# Canadian Bulk Water Exports: Analyzing the Sun Belt Conflict Using the Graph Model for Conflict Resolution

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A conflict over the proposed bulk export of water from Canada is systematically studied using the graph model for conflict resolution in order to illustrate how strategic conflicts of this type can be better understood and managed. The ongoing conflict involving a US company, Sun Belt Water Inc., and the Canadian federal and provincial governments is modeled and analyzed using the graph model methodology. This dispute reflects the kinds of controversies that can arise when international trade laws, which stress

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competition and profits, are in conflict with environmental and social laws. The Sun Belt conflict is especially interesting because of its evolution over several stages; at each stage of the conflict, the objectives of the disputants, and their strategic implications, can be realistically modeled and thereby investigated using the graph model.

## Introduction

With the proliferation of interstate trade agreements, controversies involving different jurisdictions, environmental regulations, and resource management are becoming more common. A systems approach could assist policy makers and officials in balancing the statutes of international trade agreements, environmental regulations, and social sovereignty issues. Economic activities and trade have always had obvious detrimental impacts on the environment but, nonetheless, environmental issues *per se* are typically not part of trade negotiations in that they do not pose non-tariff barriers to trade. Moreover, responsibilities are distributed among different levels of government within a state—for example, federal, provincial or territorial, and municipal—with jurisdictional boundaries not always clear. A great deal of intergovernmental negotiation and accommodation may be required to resolve such conflicts. Political scientists suggested that national governments must play a "two-level game" (Putnam, 1988), but did not provide a systematic methodology for the analysis of such games.

Canada wishes both to protect and control its natural resources, and to conform to its international free trade obligations. The bulk water export dispute, developed when the US company Sun Belt Water Inc. served the (federal) government of Canada with a notice of intent to submit a claim for arbitration under Chapter 11 of NAFTA (North American Free Trade Agreement). The story can be traced back to the 1980s, when there was a perception of "surplus" fresh water near the coast of British Columbia, motivating the BC government to promote the commercial export of water. In 1987, the BC government granted Snowcap Water Ltd. a license for bulk water export. In 1990, Snowcap and Sun Belt formed a joint venture partnership to develop the business of shipping bulk water by marine tanker from British Columbia to the United States. Snowcap's license was too small to make the business economically feasible, so Snowcap applied to increase its right to annual water quantities from 247 million liters to 15.8 billion liters. But this bid faced stiff opposition from the populace, and the BC government placed a temporary moratorium on new licenses and expansion of any existing licenses for bulk export of water. This moratorium was extended and made permanent on June 1995 by the provincial Water Protection Act, which prohibited bulk water export and large-scale water diversions.

Our objective is to demonstrate how the *Graph Model for Conflict Resolution*, a conflict analysis technique, can be used to model and analyze complex environmental disputes. We will start by providing a brief general background of the graph model methodology and the associated decision

support system GMCR II, which will be used to facilitate and expedite the application. Subsequently, we will describe in detail the dispute over proposed bulk water exports from Canada. Then we will systematically model and analyze the dispute using GMCR II. Insights gained from this study are discussed in the final section.

## The Graph Model for Conflict Resolution and GMCR II

Kilgour, Hipel, Peng, and Fang (2001) define a strategic conflict as "... *a decision situation involving two or more independent decision makers, who make individual choices that together determine the state, and who have individual preferences over the possible states (as resolutions of the conflict).*" Parties in a dispute are thus regarded as contending decision makers who are free to make choices independently but are trying to make rational interdependent choices that lead to more preferred outcomes. Each party or decision maker has multiple objectives and hence different preferences with respect to the possible states that could arise during the evolution of the conflict. The concept of strategic rationality is central to game-theoretic methods: no egoistic, rational player can pursue his or her own interests independently of the choices of the other players. Conflict analysis techniques focus on analyzing a strategic conflict in terms of its components and searching for possible resolutions satisfying certain stability definitions. Our specific interest in this paper is the graph model for conflict resolution along with its accompanying decision support software GMCR II. (For details about the graph model for conflict resolution, see Fang, Hipel, and Kilgour (1993) or Hipel, Kilgour, and Fang (2002). For details about GMCR II, see Hipel, Kilgour, Fang, and Peng (1997) or Kilgour, Hipel, Fang, and Peng (2001).)

The graph model utilizes concepts from graph theory in that each decision maker has a *directed graph* that records the unilateral moves (changes of state of the conflict) that it controls. A graph model represents a conflict as a series of transitions from one state to another (vertices of the graph) via moves (directed arcs) that are controlled by successive decision makers. The strategic interactions among decision makers are easily traced, allowing the systematic examination of permissible moves and countermoves by the players as they jockey for position. The terminal points are the possible resolutions or equilibria of the conflict model, which are defined in terms of individual stabilities. (Earlier methodologies related to the graph model are *conflict analysis* (Fraser and Hipel, 1984) and *metagame analysis* (Howard, 1971).)

A *stability definition* used to identify a possible resolution of the conflict model is a description of human behavior under the assumption of rationality, as stipulated in rational choice theory. That is, each player aims to attain his or her goals. Usually, stability or *solution concepts* reflect different styles of behavior that incorporate a player's level of foresight, willingness to make strategic concessions, risk attitude, and knowledge of others' preferences. Table 1 outlines the solution concepts applied to conflicts studied later in the paper.

Table 1

Solution Concepts and Human Behavior

| Solution Concept | Characteristics | | | | Stability Description |
|---|---|---|---|---|---|
| | Foresight | Disimprovement | Knowledge of Preferences | Strategic Risk | |
| Nash stability (R) | Low | Never | Own | Ignore | DM (decision maker) cannot unilaterally move to a more preferred state. |
| General meta-rationality (GMR) | Medium | By opponents | Own | Avoid | All DM's unilateral improvements are sanctioned by subsequent unilateral moves by others. |
| Symmetric meta-rationality (SMR) | Medium | By opponents | Own | Avoid | All DM's unilateral improvements are still sanctioned even after possible responses by the original DM. |
| Sequential stability (SEQ) | Medium | Never | Own | Takes some risks | All of the DM's unilateral improvements are sanctioned by subsequent unilateral improvements by others. |
| Limited-move stability $L_h$ | Variable | Strategic | All | Accepts | All DMs are assumed to act optimally and a maximum number of state transitions ($h$) is specified. |
| Non-myopic (NM) | Unlimited | Strategic | All | Accepts | Limiting case of limited move stability as the maximum number of state transitions increases to infinity. |

For each solution concept named in the first column, the characteristics are outlined according to four qualitative criteria--foresight, disimprovements, knowledge of preferences, and strategic risk—and then summarized in the final column. Foresight refers to a decision maker's ability to think about possible future moves. A decision maker who has unlimited foresight can imagine many moves and countermoves into the future when evaluating the consequence of an initial move. Disimprovement refers to readiness to move to a worse state in order to reach a more preferred state eventually. Disimprovements by opponents indicates that other decision makers are thought to be willing to put themselves in worse positions in order to block unilateral improvements by the given decision maker. Knowledge of preferences refers to the kind of preference information used in a stability analysis. In a stability analysis under R, GMR or SMR, the preferences of all other decision makers are not used, though their abilities to move to other states are considered. These solution concepts are useful when a decision maker is uncertain about others' preferences. The strategic risk criterion refers to the attitude of a decision maker to risk. A decision maker who behaves according to Nash stability moves from a state if and only if an improvement is available, and therefore ignores strategic risk.

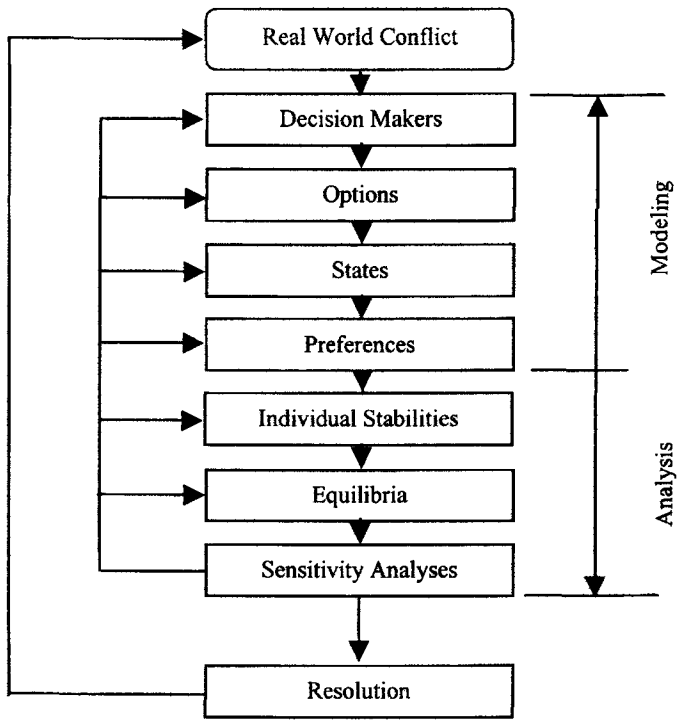
The graph model for conflict resolution methodology consists of two stages: modeling and analysis. In the modeling stage, the analyst decomposes the problem into its basic elements: the decision makers, their available options (which define both the states and the unilateral transitions of the model), and their relative preferences. Since an option can be either

chosen or not, a conflict with $m$ options has $2^m$ mathematically possible states. However, not all states will likely be feasible, and an important modeling step, therefore, is to discard the states that are infeasible. Ascertaining the preferences of each decision maker requires the determination of each decision maker's ordinal ranking of the possible states. Rankings are assumed complete and transitive, and may include ties. In general, carefully building a conflict model often provides the analyst with significant insights, even before an analysis is done. Figure 1 illustrates the general procedure for applying the graph model for conflict resolution.

The analysis stage is carried out by calculating the stability of every feasible state from the point of view of each decision maker according to every solution concept listed in Table 1. A state is stable for a decision maker if the decision maker sees no benefit in moving unilaterally from that state to any other. A state that is stable for all decision makers is an equilibrium and represents a possible resolution of the conflict. Generally, the application of the graph model for conflict resolution is best carried out iteratively. That is, at any stage of the conflict resolution method whenever new information or insights are gained, one should make the necessary changes before continuing the analysis and drawing conclusions (see the feedback arrows in Figure 1). A sensitivity analysis of the conflict model to check the robustness of the equilibrium results is also useful.

Figure 1

Applying the graph model for conflict resolution (Fang et al., 1993).



To apply the graph model using the decision support system GMCR II, the decision makers and their options are input, and then the infeasible states and allowable transitions are specified. To carry out a stability analysis, the graph model requires ordinal preferences for each decision maker by rankings of the states; no information about the degree of preference is ever required, although this information can be incorporated if available. This feature makes GMCR II quite easy to apply to real-world problems since it is easier to determine a decision maker's relative preferences among states rather than its cardinal utilities over these states. Moreover, experience has generally shown that accurate predictions can be obtained based on this limited input information (Hipel, Kilgour, and Fang 2002).

GMCR II offers three methods for ranking states: option weighting; option prioritization; and direct ranking. Option weighting requires a weight for each option, where a positive or negative weight reflects that the decision maker likes or does not like the option, respectively, and the magnitude of the weight reflects the degree of preference. Under option prioritization, a decision maker's preferences are expressed using logical statements about the options selected, listed from most to least important. In direct ranking, the analyst simply moves the states on the computer screen to reflect the decision maker's ranking from most to least preferred. Either option weighting or option prioritization can be used prior to direct ranking.

The above information about each decision maker permits GMCR II to construct a graph model of the conflict. Then, using an efficient computational engine, GMCR II calculates the stability of every feasible state for each decision maker for all the solution concepts listed in Table 1.

## NAFTA and Water Management in Canada

According to the World Resources Institute (2000), Canada has some 20 percent of the world's fresh water, and yet its annual withdrawal of fresh water represents only 1.6 percent of its supply. In Canada, responsibilities for fresh water are shared among the three levels of government: federal, provincial or territorial, and municipal. The *Canadian Constitution* assigns to the provinces primary responsibility for most natural resources, public lands, and property. Water is not mentioned explicitly in the *Constitution Act* but in law water is traditionally categorized as property, and land is taken to include water. Thus, except for northern and transboundary waters, all of Canada's water resources are owned and managed by the provinces. Nevertheless, the distinction between federal and provincial jurisdictions is not always clear, and sometimes the federal government takes action when federal concerns arise—as in the matter of water exports. Moreover, because water often crosses jurisdictional boundaries, and has so many uses, water management in Canada involves a good deal of intergovernmental accommodation and cooperation (Pearse, 1998).

Canada, Mexico, and the United States signed the North American Free Trade Agreement (NAFTA) in December 1992. Coming into effect on Janu-

ary 1, 1994, the agreement sought to promote free trade in goods and services and to increase investment, not only by eliminating tariff protection and reducing non-tariff barriers, but also by incorporating into its mandate many provisions of the GATT (General Agreement on Tariffs and Trade), as well as trade and investment-related provisions.

While trade has always had an impact on the environment, environmental issues *per se* are not usually considered by trade negotiators, except in the context of trade and investment rules. Instead of adhering to environmental values like sustainable development, free-trade agreements restrict lawmakers to act within their provisions, even for measures like environmental regulations. In NAFTA, for example, negotiators included language that recognizes stricter environmental standards only insofar as they do not pose non-tariff trade barriers, and weaker environmental standards only if they do not create a competitive advantage by providing an incentive for businesses to relocate (Tiemann, 2000).

NAFTA's most serious constraints on government sovereignty are those under Chapter 11, which establishes an extensive set of investor rights including National Treatment (Article 1102), minimum Standard of Treatment (Article 1105), and Expropriation and Compensation (Article 1110). Many concepts embodied in NAFTA provisions—specifically Chapter 11—are as yet untested by judicial determination (Shrybman, 2000) and do not have precedents. Still, whenever there is an ambiguity or conflict between NAFTA and other agreements, the NAFTA provision, with certain exceptions, prevails (Article 103 (2).) In particular, Chapter 11 confers upon corporations 'private legal standing,' or the ability to sue governments for compensation in international courts. Any bilateral understanding or agreement among NAFTA parties, therefore, would not bind foreign investors (Shrybman, 1999).

## Case Study: The Conflict over Bulk Water Exports from Canada

We now describe an important ongoing conflict over bulk water exports from Canada. The main confrontation (first level) transcends national boundaries and contains two decision makers: Sun Belt Water Inc. of Santa Barbara, California, and the Federal Government of Canada. This confrontation is not isolated, but occurs within social, economic, political, environmental, and international contexts. Concurrent with this first level confrontation is a domestic confrontation (second level), where the decision makers are, in addition to the federal government, "Water Watch"—a group of anti-free-trade activists, environmentalists, and nationalists—and the "Opposing" provinces, including British Columbia, Saskatchewan, and Alberta. To model the real situation accurately, it is imperative to take into consideration these contexts in articulating the elements of the models. Thus, we must study two correlated levels of confrontation, with dynamic linkages between them: the decision makers at the second level, except for the federal government, are not directly involved at the first level, though they can influence the behavior of other decision makers. Each decision maker, of course, tries to achieve its most preferable resolution.

In December 1998, Sun Belt alleged that Canada had breached its trade obligations under NAFTA, and announced that it would exercise the dispute settlement mechanism specified in Chapter 11 of the agreement. Submitting a *Notice of Intent to Submit a Claim to Arbitration* to the federal government, it invoked article 1109 of NAFTA to claim for damages allegedly arising from the actions of British Columbia government (BCG) and its Attorney General, between 1991 and 1998, and the consequences of the environmental control measures in force at that time. Sun Belt's sweeping charges included allegation of unfair treatment because of British Columbia's administration of its bulk water export prohibition and systematic bias against Sun Belt in the British Columbia courts. In addition, Sun Belt claimed that British Columbia's export prohibition cost it a 1991 contract with a California buyer and that British Columbia subsequently settled with its Canadian business contact without coming to terms with Sun Belt itself. It sought damages not only for its expenses, but also for billions of dollars in potential lost profits.

The federal government had a binding commitment to NAFTA, and was in conflict between its obligations to NAFTA and its constitutional obligations to provincial jurisdictions in the management of natural resources including water. As of May 2001, at least six out of thirteen cases filed under the investor-state provisions of NAFTA Chapter 11 have accused Canada of violating its free trade obligations. It is facing three challenges: first, to interpret and apply the provisions of NAFTA, in particular to the security of Canada's freshwater; second, to compel the provinces to respect Canada's international trade obligations, especially with regard to matters not under the federal jurisdiction; and third, to respond to Sun Belt's case.

To address the first challenge, the federal government's objective is to procure a memorandum of understanding from a NAFTA commission to ensure that expropriation under NAFTA does not go beyond domestic law, without opening NAFTA up to a further round of negotiations (Schacter, 1999). To deal with the second challenge, the federal government launched a three-part strategy focusing on a watershed approach. As part of this strategy, the federal government sought endorsement by the provinces and territories for a Canada-wide accord prohibiting bulk water removals from all of Canada's major watersheds. This element is crucial to the management of water in its natural state, since Canada is not constrained by NAFTA if water is regulated in its natural state, before it becomes a commercial good or a marketable commodity.

However, provincial governments expressed concerns, criticisms and even rejection of Canada's free trade agreements particularly of NAFTA investment provisions. British Columbia, Saskatchewan, Alberta, and Quebec refused to sign the Canada-Wide accord on *Environmental Harmonization* proposed by the federal government, but instead implemented their own water-export prohibition policies, which defy the federal government's water policy and may evoke trade challenges. Some provinces, including British Columbia, view the voluntary nature of the federal government initiative to prohibit bulk water removals from defined watersheds as a strong indi-

cation that the federal government does not oppose water exports from *all* provinces. In addition, some have argued that the federal government violated the Constitution Act in signing international commercial agreements that contain provisions affecting resources not under its jurisdiction. In an explicit threat, the province of British Columbia has asserted that in areas of provincial jurisdiction, British Columbia will decide whether or not to implement international agreements, including NAFTA or future trade and investment agreements (Schacter, 1999). Although the federal government did not repudiate these announcements, it may be forced to use its authority (Constitution Act, Section 132) to constrain the exercise of provincial proprietary rights to manage, use, or sell provincial water resources. Finally, Newfoundland, which originally signed the accord, has recently contemplated bulk water exports.

Canadian environmental groups, social activists, and trade unionists oppose Canada's involvement in any trade agreement made without the knowledge of the Canadian populace. They are attempting to prevent the federal and the provincial governments from subjecting Canada's water to trade disciplines, and argue that the provinces' water prohibition regulations offer no guarantees because legislation can be changed at any time. Allowing bulk exports would turn the water into a commodity under free trade rules, which would erode Canada's ability to conserve and protect its natural resource (Hryciuk and Jeffs, 2001). In December 1998, the Canadian Environmental Law Association (CELA), the Canadian Union of Public Employees (CUPE), and the Council of Canadians formed an alliance, called "Water Watch," for the protection of Canada's water.

## Graph Model: Decision Makers and Options

### *Five Phases of the Bulk Water Export Conflict*

A chronological conceptualization for the progression of what originated as a dispute between Sun Belt-Snowcap and the government of British Columbia simplifies the analysis, and suggests that the time from 1991 to 2001 be divided into two periods. The first period commenced on March 18, 1991, when the government of British Columbia imposed its temporary moratorium on bulk water export and ended when Sun Belt submitted its notice of intent in December 1998. As depicted in Table 2, the first period can be subdivided into three phases. Phase 1 runs from March 18, 1991 to January 1, 1994, when NAFTA was enacted. Phase 2 runs from 1994 until the government of British Colombia enacted the Water Protection Act in June 1995, and Phase 3 covers the remaining period, up to December 1998.

The period from 1999 to 2001 can be divided into two phases taking place at two levels. Phase 4 started when Sun Belt submitted its notice of intent and the Canadian federal government announced its three-stage strategy including the harmonization of environmental regulations initiated by a Canada-wide accord. Phase 5 covers the events that took place after Sun Belt had submitted its notice of arbitration in early 2000. Table 3

Table 2

Summary of Decision Makers and Options in the First Period from 1991 to 1998

| March 18, 1991 **Phase 1** | | 1994 **Phase 2** | 1995 **Phase 3** 1998 |
|---|---|---|---|
| **Sun Belt** | Litigate in court | Litigate in court | Litigate in court |
| | Negotiate | Negotiate | Negotiate |
| | | NAFTA | NAFTA |
| **Government of BC** | Litigate | Litigate | Litigate |
| | Negotiate | Negotiate | Negotiate |
| | Annul temporary moratorium | Annul temporary moratorium | |
| | Enact water protection act | Enact water protection act | |

Table 3

Summary of Decision Makers and Options in the Second Period from 1999 to the Present

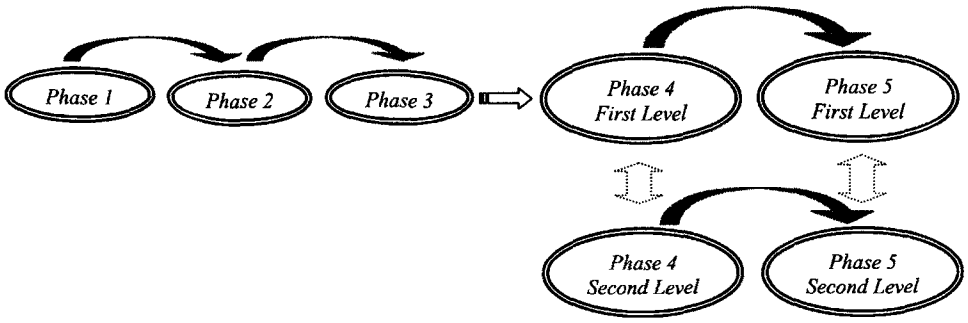
| **'Internationally'** ⇨ | **First Level Conflict** | |
|---|---|---|
| 1999 **Phase 4** | | After 2000 **Phase 5** |
| **Sun Belt** | Negotiate | Negotiate |
| | Give Notice of Arbitration | Go to Arbitration |
| | Lobbying campaign | |
| | | |
| **Canada** | Explore/Negotiate with Sun Belt | Negotiate with Sun Belt |
| | Complicate and procrastinate the case with Sun Belt | Complicate and procrastinate the case with Sun Belt |
| | Memorandum of understanding with NAFTA parties | Memo of understanding with NAFTA parties |
| | | Go to Arbitration |
| **'Domestically'** ⇨ | **Second Level Conflict** | |
| **Federal government** | Canada-wide accord | Campaign against the opposing provinces |
| | Enact Section 132 of the Constitution Act | |
| | | |
| **Opposing Provinces** | Enforce Bulk Water Export Measures | |
| | Challenge NAFTA provisions | |
| | | Legal action against federal government. |
| | | |
| **Reneging Provinces** | | Allow water exports |
| | | |
| **Water Watch** | Lobbying Campaign Against the Federal and Government | |
| | | Legal action against federal government |

summarizes the decision makers involved in the second period of the conflict, and their options for both the international (first level) conflict and the domestic (second level) conflict.

Figure 2 depicts the evolution of the bulk water-export confrontation since it started in 1991. In this paper we will provide analyses for Phase 4 only. (For further information about the analyses of the other phases and references to the original sources, and discussions with the owner of Sun Belt who kindly explained his viewpoint, see Obeidi (2002).)

Figure 2

The Dynamics of the Conflict over Bulk Water Exports from Canada.




The outcome of the conflict between the federal government and domestic groups at the second level in Phase 4, may be detrimental to the federal government's case against Sun Belt (first level game), making it vulnerable to further challenges by foreign investors, or it may give leverage to the federal government to counter Sun Belt's legal claim. Sun Belt would most prefer to negotiate, if the federal government agrees to engage in negotiation. To induce the federal government to negotiate, Sun Belt has two other options: to start a lobbying campaign in the United States against BC's actions and the Canadian federal government's reluctance to negotiate; and to make clear to the Canadian public the legitimacy of its case, and threaten to go to arbitration.

The federal government's most preferred option in the first level conflict is to establish an understanding with all NAFTA parties that the agreement covers water in its natural state, in order to refute Sun Belt claims. In addition, the federal government has the option of delaying and complicating the administrative procedures of the dispute settlement process under NAFTA Chapter 11, threatening to exhaust Sun Belt's resources; it would agree to negotiate with Sun Belt only as a last resort.

By 1999, the federal government was involved in disputes not only with Sun Belt, but also with the provincial governments. It wanted to guarantee that none of them would legislate export control measures that might pose challenges to Canada's commitments to international trade agreements. (If any province were to allow bulk water exports, its argument that water in its natural state is not subject to commerce under NAFTA provisions would be jeopardized.) Dismissing the option of reinforcing provincial water export control measures, the federal government therefore sought to neutralize preemptive moves by the provinces by introducing a Canada-wide accord harmonizing environmental policies and legislation. If the opposing provinces challenge NAFTA provisions and commence a legal suit, the federal government has the option of enacting Section 132 of the Constitution Act in order to appropriate control of water jurisdiction from the provincial and territorial governments. One year later, in Phase 5, faced

with the reality that not all provinces would sign the Canada-wide accord and that some were even contemplating *reneging* on previous commitments and others were considering challenging NAFTA, the federal government could start a campaign against these provinces, demonizing their policies pertaining to water resources management.

The opposing provinces were not keen on the federal government's accord; they preferred prohibiting bulk water exports and opposed NAFTA statutory power, especially Chapter 11. In addition, British Columbia has threatened the federal government with a legal suit should the Sun Belt case proceed.

In Phase 5, it became clear that there were two antithetical camps of opposing provinces. In the first camp, British Columbia, Alberta, and Saskatchewan prohibited bulk water exports from their territories and opposed submitting their statutory power to the federal government for fear of losing sovereignty over water resources. In the second camp, other provinces such as Newfoundland simply favored allowing bulk water exports.

Also opposed to the federal government are groups such as Water Watch, which believes that Canada will always be subject to trade challenges unless the federal government renegotiates NAFTA and explicitly exempts water from NAFTA provisions. It can lobby against the federal government's water resource policies, in an attempt to put it under public pressure. After realizing that the federal government is unable to prevent some provinces from allowing bulk water exports, Water Watch has the option of starting legal actions against the federal government for signing NAFTA.

Phase 4—Second Level Conflict: Feasible States and Preferences

A common way of representing the dispute model is by the option tableau, in which each decision maker is listed along with the options it controls. A state is defined by the status of every option for each decision maker, and appears as a column of Ys and Ns in the tableau, in which Y means "Yes," the option on the left is selected by the decision maker controlling it, and N means "No," it is not chosen. Table 4 is an option tableau for the second level conflict. For example, the column given as state number 4 in Table 4 and written horizontally in text as (Y, N, Y, N, N) means that the

Table 4

**Decision Makers and Feasible States for the Second Level Conflict in Phase 4**

| | | States | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 |
| **Federal Government** | | | | | | | | | | | | | | | |
| | 1. Accord | N | Y | N | Y | N | Y | N | N | Y | N | Y | N | Y | N |
| | 2. Enact S132 | N | N | N | N | N | N | Y | N | N | N | N | N | N | Y |
| **Opposing Provinces** | | | | | | | | | | | | | | | |
| | 3. Enforce | N | N | Y | Y | Y | Y | Y | N | N | Y | Y | Y | Y | Y |
| | 4. Challenge | N | N | N | N | Y | Y | Y | N | N | N | N | Y | Y | Y |
| **Water Watch** | | | | | | | | | | | | | | | |
| | 5. Lobby | N | N | N | N | N | N | N | Y | Y | Y | Y | Y | Y | Y |

federal government chooses only its option of launching Canada-wide accord, the opposing governments enforce bulk water export measures and do not challenge NAFTA, and Water Watch does not launch a lobbying campaign against the federal government.

The total number of options available to all decision makers is five. Therefore, thirty-two ($2^5$) states are mathematically possible. However, not all of them are realistic, and the representation of the conflict model in an option tableau should not include them. There are three reasons for infeasibility. First, the federal government will consider enacting Section 132 of the Constitution Act only under extreme conditions, when the opposing provinces challenge NAFTA provisions and institute water export measures. Second, the federal government will not adopt the accord option and at the same time enact Section 132 of the Constitution Act; these two options are mutually exclusive. Finally, the opposing provinces will not consider challenging the NAFTA provisions and will not enforce protection measures to ban bulk water export. After removing the infeasible states, 14 remain, as shown in Table 4.

Obeidi (2002) contains a detailed description of ordinal preference elucidation for all decision makers in the models, for all phases and levels. The outcome of the confrontation at the second level in Phase 4 is very important for the federal government in its confrontation with Sun Belt. If the federal government chooses a Canada-wide accord and the opposing provinces accepted it, the federal government will gain leverage before any NAFTA tribunal, and therefore will deter Sun Belt from proceeding in its case. To describe the preference ranking for the federal government, the feasible states will be separated into three groups, categorized by the strategies taken by the opposing provinces. $G_1$ contains the four states {1,2,8,9} representing outcomes where the opposing provinces do not choose any of their available options. $G_2$ consists of the states {3,4,10,11} representing outcomes where the opposing provinces choose to enforce water export measures but do not challenge NAFTA provisions. Finally, $G_3$ contains the states {5,6,7,12,13,14} representing outcomes in which the opposing provinces will choose both of their options. The federal government least prefers to enact Section 132 of the Constitution Act, and most prefers to persuade all provinces to sign the Canada-wide accord on environmental harmonization. It prefers those states where the opposing provinces do nothing to those states where they adopt stringent water control measures or challenge NAFTA provisions. Thus, the states in $G_1$ are more preferred to the states in $G_2$, which are more preferred to the states in $G_3$, i.e., $G_1 > G_2 > G_3$. Within $G_1$, the federal government prefers states 2 and 9 since under these states the federal government adopts the Canada-wide accord. State 2 is preferred to state 9, and state 1 is preferred to state 8, because in both cases the federal government prefers Water Watch not to start a lobbying campaign against it. Thus the states in $G_1$ are ranked (from most to least preferred) as (2,9,1,8) In the second group, the federal government is more wary of the states where both the opposing provinces and Water Watch implement their opposition strategies simultaneously. Because

action by the opposing provinces is more dangerous to the federal government than action by Water Watch, the states of $G_2$ are ranked (4,3,11,10) In $G_3$, states 7 and 14 are least preferred since both contain the federal government option of enacting Section 132 of the Constitution Act; the other states are ranked according to the same reasoning used in ordering the states in $G_2$, and thus the ranking of $G_3$ is (6,5,13,12,7,14). The overall federal government's preference ranking of states is (2,9,1,8,4,3,11,10,6,5,13,12,7,14).

Although the opposing provinces most prefer enforcing water export measures and lobbying against the federal government's water policy, they do not prefer resorting to the option of challenging NAFTA. The opposing provinces' preference ranking of states is (10,3,11,4,8,1,9,2,12,5,13,6,14,7). While Water Watch encourages the opposing provinces to enforce a more restrictive water export policy, it understands that inflaming Canada's relationships with other NAFTA partners would be a violation of a legal document and not in the best interest of Canadians. The least preferred states, therefore, are those that contain options where the federal government uses Section 132 of the Constitution Act and the opposing provinces challenge NAFTA as well as enforce water export restrictive laws. Water Watch's ordinal preference ranking of states is therefore (11,10,4,3,9,8,1,2,13,12,6,5,14,7).

*Phase 4–Second Level Conflict: Stability Analysis*

All the states given in Table 4 were analyzed by GMCR II for stability using all the solution concepts in Table 1 in combination with the preference ranking determined above. States 3, 4, 10, and 11 are equilibria, as shown in Table 5, and therefore represent possible resolutions of the conflict. However, only state 11 possesses a high degree of stability, much higher than any other state, since it possesses stability according to all solution concepts. State 11 corresponds to what actually happened: the federal gov-

Table 5

Equilibria for the Second Level Conflict in Phase 4

| | | | Equilibria | | | |
|---|---|---|---|---|---|---|
| | | | 3 | 4 | 10 | 11 |
| **Federal Government** | 1. | Accord | N | Y | N | Y |
| | 2. | Enact S132 | N | N | N | N |
| **Opposing Provinces** | 3. | Enforce | Y | Y | Y | Y |
| | 4. | Challenge | N | N | N | N |
| **Water Watch** | 5. | Lobby | N | N | Y | Y |
| | **Solution Concepts** | | | | | |
| | | R | | | | Yes |
| | | GMR | Yes | Yes | Yes | Yes |
| | | SMR | Yes | Yes | Yes | Yes |
| | | SEQ | | | | Yes |
| | | NM | | | | Yes |
| | | L(2) | | | | Yes |

ernment launched its three-part strategy including the Canada-wide accord for environmental harmonization across all provinces and territories. The opposing provinces enforced their water policies by enacting legislation that prohibited bulk water export from basins under their control. Water Watch started an intense lobbying campaign against the federal government policy with regard to NAFTA and water resources. Note that in all equilibrium states, the opposing provinces enforce measures banning bulk water export.

*Phase 4–First Level Conflict: Feasible States and Preferences*

In the first level conflict model shown in the top left quadrant of Table 3, the main players are Sun Belt and the federal government. Together, the decision makers have six options, but many of the sixty-four ($2^6$) possibilities are infeasible. First, the federal governments will not initiate negotiations if Sun Belt would choose nothing. Second, the federal government's options of negotiation and procrastination are mutually exclusive, since the latter will perpetuate the dispute and the former will settle it. Third, if the federal government chooses to negotiate, Sun Belt would never jeopardize this opportunity by adopting the lobbying campaign option that would reduce its ability to reach a settlement. Finally, the federal government will procrastinate only if Sun Belt submits its Notice of Arbitration. Removing

Table 6

Decision Makers and Feasible States for the First Level Conflict in Phase 4

| | States | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 |
| **Sun Belt** | | | | | | | | | | | | | | | |
| 1. Negotiate | N | Y | N | Y | N | Y | N | Y | Y | N | Y | N | Y | N | Y |
| 2. Notice of Arbitration | N | N | Y | Y | N | N | Y | Y | N | Y | Y | Y | Y | Y | Y |
| 3. Lobby | N | N | N | N | Y | Y | Y | Y | N | N | N | N | N | Y | Y |
| **Federal Government** | | | | | | | | | | | | | | | |
| 4. Negotiate | N | N | N | N | N | N | N | N | Y | Y | Y | N | N | N | N |
| 5. Procrastinate | N | N | N | N | N | N | N | N | N | N | N | Y | Y | Y | Y |
| 6. Memo | N | N | N | N | N | N | N | N | N | N | N | N | N | N | N |
| | States | | | | | | | | | | | | | | |
| | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 |
| **Sun Belt** | | | | | | | | | | | | | | | |
| 1. Negotiate | N | Y | N | Y | N | Y | N | Y | Y | N | Y | N | Y | N | Y |
| 2. Notice of Arbitration | N | N | Y | Y | N | N | Y | Y | N | Y | Y | Y | Y | Y | Y |
| 3. Lobby | N | N | N | N | Y | Y | Y | Y | N | N | N | N | N | Y | Y |
| **Federal Government** | | | | | | | | | | | | | | | |
| 4. Negotiate | N | N | N | N | N | N | N | N | Y | Y | Y | N | N | N | N |
| 5. Procrastinate | N | N | N | N | N | N | N | N | N | N | N | Y | Y | Y | Y |
| 6. Memo | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y | Y |

the infeasible states reduces the number of possible states to 30. Table 6 lists the decision makers, options, and all feasible states for this model.

To explain Sun Belt's preferences over the states, note that Sun Belt is well informed of the conflict between the federal and provincial governments. The outcome of the confrontation at the second level will have a substantial effect on Sun Belt's choice of strategy. If the opposing provinces choose to enforce restrictions on the export of bulk water, Sun Belt would take its case to NAFTA arbitration, since that act invalidates the federal government's argument that water in a natural state is not a commodity. Thus, Sun Belt would have explicit evidence that Canada indeed violated its commitments under NAFTA. Sun Belt most prefers to negotiate a reasonable settlement with the federal government, that is, it most prefers states 9 and 24. Also, Sun Belt least prefers to choose no option, as represented by states 1 and 16. Sun Belt's preferences over the remaining available outcomes depend on the federal government's strategy. Sun Belt's ordinal preference ranking of the states is

(9,24,11,26,10,25,6,21,8,23,7,22,4,19,2,17,3,18,5,20,15,30,13,28,14,29,12,27,1,16)

The federal government most prefers states 16, where it seeks clarification of NAFTA provisions through a memorandum of understanding with the United States and Mexico, and Sun Belt does not choose any of its options. Next most preferred is state 1 where Sun Belt still does nothing and the federal government selects none of its options. The least preferred states are 25 and 10; the federal government negotiates with Sun Belt, which has given a notice of arbitration. The federal government's ordinal preference ranking of states in this phase is

(16,1,17,2,21,6,20,5,27,12,28,13,29,14,30,15,19,4,23,8,18,3,22,7,24,9,26,11,25,10)

*Phase 4–Second Level Conflict: Stability Analysis*

Employing GMCR II by inputting all the information in Table 6 along with the preference rankings for both decision makers given above, produces the results illustrated in Table 7. As can be seen, the equilibria of the model are states 6, 21, 30. However, only states 21 and 30 possess a high degree of stability, because both states are Nash and sequential equilibria––a strong rational resolution for both decision makers. Moreover, states 6 and 21 are almost identical from the viewpoint of Sun Belt, since both correspond to an outcome where Sun Belt will start to lobby against Canada but keep the door open for negotiation, whereas the federal government does not respond directly to Sun Belt. The actual outcome, which corresponds to state 30, was that Sun Belt served the Canadian government with a notice of arbitration, started a lobbying campaign in newspapers and contacted some U.S. Senators, but at the same time did not close the negotiation channel completely. The federal government, however, con-

Table 7

Equilibria for the First Level Conflict in Phase 4

| | | | Equilibria | | |
|---|---|---|---|---|---|
| | | | 6 | 21 | 30 |
| **Sun Belt** | 1. | Negotiate | Y | Y | Y |
| | 2. | Notice of Arbitration | N | N | Y |
| | 3. | Lobby | Y | Y | Y |
| **Federal Government** | 4. | Negotiate | N | N | N |
| | 5. | Procrastinate | N | N | Y |
| | 6. | Memo | N | Y | Y |
| | **Solution Concepts** | | | | |
| | | R | | Yes | Yes |
| | | GMR | Yes | Yes | Yes |
| | | SMR | Yes | Yes | Yes |
| | | SEQ | | Yes | Yes |
| | | NM | | | |
| | | L(2) | | | |

tinued its efforts to work with other NAFTA countries to clarify the NAFTA provisions, especially Chapter 11. At the same time, it refused to negotiate with Sun Belt and instigated procedural hurdles with respect to Sun Belt's notice of intent.

## Conclusions and Insights

The graph model for conflict resolution is a comprehensive technique for modeling and analyzing strategic conflicts, using different stability concepts that simulate human behavior styles (see Table 1). A key advantage of the graph model is that it requires relatively little information to construct a model; ordinal preference information is much easier to obtain than cardinal utilities. The decision support system GMCR II provides extra convenience and efficiency in modeling, and produces almost instant stability results for the full range of stability definitions. Insights can be garnered to guide decision making in the real world, to analyze decisions, or to structure conflicts. As shown in Figure 1, a model may be recalibrated iteratively to make it as meaningful as possible. Appropriate sensitivity analyses can be carried out to assess the robustness of equilibria, and for other purposes.

In our treatment of the Canadian bulk water-export conflict, we provided a dynamic analysis for the various phases of the conflict, beginning in the early 1990s. Our systems approach, decomposing the conflict into various phases and levels, facilitated the modeling process and provided valuable insights. In all phases, the results of GMCR II analyses were similar to what actually happened in the real world. Decision makers can use the findings of a GMCR II study to determine whether a particular plan of action is likely to be beneficial, or, more generally, to determine the effect

of certain option selections on the outcome. For example, in the second level conflict of Phase 4, the federal government approached the provincial governments with an accord, not appreciating that some provinces were adamantly opposed to bulk water exports, or distrusted federal intentions. The federal government initiative actually failed—in Phase 5 of the conflict it abandoned the idea of a Canada-wide accord. Had the federal government recognized this possibility, it might have reconciled with the opposing provinces at this stage to avoid further repercussions and induced them to adopt measures that are more pragmatic.

Similarly, analyses can show decision makers what expectations are realistic. For Sun Belt, the equilibria obtained indicate that the federal government would not negotiate. However, Sun Belt believed that threatening a NAFTA tribunal would persuade the federal government to do so. Sun Belt, therefore, should not have relied on the negotiation option, thereby removing the federal government's procrastination option. In fact, Sun Belt could have put more pressure on the federal government's position in the second level conflict, perhaps inducing it to take Sun Belt's demands more seriously. An even more revealing insight from the analysis arises from comparison of the actual outcome (state 30) to another possibility (state 21), which was equally stable yet more preferred by both sides. Hence, even though state 30 is less preferred or *pareto inferior* by both parties to state 21, it is the *pareto inferior* equilibrium, state 30 that was realized. Better communication and cooperation between the two participants would have allowed them to form a coalition by which they could have both benefited by jointly moving from state 30 to 21.

The graph model for conflict resolution and the decision support system GMCR II can help decision makers develop a better understanding of strategic relationships and assist them in managing confrontation to achieve more favorable resolutions. Moreover, learning the implications of various choices can assist analysts in understanding conflict situations, and aid policy makers in structuring them.

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