

# CONFLICT RESOLUTION

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## Summary

Conflict is an integral component in the utilization and management of all life support systems. The reason for this is quite simple. Whenever human beings are involved in some project, or interact with one another in some way, differences of opinion inevitably arise as to what should be done. For example, there are companies that would like to export water from the Great Lakes–St Lawrence River Basin, shared by Canada and the United States, on a large scale. Environmentalists, as well as most Canadian and United States citizens, are opposed to this idea of “selling our heritage,” and hence serious conflicts have arisen. In fact, one could argue that conflict is so ubiquitous that it is embedded in the ideal concept of sustainable development, whereby the economic activities of society should be done in ways that allow a healthy natural environment to

be maintained for supporting present and future generations. Because the competing goals of economic progress and environmental stewardship are in direct confrontation with each other, a wise balance between these objectives must be reached through the employment of conflict resolution methods.

Because conflict is so pervasive, it has been studied as a phenomenon in fields ranging from the social sciences to highly mathematical areas of science and engineering. One aim of this essay is to provide an overview of the evolution of conflict studies in different domains, such as warfare and cross-cultural disputes. A second goal is to outline some of the key methodologies, procedures, and formal modeling techniques that have been developed for systematically studying a given conflict situation. Here, *conflict resolution* is considered to be the embodiment of all approaches for modeling, analyzing, and attempting to resolve conflict. Therefore, tactical and strategic techniques used in negotiation, mediation, and arbitration are considered to form part of conflict resolution. Emphasis is placed on employing conflict resolution to maximize co-operation and communication among disputants so that more desirable results can be achieved: these may include the so called “win/win” solution, whereby all co-operating parties involved in a conflict do better than they could when acting on their own. Thirdly, water management in the Great Lakes–St Lawrence River Basin is used as a case study to illustrate the great diversity and complexity of conflict, and how responsible laws and policies can be developed and implemented at local, national, and international levels for encouraging and regulating sustainable development, as well as providing fora for settling the disputes that inescapably arise.

## **1. Introduction: The Pervasiveness of Conflict**

Conflict seems to occur whenever and wherever human beings interact with one another. In interpersonal relationships, family members may argue over whether or not herbicides should be sprayed on the lawn surrounding their home to kill weeds. Within the Great Lakes–St Lawrence River Basin of North America (Figure 1), conflicts have arisen on a number of occasions concerning the proposed export or diversion of water to other regions of North America and the world. Cruel ethnic and religious wars tore apart the country of Yugoslavia during the 1990s. Nations of the world are continuously bickering with one another over trading practices, and they attempt to manage this kind of conflict through organizations such as the World Trade Organization (WTO) and the North American Free Trade Association (NAFTA). Most companies now compete with one another fiercely within a global market place as they attempt to increase their worldwide share of a given segment of the economy, for example the manufacture and sale of scrubbers for smoke stacks. Labor and management sectors of a corporation bargain and negotiate with one another as they attempt to reach a compensation package that is fair to both sides.

As can be seen from the foregoing, and many other examples, this interactive phenomenon called conflict takes place in virtually every domain of human endeavor – ranging from arguments between two individuals to warfare among nations involving huge military clashes. Moreover, conflict resolution can also involve high levels of co-operation, as when a responsible industry follows advice from government, environmentalists, and residents to reduce the level of pollutants it emits. It can also

lead to coercive actions, however, such as the beating of human rights activists by police. In other words, conflict can be harnessed in a positive manner to benefit everyone concerned, such as when political parties in a coalition government take the most attractive aspects of their political agendas to benefit optimally the citizens of the country they are governing. It can also lead to highly negative interactions, for example when a company threatens to close down a factory so it does not have to pay its employees properly and meet environmental standards. Like drama, conflict is often dynamic in nature, evolving in stages over time before a final resolution is reached. This is perhaps illustrated by ongoing negotiations over the control of greenhouse gas emissions by nations of the world. The final resolution could be a harmonious or peaceful one, like the 1984 Montreal Protocol to control substances that deplete the ozone layer, or it may be a tragic one analogous to the destruction of nation states at the end of a major war. Whatever the case, conflict is extremely complex and pervasive.

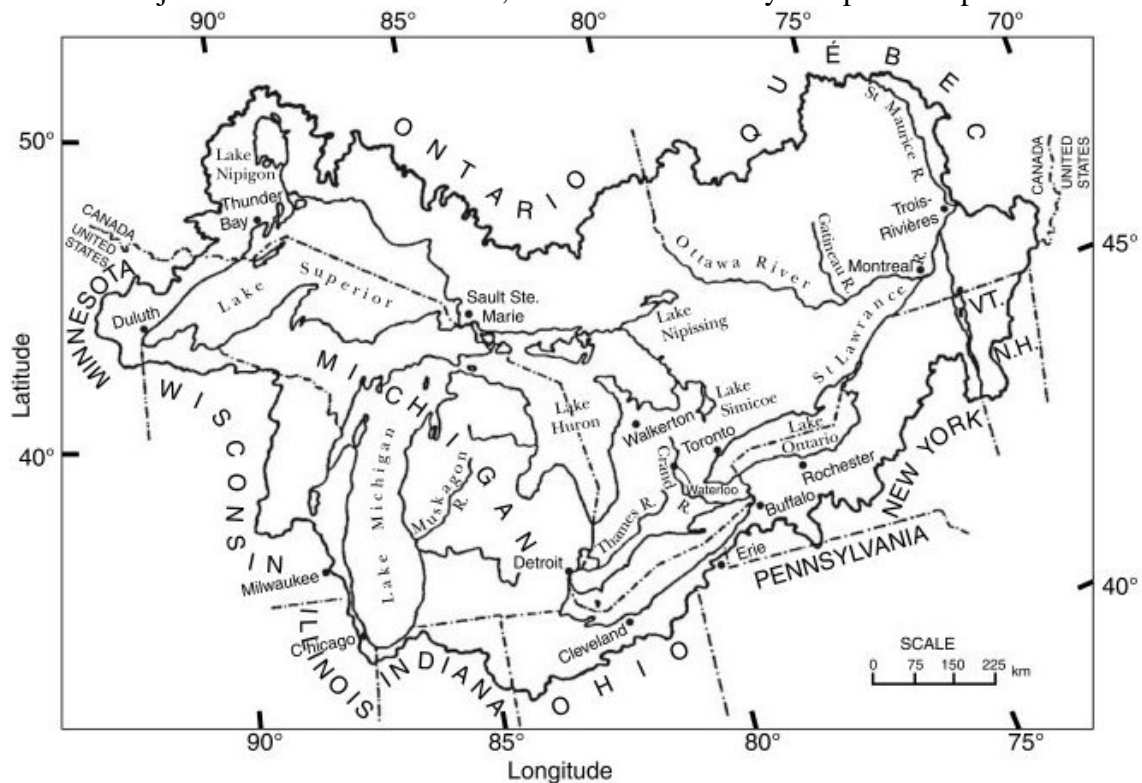


Figure 1. Great Lakes – St. Lawrence River Basin

The ideal and attractive concept of sustainable development explicitly recognizes the presence of conflict in its very definition. More specifically, sustainable development stipulates that the economic needs of societies present and future should be balanced against the necessity of maintaining a healthy environment. In reality, the exploitation of the earth's natural resources for economic gain and the preservation of the natural environment are two societal goals that are by definition in conflict with each other. Nonetheless, optimists are convinced that a suitable balance can be reached between these two disparate objectives, such that effective human decision-making can lead gradually to reconciliation in the form of sustainable development. Whatever happens, there is no doubt whatsoever that conflict resolution has a key role to play here. What is particularly interesting about ongoing negotiations over sustainable development is that

most of the affected stakeholders – future generations – are not even sitting at the bargaining table as present-day society attempts to create and implement integrative, sustainable development policies at local, regional, national, and international levels. Another intriguing feature of the sustainable development dilemma is that it can be viewed as a titanic struggle between humanity and nature. Like future generations of humans, nature is also not represented at the bargaining table. Its cries of agony can be heard in the background, however, as it continues to be abused by irresponsible industrial and agriculture activities resulting in widespread emission of a myriad of dangerous and untreated pollutants into the environment. In reality, nature possesses the ultimate power to “close down negotiations” permanently if it can eventually no longer provide vital life support systems for supporting our ever-increasing populations.

Conflict resolution embodies the systematic study of all facets of conflict. It includes the documentation and classification of real-world disputes, as well as the development and application of methodologies and formal methods for logically modeling, analyzing, and thereby better understanding conflict and how it can be resolved. Because conflict exists in such a wide variety of areas, conflict research has been carried out in many different fields, including international studies, history, anthropology, sociology, psychology, political science, law, economics, and environmental studies, as well as technical fields such as systems engineering, operational research, management sciences, risk assessment, water resources, transportation, and environmental engineering. These multi- and cross-disciplinary characteristics of the theoretical study and application of conflict resolution have resulted in the proliferation of related and complementary ways of defining and practicing conflict resolution. In fact, the literature on conflict resolution is so vast that it is difficult for practitioners and theoreticians alike to keep abreast of all developments in the field. Although many particular ways for defining conflict resolution exist in the literature within different fields, a very general and encompassing definition is employed here. Therefore, well-known approaches for handling conflict, such as negotiation, arbitration, and mediation, are assumed to be subsets of this general definition. In reality, when studying a typical conflict or taking part in its resolution directly, one uses an array of different conflict tools that may have been developed in different fields for properly analyzing the situation as it evolves over time. Additionally, it is assumed here that conflict resolution does not necessarily end up with a desired outcome: for example, a smoldering dispute may catch fire and end up in outright warfare. However, the word “resolution” has a positive connotation, indicating that most people would like to see the best result possible, and that an important ideal such as sustainable development might eventually be approached even under severe conflict conditions.

From a constructive viewpoint, conflict furnishes a valuable social mechanism by which competitors involved in a dispute can learn from each other interactively through feedback and communication. Conflict processes also encourage different parties to put themselves in the shoes of others and try to think the way they do. In many cases this can create opportunities synergistically, leading to previously unforeseen solutions that benefit everyone concerned in what is called a “win/win” solution. Alternatively, if the parties to a conflict remain isolated from one another and little communication takes place between them the final outcome may be horrific. One famous example of a conflict leading to a tragic finale due to lack of co-operation and communication is the

*Tragedy of the Commons.* In this allegory, each of the owners of cows sharing a common pasture can benefit individually by increasing the number of his or her cows grazing on the common. As might be expected, this behavior causes the amount of grass in the pasture to decrease until it disappears completely and the common pasture is valueless. Examples of this behavior are, unfortunately, not hard to find. Poor management by the Canadian government of the Grand Banks off Canada's eastern coast, coupled with greedy fishermen from many nations of the world catching as many fish as they possibly could in their oversized nets, resulted in some previously abundant fish species almost disappearing.

A tragic illustration of the complete collapse of a society brought about by the Tragedy of the Commons syndrome, involving ignorance, greed, and lack of environmental concern, is the end of the Maori civilization which once flourished on Easter Island, an isolated South Pacific island. Scientists think that deforestation caused by overpopulation and poor land management led to the extinction of the Maori around 1680, just prior to the discovery of Easter Island by the Dutch explorer Jacob Roggveen on Easter Sunday 1722. Even though Maori people were capable of erecting impressive large stone statues throughout Easter Island in the period 1400–1680, they still succumbed to the alluring destructive power of the Tragedy of the Commons. It should be pointed out that there are also historical examples of societies living on small land areas, or in inhospitable regions with severe climatic conditions or rough terrain, which wisely adopted sustainable practices out of necessity. In particular, the native Hawaiians followed an admirable concept called *Ahupua'a*, a form of innovative environmental management. From the mountaintops, down the slopes, to the beaches, and into the ocean, the Hawaiians organized their agricultural, residential, recreational, and aquacultural activities as a harmoniously functioning, sustainable system.

For those who think that the great locomotive of civilization is heading recklessly down the tracks in an unsustainable direction, leading to destruction in the final dramatic scene of the Tragedy of the Commons, the thoughts of the great French mathematician Blaise Pascal (1623–1662) may provide inspiration. In one of his *Pensées*, or *Thoughts*, Pascal put forward an idea that is popularly referred to as “Pascal’s Wager.” According to Pascal you must choose to believe either that God exists or that he does not exist. If you believe in God and he really does exist, then you win everything. However, if you believe in God you lose nothing if there is no God; on the other hand, if you do not think there is a God and He does indeed exist you have everything to lose. If God does not exist and you believe this, you have nothing to gain. In an analogous fashion, one can regard sustainable development in the context of Pascal’s Wager. Civilization has everything to gain if it believes in, and adheres to, the doctrine of sustainable development; it has everything to lose if it does not even try.

Another way to ensure the implementation of sustainable development and responsible environmental stewardship is the adoption of the Precautionary Principle. Under this principle, when there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation. Answering the question “When does one know whether one does not have to know more to proceed?” is called “optimal ignorance.” It is reassuring to know that the Rio Declaration of 1992, and many national governments, proposed the

adoption of this valuable principle.

To illustrate how conflict, in various forms and at various levels of complexity, can exist in systems connected with life support systems, water management conflicts in the Great Lakes–St Lawrence River Basin are discussed in the next section. Subsequently a range of domains in which conflict thrives, from interpersonal disputes to warfare, is described in Section 3, while social science methods (called an “analysis lens”) for studying conflict are discussed in Section 4. In Section 5 general approaches to conflict resolution, such as negotiation, mediation, and arbitration, are described. A “2 × 2 sustainable development game” is utilized in Section 6 to illustrate how formal models can be used for analyzing a conflict. Future avenues for worthwhile research into conflict resolution are described in Section 6.

## **2. The Complexity of Conflict in an International Drainage Basin**

To illustrate how conflict is intrinsic to virtually all issues surrounding life support systems, consider the situation with respect to fresh water. Ideally water can be best managed in a sustainable fashion, from an ecosystem and integrative management perspective, at the river basin level. Larger river basins often encompass local political regions within a nation, however, as well as territories in other countries. For instance, the Danube River Basin in central Europe covers an expanse of 817,000 km<sup>2</sup> lying within seventeen nations. In an effort to manage this vital basin properly and reduce strife, the nations of the Danube formulated a strategic plan for co-operative sustainable development in the region. Other well-known examples of important transboundary river basins include the Mekong in Southeast Asia, the Zambezi in Africa, the Parana in South America, and the Rhine in Europe.

### **2.1. The Great Lakes–St Lawrence River Basin**

This unique and prosperous river basin located in the heart of North America spans an area of more than one million km<sup>2</sup> of Canadian and United States territory. It is the home for about 40 million people, possesses rich agricultural land and industrial centers, and contains the largest supply of fresh surface water in the world. Ocean-going vessels can travel inland from the Atlantic Ocean up the St Lawrence River and through the Great Lakes to the end of Lake Superior over a distance of more than 2,000 km, via a navigation system referred to as the St Lawrence Seaway. As shown in Figure 1, two Canadian provinces and eight American states control land that forms part of the Basin. Hence a total of twelve governments – two federal plus ten state or provincial governments – share jurisdiction over the Great Lakes Basin, and effective management can only be done on the basis of co-operative arrangements.

### **2.2. International treaties**

Three legal systems are in force in the Great Lakes–St Lawrence Basin: international law, Canadian domestic law, and US domestic law. It is the design and scope of these laws that determine the ability of governments to manage water and other resources in a sustainable and integrative fashion, and thereby influence how conflict over these resources is handled and resolved. The “jewel in the crown” of bilateral and mutually

beneficial co-operation over water between Canada and the United States is the Boundary Waters Treaty of 1909. This far-sighted treaty provides basic legal principles with respect to boundary and transboundary waters and establishes, under Article IX, the International Joint Commission (IJC) as the institutional mechanism for implementing these principles. The IJC is composed of three members from Canada and three from the United States, who can be called upon by the governments of Canada and the United States to make unbiased recommendations and judgments on disputes falling under the Boundary Waters Treaty. When tackling a conflict that may involve water quantity and water quality (under Article IV of the treaty), the IJC assembles an appropriate array of experts from many disciplines in both Canada and the United States to carry out an extensive interdisciplinary study of the problem.

Over the years the IJC has had a tremendous beneficial impact right across North America on both sides of the Canada–US border, and especially in the Great Lakes Region. For example, earlier reference studies executed by the IJC led directly to the Great Lakes Water Quality Agreement of 1972, which was primarily concerned with reducing phosphorous levels in Lakes Ontario and Erie (Figure 1). This 1972 agreement was superseded by the Great Lakes Water Quality Agreement of 1978, which established an ecosystem approach to water quality management. The 1978 agreement not only set target loadings for phosphorus but also sought to eliminate toxic discharges. Amendments to the treaty in 1987 strengthened the ecosystem approach, and promoted remedial action plans and lakewide plans for handling critical pollutants.

At an international level a range of other treaties and international laws may, directly or indirectly, have implications for water management in the Great Lakes Basin. For example the Ramsar Convention on Wetlands and Waterfowl Habitat, the 1993 North American Agreement on Environmental Co-operation, and the Great Lakes Charter constitute international agreements that may have overlapping powers, and might therefore lead to disputes. Of particular concern to environmentalists are international trading agreements that focus almost exclusively on the economic aspects of trade in products, with little consideration for environmental and social issues. For instance, the World Trade Organization (WTO) which superseded the General Agreement on Trade and Tariffs (GATT) in 1994, looks after trading rules and procedures among its many member nations, and has an effective Dispute Resolution Body for dealing with trade disagreements between member states. The North American Free Trade Organization (NAFTA) is a regional trading arrangement among Canada, Mexico, and the United States, with a similar doctrine to that of the WTO.

When the WTO held a meeting in Seattle, Washington from November 29 to December 4 1999, major riots erupted over its perceived failure to act in an environmentally and socially responsible manner. Theoretically, it is possible for the WTO or NAFTA to make a ruling on trade that could be detrimental to the water resources of the Great Lakes–St Lawrence Basin or elsewhere. After a small Canadian company called the Nova Group of Sault St Marie, Ontario, was given permission by the Ontario Ministry of the Environment in April 1998 to export water to Asia using cargo ships, the governments of Canada and the United States announced on February 10 1999 a joint Reference for the IJC to investigate the implications of water consumption, diversion, and other removal from shared boundary and transboundary surface waters and shared

aquifers. In its final report to the governments in February 2000 the IJC recommended, among other measures, that removal of water from the Great Lakes Basin should not be authorized unless its proponents can demonstrate that such removal will not endanger the integrity of the Basin's ecosystem. Nonetheless, environmentalists from both Canada and the United States are fearful that the WTO or NAFTA could at some future time prevent their national governments from taking measures to protect their waters from being exported.

### **2.3. Canadian and US domestic laws**

The management of water resources is made even more controversial by the differences in legal systems between Canada and the United States, as well as by the division of powers between the federal and provincial or state governments within each country. The constitutional basis of Canadian Water Law was formed in the Constitution Act of 1867, which shares responsibility for water among the federal and provincial governments. Under this arrangement, the provinces have primary responsibility for managing their own water resources, although the Federal Government is in charge of areas such as navigation and shipping, fisheries, and water problems involving criminal law. Because the Federal Government negotiates international treaties, it must cooperate with the provinces in implementing treaty obligations that fall under provincial jurisdiction. A further legal complication within Canada is that water law in Quebec is derived from the Quebec Civil Code, which has its roots in the French Code Napoleon, whereas water laws in other Canadian provinces fall within civil law based on Common Law from Great Britain.

Within the United States, the Federal Government's control over water resources is more encompassing and clearly defined than in Canada. Specifically, Congress has plenary power under the Commerce Clause of the Constitution to regulate the navigable waters of the United States, including the Great Lakes, and this power also extends to non-navigable waters. Therefore, Congress can pass legislation regarding the use and preservation of the waters of the Great Lakes Basin: it did, for example, allow the Great Lakes states to enter into the Great Lakes Basin Compact and establish the Great Lakes Commission to manage the Lakes. However the title and rights to property, including the use of water, are subject to regulation and control by individual states. Therefore, each of the Great Lakes states instituted a legal regime for protecting the Great Lakes ecosystem. Within both the United States and Canada a range of water laws have been put in place at the federal and state/provincial level although, as noted above, the US Federal Government has more direct control over water resources than its Canadian counterpart.

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### **Biographical Sketch**

**Keith W. Hipel** is University Professor of Systems Design Engineering at the University of Waterloo, Ontario, Canada, where he is the Director of the Conflict Analysis Group. Dr. Hipel thoroughly enjoys teaching, and is a recipient of the Distinguished Teacher Award. His major research interests are the development and application of conflict resolution, multiple objective decision making, and time series analysis techniques from a systems design engineering perspective. The main application areas of these decision technologies are water resources management, hydrology, environmental engineering, and sustainable development. Dr. Hipel is the author/co-author of four books, eleven edited books, and close to 200 journal papers. He is Fellow of the Royal Society of Canada (FRSC), the Canadian Academy of Engineering (FCAE), the Institute of Electrical and Electronics Engineers (FIEEE), the International Council on Systems Engineering (FINCOSE), the Engineering Institute of Canada (FEIC), and the American Water Resources Association (FAWRA). Dr. Hipel is also a recipient of the Norbert Wiener Award from the IEEE Systems, Man, and Cybernetics (SMC) Society, the Outstanding Contribution Award from the IEEE SMC Society, the title of Docteur Honoris Causa from École Centrale de Lille, the W. R. Boggess Award from AWRA and the University of Waterloo Award for Excellence in Research,. He has held a Canada Council Killam Research Fellowship, Monbusho Kyoto University Visiting Professor Position, Stanley Vineberg Memorial Visiting Professorship, Centre National de la Recherche Scientifique (CNRS) Research Fellowship, and Japan Society for Promotion of Science (JSPS) Fellowship. He is also a Professional Engineer (PEng) and has carried out consulting activities with engineering firms, government agencies, and utilities in many countries. Finally, he is Vice President of the Canadian Academy of Sciences (2007-2009) and an associate editor of eight international journals, including the *IEEE Transactions on Systems, Man, and Cybernetics*, as well as *Group Decision and Negotiation*.