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Structuring the process of constructing and prioritizing best sustainable management methods for small dams in the urban center of Ouagadougou in Burkina Faso (*Bibliographic synthesis*)

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ABSTRACT

Introduction. The sustainable management of small dams (water reservoir) is a complex problem because it requires the consideration of several conflicting dimensions. This article is a bibliographic synthesis of works on structuring of the process of constructing and prioritizing best sustainable management methods for small dams in the urban center of Ouagadougou in Burkina Faso.
Litterature. Based on a multi-criteria decision making (MCDM) approach, this article illustrate how to build alternatives, i.e., management methods, namely scenarii, based on elementary actions of fighting dams degradation in interaction with stakeholders. It describes the process of searching for relevant criteria for assessing the sustainability of these scenarii. It operationalizes the approach and show its effectiveness in prioritizing best sustainable management methods for small dams in the urban center of Ouagadougou in Burkina Faso and give quickly first results based on weighted sum model (WSM) and weighted product model (WPM).
Conclusion. The Prioritizing of the best dams sustainable management methods involves complex decision aid situations that require efficient structuring process and appropriate evaluation methods to make decisions. In future studies, the structuring process could be revised taking into account new contraints formulated by the stakeholders.

Keywords: Multiple criteria decision Making, Structuring process, Dams sustainable management, Weighted sum model, Weighted product model.

RESUME

Structuration du processus de construction et priorisation des meilleures méthodes de gestion durable des petits barrages du centre urbain de Ouagadougou au Burkina Faso (Synthèse bibliographique)
Introduction. La gestion durable des petits barrages (réservoir d'eau) est une problématique complexe parce qu'elle nécessite la prise en compte de plusieurs dimensions contradictoires. Cet article est une synthèse bibliographique des travaux portant sur la structuration du processus de construction et la priorisation des meilleures méthodes de gestion durable des petits barrages dans le centre urbain de Ouagadougou au Burkina Faso.
Littérature. S'appuyant sur une approche de prise de décision multicritère (MCDM), cet article illustre comment construire des alternatives, c'est-à-dire des méthodes de gestion, notamment des scénarios, basées sur des actions élémentaires de lutte contre la dégradation des barrages en interaction avec les parties prenantes. Il décrit le processus de recherche de critères pertinents pour évaluer la durabilité de ces scénarios. Il opérationnalise l'approche et montre son efficacité dans la priorisation des meilleures méthodes de gestion durable pour les petits barrages du centre urbain de Ouagadougou au Burkina Faso et donne rapidement des premiers résultats basés sur le modèle de somme pondérée (WSM) et le modèle de produit pondéré (WPM).
Conclusion. La priorisation des meilleures méthodes de gestion durable des barrages implique des situations complexes d'aide à la décision qui nécessitent un processus de structuration efficace et des méthodes d'évaluation appropriées afin de prendre des décisions. Dans les études futures, le processus de structuration pourrait être revu en prenant en compte les nouvelles contraintes formulées par les acteurs.

Mots clés : Prise de décision multicritères, Processus de structuration, Gestion durable des barrages, Modèle de somme pondérée, Modèle de produit pondéré.

1. INTRODUCTION

Decisions on water retention management are often part of a complex analysis with conflicting socio-economic, environmental and governance issues to consider (Gregory *& al*., 2012). They are multidimensional in nature and integrate a large number of stakeholders with various value systems. Purely objective approaches to finding a single, optimal solution are unrealistic in principle (Bana *& al*., 2004). From this perspective, Multi-Criteria Decision (MCDM) approaches provide an analytical support adapted to the complexity of such a decision (Roy & Bouyssou, 1993; Belton & Stewart, 2003). They facilitate the decision-making process by making it more explicit, rational and efficient. MCDM methods are therefore suitable for the development of effective management of small dams or reservoirs.

Although having good result of a MCDM problem involves to conduct with success two main steps, namely the structuring process and the evaluation and exploitation process (Roy & Bouyssou, 1993, Maystre *& al*., 1994; Bisdorff *& al*., 2015), most of the paper dealing with cases study application of MCDM process concentrate only on evaluating and exploitation process (Bana *& al.*, 2004). So these works usually suppose that alternatives or scenarii and their evaluating criteria, which coming from structuring process, are predefined. By contrast, on this work we mainly focus our attention on conducting the structuring process in interaction with the stakeholders. Successfully conducting the structuring phase will guarantee to the stakeholders the effectiveness and acceptability of the results that will come out of the whole MCDM process.

The rest of the paper is structured as follows. Section 2 presents the case study. Section 3 is devoted to the first step of the structuring process which contains the formulation of the problem, the identification of stakeholders and the construction of alternatives or scenarii. Section 4 presents the second step of the structuring process based on the use of the chain challenges-Criteria-indicators to identify the different criteria and indicators for their evaluation. Section 5 highlights two simple models of evaluation based on weighted sum model and weighted product model which could help to have quickly interesting first results from the application of MCDM process to the case study. Finally, the last section concludes the paper and gives direction for further studies.

2. METHODS FOR SMALL DAMS IN THE URBAN CENTER OF OUAGADOUGOU IN BURKINA FASO

2.1. Presentation of the case study

Burkina Faso, a sahelian country with agricultural vocation, has a low potential in surface water (Bougairé, 2008). In addition, it is experiencing strong population growth (3.11% per year) and an urbanization rate of about 26 %, resulting in increasing pressure on its resources already weakened by climatic hazards and therefore often erratic dry seasons. In the city of Ouagadougou, three water reservoirs, also known as dams No. 1, No. 2 and No. 3, were built in 1963 to meet the drinking water needs of the population. With a combined capacity of 14 960 000 m3, these dams, along with the Loumbila dam, contributed nearly 30% to the city's drinking water supply (Yameogo, 2008). In addition to providing drinking water, these hydraulic infrastructures, together with the Bangrweogo forest, constitute the city's main ecological lungs. They also act as groundwater recharge and, at the same time, serve as buffer zones for the preservation of inhabitants against flooding, allow the development of tourist assets and the practice of recreational activities. However, with the non-potability of water due to pollution coming from the high presence of waste, the water in reservoirs is nowadays mainly used for various activities other than drinking water supply. These include market gardening, horticulture, fishing and recreational activities, all of which provide income for local populations (Sawadogo, 2008; Conchita & *al*., 2020).

Today, these water reservoirs are under multiple pressures due to high population growth and inadequate or even lack of sanitation (Groen *& al*., 1988; Foster S. D., 2001; Cissé *& al*., 2003). Increasingly, these water reservoirs are subject to a wide range of practices that threaten their existence. They also receive a large amount of household waste from the Kadiogo Canal. In addition, some market gardeners use pesticides that are otherwise prohibited for the treatment of their crops. There is also an uncontrolled occupation of the surroundings of the water reservoirs by diner promoters, horticulturists and market gardeners. All these activities are likely to threaten the existence of dams in the long term. The direct consequence is the reduction of the storage capacity of the reservoirs and the presence of invasive plants called water hyacinth (*Eichhorniacrassipes*).

Actions are periodically carried out by the municipal authorities to restore water reservoirs. However, these actions are often not fully implemented due to a lack of financial resources, and are often undertaken in isolation and without involving of all stakeholders. So, the results achieved are not always satisfactory to promote efficient and rational management of water reservoirs (Zoungrana & Combelem, 2016).

Faced with this large-scale degradation of water reservoirs and the inadequacy of the actions that are carried out, it is therefore imperative to develop an approach that emphasizes the effective participation of stakeholders at all levels in the choice of an integrated or sustainable management method for these reservoirs. This would preserve the resource and the health of riverside populations and avoid conflicts over water use.

2.2. Structuring process: step 1

This is an iterative process (Maystre *& al.*, 1994) carried out in close collaboration with the stakeholders and which includes the steps described in the following lines through the case study.

Formulation of the problem

The fight against the degradation of water reservoirs in the city of Ouagadougou has often been approached in a thematic and non-holistic manner with mixed results. For this reason, several studies believe that a policy to combat the degradation of water reservoirs must be the result of a systemic and participatory approach. Effectively combating the deterioration of dams means choosing the best integrated management method(s) that take(s) into account the multidimensional issues (economic, ecological, social and cultural), the physical environment and the concerns of the stakeholders (Roy, 1985; Metchebon, 2010).

Identification of the stakeholders

In accordance with Roy's definition of a stakeholder (Roy, 1985), in this article we have played the role of the analyst. The target parties are the local populations exploiting the banks of the water reservoirs and the municipal authorities. There were no decision-makers as such; this work is intended to provide a basis for decision-makers to make informed decisions on how to manage water reservoirs in a sustainable way (Combelem, 2021).

Construction of scenarii

The construction of sustainable management methods begins with the identification of potential actions to combat degradation and their grouping by management theme.

Identification of potential actions to combat degradation

During our discussions with the dam operators, the local populations and institutions in charge of dam management such as the Nakambe Water Agency and the Ouagadougou Town Hall, twelve (12) actions were identified as being able to slow down this degradation.

Action 1: Carrying out an environmental impact study for the rehabilitation of Dams. The project to remove sand from water bodies can generate environmental impacts and, in the event of an accident, produce major risks for man and non-renewable resources. In order to prevent these negative effects, environmental protection must be integrated into the project as soon as possible. This is also justified by Law No.006-2013/AN on the Environment Code in Burkina Faso, which stipulates in article 25 that any activity likely to have significant environmental impacts is subject to an environmental impact study or notice (Yelemou & *al.*, 2021).

Action 2: Drainage or cleaning of water bodies. Water bodies are affected by continuous degradation characterized by silting (Zoungrana & Combelem, 2016). Silting results from the transport of fine solid particles and grains of sand in the water reservoir and is reinforced by the filling due to the high presence of solid waste from human activities. This phenomenon could increase if development efforts are not made. The main activity of the desilting action in this study is to clean the silted bed of the water reservoirs.

Action 3: Construction of dam banks. Developing the banks of the three water reservoirs has been a problem since the 1970s. Recurrent flooding was the cause. Today, the banks of the three dams are sometimes used as waste dumpsites. They are invaded by wild garbage dumps of all kinds (household, biomedical, industrial, etc.) resulting in siltation and pollution of dams; their presence on the site of these dams is also a source of diseases such as diarrhea, malaria, bilharzia. Hence the interest of implementing such an action which will make it possible to limit this phenomenon of increasing degradation (Bani & Yonkeu, 2016).

Action 4: Combating the eutrophication of dams.To effectively combat the eutrophication of water reservoirs, solutions that can help prevent or limit water pollution from the reservoir, agricultural practice with the use of pesticides on the banks or bed of the river, must be considered. Existing or future legal provisions for water quality control must be effective or strengthened (Barron *& al*., 2022).

Action 5: Supervision and awareness-raising of users and local populations. The supervision of the various user groups implies a reinforcement of their capacities with regard to the management of water reservoirs. In this way, it could help to raise awareness and support among all users for the movement to protect water reservoirs.

This will involve: (i) identifying the needs for capacity building of users in the management of water reservoirs; (ii) developing and implementing a communication and training plan for users; (iii) leading local dialogue campaigns to limit activities that cause the degradation of water bodies; (iii) disseminating and popularizing laws and regulations in order to help users to know them better and make them their own.

Action 6: Carrying out an inventory of uses around water reservoirs. This action will consist in making a diagnosis of the different activities that are carried out around the water reservoirs. This would optimize water use according to the needs of each activity and take care of water retention infrastructures (dike, weir, reservoir banks).

Action 7: Establishment of a local water committee (LWC). In view of the acute problems of managing water reservoirs in the city of Ouagadougou and the growing urbanization, it is necessary to set up a LWC-Massili around these reservoirs. This LWC will constitute the unifying structure for the users of the three water reservoirs, which will mobilize them effectively to carry out the tasks of maintaining, managing and protecting the water reservoirs.

Action 8: Carrying out an environmental audit for existing installations. Article 35 of Law No. 006-2013/AN on the Environment Code in Burkina Faso, which stipulates that: regular environmental audits shall be carried out on activities likely to have significant direct or indirect impacts on the environment. This would make it possible to clean up the water in the dams.

Action 9: Reforestation around water reservoirs. The plants around the water reservoirs play several important roles: (i) they serve as a filter against pollutants and fertilizers; (ii) they also provide a barrier against erosion; (iii) the shade formed by the presence of plants on the riparian strip cools the water slightly, which limits the development of unwanted algae and aquatic plants, and also helps to preserve a refuge for fish; (iv) they also regulate the water level; (v) they promote biological diversity.

Action 10: Establish a permanent monitoring system. It is essential to set up a monitoring system to regulate access to water. To this end, a "water police" around water reservoirs would regulate activities that can have an impact on health, safety, water resources and aquatic ecosystems. The objective is to reconcile the satisfaction of needs with the preservation of the aquatic environment.

Action 11: Marking the contour of water reservoirs. This action is part of the protection of the banks of water reservoirs. It makes it possible to delimit the perimeter of the dams and to avoid any installation that is likely to degrade the water reservoirs.

Action 12: Relocation and population resettlement. Vegetable gardening is the main activity practiced around dams n°1, 2 and 3 of Ouagadougou, contributing significantly to bank degradation, water pollution and siltation (Olahan, 2010). In such a situation, all market gardeners installed around the reservoirs should be relocated on other sites in order to curb this degradation phenomenon due to their activities.

The simultaneous implementation of all these actions would entail enormous costs; hence the need to group them into scenarios in order to promote efficient management.

2.3. Principle of scenarii construction

Based on the twelve potential actions identified to combat the degradation of water reservoirs, scenarios or management methods have been developed. This is a thematic grouping of the isolated actions identified and should make it possible to slow down this deterioration. The twelve actions have been grouped into three main management themes: rehabilitation, rationalization of uses and protection of water reservoirs. In addition to these scenarios, there are three others resulting from the Burkinabe government's project to develop water reservoirs. This concerns the prestigious, tourist and socio-ecological development of water reservoirs. Finally, a final scenario was proposed for a possible privatization of water reservoirs. In short, eight scenarios were selected (Combelem, 2021). They range from the status quo to the privatization of water reservoirs.

Scenario 0 (S0): Status quo. This scenario corresponds to the continuation of the current situation. In this scenario, no new action should be considered.

Scenario 1 (S1): Rehabilitation of water reservoirs. Scenario 1 aims to respond to the degradation of water reservoirs. Indeed, a policy or measure aimed at the sustainable management of a resource is only viable if the resource is in good condition and therefore rehabilitated. This scenario is structured around actions 1, 2, 3, 4 and 5.

Scenario 2 (S2): Rationalization of water uses. Uncontrolled uses are one of the factors contributing to the degradation of water reservoirs. This rationalization of uses will consist in the implementation of actions 5, 6, 7, 8 and 12.

Scenario 3 (S3): Protection. This scenario emphasizes the sustainability of water reservoir by emphasizing the implementation of protective actions. It will consist of the implementation of actions 3, 5, 9, 10 and 11.

Scenario 4 (S4): Prestige development. Prestige development is part of the State's desire to strategically position itself as an essential economic hub. In this type of development, the banks of the water reservoirs will accommodate prestigious facilities such as large hotels, a two-storey bridge with shopping malls. The advantage of this type of arrangement is to create a large and totally secure reserved space.

Scenario 5 (S5): Tourism development. This scenario aims to install large infrastructures such as tourist, hotel, commercial and business centers around water reservoirs. This type of development will be able to attract many national and international visitors. This project will increase Burkina Faso's tourism potential

Scenario 6 (S6): Socio-ecological planning. Socio-ecological development would like to respect the natural vocation of the land around the water reservoirs. It would maintain and reorganize

activities such as urban agriculture and fishing already practiced on the site. Large green spaces could be created, accessible to all. The great advantage of this development is that it sets up a project of proximity, sustainable development in respect of nature, and especially in its rational use.

Scenario 7 (S7): Privatization of water reservoirs. The new economy of environmental resources presents privatization as the best way to ensure the sustainable management of species and natural environments in order to ensure their conservation (Boisvert & *al*., 2004). Private management of water reservoirs in the city of Ouagadougou can be an effective means of combating the phenomenon of degradation.

Indeed, in recent years, it has emerged that the private sector is the best actor in water resources management (Boag & Mc Donald, 2010). It is an innovative solution, in conjunction with public operators, to address the difficulties of intervention in dam management (Cave & Blanc, 2011).

2.4. Structuring process: step 2

Identification of challenges, criteria and indicators

The starting point was the identification of the fundamental objectives or challenges whose satisfaction makes it possible to consider that degradation is limited within the framework of a development and sustainable management of water reservoirs in the city of Ouagadougou. The identified challenges are grouped according to the dimensions of sustainable development (economic, ecological, social and governance). They express concerns related to the management of water reservoirs and the technical and economic feasibility of the various scenarios to be implemented. These challenges have made it possible to build criteria and indicators on the basis of which scenarios are evaluated (Schlaepfer, 2002). Table 1 summarizes the issues, criteria and indicators highlighted during our study.

Table 1. Chain Challenges-Criteria-indicators

SUSTAINABILITY	Challenges	Criteria (*Min/Max*)	Indicators
ECONOMIC	Reduction of IGA activities on the banks	Importance of IGA (C_1, *Min)*	Number of actors around the water reservoir
	The scenario is financially feasible	Financial cost (C_2, *Min*)	Cost of carrying out the scenario
SOCIAL	voluntary displacement of the operators is encourage	Importance of voluntary displacement (C_3, *Max*)	Number of potentially displaceable persons
	Social acceptability	Degree of acceptability (C_4, *Max*)	Scenarii selection by operators
	Population health is promoted	Importance of potential exposure (C_5, *Min*)	Importance of exposure to disease risks waterdrawn

	The water from the dams is permanent and of good quality	Water withdrawal (C_6, *Min*)	Quantity and quality of water withdrawn
	The inhabitants are protected from any risk of flooding	Flood risk (C_7, *Min*)	Frequency of flooding
	Promotion of recreational activities (relaxation, sport, other leisure activities)	Development of recreational activities around dams (C_8, *Max*)	Importance of recreational activities around dams
ECOLOGIQUE	The role of ecological lung is maintained	Ecological function (C_9, *Max*)	Good condition of the dam
	Biodiversity is maintained	Importance of diversity (C_{10}, *Max*)	Presence of aquatic species
GOUVERNANCE	The occurrence of conflicts is limited	Importance of conflicts of (C_{11}, *Min*)	Average number of conflicts
	Dam management is optimal	Involvement of stakeholders in dam management (C_{12}, *Max*)	Presence of a consultation framework

(Schlaepfer, 2002, Combelem, 2021)

Legend: IGA : Income Generating Activities; Max: the higher the value of scenario i, the better the performance of scenario i w.r.t. criterion j; Min: the lower the value of scenario i, the better the performance of scenario i w.r.t. criterion j.

Operationalizing criteria for assessing scenario

The criteria "Importance of IGA (C_1)", "importance of voluntary displacement (C_3)", "importance of potential exposure to waterborne disease (C_5)", "Flood risk (C_7)", "Drinking water supply (C_6)", "Ecological function (C_9)", "importance of biodiversity (C_{10})", "Development of recreational activities around dams (C_8)" and "importance of conflict of use (C_{11})" were assessed on a three-level scale: Low (1), Medium (3), High (5), regardless of the indicator considered. As for the "involvement of all the stakeholder in dams management (C_{12})" criterion, it is evaluated according to a binary scale and was built by linking the implementation of a scenario and its capacity to promote concerted management of water reservoirs or not. The "degree of acceptability (C_4)" criterion is evaluated according to the degree of social acceptability of each scenario by the operators. The "Financial Cost (C_2)" criterion is evaluated numerically in CFA Franc per year and corresponds in this study to the average willingness to pay by operators for the implementation of each scenario. Carrying out this process through our case study leads to evaluation matrix as shown in Table 2.

Table 2. Evaluation Matrix

Scenarii	**C_1**	**C_2**	**C_3**	**C_4**	**C_5**	**C_6**	**C_7**	**C_8**	**C_9**	**C_{10}**	**C_{11}**	**C_{12}**
S_1	3	5 438	3	28,5	1	3	5	3	3	1	3	2
S_2	3	6 102	3	22,5	5	3	1	5	5	5	5	2
S_3	5	3 038	5	32,7	5	3	1	5	5	5	5	1
S_4	5	2 684	5	6,7	5	5	5	1	3	1	3	1
S_5	3	4 438	5	2,8	3	5	5	1	3	1	3	1
S_6	5	3 357	5	4,9	3	1	1	3	3	3	3	2
S_7	5	2 907	3	1,8	1	3	3	3	3	1	5	1
Weight (%)	6.25	18.75	4.175	1.675	1.675	6.65	6.65	4.175	12.5	12.5	6.25	18.75

(Combelem, 2021). Note : In the Table 2 the evaluation of criteria is transformed, when they were to minimize, in such a way that all the criteria would now be maximized.

Weighting of criteria

The weighting of the criteria began by assigning equal weights, 0.25, to each of the economic, social, ecological and governance dimensions of sustainable development. Then, for each dimension, the criteria were ranked using the card method (Simos, 1990; Figueira & Roy, 2002) to give the weights of the criteria. Finally, for a criterion belonging to a given sub-group, to obtain its weight over the whole criteria, the value of its weight was multiplied by the weight of the sub-group to which it belongs (i.e. by 0.25). The result of the application of this weighting process is presented in Table 2.

2.5. Application of evaluation models based on weighted sum and weighted product

At this step of our work we have completed the structuring phase and the evaluation phase is normally beyond the scope of this paper. Note also that several MCDM methods (Roy & Bouyssou, 1993; Maystre *& al*., 1994, Brans & De Smet, 2016) can be used to deal with the evaluation matrix and help to choose best sustainable management methods for the dams. But in particular, in the MCDM literature we can find two simple MCDM aggregation models, namely, the weighted sum model (Vincke, 1992) and the weighted product model (Adriyendi, 2015). These models could be used to obtain quickly some first result before going deeper by using more appropriate MCDM methods for having more robust results in a second time.

Thus, starting from the evaluation matrix designated by the S_{ij}, each representing the performance of scenario *Si* w.r.t. criterion C_j , all of them were standardized according to formulae 1 or 2 if the criterion is respectively to be maximized or minimized:

$$S_{ij}^{*} = \left(\frac{S_{ij}}{MAXi\ Sij}\right) \qquad (1)$$

$$S_{ij}^{*} = \left(\frac{MINi\ |_{S_{ij}}}{Sij}\right) \qquad (2)$$

with $S^{*}ij$ the normalized value of *Sij* and maxi *Sij* (resp. mini *Sij* the maximum (resp.minimum) performance on criterion *j*. Then two performance scores, $P_1(Si)$ and $P_2(Si)$, were calculated for each scenario *Si* by applying the weighted sum formula 3 and the weighted product formula 4:

$$\boldsymbol{P1}(Si) = \sum_{j=1}^{m} \boldsymbol{Wj} \times S_{ij}^{*} \qquad (3)$$

$$\boldsymbol{P2}(Si) = \prod_{j=1}^{m} (S_{ij}^{*})^{wj} \qquad (4)$$

where *m* is the number of criteria and *wj* the weight of criterion *j*. Table 3 illustrate scenarri performance proposed by WSMand WPM.

Table 3. Scenarii performance by WSM and WPM

Scenarii	WSM scores	WPM scores
Rehabilitation of water reservoirs S1	2.517	0.103
Rationalization of water uses S2	3.113	0.264
Protection S3	2.885	0.182
Prestige development S4	2.650	0.113
Tourism development S5	2.603	0.099
Socio-ecological planning S6	2.733	0.160
Privatization of water reservoirs S7	2.411	0.082
SWM Ranking	$S_2\ S_3\ S_6\ S_4\ S_5\ S_1\ S_7$	
WPM Ranking	$S_2\ S_3\ S_6\ S_4\ S_1\ S_5\ S_7$	

(Combelem, 2021)

Table 3 shows the resulting values by applying the weighted sum model (WSM) and the weighted product model (WPM) to the case study. From these, it appears that scenarios 2 and 3 are the best methods of sustainably managing water reservoirs in the city of Ouagadougou with highest score both for WSM (3.113 and 2.885) and WPM (0.264 and 0.182). Scenarii S6 and S4 rank third and fourth respectively for all methods. Scenarii S1 and S5 vary in rank depending on the method used. Scenario S7 is the worst scenario in terms of ranking. Thus, the uses of WSM and WPM made it possible to quickly obtain satisfactory results. However, they have some limitations (Metchebon, 2010). Indeed, as far as the weighted sum is concerned, a slight variation in the values of the weights can lead to radically different results. In addition, the influence of the criteria when they take a low value is negligible. Consequently, even if on one or more criteria a scenario is very bad, it can be well ranked if it performs well on the other criteria: there is “blind compensation”. Finally, in many cases, the scenarios are not always comparable. However, the weighted sum rejects any incomparability between the scenarios. Finally, in many cases, the scenarii are not always comparable. However, the weighted sum rejects any incomparability between the scenarii. In our case study the difference of ranking between S5 and S1 obtained when applying respectively WSM and WPM methods combined with the weak difference of their score calculated by WSM and WPM methods likely show the incomparability between them.

The weighted product method does not practice “blind compensation” between criteria, unlike the weighted sum, but it does provide a single ranking that eliminates any incomparability and therefore

leaves little flexibility as to the decision to be taken. Moreover, this method can only be used if all the criteria are non-zero: it is a limitation to reflect certain situations.

This analysis would therefore benefit from the application of other so-called overclassification methods such as the ELECTRE methods (Maystre *& al.*, 1994) or PROMETHEE methods (Brans &Marschal, 2000), which take into account the notion of partial compensation between the criteria, as well as the possibility of incomparability between scenarios, thus further enriching the MCDM process for choosing best water reservoirs sustainable management methods.

3. CONCLUSION

The Prioritizing of the best dams sustainable management methods involves complex decision aid situations that require efficient structuring process and appropriate evaluation methods to make decisions. So in this study the structuring process of MCDM methodology is constructed and operationalized to select best sustainable management methods for small dams in the urban center of Ouagadougou in Burkina Faso. We identified seven (8) scenarii or dams management methods constructed basing on of twelve (12) actions of fighting dams degradation defined in interaction with stakeholders. Starting from the identification of the fundamental objectives or challenges whose satisfaction makes it possible to consider that degradation is limited within the framework of a development and sustainable management of water retention, twelve (12) criteria and their relevant measurement indicators have been developed. For quickly first results, the "Rationalization of water uses (S2)" and "Protection (S3)" have been selected as best dams sustainable management methods, when applying WSM and WPM for assessing the various scenarii. Results demonstrate the importance of a well conducted MCDM structuring phase in the final quality of the recommendation issues.

In future studies, the structuring process could be revised taking into account new contraints formulated by the stakeholders. Also, other MCDM evaluation methods could be used to select the best dams sustainable management methods and results from different methods compared.

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