



National Technical University of Athens  
School of Rural & Surveying Engineering  
Lab. of Reclamation Works & Water Resources Management

# SWOT analysis technique as a quantitative tool for adaptive management on transboundary river basins

Christina Mitsiani, PhD Candidate  
Prof. George Tsakiris





# Synopsis

- Introduction
- Adaptive management - definition
- Classical SWOT analysis technique
- New methodology- quantitative SWOT analysis
- Example – hypothetical case
- Conclusion and Suggestions



# Introduction

- Shared water resources generate conflicts between countries, which originate from issues regarding the quantity and quality.
- Many tools & models for river basin management
- The proposed methodology: a quantitative outlook of the popular SWOT analysis.
  - inspired by marketing management and has been shaped to be used for a transboundary river system
  - contributes in strengthening the present highly subjective technique
  - empirically tested
  - can be a useful tool for cooperation between the countries that share a river, in the framework of adaptive management.



# Adaptive management - 1

Water resources act as a complex system that learns and evolves.

**Adaptive river management** is the continually improving management, with strategies and policies which continuously change and adapt to external *human* interventions and *natural* changes

## **HOW?**

- by learning from the outcomes of the implemented management - “learning by doing”
- continuous process of *planning, acting, monitoring* and *evaluating*



# SWOT analysis

<b>S</b> trengths	Internal advantage to the system
<b>W</b> eaknesses	Internal disadvantage to the system
<b>O</b> pportunities	External advantage to the system
<b>T</b> hreats	External disadvantage to the system

- Useful tool for planning and decision making
- Used in many scientific sectors, as Economics and Management
- Widely applied to environmental planning and Water Resources Management
- Strengths and Opportunities: positive factors
- Weaknesses and Threats: negative factors



# SWOT as a tool to Adaptive management

SWOT analysis is actually

a review of the past or presently applied management and its methods.

Through that and detecting strengths and weaknesses of the tools and methods used, it can understand mistakes and

by drafting opportunities of the new situation (environmental and technological information, BAT, political status etc) helps to modulate a new framework in river basin management.

..... that is adaptive management



# Classical SWOT analysis -1

The classical SWOT analysis uses the above definitions as a mean to classify the various management issues using a structured format (Table 1).

## Disadvantages

- a highly subjective technique → fails to quantify the level of importance given to each of the four concepts and individual variables
- the short-term versus the long-term impact of each of the variable cannot be derived from the analysis



# Classical SWOT analysis -2

**Table 1** SWOT analysis of basic river system elements

	Sj	Sn	N	Wn	Wj	Hi	Md	Lo
<b>Cooperation</b>								
C1 to C3								
<b>Environment</b>								
E1 to E5								
<b>Economy</b>								
O1 to O4								
<b>System adaptive Behaviour</b>								
S1 to S4								

**Column variables:**

Sj = Major strength, Sn = Minor strength, N= Neutral, Wn = Minor weakness, Wj = Major weakness, Hi = High, Md = Medium, Lo= Low

**Row variables, for a transboundary river system:**

C1: Cooperation between the two governments (sharing data, auditing mechanisms, common policies)

C2: Cooperation and coordination between water institutions

C3: Following the bilateral agreements

E1: Ecosystem maintenance

E2: State of water quality

E3: Existence of Waste water treatment plans

E4: Availability of treated wastewater for irrigation use

O1: Productivity of energy

O2: Use of river water in agriculture

O3: Potable use and recreation (river as a social good)

O4: Gross Domestic Product (PPP) (2007 est, source: CIA The World Factbook)

O5: Availability of water during the dry periods, for the above uses

S1: Regional development plans that adapt to several environmental political and economic changes

S2: Following the existing guidelines for transboundary management

S3: Taking advantage of EU and International Funding Opportunities for water resources management

S4: Satisfaction of the citizens (by government policies) and public participation

(Source: Modified form, Kotler, Philip. Marketing Management, The millennium edition, 1999)





# The new technique

The technique proposed will be used as a tool on adaptive river management and will aid, showing empirically

- d) the overall status of a river system,
- e) the degree of various concepts
- f) the short- and long-term status of the system (transboundary river system)



# 1. Re-defining the concepts

The methodology is based on an hypothetical case of a transboundary system and can either focus:

- On a whole transboundary river system, which can be compared with an ideal one
- On every co-riparian river basin separately

The four concepts need to be further classified, as it follows:

Ss = Internal Strength for the short-term period

SL = Internal Strength for the long-term period

Ws = Internal Weakness for the short-term period

WL = Internal Weakness for the long-term period

Os = External Opportunity for the short-term period

OL = External Opportunity for the long-term period

Ts = External Threat for the short-term period

TL = External Threat for the long-term period



## 2. Calculating the Standardized Score

- This study centers on transboundary river management terms, such as Cooperation, Environment, Economy and System Adaptive Behavior.
- Variables C1-3, E1-4, O1-5, S1-4 can be obtained from secondary information or from empirical survey, using an **attitude scale** (e.g. 7-point interval scale, from low to high), **percentage** or **other value** (e.g. monetary).
- the units of measure used are not the same → it is essential to standardize the outcome.

The “standardized score” is actually the **relative** position of the river system (**RS**) under study with respect either to an ideal river system or to the other coriparian river system (**C**ompetitive - **CS**). The standardized score can be derived using

$$\text{Standardized Score} = (\text{RS})/(\text{CS})$$



# Standardized and Rated Score

Variables	1* (RS)	2* (CS)	3*	4*	5*
C1	2	6	0,33	6	2,00
C2	3	6	0,50	6	3,00
C3	2	5	0,40	5	2,00
E1	30%	80%	0,38	5	1,88
E2	25%	75%	0,33	7	2,33
E3	4	7	0,57	5	2,86
E4	10%	85%	0,12	4	0,47
O1	3	6	0,50	5	2,50
O2	3	4	0,75	6	4,50
O3	2	4	0,50	3	1,50
O4	3	5	0,60	5	3,00
S1	4	7	0,57	3	1,71
S2	4	6	0,67	5	3,33
S3	6	7	0,86	6	5,14
S4	3	7	0,43	4	1,71

1= Actual score of the river system (RS), 2= Score of ideal or coriparian system (CS),  
3= Standardized score (1/2), 4= Level of importance, 5= Rated score (3\*4)



### 3. Calculating the status of concepts

**Table** Status of various Concepts (random use of scores)

Concept	Variables	5*	6*	7*
$S_2$	$C_1$	4	7	19.9
	$C_2$	3		
	$E_i$	2.3	2.3	
	$O_2$	6.5	10.6	
	$O_3$	4.1		
$S_L$				
$O_3$				
.				
.				
.				
$T_L$				

\* 5= from table 2 (7-point interval scale) , 6= sub-set score of functional area, 7= Concept score



## ... Calculating the status of concepts

This data also helps to calculate the

- “river system Position” ( $\Phi_S$ ): the present status of the transboundary river system and
- the “river system Attractiveness” ( $\Phi_L$ ): determines the future prospects.

To calculate the “position” of the river system, the short-term concepts are considered using:

$$\Phi_S = (S_S - W_S) + (O_S - T_S)$$

For calculating the river system “attractiveness”, the long term concepts are used in the equation:

$$\Phi_L = (S_L - W_L) + (O_L - T_L)$$



## 4. Calculating Overall Status

- **Positive** value indicates that the part of the transboundary river system examined is relatively better compared to the other one (of the coriparian country), while **negative** value indicates a vulnerable status.
- **“River System Advantage”**  $\Phi = \Phi_S + \Phi_L$   
uses both the short term and long term results of the river system and it is the sum of “system Position” and “system Attractiveness”.



## 5. Advantages of the new technique

- a) Identify the importance of each variable from the rated score
- b) Determine the status of each of the functional areas
- c) Long-term versus short-term status
- d) "River System Position" and "Attractiveness" can be outlined, based on short- and long-term status respectively
- e) The overall "advantage" of the transboundary river system can be assessed.





# Conclusion and Suggestions

This technique, when it is used for comparing the transboundary river systems of each country, it can have remarkable results, as it can detect the vulnerable and strong elements of each side.

Easy and user friendly, it has many advantages and can be used by governments or stakeholders, for improving their policies in the framework of an adaptive management.

## Improvements

- more variables
- changes in measurable units
- rating by the help of questionnaires



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*Thank you*