



**Sustainable Water  
Integrated Management (SWIM) -  
Support Mechanism**



Project funded by  
the European Union

*Water is too precious to waste*

**Cost Assessment of Water Resources Degradation  
(CAWRD) of the Litani Basin  
Cost of Degradation  
Consultation Meeting**

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*Beirut, December 12, 2013*

# Presentation Content

- Some Economics Background
- Objective of the CAWRD
- Methodology and Limitations
- Aggregated results
- Water: waterborne diseases; Water Quality, Water Quantity, Natural Disasters and Global Environment
- Waste collection, Processing, Landfilling, Global Environment
- Air pollution in the Bekaa
- Biodiversity
- Final Note: Comparison by Basin

# Some Economics Background

- Why are we Doing CAWRD?
- How do we make choices?
- E<sup>5</sup>

# Some Economics Background

$E^5 =$

- Elasticity (change in the quantity demanded of a particular good as its price changes)
- Externalities  $\neq$  natural causes ( $\pm$  impact of one individual's action on the well being of others)
- Effectiveness (A to B at any cost)
- Efficiency (A to B the most efficient way)
- Equity (distributional aspects: are the poor living in B having proper access?)

# Objective of the Study and Expected Results

**The main objective is to evaluate the degradation cost of the selected water basin in each country.**

**This will help decision makers at the national and local levels prioritize specific actions for the improvement of the basin sustainable management.**

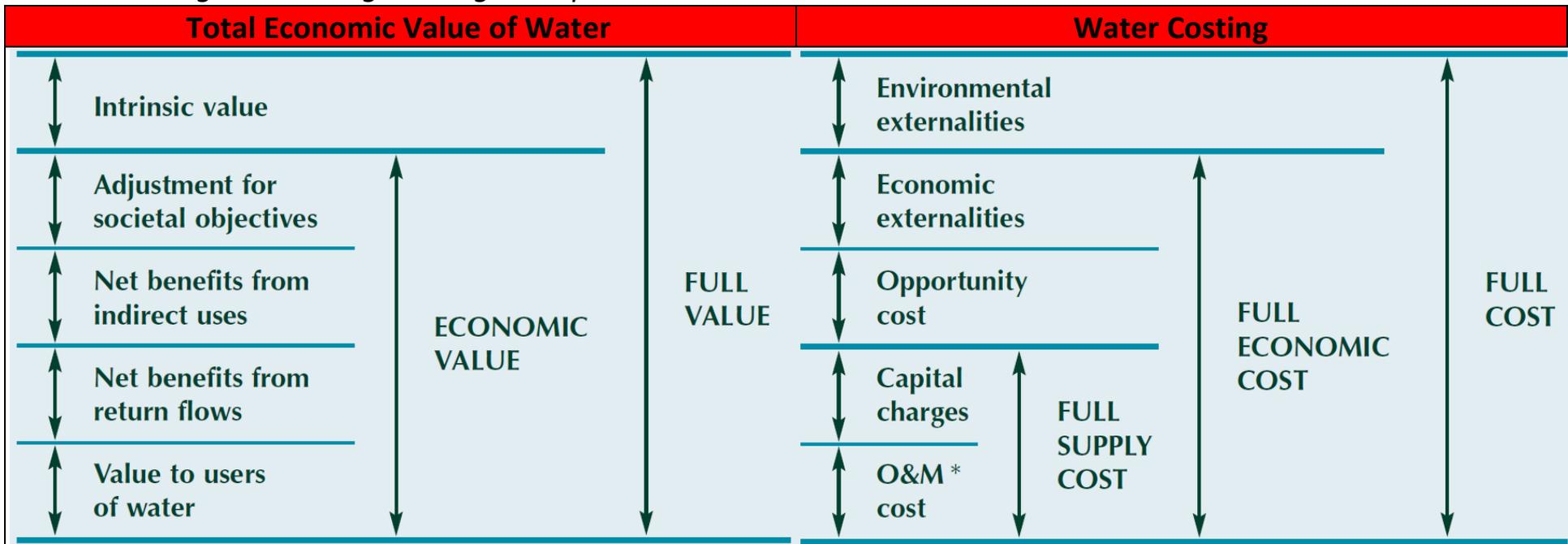
**This will be done through financing projects that will bear environmental benefits and reduce negative externalities.**

# Objective of the Study and Expected Results

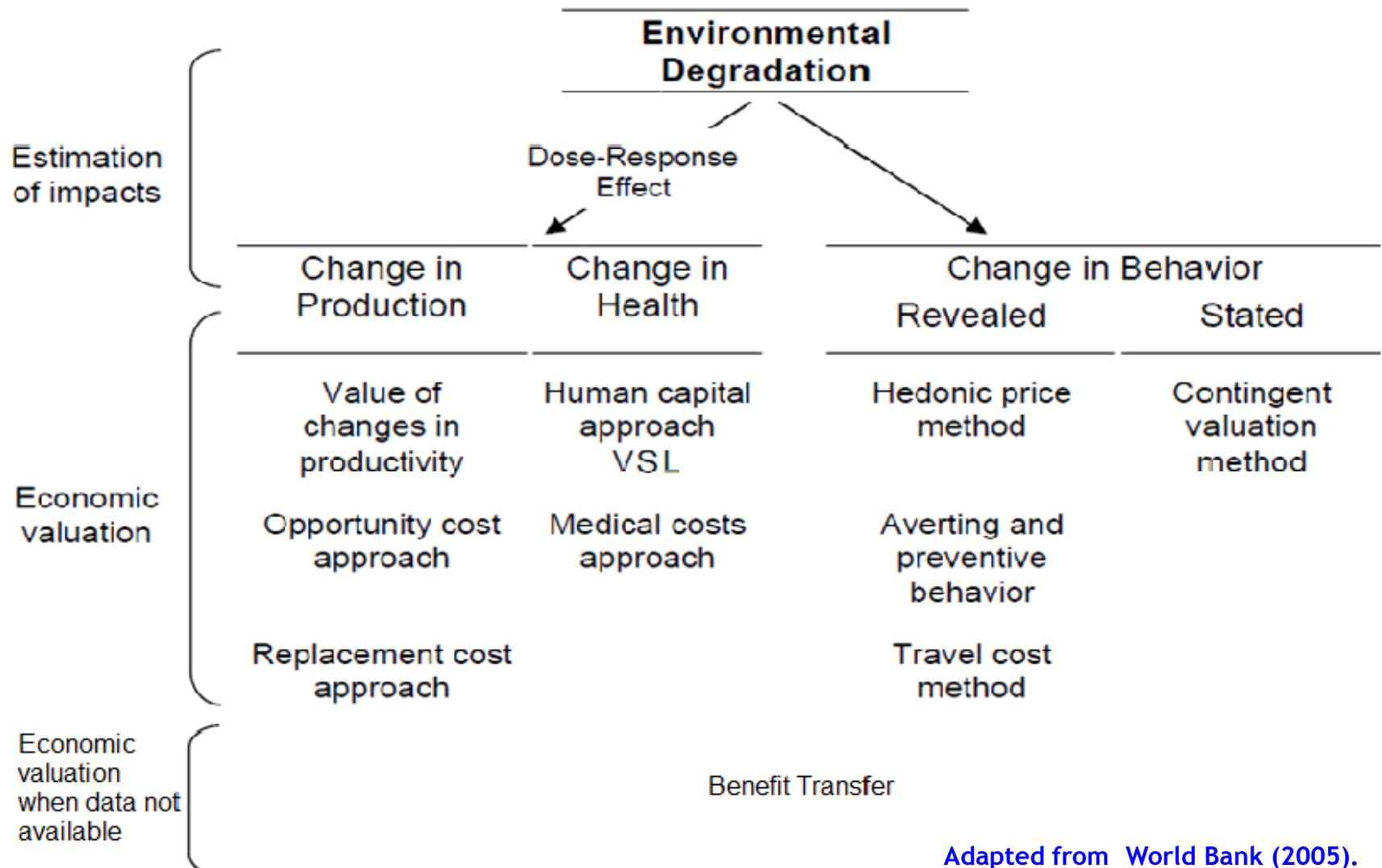
- In other words:
- The objective of the study is to quantify the degradation of the environment and monetize it
- This brings the costs of degradation to a common denominator (€, \$ or LC) which helps decision makers make the case for a better environment. Multi-criteria analysis (e.g., targeting the poor), which could include cost/benefit analysis (environmental improvement), could help decision-makers prioritize and better target investments
- Ideally, the costs have to be determined marginally

# Methodology and Limitations: Value and Costing of Water Resources

*Water Valuing and Costing Guiding Principles*



# Methodology and Limitations: Valuation Techniques for the Degradation



# Methodology and Limitations: Economic Valuation

- The methodology is therefore based on methods used by the World Bank (COED), the European Union (Benefit Assessment), the European Union and the German Government (The Economics of Ecosystems and Biodiversity --TEEB), and from other institutions.
- The COED are valued by using the available data - their source cannot be totally reliable. Moreover, due to the lack of data many hypothesis had to be created.
- The results are therefore considered as indicative and allow to provide an approximation with different sensibilities (lower and higher bound) in order to take into account the uncertainties.



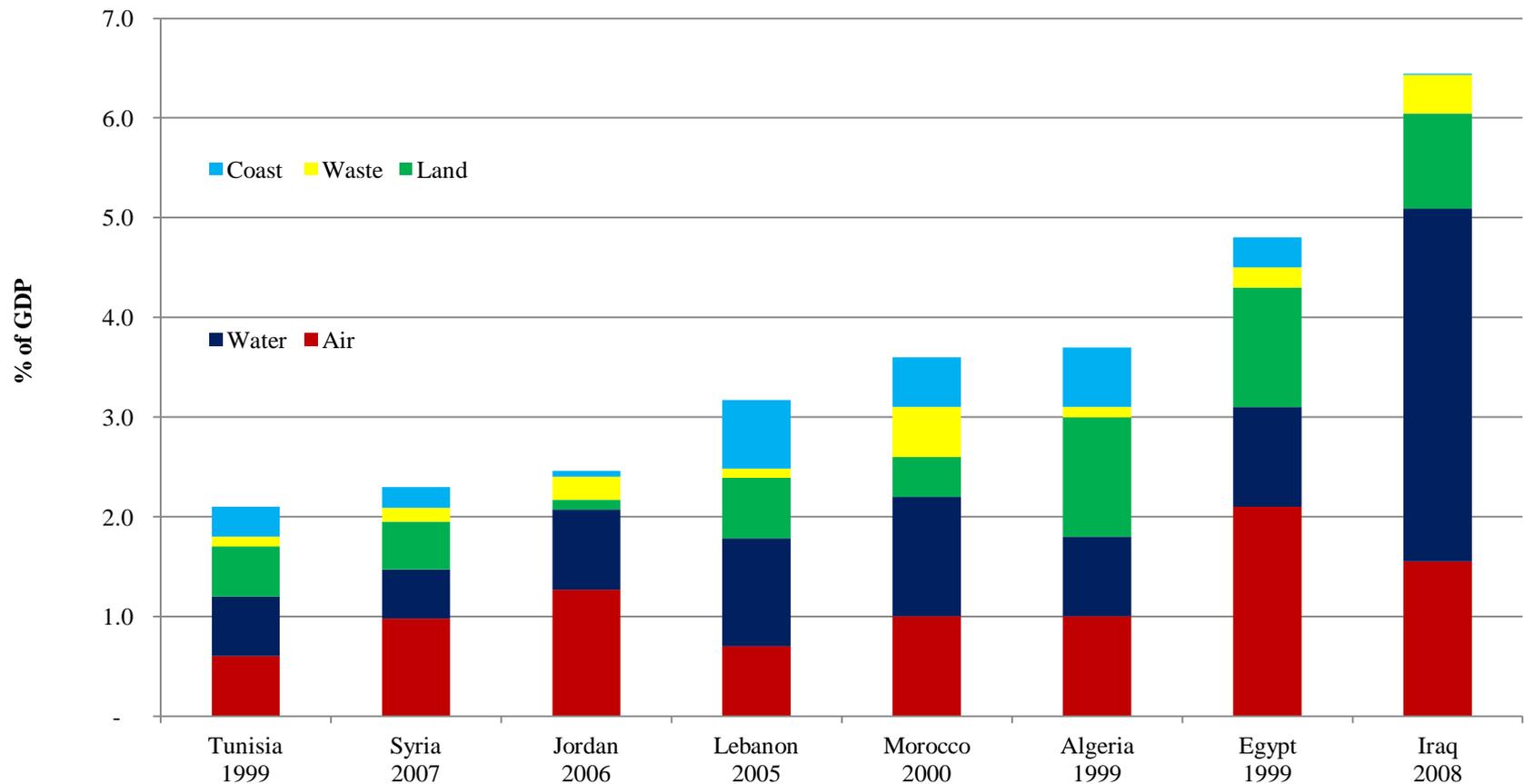
# Methodology and Limitation: Categories of Degradation Costs

## Valued Categories et Sub-categories

- Water: Water-related diseases; Water Quality; Water Quantity; Natural Disasters and Global Environment (GHG)
- Waste: Collection; Waste processing; Landfills; Global Environment (GHG)
- Air: Burden of Disease, Agricultural productivity and Infrastructure decaying
- Biodiversity
- Natural Disaster

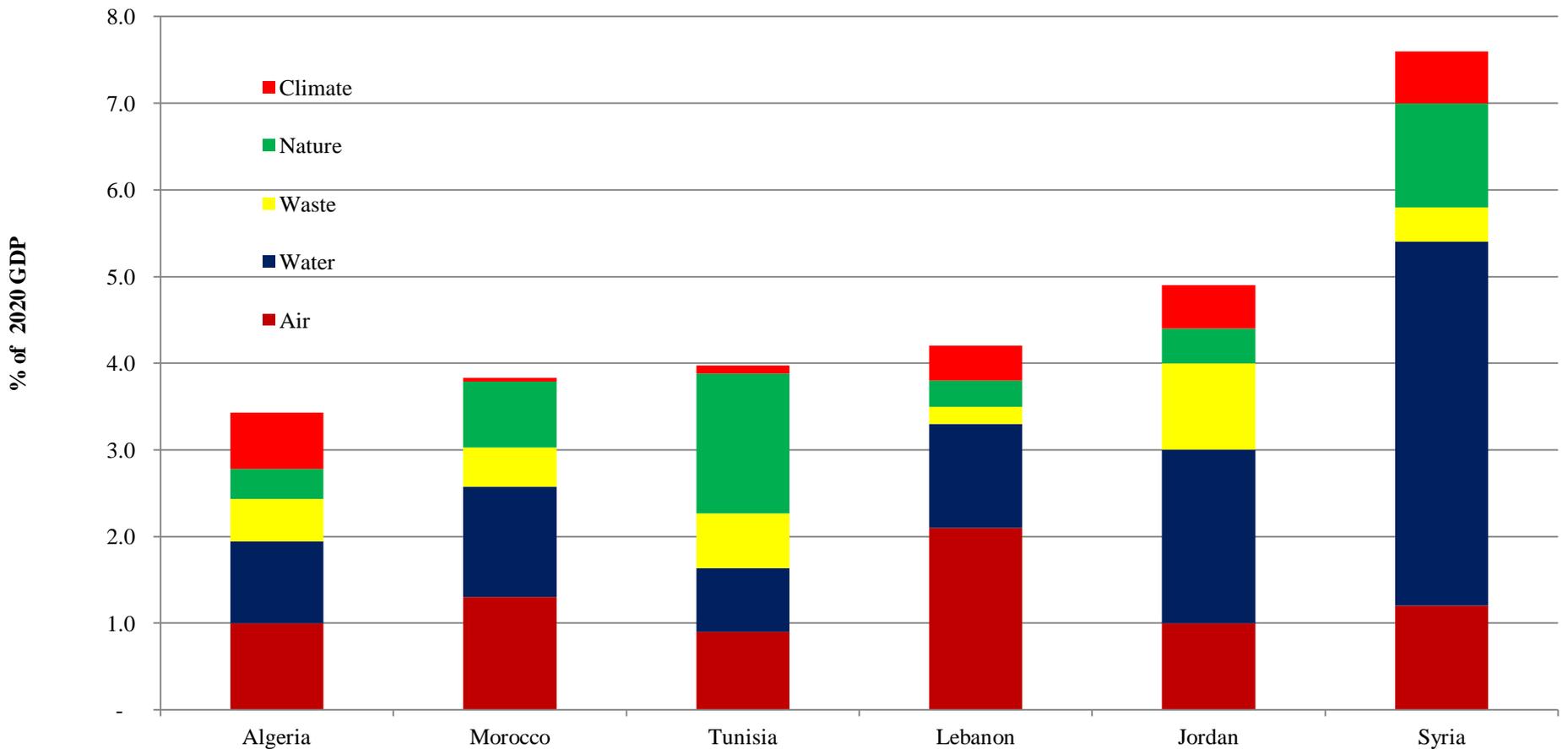
# Degradation Cost: World Bank

**COED in Selected MENA Countries**  
(% of GDP)



# Benefit Assessment: EU

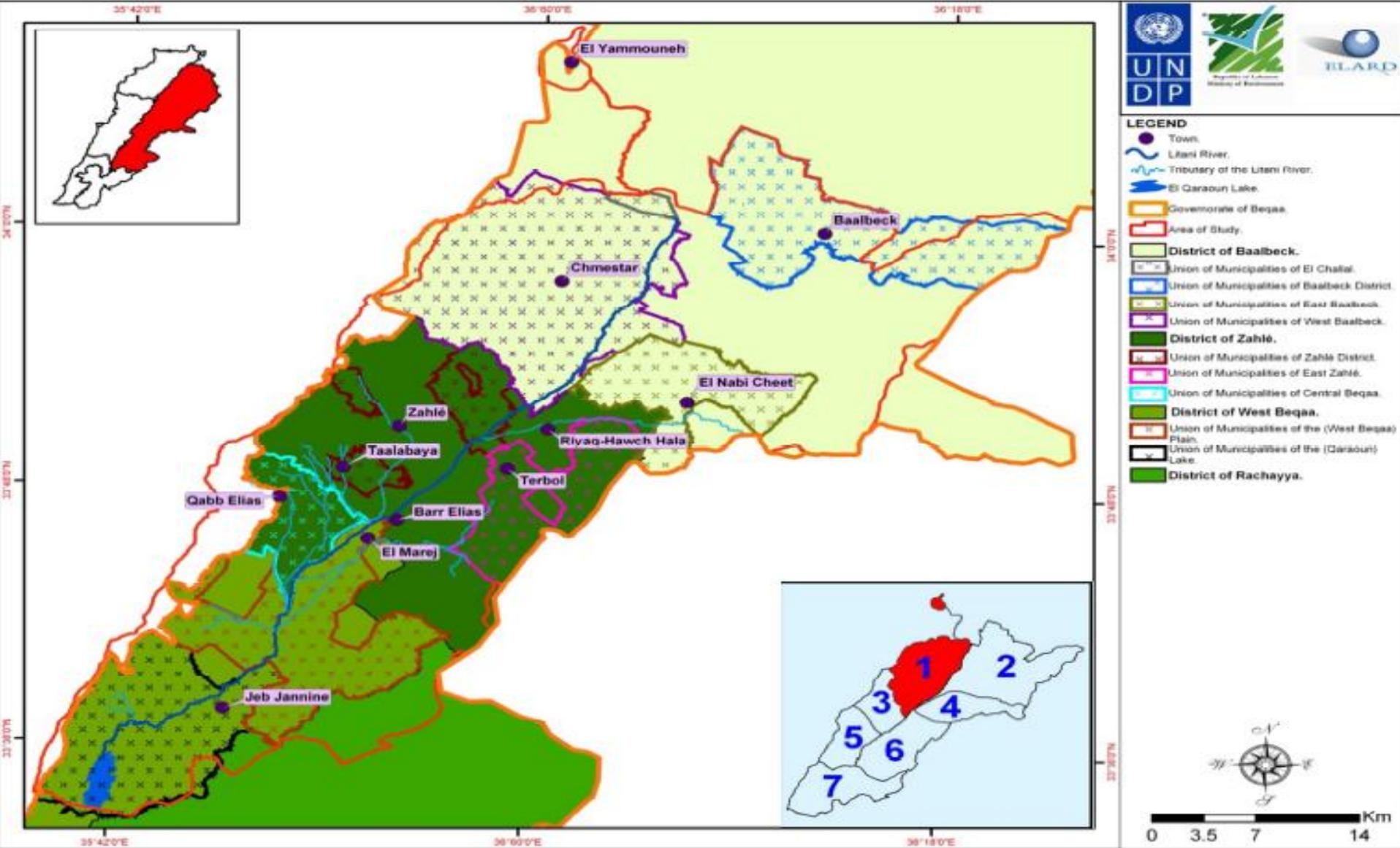
**Benefit Assessment in Selected MENA Countries**  
(% of 2020 GDP)



# Aggregated results: Litani Context

- The context of the study is the Upper Litani Basin (Intra-muros). This includes power generation but not volumes transferred for irrigation.
- The year chosen for the CAWRD: 2012.
- Population of ULB: 1.1 million in 2012 of which 0.8 million rural
- NB: There is an overlap between the basin and the Casas

# Aggregated results: Litani Context

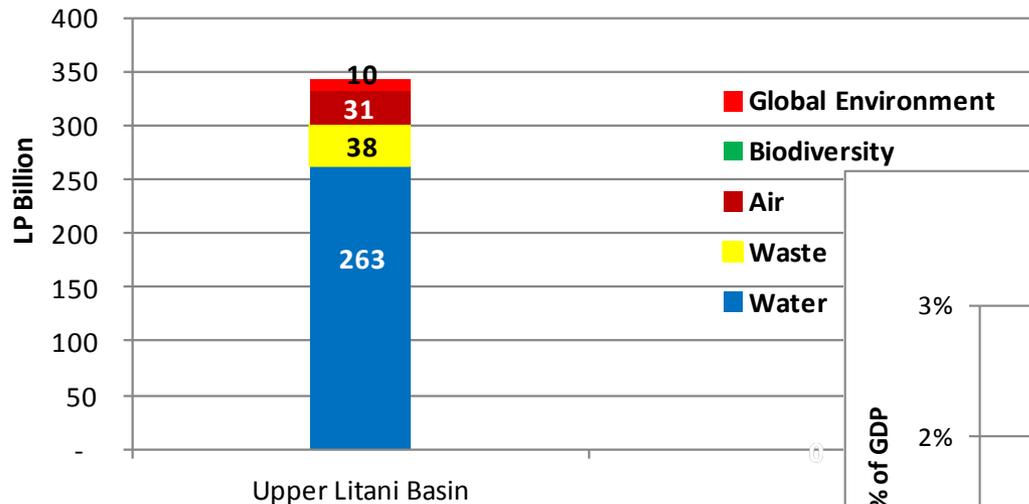


# Aggregated results: ULB

**DC Litani:** LP 343 billion equivalent to 2.2% of the Basin's GDP; 0.5% of the current Lebanese GDP

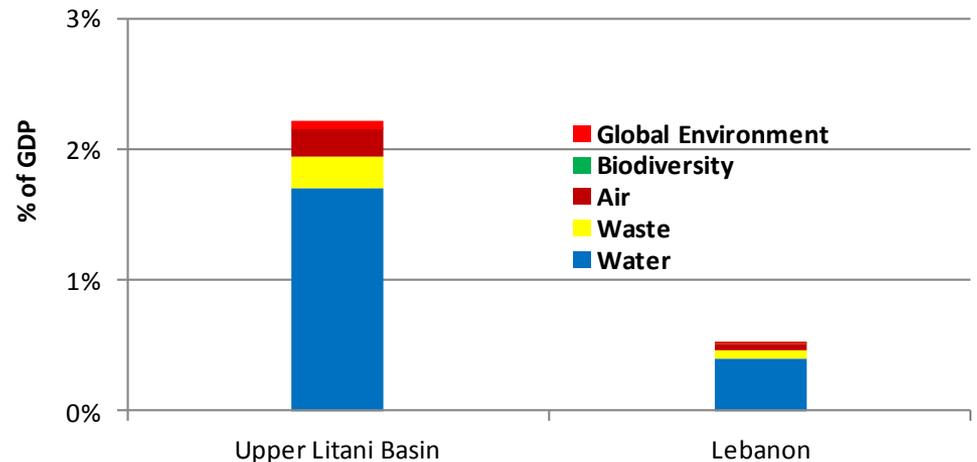
## Cost of Degradation: Total

LP Billion in 2012



## Cost of Degradation: Total

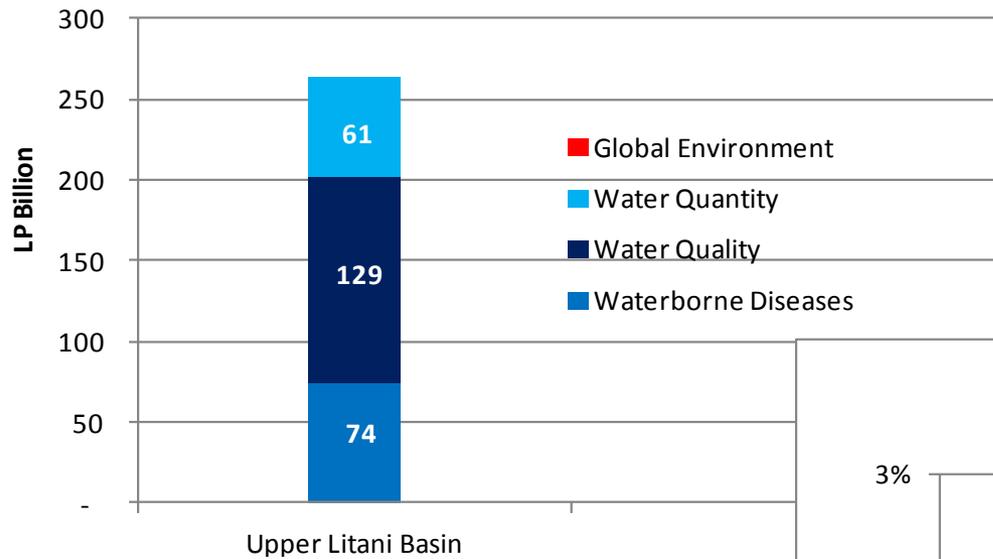
% GDP in 2012



# Degradation cost: Water

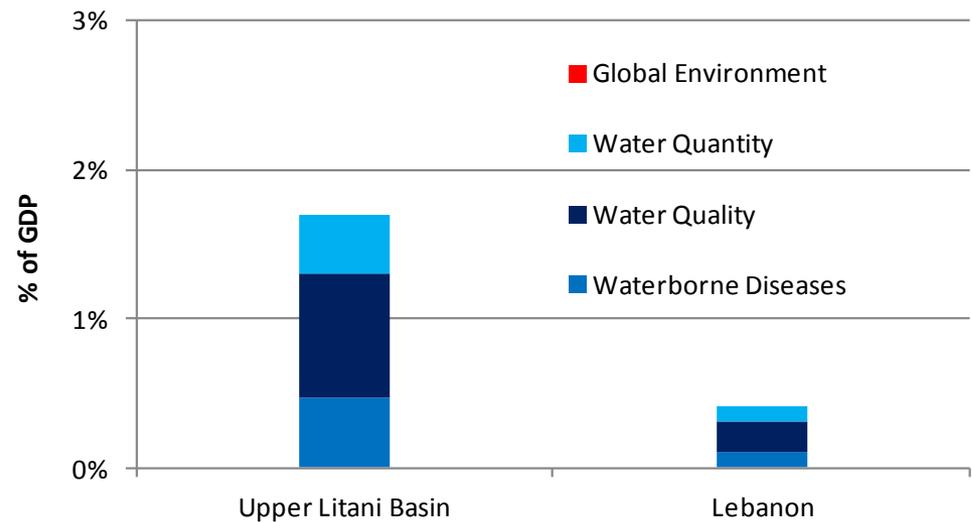
## Cost of Degradation: Water

LP Billion in 2012



## Cost of Degradation: Water

% GDP in 2012



# Degradation cost: Water

## Waterborne diseases

- **DC Litani:** LP 263 billion
- Health state. The prevalence of diarrhea and mortality due to diarrhea in the basin in urban and rural areas in 2012 were derived from national statistics and WHO with 2.3 deaths (0.3 in 13 newborns per 1,000 people) in 2012. The prevalence of diarrhea was 2.3 cases per child under 5 years and 0.5 cases per population 5 years and over.

# Degradation cost: Water

## Water Quality

- **DC Litani:** LP 129 billion
- Potable Water: Change in behavior; revealed preference (preferences and defensive measures).
- Quality of Water Resources: Stated preference (Benefit transfer)
- Salinity: Reduction of agricultural productivity.

# Degradation cost: Water

## Water Quantity

- **DC Litani** : LP 61 billion
- Technical losses of domestic water: Opportunity cost of losses.
- Technical losses of irrigation: Opportunity cost of losses.
- Pumping Additional cost: Change in production due to groundwater drawdown.
- Erosion: Replacement cost (fertilizers) due to soil nutrition losses.

# Degradation cost: Water

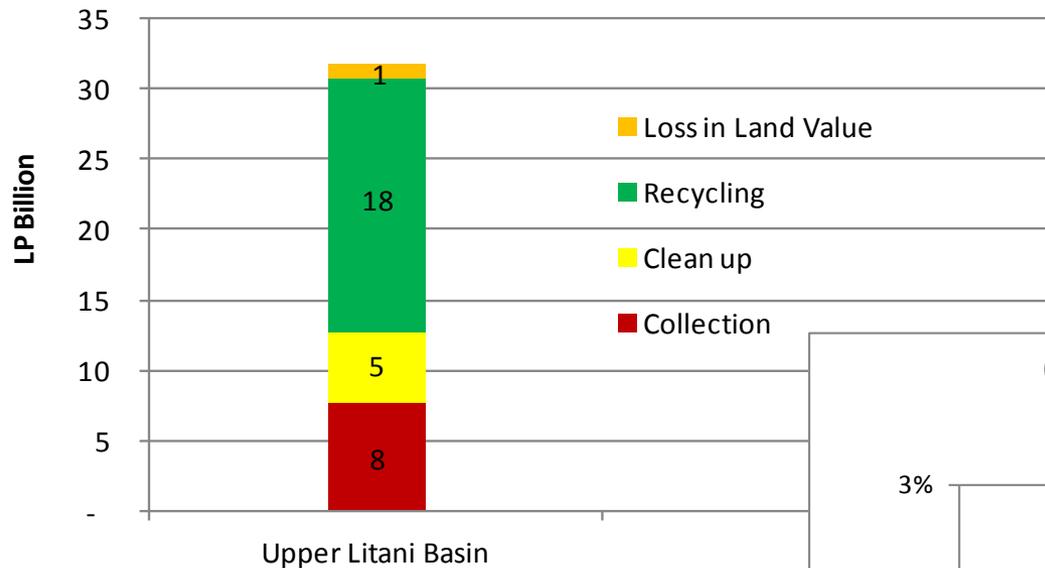
## Water Quantity

- **DC Litani:** LP 61 billion
- Dam 1: Agricultural production losses due dam storage losses: Opportunity cost.
- Dam 2: Sedimentation: Replacement cost of dams.
- Dam 3: Electricity lost generation (opportunity cost based on EDL's production cost .

# Degradation cost: Waste

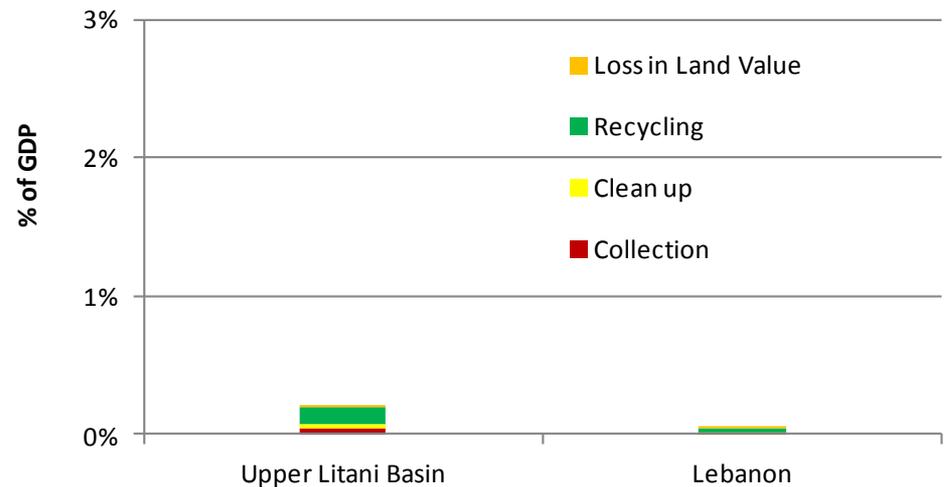
## Cost of Degradation: Waste

LP Billion in 2012



## Cost of Degradation: Waste

% of GDP in 2012



# Degradation cost: Waste

## Collection

- **DC Litani:** LP 8 billion
- Coverage cost: 1% of DI of households without coverage (5% of households).

## Clean up

**CD Litani:** LP 5 billion

# Degradation cost: Waste

## Transformation

- **DC Litani:** LP 18 billion
- Recycling and composting: transformation collected materials (Opportunity cost).

## Landfilling

- **DC Litani:** LP 7 billion
- Land value depreciation due to the vicinity to dumps (Hedonic method).
- Electricity generation: Cells (Opportunity cost).

# Degradation cost: Waste

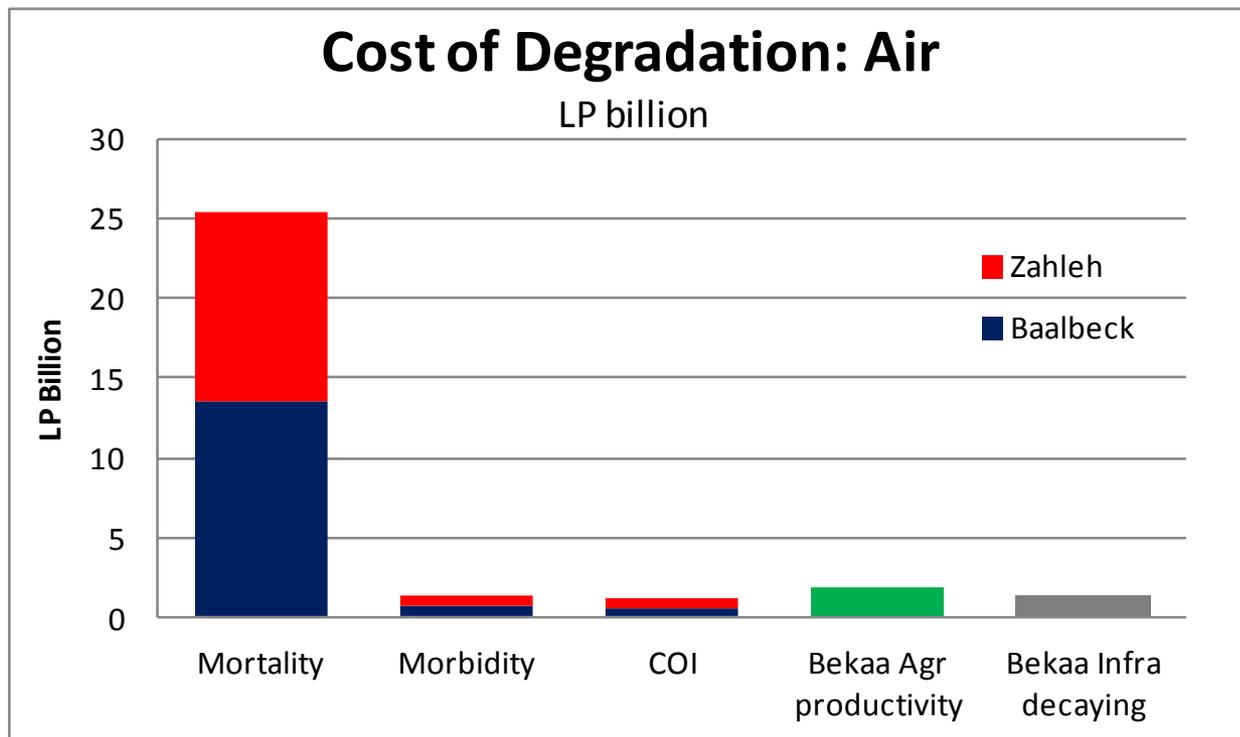
## Global Environment Global (GHG)

- **DC Litani:** LP 1.63 billion
- Methane emission reduction.

# Degradation cost: Air

## Air Pollution in Zahle and Baalbeck

- **DC Litani:** LP 31.3 Billion
- Dose-response for PM10 and PM2.5



# Degradation cost: Biodiversity

## Biodiversity

- **CD Litani:** LP 0.3 billion
- Loss of ecosystem services in wetlands (increase farmland or wetland degradation), transfer of benefits.

# Degradation cost: Natural Disaster

## Natural Disaster

- **CD Litani:** LP 8.4 billion
- Actual costs of floods and forest fires (victims, damage and loss of earnings).
- Carbon sequestration lost due to forest fires.

مع خالص شكري  
وامتثاني

Thank you  
for your attention

Merci pour  
votre attention



*For additional information please contact:*

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