Mapping the refugee camps of Gaza: the surveyor in a political environment

James Kavanagh
Royal Institution of Chartered Surveyors

Rob Home
University of East London
Aims and scope of the RICS Foundation Our Common Estate Paper Series

- combat disadvantage and inequality in our use of natural and built resources
- put forward best practice in the management and operation of land systems and markets
- focus on the worldwide aspects of research, policy and practice within the built and natural environments

Details of all RICS Foundation publications can be found at: www.rics-foundation.org

Editor
Adarkwah Antwi
School of Engineering and the Built Environment
University of Wolverhampton
Wulfruna Street
Wolverhampton WV1 1SB
United Kingdom
tel: +44 (0)1902 322261
e-mail: in7364@wlv.ac.uk

Editorial advisory board
Lynne Armitage
Queensland University of Technology, Australia

Paul Asabere
Temple University, Philadelphia, USA

Alexandra Bernasek
Colorado State University, USA

Bruce Boaden
University of Cape Town, South Africa

Peter Bower
Staffordshire University, UK

Spike Boydell
University of the South Pacific, Fiji

Aditi Chatterji
Calcutta University, India

Rob Home
University of East London, UK

Kasim Kasanga
University of Science and Technology, Kumasi, Ghana

Robin Palmer
Oxfam, UK

Geoffrey Payne
Geoffrey Payne Associates, UK

Jerome Robinson
Ministry of Agriculture and the Environment, Dominica

Amy Khor Lean Suan
National University of Singapore, Singapore

Alan Tinkler
Alan Tinkler and Co, Mauritius

Mika Törhönen
FMInternational Oy FINNMAP, Finland

Saad Yahya
Saad Yahya and Associates, Nairobi, Kenya

For matters relating directly to the RICS Foundation, please contact:
Stephen Brown
Director of Research
RICS Foundation
12 Great George Street
London SW1P 3AD, UK
stephen@rics-foundation.org

tel: +44 (0)20 7695 1568
Fax: +44 (0)20 7334 3894

The RICS Foundation is a charity, registered number 1085587, and a company limited by guarantee, registered in England and Wales, UK, number 4044051
## Contents

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Introduction</td>
<td>1</td>
</tr>
<tr>
<td>Mapping and surveying for refugee management</td>
<td>3</td>
</tr>
<tr>
<td>Refugee camps of the Gaza Strip</td>
<td>4</td>
</tr>
<tr>
<td>Land law and ownership in the Gaza Strip</td>
<td>6</td>
</tr>
<tr>
<td>Mapping needs of the Peace Implementation Programme</td>
<td>8</td>
</tr>
<tr>
<td>The practical experience of field surveying in the refugee camps</td>
<td>10</td>
</tr>
<tr>
<td>Conclusions</td>
<td>12</td>
</tr>
</tbody>
</table>

**Bibliography**

**Illustrations**

**Abbreviations**
Mapping the refugee camps of Gaza: the surveyor in a political environment

James Kavanagh
Royal Institution of Chartered Surveyors
12 Great George Street
London SW1P 3AD, UK
t: +44 (0) 20 7695 1598
e: jkavanagh@RICS.org

Rob Home
University of East London

Abstract
The need for good maps to assist the physical settlement of refugee populations, and the opportunities created by recent technological advances (such as remote sensing and global positioning systems), are increasing the importance of the land surveyor in humanitarian crisis situations. The creation of new Palestinian authorities for Gaza and the West Bank after the Oslo peace accords has combined with major investment in environmental improvements to create an urgent need for the first accurate large-scale maps of the refugee camps of the area. Based upon the field experience of one of the authors, this paper explores some political factors affecting this surveying and mapping work, and its relationship to complex local land codes and disputed land rights.

Contact
James Kavanagh
Royal Institution of Chartered Surveyors
12 Great George Street
London SW1P 3AD, UK
t: +44 (0) 20 7695 1598
e: jkavanagh@rics.org
Introduction

The management of land – that basic resource – offers a particular challenge to governments and international agencies confronted with refugee situations, in which the needs of displaced populations may be superimposed upon existing structures of land law. Political settlements of long-running refugee situations, as in Gaza and the West Bank, create new demands for the regularisation of occupation and land title, and for the upgrading of refugee camps through infrastructure investment and environmental improvements. Such initiatives require accurate large-scale maps, the field survey information for which usually has to be obtained under difficult physical conditions, in a politicised environment, and using as source materials maps that are outdated and perhaps subject to political manipulation.

In 1997 there were an estimated 22 million refugees in the world (as well as some 3.2 million Palestinians, who are separately classified by the UN special committee on Palestine). Their organised settlement has been the subject of increasing amounts of research by aid agencies, especially those seeking to minimise adverse environmental effects. Refugees can settle in a number of different ways, each with its own pattern of development and possible side-effects on the host community and environment. For example, refugees may self-settle amongst the local community, often unregistered with international agencies and host governments. They receive aid directly from the local population and remain heavily reliant on the host community and on links between the two groups. The establishment of organised settlements to contain the refugee influx during the early stages of an emergency is the internationally preferred way to settle refugees, so that they can receive official assistance and be registered. This type of settlement, which may start with temporary structures, can easily become permanent if political solutions are not found.

Refugee camps, during the initial emergency stage, are typically laid out in military style, with rows of tents, standpipes, refuse outlets, simple roads, etc. Then the refugees may start to improve their dwellings into more permanent structures, using indigenous building materials such as mud-brick, wood, and finally concrete and brick. The infrastructure, however, requires major public investment for permanent roads, sewage, refuse collection, water supplies and schools, and the lack of such investment can create long-term social, environmental and ecological consequences, both for the refugees and the surrounding community. Where located near existing urban areas, refugee camps can offer access to markets and jobs, but can also create environmental and public health problems associated with lack of drainage, roads, and public health facilities. Examples linked to the Arab-Israeli conflict are the Shabra and Chatila Camps of suburban Beirut, and the Beach and Sheikh Radwan Camps within Gaza. These camps, initially envisaged as entities separate from the local population, were laid out in a formal style of planning at odds with the more organic style of Arab city development.

The initial location of refugee camps should recognize a number of factors, which the United Nations Commission for UNHCR and World Food Programme have addressed during the last few years through their Emergency Strategy Frameworks and guidelines. Security of the population and possible defence capability are high priorities, while other considerations include the usual physical planning aspects: availability of land, water, fuel and food; links to road networks; and distances from major towns and hospital facilities. Choosing the right location is most important, as a bad location can cause unrest, and put already environmentally and socially unstable areas at risk of further destruction from the hands of the refugees themselves. Environmental guidelines concern such matters as camp maintenance, awareness programmes to combat the ecological degradation of surrounding areas (e.g. from fuel collection by the refugees themselves), and medical programmes to combat water supply contamination.
The formation of refugee settlements depends not on the wishes of the refugees themselves, but on the socio-political climate in the area of influx. Host governments prefer formal camps, which allow the movement of the refugee population to be controlled by registration, and facilitate speedy and efficient eventual repatriation. The international aid agencies, while recognising the limitations of the camp system, have to operate within the confines of the political agenda of the host country, on whom they rely heavily for logistical support and security.

THE GAZA PROFILE

Land status and categories according to jurisdictional control under Oslo agreements:

**First category:** Palestinian full jurisdiction territories represented by areas (in green and orange).

**Second category:** Israeli full jurisdiction territories represented by settlements (triangles and installations in red).

**Third category:** Israeli overriding security jurisdiction and Palestinian civil jurisdiction territories (yellow area).

**Fourth category:** Joint security jurisdiction and Palestinian civil jurisdiction territories (security perimeter) in blue.

Based on the Gaza Strip and Jericho Area Maps, Map no. 1 [Cairo Interim Agreement, May 4, 1994]
Mapping and surveying for refugee management

Aid agencies are under increasing pressure to evaluate their programmes and improve the efficiency of their relief efforts. Technological advances now allow highly accurate remotely sensed imaging, and repeated coverage of an area for the purposes of disaster evaluation. The continued democratisation of spatial information, made possible by such technological advances as the Internet, satellite imagery and Global Positioning Systems (GPS), now puts highly accurate mapping of inhospitable, and sometimes dangerous, regions within the grasp of aid agencies’ budgets and technologies.

The UN is becoming more proactive in its approach towards mapping in the developing world, having formerly found aid efforts hampered by poor topographical map coverage. An outline of recent mapping initiatives illustrates the possibilities:

- **GTOS (Global Terrestrial Observing System)** was instituted in 1993, relating to climate change, agricultural use, land cover and forest resources.
- **ARTEMIS (Africa Real Time Environmental Monitoring Information System)** has, since 1988, provided a food security early warning system for the Food and Agriculture Organization (FAO) of the UN. Using satellite data, it is supported by the governments of France and the Netherlands, and is linked with the Global Early Warning system of the World Food Programme.
- **The British Ordnance Survey** recently completed a mapping project in the Yemen Arab Republic, linking SPOT imagery to aerial photogrammetry and existing maps.

Globalisation forces are prompting the extension of mapping technology to all areas of the planet, and a global organisation such as the UN can act as both a technical advisor and an instigator of projects, as it outlined in its resource management and sustainability strategy at the 1992 Earth Summit conference in Rio de Janeiro. Experience has shown that the developing world will be ignored in this new technological mapping order unless the UN itself becomes directly involved. UN agencies are beginning to implement the latest mapping techniques within their programmes. UNESCO has also developed training in mapping and remote sensing for vulnerable countries.

Humanitarian crises usually occur in developing countries, precisely those countries that are least likely to be properly mapped. Many such countries have not been mapped since colonial times, and still lack adequate mapping at 1:25,000, 1:50,000 and 1:100,000 scales. Agencies requiring mapping information have to contend with different sources, a variety of accuracies, incompatible scales and projections, and outdated or missing data. As an alternative to paper-based terrestrially surveyed maps, satellite imagery methods are particularly suited to inhospitable and inaccessible terrain, and allow maps to be revised without the significant cost of field surveying by traditional methods. The cost of satellite imagery is falling, and stereo-images of 4.5 metre resolution can be used successfully for 1:25,000 to 1:50,000 scale map production. UNHCR has formed a GIS [Geographic Information System]/Mapping department to supply clients, and its differential GPS field project in Kenya is evaluating the efficiency of medium-scale mapping of refugee settlement areas, using GPS ground control to rectify remotely sensed satellite imagery. High-quality topographic maps in crisis-prone areas can greatly assist in the co-ordination of relief aid and transport, the mitigation of the economic and environmental consequences of a sudden refugee influx, the selection of refugee camp locations, and the planning of infrastructure and upgrading. In the emergency stage of a refugee crisis, the agencies need to evaluate the local environment they are dealing with: proximity of water supplies, fuel, food, local settlements. The selection of suitable sites for refugee camps can affect the efficiency, and even survival, of the relief effort. Within their preparedness strategies, agencies include the accurate mapping of endangered areas, and, in justifying their expenditure to donor states, there are presentation advantages in modern mapping technology which can show relief statistics, refugee movements, and areas of hostility and operations – local and regional. Also, field teams, working within highly pressurised situations, benefit greatly from good geographical information.

It can be expected that UN involvement in mapping for the developing world will increase, and mapping will become increasingly important in the management of refugee situations.
The Gaza Strip, 360 km sq. in area, is bounded by the Mediterranean Sea, Israel and Egypt, and contains Gaza City and a string of towns and refugee camps stretching to the Egyptian border. It has no discernible natural borders, and only became an area autonomous from the rest of Palestine after the establishment of Israel in 1948. It occupies a key strategic position, lying on the border between the fertile crescent of the Levant and the gateway to the African continent, the Sinai desert. As a result, a succession of invaders have occupied or passed through the area during its long history: the Ancient Egyptians, Greeks, Romans, Arabs, Ottoman Turks, the British and the Israelis. Gaza, lying on a coastal plain sandwiched between the Sinai and Negev deserts, was also an important stopping-off point on the desert caravan trade-routes. Its geographic position has had profound effects on its culture and people: There is a strong Egyptian influence on the education system and language, and large numbers of Bedouins have settled in its southern vicinity. Gaza’s prosperity and population fluctuated greatly over the centuries. In 1948, when its great refugee influx occurred, it was a sleepy provincial backwater, heavily reliant on agriculture, with its port long disused and supplanted by Jaffa and Haifa.

A British Mandate over Palestine had been granted by the League of Nations at the end of the First World War, and the Mandate period (1922-48) saw Jewish refugees flood into Palestine to escape persecution in central and southern Europe, creating friction with the indigenous Palestinian population. The United Nations Special Committee on Palestine recommended the division of Mandate Palestine into Jewish and Arab areas and the internationalisation of Jerusalem, but the unilateral declaration of a Jewish state of Israel was followed by an invasion from the surrounding Arab countries. In the aftermath of the war of 1948 (known to the Palestinians as ‘El-Naqba’ – ‘the Catastrophe’), hundreds of Arab villages and towns were destroyed, and over 700,000 Palestinian Arab civilians became refugees. In the southern area of Palestine they either removed themselves or were forcibly evicted by Israeli forces towards the Gaza Strip, which was part of the Arab section created by the UN Partition of Palestine resolution in 1947. Gaza’s population swelled from 50,000 to 200,000 as refugees flooded into the makeshift camps that began to spring up.

In 1948, the UN General Assembly established the United Nations Relief for Palestine Refugees and adopted Resolution 194, recognising Palestine refugees’ right of return to their original homes in Palestine (or right to receive compensation). Resolution 302 (IV) in 1949 established the United Nations Relief Works Agency (UNRWA), which started field operations in 1950 and continues in existence to this day. Its official mandate covers all refugees displaced by the 1948 (and later the 1967) conflicts in Israel/Palestine.

The refugee camps of the Gaza Strip were created as temporary areas for basic survival after the war of 1948, the original tents being gradually replaced by mud-brick and concrete-block structures. Some of the camps reused existing buildings, such as a British military barracks and prison. Camp regulations divided control between an Egyptian camp commander and the UNRWA administrator. The traditional structures of Arab society, based on family ties and wealth, had been damaged by the population upheavals of the war, but soon reasserted themselves within the camps. Within a few years, only the poorest members of the refugee population remained dependent on international relief aid.
MAPPING THE REFUGEE CAMPS OF GAZA: THE SURVEYOR IN A POLITICAL ENVIRONMENT

construction, and caused economic hardship to the large numbers who depended on such low-paid jobs for their livelihood. Gaza remains a pool of cheap labour for Israel, enclosed by electric fencing and watchtowers, with the only crossing points at Erez in the north and Rafah in the south, either of which can be closed at any time by the Israeli military authorities.

Following the signing of the Declaration of Principles between the Israeli Government and the PLO in 1993, UNRWA started its Peace Implementation Programme (PIP) to prepare for the creation of a new Palestinian Authority for Gaza and Jericho, which followed in May 1994. International donations were to contribute towards a structured rebuilding of what were seen as the causes of local Palestinian unrest: the appalling environmental and social conditions within the teeming refugee camps. These conditions had turned the camps into a recruitment reservoir for radical revolutionary groups such as Hamas and the Popular Front for the Liberation of Palestine during the Intifada. The lack of any real job opportunities for local people caused widespread frustration and poverty amongst the population.

REFUGEE CAMPS IN THE GAZA STRIP

<table>
<thead>
<tr>
<th>Camp Name</th>
<th>Population (1994)</th>
<th>Area (Dunams)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Beach Camp or Shati</td>
<td>58,000</td>
<td>747</td>
</tr>
<tr>
<td>Bureij</td>
<td>24,488</td>
<td>528</td>
</tr>
<tr>
<td>Deir El Balah Camp</td>
<td>13,680</td>
<td>unknown</td>
</tr>
<tr>
<td>Jabalia Camp</td>
<td>74,800</td>
<td>1,403</td>
</tr>
<tr>
<td>Khan Younis Camp</td>
<td>46,500</td>
<td>549</td>
</tr>
<tr>
<td>Maghazi Camp</td>
<td>16,700</td>
<td>599</td>
</tr>
<tr>
<td>Nuseirat</td>
<td>39,800</td>
<td>588</td>
</tr>
</tbody>
</table>

Note: a Dunam is 1,000 m² (one tenth of a hectare) Source: UNRWA Public Information Office, Gaza, 1994

Since 1948 the Gaza Strip has had a chequered history. After the 1948 war, the defeated Egyptian forces occupied it in an attempt to protect both their Sinai flank and the Palestinian refugee population. The Israeli Defence Force (IDF) occupied it during the war with Egypt in 1956, but left a year later. After the Six-Day War in 1967, the IDF reoccupied Gaza, together with the Sinai peninsular and the West Bank, and 38,500 people fled the Gazan camps to Jordan after Israeli ground and air attacks on civilians. The Israeli authorities immediately put Gaza under direct military command, from which it would not emerge until a Palestinian Authority was created in 1994. The Gulf crisis in 1990-91 caused over 150,000 Palestinians to be expelled from the Gulf States because of political support for the Iraqi regime by the Palestine Liberation Organization (PLO), and some 15 per cent of these Palestinians, mainly highly educated, went to Gaza.

The Intifada (Palestinian uprising) broke out in the Gazan camps in 1988. Over the next six years boundary closures were imposed on Gaza, which stopped Palestinian workers travelling to Israel for casual jobs in agriculture and
Land law and ownership in the Gaza Strip

In the Near East, life, and especially the practice of agriculture, is a battle against the harshness of the climate and the continual encroachment of the desert. Arable land has always been at a premium, which, together with the number of religious sites and refugee populations, creates potential for violent disagreement over land rights. Apart from turbulent forced population movement, Gaza has experienced four governing regimes in the twentieth century, each with its own form of land law: Ottoman, British, Egyptian and Israeli. The new Palestinian Authority now has the task of trying to consolidate these various land codes, a long and complicated process, fraught with problems. Competing land rights call for adjustment and adjudication, particularly the regularisation of refugees’ hitherto unconfirmed land occupation.

Modern cadastral mapping in Palestine began with the Ottoman Land Code of 1858, which was part of the modernization programme known as tanzimat. Land was designated under three main categories: privately owned; jifflik (i.e. that owned directly by the Sultan); or reserved for development. The British Survey of Palestine during the Mandate period was the first to map the area with any degree of accuracy. After the First World War, the victorious British, seeking to apply their established doctrine of Indirect Rule over colonial territories, confiscated the jifflik land in the Gaza Strip and shared it out among several powerful local Arab families, creating a power base of loyal allies, whose descendants still hold most of the land today. British Mandate land law was thus superimposed over the older Ottoman form. The Mandate period also saw the extension of Waqf land holdings. The Islamic Waqf is a religious organisation dedicated to the management and extension of Islamic land and property for public and religious purposes, such as mosques and graveyards, and receives its land mainly from donations by pious individuals and bequests. Islamic Sharia law is strictly imposed on these properties, and the charging of interest on property-based loans is prohibited.

With the end of the British Mandate, the Egyptian military occupation (1948-67) imposed Egyptian land codes on the Palestinian inhabitants of the Strip. Landowners were willing to offer their land for temporary use by the refugees, but demanded compensation when it became apparent that there would be no easy resolution of the situation, and there have been many resulting land ownership disputes. UNRWA agreed the boundaries of each camp with the Egyptian authorities in 1956, issued regulations for building materials (usually these were concrete-block walls and corrugated-iron roofs), and issued plot registration documents. There were tight controls over ‘contraventions’ such as unauthorised occupation of, building on, or selling of plots. In the 1960s there was some relaxation of controls. Military Law No. 4 of 1960 recognised the rights of the owners of the land on which the camps stood, and in 1964 refugees were allowed to exchange their plots for government vacant lands.

When Israeli military occupation displaced the Egyptians in 1967, the Israeli authorities imposed various military land regulations which had the prime purpose of dispossession and confiscation of Palestinian land for the purposes of Israeli settlement-building. The confiscation of land for Israeli settlement was a high government priority, and a series of draconian land laws, passed during the 1950s, were transplanted onto the Gaza Strip in the form of military directives. Some 40 per cent of the land of the Gaza Strip remains under Israeli control, although the 5,000 Jewish settlers are alongside a Palestinian population of nearly 1 million people. By law, all land bought or sold in Israel/Palestine must be surveyed, and its boundaries co-ordinated with the national grid, through the Israel National Mapping Organisation in Tel Aviv, making a cadastral survey possible to a high degree of complexity. Palestinian land rights are, however, typically less reliably recorded than Israeli ones.
The Israelis maintained strict control over the camps: any building encroachments upon highway land (which might endanger Israeli armed foot patrols), and any unauthorised refugee-built structures outside the defined camp boundaries were automatically demolished, thus confining the occupiers to increasingly overcrowded plots. Some 16,000 Palestinian refugees were made homeless in 1971, when the Israeli authorities widened roads and demolished refugee dwellings in the Sheikh Radwan area of Beach Camp (an area now integrated into Gaza city). In Jabalia Camp, an armed uprising led to demolition of many refugee shelters by the IDF. A military base was established in the centre of the camp, with some 6,400 refugees being rehoused into a nearby government housing project. The refugees had a high birth rate (over 40 per 1000), and families grew quickly in size (Jabalia, the biggest camp, has an average household size as high as ten individuals), yet no new land was made available and population densities rose to the levels of some developing world cities.
5

Mapping needs of the Peace Implementation Programme

With the creation of the PIP in 1993, an office of UNSCO (the United Nations Special Co-ordinator for the Occupied Territories) was created to help UNRWA co-ordinate the financial efforts of the donor countries with respect to PIP projects. A Special Environmental Health Department was established in 1992 to tackle the environmental problems of Gaza's refugee camps, and feasibility studies were undertaken for an infrastructure upgrading of the camps, which suffered from open sewers, no storm water drainage, dilapidated shelters and chronic overcrowding. As a basic indicator of poverty, the infant mortality rate within the camps, at 38.9 deaths per 1,000 live births, is nearly three times greater than that in Israel. Sewage from the camps passes into the sea untreated, and the open drains often flood in the winter months, bringing the continual threat of various waterborne diseases such as cholera, typhoid and intestinal infestations. Previously, UNRWA had found it difficult to interest donor countries in environmental projects, rather than more visible projects such as schools or hospitals, but in 1994 some US$40 million was pledged to PIP. It was envisaged that a new integrated sewage system connecting all of the camps would be built, with a new treatment plant attached. The PIP programme also set out to improve the training of local Palestinians in various technical and professional areas, with the aim of replacing international staff, and absorbing UNRWA into the new Palestinian Authority by the year 2000.

The mapping of land can have its confrontational aspect, particularly in this area of the world, with its deep-rooted ethnic and religious conflicts. Israel may be advanced in mapping technology, claiming to be the only country in the region to be completely mapped at 1:25,000 scale, but it can also claim to be the only state in the world with no officially declared and internationally agreed borders. For the Israeli authorities, mapping has been seen as a vital defence and propaganda resource. Maps of the West Bank, for instance, will call towns and regions by Hebrew, rather than Arabic names (e.g. Samaria and Judea in the West Bank, Hevron rather than El Khalil). The Israeli Military Survey has deployed modern methods of mapping, especially for the Palestinian refugee camps. During the Intifada the IDF needed to know quickly and accurately the location of their armed patrols inside the camps and their proximity to dangerous areas. The Palestinians are also deploying mapping technology in the propaganda war, to show where Israeli settlements are being built, and other acts of land confiscation that are illegal under the Oslo accord.

The technical design of infrastructure upgrading depended on accurate mapping, and, after the completion of feasibility studies, aerial mapping of the camps was proposed at scales of 1:500 (Beach Camp), 1:1250 (Jabalia Camp plus Maghazi, Bureij and Nuseirat Camps (collectively known as the Middle Camps)) and 1:2500 (Deir El Balah Camp). An Israeli photogrammetric company (Offek) was awarded the contract to fly over the camps, photograph them and produce digital maps at these scales, while a subsidiary survey company undertook the necessary ground control. The digital maps produced by this process, however, contained several significant deficiencies. Small-scale levelling showed spot height errors of up to 0.5 metres (which exceeded the specified tolerance levels), and there were extensive errors in spatial ground position and ground features. The main reason for these errors was the uncertain security situation. The aerial photography was undertaken at a time when the camps were still dangerous, to the extent that any Israeli surveyors entering the camps to complete the necessary ground control, even with a fully armed escort, were at risk of attack by the local population. The camps had been the battleground of the Palestinian uprising (Intifada) and any Israeli or unknown presence was viewed with extreme hostility. To counter this problem, Offek had flown higher than necessary so as to include control points outside the boundaries of the camps, even outside the Strip itself. These control points had been used to rectify the photos, but had also probably introduced various rotational and scale errors within the final digital base maps and decreased the scale of the photographs. This would have made it difficult for photogrammetric operators to distinguish between various features on the ground, such as small camp lanes, fences and walls.
Because of security restrictions, each camp map had its own local, individual grid system, conflicting with the philosophy that camp upgrading projects were to be co-ordinated and interconnected. Given these deficiencies, it was decided that extensive site verification and possible rectification of the aerial base maps was necessary before the design teams could start work.

There was, however, a serious shortage of trained local land surveyors. The system of licensed land surveyors from the British Mandate period survives, but since the Israeli occupation in 1967 no new licences have been granted to Palestinians. Kalandia Vocational Training College (in the West Bank) was the only educational facility offering survey training to Palestinian refugees, a course accredited by the Jordanian Ministry of Education and closely following a curriculum devised for the emergency training scheme created by the British Mandate administration during the Second World War. Training was complicated by travel restrictions imposed by the Israeli authorities, and there was little opportunity to gain experience with the newer survey technologies such as GPS and survey-related software (although UNESCO, with aid from the Norwegian and French governments, has undertaken some training with these technologies). The Surveyors’ Organisation in Gaza, although in a state of stagnation for many years, has now reopened its membership list and hopes to reintroduce the licensing system.
The practical experience of field surveying in the refugee camps

In 1994, the Irish Overseas Development Agency recruited one of the authors of this paper (Kavanagh) to be attached as a land surveyor in Gaza within the Special Environmental Health Department. That department was under increasing pressure to achieve results on the ground and to produce full design studies for the donor countries involved in environmental projects, which included Sweden in Jabalia Camp and Italy in Beach (Shati) Camp. Kavanagh’s job description made him responsible for all survey-orientated tasks required by his and other UNRWA departments and by international aid agencies, and expected him to work with the various design teams and engineers. Because of the confused land law situation, and the lack of cadastral information, his team also worked closely with the UNRWA legal department on land disputes. Once camp upgrading projects began, the survey team also became responsible for survey control of the construction, supplying contractors with benchmarks, traverse points, co-ordinate control, etc. The continual problem of Israeli closures of the border with Gaza, and the small budget of the department, forced some adaptation and initiative to complete the survey work. The survey equipment available included the Leica LISCAD survey package, with a T1100 Total Station, but without Digital Terrain Modelling, thus limiting it to two-dimensional applications.

The first task was to collate such existing survey information as could be found, including any benchmark details, co-ordinate point data, maps, etc. The Israeli Survey had based their national grid on the old British colonial network; and the British Survey sheets, Israel National Survey documentation and some old Ottoman cadastral sheets were located. When the Israeli military authorities left the Gaza Strip in May 1994, they either destroyed or took with them all survey-related documentation, and systematically destroyed benchmarks and co-ordinated pillars. The local residents had also destroyed anything with a Hebrew inscription, so that the few survey points that survived were well hidden (e.g. in graveyards) or inaccessible to the general public (e.g. on the top of watertowers).

During the Israeli Occupation the work of local Palestinian surveyors was limited to field surveying only, usually from local co-ordinates. The Israeli military surveyors would then undertake the technical calculations and complete the map production work, since survey-related information was seen as a matter of national security. The local Palestinian surveyors did, however, collect, at some personal risk, some location point data which were later invaluable to the UNRWA survey team in its task of connecting the camps by co-ordinated traverse and locating accurate benchmarks. The re-establishment of a Gaza survey control network was disrupted by closures of the entire Strip and the refusal of the Israeli military authorities to allow any technical equipment to be imported to Gaza. The Israeli authorities hold large-scale urban maps for Gaza, but did not make them available to the new Palestinian Authority.

The survey team’s work began in the relatively small Deir El Balah Camp, where survey methods were tested before moving on to the larger and more crowded camps of Jabalia and Nuseirat. Offek sheets at 1:2500 scale covered the camp and surrounding date palm groves. A pumping station was planned for the northern region of the camp, to be connected by main pressure line to the Middle Camps by way of the main Gaza-Rafah road, and this project required site verification of the aerial photographs. The survey covered all back alleys and small lanes in the camp, updating missing information on the map sheets printed directly from the Offek base map files, which proved to be a time-consuming process.

The overpowering impressions left by the camps is of claustrophobia. The smell of open sewers, dust, flies and heat, create an environment for the surveyor quite unlike any urban field-surveying project in the West. Within the close confines of the narrow backstreets of the camps, intervisibility between possible control stations was impossible, so the surveyors worked from the roofs of UNRWA installations such as clinics and social centres, which were clearly visible on the Offek base maps. A closed traverse was completed, and overlaid onto the base maps with LISCAD and ACAD software. The specifications had to
be redesigned from field experience, to meet the accuracy requirements of design engineers. The survey team then undertook a level survey of the main lanes, because existing base maps lacked some heighting information necessary for the design of new projects, and it was intended to connect the camps’ internal co-ordinate system to a Gaza-wide system, and ultimately to the Israeli national grid.

Field methods were adapted to the conditions within each camp, and, while not representing the latest survey procedures, reflected the difficulties of working in a harsh climate (temperatures in Gaza exceeded 40 degrees centigrade in summer) and volatile environment. The job called for sensitivity to the political situation. Mapping was itself seen by many as a political act, because it reinforced the permanency of the camps and brought home an unpalatable fact to the local population: that they would not be returning to their original homes in Palestine.

The mapping of the camps for specific upgrading projects, combined with the shortage of trained land surveyors, meant we could make only limited contribution to the task of detailed cadastral or land ownership surveys. The rapidly expanding population (now at densities of 6,000 people per square mile), the continuing confiscation of land for Israeli settlement, and rising land prices are factors creating serious pressures on land and disputes over land rights. At present, if a family leaves the camp, the property reverts to UNRWA. For such a situation the single-point cadastral system, recently devised for the vast informal settlements of South Africa, seems to be well suited. Its main principle is that a single known point can be established for a land parcel with information on size, owner, price, etc attached, but leaving detailed plot boundaries to be resolved at a later date. This simple and quick method would help to speed up the re-assimilation into the Palestinian mind that the land does belong to them and to create a cadastre that would form the basis of any future, more technologically advanced, land information management system within the now permanent camps. Since Kavanagh left Gaza in 1996, the survey team has expanded its work for similar camp surveys in the West Bank, becoming a valuable addition to the UNRWA field office. However, progress has been disappointing in upgrading the camps to become established urban areas or in reducing the appallingly high population densities, while frustrations over the peace process have grown. UNSCO, the Palestinian Economic and Development Authority and the newly formed Palestinian Municipal Authorities remain committed to devising a Land Information System within the Strip.

Winter turns the dirt lanes of Baq’aa Camp, Jordan into quagmires
Similar conditions occur in the camps of the Gaza Strip
Source: UNRWA Public Information Office, Gaza
Maps are cultural artefacts, and their creation and interpretation are subject to political and other pressures, especially when the territory they purport to represent is disputed between different groups. The political power conferred by the map can be used to dispossess, to establish hegemony, and to claim history, and in few places can this be more apparent than in the disputed land of Israel/Palestine. The claim to objectivity of the professional or technician is tested when confronting the political constraints that may be placed upon the work. There are many technical devices for frustrating mapping exercises, or diverting them for political reasons, as the surveyors of the Gaza camps found.

The surveying of the refugee camps is about far more than the making of a map. It confronts the Palestinian occupiers with the reality that they will never return to their original homes. A partial compensation for this loss may be better living conditions and a right to own the land that they occupy. The surveyor in Gaza may help to provide a platform for future peace in the area, by assisting both a settlement of land issues and future environmental improvements to the camps. It is envisaged that the camps could evolve into towns, with all the necessary infrastructure, and the inhabitants are being encouraged to buy their own plots. A proper cadastral survey, perhaps incorporating the principles of the single-point cadastre as an interim measure, should be combined with a review and consolidation of Palestinian land law.

Note: This article is based upon Kavanagh’s experience as a surveyor in Gaza between 1994 and 1996, and upon his BSc (Surveying and Mapping Sciences) final-year dissertation, United Nations Mapping of Refugee Camps (1998), Surveying & Mapping Science Department, University of East London, UK.

Bibliography


FAO (1997) *Emergency Strategies and GTOS*, Rome


UNCED Conference (1992) ‘Map revision targets’, *Agenda 21*, Chapter 40, Rio de Janeiro, Brazil


Deir El Balah area, as surveyed by Offek and UNRWA. From a compiled map of several 1:2500 sheets. The camp is the built-up area on the coast. Copyright: UNRWA
Scanned section of Jabalia Camp, compiled from several 1:1250 sheets. Note the density of the urban development. Jabalia is the biggest camp in the Strip, with an average population of 10 people per household. Copyright: UNRWA
Abbreviations

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Full Form</th>
</tr>
</thead>
<tbody>
<tr>
<td>ARJ</td>
<td>Advanced Research Institute of Jerusalem</td>
</tr>
<tr>
<td>FAO</td>
<td>Food and Agriculture Organisation</td>
</tr>
<tr>
<td>FIG</td>
<td>International Federation of Surveyors</td>
</tr>
<tr>
<td>GIS</td>
<td>Geographical Information System</td>
</tr>
<tr>
<td>GTOS</td>
<td>Global Terrestrial Observing System</td>
</tr>
<tr>
<td>IDF</td>
<td>Israeli Defence Force</td>
</tr>
<tr>
<td>IGS</td>
<td>International Geodynamics Service</td>
</tr>
<tr>
<td>NGO</td>
<td>Non-Governmental Organisation</td>
</tr>
<tr>
<td>PFLP</td>
<td>Popular Front for the Liberation of Palestine</td>
</tr>
<tr>
<td>PLO</td>
<td>Palestine Liberation Organisation</td>
</tr>
<tr>
<td>RESPAS</td>
<td>Remote Sensing Processing and Archiving System</td>
</tr>
<tr>
<td>SPOT</td>
<td>Satellite Pour l’Observation de la Terre</td>
</tr>
<tr>
<td>UN</td>
<td>United Nations</td>
</tr>
<tr>
<td>UNCCP</td>
<td>United Nations Conciliatory Commission on Palestine</td>
</tr>
<tr>
<td>UNDP</td>
<td>United Nations Development Programme</td>
</tr>
<tr>
<td>UNEP</td>
<td>United Nations Environment Programme</td>
</tr>
<tr>
<td>UNESCO</td>
<td>United Nations Educational, Scientific and Cultural Organisation</td>
</tr>
<tr>
<td>UNHCR</td>
<td>United Nations High Commissioner for Refugees</td>
</tr>
<tr>
<td>UNRPR</td>
<td>United Nations Commission Responsible for Palestine Refugees</td>
</tr>
<tr>
<td>UNRWA</td>
<td>United Nations Relief and Works Programme for Palestine Refugees in the Near East</td>
</tr>
<tr>
<td>UNSCO</td>
<td>United Nations Special Co-ordinator for the Occupied Territories</td>
</tr>
<tr>
<td>UNSCOP</td>
<td>United Nations Special Commission on Palestine</td>
</tr>
<tr>
<td>WHO</td>
<td>World Health Organisation</td>
</tr>
<tr>
<td>WFP</td>
<td>World Food Programme</td>
</tr>
</tbody>
</table>

Glossary

<table>
<thead>
<tr>
<th>Term (Arabic)</th>
<th>English Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intifada</td>
<td>Uprising or Revolution</td>
</tr>
<tr>
<td>Waqf</td>
<td>Islamic Religious Organisation</td>
</tr>
<tr>
<td>Jiftlik</td>
<td>Government Land</td>
</tr>
<tr>
<td>Bedouin</td>
<td>Indigenous Arab nomads</td>
</tr>
</tbody>
</table>