Thematic Week: Water Economics and Financing

Thematic Axis: Water Markets

Title: Scarcity and Competition: The Challenges for Institutions to Promote Cooperation, Conflict Prevention and Resolution

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Abstract:

With increasing water scarcity, the understanding and management of the changing dynamics of the water-society interactions become ever more critical to resolve conflicts and promote cooperation at various spatial and sectoral scales. In this context, institutions—as a system defined by the interactive roles of laws, policies, and organizations—have a pivotal role as mechanisms for resolving conflicts and promoting cooperation in water allocation and management. Although the literature is vast on the subject, there are still some key issues requiring better understanding and treatment. For instance, while the focus is more on how institutions minimize conflicts and promote cooperation, there is a lack of proper treatment of how conflicts and consensus can change existing and create new institutions and what role stakeholders and other interest groups play in such process of institutional change. Similarly, there is also a need for a better empirical understanding of the relationships among water scarcity, water rights, forms of conflict resolution mechanisms, and institutional performance. This paper aims to shed some lights on these two aspects using a stakeholder-driven model of the process of institutional change and the data from an international survey of 127 water experts from 43 countries and regions around the world.

Keywords: Empirical Analysis; Forms of Conflict Resoling Mechanisms; Model of Institutional Change; Stakeholders' Role; Water Rights;

1. INTRODUCTION

The dynamics of the water-society interactions is changing fast with increasing water scarcity and the resultant conflicts and competition at the local, national, and international levels. This changing dynamics of interactions is obviously driven both by the physical and geographical features internal to the water resource system as well as by the external factors such as demographic changes, development needs, socio-cultural requirements, and, even, political and strategic considerations. A better understanding of these changing patterns of water-society interactions are critical for us to develop and share the water resources and their benefits with minimum conflicts and maximum cooperation at various spatial and sectoral scales. In this context, institutions—as a humanly devised system of formal and informal laws, policies, and organizations—have a particularly important role to play as mechanisms for managing not only the water-society interactions but also the intrinsically linked water-environment interactions. Playing such a critical role is clearly challenging for institutions, especially considering the poorly developed nature of both the general and water-related institutions in many contexts.

Among the many challenges facing institutions today, one of the most important ones relates to the creation, functioning, and performance of the institutional mechanisms that are needed for resolving water conflicts and promoting water cooperation at various spatial and sectoral scales. This is due to the increasing number and intensity of water conflicts over time and across countries (Glieck, 2008). As a result, there has been a growing research attention on the nature and effectiveness of water-related conflict resolution mechanisms (CRMs) both at the national and international levels. Dinar (2007) and Dinar et al. (2007) have provided a comprehensive review of the vast literature on water conflict and water cooperation and have also evaluated the role of treaties, negotiations, and other approaches in dealing with water conflicts both within and among countries.

Although the literature is vast on the subject, there are still some key issues requiring better understanding and treatment. For instance, while the focus is more on the nature and role of CRMs *per se*, there is a lack of a better empirical understanding of how the effectiveness and performance of CRMs are linked to the role of other institutional and exogenous factors. Similarly, the attention is mainly on how individual water conflicts are resolved by CRMs, but the larger and the most important issue of the two-way linkage between conflict resolution and institutional change, including the mechanics and drives of such linkage remains yet to be understood better. These two issues, though look distinct, are somewhat closely related. Since the CRMs are a part of the overall institutional structure and are functioning within an institutional environment, as defined by the physical, economic, demographic, and political factors, they are closely linked with the overall process of institutional change. The overall objective of this paper is to address these two closely related issues based on a combination of theoretical and empirical models and using cross-country data from both secondary sources and an international survey of 127 water experts from 43 countries and regions around the world.

2. OBJECTIVES AND SCOPE

Given its overall aim and context, this paper has three specific objectives, which are addressed both from an empirical and theoretical perspectives. These objectives are to:

(a) develop and evaluate an empirical model, where the overall effectiveness of CRMs is specified as a function of eight institutional factors, i.e., format of CRMs, efficiency of accountability system, effectiveness of water law, extent of user participation, adequacy and quality of water information system, spatial structure of water organization, centralization tendency in water sector, and extent of regulations over water allocations;

(b) develop and evaluate another model, where the effectiveness of CRMs is specified, again, as a function of another set of eight factors, i.e., water scarcity, population density, development status, share of protected areas, non-water-related internal and external conflicts, law and order situation, quality of bureaucracy, and the effectiveness of general institutions; and

(c) use the Subjective Theory of Institutional Change, which is proposed by Saleth and Dinar (2004), to demonstrate the two-way linkage between conflict resolution and institutional change, including the mechanics and drives of this linkage.

As can be seen, the first two objectives aim to demonstrate how the performance of the CRMs is influenced by the relative role of institutional and exogenous factors. The last one aims to show the larger dimension of the two-way linkage between conflict resolution and institutional change in the particular context of water sector. In this sense, these objectives also set indirectly the overall scope and focus of the paper.

3. MODELS OF CONFLICT RESOLUTION PERFORMANCE

For evaluating the relative role of institutional and exogenous factors affecting conflict resolution performance, we postulate two econometric models. The first model is specified as follows:

$$EFFCRM = f(FMTCRM, EFFACP, EFFWLA, EFFUSP, AQWINF, SPSWOR, CENTEN, EFFREG) \quad [1]$$

Where,

EFFCRM = Overall effectiveness of conflict resolution mechanisms[1] captured in terms of judgmental perception on a 0-10 scale;

FMTCRM = Format of conflict resolution mechanisms with values ranging from -1to 9, where -1 for none, 0 for unclear situation, 1 for bureaucratic systems, 2 for national water council and the like, 3 for tribunals, 4 for judicial/legislative mechanisms, 5 for river boards, 6 for water courts, 7 for basin organizations, 8 for markets or negotiations, and 9 for multiple arrangements;

EFFACP = Overall effectiveness of accountability provisions in water law and water organization[2] evaluated in terms of judgmental perception on a 0-10 scale;

[1] The conflict resolution mechanisms considered for evaluation include: bureaucratic systems, national water council and the like, tribunals, judicial/legislative mechanisms, river boards, water courts, basin organizations, markets or negotiations, and multiple arrangements.

[2] EFFACP is formed by averaging two variables, i.e., effectiveness of accountability provisions in water law and the same in water organizations, which are themselves formed by averaging the individual scores related to different sets of accountability aspects. The legal dimension covers accountability aspects related to both officials (e.g., indemnity clause, penalty provisions, and administrative actions and users (e.g., injunctions, sanctions, and tort liabilities). The organizational dimension covers the following categories present both within and outside formal water administration: administrative oversight, financial auditing, work auditing, grievance cells, monitoring procedures for sectoral/regional water allocation, inter-ministerial committees, statutory bodies, local administration, user groups, and NGOs.

EFFWLA = Effectiveness of water law evaluated in terms of judgmental perception on a 0-10 scale;

EXTUSP = Extensiveness of user participation in water management decisions evaluated in terms of judgmental perception on a 0-10 scale;

AQWINF = Adequacy and quality of water information system evaluated in terms of judgmental perception on a 0-10 scale;

SPSWOR = Spatial structure of water organization or administration in the counry taking a value of 1 if organized in terms of administrative divisions, 2 for the hybrid basis, i.e., in terms of both geographic divisions and hydro-geologic regions, 3 for broad hydro-geological regions, and 4 for river basins;

CENTEN = Extent of centralization tendency within the water sector evaluated in terms of judgmental perception on a 0-10 scale; and

EXTREG = Extent of legal and administrative restrictions on water allocations and transfers evaluated in terms of judgmental perception on a 0-10 scale.

As can be seen, the model in equation [1] captures the role of institutional factors, which are largely internal to water institutional structure. As such, an evaluation of this model can show how conflict resolution performance is affected by the strength and richness of the linkages that the CRMs have with other closely related institutional aspects. In this sense, this model actually captures the effects of institutional embeddedness of CRMs. Obviously, CRMs with a stronger institutional embeddedness will perform better as compared to those with thinner or weaker institutional linkages. Considering the independent variables in the model, we have taken some of the most important institutional factors that influence the performance of conflict resolution.

As to the direction of the effects of the variables in the model, we can expect FMTCRM to have a positive effect because multiple, decentralized and, market-based CRMs are more likely to improve conflict resolution performance as compared to few, centralized, and bureaucratic mechanisms. Similar positive effect can also be expected from the next four variables, i.e., EFFACC, EFFWLA, EXTUSP, and AQWINF, as better accountability provisions, effective water law, strong user participation, and sound water information system will tend to improve the prospects for conflict resolution. The direction of the effect of SPSWOR, however, depends on the observed nature of the water management organization. If it is better aligned with the physics of the hydrological system, it is likely to contribute to conflict resolution than otherwise. On the other hand, CENTEN and EXTREG tend to constrain the performance of CRMs because of the negative effects that centralization have on negotiation and stifling regulations have on water allocation.

The second model, which has the same dependent variable as in [1] but with a different set of independent variables, is specified as follows:

EFFCRM = f (WATDEP, GNPPPC, POPDEN, PROTAR, CONFLT, LAWORD, BURQLT, EFFGIN)……[2]

Where,

WATDEP = Extent of water depletion measured in terms of freshwater withdrawal as a percentage of total freshwater resources;

POPDEN = Population density in terms of persons per square kilometer;

GNPPPC = GNP per capita in terms of '000 purchasing power parity US$;

PROTAR = Protected area as a percentage of total national territory;

CONFLT = Extent of non-water related internal and external conflicts evaluated on a 0-12 scale;

LAWORD = Law and order situation evaluated on a 0-6 scale;

BURQLT = Quality of public bureaucracy evaluated on a 0-4 scale; and

EFFGIN = Effectiveness of general institutions[3] captured in terms of judgmental perception on a 0-10 scale.

In contrast to the model in equation [1], the one in equation [2] captures the role of factors, which are mostly exogenous to water institutional structure *per se*. As can be seen, the variables included in the model captures some of the important aspects, which together characterize the overall environment within which the CRMs and their supporting institutions (i.e., those included in the first model) are operating. Of them, WATDEP and POPDEN are taken as proxies for the magnitude of water scarcity and water demand respectively. While GNPPPC captures the development status, PROTAR captures the potential conflict between water development and environmental protection. The remaining four variables, i.e., CONFLT, LAWORD, BURQLT, EFFGIN, capture the overall governance environment, as reflected respectively in terms of the extent of non-water related conflicts, law and order situation, bureaucratic quality, and the general institutional strength of the country.

As to the expected direction of their effects, WATDEP and POPDEN are likely to have a positive effect on the reasoning that increasing water scarcity and demand will tend to create conditions for the creation of many and more effective CRMs at various levels. GNPPPC will also have a positive effect because economically more developed countries are likely to have better and more effective CRMs. PROTAR and CONFLT can also be expected to have a positive effect in the sense that increasing water-environment and general conflicts are likely to create conditions for more effective CRMs. Similar positive effect can also be expected from the remaining three variables, i.e., LAWORD, BURQLT, and EFFGIN, as better law and order situation, bureaucratic quality, and institutional conditions are likely to improve conflict resolution performance in most contexts. It is important to note, however, that the direction of the effects of these variables can very well be different from our expectation. This is because the reasoning noted for their positive effects of some of them is based essentially on the potential demand and practical pressures they create for the creation and more effective functioning of CRMs. But, when the political systems are not responding quickly to these pressures, then, only few or ineffective CRMs will continue to persist. In this case, the effects of these variables can either be insignificant or, even, be negative.

Having specified the two models of conflict resolution performance and also explained their logic and theoretical rationale, let us note that although the factors included in both these models are only few of the many possible factors influencing the functioning and performance of CRMs, the estimation of both these models will help shed light on the relative role of some of the most

[3] The effectiveness of general institutions is evaluated by taking that of water institutions as a proxy on the justification of the direct association between the effectiveness of general and water institutions. The effectiveness of water institutions in each country is evaluated in terms of seven each of legal, policy, and organization-related institutional aspects. For details, see Saleth and Dinar (2004).

important institutional and exogenous factors in promoting conflict resolution and cooperation in water resource development, sharing, and management. Similarly, although these models deal with the role of factors affecting the performance of country level CRMs, they do have larger implications in the sense that they can provide valuable clues for the identification of potential factors for improving the performance of regional and international CRMs.

4. EMPIRICAL ASPECTS AND DATA

Although the models are interesting, there are some major challenges in getting appropriate data for their empirical estimation. It is clear that these models are specified essentially in a cross-country context. It is possible to have data on some of the quantitative variables, especially those in the second model such as WATDEP, POPDEN, GNPPPC, and PROTAR, from readily available secondary sources. In many cases, such ready data also have the additional problem because of their temporal inconsistency due to the absence of poor quality of data for some countries. This problem can be addressed by getting data for a year on which comparable data is available for all variables for the sample countries.

The major challenge, however, relates to getting data on the qualitative variables in both models. This partly because of the near impossibility of getting observed and quantitative information on them and partly because of the difficulty of getting current information, even on a qualitative basis, without a large international survey. To overcome this problem, we intend to use the perception-based judgmental data collected for different purpose and available from different sources. For the evaluation of the first model, we can use the perception-based information collected from 127 water experts spread across 43 countries and regions around the world.[4] In the case of second model, we get the secondary data on WATDEP, POPDEN, GNPPPC, and PROTAR from various issues of the *World Development Report* by the World Bank and *World Resources* by the World Resources Institute. The data on the three governance related variables (CONFLT, LAWORD, and BURQLT) are obtained from the *International Country Risk Guide*. The data on EFFCRM and EFFGIN are based on country-specific averages of the scores of the 127 water experts in the international survey noted above.

Finally, it is important to note two important aspects of the data sets and samples for the two models. First, although both models are specified in a cross-sectional context, the sample for the first model covers 127 water experts spread across 43 countries and regions. As a result, the first model captures both in-country and cross-country variations in the perceptional evaluation of conflict resolution performance. On the other hand, the sample for the second model covers 39 countries[5] and, as such, it captures only the cross-country variations in conflict resolution performance. Second, since the data on the qualitative variables in the models relate to the period 1998-99, the data on the quantitative variables included in the second model were also collected for the same or closer period so as to ensure the temporal consistency of the data set for both models. The descriptive statistics for all the variables included in models 1 and 2 are provided in respectively in tables 1 and 2.

[4] The details of the variables covered and the sample experts contacted can be found in Saleth and Dinar (2004). The countries and regions covered in the survey are: Argentina, Australia, Bangladesh, Bolivia, Brazil, Cambodia, Canada, Chile, China, Egypt, France, Germany, India, Indonesia, Israel, Italy, Japan, South Korea, Laos, Mexico, Morocco, Myanmar, Namibia, Netherlands, Nepal, New Zealand, Pakistan, Poland, Portugal, Philippines, South Africa, Spain, Sri Lanka, Sudan, Taiwan, Thailand, Tunisia, United Kingdom, Vietnam, and four states in the US (California, Colorado, Illinois and Texas).

[5] These countries include all the countries noted in footnote 4 with the exception of Taiwan and the substitution of the US for the four US states with their average scores of relevant variables.

Table 1: Descriptive Statistics for the Variables in Model 1.

Model Variables	Mean	Standard Deviation	Minimum	Maximum	Count
EFFCRM	5.235	2.565	0.000	10.000	127
FMTCRM	5.929	3.619	0.000	9.000	127
EFFACP	4.377	2.023	0.000	10.000	127
EFFWLA	5.361	2.059	0.000	10.000	127
EXTUSP	3.744	2.351	0.000	10.000	127
AQWINF	6.165	2.258	0.000	10.000	127
SPSWOR	2.583	1.417	0.000	5.000	127
CENTEN	5.063	2.878	0.000	10.000	127
EXTREG	3.853	2.299	0.000	9.000	127

Table 2: Descriptive Statistics for the Variables in Model 2.

Model Variables	Mean	Standard Deviation	Minimum	Maximum	Count
EFFCRM	5.134	2.126	0.500	10.000	39
WATDEP	23.445	32.070	0.101	153.986	39
POPDEN	154.949	186.495	2.000	981.000	39
GNPPPC	9.969	8.799	0.239	30.600	39
PROTAR	8.567	6.628	0.000	27.000	39
CONFLT	9.308	1.494	6.000	12.000	39
LAWORD	4.436	1.392	2.000	6.000	39
BURQLT	2.641	1.088	0.000	4.000	39
EFFWIN	5.434	1.728	0.000	8.500	39

5. RESULTS AND ANALYSIS

The two models of conflict resolution performance were estimated with the respective data sets described in the previous section. In their estimation, simple linear functional form was assumed and no constant term was used. The two models were estimated with the Ordinary Least Square technique using the econometric procedure available within the EXCEL program itself.

The results for model 1, which captures the effects of other water-related institutional aspects on conflict resolution performance, are presented in Table 3. The relative size, sign, and statistical significance of the estimated coefficients of the variables representing these institutional factors can indicate their relative role and importance. Before interpreting the results, we can also note that in terms of the high value of R2 and statistically significant F value suggests that both the explanatory power and statistical fit of the specified model are very good. As can be seen from the results, of the eight variables postulated to influence, only two, i.e., SSWORG and EFFREG, are not significant. Though non-significant, these variables, however, have the expected sign, suggesting the favorable effects of having water organization aligned towards basin-based structure and the

stifling effects of too much regulation on water allocation and water transfers. Among the significant variables, all of them have the expected sings. While CENTEN has negative sign, all the remaining variables have the positive sign.

Table 3: Estimated Coefficients for the Variables in Model 1.

Model Variables	**Estimated Coefficients**		**Level of Significance**
FMTCRM	0.197*	3.596	0.000
EFFACP	0.354*	3.244	0.002
EFFWLA	0.348*	3.461	0.001
EXTUSP	0.100#	1.266	0.208
AQWINF	0.119#	1.402	0.164
SPSWOR	0.159	1.232	0.220
CENTEN	-0.105*	-1.738	0.085
EXTREG	-0.092	-0.914	0.362
Adjusted R2	*0.865*	-	-
F-Test Value	*109.936*	-	*0.000*
Sample Size	*127*	-	-

Note: * indicates the level of significance at 10 percent or better and
# indicates the level of significance at 20 percent or better.

Considering the magnitude of the significant coefficients with a positive sign, two variables, i.e., EFFACC and EEFWLA, have much stronger effects as compared to others, i.e., FMTCRM, AQWINF, and EXTUSP. This is an important result, which suggests clearly the preeminent role of accountability mechanisms and strong water law in strengthening conflict resolution mechanisms. From a policy perspective, this result means that although format of CRMs, water information, and user participation are all important, the efforts to improve conflict resolution performance should go beyond these factors. The focus should be on the strengthening of water law and accountability systems because they have a more sustainable and long-term impacts on conflict resolution structure and performance.

The significant negative effect of CENTEN means centralization tendency within water sector and its organization are not favorable for improving conflict resolution performance. This result, in a sense, tends to contradict the common view that certain dose of centralization can be good for resolving conflicts. While the assumption is based on the favorable role of compulsions in resolving conflicts, the positive effects of decentralized systems in promoting negotiations and market-based bargaining cannot be underestimated, especially in contexts with democratic and free market systems. This fact taken with the stifling role of too much water regulations suggests clearly that the efforts to strengthen CRMs should be part of an overall program of water institutional reforms. Since such reforms are likely to improve the institutional structure within which the CRMs are operating, they will have a favorable effect on their performance as well.

Let us now turn to the results of Model 2 presented in Table 2. Given the high R^2 and F value, these results are as reliable as those pertaining to Model 1. While the results of Model 1 capture the relative role of factors within water-related institutional structure, those for Model 2 capture the effects of the exogenous factors, which together define the environment within which the water institutional structure, including the CRMs themselves, is operating. As can be seen from the Results in Table 4, all the variables, except two, have the statistically significant effect. Although CONFLT and LAWPRD are insignificant, they have the expected positive sign. Their insignificance suggests that conflict resolution performance is largely independent of the prevailing law and order condition and non-water related internal and external conflicts.

Table 4: Estimated Coefficients for Variables in Model 2.

Model Variables	**Estimated Coefficients**	**T-Ratios**	**Level of Significance**
WATDEP	-0.018*	-1.988	0.056
POPDEN	-0.002#	-1.480	0.149
GNPPPC	-0.128*	-2.076	0.046
PROTAR	-0.066#	-1.323	0.195
CONFLT	0.075	0.437	0.665
LAWORD	0.192	0.617	0.542
BURQLT	1.097*	2.241	0.032
EFFGIN	0.615*	3.082	0.004
Adjusted R2	*0.868*	-	-
F-Test Value	*49.959*	-	*0.000*
Sample Size	*39*	-	-

Note: * indicates the level of significance at 10 percent or better and
# indicates the level of significance at 20 percent or better.

Among the significant variables, only the two governance-related variables, i.e., BURQLT and EFFGIN, have the expected positive sign, suggesting the favorable effects that bureaucratic quality and general institutional strength have on conflict resolution performance. The significant but negative effects of WATDEP, POPDEN, GNPPPC, and PROTAR, though unexpected and seem to be counter-intuitive, suggest some inconsistencies between the actual requirements and observed performance of CRMs across countries. Thus, countries with severe water scarcity and higher water demand, where the role and need for CRMs are stronger, actually have poorly performing CRMs and *vice versa*. Similarly, countries with a higher share of protected areas, taken as a proxy for the potential for water-environment conflicts also have ineffective CRMs.

From a policy perspective, this spatial pattern supports the commonly held view that international funding and policy efforts to strengthen CRMs should target countries where there is a severe water scarcity, intense water demand, and potential water-environment conflict. In terms of the relative magnitude of their impacts on conflict resolution performance, the two variables which have the significant positive effects, i.e., BUEQLT and EFFGIN, dominate over those with the significant negative effects. In fact, BURQLT has the largest influence, followed somewhat closely by EFFGIN. This result reinforces further the central role that the governance factors

related to bureaucratic and institutional quality play in strengthening CRMs and their functional performance.

6. CONFLICT RESOLUTION AND INSTITUTIONAL CHANGE

The results in the previous section show how conflict resolution performance is influenced by the relative roles of factors both internal and external to water institutions. This also show that CRMs are an integral part of the overall institutional structure and are, therefore, functioning within an institutional environment, as defined by the physical, economic, demographic, and political factors. Any change in the institutional structure and its environment will have an obvious effect on the mechanisms of conflict resolution. But, this is only one dimension. But, the other and more important dimension relates to the fact that conflict resolution, viewed as an overall process of resolving socio-economic and political conflicts, also has a fundamental bearing on the process of institutional change itself. It is these two dimensions that, in fact, underline our proposition concerning the two-way relationship between conflict resolution and institutional change.

While we have provided an empirical analysis of the first dimension in the previous section, here, we will provide a theoretical treatment of the second dimension. In order to demonstrate the linkages between the processes of conflict resolution and institutional change, let us use the Subjective Theory of Institutional Change, the theoretical precedence and justification of which can be found in Saleth and Dinar, 2004.[6] Although this theory is developed for a different purpose, it can, however, be used to show how the process of conflict resolution actually leads to the process of institutional change and also to provide interpretations for this linkage in terms of its underlying mechanics and drivers. Before doing this, it is very instructive to start first with a short description of this theory.

The Theory Subjective Theory of Institutional Change was actually developed to provide a more complete explanation of the entire process of water institutional change by combining available theories of institutional change within a unified framework. The central and the most distinguishing part of this theory relates to its explicit recognition of individuals as the source of change, focusing particularly on how the convergence in their subjective perception remain as the motive force for institutional change.[7] Perceptional convergence also implies the articulation or solidification of the demand for institutional change. Importantly, the emergence of this demand provides incentives for the political entrepreneurs to lobby for institutional change on the one hand and pressures for the state or other agencies to provide institutional supply in the form of creating new or changing prevailing institutions.

The major issue is whether perception could converge at all in the face of many factors that create divergence such as interest conflicts, rent-seeking, path dependency, ideology, bias, and uncertainty. However, there are also factors that tend to minimize perceptional divergence. These factors include the opportunity costs of inaction in terms of foregone individual and social benefits, economic and political changes, technological progress, cultural influences, the persuasive powers of the state or other authorities, natural disasters, and international and donor influences. The prospects for perceptional convergence are also enhanced by the powerful effects of information flow, interaction, and learning. Thus, when perceptions converge and this leads to institutional

[6] For a detailed discussion of the theoretical precedence and justification for this framework, see Saleth and Dinar (2004).

[7] The subjective nature of institutions and the subject factors in institutional change are recognized widely in the institutional economics literature. But, it is North (1990), who explicitly recognized the powerful roles subjective perception plays in institutional choice and change. Similarly, Bromley (1989) assigns an important role to 'collective attitude' as a source of institutional change.

demand and supply, it means that there is an underlying process in which the society is able to resolve the conflicts between these divergent sets of factors. How these conflicts are resolved can indeed be explained with the help of the Subjective Theory.

The central role that the convergence in subjective perception plays in resolving conflicts in different stages of institutional change can be understood by viewing the change process within a stage-based perspective, as depicted in Figure 1. In Figure 1, there are four crucial stages: (a) mind change, i.e., the changing perception of stakeholders and decision-makers both at the micro and macro levels, (b) political articulation and programmatic translation of perceptional change, (c) practical implementation of reform program that begins first with symbolic and procedural changes and, then, continues with real and substantive changes, and (d) ultimate impact of institutional changes. Notably, these stages progress not as a linear process but as a circular process subject to constant subjective and objective feedbacks and adaptations.

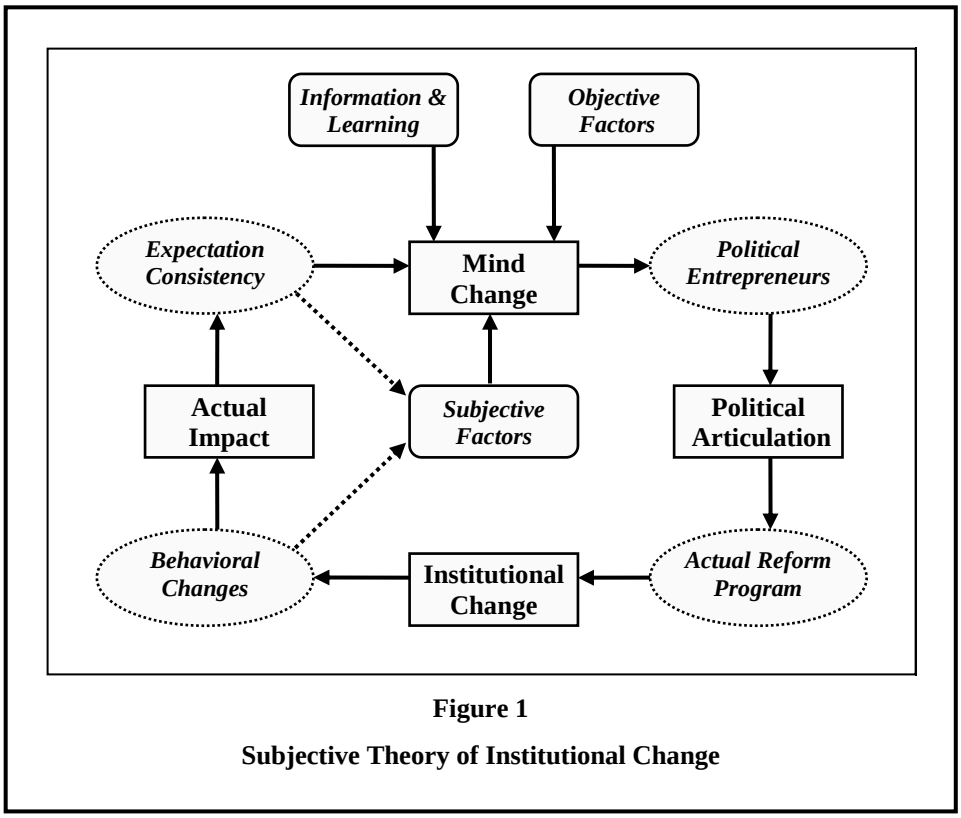

Figure 1

Subjective Theory of Institutional Change

As to the mechanics and drivers of convergence in different stages within the circular process of institutional change, there are both subjective factors (e.g., ideology, norms, bias, and ignorance) as well as by objective factors (e.g., relative prices, technological change, and other economic and physical factors) in the first stage of mind change. In the remaining stages, there are mechanisms and drivers that operate both at the group and individual levels. They include the political entrepreneurs, lobbying and bargaining activities, political decision-making systems, public bureaucracy, information flow and learning externalities, and behavioral changes and performance expectations. Notably, the circular process of change is not free from the influence of existing institutions partly due to their technical features such as path dependency and partly due to their effects on the worldview of the main actors and stakeholders.

Of the four stages in the process of institutional change, the first stage involving mind change assumes a critical significance. The mind change of individuals signifies a change in their mental construct of the world and it gathers power when there is a critical mass of perceptional

convergence among actors and stakeholders as to the need, extent, and direction of institutional changes. In addition to the subjective and objective factors noted above, mind change is also affected both by the behavioral and performance impacts of existing institutions as well as by the nature and direction of the ongoing process of institutional change itself. In this respect, the total benefit and its individual shares expected from institutional changes can also play a powerful role in influencing the mental construct of desirable institutions. As long as the expectation of a majority of individuals is not fulfilled by the ongoing institutional changes, the circular process will continue to create new and additional demand for institutional changes. While underlining the positive role of information and learning on the process of mind change, we also need to recognize the deleterious effects of the purposive and biased campaign by powerful interest groups to alter or distort the general perception and hence, the demand for institutional change.

With mind change, the thinking and language of those who can influence institutional change undergo gradual change creating an economic and political environment propitious for institutional reform. This characterizes the interface between the first and second stages where there is a strong perceptional convergence on the need for and nature of institutional change. Since such perceptional convergence also gets crystallized into the economic and political spheres, there is an articulated demand for institutional change motivating political entrepreneurs to initiate and lobby for institutional reforms on the desired lines. As economic incentives motivate economic organizations to convert perceptional convergence into political demand, political incentives also motivate political organizations to convert this political demand into concrete policy actions.

Although the economic and political organizations can agree on the need for change, they usually disagree on the details of change because they cater to different social groups each with divergent perspectives and expectations on institutional change. Therefore, the reform program that would emerge at the end of the political process is an outcome of the relative bargaining strength of the political and other interest groups. The relative bargaining strengths of these groups change not only with the changing resource realities and national/international economic environment but also during the process of adjustments within the reform program itself. We also note that the reform package is subject not only to the political bargaining process but also to the technical constraints such as path dependency that delimit feasible paths of change. Thus, the final reform program reflects political compromises and technical adjustments.[8]

There is also a considerable scope for slippage between proposed reform program and observed changes in existing institutions. This is especially so in a democratic system and also when the bureaucracy is not effective in translating the reform proposal into actual changes. In many contexts, the initial changes following a reform program are mostly ceremonial and procedural in nature (e.g., policy declaration, legislation enactment, and renaming or merging of organizations). It is also possible that these ceremonial changes and the false impression that the substantive changes will eventually follow can be sufficient to keep the demand for reform dormant for sometime.[9] Therefore, the perceptional convergence and political commitment are to be both powerful and enduring to take the reform process to the stage of substantive institutional changes.

[8] Notice that the technical adjustments required to account for path dependency constraints need not occur only at the stage of reform design. It can occur even during the stages of both mind change and its political articulation as the processes at these stages are also influenced by existing institutions. Thus, for instance, when the existing institutions characterize a democratic system, there cannot be any perceptional convergence or political lobbying for dictatorial institutions.

[9] This is likely to be the case when the institutional changes contemplated by the original reform program are against the interest of the economically and politically powerful groups. In some cases, the procedural changes can also have a facilitative role both in realigning political groups and in creating a pro-reform atmosphere.

Even substantive institutional reforms cannot lead to actual institutional changes, if bureaucratic snags and inefficiency either dilute or distort the reform implementation. This slippage can be counted when the grassroots' support and pressures are powerful and persistent enough to keep up the momentum of change. Even when institutional reforms are fully implemented, their impacts on institutions and their economic performance are neither immediate nor automatic. The direct outcome of institutional change is actually a process of behavioral changes and their ultimate outcome depends on the extent that these behavioral changes improve actual production and exchange. The material outcome of the process is, therefore, not immediate but takes a long time, often going far beyond the program period, to manifest in observable terms.

Although the evaluation of the future and uncertain impacts of institutional changes are difficult to evaluate on a uniform standard, individuals do overcome this with a constant process of adaptation of their subjective evaluation of both the action (institutional change) and the outcome (performance impact) with information available at each point in time.[10] This is known as the 'adaptive instrumental evaluation' approach (see Tool, 1977; Bromley, 1985). In this approach, both performance evaluation and adjustments of decisions are possible without having to wait for the observation of actual outcome that would occur after a long time gap. As such, subjective evaluation and its convergence are also crucial even during the third and fourth stages, where the actual institutional reforms, behavioral changes, and performance impacts are occurring.

In all four stages, we have seen the process of institutional change to move only with different forms of convergence or consensus among different sets of actors and stakeholders. The emergence of such convergence or consensus can be interpreted as an outcome conflict resolution. In the first stage, for instance, the convergence is among people either as users or as the voting public and this convergence is motivated by the opportunity costs of status quo, as determined by changing economic, technical, and resource-related factors. But, in the second stage, the convergence is among different interest groups, political parties, and decision-makers. Although the conflicts in this stage are resolved through negotiation, bargaining, and compromises, the strength of institutional demand, as signified by the transaction cost-induced convergence in the first stage, continue to influence the convergence process in the second stage.

In the third stage, the convergence is between the proposed reform program and its actual implementation and this is attained by resolving the bureaucratic and other interest conflicts both within and between water-related organizations both on the public and private spheres. The conflict resolution here is mediated by legislative efforts, administrative dictates, grassroots pressures, and, even, judicial injunctions. In the final stage of reform impacts, the convergence is between social expectations (which are, in part, created in the first stage itself) and actual impact. As we have explained earlier, the conflict here is mediated by the convergence in the adaptive instrumental evaluation of users, policy-makers, and, even, donors and other international technical and development agencies. In this sense, conflict resolution, taken in a larger sense as part of the general socio-economic and political process, is a major driving force for institutional change.

[10] The process of 'mental accounting' in which people organize the outcomes of transactions and evaluate them relative to a 'reference point' (see Kahneman and Tversky, 1984: 341) can be identified as the mechanism that is being used by individuals for adjusting their subjective evaluation. The reference point can be either their instrumental values or the outcomes at status quo position, or both. Notably, these reference points themselves can converge among individual due to the roles of interaction, information flow, and learning as well as those of 'best cases' as common standards, norms, or ideals

7. CONCLUSIONS AND IMPLICATIONS

This paper has addressed two major challenges related to the interface between institution and conflict resolution, which are either less explored or unexplored in the literature, particularly with level of treatment and details they actually deserve. The first is the challenge for institutions to promote conflict resolution and cooperation and the other challenge relates to the role of conflict resolution and consensus formation in promoting institutional change. These two intimately related challenges are evaluated in terms of the two-way linkages between institutions and conflict resolution and treated both from empirical and theoretical perspectives. The linkages between institution and conflict resolution are evaluated with two models of conflict resolution performance. The first model provides some empirical evidences for the relative roles of internal institutional factors forming part of the water institutional structure and the second model provides similar evidences for the relative roles of exogenous factors that define the water institutional environment. Notably, these models treat conflict resolution as a mechanism, but the theoretical model, which shows how conflict resolution of various forms drives institutional change in different stages of the change process, treats conflict resolution as part of the change process.

The results from the empirical models of conflict resolution shows that among the water-related institutional variables, effective accountability provisions and strong water law have a much more important roles in improving the performance of conflict resolution mechanisms. The format of conflict resolution mechanisms also has a positive role in this respect, suggesting the importance of less bureaucratic and more negotiation-based arrangements. Similarly, sound water information system, strong user participation, more decentralization, and fewer regulations have also a significant role in improving conflict resolution performance. Since the performance of conflict resolution mechanisms is firmly embedded with the supporting water-related legal, policy, and organizational aspects, from a policy perspective, efforts to improve their performance will be much more effective when they form part of a larger program of water institutional reforms.

Among the exogenous factors likely to influence conflict resolution performance, governance-related factors such as the quality of public bureaucracy and the health of the general institutional are relatively more important. Although the physical, economic, and environmental related factors such as water scarcity, water demand, development status, and water-environment conflicts are significant, they has an unexpected negative role. The behaviors of these variables, though counter-intuitive, do support the commonly held view on the spatial pattern of conflict resolution mechanisms, i.e., they are ineffective in countries and contexts, where should be effective. From a policy perspective, the message here is that international funding and policy efforts to strengthen conflict resolution mechanisms should target, as it has been now, on countries with severe water scarcity, intense water demand, and potential water-environment conflicts.

The Subject Theory of Institutional Change, which is built by linking and synthesizing several theoretical traditions, is able to demonstrate the central role of convergence, consensus, and conflict resolution during different stages in the process of institutional change within water sector. Both the forms of conflict resolution and the groups involved in the process as well as their mechanics and drives differ in different stages. While the forms vary from economic process to political and bureaucratic process, the groups vary from user groups and general public to political groups, decision-makers, and bureaucrats. The mechanisms and drivers of conflict resolution operating in different stages include transaction costs consideration, political entrepreneurs, lobbying and bargaining activities, political decision-making systems, public bureaucracy, information flow and learning externalities, and behavioral changes and performance expectations.

As we have shown, the process of institutional change moves from each stage only with convergence or consensus among different sets of actors and stakeholders relevant in each stage. Such convergence emerges through various forms of conflict resolution which are either my market

or non-market process. It is this process that makes conflict resolution as a major driving force for institutional change. The two-way linkages between institutions and conflict resolution, though intuitive and well known, require still more rigorous and empirical treatment than what is being attempted here. In this respect, this paper is only a modest attempt to contribute to research and policy on this subject of current and futuristic importance in national and global water debates.

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