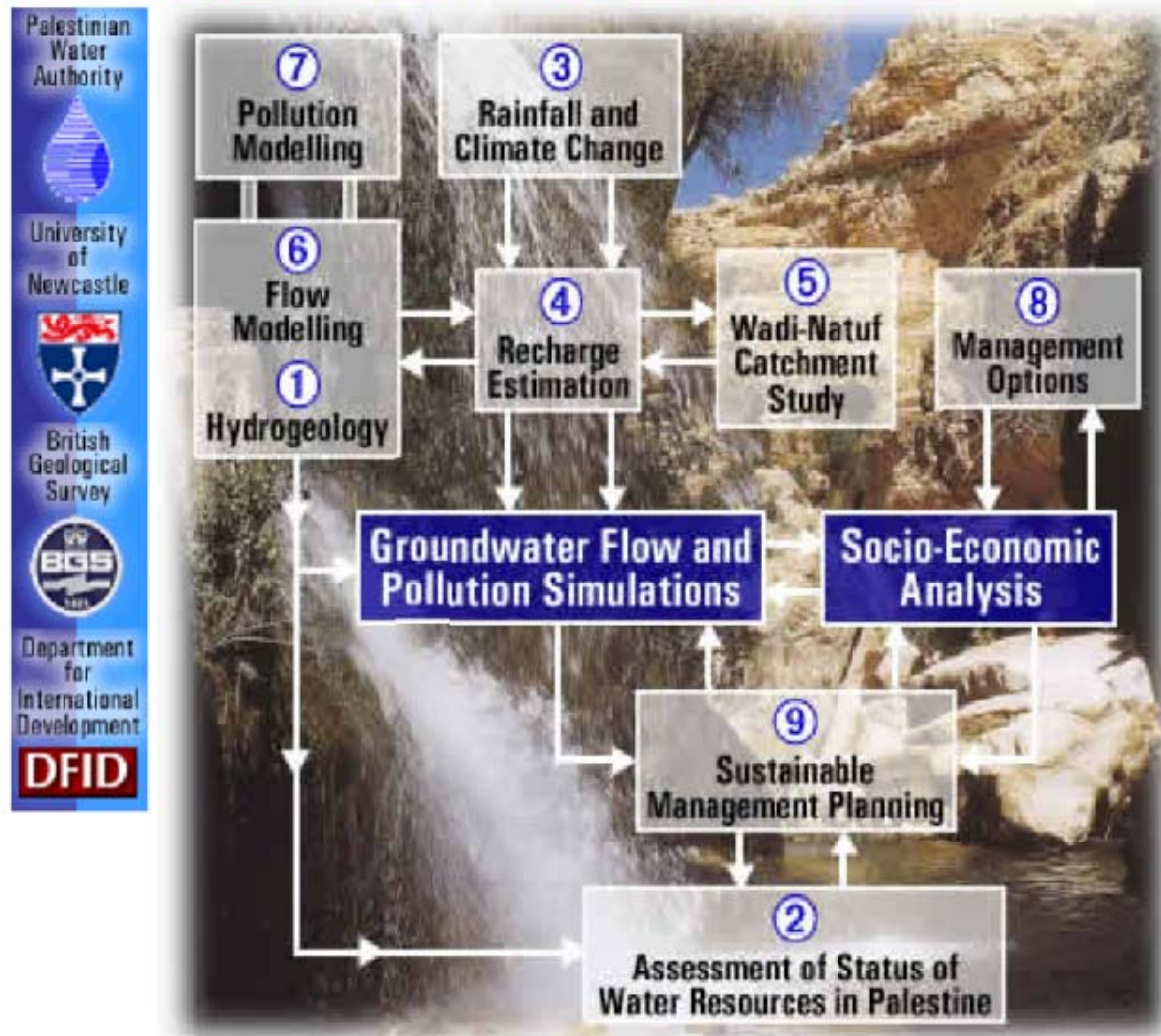
1. The water crisis in Palestine
2. IWRM: concept and objectives
3. Progress with implementing IWRM
4. Institutional frameworks for IWRM
5. Towards IWRM in Palestine: the SUSMAQ Project and beyond
6. Future challenges

Sustainable Management of West Bank and Gaza Aquifers (SUSMAQ)

- Major capacity building project undertaken by Newcastle University and other partners (1999-2005)
- Main beneficiary was Palestinian Water Authority
- Established the data, information, modelling and decision support tools needed to undertake IWRM in Palestine
- Demonstrated how IWRM could be implemented
- Has informed the Final Status Negotiations over water with Israel

SUSMAQ Project Structure

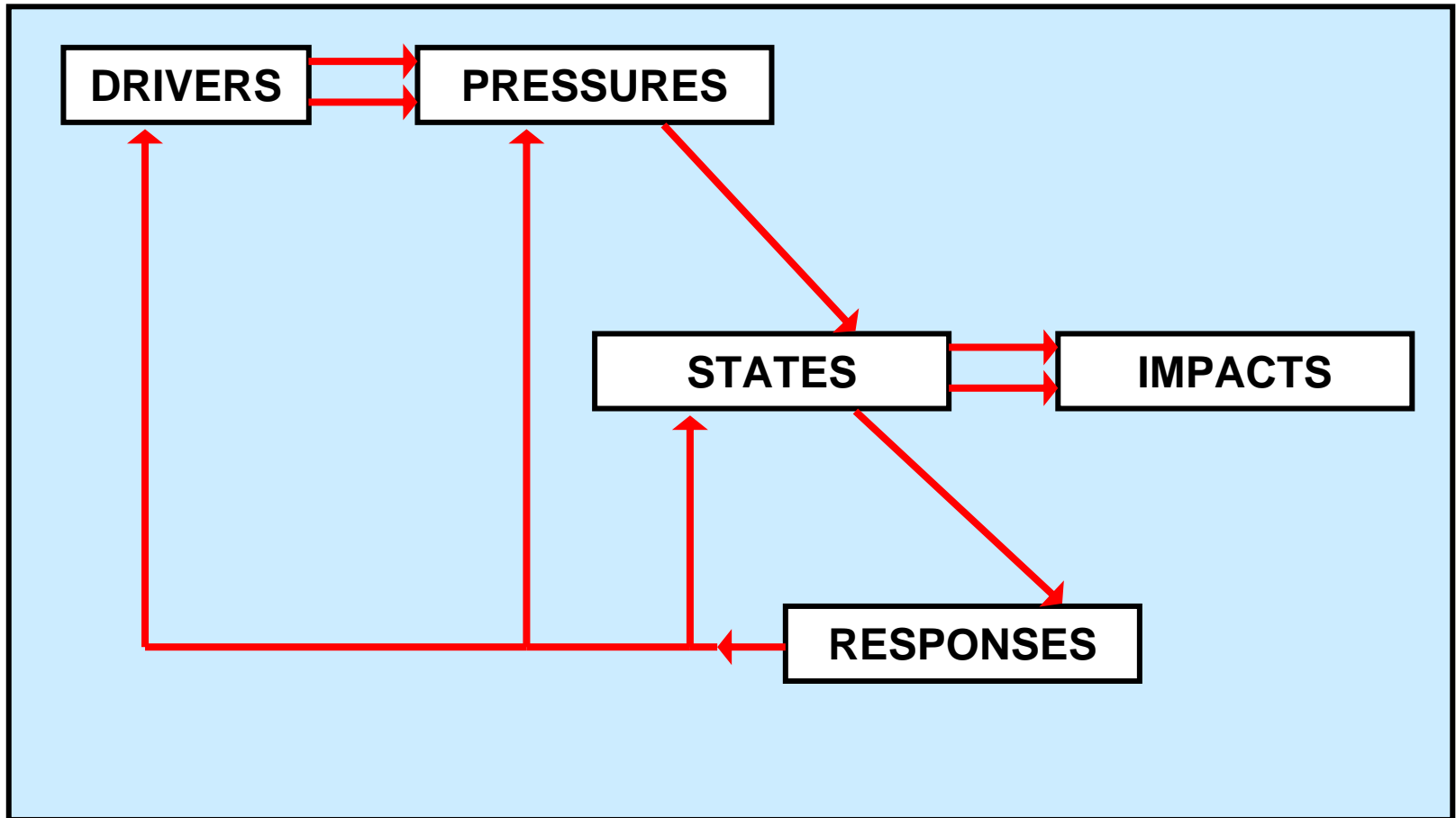
SUStainable Management of the West Bank and Gaza AQUifers



SUSMAQ Project Structure and Components

- Two core project elements, Groundwater Flow and Pollution Simulations and Socio-Economic Analysis were supported by a number of project components
- The overall outcome of the project is a framework for Sustainable Management Planning (9) which will enable the PWA to derive estimates of the sustainable yields of the West Bank and Gaza aquifers under a range of economic, demographic, land use and climate scenarios.
- Environmental, economic and social measures of sustainability have been employed in this framework, which has involved stakeholder participation throughout.
- SUSMAQ has provided the PWA with the capacity and tools to undertake IWRM in Palestine

Drivers - Pressures – States – Impacts - Responses Framework



- Used by OECD, EU, National Governments

Framework for Sustainable Management Planning

- Based on DPSIR Framework
- Climatic and Socio-economic scenarios specified to describe Drivers and Pressures under different possible futures
- Aquifer Models and Socio-economic Analyses used to evaluate Environmental, Social and Economic States
- Responses are specified as a range of Management Options (MOs)
- Basic Indicators (BIs) used to measure performance of Management Options
- BIs and MOs derived through stakeholder workshops

Sustainability Indicators

Social indicators

- Water Connection
- Water Quality
- Water Usage
- Agricultural Jobs
- Jobs in Industry
- Source Yield and Livelihoods
- Expenditure on Water

Environmental indicators

- Aquifer water level
- Reliability of supply from aquifer
- Yield of major aquifer springs
- Aquifer water quality
- Wastewater discharge
- Agricultural pesticide use
- Industrial effluent

Economic indicators

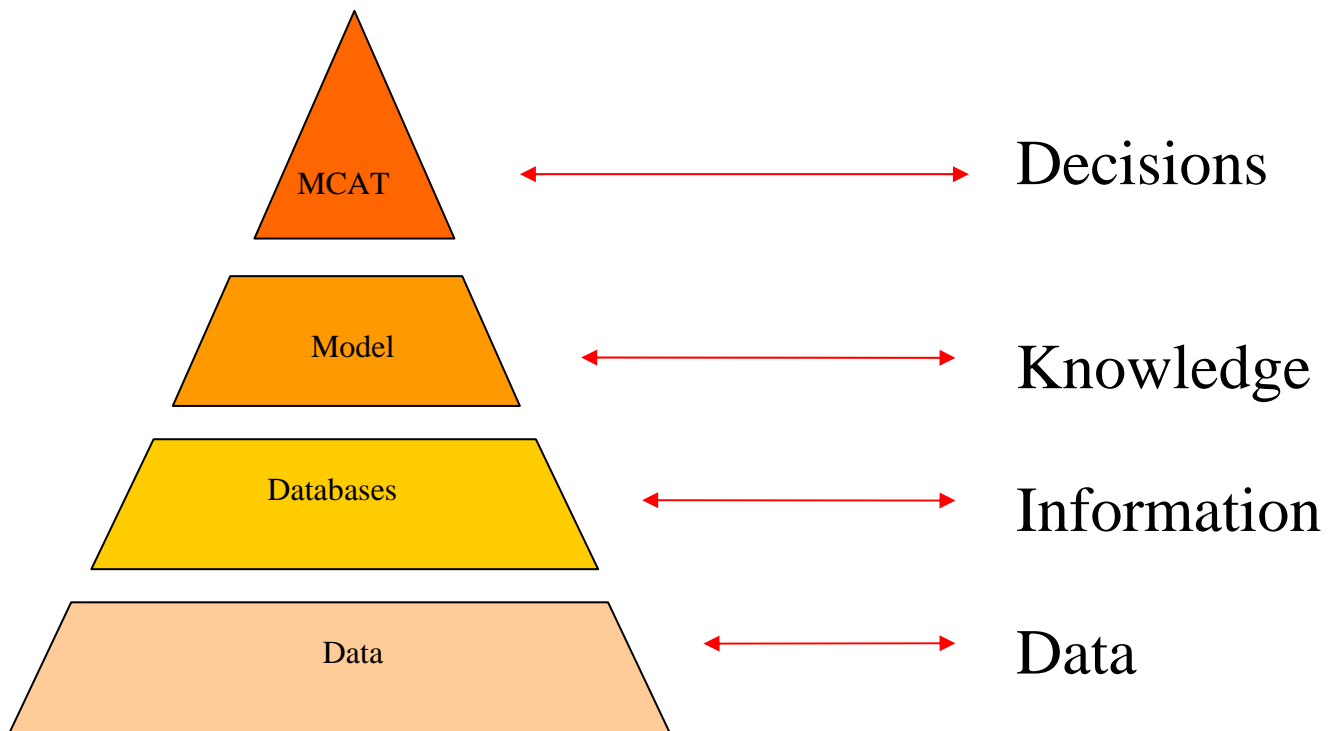
- Internal rate of return (IRR)
- Agricultural water production cost
- Public network production cost
- Public network production cost per beneficiary
- Industrial/Agricultural water productivity

Management Options

- ◆ Groundwater supply development
- ◆ Rainwater harvesting
- ◆ Tanker supply
- ◆ Direct connection from Mekerot
- ◆ Desalination (including associated infrastructure)
- ◆ Demand management
- ◆ Environmental protection/conservation
- ◆ Wastewater reuse
- ◆ Sectoral reallocation
- ◆ Changes to agricultural policy
- ◆ Water transfer
- ◆ Administrative and institutional structures
- ◆ Surface water development
- ◆ Importation of water

Structure of the Decision Support Tool

- Multi-Criteria Analysis Tool (MCAT) used to rank MOs



Combination and Weighting of Basic Indicators

SUSMAQ - MCAT - Weights

Weights

Basic Indicators	Weight	Second Level Group	Third Level Group
Internal Rate of Return	0.25		
Agricultural water production cost	0.25	Economic efficiency	
Public network production cost	0.25		
Production cost per beneficiary	0.25		Economic
Agricultural job creation	0.5	Job creation	
Industrial job creation	0.5		
Water ratio between industry/agriculture	0.5	Water allocation	
Virtual water imports	0.5		
Change in aquifer water level	0.3		
Reliability of supply from aquifer	0.3	Aquifer State - Quantity	
Yield of major aquifer springs	0.4		
Aquifer water quality: chloride/nitrate	0.5	Aquifer State - Quality	Environmental
Wastewater discharge: faecal coliforms/BOD	0.5	Pollutant pressures	
Agricultural pesticide use	0.5		
Industrial effluent	0.5		
Household connections	0.5	Domestic water availability	
Yield of small wells/springs	0.5		
Domestic water access: quality	1	Domestic water access: Q	Social
Domestic per capita water use	0.5		
Domestic water cost	0.5	Domestic water use	

Back Check Run

What next with IWRM?

SUSMAQ has embraced 4 of the 5 IWRM themes – (2),(3),(4),(5):

- (1) Institutional and Legal Framework
- (2) Stakeholder Participation
- (3) Socio-economic
- (4) Capacity-building
- (5) Environmental Sustainability.

✦ The major remaining challenge is (1)

Obstacles to IWRM Implementation

- Fragmented institutional set-up due to political and security constraints
- Economy depressed by non-market forces eg. citrus farmers unable to get goods to market
- Institutional bottlenecks occurring in implementation: inadequate decision-making platform
- Lack of financial resources
- Cultural impediments to the IWRM concept

What is needed....

- The Major Missing Link in both the traditional and IWRM approaches is administrative integration (institutional frameworks) relating to the shared water resources
- A Joint *Palestinian and Israeli Joint Water Management Council* that coordinates water resources planning and management responsibilities, and activities at all levels of public, private, and civil society sectors.
- IWRM is currently the latest, most widely advocated and used water management paradigm around the world that can provide the basis for such cooperation

Why a Palestinian and Israeli Joint Water Management Council (PIJWMC) is needed

- There exists one main, finite, source for water: Groundwater
 - Palestinians and Israelis rely heavily on the shared underground aquifers beneath Israel and Palestine.
- IWRM provides a widely accepted framework and principles around which a holistic and integrated management approach can be taken to the shared water resources.
- Water for Peace!

How can IWRM help achieve the PIJWMC?

Key Questions:

- (1) Who are the core and peripheral players in the PIJWMC?
- (2) What are the interactions needed to achieve the IWRM goals?

Guiding Principles for:

- (1) Resolving the hydro-politics
- (2) Technical feasibility and implementation of Management Options
- (3) Equity in water consumption

Outline

1. The water crisis in Palestine
2. IWRM: concept and objectives
3. Progress with implementing IWRM
4. Institutional frameworks for IWRM
5. Towards IWRM in Palestine: the SUSMAQ Project
6. Future challenges

Can IWRM Succeed?

- It would be easy for a policy maker faced with the prospect of wholesale governance change to conclude that it is all too complex with too many difficult trade-offs and choices to make.
- It is much easier and certainly politically safer to maintain current policies and practices and avoid confronting the vested interests who gain from the status quo.
- However, doing nothing is not an option; problems will simply get worse and more difficult to tackle.

IWRM: Responding to Change

- IWRM is a process of change; a process which can start from small beginnings.
- No perfect IWRM system exists, and the search for perfection can lead to inaction, not action.
- As a process of change which seeks to shift water development and management systems from their currently unsustainable forms, IWRM has no fixed beginnings and will probably never end.
- But IWRM must also respond to major socio-economic and climate change drivers....

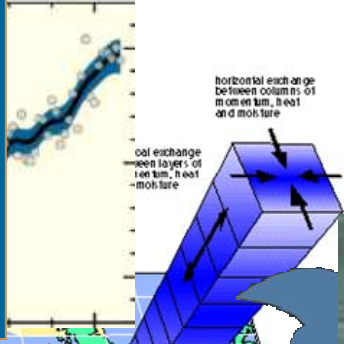
IWRM: Responding to Change

- As already noted, IWRM does not have a unique prescribed form; many different variants are evolving across the world which suit local needs. But the overall goals are the same.
- The global economy and society are dynamic and the natural environment is also subject to change.
- IWRM systems will, therefore, need to be responsive to change and be capable of adapting to new economic, social and environmental conditions and to changing human values.

Change: the Major Challenges....

- Climate Change : Adaptation and Mitigation
- Urbanization

Detection and Attribution



Climate Prediction

Impact Assessment

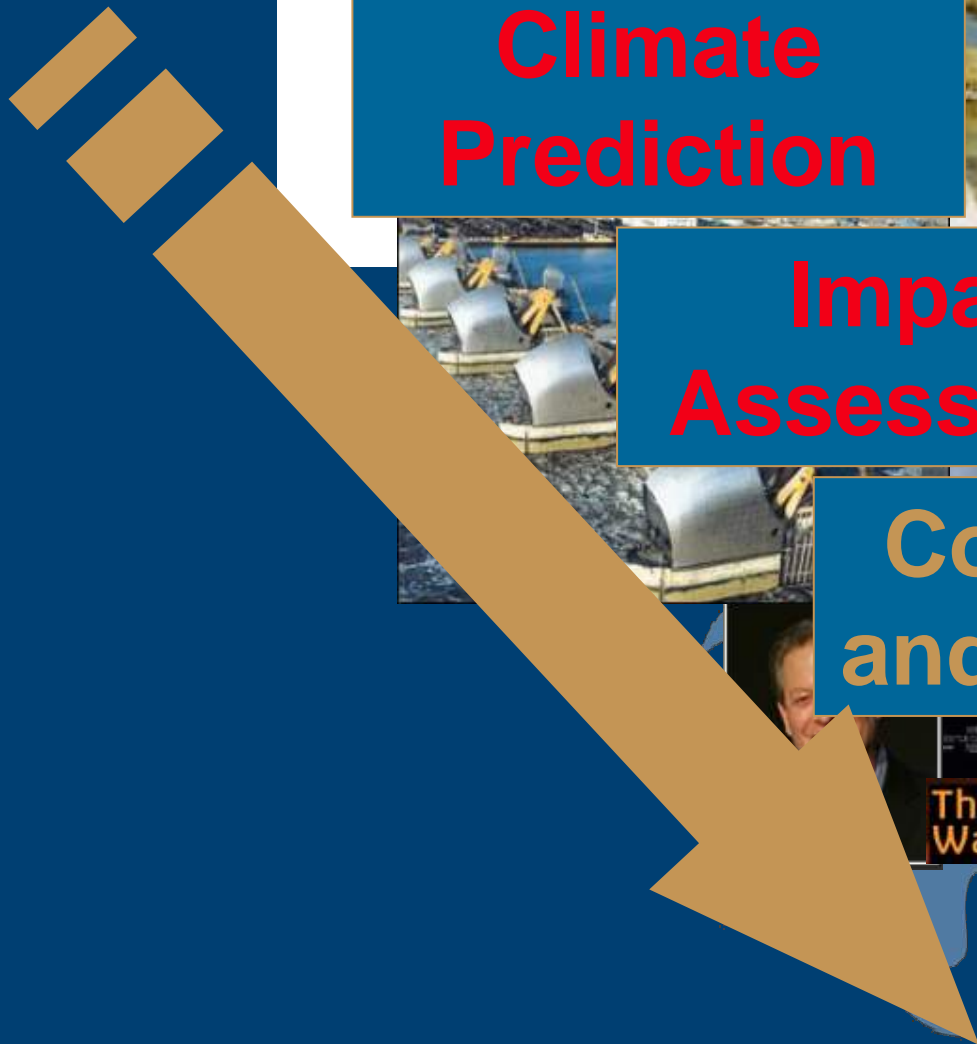
Communication and Policymaking

Adaptation and Mitigation

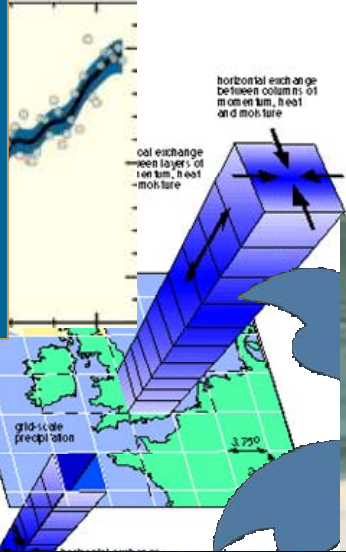


OF CLIMATE CHANGE

The G
Warn



From Earth Systems Science....




....to Earth Systems Engineering & Management

World Water Day 2007: Coping with Water Scarcity- Challenge of the 21st Century (UN Water)

- 'Climate change: more troubled water ahead'
- Climate change will exacerbate water scarcity
- 'Water conflicts can arise in water stressed areas.....sharing a very limited and essential resource is extremely difficult.....in the absence of clear and well established rules, chaos tends to dominate and power plays an excessive role, leading to inequitable allocation of water....a greater focus is needed on the peaceful sharing and management of water at both international and local levels'

World Water Day 2007: Coping with Water Scarcity- Challenge of the 21st Century (UN Water)

- The fact that so many of the world's rivers and aquifers are shared by more than one country places a major emphasis on water allocation agreements.
- A mature debate is now emerging about sharing the benefits of water rather than agreeing national quotas of bulk water.
- Analysts have shown that, under the prevailing international setting of the past decades, water has been a source of cooperation between nations rather than a source of conflict
- There is an expectation that such cooperation will continue, and indeed that there will be greater recognition of its importance to maximizing the benefits from water within development.



**“It is not the strongest
of the species that survive,
nor the most intelligent,
but the one most responsive
to change!”**

Charles Darwin