



A new bankruptcy method for conflict resolution in water resources allocation



Hojjat Mianabadi ^{a,*}, Erik Mostert ^a, Mahdi Zarghami ^b, Nick van de Giesen ^a

^a Department of Water Resources, Faculty of Civil Engineering and Geosciences, Delft University of Technology, Stevinweg 1, 2628 CN Delft, The Netherlands

^b Faculty of Civil Engineering, University of Tabriz, 51664 Tabriz, Iran

ARTICLE INFO

Article history:

Received 22 March 2013
Received in revised form
15 May 2014
Accepted 20 May 2014
Available online

Keywords:

Conflict resolution
Water resources allocation
Bankruptcy theory
Euphrates River

ABSTRACT

Growing competition over water resources has caused political disputes among stakeholders and has brought conflict resolution in the focus of negotiation processes. In these cases, bankruptcy rules for redistributing an asset when it is not sufficient to meet all claims could be applied. In this paper, we develop a new bankruptcy rule for water resources problems that considers agents' contribution to the total resources as well as their claims, which is in accordance with the UN Watercourses Convention (1997), as important factors for reallocation. Using the Euphrates River and a hypothetical case from the literature as examples, the new rule is compared with four alternative rules. The results show that the novel solution is potentially more powerful to help solving conflicts over river sharing problems.

© 2014 Elsevier Ltd. All rights reserved.

1. Introduction

Water resources scarcity, growing resources consumption, and non-equitable distribution of resources have caused several political disputes in the world (Homer–Dixon, 1994). Concerning shared water resources alone, 43 political or military acts have taken place around the world during the past 50 years. This includes 37 acute disputes that led to small-scale and extensive military acts (Wolf, 2007).

Resolving disputes over water resources is a complex task. Power and politics are important, but normative arguments play a role as well. Generally, conflict resolution is only possible if all parties concerned consider the proposed solution as “fair” (Gray, 1989). Hence, parties need to legitimize or “sell” their preferred solution as fair. As Majone (1989) puts it, “even when a policy is best explained by the actions of groups seeking selfish goals, those who seek to justify the policy must appeal to the public interest and the intellectual merits of the case” in order “to bring other people around to (their) position”. Those others that need to be brought around may be the other parties in the conflict, but also influential third parties, such as funding agencies, on whose support the parties in the conflict may depend.

* Corresponding author. Tel.: +31 15 2781029; fax: +31 (0) 15 2785559.
E-mail addresses: h.mianabadi@tudelft.nl (H. Mianabadi), e.mostert@tudelft.nl (E. Mostert), mzarghami@tabrizu.ac.ir (M. Zarghami), n.c.vandegiesen@tudelft.nl (N. van de Giesen).

The central issue at the heart of international water quantity conflict is that there are no internationally accepted allocation mechanisms for sharing water resources or their benefits (Wolf, 1999). With respect to the allocation of internationally shared water resources, the main normative principle is the principle of “equitable and reasonable utilization” which does not necessarily mean equal sharing of resources (Correia and Da Silva, 1999; Salman, 2007; Rahaman, 2012). Several international rules and conventions have been adopted that mention this principle, most notably the Helsinki rules on the Uses of the Waters of International Rivers from 1966 (International Law Association (ILA), 1966), the United Nations Convention on the Law of the Non-Navigational Uses of International Watercourses from 1997 (UN Watercourses Convention, 1997), and the Berlin rules on water resources from 2004, revising the earlier Helsinki rules (International Law Association (ILA), 2004). According to the Article 6 of the UN Convention, utilization of an international watercourse in an equitable and reasonable manner requires taking into account all relevant factors and circumstances, including the following (UN Watercourses Convention, 1997):

- (a) Geographic, hydrography, hydrological, climatic, ecological and other factors of a natural character;
- (b) The social and economic needs of the watercourse States concerned;
- (c) The population dependent on the watercourse in each watercourse State;

- (d) The effects of the use or uses of the watercourses in one watercourse State on other watercourse States;
- (e) Existing and potential uses of the watercourse;
- (f) Conservation, protection, development and economy of use of the water resources of the watercourse and the costs of measures taken to that effect;
- (g) The availability of alternatives, of comparable value, to a particular planned or existing use.

The Berlin rules add to these factors the sustainability of proposed or existing uses and minimization of environmental harm and states explicitly and unequivocally that there may be more relevant factors.

Equity is generally seen as key to international water resources allocation (Wolf, 1999; Zaag et al., 2002). Yet, despite several studies, there is not yet an universal consensus on the meaning of “equitable and reasonable utilization”. Salman (2007) notes that the management of transboundary river basins remains the most significant issue that is not yet regulated by a global convention or treaty.¹ This problem has acted as a formidable obstacle on the road to peaceful negotiations in transboundary basins (e.g. the conflict among Egypt, Ethiopia and Sudan and other riparian states on the Nile Basin (Just and Netanyahu, 1998; Ansink, 2009), the conflict among Tajikistan, Afghanistan, Kyrgyzstan, Uzbekistan, Turkmenistan on the Amu Darya Basin (Rahaman, 2012), the dispute between USA and Mexico over three shared rivers (Drieschova et al., 2008), and the conflict among Turkey, Syria and Iraq in the case of Euphrates-Tigris Basins (Korkutan, 2001; Zawahri, 2006)).

Analytical methods may be useful for determining the meaning of “equitable” and “reasonable” in specific cases. Zaag et al. (2002), for instance, developed some analytical methods to reallocate all (blue and green) water resources based on equal division only, catchment area only, or basin population only, and applied these to the Orange, Nile, and Incomati rivers (Zaag et al., 2002). Yet, analytical methods should ideally consider all the relevant factors and circumstances mentioned in Article 6 of the UN Watercourses Convention. While there is certainly no guarantee, the more attributes of the “equitable” and “reasonable” allocation they consider, the bigger the chance that they will be acceptable to policy makers and other stakeholders and will contribute to conflict resolution in practice.

One of the analytical methods that could be used for conflict management in resource allocation problems is bankruptcy theory. The aim of this method is to distribute an asset (E) among a group of creditors, when this amount is insufficient to satisfy all their claims (C) (Herrero and Villar, 2001). Over the years, several bankruptcy rules have been developed. Some of these rules are based on the associated cooperative bankruptcy game (Grundel et al., 2011). The most used bankruptcy rules are the proportional rule (PRO), constrained equal losses (CEL), and constrained equal awards (CEA), which are based on equal proportions of the claims, equal losses (difference between claim and award) and equal awards, respectively. These three rules which have strong theoretical and empirical support (Ansink and Marchiori, 2010), have been used in many practical studies such as (Gächter and Riedl, 2006; Herrero et al., 2009; Xia and Cui, 2009; Sheikhmohammady et al., 2010) and (Ansink and Weikard, 2012). The proportional rule (PRO) is probably the best known and most widely used solution method among

bankruptcy rules (Herrero and Villar, 2001). An overview of bankruptcy rules have been documented by Thomson (2003) and Bosmans and Lauwers (2011).

In recent years, several researchers have sought to examine the applicability of bankruptcy theory to different natural resources allocation problems, such as groundwater resources management (Madani and Dinar, 2013), multipurpose resources allocation (MPRA) problems (Grundel et al., 2011) and fisheries (Inarra and Skonhofs, 2008). Zarezadeh et al. (2013) proposed bankruptcy optimization models to allocate water based on four bankruptcy rules with respect to time sensitivity of water deliveries during the planning horizon. Ansink and Weikard (2012) extended a class of sequential sharing rules (SSRs) and used them in water resources management (Ansink and Marchiori, 2010). Madani and Zarezadeh (2012) studied the utility of bankruptcy rules in resolving water resources conflicts using a range of bankruptcy rules in a hypothetical groundwater bankruptcy problem. In addition, a comprehensive review of the connection between the bankruptcy theory and river sharing problems has been given by Beard (2011). Sheikhmohammady et al. (2010) applied several well-known bankruptcy procedures to allocation of Caspian seabed resources, oil and gas, across the five Caspian states. Furthermore, Zarezadeh et al. (2012) used PRO, CEA, CEL, and Adjusted Proportional (AP) rules to suggest fair allocation plans in different climate and development scenarios for an internal Iranian river shared by eight provinces. Such studies reveal that the bankruptcy theory can be applied to natural resources allocation including water resources problems in river basin systems.

Most of the previously mentioned rules such as the PRO rule do not take into account the contribution that the agents have made to E . The aim of the present study is to give an analytical method that does consider this contribution. The other factors mentioned in art. 6 of the UN Watercourses convention such as social and economic needs and dependent population, can be taken into account when assessing the claims of the different parties. In this paper, these claims are assessed using scientific studies. To apply the proposed bankruptcy rule, it is essential that all relevant factors (cf. art. 6 UN Watercourses Convention) are considered in determining the demands of each riparian country and that the political and military power of each state does not lead to exaggerated claims.

This paper is arranged as follows. The new proposed rule will be explained in the next section. In Section 3, the proposed rule will be applied to the Euphrates River and to the hypothetical case study proposed by Ansink and Weikard (2012). In the same section, we also compare the results of the proposed rule with four alternative solutions of bankruptcy to an illustrative river allocation problem. Finally, Section 4 summarizes the conclusions of paper.

2. Methodology

There are two reasons for using bankruptcy rules to address rivers reallocation problems (Ansink and Weikard, 2012). First, as in real bankruptcy problems, claims exceed the available resources. Secondly, bankruptcy rules are relatively simple and can be used easily by agents and policy makers in rivers sharing problems.

An ordinary bankruptcy problem differs from a bankruptcy problem in river systems problems. First, in an ordinary bankruptcy problem, there are three variables modeling the problem: (1) a finite set of agents $N = \{1, 2, \dots, n\}$, (2) the asset E which should be divided among the agents, and (3) the claims of agents (c_i). In rivers sharing problems, there is another variable which shapes the problem: (4) the contribution of agents to E (a_i). In case of transboundary river basins a_i is the amount of flow originating in basin state i . In other words, in a simple bankruptcy problem claimants are characterized only by their claims c_i , but in a river allocation

¹ The Helsinki rules and the Berlin rules have been developed by a professional organization – the International Law Association – and are not conventions signed by states. The UN Convention is a convention, but it has not yet entered into force because too few states have ratified the convention.

Download English Version:

<https://daneshyari.com/en/article/7483659>

Download Persian Version:

<https://daneshyari.com/article/7483659>

[Daneshyari.com](https://daneshyari.com)