Water metabolism in North African cities: methods and some preliminary results

Marta Dinarès (Marta.Dinares@uab.cat)

GRATS SEMINAR
UAB Campus, Cerdanyola del Vallès, 10th-11th June 2013
Contents

1. Introduction
2. Objective
3. Methodology
4. Case study. Preliminary results
5. Conclusions or reflexions

1.- Introduction

2.- Objective

3.- Methodology

4.- CS. Preliminary results

5.- Conclusions

COASTAL CITIES

- Low elevation coastal zone
- 2% of the world’s land area
- 13% of the world’s urban population

Cities and/or Urban Settlements

- Use 3/4 of the world’s resources and discharge a similar proportion of wastes to the environment

Socio-economic development

Human pressure; Ecosystem impacts

WATER DEMAND

Quantity & Quality SUPPLY/water AVAILABILITY

MDinares_GRATS Seminar_UAB, Cerdanyola del Vallès_10th-11th June, 2013
1.- Introduction
2.- Objective
3.- Methodology
4.- CS. Preliminary results
5.- Conclusions

NORTH AFRICA:
• 70-90% of the population is concentrated along the narrow coastal strip of the Mediterranean shoreline

NORTH AFRICA:
• Yearly average per capita renewable water availability is of less than 950m³
• 650m³/cap/yr. by 2025 (climate change studies)
• One of the most water-scarce and water-stressed regions of the world

How to increase socially just and sustainable use of water resources?
• To assess the sustainability of water use by Northern Africa coastal cities

  • To develop a better understanding of NA cities functions, state and needs in terms of water resources, by defining and quantifying the physical flows and stocks of water that characterize the urban coastal system

  • To apply the described flow-system to the city of Nador in Morocco (case study)
• Conceptual framework: **Urban metabolism** (biophysical-quantitative approach)

• Methodological framework: **Material Flow Accounting and Analysis**
  
  • acceptance of “material balance” principles for the “resource system modelling”
  
  • tools and methods within MFAA framework: Material Flow Analysis (MFA); Substance Flow Analysis (SFA); Physical Input-Output table (PIOT)

• Scale: Local/Regional_City flow analysis assessment
  
  • studies at local/regional scale use previously published methods with necessarily required modifications and improvements

1. Planteamiento
2. Objective
3. Methodology
4. CS. Preliminary results
5. Conclusions
Morocco

Water DEMAND ≡ Water CRISIS

Water AVAILABILITY (Qty & Qilty)

1. Introduction
2. Objective
3. Methodology
4. CS. Preliminary results
5. Conclusions


Total water inflow \( = 29 \text{Km}^3 \) (15\( \text{Km}^3 \) SW + 4\( \text{Km}^3 \) GW) technically and economically exploitable + 7\( \text{Mm}^3 \) Desalinated

Per capita availability: 2.560\( \text{m}^3/\text{cap/y} \) (1960) 720\( \text{m}^3/\text{cap/y} \) (2010) (E) 520\( \text{m}^3/\text{cap/y} \) (2020)

Total water demand \( = 13 \text{Km}^3 \) 80% used for irrigation and the remaining 20% for other uses (drinking, industry)

Sanitation and pollution/contamination is the main problem together with informal settlements
- Sewage network system (relatively good)
- Waste water treatment insufficient (35 WWTP)

Morocco Water CRISIS

Water Act (1995)

Creation of Basin Agencies

Need for demand oriented management policy
Nador’s Location
Country: Morocco
Region: Oriental: 1 Préfecture, 6 Provinces;
Province: Nador
City: Nador

Source: (Khattabi, et al., 2007).
Nador (Morocco) Case Study

1.- Introduction

2.- Objective

3.- Methodology

4.- CS. Preliminary results

5.- Conclusions

Nador

- Drinking water supply = 13Mm³/year:
  (Nador province, 2007)

Mohammed V and Mecheraa Hammadi Dams

Moulouya river

Local groundwater sources (aquifers Bouareg-Gareb)

Nador City Situation

- 74.7% of Nador’s households connected to the water supply network (2007)

- 64.7% Nador’s households connected to the sewer network system (2007)

- Still some informal settlements persist in the peripheries of Nador city

- Sanitation is the main problem together with high pollution levels in Mar Chica lagoon

RADEEN projected investments 2006-2010

- Extension of Nador’s drinking water network to ensure 100% city supply

- Rehabilitation and enlargement of the sewage network to informal settlements

- Rehabilitation of the waste water treatment plant and construction of a 2nd WWTP (started operating in may 2010)

- Construction of a desalination plant to be operative in 2015
• The methodological framework provided by MFA enhances the scope for application of environmental accounting and systems analysis at the local scale.

• Nador’s limited water resources, in contrast with its level of socioeconomic development, indicates the need to rationalize water resources, increase recycling and reuse, protect groundwater quality and prevent water pollution.

• The study of UM in Nador may help to understand the water flows of the city and their social and environmental fairness.