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AN ANALYSIS OF THE CAUVERY RIVER WATER
DISPUTE

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BCID Research Paper 3

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Abstract

This paper focuses on the dispute over river Cauvery in Southern India. Among the causes of river water disputes are contested property rights, difficulty in enforcing such rights, conflict of uses and a lack of willingness to compromise. A co-operative outcome in such cases depends on several factors: asymmetry of power in a triadic relationship between a federal government and two riparian states (one upstream and one downstream). Other factors influencing co-operation are the extent to which the claims of river waters can be elevated from those of immediate riparian peoples to those of an entire state; the dominance of a masculine paradigm towards ‘taming’ river waters using ‘hard’ investments rather than ‘soft’ and decentralised alternatives. On the basis of district level data, the importance of river Cauvery to the hydrology, economy and polity of the two contesting states is examined. This analysis helps us to appreciate why the two riparian state governments have limited room to manoeuvre. Drawing from two brief case studies of Murray Darling Basin and recent litigation in the USA, and other international experiences of river water treaties, the paper identifies various implications for the resolution of Cauvery and other river water disputes.

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Water and Identity: Making Sense of the Cauvery¹ River Water Dispute

1. Introduction

Etymologists are divided in terms of whether the word ‘riparian’ (of the boundaries of a river) is derived from river or the word ‘river’ (that which flows between two boundaries) is derived from riparian. It appears that where there is a river, dispute cannot be far off. This paper aims to explore inter-state river water disputes in a federal context using the Cauvery river dispute in India as a case study. Water resources are prone to contested entitlements and property rights. Such contests are exacerbated as pressure on fresh water sources increases. In the case of river waters, co-operation is further complicated because of the asymmetry between the upstream and the downstream users. A further complication arises when a river’s waters can be used for multiple purposes and there is no easy way to determine which purpose should have a priority over others.

There is a rich literature on international environmental agreements (Haas et al, 1993; Weiss and Jacobson,1998; Sand, 1999) and on collective action, when it works and why. Mancur Olson’s (1965) seminal analysis suggests that collective action depends on (a) group benefits and costs; (b) whether such benefits are ‘public goods’; (c) whether non-violators can be excluded and penalised. Olson’s recommendation to overcome collective action problem is to create separate and selective incentives. Sandler (1992; 1998) suggests that these principles have been crucial in explaining why some international agreements are successful.

Against this background, this paper examines various challenges to sharing water peacefully, in the context of the river Cauvery dispute. Section 2 presents a review of some theoretical considerations in understanding river water disputes. Section 3 provides a historical and institutional perspective of Cauvery dispute. Section 4 identifies the various causes of the disputes. Section 5 draws together these discussions in terms of policy implications.

2. Understanding river water disputes: International and national aspects

Considerable attention has been paid to the potential role of water resources in causing or exacerbating conflicts between nation-states (e.g., Homer-Dixon,1998; Correia and de Silva,1999; Yoffe and Ward, 1999; Salman, 2000; Swain, 2000). The emergence of co-operation and developing mechanisms to resolve conflicts has been examined in a number of studies (Elhance, 1999; Gleick,2000; Sadoff et al., 2002; Nakayama, 2003). However, there is fairly limited discussion on inter-state water disputes within a given country, though some of the policies recommended for international river systems have some relevance to inter-state rivers (Chapman and Thomsan,1995; Benvenisti,1996; Biswas and Uitto, 2001; Gleick,2000).

¹ Some times spelled as Kaveri.

In this section, first I will examine some key considerations with regard to international water disputes. Then, the issues concerning inter-state water disputes are examined.

2.1 Theories and Principles for resolving international water disputes

Worldwide, there are 261 international river basins. A systematic study of the various water agreements is presented in the Transboundary Freshwater Disputes Database (TFDD) project of Oregon State University (Giordano and Wolf,2003). This database also includes details of 149 international water related treaties and 34 inter-state river compacts in the USA.

Approaches to the resolution of international river disputes reflect various legal principles (see Benvenisti, 1996; Guhan,1993; Giordano and Wolf,2003). Some of the major legal principles are listed below:

- i. *The principle of absolute sovereignty*- where a riparian state may claim that it has absolute rights over a river flowing through its territory and that how it chooses to use those waters is its domestic concern and other states have no right to intervene or dictate. This is popularly known as the Harmon doctrine supposedly based on the opinion given by the American Attorney General Hudson Harmon in the case of Rio Grande river dispute between Mexico and the USA in 1895.
- ii. *The principle of absolute territorial or riverine integrity*- where a (lower) riparian claims that their right to the river's natural flow is absolute. Territorial integrity is interpreted in terms of historical or prescriptive rights or that the use of river waters are instrumental to the territorial integrity of the lower riparian and thus these are inviolable.
- iii. A related interpretation is known as the *principle of prior appropriation* whereby the riparian who has used the waters first can claim a right.
- iv. The principle of *limited territorial sovereignty* means that the rights of each riparian state are co-dependent and not absolute. This requires each riparian state to use the river waters without causing any harm to other riparians' use of the waters.
- v. The *principle of equitable allocation* or use is related to this and in this the river is considered as a common property and all riparians are expected to allocate waters equitably based on various factors.
- vi. The principle of basinwide management suggests that a river basin should be considered as a management unit no matter if it is spread across two or more nations. The economic efficiency approach for example is reflected in the view that the first best allocation of river waters is that which maximises the net present value of the social benefits. This is also referred to as the economic approach. It appears that a significant majority of the *inter-state river compacts* focus mainly on economic efficiency (for example,

McCormick,1994; Bennett et al.,2000). However, river water sharing instruments cannot be entirely based on economic efficiency grounds when such water is used for multiple purposes where it is not easy to interpret the principle of equitable distribution with ease. In such cases, a trade-off between different purposes could trigger conflicts among different stakeholder groups. Even if one purpose such as agriculture dominates others, arguments will persist if subsistence agriculture is wide-spread. In such cases, other than economic efficiency, aspects such as livelihoods and vulnerability also need to be considered.

Giordano and Wolf (2003) consider the absolute principles such as (i) and (ii) above to be *extreme* principles and other principles such as (v) and (vi) as *moderate* principles. The Helsinki Rules of 1966 drawn up by the International Law Association focused on reasonable and equitable use of international waters. These rules did not have the status of a law but were mainly considered to be guiding principles for legal interpretation in the case of international river disputes. The UN constituted the International Law Commission in 1970 and after more than two decades, the Commission's draft international bill was adapted by the UN General Assembly on 21 May 1997 as the UN Convention on the Law of the Non-navigational Uses of International Water Courses². As Giordano and Wolf (2003:74) point out, developing common legal principles that can apply to over 250 international river basins is doubtlessly a complex task and as a result it is inevitable that the principles will turn out to be general (and vague). However, both the Helsinki rules and the UN Convention focus mainly on the principle of equitable allocation while taking into account all other factors such as economic, environmental and social aspects in all the basin states.

Based on a review of the 49 international water accords and treaties, Giordano and Wolf (2003) suggest that there is a tendency of co-riparians to develop practices keeping in view basin-specific characteristics. Their analysis suggests that while river water disputes start with 'rights based' claims by upper and lower riparians, gradually they move towards a 'needs based' allocation requirements. Secondly, they note that river water treaties tend to protect prior-use clauses. They point out that the prior use of waters by lower riparians tends to be recognised and protected in the treaties (though this does not mean that lower riparians get more quantity of water). Thirdly, while it is unlikely that a river treaty is based entirely on economic principles, they point out that many treaties do include economic efficiency considerations. Fourthly, while international efforts such as the UN Convention tend to draw up general principles to accommodate as many different river sharing issues as possible, they note that in each case, the riparians tend to identify and develop provisions that address issues specific and local to the river concerned. Based on their analysis, Giordano and Wolf (2003:78-79) identify four characteristics of effective treaties. (i) Effective treaties provide for flexible and adaptable management structure. (ii) "Effective treaties identify clear allocation schedules [for the release of waters]

² This was open for signatures and was to enter into force when 35 states have ratified the convention. As of 15 August 2002, 20 states have signed the convention. See international law commission's site at URL http://www.internationalwaterlaw.org/IntlDocs/Watercourse_status.htm. The riparian states are referred to as 'watercourse states'.

while simultaneously providing for extreme hydrological events, new understanding of basin dynamics, and changing societal values." (iii) Successful treaties tend to focus on equitable distribution of final benefits rather than equitable use of water itself. (iv) Effective treaties include clear mechanisms for conflict resolution. Interestingly, the need for flexible systems of norms and sanctions is also recognised at microlevel studies of collective action (Bardhan,1995; Anand,2003).

2.2 Resolution in inter-state water disputes within a nation

Dispute resolution in the case of intra-national waters requires a different approach, where (a) escalation of dispute into armed conflict or war is not possible: and (b) the federal government, national constitution, and the supreme court can provide opportunities for intervention. In the case of India, river Cauvery dispute has received some attention (Guhan,1993; Jeyarajan,1998; Iyer, 1999; Pelkey, n.d.). However, the structural or systemic aspects of the water disputes or the factors that are likely to promote co-operation remain to be examined.

Some of the main causes of a river water dispute are contested property rights, changes in established rights or use patterns, the degree of asymmetry, and the scope for collective action. These are considered in this section.

a. Property rights dimensions

With regard to *contested property rights*, the main issues are: whether any property rights exist in the first place; how these property rights are defined; how they are distributed; whether these are essentially riparian rights (appropriation) or use-preserving rights³; whether it is possible to monitor the use; whether an enforcement mechanism exists and in case of disagreement, who intervenes. Water is a fugitive resource that cannot be easily contained by political boundaries or property rights. The various institutions and allocation mechanisms that work very well in case of other liquid (and somewhat fugitive) resources such as petroleum cannot work in the case of water for two major reasons. First, unlike petroleum, water is not merely an input into production processes but is essential for life⁴. This is recognized and codified into religious or cultural values concerning rights over water in different societies. Such values seem to be operating fairly successfully at the level of an individual⁵. However, they are not adequate to guarantee water security at the level of a collective, such as a nation or a region or a city. Secondly, because of the fugitiveness of water, property right institutions are far more contested than in the case of resources such as petroleum. Two types of property rights for allocation of water are predominant: the concept of inalienable right attached to property rights to land (in the case of groundwater)

³ This is specially relevant when the two riparians have two different uses of the river as their first priority. For example, an upper riparian may consider irrigation as first priority. This may affect volumes and flows and if the lower riparian has navigation as the first priority, they may not challenge the upper riparian's right to withdraw water but may want a limit imposed to preserve their navigation.

⁴ Though vast quantities of water are used mainly for agriculture, it is difficult to develop property right institutions to isolate productive use of water from consumptive use.

⁵ Hence, it is highly improbable that *thirst* and lack of water is recorded as the primary cause of death of an individual in any society.

and the riparian rights based on *prior appropriation* doctrine in case of surface sources such as rivers and lakes. However, in both cases, private decisions have significant externalities on others. As a result water extraction involves a conflict of common property and private property mechanisms.

Quite often, a dispute is triggered by a change in established use patterns or appropriation regimes. For example a decision to alter the volume of flow or withdraw water by building a new dam or other impounding structures or decisions that affect the quality of water (for example, through pollution) fall in this category. Because river waters can be used for several purposes and because use of upstream waters for some such purposes can preclude certain other uses downstream, there is scope for dispute.

b. Aspects of asymmetry

The *degree of asymmetry* between the riparians is an important element of whether a co-operative outcome will emerge or not. Asymmetry has two dimensions. Locational asymmetry means that the actions of the upper riparians can produce an externality on the lower riparians but not *vice versa*. Power asymmetry means that the riparians are not equals. In the context of international rivers, the hegemonic theories of power can be used. For example, in the case of international river basins in the Middle East, Lowi (1993:203) argues that co-operation cannot be achieved unless the dominant power in the basin accepts that or has been induced to do so by external powers. So in her view, co-operation amongst riparians occurs only if: "(1) the dominant power's relationship to the water resources in question is one of critical need, linked to its national security concerns, and (2) it is not the upstream riparian". As Lowi (p.73) observed in the cases of Euphrates, Indus and Jordan basins, the relative power between riparians can change over a period of time.

It appears that one of the reasons for the success of the Indus Waters Treaty is that a situation of asymmetry has been converted into symmetry by treating each tributary as a single unit and allocating in its entirety to one of the parties (Lowi,1993; Iyer,1999). Such 'no inter-dependence' approach can work when there is scope for sharing a number of rivers rather than sharing the waters of a given river.

Asymmetry of power is more difficult to define in the case of inter-state rivers than in the case of international rivers. Here, relative power relates to the nature of federal and state relationships, the constitutional status of river waters and the political self-interest of federal government regime. The distribution of power between riparian states depends on their relative population (and hence, their ability to control any vote in the national parliament); the strength of the ruling coalition in the federal government; whether one or more of the riparians have alternative water sources. Experience in India suggests that when federal government is strong (i.e., a single party has sufficient majority in the federal parliament), it can coerce riparian states to come to an agreement. When federal government is weak (i.e., a coalition with a small majority), it may have a self-interest in keeping river water disputes alive. Similarly, the strength of state legislatures can also have significant influence. Six possibilities can be considered as shown in table 1 below. For simplicity, it is assumed that there are only two riparian states (one upstream and one downstream).

Table 1: Asymmetry- Six possible situations for river water disputes⁶

	Federal government is <i>Strong</i>	Federal government is <i>Weak</i>
Both riparian states are weak	<i>Case A</i> Minimal scope for dispute: federal government can coerce agreement	<i>Case B</i> River water sharing agreement, if any, is likely to remain a short-term and informal arrangement.
Powerful state is the upstream riparian	<i>Case C</i> River dispute arises if federal government intervenes on behalf of the downstream riparian	<i>Case D</i> No river dispute: Agreement will be determined by upstream riparian
Powerful state is the downstream riparian	<i>Case E</i> River dispute arises if federal government intervenes on behalf of the downstream state	<i>Case F</i> There is scope for self-enforcing agreement between the two riparians

As in the case of international rivers, in the case of inter-state rivers too, *the scope for mediation* by third party (namely, the federal government) is crucial. If third parties cannot intervene, a co-operative solution needs to evolve only through mutual consent of the disputants. With regard to the role of federal government, three different scenarios are possible. The first scenario is of a strong federal government and weak state governments (case A). In such a case, the federal government can decide river water allocation and wield its power to enforce a solution. The second scenario is of strong states and weak federal government (case D or case F). Co-operative outcome depends mainly on whether the more powerful state is upper or lower riparian. The federal government is essentially a weak observer with no or limited scope to intervene. The third scenario is of volatile distribution of power (case B, case C or case E). In such cases, a competition may ensue between the two disputing riparians to woo the central government to support their cause.

It is also possible to interpret asymmetry from a game theoretic model. Usually, the prisoner's dilemma (PD) model is used as an example of two person co-operation issues. In the classic PD model, two individuals are confronted with a single period co-operation decision: whether to co-operate or defect. Each agent considers the pay-offs of co-operation and defection and finds that no matter what the other agent decides, it is in her self-interest to defect. This model can be extended to sequential (multi-period or repeated) game where agents may decide their strategy after taking into account the other agent's actions in the previous rounds. If played over

⁶ Here 'strong' federal government means where the federal government has the powers to act independently and influence decisions about inter-state river waters. A weak federal government is one which cannot intervene without the consent of the states concerned.

sufficiently large number of turns, the norm of reciprocity may influence over lead to the agents' strategies converging towards Nash equilibrium of co-operative outcome.

An alternative model which may be relevant in the cases of river water disputes is known as the chicken game (CG). In this, each agent/player tries to push the situation towards brinkmanship with a view that one of the two players will have to 'chicken out' to avoid catastrophe (see Hardin,1982; Sandler,1992; Hirshleifer, 2001; Dixit and Nalebuff,1993). Thus, each player asserts that their position is the correct one and that the only way to resolve the issue is for the opponent to modify their position. In the short term, this appears like a deadlock and if there is no inter-dependence the situation can remain in a status quo forever. Think of a draw in a game of chess where both players have a small number of pieces with no asymmetry. However, in real life, states sharing rivers also tend to share other things and this inter-dependence suggests that a chicken game cannot continue endlessly.

c. River water disputes as collective action problems

River water dispute, as a situation that requires actions by more than one party, is a situation of collective action (see Sandler,1992; Anand,2003). Two or more agents, need to take an action that produces some collective benefits. In the case of river waters, agent 1 can be an upstream riparian. Left to themselves, they would like to withdraw all the quantity of water that they can potentially withdraw and use. Agent 2, the lower riparian imposes a limit on the quantity that agent 1 can withdraw. Left to themselves, the lower riparians would like to prevent the upper riparian from using any water at all from the river and thus, ensure that the entire river flow is available only for downstream peoples. Collective action, is, however not costless⁷. Olson's seminal analysis suggests that collective action will take place only if benefits to the individual agents exceed costs to themselves. For the upper riparian, the cost of collective action is the water foregone (and the attendant reduction in patronage that can be distributed). Similarly, the lower riparians would like to press for as large a claim as possible. The cost to them is in terms of loss of credibility of the claim (and the scope for entirely losing the riparian right). The true costs and benefits are only known to the agents and are difficult to assess. Hence, the difficulty in predicting when collective action works and when it may not work.

Related to this is the question of whether there is any issue-linkage. Suppose that two riparians share a river but also have other transactions (say, a joint police task force to nab a gang of brigands using a forest on the border between the two states or narcotics control operations). The rivals may determine their strategy of whether to co-operate or not on one issue depending on what the other did in case of the other issue/s. For example, a tit-for-tat strategy means non-co-operation on other issues may trigger non-co-operation in sharing river waters and vice versa. A further issue relates to

⁷ From a purely theoretical point of view, it is also possible to use a Coasean bargain framework to depoliticise the riparian rights. However, for Coasean trading to work, the riparian rights must be finally linked to quantities of water and how such quantities are valued. Valuation of water as an input in production process may be feasible but such valuation may be irrelevant or very inequitable in case of drinking water security issues. Apart from the ethical dilemmas, politically, such a framework is almost impossible. Why should any rational, self-interest maximising political party willingly give up its source of power?

whether each of them uses a 'compensatory' framework where shortfall in one aspect can be compensated with improvement on another aspect. Thus, whether or not two riparian states will co-operate depends on (a) whether the river is the only transaction between them; (b) if not, whether there is any issue-linkage; and (c) if so, whether the issues are considered in a compensating framework or whether they are considered to be discrete entities.

Thus, a range of scenarios exist and the policy choice depends on whether the central government is stronger or weaker than the states, whether the riparian rights are clearly identifiable, whether there can be gains from specialisation among the disputant states and so on. In the absence of a recognition of such factors, a 'one size fits all' approach to river water disputes leaves it *ad hoc* and reactive.

2.3 Experiences with regard to resolving river water disputes

As already noted, there is considerable literature on international river basins and their management responses. However, literature on inter-state disputes within a federal context, is rather scanty. In this section, two illustrative examples one from Australia and one from the USA are briefly considered.

Case study 1: Murray-Darling Basin⁸

The Murray-Darling basin initiative is considered to be the largest integrated catchment programme in the world. The watershed area of the two rivers totals about 1 million square kilometres. Murray river, apart from being a source of water for agriculture and water supply, is also used for navigation. When attempts were being made to divert Murray waters for irrigation in around 1880, the conflicts surfaced. The sharing of waters became an important issue by the time the Australian Federation constitution came in operation in 1901. A severe drought from 1895 to 1902 and a non government initiative for a conference in 1903 facilitated various colonies and states to come together. However, the River Murray Waters agreement did not emerge until 1915. This agreement was signed by the Federal government of Australia and the governments of New South Wales, Victoria and South Australia. The agreement provided for various storage schemes to be constructed. The River Murray Commission was created with the responsibility to ensure that the main river stream was maintained and that three states received their shares as per the agreement. Until the late 1960s, the Commission focused mainly on water quantity. While investigating salinity issues in the 1960s, the Commission gradually enlarged its focus to include water quality issues. By 1980s, it was becoming clear that water resources management cannot be confined to water alone but must be considered along with water quality, environmental issues and land management concerns. In 1985, a meeting of various ministers dealing with these and other issues in Adelaide, ultimately led to the 1987 Murray Darling Basin agreement between the federal government and the three states as an amendment to the Murray Waters Agreement. This was replaced by an entirely new agreement in 1992. Two other members joined subsequently- Queensland in 1996 and Australian Capital Territory in 1998.

⁸ Information for this case study is mainly from Murray Darling Basin initiative's website: URL <<http://www.mdbc.gov.au/>>

The agreement provides for three institutions. The MDB ministerial council is the primary decision making body. It comprises land, water and environment ministers in the party states. From each state and federal government, up to three ministerial members can sit in the council meetings. ACT government member sits on the council as a non-voting member. At the bureaucratic level, the agreement provides for the MDB Commission which is the executive arm. The commission is an autonomous organisation equally responsible to the governments of the agreement. Apart from the President, it has two commissioners from each state. The commissioners are the chief executive and senior executives of state agencies responsible for land, water and environmental policies within the state. The commission is also responsible for monitoring water quantities and quality of water in the Murray River (article 41). There is also a community advisory committee consisting of individuals and members of networks from the MDB area. This committee's responsibility is to advise the Ministerial Council from a community point of view. While it is recognised that there are limits to participation in a multi-jurisdiction river basin, nevertheless, community participation is considered as one of the crucial elements to the robustness of MDB (Chenoweth et al, 2002).

The costs of programme and projects are apportioned to the state governments equally unless the council decides otherwise (article 65). Any state drawing a plan or project proposal that is likely to affect the flow of water in the river is obliged to inform the commission (article 46). The commission is required to conduct an environmental assessment of such proposals (article 47). Goss (2002) notes that the recently created Environmental Manager role in the Commission in relation to the integrated catchment management programme and the sustainable rivers audit is expected to contribute to strengthening accountability in this respect.

Case study 2: Inter-state river compacts in the USA

In the USA, the allocation of waters of many inter-state rivers are carried out through a mechanism of inter-state river compacts. These compacts are essentially negotiated contracts between states. Benvenuti (1996) provides a detailed study of the inter-state river compacts and various design considerations from a collective action perspective. Bennett et al (2000) focus on economic efficiency arguments. Most recently, the sharing of Missouri river waters has emerged as a prominent dispute. Missouri is an inter-state river involving seven riparian states from Montana to Missouri. A system of dams has been built on the basis of a 1944 flood control legislation to control river flows. This system of dams is maintained by the Army Corps of Engineers. Due to prolonged drought in 2002, the Federal government intervened to change the existing legislation to change flows in the river. The core of the present debate is a tension between protecting fishing and recreation uses in the upstream states versus maintaining river flow (volume of water) for navigation in the midstream states and the possible effects of fluctuations in flows for downstream end states. According to reports in the *Columbia Daily Tribune*, the states of Montana and Dakotas claim that release of waters from the dams in their states to maintain navigation in downstream states adversely affects fishing and recreation uses which according to them is crucial to their economies. According to the lawyers representing Missouri, the people of that state which is at the downstream end of the river are worried that changes to spring

and summer flows will increase their vulnerability to floods and droughts respectively.

Arkansas River dispute has been another long standing dispute⁹. The river compact for sharing of the waters between Kansas and Colorado was signed in 1949. However, in 1985, Kansas state brought a case before the US Supreme Court claiming damages on the grounds that for years Colorado has been permitting farmers to develop wells which have affected the flow of water to Kansas. In its judgement of 1995, the Supreme Court ruled that while the agreement was not intentionally violated by Colorado, it amounted to violation of the agreement in terms of drawing more quantity of water than it was entitled. Following this, the dispute focused on the amount of compensation for Kansas and how the river should be managed in future. The claim from Kansas was to the tune of \$53 million. The Supreme Court appointed a Special Master to examine the claims and make a report. While the Master's final report is awaited, the draft report is said to have placed the compensation at \$29 million (closer to the amount suggested by Colorado).

Discussion of the two case studies:

A number of factors seem to have contributed to the success of the MDB initiative. The issue was active at the time when the constitution of Australia was being considered. This in itself may not be an important factor but may have helped in developing a flexible institutional structure for decision making in the case of the River Murray. Secondly, the main tension in the case of this river is between withdrawal of water for consumption versus maintaining river flow (for navigation). In some ways, this tension seems to have favoured a conciliatory approach. Thirdly, during the last three decades, the scope of the initiative shifted away from narrow focus on water quantities to include water quality, later environmental objectives including habitat protection, biodiversity and linked with land management perspective. This has also reflected in management mechanisms such as Fourthly, this enlargement in focus was matched by appropriate organisational structure for instance, in the composition of the MDB Council. Fifthly, apart from political representation, a more direct role was also created for community consultation and participation of stakeholders. Finally, while the primary decision making body remained a political council, the technical and executive responsibilities are devolved to an autonomous Commission. This approach seems to have been used later in Mekong River Basin as well (see Nakayama,2003).

Going back to the four characteristics of effective treaties as identified by Giordano and Wolf and discussed in the previous section, we find that the MDB initiative scores well on all four of those dimensions. The Council-Commission provides the flexible management structure. The inclusion of ministers responsible for land and environmental issues suggests how the institution was adapted to the changing needs. Clear allocation rules are strengthened through integrated management and sustainable river audit methods. Focus on broader environmental concerns also reflects an emphasis on equitable distribution of final benefits rather than merely quantities. Some provisions are laid down for conflict resolution.

⁹ See <http://www.uswaternews.com/archives/arcrights/2kanand9.html>

On the other hand, the river compacts approach in the USA seems to score high on conflict resolution mechanisms but somewhat low on the other three dimensions. Specially, there is little emphasis on equitable distribution of final benefits of water.

3. River water disputes in India

In India, until the Montagu-Chelmsford reforms in 1919, water and irrigation were part of the public works department. In these reforms, the responsibility for irrigation was given to the provincial governments and the Government of India's role was confined to advice, co-ordination and settlement of disputes over inter-provincial rivers¹⁰. This role continued after Independence in 1947 in terms of the provisions in the Constitution of India. The Seventh Schedule to the constitution determines the legislative domain of federal and state governments. Water is a state subject and is included as entry 17 in list 2 (i.e., subject matters for state legislation). This entry reads: "Water, that is to say, water supplies, irrigation and canals, drainage and embankments, water storage and water power subject to the provisions of Entry 56 of List I". The role of federal government is stipulated in entry 56 of list 1: "'Regulation and development of inter-State rivers and river valleys to the extent to which such regulation and development under the control of the Union is declared by Parliament by law to be expedient in the public interest'". Further, article 262 of the constitution empowers the Parliament to make laws for the adjudication of inter-state water disputes. That article also permits the Parliament to exclude such disputes from being referred to the Supreme Court.

The Inter States Water Disputes (ISWD) Act, 1956, was enacted by the Parliament to deal with inter-state disputes. If one or more riparian states of an inter-state is/are of the opinion that their interests are (or are likely to be) affected by actions or plans of other states, they can request the government of India to constitute a tribunal under the Act. Within one year of receiving such a request and when convinced that such dispute cannot be resolved through negotiations, the government of India shall constitute a tribunal to hear the disputes concerning claims of water sharing and adjudicate an award. Such a tribunal should have three members who should be judges of the supreme court or the high court and are appointed by the Chief Justice of India; the government of India can appoint up to two assessors to assist the tribunal; after considering all the aspects as may be necessary, the tribunal gives its report to the government of India; if the riparian states or the government of India need any clarification, they can apply seeking such clarification from the tribunal; the tribunal may give further clarifications. Then the report, called award, is published by the government of India in the official gazette. Once it is published, the award is binding on all the parties and it is deemed equivalent to an order or decree of the Supreme Court. The act also empowers the central government to make schemes and constitute an authority to implement the tribunal's award.

So far, five Inter-state water disputes tribunals have been constituted, namely: Krishna Water Disputes Tribunal (constituted in January 1969; final report given in 1976); Narmada Water Disputes Tribunal (constituted in October 1969; final report given in December 1979); Godavari Water Disputes Tribunal (constituted in April 1969; final

¹⁰ See Ministry of Water Resources website < <http://wrmin.nic.in/welcome.html> >

report given in July 1980 incorporating various out of court bilateral and trilateral agreements among riparian states); Ravi and Beas Waters Tribunal (constituted in April 1986) and the Cauvery Water Disputes Tribunal (constituted in June 1990). See Salman (2002) and Iyer (2003) for a discussion on these aspects. Considering that 9 out of the 12 major rivers in India are inter-state rivers, it appears that not every inter-state river is a source of dispute¹¹.

The nature of relationship between the federal and state governments has significantly changed from that of the 1950s when the ISWD act was created (see Kohli,1990; Varshney,1998; Dasgupta,2001). In the 1950s, the Indian political space was essentially uni-polar with the Indian National Congress having an unassailable position as the lead party in national government as well as in many states. By mid 1980s, this position began to change with the emergence of regional parties. Since 1989, it became necessary for coalitions to be formed to command a majority in the lower house of the Parliament and thus form the national government. There is, therefore, a need to examine the potential of pro-active, consensus based and flexible approaches. However, the present scheme of things very much relates to the discussion of asymmetry in the previous section and until recently, the federal government could 'sit on' requests for constitution of tribunals indefinitely.

Many important provisions including the limit of one year from the date of receipt of a request by government of India to constitution of a tribunal, the requirement for the tribunal to give its award within three years (with a proviso that government of India can extend this by another two years), the provision for central government to appoint two assessors to assist the tribunal and so on were introduced through a recent amendment to the Act in 2002.

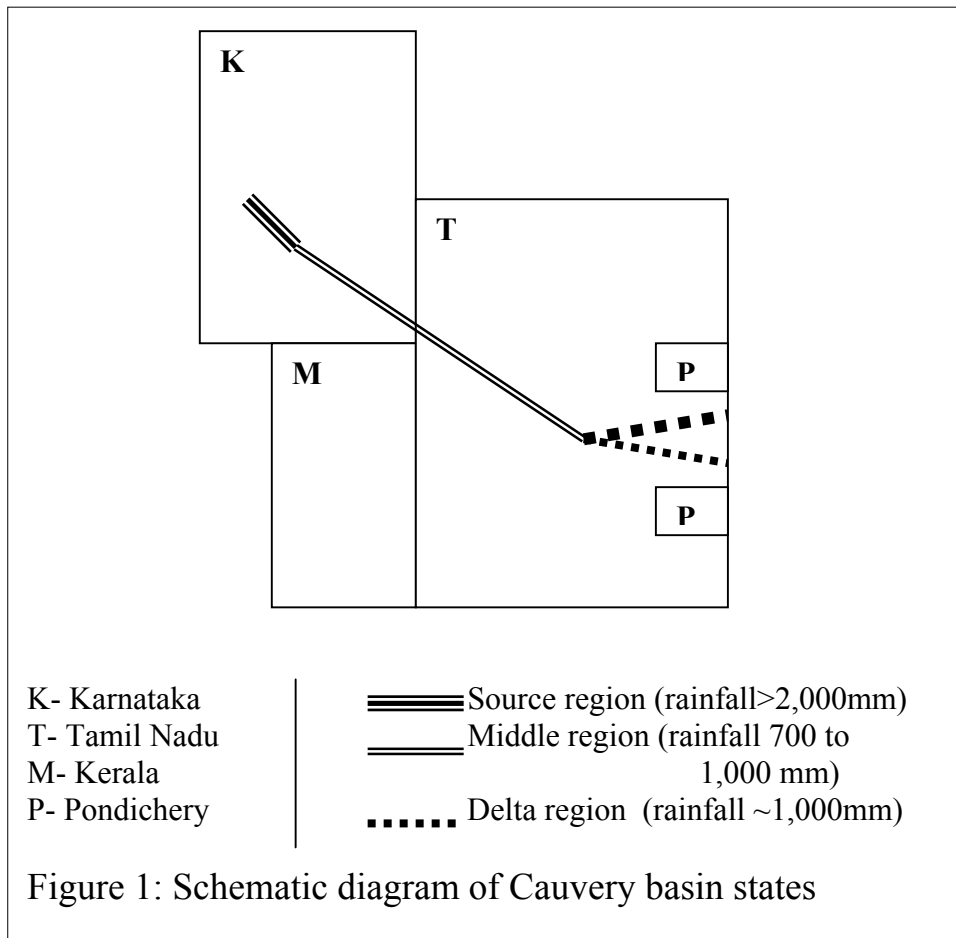
4. The Cauvery River Dispute

River Cauvery is a peninsular river in southern India. Its origin is in the Western Ghats and it is a perennial river fed by rain waters. It is of about 800 km long with a drainage basin estimated to be about 81,000 square km¹². Though the states of Karnataka (K), Kerala (M), Tamil Nadu (T) and Pondichery (P) are riparian states, the river flows mainly through K and T states and discharges into the Bay of Bengal. The river basin consists of three distinct areas (see figure 1). The part of the basin at the source of the river is in Western Ghats and it receives annual rainfall of over 2,000 to 2,500 mm mainly from the South West monsoon (June-September). The middle section of the basin consists of many of the Cauvery districts in K and T where the annual rainfall is in the range of 700 to 1,000 mm. The third section of the basin is mainly the delta region in T including the districts of Tiruchy, but mainly Tanjavur, Tiruvarur and Nagapattinam. Here too, the average annual rainfall is around 1,000 mm but mainly from the North East monsoon (October-December).

¹¹ The twelve major rivers are: Indus, Ganges-Brahmaputra, Sabarmati, Mahi, Narmada. Tapi, Brahmani, Mahanadi, Godavari, Krishna, Pennar, and Cauvery. The first two are also international rivers. See Government of India, Ministry of Water Resources web page URL <<http://wrmin.nic.in/resource/wresource1.htm>>.

¹² For comparison: Thames has a length of 340 km and a drainage basin of about 10,000 sqkm.

Much of the dispute concerns the quantity of water. Hence, the following figures about the quantity of flow are only a guideline and not authoritative. Based on the data for the period of 1934 to 1972, Guhan (1993) reports that the total yield of water from Cauvery per annum was 670 TMC ft¹³ at 75% dependability and 740 TMC ft at 50% dependability. The claims made by the four riparian states total about 1,150 TMC ft. A majority of these claims are towards irrigation. Industrial and drinking water supply requirements are estimated to be less than 100 TMCft. This includes 30 TMCft of water allocated for water supply to Bangalore city. The Cauvery system includes many tributaries some entirely in K and some entirely in T.



3.1 The 1892 and 1924 agreements

In any major river water dispute, the bone of contention is about rights over resources. In most cases, the riparian rights are customary rights based on prior use rather than statutory rights and these are based on agreements made several decades ago, for historical, social and political rather than economic reasons. For example, in the Cauvery dispute this goes back to an agreement between the then states of Mysore

¹³ 1 TMCft= 1 thousand million cubic feet = 27 million cubic metres.

and Madras¹⁴ in 1892. At the time of this agreement, the then Madras state was under the British administration while Mysore was a princely state. For a short period of time between 1831 to 1881, both Madras and Mysore were under the British administration. During this period, irrigation projects were continued in both Mysore and Madras. According to Guhan (1993:8-9), a master plan was prepared in 1866 for restoring and improving tanks and other irrigation works in Mysore and these were approved by the Secretary of State in 1872. However, due to 1877 famine, public works programmes were severely curtailed and interest in irrigation schemes was revived after the transfer of Mysore to Maharaja's administration in 1881. Madras state raised concerns about the proposals for expansion of irrigation by Mysore and after about a decade of correspondence, a conference was held in 1890 with the objective of agreeing "...on the principles of a *modus vivendi*, which would on the one hand allow to Mysore reasonable freedom in dealing with her irrigation works, and on the other, give to Madras practical security against injury to her interests" (c.f. Guhan, 2003). Following this conference, various rules were identified and agreed by both states and in effect formed the 1892 agreement. As per the agreement, Mysore state should not erect any new irrigation reservoirs across any of the main rivers without the prior consent of Madras state. When any new irrigation scheme is proposed, all information about this should be shared with Madras state and its consent is essential before any work commenced. The agreement also stipulates that the Madras government is bound not to refuse consent except for the protection of prescriptive right already anquired and actually existing. Between 1900 and 1910, both Mysore and Madras states developed proposals to irrigation projects. The former was known as Kannambadi dam project (now Krishna Raja Sagar or KRS); the latter was known as Cauvery-Mettur project (now referred to as Mettur reservoir). Guhan (1993:11) notes that both states were exchanging details of the proposals and were also corresponding with the Government of India. The KRS project envisaged two phases; in phase 1 the dam was to create a storage of 11 TMCft; in the second phase the capacity was to be increased to 41 TMCft. While Madras gave its consent to the first phase, it wanted the Government of India to ensure that the consent should not be given to second phase until assurances are given that water requirements of Madras will not be adversely affected. During 1910 to 1924, a number of discussions took place and on the basis of these, the 1924 agreement emerged.

Under this agreement, the Madras state gave its consent to the KRS project with storage up to 44 TMCft. The Mysore government was required to regulate the discharges and ensure flows as per the rules in the annexure to the agreement. The agreement also stipulated that new irrigation in Mysore (over and beyond what was already existing or those permissible under the rules) to 110,000 acres. Similarly, the Madras government agreed to limit new area of irrigation from the Mettur project to 301,000 acres. The Mysore government was also permitted to extend irrigation in the main rivers of Cauvery to an effective storage capacity of 45 TMCft. Both states agreed to inform each other of any proposals for new projects. It was also stipulated that the limitations mentioned in the agreement should be open to reconsideration at

¹⁴ After Independence, states in India were re-organised in 1956. Mysore state became Karanataka; a part of Madras Presidency became Tamil Nadu state. A part of Madras Presidency became part of the Andhra Pradesh.

the expiry of 50 years. It is due to these agreements that the stretch of river between KRS and Mettur Dam acquired the centre-stage in Cauvery water dispute.

The 1924 agreement was in some respects ahead of its time. However, through the benefit of experience we can now see that the agreement did not meet with the four characteristics identified by Giordano and Wolf. It does not provide for a flexible and adaptable management structure. While it does stipulate clear allocation mechanisms, it does not include extreme variations due to hydrological events and how the flow patterns and distress should be shared in such cases. The emphasis was very much on equitable distribution of quantity of water rather than final benefits. It includes limited provisions in relation to conflict resolution.

3.2 Milestones in the River Cauvery dispute- 1970 to date

According to the Government of India (2001), the main milestones concerning the dispute are the following:

- a) The 1924 agreement provided that it should be open for reconsideration at the expiry of 50 years.
- b) Discussions between K and T during the 1960s and 1970s did not produce an agreement. According to Guhan (1993:29), between 1968 and 1990, there were 26 ministerial meetings concerning the Cauvery river; 5 of these were bilateral meetings between K and T and 21 were tripartite meetings involving the Union Minister for irrigation as well. He also notes (p.34) that while some progress was made on technical proposals during 1972-76, these technical discussions did not result in political agreement. According to him, when the government of India played a mediating role as in 1972-76 period, an agreement was more likely. However, elections in 1977 changed this scenario.
- c) By 1981, the claims from the riparian states became quite divergent. The government of K claimed 465 TMCft of water; Kerala claimed another 100 TMCft; Pondichery's claims were for 10 TMCft. This adds up to 575 TMCft. Government of T wanted the flows to be in accordance with the 1892 and 1924 agreements. In its view, the existing utilisation suggested that the total amount of Cauvery water used was 748 TMCft; of which T (including P) used 566 TMCft; Karnataka used 177 TMCft and Kerala used 5 TMCft.
- d) The government of T made a request to the federal government in 1986 to constitute a tribunal under the ISWD Act, 1956. The tribunal was constituted in June 1990.
- e) One of the main issues raised by T is to stop K from using any more waters of Cauvery and to maintain a *status quo* as of May 1972. For this, T wanted the tribunal to restrain K from constructing any new projects or dams etc. T also wanted the tribunal to direct K to make 'timely and adequate release of waters'.

- f) In January 1991, the tribunal gave an interim award directing K to ensure that 205 TMCft of water is available to Tamil Nadu. The year for this purpose is from June to May. The tribunal specified the quantities that K must release each month.
- g) The government of K was not happy with the interim award and passed an ordinance rejecting the validity of the award. Governments of T and P on the other hand requested the central government to publish the order in the gazette to give it a finality. The central government referred the matter to the Supreme Court.
- h) The Supreme Court clarified various legal issues, held the K ordinance to be ultra vires and asked the tribunal to consider the appeals on merit. The central government published the interim award of the tribunal in central government gazette in December 1991. Protests ensued in K and in the resulting tension up to 25 people were killed (Guhan, 1993).
- i) The Tribunal had to be reconstituted in January 2003 following the death of one of the members. The Tribunal was duly reconstituted and it has since considered all 50 issues framed for its consideration and grouped them into three groups, namely (i) the 1892 and 1924 agreements; (ii) availability of water- surface flows, additional/alternative resources and (iii) Equitable apportionment. As of March 2004, the Tribunal has completed hearing both parties with regard to issue groups 1 and 2. It is expected that the Tribunal will finalise its award towards the end of 2004 or early part of 2005.

Though the interim award was given in 1991, the matter remained contested until 1998. In August 1998, the federal ministry of water resources constituted two institutions as per the ISWD Act.

- a) The Cauvery River Authority (CRA) with the Prime Minister as the chairperson and the chief ministers of the four states of K, M, T and P as members. The purpose of this authority is to implement the interim award of the tribunal.
- b) The Monitoring Committee, mainly consisting of various federal and state civil servants and a few technocrats. The purpose of the monitoring committee is to collect data, monitor the implementation of the decisions of the authority and in case of any difficulty, to refer the matter to the CRA.

The authority has met six times until February 2003. As per the rules, the quorum required is 3 members (i.e., chief ministers of at least three states out of K, M, T and P). However, in November 2002 and again in January 2003, a meeting of the CRA had to be cancelled at the last minute due to lack of quorum. Later, the Supreme Court directed that quorum is not necessary. In February 2003, the CRA directed K to release a certain amount of water so that crops in T can be saved. Soon after the meeting, the chief minister of K said that he was “unhappy” at the decision; ironically

the chief minister of T also said that she was “terribly disappointed”¹⁵. The dispute persists and it was observed to be an important political issue in the recently concluded (April-May 2004) general elections to the lower house of Indian Parliament and also the state legislature of Karnataka. It is seen that the Common Minimum Programme of the United Progressive Alliance led by Congress includes the resolution of Cauvery dispute as a priority. Also, in the last week of May 2004 and first week of June 2004, delegations of members of parliament from both K and T states have been meeting with the Prime Minister seeking his intervention with regard to the release of waters.

3.3 The main sticking points in Cauvery Dispute

While the Cauvery dispute is fairly complex, in this section an attempt is made to summarise the main sticking points from each riparian’s viewpoint.

(a) The main arguments of K:

The main arguments are presented by each state to the Cauvery Tribunal and these arguments are not in the public domain. However, from the material that is available in the public domain, mainly a set of three volumes published by the government of Karnataka¹⁶, and from the statements made by state political leaders and reported in the newspapers, the following five main points can be identified.

First, K’s claim is that at the end of 50 year period in 1974, the 1924 agreement in its entirety should be deemed to have expired. Therefore, claims based on that agreement should not determine allocation of waters today. According to K, the 1924 agreement was made at a time when T was under the British rule and K was under Maharaja’s administration when K did not have the freedom to argue strongly to put forth its interests.

Second, in K’s view, the farmers in the upstream areas have as much right to irrigate and grow crops as do farmers in the downstream areas. K’s claim is that the so called prescriptive use of downstream farmers is essentially because such areas were under the British administration which could use its authority and powers to extract more waters to downstream needs than would normally be the case.

Thirdly, it is argued that K is mainly dependent on the South East monsoon (June-September) which contributes significantly to the flow in river Cauvery. On the other hand, it is argued that while T is pressing for claims, T also benefits from a significant amount of rain from the North East monsoon (October-December). It is, therefore, suggested that a claim on Cauvery waters ignores this unequal distribution of rainfall and the resulting runoff. While T does not have to share any water from its N-E monsoon, K is forced to share water from the S-E monsoon with T and this it is argued is inherently unfair.

¹⁵ See *The Hindu*, February 11, 2003 at URL <<http://www.hinduonnet.com/thehindu/2003/02/11/stories/2003021105540100.htm>>

¹⁶ Government of Karnataka, n.d.; Government of Karnataka, 2002a; and Government of Karnataka, 2003.

Fourthly, it is argued that a downstream state cannot make a claim when there is scarcity of water and inadequacy in upstream areas. Thus, it is argued that K can discharge waters to T only if there is adequate quantity of water to meet with K's needs. In recent years, this has been an important issue with regard to implementing the flow pattern as stipulated in the interim award of the Tribunal. The government of K finds itself in a difficult position to release waters to T when its own farmers face acute water stress. In 2003, reportedly a farmer in K committed suicide by falling in the reservoir¹⁷. The government of K is thus pushed into a tight corner whereby implementing the Tribunal's award in terms of flows in summer months is perceived by local farmers as denying water to them.

Fifthly, K's argument appears to be that riparian rights need to be reconsidered such that the share of water of the rivers is in proportion to basin area and contribution to the river flow. For example, according to Government of Karnataka (n.d.:10) the extent of Cauvery basin area and yield contribution are as given in table 2 below.

Table 2: Cauvery basin area and yield contribution by different riparian states according to Government of Karnataka (n.d.:10).

	K	T	M	P
Basin area in sq km (% of total basin area)	34,273 (42.2%)	43,868 (54.3%)	2,866 (3.5%)	148
Drought area in the basin in sq km (% of basin area in the state)	21,870 (63.8%)	12,790 (29.2%)	--	--
Yield contribution in TMCft	425 (53.8%)	252 (31.9%)	113 (14.3%)	

The argument seems to be that K's claims over Cauvery waters must be seen in the context of its contribution to Cauvery flow and also its needs in terms of drought prone area in the basin.

(b) The main arguments of T:

In the case of T, there is no published information from the government in the public domain to gauge government's stance. On the basis of reported items in the newspaper media and occasional statements in the Policy Notes in the State Legislature, the following points can be identified.

According to T, the 1924 agreement is foundational to the development of key projects in both the states and therefore, it cannot be changed now as any such change will have significant detrimental effects. In T's view it appears that the provision of reviewing at the end of 50 years relates to various arrangements to implement the agreement rather than changing the core principles of the agreement itself.

¹⁷ Approximately, around 2,000 deaths per annum in K are said to be suicides. However, suicides amongst farmers in K appears to be mainly related to debts and financial crises (Menon, 2003). The Expert Committee on Investigating into Causes of Suicides by Farmers, set up by the government of K in its 2002 report identified alcohol, family problems and poverty as the three main causes of suicides.

Second, the long history of farmers in Cauvery delta irrigating and producing rice should not be denied. As the 1924 agreement recognised these prescriptive rights, these need to be protected. Farmers in K are not denied from using the waters but that there is a limit on the volume of water and area to be irrigated so that downstream users' rights are not jeopardised.

Thirdly, monsoon features are natural factors based on which claims cannot be made. These monsoon patterns have existed long before river water sharing agreements came into picture. The main point seems to be that K is free to exploit the S-E monsoon or other sources so long as the flow of water in Cauvery is guaranteed such that the downstream farmers' prescriptive right is not negatively affected.

Fourthly, T's argument seems to be that an inter-state river is a common property and not a private property of the upstream state. Hence, it cannot be argued that after the needs of one state are met, only excess waters, if any, will be released.

Fifthly, T seems to recognise that basin area, contribution to river flow and other factors can be taken into account. However, this needs to be applied to distribution of waters beyond those needed to meet the prescriptive rights of downstream farmers.

4. Identifying the key issues of Cauvery dispute

4.1 Is Cauvery so important to both states?

For the purpose of this analysis, I am focusing on data at state and district levels. By overlaying the river basin map available from the Ministry of Water Resources of Government of India on a map of districts, in my analysis, the following districts are identified as Cauvery basin districts.

In Karnataka- Kodagu, Hassan, Tumkur, Bangalore Urban, Bangalore Rural, Kolar, Mandya and Mysore of the southern Karnataka plateau are included in my analysis. Some areas in some of the other districts in central Karnataka plateau also are part of Cauvery basin but they are not included in my analysis here.

In Tamil Nadu- Erode, Salem, Namakkal, Karur, Tiruchy, Perabalur, Tanjavur, Tiruvarur and Nagapattinam are included. Some areas in the districts such as Coimbatore, Dharmapuri, Dindigal and Pudukottai are in the basin area. However, in my analysis I am not including these districts.

(a) Hydrology-Importance of Cauvery to state water resources:

In both T and K, there are also arguments that Cauvery is not the only source of water for either state. For instance, in the case of T, apart from Cauvery, there are 16 major river basins (The World Bank, 1995:293). Of course, compared to total surface water potential of T, estimated to be about 25,000 million cubic metres (Mcum), Cauvery alone accounts for 7,000 Mcum or approximately 30% of total potential. Based on figures from Government of Karnataka (2002b), in K, there are 7 river basins. The surface potential is estimated to be 79,000 Mcum at 75% dependability. If the west flowing rivers are excluded, the surface water potential is significantly lower than the

above figure and is around 32,000 Mcum. K's claim of 465 TMCft of Cauvery water works out to about 12,000 Mcum of this potential (approximately 37% of total potential). Thus, in both states, Cauvery water forms a very significant share of the potential.

That Cauvery contributes to a significant share of each riparian state's water resources is not a sufficient explanation of the dispute. In both states, a very high proportion of the Cauvery water resources are committed. This leaves limited resilience to cope with shocks and variations. In years of below average rainfall, the situation can reach flash-point quickly. To analyse this, I have attempted to look at the rainfall statistics. However, long term time-series data is available at state level for K only but not for T. District-wise data is available for period 1991 to 2002 for K and for period 1997-2002 for T. These are shown in tables 3 and 4 below.

Table 3: Annual rainfall (mm)-Cauvery districts and Karnataka average:1991-2002

Year	Kodagu	Hassan	Tumkur	Bangalore U	Bangalore R	Kolar	Mysore	Mandya	State
1991	2627	1272	911	1377	1210	1027	901	882	1251
1992	2942	1503	647	687	835	730	794	649	1333
1993	2156	999	728	941	982	813	731	730	1123
1994	3379	1322	614	654	678	590	957	690	1229
1995	2686	1196	516	661	673	645	663	616	1219
1996	2997	1272	684	787	873	834	911	844	1325
1997	3358	1585	624	799	828	631	875	826	1490
1998	2826	1258	727	934	1092	776	791	708	1479
1999	2939	1436	651	964	998	573	912	815	1431
2000	2835	1417	785	1053	954	788	955	898	1422
2001	2557	1206	618	723	797	802	743	691	1194
2002	2118	732	521	471	657	478	586	483	863
Mean	2785	1266	667	838	881	724	818	736	1280
SD	393.8	229.2	109.9	236.0	172.9	148.0	119.9	122.3	177.0
Mean/SD	7.1	5.5	6.1	3.5	5.1	4.9	6.8	6.0	7.2

Source: Department of Agriculture, Government of Karnataka.

Table 4: Annual rainfall (mm)-Cauvery districts and Tamil Nadu average: 1997-2002

	1997-98	1998-99	1999-2000	2001-2002			Mean	SD	Mean /SD
	Total in the year	Total in the year	Total in the year	SW mon-soon	NE mon-soon	Total in the year			
Erode	820	704	632	170	255	500	664	134.0	5.0
Salem	973	1194	1020	397	199	698	971	205.5	4.7
Namakkal	973	766	724	260	165	490	738	198.1	3.7
Karur	820	544	674	63	194	313	588	215.1	2.7
Tiruchy	820	822	751	198	243	552	736	127.2	5.8
Perambalur	820	1107	730	147	344	606	816	213.1	3.8
Tanjavur	1267	1111	942	264	450	989	1077	145.2	7.4
Tiruvarur	1813	1413	1275	213	463	973	1369	348.7	3.9
Naga-pattinam	1813	1470	1431	258	818	1447	1540	182.5	8.4
State average	1152	1080	897	260	379	795	981	164.0	6.0

Source: Data for years 1997 – 2000 from Government of Tamil Nadu, 2000; data for 2001-2002 from Government of Tamil Nadu, 2002.

The above tables confirm the point made in the introduction to section 3 about the three distinct areas of the Cauvery basin, namely the source region mainly in Kodagu district (rainfall above 2,000mm); much of the middle region with low rainfall (600 to 1,000 mm) and the delta districts benefiting from NE monsoon (1,000 to 1,500 mm). Another important conjecture that can be drawn is that the variation in rainfall is high in some districts. For example, the ratio of mean to standard deviation (μ/σ) seems to suggest that some districts may be highly vulnerable to rainfall variations. For

example, such high degree of variation in the two Bangalore districts and Kolar in K and Karur, Namakkal and Perambalur in T could be a trigger that leads to political mobilisation in years of distress.

(b) Economy- Importance of agriculture to state economy:

Though both K and T states have attracted technologically advanced industries, agriculture continues to be an important activity in both states (see table 5 below). In 1993, agriculture's share of state GDP for Karnataka was 33%. The data for 1993 to 2001 in constant prices indicates that this share has slightly decreased to 26.7% in 2000-01. In the economy of T, agriculture's share has been slightly smaller than that in K and this relative share appears to have declined slightly in recent years.

Table 5: Agriculture in state gross domestic product of K and T: at constant 1993 prices- Rs. millions

	1993-94	2000-01
Karnataka		
State domestic product	410,790	699,513
Agriculture SDP	135,362	187,039
Share of Agriculture in state SDP	32.95%	26.74%
Tamil Nadu		
State domestic product	515,763	791,206
Agriculture SDP	123,535	136,742
Share of Agriculture in state SDP	23.95%	17.28%

Sources: 1. Government of Karnataka, Department of Agriculture website: URL< http://raitamitra.kar.nic.in/main_stat.htm>.

2. Tamil Nadu data from Government of Tamil Nadu, 2002.

While agriculture is important to both states, Cauvery districts in both states play an important role in the agricultural activity and production. From table 6, we can see that in all the Cauvery districts in K apart from Bangalore Urban, nearly 50% of the geographic area is sown. About 15% of the area is sown more than once. For the Cauvery districts as a whole, about 25% of the area is irrigated. The proportion varies from district to district. In Mandya and Mysore districts, irrigated area forms a significant share of the area sown and in both these districts, much irrigation comes from canals. More than a fourth of foodgrains production of K's comes from these 8 districts.

Table 6: Area sown and area irrigated in Cauvery districts in Karnataka: 2001-02 (sqkm)

	Net area sown	Net irrigated area	Area irrigated by canals	Share of state's foodgrains production
Kodagu	1,471	30	24	0.8
Hassan	3,704	806	286	4.1
Tumkur	5,747	1,425	49	4.8
Bangalore U	818	129	0	1.3
Bangalore R	2,950	615	84	3.6
Kolar	3,506	921	0	3.3
Mandya	2,471	1,111	882	3.8
Mysore	3,909	1,262	971	5.2
Sub-total	24,576	6,299	2296	26.9
State total	100,315	25,649	9,035	100.0

Source: Government of Karnataka, Agriculture Department website: URL<http://raitamitra.kar.nic.in/main_stat.htm>.

Table 7: Area sown and area irrigated in Cauvery districts in Tamil Nadu- 2000-01

	Net area sown	Net irrigated area	Area irrigated by canals	Share of state's rice production
Erode	3,082	1,739	916	3.5
Salem	2,646	1,134	85	2.7
Namakkal	1,962	706	141	1.2
Karur	1,025	540	234	1.1
Tiruchy	1,771	1,053	450	4.3
Perambalur	2,157	727	116	2.4
Tanjavur	2,029	1,730	1,564	9.8
Tiruvarur	1,497	1,445	1,389	9.0
Nagapattinam	1,503	1,281	1,278	7.4
Sub-total	17,672	10,355	6,173	41.4
State total	53,033	28,876	8,342	100.0

Source: Government of Tamil Nadu, 2002: Statistical Handbook, from URL <<http://www.tn.gov.in/deptst/Tab04.HTM>>

Similarly, from table 7 it can be seen that the 9 Cauvery basin districts in T together account for more than a third of the net area sown in T; they account for more than a third of the irrigated area in the state. Again, the Cauvery delta districts (Tanjavur, Tiruvarur, Nagapattinam) seem to be almost entirely dependent on canal irrigation. The crucial significance of these 9 districts to state's rice production is clear. Also, the three delta districts account for more than a fourth of all rice produced in the state- hence their nickname as 'rice basket of the state'.

(c) Polity- Importance of Cauvery belt to government formation in the state:

In a parliamentary system of democracy, it is difficult to argue that a group of constituencies can critically determine the formation of government and thereby its policies. Without detailed analysis of electoral trends, any such arguments remain conjectures. The analysis in this section is based on two recent elections to state legislatures in both K and T states.

Table 8 below presents details of state K. In 1999 elections, Indian National Congress (INC) formed a majority government. Out of 132 seats won by INC, 32 seats i.e., approximately 24% were from the Cauvery districts. In 2004 elections, INC won 65 seats in the state; 19 of these were won in the Cauvery basin districts. The present state government is formed by a coalition/support arrangement between INC and JD(S) parties. Together, these two parties have won 123 seats (out of 224 seats in the assembly). Of these 123 seats, 43 seats, i.e., 35% were won in the Cauvery districts. During the last two years, almost all parties in Karnataka took a 'hardline' position with regard to release of Cauvery waters. While we cannot prove beyond doubt the impact of such position on electoral performance, it does appear from the data in table 5 that such a hardline position may have been electorally crucial. Also, relatively, the share of assembly members from the Cauvery district constituencies in the state ruling coalition has increased significantly. This suggests that the scope for the present state government to pursue conciliatory measures may have narrowed further.

Table 8: Winning assembly seats in Cauvery districts- is it crucial to forming state government? Assembly results of Karnataka 1999 and 2004 elections

District	Constituency serial numbers	Total number of constituencies	2004 Elections			1999 elections
			INC	JD(S)	Total for JD(S) and INC	INC
Kodagu	...					
Hassan	129,130, 131, 132, 133, 134, 135, 136	8	1	6	7	4
Tumkur	54,57,58, 59, 60, 61, 62, 63	8	0	5	5	4
Bangalore U	84, 85, 86,87, 88, 90,98,99	8	4	1	5	6
Bangalore R	76,77,78,79, 80,81,82,83	8	7	0	7	4
Kolar	68, 69,70,71, 72,73,74,75	8	4	1	5	4
Mandya	101,102,103,105, 106,107,108,109	8	2	5	7	6
Mysore	114,115,116,117, 122,123,124,125	8	1	6	7	4
Sub-total		56	19	24	43	32
State total		224	65	58	123	132

Source: Compiled by author based on information from Election Commission of India, from website URL <http://www.eci.gov.in/>

Note: District-wise detail of assembly constituencies was unavailable. Instead of districts, Paraliamentary constituencies closely corresponding to the Cauvery basin districts are used here.

Similarly, the data relating to assembly constituencies in the Cauvery districts of Tamil Nadu, and the assembly election results of 1996 and 2001 are presented in table 9 below. While we cannot establish a causal relationship, it seems that there is an association between winning a significant number of seats in the Cauvery districts and winning a majority in the state assembly. Also, the proportion of legislative assembly members from Cauvery districts in the house has increased from 27% in 1996 to 31% in 2001. Thus, it appears that the scope for conciliatory stance for Tamil Nadu government may also be rather limited.

Table 9: Winning assembly seats in Cauvery districts- is it crucial to forming state government? Assembly results of Tamil Nadu 1996 and 2001 elections¹⁸

District	Constituency serial numbers	Total number of constituencies	Won by AIADMK in 2001 elections	Won by DMK in 1996 elections
Erode	113,117,118,119,120,121,122,123,124,125	10	8	8
Salem	84,85,86,87,88,89,90,91,92,93,100	11	8	7
Namakkal	94,95,96,97,98,99	6	4	4
Karur	151,152,153,155	4	3	4
Tiruchy	154,156,157,158,159,165,166,167,168	9	6	9
Perambalur	160,161,162,163,164	5	4	3
Tanjavur	179,180,181,182,183,184,185,186,187,188	10	5	8
Tiruvarur	173,174,177,178	4	0	1
Nagapattinam	169,170,171,172,175,176	6	4	4
Sub-total		65	42	48
State total	234		132	173

Source: Compiled by author based on information from Election Commission of India, from website URL <http://www.eci.gov.in/>

The above tables also seem to suggest the incentives that opposition parties in the respective state assemblies face. It is possible to argue that given the limited room to manoeuvre of the ruling parties, opposition parties may use the Cauvery dispute to cause discomfort to the government.

4.2 Other factors that may hinder a solution

Peculiar impact of asymmetry: First, the nature of asymmetry is not static but undergoes change as national and regional politics changes. River water disputes seem to become more pronounced when federal government is formed by a weak coalition and at least one of the riparian states has a strong state government (i.e., stable majority in the state legislature). River water disputes provide an opportunity for competitive politics and short term negotiations to form ‘alliances of convenience’. Recall the various cases discussed in table 1. By the time the 1924 Cauvery agreement lapsed in 1974, the relative power of central government in India was in decline. This is caused by various factors including the erosion of moral legitimacy commanded by previous generation of central government leaders due to their role in the Independence struggle, the increasing spectre of corruption and re-

¹⁸ DMK and the AIADMK are the two main regional parties in Tamil Nadu. Since 1968, the state government has been formed by one of these two parties: DMK from 1968-1977; again from 1989-1991; and 1996-2001. AIADMK from 1978-1988; again from 1991 to 1996; and from 2001 to date.

organisation of some rural interests along new power groupings. The situation since then has remained as one of case B (weak federal government; two weak riparian states) or case C (strong centre; powerful upstream riparian); or case E (strong centre; powerful downstream riparian) opening up a situation of competitive claims and counter-claims of legitimacy. In the case of river waters, the asymmetry is also linked to geography, terrain, moisture retention capacity of the soil, ground water resource distribution and links between river waters and the overall hydro-geology. A number of issues emerge from this. Should riparian rights be linked to ground water resources? The UN Convention and revised Helsinki rules point to the need for considering both surface and groundwater resources in an integrated manner. Other questions include: should rain fall and contribution to river flow determine riparian rights? Should shortfalls in allocation in one period be carried forward to the next period?

Lack of incentives to co-operate: Secondly, there is no attempt among the basin states to take a basin-wide approach to integrated development and conservation of Cauvery waters. The political processes are forcing each state to behave as a self-interested utility maximising agent. Basin-wide initiatives seem to be important in promoting collective action to resolve the disputes in the case of transboundary river basins. The CRA as it stands now is more a meeting than an authority. Apart from the prime minister, the members of the authority are also the ones who are the disputants in the first place. In its present form, the CRA seems to depend on either the charisma or respect that the prime minister could potentially command or the moral suasion that such a highly public meeting and the related media attention could generate. Both of these are important elements. However, either cannot guarantee that a decision will be reached or that it will be implemented.

Much focus on absolute quantities of water: Thirdly, all the claims and counter-claims relate to *absolute* riparian rights in terms of quantities and measures in TMCft. An agreement based on absolute quantities is prone to serious difficulties when there is significant variability in flows. An alternative is to examine a 10 year or 25 year record (reasonably longish period to capture variability) and on that basis, agree to a regime of relative riparian rights, i.e., shares mentioned in proportion or percentage terms¹⁹. The Guhan formula of sharing waters on the basis of proportionate allocation encourages sharing of both surplus waters in bountiful years and also sharing distress in drought years equitably among the riparian states.

The lack of independent monitoring: However, the Guhan approach will work effectively if the function of monitoring the flows and determining the total volume to be shared in a given year is completely delinked (i.e., depoliticised) from the riparians i.e., an independent monitoring commission²⁰. My argument is to merely make the monitoring function independent. (This is different from Richards and Singh, 2002, who argue in favour of a depoliticised national water commission. In my view, such depoliticisation is not possible.)

¹⁹ I suggested this in 2003 before gaining access to Guhan, 1993, where I find that a similar formula has already been proposed. In his memory, hereafter, this suggestion is referred to as Guhan formula.

²⁰ Technically, this is like the Drinking Water Inspectorate in the UK or a meteorological department. The secretariat of the Mekong Committee and now the Mekong River Commission has been doing this for several years; see Nakayama, 2003: 103.

Limited role for non-state actors: This relates to why river water disputes become inter-state disputes. In international rivers, sovereignty means that only the national government is competent to legally represent the people and sign any treaties. The issue is slightly different in the case of an inter-state river within a nation. Of course, theoretically, a state government is a legitimate representative of people of the state. State governments attempt to use river water disputes to enhance their legitimacy and monopolise the role of representing the various riparian interests. Such river disputes seem to present an important opportunity to construct a visible threat to food security but in turn the essential foundation of a society and the identity of the people themselves. In Indian context, statehood and identity can be closely related. Such a climate may lead to prejudices and tribalising individuals by essentialising one aspect of identity over others and resorting to a language of 'us' and 'them'. As the tragic experiences of communal riots in India and organised killings in Rwanda suggest, such tribalising of identities can lead to potentially dangerous consequences.

A crucial ingredient for resolution of water disputes is the development of common understanding and trust. This cannot be done by government alone; for instance, in the case of Nile apart from the basin states, the role of international NGOs has been considered to be crucial in encouraging co-operation (Nakayama, 2003). As seen earlier, non government action to organise a conference in 1902 was considered crucial to the eventual River Murray Waters Agreement of 1915. There have been a number of non-government initiatives including citizen dialogues in 1992 and most recently the 'Cauvery family' approach to establish dialogue between Karnataka and Tamil Nadu farmers from Cauvery districts in both states. However, at present, both legal and political factors limit the scope for non-government initiatives.

The paradigm of masculinity: The paradigm in which river water disputes are conceived and analysed is predominantly one of masculinity. whole discussion revolves around riparian rights and measurements and about why the problem is mainly caused by the other riparian. The detail of what the water is used for and whether it exaggerates the inequality are not discussed. For instance, as of 1991, about 33% of rural population in K and 36% of rural population in T did not have access to safe drinking water (the Government of India, 2003:S-114). However, the water disputes focus mainly on how the river water is crucial for agriculture. Where drinking water is mentioned, it tends to be a legitimising device than the main basis of claim. As Arnold notes in the case of famines, (1984:67), water scarcity and contests over riparian rights are also not socially indiscriminant. The riparian rights and arguments mainly relate to irrigation and, as other studies have shown, access to irrigation and whether or not such irrigation infrastructure works successfully and the necessary collective action institutions emerge can be highly selective (Wade, 1988; Bardhan, 2000). The water resources management paradigm of masculinity focuses on 'hard' investments rather than on 'soft' institutions. The most recent example of this paradigm is a proposal being examined by the Ministry of Water Resources in the Government of India to construct a national river grid involving inter-basin transfer of water on a very large scale. This paradigm of 'hard' projects seems to fit well with the recent emphasis on liberalisation of agriculture. The expressions of control, measurement, orderly allocation of water, its productive use fit better in a so-called picture of 'progress' which urban and more vocal groups can identify with. Such

identification by vocal groups may be essential to elevate the issue from one of natural resources management to one of identity of a people.

5. Conclusions

The analysis in this paper suggests that political and institutional factors determine whether a river water dispute arises and whether it remains a dispute. The scheme provided by the ISWD Act of 1956 is mainly a constitutional-legal approach. While this is important, many limitations remain. At present, as in the USA, the Indian approach seems to be mainly legal-constitutional approach. This scheme centres around claims over water rights in terms of water quantities. Thus, even while the tribunals take into account a number of factors, the overwhelming public perception centres around quantity of water and how it is apportioned between different riparian states. Also, in the Indian case, the ISWD act's scheme provides for limited triadic relationships. The act is symptomatic of an era when diadic relationships between a paternal federal government and 'childly' states were constructed as vertical relationships. In this scheme, state governments have limited incentives to develop co-operative projects. As in the case of global and regional public goods, the transaction costs of forming collective action can be minimised by exploiting economies of scope i.e., states which co-operate on one issue can use that experience to develop other co-operative ventures. In the present constitutional scheme, such there is little incentive for states to co-operate except when an inter-state issue such as a river is involved.

While the Tribunal's award may settle some of the legal disputes, many of the root causes of the dispute will still remain. There is need for developing a viable collective action institution to implement the award of the Tribunal. Various possibilities exist. Some of the priority actions are identified below.

In both K and T states, it is important to highlight the fact that in the constitutional scheme of things, allegiance to the constitution means the award of the tribunal must be accepted even if the award is not entirely to the liking of one or the other parties. Otherwise, a situation of constitutional breakdown can arise. There is a need to 'de-emotionalise' the issue. The media and non-governmental organisations and international organisations can play an important role in this respect. The various attempts to organise people-to-people dialogues can also be useful.

Secondly, the fixation with absolute volumes or quantities of waters is one of the contributing factors to the dispute. The Guhan formula of proportionate sharing has the potential to allocate waters equitably in both bountiful as well as drought years. As the analysis of Giordano and Wolf identified, including provisions for water allocation mechanisms in the event of extreme variations is crucial to the success of a water sharing agreement.

Thirdly, there is need to examine the scope for a river-basin wide authority. Lessons can be drawn from the Murray-Darling basin initiative and the Mekong basin initiative. It is possible for riparian states to voluntarily take a proactive approach to managing a river basin and request the federal government to constitute a river water board under the River Boards Act of 1956. However, as Iyer (2003) notes, that act is considered to be a 'dead letter' in that few river boards have been constituted to

formulate integrated development schemes. In the immediate future, the existing experience suggests that formation of a single river authority is less likely. However, in the long run such an authority can ensure that river waters are allocated efficiently, equitably and transparently. An inter-state river can have a unitary management authority with representatives of the four basin states, for example, the ministers in charge of water resources or irrigation and the federal water resources minister as an *ex officio* member. The chair person of the authority can be elected for a specific term of office.

Fourthly, water sharing and distress sharing must be undertaken within the context of transparent assessment of all water resources and also the water use patterns. In the cases of both Mekong and Murray Darling basins, the emphasis has shifted towards sustainable management of river waters to meet a diverse set of purposes. No doubt, farmers in both K and T states have a rich heritage of knowledge capital developed by experience. It is still important to take a critical look at water use patterns and explore ways to produce 'more crop per drop'. This includes exploration of alternative agricultural and water management practices including watershed development approaches (Iyer, 2003).

Finally, it is important to recognise and encourage a self-critical awareness in water organisations and policy makers. The paradigm of masculinity is inherent in a sector where engineering and technology aspects dominate management and decision making approaches. This cannot be countered or removed in one step. It is important recognise that such biases exist and these shape and influence the way societies conceive human-environment interactions and the responses developed. Evolving and learning organisations are crucial to achieve the goal of sustainable management of precious resources such as river waters.

References

Anand P.B., 2001, Water 'Scarcity' in Chennai, India: Institutions, Entitlements and Aspects of Inequality, Discussion Paper number 140, UNU-WIDER Discussion Papers Series, Helsinki: The United Nations University, World Institute for Development Economics Research (available from URL <http://www.wider.unu.edu/publications>)

Anand P.B., 2003, From conflict to co-operation: Some design issues for local collective action institutions in cities, *Journal of International Development*, 15,2,

Arnold D., 1984, Famine in Peasant Consciousness and Peasant Action: Madras, 1876-8, chapter in R. Guha (ed), *Subaltern Studies: Writings on South Asian History and Society*, volume 3, Delhi: Oxford University Press.

Bardhan P., 1995, Rational Fools and Co-operation in a Poor, Hydraulic Economy, chapter 9 in Basu K., Pattanayak P. and Suzumura K. (eds) *Choice, welfare and Development: A Festschrift in Honour of Amartya Sen*, Oxford: Clarendon Press.

Bardhan P., 2000, Irrigation and Cooperation: An Empirical Analysis of 48 Irrigation Communities in South India, *Economic Development and Cultural Change*, 48,4, 847-866.

Bennett L., Howe C., and Shope J., 2000, The Interstate River Compact as a Water Allocation Mechanism: Efficiency Aspects, *American Journal of Agricultural Economics*, 82,4, 1006-15.

Benvenisti E., 1996, Collective Action in the Utilisation of Shared Freshwater: The Challenges of International Water Resources Law, *The American Journal of International Law*, 90, 384-415.

Biswas A. and Uitto, 2001, *Sustainable Development of the Ganges-Brahmaputra-Meghna Basins*, Tokyo: The United Nations University Press.

Chapman G. and Thompson, 1995, *Water and the Quest for Sustainable Development in the Ganges Valley*, Mansell: Continuum International Publishing House.

Chenoweth J., Ewing S. and Bird J., 2002, Procedures for ensuring community involvement in multijurisdictional river basins: A comparison of the Murray-Darling and Mekong River basins, *Environmental Management*, 29, 7, 497-509.

Corrêa F. and de Silva J, 1999, International framework for the management of transboundary water resources, *Water International*, 24, 2, 86-94.

Dasgupta J., 2001, India's Federal Design and Multi-cultural National Construction, chapter 3 in A.Kohli (ed), *The Success of India's Democracy*, Cambridge: Cambridge University Press.

Dixit a. and Nalebuff J., 1993, *Thinking strategically: Competitive edge in business, politics and everyday life*, New York: W.W.Norton and Co.

Elhance A., 1999, *Hydro-Politics in the 3rd World: Conflict and Co-operation in International River Basins*, Washington DC: United States Institute of Peace Press.

Giardano M. and Wolf A., 2003, Transboundary freshwater treaties, chapter 3 in Nakayama, 2003.

Gleick P., 2000, Water Conflict Chronology, September 2000 version, Pacific Institute for Studies in Development, Environment and Security. URL: <<http://www.worldwater.org/conflict.htm>>

Gleick P., 2002, *The World's Water 2002*, Washington DC: Island Press.

Goss K., 2002, Report card 2001- Murray Darling Basin, *Water Science and Technology*, 45,11, 133-144.

Government of India, 2001, Monthly Summary for the Cabinet for July 2001 – Unclassified, Ministry of Water Resources, Delhi: Government of India.

Government of India, 2003, *The Economic Survey: 2002-2003*, Ministry of Finance, New Delhi: Government of India.

Government of Karnataka, n.d., *Cauvery Water Dispute: Saga of a century old thirst for water*, Bangalore: Irrigation Department.

Government of Karnataka, 2002a, *Cauvery water dispute: People's struggle for rightful share*, Bangalore: Water Resource Department.

Government of Karnataka, 2002b, *State Water Policy*, Bangalore: Government of Karnataka.

Government of Karnataka, 2003, *Cauvery water dispute: People's struggle for rightful share*, volume 2, Bangalore: Water Resource Department.

Government of Tamil Nadu, 1983, *Krishna Water Supply Project for Madras*, Madras: Government of Tamil Nadu.

Government of Tamil Nadu, 2000, *Tamil Nadu: Season and Crop Report*, available from <<http://www.tn.gov.in/crop/index.htm>>

Government of Tamil Nadu, 2002, *Statistical Handbook 2002*, available from URL <<http://www.tn.gov.in/deptst>>

Guhan S., 1993, *The Cauvery River Dispute: Towards Conciliation*, Madras: Kasturi Publications.

Haas, P., R. Keohane, and M. Levy (eds), 1993, *Institutions for the Earth: Sources of Effective International Environmental Protection*. Cambridge, MA: MIT Press.

Hardin R., 1982, *Collective action*, Baltimore: Johns Hopkins University Press.

Hirshleifer J., 2001, *The dark side of the force: Economic foundations of conflict theory*, Cambridge, Cambridge University Press.

Homer-Dixon T., 1998, Environmental Scarcities and Violent Conflict: Evidence from Cases, chapter in Brown M., Cote Jr. O., Lynn-Jones S., and Miller S., (ed), *Theories of War and Peace: An International Security Reader*, Cambridge, Massachusetts: The MIT Press.

Iyer R.R., 1999, Conflict-Resolution: Three River Treaties, *Economic and Political Weekly*, 34, 24, 1509-18.

Iyer R.R., 2003, *Water: Perspectives, issues, concerns*, Delhi: Sage Publications.

Jeyarajan J., 1998, Cauvery dispute: Changing paradigms, *Economic and Political Weekly*, 33,46, 2900-01.

Kohli A.(ed), 1990, *India's democracy: An analysis of changing state-society relations*, Princeton NJ : Princeton University Press.

Lowi M., 1993, *Water and Power: The Politics of a Scarce Resource in the Jordan River Basin*, Cambridge: Cambridge University Press.

McCormick Z., 1994, Interstate Water Allocation Compacts in the Western United States-Some Suggestions, *Water Resources Bulletin*, 30, 3, 385-395.

Menon P., 2003, Death and distress, *Frontline*, 20,24, available from URL <<http://www.frontlineonnet.com/fl2024/stories/20031205002603700.htm>>

Nakayama M. (ed), 2003, *International waters in southern Africa*, Tokyo: United Nations University Press.

Olson M., 1965, *The Logic of Collective Action, Public goods and the theory of groups*, Cambridge, MA: Harvard University Press.

Pelkey N., n.d., The Cauvery Water War (sic), Division of Environmental Studies, University of California, Davis- accessed from URL: <<http://www.des.ucdavis.edu/staff/pelkey/cauvery.htm>>

Richards A. and Singh N., 2002, Inter-state water disputes in India: Institutions and policies, *International Journal of Water Resources Development*, 18,4, 611-25.

Sadoff C., Whittington D. and Grey D., 2002, *Africa's International Rivers: An economic perspective*, The World Bank, Washington DC.

- Salman S., 2000, International rivers as boundaries, *Water International*, 25,4, 580-5.
- Salman S. 2002, Inter-state water disputes in India: an analysis of the settlement process, *Water Policy*, 4, 223-237.
- Sand P. 1999, *Transnational Environmental Law: Lessons in Global Change*, London: Kluwer Law International.
- Sandler T., 1992, *Collective Action: Theory and Applications*, Hemel Hempstead, Hertfordshire: Harvester-Wheatsheaf.
- Sandler, T.,1998, Global and Regional Public Goods: A Prognosis for Collective Action, *Fiscal Studies*, 19 (3): 221-47.
- Swain A., 2000, Water Scarcity as a Source of Crises, chapter in E.Nafziger, F. Stewart and R. Vayrynen (ed), *War, Hunger, and Displacement: The Origins of Humanitarian Emergencies: Volume 1*, UNU/WIDER Studies in Development Economics, Oxford: Oxford University Press.
- Varshney A., 1998, *Democracy, Development and the Countryside: Urban-Rural Struggles in India*, Cambridge: Cambridge University Press.
- Wade R., 1988, *Village Republics*, Cambridge: Cambridge University Press.
- Weiss E. and Jacobson H. (ed), 1998, *Engaging Countries: Strengthening Compliance with International Environmental Accords*, Cambridge MA: The MIT Press.
- (The) World Bank, 1995, Staff Appraisal Report Annexes, Tamil Nadu Water Resources Consolidation Project, Report number 13506-IN, Washington DC: The World Bank.
- Yoffe S. and Ward B.,1999, Water resources and indicators of conflict – A proposed spatial analysis, *Water International*, 24,4,377-84.

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