



# International Conflicts

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## Abstract

There are well over 170 nations of the world. The Food and Agricultural Organisation and the United Nations are developing a database of world conflicts. These conflicts are between and within countries and are related to land. It comes as somewhat of a surprise to most people that upwards of 75% of the world's nations have some kind of land related conflict. This project, in association with FAO is developing a spatial database of the conflicts. The paper will demonstrate the development of a data model for the complex interrelationships between countries and their interactions relating to land. The spatial database will store all countries and conflicts related to land. Display and queries will be used to highlight the massive issues which relate to national and international conflicts.

The spatial database has two particular design tasks which are unusual. The first is that it is not easy to determine information relating to such conflicts and secondly the conflicts between countries seem to erupt and fade with quick and complex succession. These two issues present unique design problems that have been overcome in the database design.

*Keywords and phrases:* land conflicts; international conflicts; border disputes.

## 1.0 International conflicts data model

### 1.1 Introduction

Land is an important asset. It is considered to be a finite resource. Humankind has evolved with land as central to the definition of self, culture and existence. Down through the ages land has been central to the

expansion of empires, wars, deaths, famines, exploration, food and wealth to mention just a few. Land is central because it provides an identity of place - "I belong here" - "This place is home" - "We are New Zealanders" - these phrases are central to our culture, our definition of self. It is not surprising therefore that people want to protect and guard their interests in land. Such interests of course have been modified over time though most people consider land as being in their trust, used or owned. The differences in these concepts of the association of people and land are indeed very considerable but they all very clearly connect us and that upon which we stand.

Today land has clear financial and territorial imperatives for our daily lives. Land creates wealth and defines the extents of estates and nations. There is a school of thought that says that the "money cycle" starts with the sale of land. Regardless of it being a cow, a handshake or a million dollars, the sale starts a process of improvement that inevitably moves money in a creative cycle. Land is sold, seed is sown, food is gathered and sold, people eat, wealth is created, people survive and nations grow. So the cycle moves.

Ask the simple questions; a) How many countries exist in the world? and b) how many countries have national and international conflicts. With the rapidly changing world the answers do not remain true for long. Putting aside any disputes as to what is a country, and its recognition by others, it is fair to say that there are just under 200 countries in the world today. Of these 75% have a conflict of one sought or another which is related to land. Yes, 75% - a staggering and worrying number!



The United Nations, Food and Agricultural Organisation has a global charter to develop and support agricultural and food security for the peoples of the world. Of course national and international security issues have a significant impact. This very important for the emerging nations of Europe, Latin America and Sub-Saharan Africa. In some cases in these nations, land ownership, be it private, tribal, communal or centralist government, is pivotal to the development of self reliance and sustainability of food and agriculture.

This paper outlines the development of a spatial information system which clearly depicts the serious plight that land disputes continue to create for the nations and peoples of the world. The impacts are spatially widespread and are considered to have an underestimated effect on the peoples of the world.

### 1.2 Data Model Introduction

The entity relationship data model should closely represent reality. The importance of an accurate model cannot be stressed enough, as the ramifications of an incorrect model can be tremendous.

When developing entity relationship models Firms, 1990 stated that there are two main objectives. "These are:

- (a) to adequately and accurately represent in an understandable manner, real world phenomena and relationships that exist between them and
- (b) to develop models with sufficient rigour to form the basis for database structures in which specific instances of the real world phenomena may be represented in the form of data values.

When developing the entity relationship model for the international conflict it soon became apparent that these conflicts are dynamic and at any stage a huge change in the state of conflict within the world (such as a third world war) could occur. So a third objective was derived:

- (c) to develop models with sufficient flexibility so that the changing needs of the real life occurrences could be accounted for with little impact on the database.

### 1.3 Data Model Progression

The *Land Conflicts System* data model has been progressively developed. This development process and the emergent data model were evolved from the following business rules:

- conflicts come and go as time progresses and so maybe historical in nature,
- conflicts can occur both between countries (international – such as a border dispute) or within countries (internal – such as the case within New Zealand, indigenous (Maori) land claims),
- only two countries existed in any one conflict,
- had to satisfy the relational data model rules,
- every country was part of a continent – or super region.

At the beginning of the analysis it was realised that a single country could participate in none, one or many conflicts. It was also apparent that in any single conflict one (an internal conflict) or two (international) countries could participate. From these two statements version 1 of the model was derived:

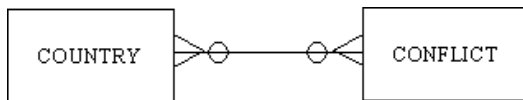


Figure 1. Version 1 of the Model – A many to many relationship.

Many to many relationships are difficult to deal with, so an associative entity was introduced (current\_conflict.) A conflict\_type entity was also introduced as a lookup table for the current\_conflict, which was split into a hierarchy of possible occurrences. First split up into international and internal and then international was split into bordering nations and non-bordering nations. Internal was also split into indigenous disputes and political unrest. Indigenous was split even further into widespread or isolated. Within the associative entity were attributes relating to the details of the conflict such as current\_status and also the values of the countries within the conflict (country1 and country2). If values of those two attributes were the same then an internal conflict existed, but if they were different an international conflict existed.



This model looked as though it would suffice but it became apparent that a complex querying problem could result from the country\_conflict entity. With two attributes associated with countries, a search on a particular country would have to search through both of those attributes. With the conflict that exists for example between Pakistan and India, Pakistan could be stored as country1 and India as country2 and all the other relevant details stored. If a query was placed to show all the conflicts associated with India (stored as country2) the query would have to be placed on both attributes and if an internal conflict occurred two occurrences would result. A possible solution to this problem was to place all the conflicts in twice so that as well as Pakistan being stored as country1 and India as country2 the roles would also be reversed so that only one attribute had to be queried. This is obviously bad design practice as multiple occurrences within the database would result seriously affecting performance (when the database grew to a sufficient size) and also storage area that would be required would almost double. Another more viable solution was derived which saw the

introduction of another entity country\_in\_conflict and the renaming of the country\_conflict entity to current\_conflict. The new table comprised of two attributes: (1) the conflict\_id and (2) the country\_name, and the renamed table had all the values relating to the conflict but did not hold any of the country names. The conflict would then be referenced via the conflict\_id, which exists in both tables. This solved the problem and also improved the flexibility of the database.

The temporal aspect was the next modelling issue to be addressed. As mentioned earlier conflicts begin and finish after some sort of resolution has been reached. Two desirable solutions to the temporal aspect of the database were found and the choice of either is a design decision.

The first solution involves the development of one completely new entity called historical\_conflict which has all the attributes that current\_conflict has and also has attributes relating to the resolution of the conflict. When a conflict is resolved all the attributes from the current\_conflict table are copied to the historical\_conflict table and the resolution details added, and then those occurrences are removed from the current\_conflict table. The relationship that the historical\_conflict table has with the



Figure 2. Version 2 of the Model – The introduction of the associative entity country\_conflict.

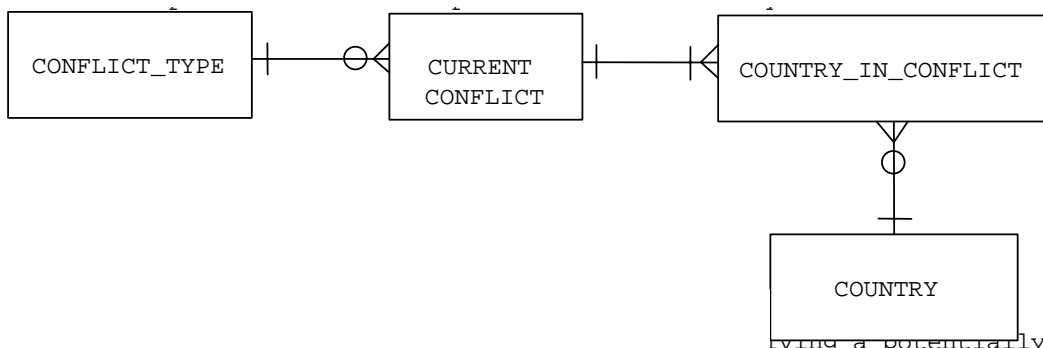


Figure 3. Version 3 of the Model – The introduction of the new entity country\_in\_conflict resolving a potentially complex querying problem.

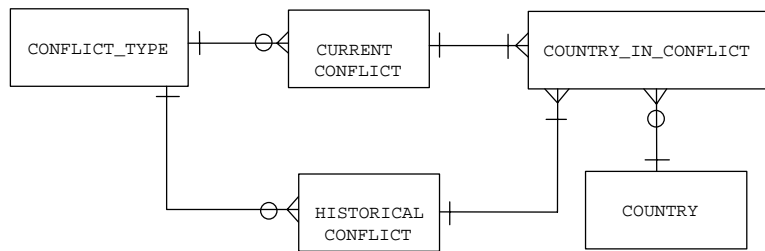


Figure 4a. Version 4a of the Model – Incorporating the historical aspect of a land conflict by use of a new table.

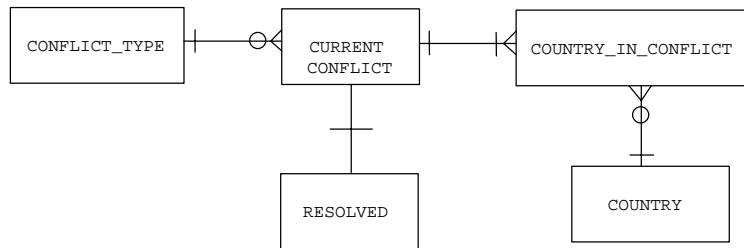


Figure 4b. Version 4b of the Model – Incorporating the historical aspect of a land conflict by use of sub-typing (the solution adopted).

country\_in\_conflict is exactly the same as the current\_conflict – country\_in\_conflict relationship and similarly with the conflict\_type table. The creation of this new entity is not really necessary as the advantages associated with it are only performance based and as such would have little effect unless the system contained tens of thousands of records. That sort of size is not envisaged for some time. This is an archive mechanism and would only need to be accessed for historical reports.

The second option is the sub-typing implementation strategy with a sub-type of current\_conflict being a new entity resolved. This option provides more flexibility and simplifies the model. It consequently makes the implementation easier by preventing the

involved transaction of copying all the attributes from one table to another, then deleting the occurrences and then adding the resolution details. Problems could occur if halfway through the transaction (that is before the current\_conflict occurrence was deleted) the database crashed and the database was left in such a state where a conflict was both resolved and still current. Although secure transactions are available this implementation approach removes the need for the concern and complexity associated with this sort of transaction. Version 4b is virtually the model used in this system development.

The final version adopted is just a tidier version of 4b incorporating a lookup table on the country table, a new entity called continent. This reduces errors with

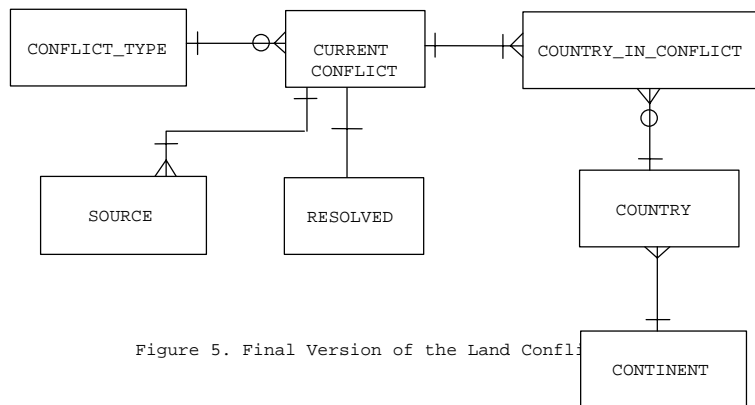


Figure 5. Final Version of the Land Conflict



having to enter initial country data into the system and entering the continent that they belong to such as spelling. Also within the final version is a new entity called source. This entity is to help with maintenance of the database and to keep the data current. The source entity will consist of three attributes: (1) conflict\_id, (2) source and (3) date. This allows for every conflict that does exist within the database the initial source of information for that conflict and it also allows for the sources to be read, updated and added to while still knowing the most recent source of information for that conflict. The final version 5 is detailed below:

#### 1.4 Advantages of the Model Used

The final version of the model developed achieves all the objectives specified in the introduction. A big advantage of the final version is that the model is extremely flexible (the third objective).

## 2.0 Data Collection

Data collection plays a pivotal role in the development of any geographic information system and the accuracy and currency of the data may directly affect the success of the system. In the *International Conflicts System* the accuracy of the spatial data (such as positioning of the countries) does not play a significant role. As it is only the attribute data used for enquiries that must be current and accurate. The general shape of countries would suffice. Of course the birth of new countries a present phenomena, should be faithfully recorded.

### 2.1 Data Sources

Problems arise when trying to collect current data. Books provide good historical information about conflicts that have existed for a long period of time or for those that 'flare' up after previously being resolved. For data currency, newspapers, television and World Wide Web resources are often the most reliable. Both searches can prove to be very time consuming. Searching the web this source can prove extremely time wasting!

Searches on the web have often proved to be both a profitable and frustrating time in terms of the 'relevant' data gathered. On the one hand several

links between 'relevant' web sites can often lead to nothing, but on other occasions some sites can prove to be very helpful. On the other hand, relevant data obtained from the web often gave good background information relating to specific conflicts as well as giving reasonably (that is anywhere up to 18 months) current information. One such example is that located at <http://www.cfcsc.dnd.ca/links/wars/index.html/> which provides good graphical and textual representation of most of the conflicts currently occurring with links to other web sites that have varying information about the current conflicts. But not all sites are as helpful as this one and as such the filtering process separating relevant from irrelevant data has proved to be one of the big time consumers when searching the web.

For currency and accuracy good sources are the newspapers and television although television is hard to reference. A simple process of looking through the world section of perhaps the 'New York Times' has proved to be invaluable.

Books have their place when it comes to seeking information about the conflicts but although extremely accurate, it is from more of a historical perspective. A book such as "*Border and Territorial Disputes*" from the outside may look to be of extreme use and is, but when it comes to currency the book has little place in such a search. However books such as these do provide a very good background into the conflict and provide invaluable information about major long term conflicts between countries.

## 3.0 Discussion

### 3.1 Ongoing Issues

With the system implemented, maintenance issues need to be addressed. Issues that need to be addressed are the currency of the data in the system, information about resolved disputes needs to be reported, activities that can occur within a country such as amalgamation, the inclusion of more than two countries in a conflict and the creation of a new table if performance is hindered in such a way that the system warrants the new table.



### 3.1.1 Data Currency

Currency of data is always going to be important in any system and this is definitely the case in the *International Conflicts System*. The source entity is designed to assist the database administrators in keeping the information accurate and current. The attributes within this table are *conflict\_id*, the source as well as the date. This is a valuable asset because all the sources associated with obtaining information about a particular conflict are easily placed into the database and easily retrieved. This attribute references the main source of information about the conflict. It is then possible to have referenced to see if they have been updated (such as World Wide Web pages.) The necessary information may be retrieved to update the conflict. This leads to easy maintenance of the data. Another viable option is to put the system on the web for each country to file an update to and keep the system accurate and timely.

### 3.1.2 Country Amalgamation/Split

There are still a couple of issues that need to be addressed which effect the state of countries as they exist now and as they could well exist in the future. As highlighted in recent years with the former Yugoslavia countries can be split into several portions each creating a new instance of a country in itself. Rules need to be addressed about what happens to existing conflicts when such a split in a country occurs. Different issues need to be addressed in a similar area when a small section of a country becomes independent, such is the case in the former Soviet Union where small sections became independent still leaving the larger portion of the country intact. A third issue is that of the amalgamation of countries as occurred in the former East and West Germany now both are the one country.

### 3.1.3 Multiple Countries within a Conflict

The business rule created at the start of the system development was that a maximum of only two countries could participate in any one conflict. The possibility of conflicts arising where a third or even many parties enter into a conflict are reasonable. A similar scenario as would occur in a third world war or more currently the quadripoint disagreement

between Botswana, Namibia, Zambia and Zimbabwe would have to be accounted for. This has already been done with the *country\_in\_conflict* entity which can accommodate any number of countries within a single conflict, so the only issues that have to be dealt with are that of data entry, reporting and graphical display.

### 3.1.4 Conflict Occurring Outside Specified Countries

There is an issue of two countries being in conflict, but the conflict actually occurs within the borders of a third country. Recent events such as the USA embassy bombings in Kenya and Tanzania by Sudan are good examples. The present system does not cater for such events, though modifications have been considered and are feasible.

## 4.0 Conclusion

Having proceeded through the development phases of the system development life cycle we now have the *Land Conflicts System* up and running on MapInfo front-end. Issues became apparent during the coding phase, using MapBasic, which is for Spatial Information Systems to utilise their full potential they must 'learn' to support the relational model. This will undoubtedly give us, as a user, an extremely powerful tool to perform spatial queries on, for example, blocks of land that are in some way related.

Flexible entity relationship diagrams become a huge asset when developing a spatial database system and help to overcome problems or changes that occur in the lifecycle of the system. Data currency issues will always be prevalent and for the system to be completely successful this database must be kept current as more conflicts over land are inevitable. There are still ongoing issues that need to be addressed and resolved and with peace talks failing to resolve conflicts in some situations, such as has occurred between Palestine and the Israeli's, further complex issues will become apparent.



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## APPENDIX 1 : Data Dictionary

ENTITY	ATTRIBUTES
<b>COUNTRY</b>	
*COUNTRY_NAME	Character (30)
POPULATION_000'S	Integer (8)
MALE_POP	Integer (8)
FEMALE_POP	Integer (8)
(CONTINENT_ID) (REFERENCES CONTINENT)	
<b>CONTINENT</b>	
*CONTINENT_ID	Character (4)
NAME	Character (15)
<b>CONFLICT_TYPE</b>	
*CONFLICT_TYPE_ID	Character (4)
CONFLICT_DESCRIPTION	Character (40)
<b>SOURCE</b>	
*SOURCE_ID (CONFLICT_ID, SOURCE_NAME, SOURCE_DATE)	
SOURCE_NAME	Character (20)
SOURCE_DETAIL	Character (50)
SOURCE_DATE	Date (8)
(CONFLICT_ID) (REFERENCES COUNTRY_IN_CONFLICT)	
<b>COUNTRY_IN_CONFLICT</b>	
* COUNTRY_IN_CONFLICT_ID (CONFLICT_ID, COUNTRY_NAME)	
COUNTRY_CONFLICT_CONTACT_NAME	Character (20)
COUNTRY_CONFLICT_CONTACT_ADDRESS_1	Character (20)
COUNTRY_CONFLICT_CONTACT_ADDRESS_2	Character (20)
COUNTRY_CONFLICT_CONTACT_ADDRESS_3	Character (20)
COUNTRY_CONFLICT_CONTACT_PHONE	Integer (20)
(CONFLICT_ID) (REFERENCES CURRENT_CONFLICT)	
(COUNTRY_NAME) (REFERENCES COUNTRY)	
<b>RESOLVED</b>	
*RESOLVED_ID (CONFLICT_ID, RESOLUTION_DATE)	
RESOLUTION_DATE	Date (8)
RESOLUTION_DETAILS_1	Character (100)
RESOLUTION_SANCTIONS_1	Character (100)
(CONFLICT_ID) (REFERENCES CURRENT_CONFLICT)	

CURRENT\_CONFLICT

*CONFLICT_ID	Integer (6)
CONFLICT_CAUSE	Character (20)
CONFLICT_DESC	Character (100)
CONFLICT_START	Date (8)
CONFLICT_REGION	Character (20)
CONFLICT_LATEST_DEVELOPMENT	Character (100)
CONFLICT_DEAD	Integer (8)
CONFLICT_SCALE	Character (1) <sup>1</sup>
CONFLICT_MEDIATOR	Character (15)
CONFLICT_MEDIATOR_CONTACT_1	Character (15)
CONFLICT_MEDIATOR_CONTACT_2	Character (15)
(CONFLICT_TYPE_ID) (REFERENCES CONFLICT_TYPE)	
(CONFLICT_LATEST_SOURCE_ID) (REFERENCES SOURCE)	

<sup>1</sup>This can be a number between 1 and 5, 1 being the least active and 5 being intense, that is a bloody war