

*Numerical indexing method of risks
of conflicts around the
transboundary water resources*

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Risk of Conflict is defined by an INDEX

Indicators of risk having weights proportional to their relative importance

Combination

Rates which traduce local conditions of these Indicators



A partial index of risk (multiplication of weight by rate)



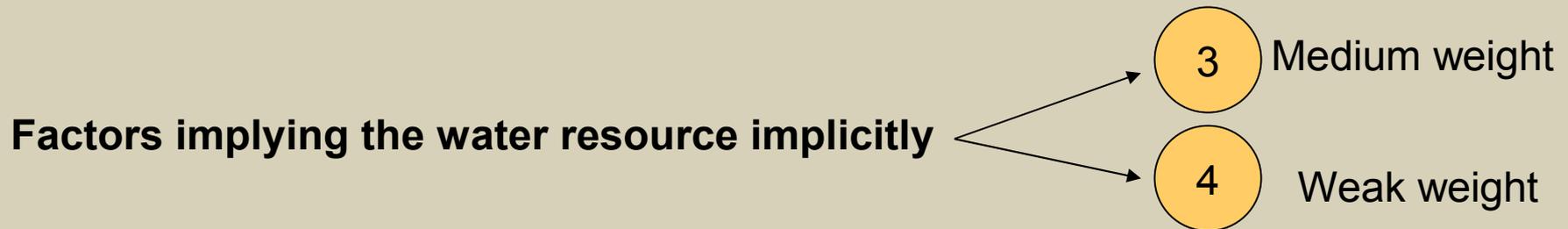
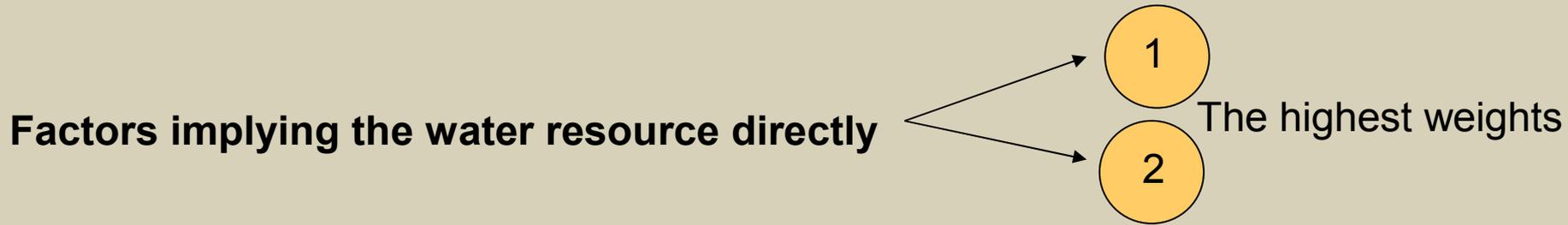
The sum of these partial indices gives the global index of risk of conflict for a given region.

Risk Indicators and their respective weights

- Degree of dependence to the transboundary water resources → 5
- Satisfaction degree of the water needs → 4
- Geopolitical context of the zone of conflict → 3
- Geographical position in relation to the water resources → 2
- Water governance by parties in conflict → 2

The **various factors**, which in certain situations can be redundant, are evaluated separately and in an independent way because it is question of evaluating **their intrinsic influences**

Relative weights assigned to proposed indicators can lead to discussion however the following remarks guided this choice:



The water governance is of local influence initially, but can act in a favourable and implicit way on the transboundary water resources. This factor is directly influenced by the development level of a country.



Rating intervals of the indicators of risk

According to the local conditions
the indicators of risk take values varying between 1 and 10

The highest dimensions indicate a high risk of tension and conversely

Ratings must be established for each country
concerned by the transboundary water resources

$$(IPR = I_{iw} \cdot I_{ic})$$

IPR: partial index of risk

I_{iw} : indicator fixed weight

I_{ic} : indicator rate (variable) reached in the studied case

Ratings intervals of the dependence degree to the transboundary water resources

Variation intervals

Cotes

Total dependence

10

Partial dependence with difficulties of satisfaction of the needs by other resources (natural and technical difficulties)

8

Partial with possibilities of supplying by other resources but with a high capital cost

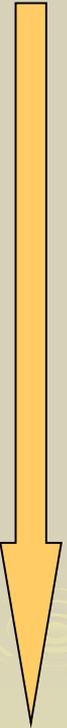
6

Partial with possibilities of supplying by other resources with an advantageous capital cost

3

Partial to weak with an effective supply by other resources

2



Partial index of minimum risk (PIR min) = fixed weight. Minimum rate = $5 \cdot 2 = 10$

Partial index of maximum risk (PIR max) = fixed weight. Maximum Rate = $5 \cdot 10 = 50$

The needs satisfaction degree

Rating of the variation intervals of this indicator rests on the evaluation of the satisfaction degree of the needs of the concerned countries in **the traditional categories of uses:**



Industrial → It can in certain situations involve **a fast reaction**, for example in the case of the **lack of water for a hydroelectric station**, all the more if the problem is posed in **a frontier context**

The diversity of the situations



same weight to these sub indicators : i.e. 4



The partial index for this indicator = $\sum I_p$ relating to the three uses / 3

However, in regions where industry is almost non-existent (poor countries), the weight of this factor is removed. The partial index is then obtained by dividing by 2 the indices relating to the two uses (agricultural and domestic).

The standards of international institutions (WHO, FAO, UNO....) and the results of research works were taken into account in the development of the ratings intervals of the various uses.

**Ratings intervals of the agricultural use are expressed
as a percentage of surface to irrigate**

**Ratings intervals of the satisfaction degree of the industrial
needs are expressed in percentage of the needs**

Partial index relating to the 3 uses :

Partial index of minimum risk (PIR min) = (3.4)/3 = 4

Partial index of maximum risk (PIR max) = (3.40)/3 = 40

Geopolitical context of the conflict zone

Rating intervals

Variation intervals	Cotes
Zone of war	10
Zone of diplomatic tension	8
Zone of ethnic tension	6
Normal relations between states	4
Zone related to a community space (ex European Community)	1

Partial index of minimum risk (PIRmin) = 3

Partial Index of maximum risk (PIRmax) = 30

The geographic position of the belligerent countries

For example, a country which is located in the upstream part of a river benefits better from this situation, either by its natural position or by a provoked way.

Variation intervals

Rate

Existence of a provoked dominant position

(Occupation by force, polluted water discharges, water derivations,...)

7

Existence of a natural dominant position

3



This concept is not exhaustive to rivers but also relates to groundwater and it integrates in an implicit way the environmental aspect.

Partial index of minimum risk (PIR min) = 6

Partial index of maximum risk (PIR max) = 14

The water governance by parties in conflict

The rating intervals proposed here, rest on factors which are inspired, among others, by the criteria of effective water governance proposed by the IWRM Toolbox of the GWP (2001)

Which gather tools at the same time for diagnosis and for assistance to an effective Governance which is based on cases studied throughout the world.

For this indicator the mode of calculation suggested is to decrease the dimension attributed to each factor when this one exists

The weakest dimension for this indicator is obtained as follows:

$$[10 - 6(1.5)] = 1$$

Indeed, each time that one of the conditions of good governance is filled, the risk decreases obviously, until reaching the minimum dimension which is equal to 1, because the optimum governance in the field of water is never reached

Partial index of minimum risk (PIR min) = 2

Partial index of maximum risk (PIR max) = 18

GIR : Global Index of Risk of Conflict around Transboundary Water Resources

It is the sum of the partial indexes:

- $GIR = \sum PIR = \sum I_{iw} * I_{ic}$
- According to this procedure, the global index of minimum risk of conflict is 25, whereas the maximum index is 160.

Example of the transboundary water resources of the Jordan river basin



2 difficulties:

- One relating to the data concerning the satisfaction of the water needs, with **confusions and differences between real, theoretical availability and real consumption**. In this case, the approach must be very critical and thorough.
- The other relating to the **lacks of data** concerning the state of the **water governance** in certain cases, which it was necessary to approach by estimation.

GIR min = 25
GIR max = 160

Ghaza

152

Lebanon

85

West Bank

143

Syria

107

Jordan

130

Israël

112 ----(92)

GIR

For Israel, this index can evolve to 92 next years if the projects relating to Desalination of sea water are carried out. Those relate to a supplement varying between 500 and 750 million m³/y.

Conclusion

- The combination between weights and rates lead to the numerical expression of the risk of conflict around the transboundary water resources. This weighted method applied in the same way to all concerned parties decreases the risk of error on the final result.
- If the definition of certain ratings intervals can lead to discussion, the relative order of classification seems correct and the global index of risk of conflict around the transboundary water resources allows a classification of the zones relating to this risk and their cartography.

**First application
on a concret case**



**Correct estimation
of the real situation**

- The databases of various organizations working in fields which are on relation with this context facilitate the acquisition of the majority of the data necessary for calculation of the various indices. These indices can be updated like the databases making it possible to follow the evolution of the global index of risk.
- It is obvious that this approach can not be applied, at least with difficulty, to all situations because conditions are much diversified, but it allows an approach of the most common situations.

Thank you

This approach allows :



Standardized qualification of the risk of conflict around the transboundary water resources;

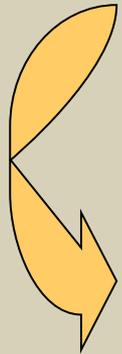


Fast comparison between different regions of the world exposed at this risk;



Cartography of the zones at risk.

The dependence degree of a country to the transboundary water resources for the satisfaction of its various needs is a **decisive factor of conflict even if the other indicators have rates of weak risk, i.e. :**



If criteria's of effective governance exist

If it has normal relations with the concerned countries

If geostrategic problems do not arise

The transboundary water resources are perceived like a vital energy resource on which one has a right of ownership and about which one does not make any concession.

Satisfaction degree of the water needs

Rating of the variation intervals of this indicator rests on the evaluation of the satisfaction degree of the needs of the concerned countries in **the traditional categories of uses:**

The domestic and agricultural uses seem to be logically most influential on the risk of conflict because the first affects directly the consumption and the daily life of the population while the second affects its needs in food;

The non satisfaction of the industrial needs, whose effects on the populations are later and indirect can involve a faster intervention of the governmental authority. The lack of water for a hydroelectric station for example is a very alarming situation for a state and if the problem is posed in a transboundary context, it unquestionably constitutes a source of conflict.

The diversity of the situations which can occur make that it is preferable to initially assign the same sub weight to the impact of each one of these uses, i.e. 4.

The partial index for this indicator (the degree of satisfaction of the different uses) is obtained by dividing by 3 the sum of the indices relating to the three uses.

Nevertheless, in regions where industry is almost non-existent (poor countries), the weight of this factor is removed). The partial index is then obtained by dividing by 2 the indices relating to the two uses (agricultural and domestic).

The standards and the results of research of international institutions (WHO, FAO, UNO....) were taken into account in the development of the ratings intervals of the various uses.