

Towards a Comprehensive International Boundary Making Model

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SUMMARY

This article discusses the theory of boundary making, including a process driven methodological model. It is a result of a long term practice and study covering wide diversity of topics: from political and technical to stages of precise documentation and boundary maintenance. In this article precise boundary definitions are discussed in light of existing theoretical research, and the order of precedence of boundary definitions and the implementation of precedence of practical evidences.

A new modern methodological model to support boundary making is introduced. A special importance is given to the operation of a joint team of experts along the process, taking responsibility over all the technical activities.

The model is based on many practical cases, reflecting decisions of the ICJ, international tribunals, existing theory and international practice, as well as the practice of the authors in various cases, especially with regard to the boundary making process of the international boundary between Israel and Jordan which serves as a case study for the research.

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1. INTRODUCTION

Lord Curzon (1907), Sir Henry McMahon (1935, and earlier presentations since 1896), Col. Sir Thomas Holdich (1916) and C.B. Fawcett (1918) defined the basics of the modern theory of boundary making. The advantages of their practical involvement in boundary making throughout continents gave a special impact to their publications. Significant attention was given to differentiation of terminologies of the stages of boundary making: especially between the terms delimitation and demarcation. Delimitation represents the preparatory work and the definition of the boundary in the treaty either by words or on maps, while demarcation represents the laying down of the boundary on ground after the treaty has been signed [Mc Mahon in 1896 according to Trotter (1897)].

Publications of Lapradelle (1928) and Jones (1945) reflect the second major step in the separation of the practical stages of boundary making. They separate the process into four basic stages: Allocation, Delimitation, Demarcation and Administration.

In spite of the fact that international boundaries are a very important tool, maybe the most essential one for the stabilization of the relations between nations, an up-to-date, internationally agreed model of boundary making does not exist, nor does a comprehensive attempt to extend the early four phase description of the process. The lack of such a model leads to insufficient technical support for statesmen with regard to the delimitation of the boundary and the practical arrangements associated with it. Statesmen on both sides usually have to come to an agreement in a tense atmosphere, sometimes after wars or during tough conflicts. They act under public and sometimes even international pressure. The process of negotiation, which includes usually the requirement to compromise with regard to national interests, leaves them no room for the technicalities: these must be taken care of by professional staff like Lawyers and Geodesists. Consultation with people who may not have the proper knowledge and technical skills, may cause troubles later on during the boundary making process.

Unclear definition of the boundary in the allocation may result in problems during delimitation and subsequently delays in the Agreement execution. If the definition of the delimitation and the guidance to the demarcation are not sufficient, a conflict may arise before or during the demarcation. If the demarcation is not well documented and mutually and formally agreed, it may cause conflicts and even wars in the future. If the boundary is not well maintained and the boundary zone well administered, the behaviour on ground will not fit the boundary line, which may cause conflicts in the future.

A comprehensive boundary model may resolve these potential problems prior to their appearance. It serves as a source of reference and as a check list, which may reduce complications and speed up negotiations. It can also, if followed by the two parties, reduce misinterpretations and conflicts, and speed up the process of the demarcation on ground which follows the Agreement, as well as contribute to future precise reconstruction or densification of boundary markers.

Our practical experience based on the demarcations of the International Boundary between Israel and Egypt, of the Intermediate lines between Israel and Egypt during the years 1973-9 and of the Israeli-Syrian Separation line 1974-5 led us to the conclusion that additional stages should be added to the four accepted basic ones. We implemented these conclusions in the process of boundary making between Israel and Jordan during the years 1994-2000.

2. THE POLITICAL AND ADMINISTRATIVE FRAMEWORK

The political and administrative framework includes three stages with regard to the boundary: Negotiations which include the allocation of a boundary line; A Treaty or Agreement which includes the delimitation of the boundary line; and the ongoing Frontier Administration including the boundary maintenance. These will be discussed in details in the following sections.

2.1 The Terms of Reference of the Negotiations including the Allocation

A Peace Agreement between two states is, usually, a result of a long process of negotiations between the governments of the states. The purpose of the negotiations is to bring the sides together in mutual agreement from a previous conflict situation reflecting in disagreement over different interests. The gaps between the sides in various issues, like boundaries, use of water resources, military considerations, ethnic problems, economic disputes etc., are so wide, and the heritage of hatred and violence is so deep that the break through can sometimes only be achieved with the assistance of third parties.

Thus, paving the way to an Agreement reflecting the mutual interests requires two stages.

The first stage usually follows internal disputes in each of the countries, because of the need to compromise on national interests. The target of this stage is to agree on a framework of negotiations and on a common Agenda. The common Agenda defines the subjects to be discussed for integration in the final Peace Agreement, and also the framework of initial agreements on crucial subjects; it usually includes a rough outline of the specific agreements.

The allocation of the boundary line is either a part of a Common Agenda document or is defined separately. It serves as a directive to the Boundary Commission about the framework of the negotiations and discussions to achieve an agreed detailed delimitation, which will be integrated in the Treaty itself.

The stage of negotiations, which leads to a Common Agenda, is characterized by heavy political pressures. The tense, loaded atmosphere sometimes leads to limiting the size of the team for the sake of secrecy. Preparations for this stage suffer from this limited use of professional support. The main professional and technical support is provided after the Common Agenda is published; the practical negotiations are conducted in designated committees, one of which is a committee on boundaries and other territorial issues.

The allocation is a directive to the boundary committee. In spite of the range of freedom that the boundary committee has over details, the allocation does put certain limits and constraints on it, from which it cannot deviate. If it does, the mutual understandings that are the foundation of the Common-Agenda will collapse and the process will cease.

In order to prevent inopportune surprises, which may cause either of the states to discontinue the negotiations after the allocation has been determined by the two sides, the allocation should be carefully scrutinized by professionals. This scrutiny should be judicious, to ensure

that there is no misunderstanding of the wording of the allocation and that potential interpretations are acceptable. This requires the involvement of a professional boundary engineer, at least for limited consultancy, at this stage (the term "boundary engineer" is suggested by Adler (1995) and Rushworth (1996) for a geodetic expert who is well experienced in the process of boundary making).

2.2 The Treaty/Agreement

The Treaty is a formal document that legally defines all relevant issues between the states and systematizes their relationships. An essential part of the Treaty between the states is the territorial one, including the boundaries between them. The delimitation of the international boundary is an integral part of the Treaty and a specific article is usually dedicated to it. The delimitation is an accurate, detailed, legally phrased definition, to avoid any future dispute over its practical interpretation. Using up-to-date technologies, including commonly used geodetic equipment like GPS, and common worldwide geodetic reference systems like WGS84, it is possible to define the boundary very precisely by coordinates at the centimetre level. This frees both sides from the constraints of local, uncommon geodetic reference systems.

The boundary demarcation follows the delimitation in the Treaty, which functions as the professional directive concerning the demarcation; this, too, is done by boundary engineers. The more professional the delimitation is the easier and more accurate will its implementation on the ground be where it forms the demarcation. Hence, boundary engineers, with their geodetic knowledge and experience in boundary making including field demarcation, should be involved in the preparation of the delimitation document.

To become the ultimate source for boundary maintenance and future boundary restoration or reconstruction, the delimitation must be precised by accurate definition of coordinates. For this purpose, in the article dealing with the international boundary in the Treaty, our model defines a clear procedure for incorporating precise boundary coordinates, in spite of the fact that the coordinates are not defined yet at the time of the original signature of the Treaty.

The procedure sets out a timetable for a professional team to accomplish a sequence of tasks, including demarcation, field survey and documentation of a list of boundary coordinates.

The model designates the geodetic technology and common reference system, and declares that the final coordinates be produced by the predefined procedure, and be later incorporated as part of the Treaty.

Thus, in spite of the early stage of the Treaty in the process of boundary making, the Annex referring to the international boundary in the Treaty of Peace includes instructions about the demarcation and field measurements, and the documentation of the list of coordinates. It also lays down procedures for their adoption in advance, so that the documentation of boundary coordinates can become part of the boundary annex to the Treaty of Peace.

In addition, the Annex refers to the maintenance of the boundary pillars and to the use of coordinates for the reconstruction of pillars.

3. THE NEW BOUNDARY MAKING MODEL

Linear and non-linear Models

The model covers all the stages of the process of boundary making, the components and activities to be included in the process and the recommended technologies and technical means. The latter should be revised from time to time due to progress of technology.

The model does not always reflect a linear process of succeeding steps, though the linear option is more common nowadays. The linear process includes the stages of allocation, delimitation, Boundary Agreement, demarcation, documentation and boundary maintenance.

Even this linear process is based on interrelation between the activities of the technical experts and the politicians. The allocation is a task for the statesmen but is strongly influenced by the technical preparations of the experts. The agreement which is produced by the statesmen contains the delimitation which is prepared by the experts. The boundary administration, which is a task of the politicians, includes boundary maintenance which is the responsibility of the technical experts. Sometimes even the documentation has to be authorized by the politicians.

The non-linear process was mainly used in the past, during the colonial period, when geographic knowledge of the areas of boundary delimitations was very poor. In that version of the model the process used to be iterative. The initial delimitation served as an “advanced, detailed allocation”, giving wide room to the demarcators to change the lines according to local considerations, mainly geographic and ethnographic. This actually made the demarcation process into a complex technical/political task. The resulting delimitation which was incorporated in the treaty was actually a formal documentation of the demarcation.

The various stages along the process are interrelated in any option including the modern linear process. This is expressed by the integration of considerations belonging to later stages during the implementation of earlier stages. In order to optimize the process, the analysis should be made from the last stage backwards, and then the relevant considerations should be integrated. Since the last stage is the boundary maintenance as part of the boundary administration, the ease of maintenance, including the potential requirement of restoration, reconstruction or boundary pillar densification, and the requirements of the practical administration, ought all to be considered during the documentation and the demarcation of the boundary.

The ease of practical demarcation, depending on the type of terrain, the accessibility and the stability of the area, and the stability of the soil and potential natural erosion, must all be taken into consideration during the delimitation process. Major issues of administration, too, including the use of natural resources and ethnographic considerations, have to be taken into consideration during the delimitation stage, and even as early as the allocation stage. This is reflected, therefore, in the preparatory work before the allocation.

Furthermore, since the delimitation is integrated in the formal Treaty, which is signed by the Statesmen, while the coordinates of the boundary line are produced only after the field demarcation, we recommended that the coordinates be defined in the delimitation, which will become part of the Treaty in a later stage, thus empowering the list of coordinates by the authorization of the Statesmen and of the Treaty.

But in spite of all the interrelations, we consider the differentiation of the process into the above mentioned stages to be very important.

3.1 The Model Components

The new Model was established based upon the following 7 sequencial components/ stages:

I. The Allocation

This is the first step of agreement and guidance made by the statesmen with regard to the international boundary. We follow the definition of Jones (1945): “Allocation means the initial political division of territory between two states”.

In modern times the allocation is usually a result of compromise between the two parties representing the two bordering countries. In the colonial times it used to be either a general agreement between two colonial powers- For example between Great Britain and France after World War I with regard to the boundaries between the Levant (Syria and Lebanon) under France and Palestine (including Trans Jordan) and Mesopotamia under GB – or as an international decision of a Colonial Power regarding separation or creation of States within its protectorate or Mandate – For example the separation of Lebanon from Syria in 1920 by France or the separation of Trans Jordan from Palestine in 1922 by Great Britain.

The Allocation used to be defined in a few ways. One of the methods is by a reference to previous known administrative or international boundaries. An example to a reference to existing districts can be found in the definition of the separation line between Lebanon and Syria in the Order of Governor Gureau on 31 august 1920:, or the reference to the boundary under the Mandate in the language of the 1979 Peace Treaty between Israel and Egypt.

Another method was to refer to natural prominent geographical features. This method was used all over the British Empire and was described largely in publications (Curzon, 1907, Holdich, 1916, Fawcett, 1918 etc.). The use of it enabled a very quick description of the boundary, without knowing well the area itself or visiting it. The results of it were many conflicts which rose during the implementation process due to bigger mismatch between the definition and the real geographical situation on ground. In other cases the administration avoided demarcation in order not to face conflicts. The usual geographical features used for that method are chains of mountains, rivers, lakes and valleys. This method was used in the separation between the Mandated area of Trans Jordan and that of Palestine in 1922.

A third method, which was used during the colonial period, was the geometrical method (Curzon, 1907). This method which defined long straight lines along Longitudes or Parallels, was used largely in Africa. It was used mainly in deserts and unimportant and less populated areas. This method refers actually to astronomical lines, and is referred to by others as the astronomical method.

This was also the general directive of the 1906 administrative line between the Egyptian Chadivate and the Ottoman Empire which became later the international boundary between Egypt and Mandatory Palestine. The intention of the allocation was, roughly, a straight line between Raffa in the north and Taba in the south (this line fully annexed the whole of Sinai to Egypt for the first time, due to the British interests). This line was practically changed during the physical demarcation due to local problems and considerations. The allocation expresses

the intention of the statesmen. It used to be done usually at a very early stage with lack of knowledge of the actual situation on the ground. At a later stage, during the delimitation process, after a long process of negotiation, which takes into account a better knowledge about the geography and the economic and political interests, the boundary line in many cases moved, sometimes tens of kilometers and more. An example to it can be seen in the initial delimitation of the boundary between Syria and Palestine in the Franco-British 23rd December 1920 Paris Convention, which reflected a remarkable deviation from the 1916 Sykes-Pico Agreement which can be considered as the original allocation. Furthermore, even the delimited line can be changed, usually during demarcation, when representatives of the two parties were exposed to the situation, including the physical geographic situation, the population in the area, the water sources, the roads and various economical and natural facts. Such an additional change was practiced in the same case, when the demarcators changed in 1921-1922 significantly the 1920 line as mentioned in the next paragraph. The requirement to make changes on the ground, in order to adapt the line to local constraints, was well known, and empowered, in many cases, the demarcators with the authority to perform such changes. In spite of the fact that the allocation is an act of statesmen, it is interrelated with activities of professional staff. On one hand the positions of the statesmen of both sides are based on information of all kinds. The positions are based on knowledge about the topography, about the population, about the natural resources, and about additional geographic, as well as, historic, ethnographic, anthropologic and cultural information. The positions are built on the evaluation of the information translated to national interests, mainly economic and security interests and with reference to legal considerations. These interests gathered with political interests participate in building the positions.

A proper way of organization of the information and the integration of it can improve the process of decision making.

Since most of the information is location based, the modern technology of GIS (Geographic Information Systems) is suitable and is very powerful, to be used both for the collection, integration and management of the information, and to support the decision making process, adding to it the flexibility of evaluating, in real time, the results of changes of the parameters which are considered for the decision.

For a proper implementation of the above mentioned information based environment, an expert, or a team of experts, should be designated. This expert, or these experts, should serve as technical consultants to the statesmen at the early stage of the boundary allocation.

This technical support has an additional importance. Since the allocation has a major influence on the delimitation, being its directive, and, further on, on the demarcation, it is beneficial that a technical expert, preferably a boundary engineer, who already had experience in boundary making, participates in the early stage. This participation can prevent unexpected complications during the implementation of the boundary process.

When a Joint Team of Experts is established, after the allocation and before the delimitation, this person will be part of it.

II. The Delimitation

We follow the earliest definitions of the term made by McMahon in 1896 (Trotter, 1897): "...the definition on paper either in words or on a map of the limits of a country", and Curzon

(1907): “Delimitation signifies all the earlier processes for determining a boundary down to and including its embodiment in a Treaty or Convention”. While the delimitation is signified by a work with documents the physical demarcation is signified by the laying down of the boundary on ground.

The Delimitation stage is the most complicated stage during the implementation after the Allocation. In certain cases it is comprehensive and fully accomplished before the signing of the Treaty. As was defined by Curzon and McMahon it covers ”all the preliminary processes and procedures before a boundary is laid down on the ground” [McMahon in 1896 according to Trotter, (1897)]. But sometimes, during the demarcation on the ground, additional changes are required, and the delimitation is changed due to those changes.

The delimitation of the boundary between Palestine and Syria (and Lebanon) is a typical example to the differentiation. The final delimitation of the boundary line, which was defined in the 1923 Agreement, adopted the significant changes which were made during the demarcation process of 1921-2 in pursuance of the initial delimitation in 1920.

In order not to mix the various stages, our core model refers to the modern boundary making process, in which there is only one stage of delimitation, followed by a demarcation. The above mentioned examples, reflect the tradition, a century ago, due to lack of geographic knowledge about the area, to perform an initial or preliminary delimitation followed by a physical demarcation, and then to arrive to a final delimitation which is a very detailed, mutually agreed, professional definition of the boundary. For these cases, which can be considered today as a legacy, we will add an optional stage to the model, to be called the final delimitation. In the modern cases when the preliminary delimitation is also the final one there will be no separation.

This is the stage in which experts of both sides translate the general definitions included in the Allocation to practical precise definitions taking into account local considerations. Sometimes the experts deviate from the original definition to adapt it to the local conditions. This is due to preliminary or post authorization.

The negotiations during the delimitation stage are handled before the signing of the Treaty, and therefore may be tensed, and may lead to an explosion. This is the reason that the statesmen are still involved either directly or indirectly. But since the precision of the delimitation process is very important, in order to avoid problems during the demarcation on ground the participation of practical experts, who are capable of anticipating the practical problems of demarcation is essential.

McEwen (1971), Kadmon (1994) and Adler (2001) recommend that practical experts should participate in the wording of the treaty or agreement at the delimitation stage. Rushworth (1996) recommends the participation of experts, at least as consultants to Tribunals when deciding on delimitation.

The importance of such an involvement was discussed by Cukwurah (1967, p. 34).

According to our model the two parties to the negotiation should found an organ called the Joint Team of Experts, as early as possible, in order to accomplish jointly all the professional tasks of the boundary process. This team should include geodesists, cartographers and other mapping experts. The team should be a part of a Joint Boundary Commission together with lawyers, liaison persons, consultants as necessary and a commissioner who has the confidence of the statesman who is leading the negotiation between the states.

The joint team of experts should be assigned the definition and preparation of all the necessary professional data and tools for the boundary annex of the treaty, the definition of the wording and the graphical expression of the delimitation which will be incorporated in the Treaty.

The Joint Team of Experts will be also assigned the tasks following the delimitation, including the demarcation, the surveying and field measurements, the documentation and the boundary maintenance.

The advantage of founding this team as early as possible is that being professional the members of the Joint Team of Experts have a common technical language, and they are used to team work. Thus, once their task is clear the level of suspicion between them is much lower than between the politicians. As the cooperative work proceeds, the level of confidence grows, and this is very contributing to the implementation of the task.

According to our model the Joint Team of Experts should begin to prepare as early as possible, even before the delimitation is ready, the required professional tools for the whole process. The essential tasks of the technical support of the Joint Team of Experts during this stage

include the preparations for the delimitation, including: field reconnaissance; definition of the parameters of the geodetic support and implementation of the relevant activities with regard to it; definition of the mutual set of graphic aids, including maps, which is required as a background for the depiction of the layout of the boundary line in the Treaty.

The tasks include the preparation of the delimitation of the boundary line itself, both in wording and on the set of mutual maps of the Treaty, in coordination with the statesmen. In case that the delimitation covers other sections than the land boundary, like a boundary line in a river, in a lake or a maritime boundary, it is the task of the Joint Team of Experts to define the technical parameters and methods for this delimitation and to implement them.

The last task of the Joint Team of Experts at the delimitation stage is the definition of the method of defining boundary coordinates, and of the order of precedence of the various boundary definitions in the future (for example: between boundary coordinates, delimitation on maps, the wording of the Treaty and the physical signals).

The delimitation should be carefully handled, and be honestly conducted by both sides on a basis of the best available data, in order to assure a successful demarcation, as well as steadiness of the boundary in the future.

III. The Demarcation

McMahon (Trotter, 1897), Holdich [28 July 1902 letter to under secretary of state (Rushworth, 1997)] and Curzon (1907) defined the demarcation as laying the boundary on the ground. Curzon referred to demarcation “as applying to the final stage and the marking out of the boundary on the spot “. He referred to demarcation as a more mechanical process than delimitation setting up beacons or pillars or posts, numbering them and recording them on maps (Rushworth 1997).

This stage is accepted as the third of the four stages, the last to be boundary administration (Jones 1945, Prescott 1987, Biger 2001).

According to McMahon (1896) the delimitation does not supply “Stability and finality which should be the underlying object of all international boundaries”. According to ICJ (1962, Preah Vihear Case) only the demarcation defines finally the boundary.

There is a level of latitude which is granted to the demarcators, when implementing their task, in order to take into account local geographical, administrative or other considerations (Curzon, 1907, Jones, 1945, Cukwurah, 1967, Brawer, 1988, Biger, 1991, Rushworth, 1997). Rushworth (1997) comments that although latitude was more essential when the delimitation maps were of poor quality, it is still considered necessary for modern demarcation.

According to Jones (1945, p. 59), the provisions which are granted to the demarcators to deviate from the delimitation refer, usually, to equitable compensation. He gives a few examples for such provisions, which include the Argentina-Chile convention of May 2, 1904 and the Estonia-Latvia delimitation convention of October 19, 1920. Jones recommends not to mention territorial compensation in the treaty, thus to enable non territorial compensatory measures. Jones (1945, p. 60) refers also to the restriction of the deviations to slight or minor modifications and gives examples in cases like the cases of Colombia-Ecuador treaty of July 15, 1916, Colombia-Peru treaty of March 24, 1922 and the Costa Rica-Nicaragua convention of December 24, 1886, which specifies the commissioners a limit of one mile for a deviation from the delimited line. The Protocol of Peace, Friendship, and Boundaries between Ecuador and Peru, which was signed at Rio de Janeiro on January 29, 1942, does not put a limit to the parties who may "grant such reciprocal concessions as they may consider advisable in order to adjust the aforesaid line to geographical realities" (United States, Executive Agreement Series, No. 288 (Washington, 1943). Article 9).

The demarcation process is sometimes delayed to very long periods of time. Until the 20th century only a few boundaries were demarcated (Brawer, 1988). Later on Colonial powers preferred not to demarcate many boundaries because of economical reasons, mainly due to the fact that the boundary was in an uninhabited area like Wadi Araba between Palestine and Trans Jordan (Brawer, 1988) and Wadi Batin between Iraq and Kuwait (Brown, 1994).

The trend today is to demarcate international boundaries, but there are countries that still avoid it because of economical reasons, or in order not to enter into potential conflicts.

Our experience during the demarcation of a few boundary lines raised the following conclusions:

- a. Delimitation lines which are marked on generalized maps (1:250,000 and smaller scales) are not adequate for field demarcations and cause very serious problems of interpretation.
- b. A Verbal description is not a sufficient tool of delimitation, when used for a demarcation, which is performed after many years.
One reason is that the verbal description refers to features that change or disappear, like trees, buildings, wells etc. The description may be well interpreted just after its definition, but not after a long delay.
Another reason is that the verbal description usually refers to natural geographical features, mainly ridges of mountains, river beds, wadis which are difficult to interpret as a definitive line. Another reason is the use of geographical names.
- c. Various kinds of boundary definitions may contradict each other. One example is a contradiction between a verbal description and a geographical layout or delineation on

a map. This was experienced in 1981 with reference to the interpretation of the definition of the international boundary between Israel and Egypt in the Peace Treaty, and during the Mandate over Palestine with reference to the interpretation of the definition of the boundary in 1922 in the Order in Council and the representation of the boundary on the mandatory maps (Brawer, 1988 pp.86-7). Sometimes, when a boundary is depicted on maps of various scales there is a contradiction between the depictions. This was experienced in 1979 in the case of the Peace Treaty between Israel and Egypt with reference to the depiction of the withdrawal lines on the 1:250,000 and the 1:100,000 maps.

The recommended solution is to reduce the use of various descriptions and, if they are used, to define an order of precedence between them.

- d. Tracing remnants of old demarcation may also cause complications. This was experienced in 1981 during the demarcation of the international boundary line between Israel and Egypt, especially in the sandy areas in the north and in the southern area. In the north there were in certain cases various physical pillars, not far from each other, representing generations of renewal of boundary pillars. In other cases, the pillars disappeared in the sand dunes, and they were exposed in a windstorm in places different from the new demarcated boundary, or not fitting the original verbal description (e.g. of a straight line). In the south, pillars disappeared or the ground was removed in the past for engineering constructions and only contradicting definitions existed.
- e. The best results of demarcation, and the easiest to implement the process, would be achieved if the delimitation is thoroughly made jointly, including field thorough reconnaissance, and physical marking of the delimited line. Latitude should be given to the demarcators to adjust for topographical and other problems and obstacles, including accessibility problems, or anticipated unstableness of the boundary pillar, which requires continuous maintenance. The result of the survey should include a detailed description of the demarcated boundary, the core of which should be a joint list of boundary coordinates in a common geodetic system. This will be the binding source for boundary restoration in the future.

IV. The Final Delimitation

This stage is not always practiced. It is brought here to represent historical cases, in which the final delimitation of the boundary in the treaty was formulated, after a joint commission of experts demarcated the boundary, which had already been preliminary delimited in a formal document/agreement by the statesmen.

Jones (1945) recommends that the boundary should be ascertained on the ground and then be delimited.

An example to such a case can be seen in the 1923 agreement between GB and France with regard to the international boundary between Palestine and Syria (and Lebanon).

This boundary, as described in the previous paragraphs, had been initially delimited in the Paris convention in 1920, and was demarcated in 1921-2 by the field commission which was headed by Paulet and Newcombe (The demarcators made significant changes to the original

line. Part of the changes had been made according to Franco-British agreed instructions which were delivered to the boundary demarcation committee).

The final delimitation includes a descriptive part and accurate data of field measurements. The most accurate definition today is an analytical list of coordinates for the entire boundary on a common geodetic system including a common accomplishing data file.

In the case that the final delimitation is included in the document of the treaty, it gets its direct authorization and no additional demarcation is legally required, like in the case mentioned above between Palestine and Syria (and Lebanon). (But the demarcation is practically required for the boundary administration).

Sometimes the treaty itself tasks a commission to accomplish certain duties to be performed after the treaty is signed. In such a case the additional document should be authorized by the two parties. An example to such a case is found in the Treaty of Peace between Israel and Jordan. The Treaty tasked the Joint Team of Expert to demarcate the land boundary and to define geographic coordinates which will be agreed upon by both parties, will be binding and will take precedence over the maps (The treaty delimitation as defined in the Map Album which was annexed to the Treaty of Peace).

As mentioned above, this stage can be omitted in many cases. We preferred to designate it as an option, in order to put into frame activities that exist in reality in certain cases.

In the case of a preliminary geometric delimitation that refers to meridians or parallels, this may impose many practical problems in the field, but, on the other hand, theoretically and legally no additional delimitation and even no demarcation are required.

V. Documentation

Following the Court's leading principle, that the element of stability and finality should be the underlying object of all international boundaries (ICJ, 1962 Preah Vihear Case), we think that a joint comprehensive detailed documentation of the boundary, which is sufficient to support an accurate construction or reconstruction of every boundary pillar, is the ultimate mean to achieve it.

Furthermore, in spite of the fact that physical demarcation of the boundary is recommended, especially in areas of tension, for the ease of boundary administration and reduction of violations, theoretically and legally a combination of a mutual delimitation and comprehensive documentation may also be sufficient.

My recommended approach is to define the documentation of the boundary as a designated major stage in the process of boundary making, similar to land registration in the land administration process, with the difference that the final approval and authority is not given by an authority of a single state, but given by the two neighboring states, along the relevant boundary line, by their authorized representatives.

The comprehensive detailed documentation should be the ultimate goal of boundary makers, and it maintains the quality of finality and theoretical stability. In order to obtain the full range of stability, including the practical point of view, it should follow and accomplish a thorough well maintained demarcation.

Current technologies can support a level of several centimeters of accuracy. That is ten times better than required for most cases of international land boundaries, and hundred times better than the accuracy of most of the existing international boundaries in the world.

An accurate detailed comprehensive documentation supplies the technical solution for any potential conflict between relevant countries, with regard to the accurate location of the boundary line, or any interpretation with regard to it.

If not preventing, a common accurate detailed documentation can, at least, shorten the work of an arbitration or conciliation tribunal or of a jury of the Court, since it contains the solution of the case. The accuracy, and the comprehensiveness of the documentation, defines the technical solution, while the signatures of the authoritative representatives give it the legal decisiveness.

It might be even a constructive idea to advance an international effort for the promotion of peace in the world, to document accurately international boundaries, especially in areas of tension.

The importance of a certain level of documentation was recognized in the past. Jones (1945, p.199) marked out that the importance of a technical report of the demarcation is to prevent loss of data, which may be valuable for future demarcations and future surveying and geodetic work. Cukwurah (1967, p.79) mentions that “on completing demarcation work, it is the duty of demarcators to compile a detailed general description of the posts, marks and beacons including their types, forms, dimensions and coloring”.

According to our experience, the value of the descriptive data with regard to the type and shape of the pillars is only complementary, while the positional and geodetic data, that fully documents the location of the boundary, and which is sufficient to support any objective technician to reconstruct the boundary line is essential.

Our experience is based on a few practical cases with regard to reconstruction of old international boundaries. The first case was experienced in 1981, when a joint team of experts tried to trace the international mandatory boundary line between Palestine and Egypt. This line was agreed to be the new International Boundary between the State of Israel and the Republic of Egypt according to the 1979 Peace Treaty between the States. This line had been delimited and demarcated in 1906. The joint team tried to trace the old pillars on ground (the pillars were of different types). Most of the pillars along the mountainous southern part of the boundary were found in the field, except the southern edge, including Taba, which was a populated area. All of the pillars along the sandy northern part disappeared, and only part of the pillars in the hilly central part existed. Would there be a proper certified detailed technical documentation during the mandatory period, it could be implemented in the Peace Treaty, and in any case the dispute would be prevented.

The second case was experienced in 1994, when the Joint Team of Experts had to define the international mandatory boundary line between Palestine and Trans-Jordan. This line was supposed to serve, according to the agreed Common Agenda, as the reference line to the international boundary between the State of Israel and the Hashemite Kingdom of Jordan to be incorporated in the 1994 Treaty of Peace between the States.

Since the mandatory boundary had not been demarcated, and definitely not documented, the only existing material were various interpretations either verbal or on inaccurate maps. The parties practiced good will, and their creative professional skills, to overcome the complicated problems. It could also end with a dispute. All of this would be prevented if a proper technical documentation existed.

The third case was the marking of the “blue line” between Israel and Lebanon in 2000. This task of the UN cartographic team was based, according to the UN documents, on the international mandatory boundary that was delimited in 1923.

Since no common certified documentation of the international boundary existed, the team reported on difficulties in the negotiations with the two parties until its final definition. The difficulties could be prevented if such documentation existed.

Following the experience, we tried in 1992 to implement our conclusions in a detailed documentation of the international boundary between Israel and Egypt. The joint technical work included GPS measurements of the boundary pillars, which resulted in technical data about the boundary line, including a list of coordinates, distances between the pillars, horizontal angles of directions of the boundary line for each boundary pillar, slope distances between boundary pillars, a 1:250,000 graphical layout of the boundary and 1:100,000 maps showing the boundary. Technical reference data was also included, like the datum definition and the computation of grid coordinates.

The content of the documentation included also background data about concepts, chronology, data about the boundary line route, description of the documentation procedure, general data about the GPS survey, the equipment, the data processing, the technical problems and the boundary line maintenance. The Annex to the documentation includes relevant clauses from the Treaty of Peace and a map album of the boundary pillars, showing for each boundary pillar three aerial photographs taken from a helicopter (one vertical and one from each side of the boundary pillar) in addition to the coordinates and a graphical scheme.

The detailed album was produced jointly by the technical teams of the two States, and was fully agreed upon on the technical level in 1996. But the Egyptian technical team has not received an approval from the political level to sign it.

The fact that, since the Treaty of Peace, the boundary area between Israel and Egypt is not abandoned anymore, and two roads follow the fences on both sides, contributes to the stability of the boundary line. The existing agreed documentation is also a supportive factor, but the absence of a continuous joint maintenance, together with the absence of signatures of both parties, may contribute to instability of the boundary line in the future.

The lesson learned from the peace process between Israel and Egypt was that the agreement about the core of the documentation, which includes the initiation of boundary coordinates, as well as the creation of the joint organ to carry out the task, was incorporated in the Treaty of Peace between Israel and Jordan itself, thus giving a preliminary authorization to the experts. This is a most powerful way to ascertain a stable boundary line.

The process of documentation was, in the case of Israel and Jordan, inherent in the workflow of the JTE. The preparation of a documentation, that includes coordinates of the boundary line, in the accuracy frame of one decimeter, with an attachment of a graphic scaled chart, which shows the boundary line and documentation of the geodetic reference, and the description of the process was prepared gradually for each part of the boundary. That included the land boundary, the maritime boundary in the Gulf of Aqaba, the boundary in the Dead Sea and the boundary line along the Yarmouk River (the documentation of which was required because of the construction of a dam on the river). The documentation for each sector was prepared separately, and was signed upon finalization by an expert of each party and by the head of the JTE of each party.

In order to strengthen the legal authorization of the documents a special document was prepared to confirm the documentations and them being the implementation of the Treaty of Peace. This document was signed by both chairmen of the Joint Boundary Commission.

During the first eleven years, following the Treaty of Peace, the documentation has already shown its importance for the maintenance of the boundary. It was practiced to solve practical issues in each one of the portions of the international boundary.

Conclusions and recommendations:

The documentation stage should be considered essential and one of the main stages in the process of boundary making. The core and most important part of it is a list of precise coordinates defining the boundary line, accomplished by supporting technical data. In addition, it is recommended to add descriptions and details of the process, and relevant connections, to the Peace Treaty and the implementation process.

VI. Boundary Maintenance

Since the field demarcated boundary is very important for the practical behavior around it, it is important to maintain the boundary appearance in the field. From the practical point of view it refers to the maintenance of the boundary pillars and the arrangements, which are made along the boundary line between the pillars for that purpose.

In other places than the land boundary, maintenance has different meanings, like placement of buoys in the sea, or arrangements that are made along rivers in order to monitor the boundary line with reference to the river changes.

With reference to the land boundary, in the absence of detailed joint boundary documentation, the demarcated posts are the leading evidence, pointing out the location of the boundary. They are important for the continuous boundary administration, in order to prevent unintended penetrations and violations of sovereignty. Their existence helps people near the boundary, to be acquainted with the boundary location, to adjust their behavior to the existence of the boundary and to prevent intentional and unintentional violations of sovereignty. Such violations may be expressed even by violations of infrastructure, including roads and constructions, or illegal exploitation of natural resources. Such violations may, on the long run, result in disputes between the relevant states and even in armed conflicts.

Cukwurah (1967, p.83) emphasizes its importance in the following: "The delimitation and demarcation of an international boundary will be no avail if, in the long run, no provisions are made by parties for the protection, maintenance and repair of an established boundary. The inviolability of such boundaries is generally recognized in its policies and practices of states. This sanctity can advance (if continuously respected) or destroy (if violated), the good neighborliness existing between adjoining states. And this fact is very often reaffirmed in boundary treaties". Jones (1945, p.214) refers to it as well.

The reasons for disappearance of boundary pillars can be many, either natural or caused by people. Examples of natural reasons can be:

Unstable ground like on sand dunes, muddy soil or a slope of soft soil. Except a potential tilt because of unstable ground, the pillar may fall down, and be moved from its place, mainly because of water erosion or wind erosion. If possible, the demarcators should avoid constructing boundary pillars on unstable ground, which will require continuous and costly

procedures of maintenance, or if there is no choice, a proper type of pillar should be adopted (usually a very deep construction, sometimes a pipe type).

Sometimes water erosion, or wind erosion, cause a pillar to come apart, especially if masonry constructions or cairns are not sufficiently fortified, or if iron parts are rusted.

Examples of those types of natural causes were practiced along the international boundaries between Israel and Egypt (mainly in the sand dunes), and between Israel and Jordan, either the exposition of bases of pillars in sandy areas and in the waterbed of the Wadi (in both cases fortification with stones around the bases of the pillars solved the problems), or in the muddy area south of the salt pans of the Dead Sea (where a very long pipe replaced the standard concrete pillar), and with the special case of the boundary pillar on the water line of the Gulf of Aqaba, where the salty water erosion causes the concrete pillar to disintegrate (This will be solved by replacing the pillar with one which will be made of special concrete with anti salt water additives).

In extreme cases, potentially even along the Wadi Araba, which is part of the Great Rift, pillars may move because of an earthquake.

Many human sourced problems could cause damage or disappearance of boundary pillars. This brought to a definition of punishment for such offenders in international law. According to Cukwurah (1947, p.84) under Roman law the punishment was to be sacrificed to god...

Proper maintenance of the boundary required a continuous procedure of periodical reconnaissance. This process should be preliminary agreed, if possible during the negotiations of the peace treaty, or in the joint team of experts if such an organ is constructed. It is recommended that the reconnaissance tour should be concluded in a report that will point out all the problems, the required measures and a follow up of previous items that had been raised in the past.

The easiest maintenance, to be taken care of, refers to minor actions, like repainting a pillar. The more complicated actions refer to a reconstruction or replacement of boundary pillars. In order to do a proper job with this regard, a proper detailed technical documentation is required.

In order to achieve a successful maintenance of the boundary line, on the long run, a few conclusions have to be made:

1. The task should be assigned to a joint active technical team.
2. The preplanning of the location of the boundary pillars, as well as their types and materials, should consider optional requirements of the boundary maintenance.
3. Detailed technical boundary documentation is essential, and should be prepared as soon as possible and authorized by the parties of the two States.
4. Periodical reconnaissance tours in the field are required, and maintenance actions, like repair, reconstruction etc., should not be delayed for a long time in order not to cause deterioration of the boundary condition.

A permanent designated joint team of specialists is the proper organ to take care after the boundary.

An example to tasks assigned to the joint team is given in Article 4 of the Treaty between the United States and Canada of 24 February 1925, where with regard to the demarcated boundary the Commissioners are empowered and directed.

VII. Boundary Administration

Boundary Administration is the stage which follows the Treaty between the States, and includes all the activities with regard to the area close to the boundary line and sometimes even the boundary zone.

It refers, mainly, to the administrative rules and behavior on both sides, but also to the behavior of the inhabitants. It includes the interrelations like passage of people and passage of goods, including the existence of passage stations and passage control, security control, including trespassing and smuggling, roads and other means of traffic and communication, usage of water, Agriculture etc.

It covers the boundary maintenance as well, and forms a well maintained boundary line, but it is required even when the boundary is not well demarcated, or even if the boundary is disputed. In such case its responsibilities are even bigger.

Jones (1945) defined the boundary administration as the 4th definite and last stage of the boundary process. Others also referred to the administration, either before Jones (Lapradelle, 1928), and mainly after him (Prescott, 1987, Brawer, 1988, Biger, 2001).

Cukwurah (1967, p.85) declares that "In effect, the continuous functioning of the boundary commission in all cases is an important factor in the efficient operation of the boundary."

We do not consider the boundary administration to be a separate stage that refers to boundary making, but to form an umbrella, conducting the practical interrelated life in the boundary zone covering also the boundary maintenance.

We also see a great importance to the influence of the boundary administration on the boundary maintenance, the condition of the boundary pillars, and the monitoring of cross boundary intended or unintended projects and activities.

Because of the importance (sometimes crucial) of the Boundary Administration on the interrelations between the relevant States in preventing conflicts, it is strongly recommended to found a joint committee to deal with the issues of the boundary administration. Because of the positive and important impact (sometimes crucial), that the boundary administration and maintenance have on each other, it is recommended to connect the two teams.

In certain cases, like between the US and Canada (McEwen,2001), the permanent Boundary Commission monitors all the components of the boundary administration, with regard to physical penetrations or violations of the international boundary line, including cooperative projects, and the boundary maintenance. The boundary maintenance is covered directly by an organ of the Boundary Commission, which is the Joint Team of Experts.

In some cases there are various committees dedicated to special subjects (boundaries, water, customs, environmental issues etc.) rather than one all-purpose committee, like between Israel and Jordan.

In many cases the boundary administration is done unilaterally by each side. This is mainly typical to states that are hostile to each other.

4. SUMMARY AND CONCLUSIONS

This article elaborated on the issue of the boundary making process and innovated by adding two designated stages to the traditional three stages. The three traditional theoretical stages include the allocation, the delimitation of the boundary, and its demarcation on the ground.

These stages were reviewed including the interrelation between them. The basic terms and definitions were reviewed too.

The two additional **designated stages**, proposed in this article, include the preparation of a mutually agreed precise documentation, and the boundary maintenance stage.

A **mutually agreed precise documentation** of the boundary, which is adequate for boundary maintenance and boundary restoration, is considered to be the most important tool for preventing future conflicts over the location of the boundary.

An adequate ongoing **boundary maintenance** is an important contributor to continuous boundary stability.

The article analyzed also the interrelations between the political and technical stages and activities.

We believe that a joint effort of following the proposed model, including a thorough preparation of the delimitation and the treaty, to assure the proper incorporation of the main essential elements, contributes to the stabilization of the boundary. This, supported by on going joint boundary maintenance, will prevent future boundary disputes, thus, contributing to peace.

The proposed model has been implemented successfully during the last fourteen years along the boundary making process of the international boundary between Israel and Jordan.

REFERENCES

Adler R., (1995) Positioning And Mapping International Land Boundaries, Boundary & Territory Briefing 2(1), IBRU, Durham.

Adler R., (2001) Geographical Information in Delimitation, Demarcation and Management of International Land Boundaries, Boundary and Territory Briefing 3(4), IBRU, Durham.

Biger G., (2001) The Boundaries of Modern Palestine, London.

Brawer M., (1988) Israel's Boundaries (in Hebrew), Yavneh Publishing House, Tel Aviv.

Brown H., (1994) The Iraq-Kuwait Boundary Dispute: Historical Background and the U.N. Decisions of 1992 and 1993, IBRU Boundary and Security Bulletin 2 (3), October 1994, 66-80.

Cukwnrah A.D., (1967) The Settlement of Boundary Dispute in International Law, Manchester.

Curzon, Lord of Kedleston, (1907) Frontiers, The Romanes Lecture 1907, University of Oxford.

Fawcett C.B., (1918) FRONTIERS – A Study in Political Geography, Oxford University Press.

Hartshorne R., (1936) Suggestions on the Terminology of Political Boundaries, Annals of the Association of American Geographers 26, pp. 56-57.

Holdich T.H., (1916) Political Frontiers and Boundary Making, MacMillan and CO., London.

Jones S.B., (1945) Boundary Making A Handbook For Statesmen, Treaty Editors and Boundary Commissioners, Washington D.C Carnegie Endowment For International Peace.

Kadmon N., (1993) Delineation of the International Boundary Between Israel and Egypt in the Taba Area – A Cartographic Evaluation, in: Studies in the Geography of Israel, Israel Exploration Society, Department of Geography, The Hebrew University, Jerusalem, pp. 50-70.

Lapradelle P. De, (1928) La Frontier: Etude de Droit International, Paris: Les Editions Internationales.

McMahon Sir Henry, (1935) International Boundaries, Journal of the Royal Society of Arts, 84: 4,330.

McEwen A., (1971) International Boundaries of East Africa, Oxford, Calderon Press.

McEwen A., (2001) The Value of International Boundary Commission: The Canadian/American Experience, IBRU Conference, Durham, UK.

Prescott J.V.R., (1987) Political Frontier and Boundaries, University Hymann, London.

Roberts J., (1995) Israel and Jordan: Bridges Over the Borderlands, IBRU Boundary and Security, 4 (3), 57-60.

Rushworth D., (1996) Mapping in Support of Frontier Arbitration, 'IBRU Boundary and Security' 4 (3) 57-60.

Rushworth D., (1997) Mapping in Support of Frontier Arbitration: Delimitation and Demarcation, 'IBRU Boundary and Security' 5 (1) 61-66.

Trotter J.K., (1897) The Science of Frontier Delimitation, Royal Artillery Journal.

BIOGRAPHICAL NOTES

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