28 years of Successful Joint Israeli-Jordanian Boundary Making and Boundary Maintenance – Part 2

Haim SREBRO

Introduction

In 1994 Israel and Jordan signed a Peace Treaty, which included an innovative boundary delimitation, utilizing for the first time, orthophoto maps. It included boundary-making procedures regarding demarcation, monument placement and surveying, boundary documentation and maintenance, as well as maritime boundary delimitation. For these tasks a Joint Team of Experts (JTE) was established as part of the Joint Boundary Commission.

The boundary line passes on land (Ha'Aravah/Wady Araba Valley), in the sea (the Red Sea), through a lake (the Dead Sea), and along rivers (the Jordan and Yarmuk Rivers). For the last 28 years the JTE has successfully completed all its tasks, and has solved all the challenging boundary issues.

These issues included the reconstruction and placement of boundary pillars because of natural causes such as seasonal floods and sea water erosion, as well as the reconstruction and re-placement of boundary pillars due to artificial works along the boundary. It included delimitation of the maritime boundary and the boundary in the Dead Sea, which is rapidly shrinking as a result of the lowering of the sea surface, including its northern coastline, which moves southwards, stimulating the elongation of the Jordan River for hundreds of meters. This has created a new situation regarding the boundary line (a boundary line in a lake is transformed to a boundary line in a river in a different location). Other cases referred to cases in rivers, including natural changes in the river's course as a boundary river. This involves both slow natural changes due to accretion, as well as sudden natural changes due to floods and the collapse of river banks. Other cases referred to changes in the course of rivers due to artificial activities.

The active joint cooperation of the JTE has continually dealt with all these issues, sometimes proactively in order to prevent problems or to take appropriate measures before problems arise; often JTE has dealt with issues on the fly when problems arose. JTE's preparation since 1994, to cope with various problems and its preparedness to react quickly, to meet members and to visit remote locations, has transformed the JTE, which had been formed originally as a professional organ, into the main joint organ that deals with the practical boundary issues.

In order to cope with the situation, the JTE, which acts as the right hand of the JBC, has prepared Standard Operating Procedures; it holds an annual reconnaissance along the boundary line, as well as annual meetings. In addition, it holds many other meetings according to specific requirements. The JTE members maintain close

relations with other ministries on each side, and especially the defense authorities, as well as legal advisers and the liaison organizations on both sides of the border. The chairs of the JTE report to the chairs of the JBC. The JTE includes active members of national mapping organizations on both sides as their working force; thus, they utilize the most advanced technologies in surveying, mapping, and geo-information.

Part 1 elaborates on the involvement of the JTE in boundary making and in boundary delimitation, demarcation, and documentation.

Part 2 elaborates on the JTE activities dealing with boundary maintenance since the peace treaty.

General

The Israel-Jordan Joint Team of experts was established in July 1994 during the first session of the Joint Boundary Commission (JBC), at the beginning of intensive talks on-site at the Aravah (Wadi Araba), in order to prepare an Israeli-Jordanian Peace Treaty. The main task of the JTE was to serve on the executive sub-committee of the JBC and to deal with all practical matters, including preparing an appendix to the peace agreement regarding the delineation of the international boundary line, delimiting the boundary line and marking it in the field, demarcating the boundary by boundary pillars, surveying the boundary pillars, as well as documenting the boundary and maintaining it in the future.

The JTE has successfully completed these tasks, and in addition, it has promoted the relationship between the two sides. The boundary making model, developed and implemented by the JTE, was cited in the professional literature[1] as a model for international boundary making. Last year, the JTE marked 27 years of successful cooperation of boundary making and boundary maintenance. During the last years, the JTE has had between five and ten meetings a year; thus it is the most active joint committee of all the committees established during the Israeli-Jordanian peace process, not to mention military cooperation.

The JTE operates along a boundary area 400 km long, through various landscapes, along the Dead Sea Rift, the lowest valley on earth, including a land sector (the Aravah/Wadi Araba), a river sector (the Jordan and Yarmuk Rivers), a lake sector (the Dead Sea), and a maritime sector (the Gulf of Eilat/Aqaba). Part of the boundary follows relatively[2] stable land ground and part of it follows unstable ground along moving rivers and a shrinking lake.

[1] Adler R., 1995; Adler R., 2001; Srebro H. and Shoshany M., 2009; FIG, 2013;
[2] The Aravah area is influenced by winter floods and by wind erosion.

The work of the JTE is characterized by close cooperation. It operates as one team chaired by two persons – one from each side. The JTE works as part of the JBC, by virtue of the authority granted to the JBC by the Peace Treaty.

1. **The JTE's modes of operation**

a. The JTE is an organ of the JBC. The heads of the JTE are members of the JBC. They receive their authority from the joint mission of the JBC, as specified in the Peace Treaty documents and from the decisions of the chairs of the JBC, to whom they report.
b. The JTE has acted continually since its establishment in July 1994.
c. The JTE members from both sides of the boundary operate as one team and their activities are carried out in full cooperation between the representatives of Israel and Jordan.
d. The JTE's modes of operation and the documents defining and relating to JTE's activities are detailed in an SOP (Standard Operating Procedures) book, which was prepared by the JTE and approved by the chairs of the JBC.
e. The chairs of the JTE have prepared annual reports on the JTE activities. These reports are prepared and signed during the annual meetings and are distributed to the chairs of the JBC during the JBC meetings.
f. In addition to annual meetings of the heads of the JTE, the JTE holds an annual boundary reconnaissance along the boundary pillars. At the end of the field survey, the JTE prepares a report on the condition of the boundary pillars with recommendations for measures that should be taken. On this basis, the heads of the JTE make relevant decisions regarding boundary maintenance.
g. In addition to the JTE's annual meetings, the JTE holds practical meetings as required in the field, upon the request of one of the sides. These meetings include field checks, in order to check the cross-border field activities or the cross-border physical installation or even cases in which such installations are too close to the boundary line. In such field checks, the JTE checks the location of the event relative to the agreed boundary line, and the influence of the event or installation on the boundary line and its maintenance. In cases of damage to boundary pillars or activities that influence a boundary river's course, the JTE reports the facts, and the heads of the JTE jointly decide on temporary or permanent measures to be taken in order to solve the problem.
h. In case of disagreements between the heads of the JTE, the heads have the option to raise the issue with the chairs of the JBC.
i. The JTE meetings and joint activities take place according to the requirements either in the field or at agreed upon installations. These meetings refer to boundary maintenance, as well as to field checks and include discussions regarding the follow-up and promotion of joint prolonged projects.

j. The JTE meetings take place at sites along the Israel-Jordan boundary line as required, or at the offices of the military liaison units near the boundary terminals, either on the Jordanian or the Israeli side.
k. The annual JTE meeting takes place in Eilat, usually following the annual boundary reconnaissance tour.
l. Other main meetings are integrated into the JBC meetings, or take place as special meetings with the heads of the JTE in Amman or Tel Aviv.

2. **Maintenance of the boundary pillars**
   a. Initial placing of boundary pillars
      The JTE initially jointly placed 124 boundary pillars along the Aravah/Wadi Araba valley, following the Peace Treaty boundary delimitation.
      Following a joint demarcation in the location field of the boundary pillars, in 1995 the JTE placed on the ground 119 standard concrete boundary pillars, which were produced by a Jordanian contractor.
      Owing to unstable muddy soil at the BP123 location, near the southernmost Dead Sea salt pan, a non-standard pillar was erected at the site at a later date. The alternative pillar, having a cylindrical long shape, was manufactured and placed on the site by the Dead Sea Works. Its height fitted the requirement that it should be viewed above the local high flora. A special thick layer was paved on top of a muddy track in order to enable access to the boundary pillar, due to the risk of suspected scattered mines in the area.[3]
      At the BP107 location, a long pipe replaced a standard boundary pillar, since the slope of the brittle soil on-site did not enable a heavy concrete pillar to be erected.
      The JTE did not place a standard boundary pillar at the position of BP1 due to the Jordanian request to preserve an old 1946 British boundary pillar. The placement of BP0 on the shoreline[4] was delayed until a joint decision was reached regarding the configuration of the three southern pillars: BP0, BP1, and BP2.

   b. Maintenance of boundary pillars due to wind and water erosion
      Common wind erosion cases refer to the fading of the red and white colors of the pillars' pipes. These pillars are easy to maintain. Other cases of wind erosion are typical of pillars in the sand dune section. In this area the boundary pillars may be covered by sand and need exposure. In other cases, the base of the pillar may be exposed, sometimes causing the pillar

[3] Such mines could be swept away from old mine fields during winter floods.
[4] BP0 became the point of origin of the Israel-Jordan maritime boundary – BP0=MB0.

to tilt or fall down. In both cases, the JTE has to deal with the problems and restore the boundary pillars.
Sea water erosion is relevant only to BP0 on the shoreline. This boundary pillar required restoration and replacement on higher ground due to sea water erosion until 2009, when a three-level concrete construction was built, and a new boundary pillar was placed on top of it.

c. Maintenance of boundary pillars due to floods
Some of the boundary pillars are located in zones of seasonal water floods. Two of the boundary pillars in the northern section of the Aravah/Wadi Araba were swept away during powerful floods. One of them (BP75) was completely covered by mud and not found. A new pillar and a high concrete base were produced and installed, but they could not withstand another powerful flood. Although most of the pillars, even in low places, can be reinforced and maintained, the location of the destroyed BP75 is definitely not suitable for erecting a standard concrete pillar.

d. Maintenance of boundary pillars due to man-made changes
The usual damages to boundary pillars due to human activities mostly occur during boundary maintenance, often in sand dunes. However, these damages are minor. More extensive damage to boundary pillars largely refers to the use of heavy vehicles and equipment while restoring and placing boundary pillars.
In 2008, during mine cleaning while constructing a large project on the Jordanian side (the Ayla Project), the contractor destroyed the old 1946 boundary pillar, which had been adopted as the new boundary pillar as well. As a result, a new boundary pillar was constructed and placed on a new two-level concrete base.
The most prominent case occurred from 2016 to 2018, when some of the boundary pillars in the southern section had to be removed and re-installed due to a change in the topography along the border line, in order to stabilize the boundary line in this section. This required constructing a massive high security fence on the borderline itself, and constructing a new security road on the Israeli side. Since it was suspected that in the area along this section mines had been swept away from old mine fields, the boundary pillars had to be temporarily displaced so that the mine cleaning process could proceed. During this process, procedures for proper drainage and for accessibility to the boundary pillars were arranged. Finally, all the boundary pillars were restored. In a few cases, they were placed on new concrete bases. Following this process, the boundary pillars along this section are now very stable and almost never need any maintenance.

The JTE was completely involved in this process, from its beginning until its end, including instructing and supervising the contractors.

e. Cooperation and coordination of physical activities along the boundary
Since the 1994 peace agreement, both sides of the JTE have maintained continuous and close cooperation along the boundary line. This cooperation prevents misunderstandings, disputes, and friction. The JBC members on both sides are part of their defense ministries, which enables effective cooperation between the members. The JTE is supported by military cooperation between the two sides, and takes advantage of their good communication.
In addition, the JTE is supported by the military liaison units, which have maintained ongoing joint cooperation and coordination since 1994.
The JTE cooperation includes annual boundary field reconnaissance, usually following the winter rains and floods. In addition, the JTE meets in the field at sites along the border if there was damage to boundary pillars or physical ground changes resulting from natural (e.g., floods) and man-made reasons.
In addition to joint field reconnaissance, the JTE holds office meetings for boundary maintenance. As a part of these meeting, the JTE routinely holds an annual meeting in Eilat, following the annual joint boundary reconnaissance surveys. One of the purposes of the meeting is to prepare an annual JTE report, summing up the detailed annual boundary conditions, and issues that had been taken care of during the previous year, as well as items that need further discussion and analysis. Special JTE meetings take place in Amman or Tel Aviv. Some of them are integrated into the JBC meetings: the heads of the JTE report to the chairs of the JBC and submit the annual JTE reports to them. Most of the JTE office meetings take place in the liaison offices at the boundary terminals.

f. Accessibility to the boundary pillars
The main Israeli road along the Arava/Araba Valley is much closer to the boundary line than the main Jordanian road is – less than one kilometer versus a few kilometers. The Israeli military road is much closer, and along most of the boundary line it follows the security fence, which is adjacent to the boundary pillars. Therefore, the JTE has jointly agreed to conduct the annual boundary line reconnaissance tour along the Israeli security road.
There are a few exceptions along the northern section of the line, where accessibility to the boundary pillars from the Israeli side is limited due to passing through areas that are suspected to contain sporadic mines that were swept away from old mine fields during the winter floods. Both sides

agreed that the boundary checks at these sites would be checked unilaterally by Jordanian members of the JTE before the annual JTE meetings.
The joint boundary visits to BP1 and BP0 used to be from the Jordanian side because of an old minefield west of the pillars. During the last years, since the area has been cleaned of mines and since the construction of a new Israeli road down to BP0, following the new massive and steady Israeli fence, the JTE has easily checked the stabilized boundary pillars along the southern boundary section by a car ride. For special cases that require crossing the boundary fence, dedicated boundary gates were prepared. .

g. Annual joint reconnaissance along the boundary line
The joint annual boundary reconnaissance used to be conducted from the Israeli side by four joint surveying teams. However, during the last years, this has been reduced to two joint teams plus a managing team that usually joins one of the teams. In the past, the managing team used to check BP0 and BP1 from the Jordanian side.
The joint annual boundary reconnaissance tour is preferably conducted in the end of spring, following the winter flood season and before the extreme heat of the summer, taking into consideration the timing of RAMADAN. On rare occasions, however, the timing differs. The annual 2021 boundary tour was delayed until January 2022 due to COVID pandemic constraints.
During the boundary checks, the teams check the existence or absence of boundary pillars including the movement and tilting of boundary pillars and their upper pipes with reference to their original documented positions. In addition, the team checks the stability of the ground bases of the pillars in relation to the environment – whether the soil has been swept away by floods or scattered by winds, whether the pillar has been fully or partially covered by sand dunes, and whether the pillar appears to be in order and its colors are not faded.
The findings are noted in the annual JTE boundary report; the JTE deals with the required measures needed to solve any problems. If there is movement of a boundary pillar or suspected movement, the JTE conducts surveys to check the situation, based on the control points of the joint boundary network – IJBD94.
The joint boundary network also serves to restore or re-install replacing boundary pillars if required.

h. Special boundary pillar cases regarding boundary pillars are dealt with by the JTE, including making decisions, as well as conducting field inspections and field surveys. A few examples follow.

(1) The boundary pillars near the Gulf of Aqaba/Eilat, namely, BP0, BP1, and BP2.
The JTE placed these boundary pillars more than a year after the 1994 peace agreement, following a specific agreement between the two states regarding the location of the three pillars.
Since the initial placement, the JTE has replaced all three pillars (at the same locations but at different heights). BP0 on the shoreline was replaced twice because of sea water erosion until its placement on a high stable concrete construction site in 2009. BP1 was replaced once by a standard boundary pillar after the destruction of the old 1946 boundary pillar (during major development works on the Jordanian side along the southern area – the Ayla project); it was placed on a high concrete construction site in 2009. BP2 was replaced on a concrete base in 2018, after old mines were removed from the area. Unfortunately, floods from the north undermine the concrete base of BP1. This requires urgent maintenance in order to prevent the destruction of the base and the boundary pillar.

(2) Stabilization and replacement of boundary pillars along the southern section (BP3-BP20).
This activity, which required the tight involvement of the JTE during the years 2016-18, was required to stabilize the border line near Eilat's new airport. The stabilization project included the regulation and re-arrangement of the drainage along the border line to avoid damage from winter floods, and the construction of a new security road and a high security fence. The earthworks included the establishment of a proper ramp along the border line; they also required mine removal around the boundary pillars. The boundary pillars had to be replaced, and sometimes elevated to a new ground level on top of massive concrete bases.

(3) Replacement of boundary pillars due to seasonal floods.
As already mentioned above, powerful seasonal floods can damage boundary pillars that are located in Wadi Araba/Nahal Ha'Aravah. One of the boundary pillars (weighing over 2 tons) – BP118 – was swept by the water for a hundred meters. The JTE restored the pillar and stabilized its base.
Another boundary pillar – BP75 – was swept away and was covered by mud and could not be found. The JTE reproduced a new pillar to replace the missing boundary pillar, positioning it at a higher level on top of a new massive concrete base. Nevertheless, a few years later, a powerful flood swept away the soil beneath the concrete base, and the massive high concrete base and the boundary pillar on top of it

consequently tilted and may fall down after another powerful flood. This requires preventive maintenance.

3. Subjects referring to the Dead Sea and the Salt Pans

a. General

The area of the Dead Sea and salt pans was originally a natural lake. It is common to delimit border lines in longitudinal lakes if they are positioned along rivers or in the middle of lakes. This used to be the case with the Dead Sea, which follows a river (the Jordan River) and a geological fault line (the Dead Sea Rift), when the British delimited the international boundary in the middle of the Dead Sea during the Mandate over Palestine and Trans-Jordan.

Unfortunately, over the years, the shallow southern basin of the Dead Sea has dried up, and salt pans have been established in it on both sides of the old border. Although it was not self-evident, Israel and Jordan chose to delimit the boundary line between them in the area of the salt pans with reference to the international boundary line during the British Mandate. In addition, the loss of water from the Dead Sea due to the industrial exploitation of the water through evaporation at the salt pans, due to the depletion of the Dead Sea water sources, mainly from the Jordan River, and due to the loss of water from the Dead Sea through evaporation, as a result of global warming, caused the Dead Sea to contract significantly. The water surface has diminished and its coast lines have receded. Despite the differences in the retreat of the coastlines on both sides,[5] Israel and Jordan have agreed to delimit the boundary line with reference to the boundary during the British Mandate and not along the current median line of the Dead Sea.

The retreat of the northern coastline southward has additional aspects. The Jordan River has to continue its course southwards through the dried area in order to reach the Dead Sea. The new course of the river along this section does not coincide with boundary delimitation during the British Mandate. The solution followed the mutual Israeli-Jordanian agreement that the boundary along the middle of the course of the river, if natural and gradual changes exist, will prevail. The process continues due to the continuous drying of the Dead Sea. Therefore, the JTE must continue to monitor the changes in the Jordan River in this section, and adjust the boundary line accordingly.

[5] The recession of the coastline on the western (Israeli) side is more significant due to the moderate slope of the ground.

b. Special subjects that the JTE dealt with over the years regarding the boundary in the Dead Sea and the Salt Pans section are as follows.
   (1) The first joint task of the JTE regarding the salt pans section was a joint project to define the peace treaty boundary line delimitation by agreed coordinates based on the IJBD94 boundary reference system. After this successful joint project, the usual items of field checks and discussions regarding the salt pans section refer to new dykes of salt pans and to additional earthworks and installations along existing dykes. The question is if such earthworks cross the delimited boundary line.
   (2) A major item of discussions regarding the area along the salt pans and the southern part of the Dead Sea refers to the canal that transports the remaining chemical solutions that return from the salt pans northwards to the Dead Sea.
   Although the canal that feeds Dead Sea water southwards to the salt pans is well organized technically, the drainage of the remaining solutions after extracting the essential chemicals is not. The Dead Sea Works companies on both sides direct the remaining solutions to a wide strip between the salt pans of both sides, where the two flows meet and unite into one stream, without any regulation and technical direction through an organized channel. The result is that the stream of the remaining solutions forms a sporadic uncontrolled channel along tens of kilometers until it finds its way to the Dead Sea. One result of this process is that the water bed of this channel continues to lower its level, since the Dead Sea surface is continually being lowered, which poses a risk to the dykes of the salt pans. Another result refers to the international boundary. The sporadic channel of the course of the flow of the remaining solutions does not follow the international boundary line; it leaves a large piece of land that is not accessible on land from one of the states. This is an issue that should be dealt with by both parties.

4. Subjects referring to the river boundaries

a. General
   According to the 1994 Peace Treaty, it has been agreed that where the boundary follows a river, in the event of natural changes[6] in the course of the flow of the river, the boundary will follow the new course of the flow. If there are any other changes[7], the boundary will not be affected unless otherwise agreed. In such cases, the JBC should meet as soon as possible

[6] Accretion or erosion
[7] Such as sudden natural changes in or along the rivers (avulsion or cutting of a new bed).

to decide on the measures needed, which may include physical restoration of the location of the river course. The Peace Treaty specifies that no artificial changes may be made except by mutual agreement between both parties.

The treaty sets the boundary line in the main course of the Jordan and Yarmuk Rivers by delimiting it on 1:10,000 orthophoto maps attached to Appendix I(a) of the treaty.

According to the Peace Treaty, adjustment to the boundary line in any of the rivers due to natural changes (accretion or erosion) will be carried out whenever it is deemed necessary by the JBC or once every five years.

The wording of the Peace Treaty regarding the boundary in rivers adopted traditional concepts (of accretion and avulsion) that became common, although they have not been accepted as international law. This perception has developed in a world in which man-made interventions in the natural flow of rivers were rare. However, what was rare in the past regarding river boundaries became common in the second half of the 20th century. The phenomenon of human intervention in the flow of rivers has rapidly expanded during the first decades of the 21st century as a result of increased population growth and global warming. The warming and the over-exploitation of fresh water, either because of direct use or by the use of water for food and energy production, were followed by large man-made water projects. Such projects included diverting rivers, the construction of dams for water consumption and for electricity production plants, as well as the construction of water reservoirs for irrigation. The result today is that the old traditional perception that the flow of a river is natural and is not influenced by human intervention is not valid any more in most rivers. This is significant in river boundaries where changes in the course of the river consequently influence the course of the boundary line. In the new reality, it is not logical to continue to adopt the old perception without adapting it to the existing reality.

These developments are fully relevant to the Jordan and Yarmuk Rivers regarding the Israel-Jordan boundary line, and the flow of both rivers cannot be considered as a natural flow. In addition to the general trend due to global warming and population growth, several significant water projects have led to similar conclusions. Already in 2000, the JBC decided to fix coordinates in the Israel-Jordan international boundary line in the Yarmuk River due to the construction of a dam on the river so that Jordan could use the water. An analysis of the long term behavior of the Jordan River revealed that due to the dramatic reduction in the water flow, since the 1994 Peace Treaty, the "natural" fluctuations of the river are up to 15 m versus 500-800m in the past. The approach of fixing the international boundary line in the Jordan River in coordinates according to the Peace

Treaty delimitation is supported by the author, but it has not been adopted by the JTE. If such decisions occur, the two sides have to agree on equal rights regarding the use and accessibility to the water by both sides.

b. Relevant cases along the Yarmuk and Jordan Rivers.
The following are a few cases that pose challenges regarding the delimitation of the boundary line in the Jordan and Yarmuk rivers.
   (1) The construction of a dam on the Yarmuk River near Adassiya in order to divert water from the river to the Abdulla Canal in Jordan.
   Due to the artificial change in the river's natural flow and due to the establishment of a water reservoir upstream and to the significant reduction of water volume downstream, both sides decided to fix the coordinates of the international boundary line in this section following the delimitation of the boundary line on the orthophoto of the peace treaty. The JTE documented it and the JBC formally approved it.
   (2) The construction of a cross-river gas pipe.
   Owing to the impossibility of drilling under the river bed at the required location, the technical solution was to transfer the river flow temporarily to elevated large water pipes, to dig a channel for the gas pipe, and lay the pipe down, then cover it, and restore the river's original water bed.
   Since this was an artificial change in the river's flow, the JTE prepared a list of the coordinates of the international boundary line delimitation, based on the delimitation of the boundary line on the orthophoto of the peace treaty. All stages of the process were recorded on orthophoto and topographic maps that were prepared using cameras on drones. The final restoration of the river's water bed utilized the coordinates of the international boundary line extracted from the peace treaty's boundary delimitation line.
   (3) An artificial change in the flow of a boundary river.
   The construction of fish pools along the boundary river has influenced the course of the river. Both sides agreed that since this was an artificial change, the side responsible should restore the river to its original course, following the coordinates defining the boundary line, as delimited on the orthophoto of the peace treaty.
   (4) A sudden natural change in the course of a boundary river.
   A sudden natural collapse of a very high brittle bank of the Jordan River created a new high hill that significantly blocked a road along the river and the course of the river up to a perpendicular distance of over one hundred meters from its original course.
   This caused a bypass of the course of the river from its original water course.

The parties have not yet decided how to handle this case. The restoration of the original course seems to be an enormous challenge, both technically and economically and the remaining high brittle banks in the area are still very unstable and may collapse. Such cases in the past used to lead to the creation of natural meanders in the course of the river.

(5) The delimitation of the boundary line along the elongated section of the Jordan River.
As a result of the recession of the northern coastline of the Dead Sea due to the lowering of the surface of the sea, the Jordan River's course has become elongated until it reaches the sea.
According to the 1994 peace treaty, the boundary line in the river follows the middle of the main course of the flow of the Jordan River. So theoretically, the boundary line should follow the middle of the course of the elongated section.
However, the boundary line in this area was already delimited on an orthoimage of the Dead Sea in the 1994 peace treaty. There is a difference between these two definitions regarding the delimitation of the boundary line in this section. The parties have not yet decided about the solution.

5. **Joint Projects**
   a. The successful cooperation between the two sides within the JTE beginning three months before the October 1994 peace agreement has continued until today. The participants on one side are professional representatives of RJGC and the Jordanian military mapping unit and on the other side professional representatives of the Israeli military mapping unit and the Survey of Israel. The mutual confidence developed during the close professional and technical cooperation while working on preparing the documents of the Peace Treaty and other tough technical challenges under severe time schedule constraints. The requirements were not limited to purely mutual technical work, but at the same time each one of the teams had to support the politicians of that side in order to find a common solution to the large gaps between the two sides. The mutual confidence between the professional members evolved with the mutual understanding that only a combined work as one professional team, maintaining openness and fairness can achieve the required goal. The success of the joint team, while developing and adopting a new methodology for the first time for this boundary agreement, became later on a model and example for joint professional cooperation for international boundary making.
   This collaboration has contributed to relationship of mutual confidence and even personal friendship.

During the years the parties held mutual visits as required for the purposes of the duty for maintaining the boundary as well as for joint projects for the benefit of both sides.
The cooperation between the two states in the field of surveying and mapping is essential for both sides, as a result of their geographic location along their land and maritime boundaries. The international boundary between the two states follows the Dead Sea Rift, which is the border line between the African tectonic plate on its west side and the Arab tectonic plate on its east side. This border line is prone to earth quakes and has experienced severe and destructive earth quakes in the past. Long term research and analysis on the base of systematic monitoring of the relative movements between the two sides of the rift line can improve the preparedness of both states for potential high risk disasters. It may have even contribute to potential anticipation of a disastrous event. Such a research and analysis process requires high precision measurement in adequate locations from both sides of the rift line. Since the two sides of the geological rift line are located in different countries – Israel and Jordan - such a program requires joint efforts and full collaboration.
The successful collaboration within the JTE supports good conditions for such joint professional projects. This is augmented by the participation of representatives of the national official survey organizations of both sides in the JTE. The effective potential of such joint projects is even more promising because the JTE operates under a joint military-security umbrella.
The JTE established before the 1994 peace treaty a joint surveying reference network – IJBD94 – to serve as a reference system for the boundary. The reference network consists 6 stations on each side from Hamat-Gader/El-Hama in the north to Aqaba/Eilat in the south. The coordinates of the boundary pillars and boundary line as well as the maintenance of the boundary are based on the IJBD94 boundary reference network. This surveying network is also the base for joint geodetic projects. The initial plan also included integration of geologists in such joint projects. Most of the joint project initiatives referred to such cross-border surveying projects.

b. Joint JTE projects taken care of over the years:
   (1) A joint Eilat/Aqaba marine chart.
   This trilingual marine chart is intended to support the safety of navigation at the head of the Gulf of Aqaba/Eilat. This is important due to the busy marine traffic in this area, especially on the Jordanian side, since the Port of Aqaba is the only port in Jordan.

This joint project has nearly been completed, and it awaits final approval.

(2) A project to establish a regional surveying network to monitor the relative movement of tectonic plates.
This project was planned as a joint venture of Jordan, Israel (both represented in the JTE), Cyprus, and Greece to monitor the relative movements between the Arab Plate, the African Plate, and between the Euro-Asian Plate. Special solid and stable control stations were planned for the project. Unfortunately, the project did not achieve the required funding and was not included in the European R&D program.

(3) A joint collaboration cross-border surveying project involving the JTE and the Geological Survey, to monitor the relative movement between the Arab and African plates along the Dead Sea Rift. This project intended to make use of the existing IJBD94 boundary network, and to augment it by additional stable control stations. However, due to the COVID-19 pandemic and to the economic consequences that followed, this project is now on hold.

(4) In addition to standard joint projects such as monitoring the stability of the IJBD94 network every five or ten years, the JTE supports the establishment of joint cross-border bi-lateral projects, such as the cross Jordan River gas pipe line, a joint industrial park, and others.

References

Srebro, H. (2012). *The boundaries of Israel today*. Survey of Israel.

Srebro, H. (2013a). A Model of Boundary Delimitation in a Peace Agreement. In: FIG Publication NO 59 on International Boundary Making. Editor: Haim Srebro, Chapter 3, pp.51-66.

Srebro, H. (2013b). The Israel-Jordan International Boundary. In: FIG Publication NO 59 on International Boundary Making, Editor: Haim Srebro, Chapter 4, pp. 69-93.

Srebro, H. (2017). The influence of changes in the Jordan and Yarmuk Rivers on the international and cadastral boundaries (Part 1). FIG Working Week 2017, Helsinki.

Srebro, H. (2019). River Boundaries (Part 2): The influence of changes in the Jordan and Yarmuk Rivers on international and cadastral boundaries. FIG WW 2019 Hanoi, Vietnam.

Srebro, H. (2020a). River boundaries. In H, Srebro (Ed.), International

Boundaries on unstable ground (pp.13-24). FIG publication, 76: International federation of surveyors (FIG).

Srebro, H. (2020b). Boundaries in rivers practical case – the influence of changes in the Jordan and Yarmuk rivers on the international and cadastral boundaries. In H, Srebro

(Ed.), International boundaries on unstable ground (pp. 25-43). FIG publication, 76: International federation of surveyors (FIG).

Srebro, H. (2020c). Boundary lines in lakes. In H, Srebro (Ed.), International boundaries on unstable ground (pp. 44-59). FIG publication, 76: International federation of surveyors (FIG).

Srebro, H. and A. Khasawneh (2020). 25 Years of Successful Joint Israeli-Jordanian Boundary Making and Boundary Maintenance – Part 1, FIG WW 2020, Amsterdam

Srebro, H. and M. Shoshany (2006). Towards a Comprehensive International Boundary Making Model, Proceedings of the XXIII FIG Congress in Munich, October 2006.

Srebro, H. and M. Shoshany (2007). The Order of Precedence of Boundary Delimitation, FIG WW 2007.

Srebro, H. and M. Shoshany (2009). Comprehensive Process-Driven Boundary Making Model: A Case Study of the Israel-Jordan Boundary. Survey Review, 41, 312 pp. 174-191, April 2009.

Srebro, H. and M. Shoshany (2013). The Process of International Boundary Making. In: FIG Publication NO 59 on International Boundary Making, Editor: Haim Srebro, Chapter 1, pp.17-38.