12

Economy

• Economic Road Map
• Cooperation between Two Economies: The Cases of Transportation and Electricity

(Written by: Aix Group: Economic Dimensions of a Two-State Agreement between Israel and Palestine)

- Development Strategy
- Forms of Cooperation
- Airports
- Seaports
- Roads
- Rails
- Air Transportation
- Sea Transportation
- Estimating Future Demands
- Strategic Scenarios
- Electricity Supply Capacity
- Trade
- Labor
- Fiscal Policy
- Monetary Policy
- Investment

Economic Road Map

The paper assumes the emergence of a two state-solution embodying Palestinian economic sovereignty, unambiguous borders and the conduct of economic relations in a spirit of cooperation and mutuality. The economic vision of permanent status is based on economic arrangements that will seek a convergence of Palestinian living standards with those of Israel and promote independence in economic policy-making while acknowledging economic interdependency.

The paper reflects the recognition that future Palestinian economic strategy can no longer afford to rely so heavily on the export of labor and remittance income. It is unlikely that the number of Palestinians working in Israel will again approach historical levels; moreover, domestic Palestinian production and exports are compromised by the upward pressure on domestic wages and prices exerted by higher Israeli wage levels.

Trade

It is recommended to establish a Free Trade Area, consistent with World Trade Organization protocols. We believe that an FTA between a Palestinian state and Israel is likely to be feasible and efficient, as well as to offer exploitable development opportunities. It would provide Palestinians open access to the Israeli market, with Israel continuing to be a key trading partner. At the same time, an FTA will allow the Palestinian state to diversify its trade relations and implement development policies conducive to economic growth and prosperity. An FTA will be most efficient if accompanied by a friendly system of Rules of Origin. Israel would grant the Palestinian state, as a developing economy, the option to temporarily protect selected sectors.

Labor

It is recommended that designated border passages be established through which labor flows would be unencumbered, while subject to regulation through taxes and/or permits. Palestinian workers should be given preferential access to the Israeli labor market, as compared to other foreign workers, reflecting the lower negative externalities for the Israeli economy. In addition, work permits should be granted to and held by individuals, not contractors. Although the Israeli labor market will play a diminishing role in Palestinian development, its importance in an orderly economic transition is significant.

Fiscal Policy

Under an FTA, each country would run an independent international customs policy, but would not impose duties on goods originating in Israel/the Palestinian state (with certain exceptions as defined under the agreement). To minimize smuggling, indirect tax policy needs to be closely coordinated, and VAT and other indirect tax rates (excises, purchase taxes) should only diverge marginally, if at all. Double taxation should be avoided since this would discourage cross-border economic activity. Accordingly, there is a case for applying lower income tax rates to Palestinian workers in Israel as compared to those applicable to Israelis or other foreign workers. Alternatively, Israel should continue to remit to the Palestinian state a large portion of the income tax it levies on Palestinians working in Israel, as well as any social security deductions.

Monetary Policy

It is recommended that the restrictions embedded in the Paris Protocol preventing the Palestinian Monetary Authority from issuing Palestinian currency be lifted.

Investment

It is recommended that both countries accord one another's investors and investments national treatment - with some exemptions in cases that bear upon special national interests. The future economic agreement should permit full repatriation of revenues and income, should preclude the possibility of double taxation, and should address expropriation and regulatory matters pertaining to facts and disputes created after its entry into force. Donors can contribute to cross-border investment by establishing funds that can be used to build equity positions in Palestinian firms and to create joint ventures with Palestinian partners, as well as by continuing to offer risk insurance and guarantees to investors.

The introduction of these new economic arrangements will require intensive bilateral cooperation. This would be facilitated in particular by the establishment of a Joint Israeli-Palestinian Economic Committee, as well as by regular dialogue at experts' level to exchange views on all areas of economic policy. The establishment of an Israeli-Palestinian Development Fund should be considered; this institution could play a major role in encouraging a variety of joint activities, such as industrial estates, business ventures for domestic and external markets, tourism projects and joint public/private infrastructure initiatives.

The transitional period requires, above all, a vigorous effort to stimulate Palestinian economic recovery. This can only be done by restoring movement and predictability in transactions. Three basic ingredients are required to achieve this:

i. an unencumbered flow of goods across borders and within the West Bank and Gaza;
ii. an unencumbered flow of persons within the Palestinian Territories, coupled with a flows of workers to Israel which regains some stability and predictability; and
iii. the continued uninterrupted flow of fiscal transfers from Israel to the Palestinian Authority.

Cooperation between Two Economies: The Cases of Transportation and Electricity

Introduction

Israel and Palestine are highly diverse – culturally, socially, economically and politically. There are large development gaps within and among the two countries, and enormous differences in income levels and living standards. At a practical level, an appropriate model for further economic cooperation between Israel and Palestine must consider and respond to these vast differences, while helping them to narrow the development gaps, individually and collectively, and narrow the imbalance of power between them.

Due to long neglect of basic infrastructural development, Palestinians are heavily reliant on Israeli infrastructure. Even rapid development plans cannot lead Palestine to self-sufficiency in the coming decades. Reducing Palestinian dependency on Israel as a major supplier may set a too heavy a burden on the Palestinian economy. Therefore, we considered steps that will lead to an improvement in Palestinian terms of trade by improving the existing infrastructure and providing a long-term solution that will ensure sovereignty and the benefits of cooperation with Israel.

The most pragmatic scenario would be a multi-track, multi-speed approach that allows Palestine and Israel to embrace regional cooperation according to their particular needs, levels of development and sovereignty considerations. For instance, it may be more efficient for the Palestinians to postpone the self-production of electricity and rely on electricity imports from Israel, Jordan and Egypt, thus strengthening their bargaining position in the market.

Policies that will bring Palestine closer to meeting its infrastructure needs do not contradict cooperation with Israel; on the contrary, they may contribute to Israeli-Palestinian economic relations. This paper primarily suggests that Palestine, as a sovereign nation, can and should provide its residents with their basic infrastructural needs. This does not suggest constructing infrastructure projects that ignore the benefits of utilizing existing infrastructure in Israel. The Israeli infrastructure could, in some cases, provide service to both Israel and Palestine. At the same time, Israel may benefit from the development of certain infrastructures in the Palestinian state. The integration of Egypt and Jordan to systems like electricity may benefit the region as a whole. The approach presented here is based on the assumption that, in addition to free market considerations,

cooperation must be based on reciprocity, improved bargaining positions of all actors and consideration of national security in supplying crucial basic needs.

Currently, Israel controls Palestine's primary infrastructures, leaving Palestinians vulnerable to boycotts that halt economic activity and the supply of basic needs. A key principle presented in this document is a suggested development strategy to change the distorted power relations and encourage more balanced cooperation for the mutual interest of both sides.

This chapter focuses on roads and electricity to demonstrate cooperation possibilities in other infrastructure projects. For example, by applying the suggested methodology to the case of road infrastructure, Palestinians will have two alternatives for travel between Gaza and the West Bank. The first alternative, essential to the performance of Palestine as a unified economic space, should be a road directly controlled by Palestine. This does not exclude the possibility of enabling a second option that crosses Israeli-controlled territories. Therefore, uninterrupted movement between all regions of Palestine will not be subject to Israeli "good will". The same is true in the case of the construction of a seaport in Gaza; we expect Palestinian foreign trade to be shipped via both Gaza and the Israeli seaports as much as we expect Israeli traders to use the services of the Gaza seaport. However, in case Israel imposes restrictions on Palestinian use of Israeli seaports, the Palestinians will be able to continue trading via the Gaza seaport.

Any attempt to develop modern infrastructures in Palestine needs to start from the following assumptions:

- Palestine will include all the territories conquered by Israel in 1967 with some minor exchanges of territories. Between 5-6 million Palestinians will inhabit the state in 2020, depending on levels of decline in fertility rates and the number of refugees that will be absorbed in the state. The Palestinian state will experience rapid economic growth once peace frees the existing constraints set by Israeli martial law and once an import of international capital, including compensations for the refugees, is invested in economic development.

- Palestine's national space will be developed around two main centers: greater Al Quds and Gaza. Greater Al Quds' metropolitan area will include Ramallah and Bethlehem. They will be the political capital of the state, the center of businesses, economic management and social and cultural life. Gaza will develop around the international sea and air ports, energy distribution and production centers, a large water desalination project, etc. Around these infrastructures, industrial areas and control centers are expected to develop (mostly export-oriented products to the European market).
- Except for the two metropolitan centers of Al Quds and Gaza, the other cities should be developed as compact cities. A small number of compact cities makes public transport system more competitive; in a state as crowded as Palestine, this may leave some open spaces between urban areas. Open spaces are essential to the quality of life in the new state. Urban sprawl and suburbanization should be limited to the use of the settlements' infrastructures. Otherwise, condensed neighborhoods and work centers should be built on the fringes of existing cities.
- The main frontier of the state, in which refugees may be settled, will develop along the eastern slopes of the West Bank and Jordan Valley. Lands owned by the government contain reservoirs of unused water. These, along with the warm climate, are ideal conditions for farming and producing export to the Arabian Gulf countries and Europe.
- An efficient and free access between the West Bank and Gaza Strip are fundamental for the success of Palestine as a united state. On the one hand, territorially divided states have not been successful in the past. On the other hand, the small amount of Israeli territory between the two areas can be crossed within 20 minutes if political and infrastructural facilities permit. We believe that if a Palestinian citizen and entrepreneur will be able to cross from one area of Palestine to the other without a border crossing, and the economy will be free from the threat of boycotts, territorial considerations will not put any burden on the livability and unity of the Palestinian state.

- The rest of the territories located in the peripheral regions must be connected to the larger cities as the centers of economic development. Therefore, the first priority should be given to the construction of modern roads connecting the peripheral regions to the main centers, rather than the development of these regions as industrial centers. Due to the state's small size, all the peripheral areas are within commuting distance from the core areas in a way that will make it possible for them to join the modern labor market in the cities.

This chapter forecasts the need to develop transportation and electricity for the next two decades, focusing on the opportunities for international cooperation between Palestine and Israel. The first step to achieving this goal is to characterize the existing infrastructure and suggest a general strategy for its development to meet future needs. Following this, projects for cooperation are extracted.
Some general principles applicable for both sectors are:

- Priority given to existing infrastructure through their repair and rehabilitation.
- Investment programs based on economic viability of projects.
- Cooperation must be based on mutual interests.

Transportation

1. General

The existing transportation facilities in Palestine are incapable of providing a cost-effective service to the region and realizing its full development potential. The development of a comprehensive roads network is one of the bases for building an integrated and economically developed Middle East. Exploiting the existing infrastructure in both Palestine and Israel, and jointly planning to develop the integrated network will mutually benefit both sides. A flawless transportation network will create opportunities for new enterprises at the regional level by taking advantage of lowered production and distribution costs for local and imported goods.

In the case of cooperation in road infrastructure, our guiding principle is that the two states' permanent status agreement will create a peaceful environment in which it will be possible to drive vehicles between Palestine and all its neighboring countries, including Israel, via border crossings, and back again.

1. Development Strategy

The physical condition of the current network serving the Palestinian population is in a state of disrepair. Inadequate services follow long years of occupation, lack of maintenance and underinvestment. Around 50% of the roads in the Gaza Strip are unpaved, while 40% of the West Bank's road network is below acceptable service levels[1]. Large sections of the network pass through densely populated areas. The Israeli network, on the other hand, is in far better condition.
The total length of the road network in the West Bank and Gaza Strip are 2,206km and 294km, respectively. After the Declaration of Principles in 1993 , intensive construction of bypass roads was initiated by the Israelis. These roads were constructed on land confiscated from Palestinians. Their construction adversely affected the Palestinian society by transforming the communities into disintegrated geographic entities; affecting land use and socio-economic development of the West Bank and Gaza Strip. A total of 818km of bypass roads was built with 768km in the West Bank and the rest in Gaza Strip[2].

It is worth noting that the Palestinian network standards inspire to be similar to the Israeli network. However, these standards were poorly implemented due to the lack of resources. In the development of a transport network, several elements must be taken into consideration:

- Trade offs among different transportation means.
- Trade offs between the cost of developing the infrastructure and the cost of using the infrastructure.
- Topographical and other physical characteristics of the environment.

The first dilemma relates to the trade off between railroads or car roads. The constant investment in rail is higher than in car roads. In the mountainous topography of Palestine the differences can be close to double. Trains have a higher capacity to transfer heavy and large cargoes for longer distances at lower prices. However, cars are more flexible and can transport goods directly to their targets, losing less time in terminals. Since most transport across Palestine is predicted to consist of passengers and products of light industries, and because distances are generally short (not more than several dozen kilometers), road transport has a significant advantage over railroads.

Based on train prices from Tel Aviv to Jerusalem, which crosses a mountainous topography, one mile of rail infrastructure is expected to cost $21 million, or $315 billion for the entire route (about 150 miles). Furthermore, even the RAND Report[3], which recommends constructing a railway system, admits that it must be complemented by a car road system. A road system will cost, based on the prices of Route 6 in Israel, about $13.4 million per mile or about $2 billion in total. Assuming that a wider road system will cost about 50% more, and taking into consideration the need to build two terminals in each of the larger cities – one for trains and one for busses – at an expense of about $30 million each, makes the railroad system too expensive. A rough estimation leads to the conclusion that the railroad and car road system will cost around $5.5 billion, while the road system will cost around $2.5 billion.

Any transportation network has to be based on the optimal balance between the costs of supplying the infrastructures and the user costs of these infrastructures. Road constructors are concerned in connecting all destinations via the shortest route

while consumers' interest rely on the shortest route between any two destinations, which means constructing the longest total road system. This dilemma leads to a clear solution in Palestine along the contrasting interests. A main route along the crest of the West Bank mountains creates shorter connectivity between urban destinations, connects about 75% of Palestinian urban populations, and serves the roads' supply and demand.

The resulting road system will be based, therefore, on the following principles:

1. The system will be based on a three level hierarchy of links: (i) A longitudinal national link that will serve as the backbone of the network as a whole; (ii) A secondary East-West link, located mostly in the West Bank, connecting Palestine to neighboring countries, and between medium size cities; and (iii) A local and regional road network, connecting small towns and villages to the second level link.
2. The system should encourage the development of the existing cities in a compact form.
3. The system should encourage the development of the eastern frontier with second and third level roads.
4. The system should encourage connecting the network to the neighboring countries.

The transport network infrastructure will be built around a national North- South Route between Jenin and the Gaza Strip and along the rest of the West Bank through Nablus, Ramallah, Al Quds, Bethlehem, El-Khalil, Gaza, Khan Unis, Dir El Balah, Rafah Airport and Rafah. The route will cross Israeli territories along a channel and enable free crossing with no check points or international terminals.

The main route will follow the infrastructures of Route 60 along the West Bank, and Route 4 along the Gaza Strip. However, to avoid congestion, the route should bypass the larger cities on their east sides, as close as possible to the city centers. Large cities will have two to three exits while the smaller cities will have only one exit. A public transport terminal will be built adjacent to the central station in each city. This means that 11 terminals and 20 to 25 exits will be built along the route. Smaller towns will have to connect to the backbone route (60)

through these exits only. This will discourage the process of urban sprawl and suburbanization, and will advantage compact urban development.

There are two questions concerning the national route: First, should it be based on a railroad system or car road system? Second, what should the location of the route be? Concerning the first question, we suggest developing a highway with 3–4 lanes in each direction, enabling the transfer of trucks, busses and private cars efficiently and at high speed (140km/h). The entire complex, which will be about 120m wide, will also include the national electrical, telecommunication and fuel lines. The small number of exits will enable smooth traffic flows along the route.

The alternate train system will be more expensive to implement and less flexible to use, despite the major investment required. Bus stations will be located closer to city centers. Busses will leave stations more frequently requiring less waiting time from consumers and easy access by private cars will be available. We estimate that passengers from the metropolitan core of Al Quds will be able to reach the international airport in Rafah or Gaza city center in the reasonable time of less than one hour.

Concerning the location of the route, three alternatives may be considered:

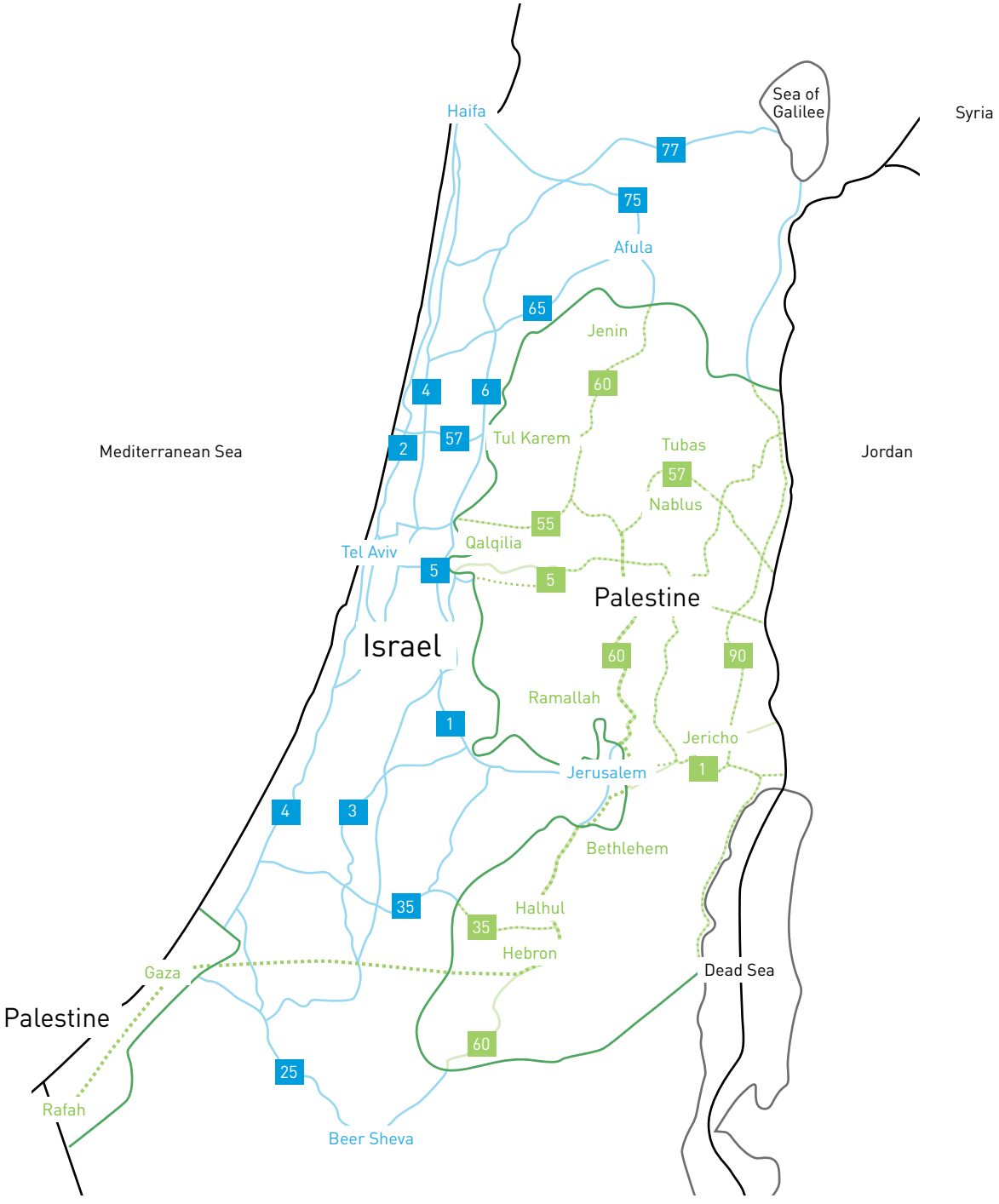
1. The existing Route 60 in the West Bank and Route 4 in the Gaza Strip. This alternative is the cheapest to construct. However, it has the significant disadvantage of increasing traffic congestion to impossible levels.
2. The second alternative is to use the relatively unpopulated areas along the eastern slopes of the mountains in the West Bank. This can be implemented as a lever for building new modern towns 10-15 km east to each of the larger cities in Palestine, and connecting the new cities to the old ones by a wide road. Planners of the RAND Report believe that such a large, national project will improve living standards, and supply national identity, pride and the ethos of progress. We believe that this ambitious and expensive alternative will be more of an economic, social and cultural burden than a lever for progress. It is based on a blind belief in the modernist idea of progress and the power of comprehensive rational planning to lead to progress. We prefer to reserve additional capital for

creating long lasting profit oriented jobs. The use of comprehensive rational planning methods proved itself destructive to urban culture, traditions and the crystallization of socio-cultural identity. City builders build houses and infrastructure but not urban lifestyles and cultures which grow organically. We estimate that this alternative will lead to the deterioration of the old cities with their local cultural characteristics of bazaars, markets and livability. This will have a tremendous impact on socio-economic gaps, etc. The new cities may produce alienation and loss of identity similar to renewal projects in western cities and the attempts to build new capitals in cities like Brazilia.

3. The third alternative is to utilize, as much as possible, Routes 60 and 4 but to build bypass sections to the cities and/or channels underneath the central cities. The most problematic part will be in Al Quds, a section that will need special care and planning considering functional and political aspects of the plan.

The second level of roads will focus on East-West routes that will connect medium-size cities to the national route and Palestine to neighboring states. The Israeli roads, built for the settlers will supply the foundation for this second level network. These roads are already bypassing the large cities. Nevertheless exits to these cities will have to be built anew. They will enable rapid connection from the main access to cities like Tul-Karem, Qalquilia and Jericho, as well as shorter routes to smaller cities like Salfit and Tubas.

The main roads connecting Palestine to Jordan will be the Al Quds–Jericho Route and the Nablus–Jiftlick Route. Connections to Israel are already being built along the Hotze Shomron and the highway to Jerusalem (Route 1). These roads can be upgraded to international roads that cross Israel and Palestine, from west to east, into Jordan. Furthermore, the second level of the network will also include three longitudinal routes in the West Bank and additional one along the coast line in the Gaza Strip. In the West Bank the Jordan Valley Route 90 and the Alon Road (458) will become the backbones of the frontier development region, and the Western Route 446 will complement the network improving connectivity within the eastern and western zones.


Haifa
Sea of Galilee
Syria
77
75
Afula
65
Jenin
60
4
6
57
Tul Karem
2
Mediterranean Sea
Tubas
57
Jordan
Nablus
55
Qalqilia
Tel Aviv
5
5
Palestine
Israel
60
90
Ramallah
1
Jericho
1
Jerusalem
4
3
Bethlehem
35
Halhul
35
Hebron
Gaza
Dead Sea
Palestine
60
25
Rafah
Beer Sheva
1967 Lines (Green Line)
International borders
Israeli roads
Palastinans existing roads
Suggested main roads
Suggested secondary roads

The third level in the hierarchy will constituted the Palestinian road system. Most of these roads will be connected to the second level network, creating the intra-regional road network. Most of these roads need intensive reconstruction following neglect during the Israeli occupation, damage by the Israeli military, and lack of developmental priority by the PA.

2. Forms of Cooperation

Within this scope, with the road network, joint cooperation will exist on two levels: (1) The network level (the infrastructure itself); and, (2) The traffic level.

Currently the Israeli and the Palestinian networks are separated and, due to security concerns, the few existing linkage points are controlled by Israel. Furthermore, the Jewish settlements are served by bypass roads that are closed to Palestinians. In the short-term, the Palestinians urgently need freedom of movement among cities and towns and a territorial link between the West Bank and Gaza Strip. With a peace agreement all road blocks inside Palestine should be eliminated, all bypass roads opened for Palestinian use and the link between Gaza and the West Bank operated.

An envisioned peace agreement in the region will allow cooperation opportunities in many fields, mostly technical. Such cooperation, supported by agreements and treaties, will facilitate the seamless integration of both networks.

The first set of recommendations relates to infrastructures:

- The most salient project is the link that will enable free movement between Gaza and the West Bank by cars. In addition, the link has to enable the construction of a whole set of infrastructures like cables, electricity lines, a gas line etc. The route must be fully controlled by the Palestinians, but the land above the link will remain Israeli territory. Such an arrangement must be anchored in a formal agreement between the states, and will secure Palestinian free movement and access to maintenance.

- Route 1 from Tel Aviv to Allenby Bridge, and the suggested route from Cross Samaria to Damia Bridge will be upgraded to enable easy access from Tel Aviv to Amman through the Palestinian territory. In addition, the Palestinians will develop modern cross-border terminals in Damia and Allenby that will serve both the Israeli and Palestinian transportation. The project will be financed by border taxes.
- We believe that open borders is not realistic in the foreseen future, for three reasons: First, economic gaps and different economic policies may encourage mass attempts to smuggle merchandizes through the open borders (see the chapter on Jerusalem). Second, Israel may be threatened by the mass entrance of unregistered migrant workers from throughout the Arab countries. Third, both countries will be interested in maintaining security, threatened by fundamental groups from both sides. Under these circumstances cooperation between the two states must be based on border management that enables a controlled border crossing on the one hand, but a flexible system of crossing on the other hand.

To meet these needs a large, modern terminal will need to be built. The terminal must be able to process large numbers of people, within half an hour in peak times, and not more than fifteen minutes on average, including all the security checks. Estimates indicate a need for about 40 such terminals, of two kinds: one for commuters and one for cargo. Eight cargo terminals will be needed – two in Gaza, one in the northern border of the West Bank (Jenin), one in the southern border of the West Bank, two in Jerusalem (towards Ramallah and Bethlehem) and two towards central Israel. The exact number can be reconsidered according to the development of economic relations between the two countries. The rest of the terminals will be devoted to passengers. A special focus must be given to the Al Quds-Jerusalem border where higher levels of integration and free crossings are needed for commuters and tourists. Commuters and truck drivers will cross the border with their original cars, and security checks, if needed, will take only a few minutes and will be based on new technologies such as x-rays for trucks and personal properties. Visas will be given at the terminal. People and cars that frequently cross the borders will be able to acquire long-term visas. The terminals will serve Israelis and Palestinians under equal terms, like

international terminals operating throughout the world. In the long-term we recommend abolishing visas.

- Two terminals will be located along the West Bank-Gaza canal enabling exits to Route 6 and Route 25, which connect also to Route 4 and 20 along the Israeli coastline plain.
- The terminals will be used also for the payment of taxes. This applies mainly for the cargo terminals, where Palestinians will be able to collect customs and clearances independently of Israel.
- Concerning the network management we suggest the following:

The Marking System:

The current marking system is inherited from the Israelis and follows international standards. Therefore, cooperation on this level and unifying both systems requires minimal effort.

- **Marking language:** The Arabic language is used within the Israeli marking system as it is considered an official language; this promotes easier integration on the regional level where Arabic is widely used. In Palestine, Arabic and English will be used for marking.
- As both networks will be integrated, new traffic patterns will emerge; this might require the establishment of a bi-national committee that will recommend adaptations of the Israeli and the Palestinian transportation networks to the new developments initiated by the integration of the systems.
- Car license registrations must be unified for both Israel and Palestine to enable border crossing between Israel and Palestine with cars. If Palestine allows the importation of cheap cars (produced especially for third world countries), we recommend supplying Palestinians with two types of registration numbers – one with permission to drive only in Palestine and other countries that allow these cars, and a registration number that is also recognized by Israel. The two registration numbers will be distinguished by different colors. This recommendation considers the growing market for simple cars for third world countries, cars that Israel will, most likely, not allow, but may interest Palestinians.

- Taxis adequately licensed will be allowed to cross the border to serve cross-border passengers.
- Bus companies from Israel and Palestine will be allowed to apply for rights to operate cross-border lines. Such applications will be submitted to the bi-national committee suggested above. One can foresee the attractiveness of several such lines. A bus from Tel Aviv through Jerusalem and Al Quds, to Jericho and Amman may be a demonstration for the new opportunities opened to transportation companies.

The bi-national committee will also deal with coordinating the following issues:

- Sharing cars, car owners and drivers databases. This is essential when drivers from both countries will use each others networks (in cases of accident, theft, etc).
- Mechanisms for selling and buying cars between both sides.
- Import policies (totally dependent).
- To introduce locked-freight transportation systems, food and beverage, industrial and agricultural, and to agreed standards of the transportation of these goods.
- The Palestinians are independent on the issue of permanent entrance of vehicles and to re-evaluate the agreements with Egypt and Jordan.
- Introduce cooperation on meteorological issues related to traffic on land, sea and air.
- Share data of traffic and traffic patterns within the network.
- Environmental impact of any network development.

We have devoted a special concern for the development of sea and air ports and to cooperation policies in managing them.

2.
Airport

An examination of future transportation needs clearly indicates the necessity for air transport services to handle the projected passenger and cargo, internally and between Palestine and other parts of the world. This requires the reopening of the Gaza International Airport. The airport is located at about 40 minutes driving distance from Al Quds, the capital of the Palestinian state. An international port in Gaza does not pose special difficulties in coordinating air traffic with Israel and Egypt beyond common air transport regulations. Unlike the Gaza airport, an airport in Al Quds poses complex coordination issues with Israel. Therefore, we recommend that only a small and secondary airport for small airplanes be considered there. It will serve local flights to Gaza Strip and neighboring countries, mainly Amman. In the future, it may be used to supplement the Gaza International Airport. However we do not believe that there is any justification to channel significant investment to the development of a second airport in Palestine. The right of Palestinian flights above Israel between Al Quds and Gaza should be secured in bilateral agreements.

3.
Seaport

With the absence of a Palestinian port, the whole region is currently being served by the modern Israeli ports along the Mediterranean. Palestinians are in favor of developing a seaport in Gaza Strip. Such a port must remain flexible and able to handle different types of cargoes, rather than specialize in one particular cargo. This may increase competition with Israeli ports and improve the bargaining position of Palestinian exporters and importers. If the Gaza seaport is a cheaper option Israeli businessmen may choose to utilize it.

One important aspect of the road link between Gaza and the West Bank will be its connection to the Gaza seaport. We expect a considerable portion of the Palestinian foreign trade to pass through the Israeli seaports. However, if Palestinian utilization of Israeli seaports will be too costly, the option to deliver Palestinian foreign trade through Gaza would ensure the viability of the Palestinian economy. This will strengthen the bargaining power of Palestinian and some Israeli users of the Ashdod port. In order to increase competition between the two ports we recommend developing the railroad between Gaza and Ashdod. The line can later be expanded to Tel Aviv through Gaza and Rafah and extended to Egypt; linking Asia with Africa. This would be a recreation of the same route created by the British during their mandate in the region.

Strategic Scenarios

Within this study three possible scenarios are benchmarked within the current situation.
The current situation: There are two transportation networks; Israelis control the Palestinian intercity linkages and no linkages exist between the Gaza Strip and West Bank. There is a developed Israeli network. The Palestinian network is underdeveloped; Palestinians have no port, a damaged airport and no free access to the developed transportation services on the Israeli side.

In all the following three scenarios, the **two-states** solution is envisioned, the impact of the **separation wall / barrier** is minimized, and the **territorial link** between the Gaza Strip and West Bank exists. This Study will also evaluate the transportation sector from the following expected scenarios:

Scenario I: Full Integration
Two independent states comprising of a common transportation network, allowing free access to everyone, everywhere. There will be no need for a designated territorial link between the West Bank and Gaza Strip - similar to the European Union.

Scenario II: Separation
Two independent states with separate networks. Palestinians remain in Palestine and Israelis aren't permitted to enter Palestine. The Gaza-West Bank linkage should exist.

Scenario III: Partial Integration
Two independent states with shared partial usage of main links, such as the North-South Route and some specific highways, without restrictions. Citizens from both countries can drive in either state but require special permission (visa).

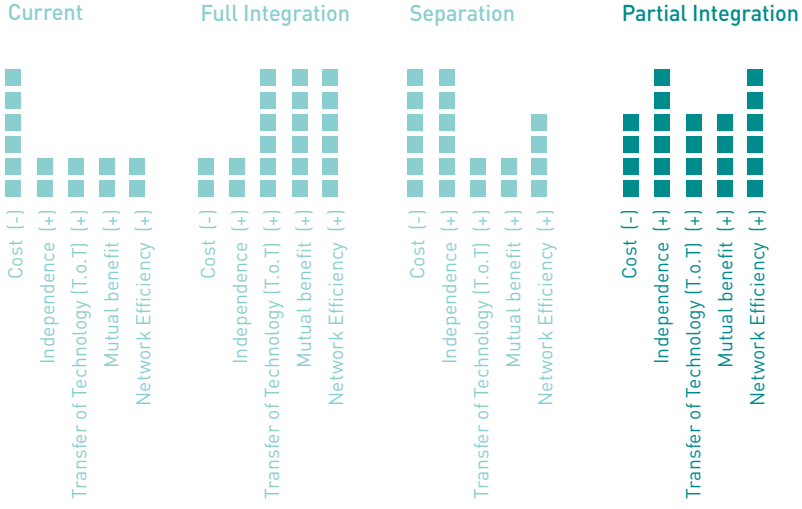
4.
Roads

The current road network is not ideal. There are many roads that are not maintained and are damaged and blocked. Additionally, links between the Palestinian cities are unreliable.

Assumptions:

1. Palestinian networks need extensive rehabilitation to reach internationally accepted standards. It is the assumption that the donor community will participate in developing the road network.
2. When sharing the roads, a joint office will arrange for road tax allocation upon a specific agreement.

Table 1: Transportation Scenario, Road



The best strategy for this sector is to implement **partial integration** for the first 7–10 years; then gradually implement **full integration** as the optimal solution for the region.

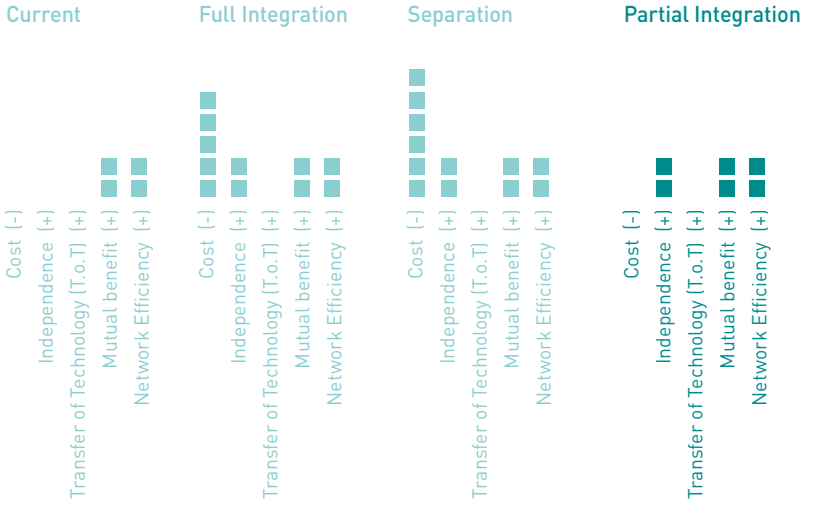
5.
Rail

There are no rail services currently operating in Palestine, though a rail system exits in Israel.

Assumptions:

1. No rail network will be implemented within Palestine in the near future.
2. Under Scenario I and III Palestinians will have access to the Israeli rail network at the same cost as the Israelis.

Table 2: Transportation Scenario, Rail



It is recommended that **partial integration** within the rail sector be implemented for 7–10 years, allowing Palestinians the use of the Israeli rail network. Following this period, a traffic evaluation must be conducted to **reevaluate** the **full integration** option, and to consider extending the Israeli network within Palestine, by a Palestinian rail company.

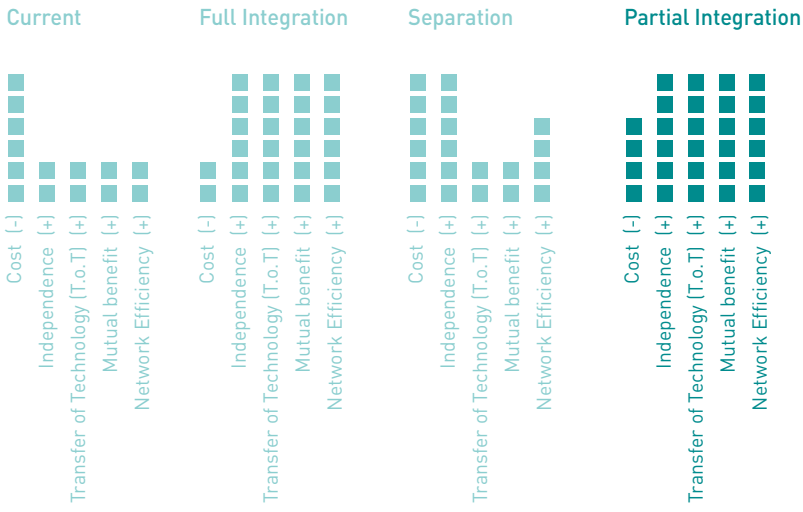
6.
Air

An assessment of future transportation needs clearly indicates the necessity for air transport services to handle the passenger and cargo to other parts of the world. This requires the reopening of Gaza International Airport, and the construction of another secondary airport in the West Bank.

Assumptions:

1. International airport in Gaza.
2. National airport in the West Bank.
3. In Scenario III, transit flights are acceptable.
4. In Scenarios I and III, Israelis can fly out of Gaza and Palestinians fly out of Ben Gurion Airport.

Table 3: Transportation Scenario, Air



The **partial integration** scenario is the best for both parties, where both will cooperate within specific and certain issues that both agree benefits them.

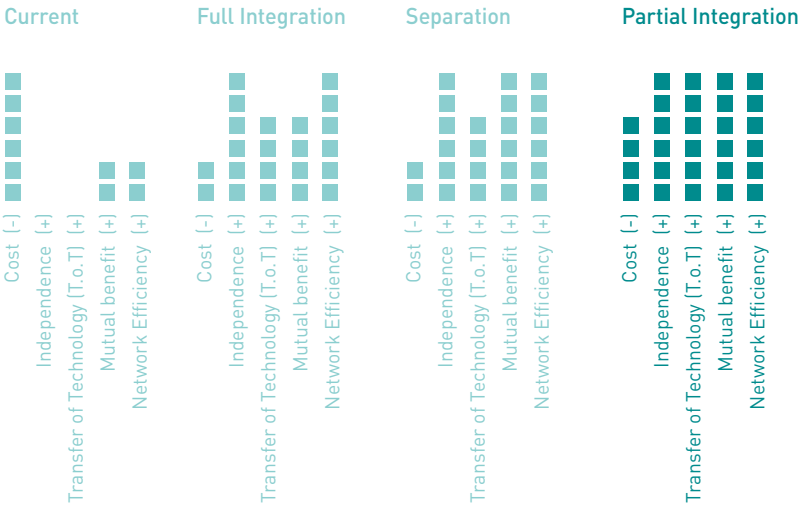
7.
Sea

Though it is not the most economically efficient solution, Palestinians view the sea port as a symbol of economic sovereignty.

Assumptions:

1. Roll on roll off.
2. % usage of Israeli port.

Table 4: Transportation Scenario, Sea



Again, **partial integration** is the best option, where the Palestinians will have their own port but can continue to utilize the Israeli ports. Both Israelis and Palestinian should be able to choose their desired shipping port based on economic incentives.

Electricity

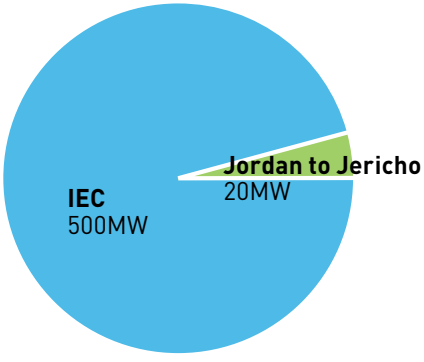
1. General

Supply of electricity to the Palestinian state requires an analysis of production and available fuels, dissemination and distribution. In addition, it requires understanding the role of the main actors - Palestine, Israel, Egypt, and Jordan - in the supply of electricity to Palestine and as partners for cooperation with them. As in the discussion on transportation, we briefly characterize the current system, predict future needs and the different means for meeting these growing demands, and recommend projects for cooperation and regional electrical systems integration. Stable, uninterrupted and relatively cheap electricity supply is a necessary condition for sustained economic growth. We therefore view the development of economic cooperation based on reciprocal relations as a power to consolidate the peace process between Palestine and Israel.

Currently, Palestine is heavily dependant on electricity imports from Israel. The domestic electricity production cannot meet demands and the status of the network is despairing.

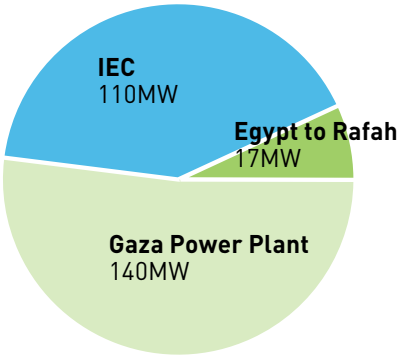
Table 5: Existing Palestinian Supply Capacity

West Bank



520MW – Total existing capacity

Gaza



267MW – Total existing capacity

Source: World Bank, West Bank and Gaza Energy Sector Review, May 2007.

The only power station in Gaza works on diesel engine, producing relatively expensive electricity. The production can be distributed only in Gaza. This means that the dependency ratio on electricity imports from Israel is close to 80%, creating complete dependency on Israel. Imports from Egypt and Jordan are marginal and are restricted to Rafah and Jericho.

Transmission systems are almost non-existent. The Palestinian territories are subdivided into four regions, each of them supplied by end lines of the Israeli network. They have transmission capacities that range between 6.6KV–33 KV. Electrical networks in the West Bank are considered distribution networks. The Israeli Electrical Company (IEC) supplies electricity to Palestinian villages adjacent to its overhead lines. There are three main lines in the West Bank and nine main lines in Gaza Strip. These lines were designated to supply Israeli settlements and military camps. During the last four decades, electrical installations were financed by the local population. For this reason, some rural villages located far from Jenin or Hebron have no electricity.

The Palestinian Electric Company (PEC) was established in 199, with 33 % of its assets for public shareholders, and 67 % for private shareholders. Municipalities in the West Bank perform the role of electricity distribution companies; in some cases there is a limited production capacity. Maintenance standards of the lines are low resulting in higher rates of losses. Misusage causes the wires and transformers to heat, thus creating losses and supply interruptions in the electricity system. Moreover, it creates lower tension in the electricity lines, especially near the ends. This results in a poor, practically unusable quality of electricity. Industry and other essential consumers are economically injured as they are prevented from maintaining a normal production pace and are unable to upgrade and extend production to modern standards. Consequently, these consumers to are forced to establish their own production units close to the factory. Needless to say, this temporary solution complicates production and makes it more expensive. In total, estimation losses reach the impossible rate of 30-35%[4], partly due to the network's low standards and mainly to low rates of payment to the electricity companies.

The economic consequence of such losses is estimated at $4.29 million per year. This, in turn, increases the price for KWh (between $0.1-0.5 per KWh)[5]. In addition, the Palestinian Authority highly subsidizes the prices by paying part of the customs accumulated for them by Israel to the IEC. For example, on December 3, 2001, the IEC asked the Israeli government to cut $20 million from the transfer payments (taxes collected from Palestinian workers in Israel) it makes to the PNA as a result of the accumulated electricity debt for the municipality of Gaza. The IEC threatened to cut power because of the "critical" nature of the political situation. In the case of a military closure, however, the amount of money transferred to the PNA is minimal.

The percentage of households connected to the public electricity network increased from 96.8% in January 199 to 99.5% in July 2000. However, this figure is misleading. In fact, only 93 .1% of households receive uninterrupted electricity services (twenty-four hours a day, seven days a week), while the transmission losses were very high, indicating a poor quality of supply. The implications of the defective electricity system for the industrial sector are considerable. The industrial sector suffers from a supply shortage, while the proportion of the cost of electricity is very high (nearly 35% of the operation cost). In 2000 the average price of electricity reached nearly US$0.30 per KWh. This was 3 times higher than the average price in Israel or Jordan; twice as high as that in Lebanon and 5 times higher than the average price in the USA[6].

Electricity supply depends on import, especially in the West Bank. The Palestinian Energy Authority is expected to regulate this in the PT, in zones under its control, while the Jerusalem District Electric Company (JDEC) distributes electricity to East Jerusalem and some Palestinian suburbs around Jerusalem. After the Oslo Agreement, three distribution companies were considered: Gaza Electric Utility (GEU), South Electric Company (SELCO), and North Electric Utility (NEU). Municipalities act as distribution utilities and collect payment for electricity from the consumers. However, some 65 localities in the West Bank are not connected to a public electricity network, including 38 in the Hebron district. Of the 531 West Bank and Gaza Strip localities with connections, 165 received their electricity from the JDEC, 215 from the IEC, 22 from private generators, 68 from community councils and 61 from other sources[7].

In addition to the desperate situation of the network and the mismanagement of distribution the IEC does not respond to Palestinian needs:

- The municipalities and village councils purchase a limited amount of electrical energy from the IEC. In order for the municipalities to increase their electric supply, they have to pay large amounts of extra money in the form of fees to the IEC.
- The IEC does not respond positively to this increase in the demand, unless it has an overflow on its transmission lines. In all other cases, those requesting increases in electricity must finance it themselves.
- Priority of service is given to the Israeli customer. Concurrently, a low voltage exists at the end of the feeder lines.
- The low voltage at the end of the transmission lines is attributed to the radial system used for these main feeders. This causes the electricity to be easily cut off in cases such as grid maintenance making it difficult for businesses to develop.

2.
Estimating Future Demand[8]

Energy consumption in the West Bank and Gaza Strip is small in total, and low by regional standards per capita[9]. Despite the troubles of recent years, energy demand has continued to grow quite rapidly. Total electricity consumption, as indicated by electricity purchases of GEDCO and JDECO, grew by an average of 10% annually in 1999-2005. The World Bank estimates indicate that even under a low consumption scenario, demand will outstrip supply capacity by 2008. According to a published report from the MEDA program[10], electricity problems, high prices and low reliability play a significant role in preventing industrialization. In addition to political instability, electricity supply shortages limit growth prospects.

In order to estimate the required investment in electricity generation capacity, we compared current Palestinian electricity consumption with that of Israel in the late 1950s. Palestinian electricity consumption in 1995 was similar to that of Israel in 1957, and in 2001-2002 Palestinian electricity consumptio was equivalent to Israel in 1961[11]. Israeli electricity consumption per capita in 197 0 was used as reference to determine Palestinian electricity consumption per capita for the year 2020[12]. Israeli electricity consumption per capita for this period was 1900 kWh. Moreover, the following characteristics, unique to the Palestinian economy, were taken into consideration:

1. The general population is expected to grow due to natural growth and the return of refugees. The current average number of persons per household is 6.4. The average household size is expected to decline over time.
2. The marginal effect of the household size over the basic electricity consumption i.e. lighting, refrigerating etc. is low, but will grow parallel to Israeli development during the compared years.
3. The Palestinian industry will not be as energy intensive as Israel's. The rate of growth in electricity consumption by the Palestinian industrial sector will not exceed that of the residential electricity consumption.
4. Electricity intensive projects such as the construction of the national water canal in Israel during the selected period, and construction of a water desalination facility in Gaza are accounted for separately.

According to the characteristics described above, in order to predict Palestinian electricity consumption by comparison to Israeli figures, it is necessary to deduct approximately 25%[13] of the equivalent Israeli consumption per capita. Therefore the average electricity consumption per capita in Palestine is predicted to reach 1400 kWh by the year 2020, similar to the average consumption per capita in Israel in 1966-1967.[14]

Based on the assumption that the annual electricity consumption per capita will amount to 1400 kWh by the year 2020, and assuming the general population size will reach 6 million,[15] electricity consumption in the Gaza Strip and West Bank will amount to roughly 8.4 billion KWh per year. Assuming 18% system losses, the estimated production required to meet the expected demand will be 10.2 billion KWh per year.

Assuming the load factor[16] to be 68 %,[17] the production capability required would be 1700MW. However, due to occasional malfunctions, periodic repairs and production units' maintenance, an additional 25% operational reserve is required.[18] Hence, it is expected that the required installed production capacity to provide Palestine with reliable electricity supply to be 2300MW. This additional reserve is also required in order to cover the possible downward bias in comparison to Israel[19] due to the differences in the expected rate of increasing demand for electricity.

Note: Due to the lack of sufficient information, risks and uncertainty, the given estimations ought to be refreshed prior to practical application. Data and estimations should be adjusted according to updated circumstances and conditions.

Based on the analysis described above, it is more probable that risks to this projection lie on the up side. The future consumption can exceed our projection due to the necessity of constructing a water desalination facility in Gaza. Downward bias to this estimate could also occur when barriers to economic growth are lifted or if return of Palestinian refugees exceeds population growth assumptions. Even a more simplistic extrapolation of 10% growth per year, based on current electricity supply figures, suggests electricity supply requirements would exceed 2700MW.[20]

Even if we accept the more modest prediction, we have to assume a dramatic increase in consumption due to rapid population growth and economic development. This will set tremendous challenges to the development of electricity sources. The problem is even more disturbing due to the potential for imports from neighboring countries. Israel, which is the main supplier of electricity to Palestine, is facing a shortage in production that will last at least up to the target year of 2020. Therefore, one can expect that Israel will be reluctant to increase export to Palestine. The IEC has even considered initiating stops in electricity supply to selective regions in peak times to reduce the risk of the collapse of the entire production system. Under these circumstances Palestinian regions may be especially vulnerable to electricity stops. Jordan and Egypt do not have the facilities to increase electricity export to Palestine. Some private Egyptian investors proposed to build a gas power station in Sinai that will export electricity to Palestine. However, the Egyptian government refused to approve the project. A Jordanian initiative is even more complex, since it depends on the construction of a gas pipe from Egypt to Jordan, which may be quite expensive. This leads to the conclusion that the Palestinians will have to increase self production, and increase efforts to secure supply by official, long-term agreements with all neighboring countries.

3.
Development Strategy

The main conclusion from the analysis is that the electricity infrastructure requires emergency treatment in building the dissemination network, the distribution system and the access to supply sources. Without it, any economic development will be blocked. The most emergent projects are as follows:

- Establishing a dissemination system that does not exist today. We recommend building a national electricity carrier starting from Gaza and ending in Jenin. This will also enable connections to the Israeli, Egyptian and Jordanian networks. Such a carrier must have a capacity of 161 kWh, to meet demands till 2020. The carrier will become the backbone of the Palestinian network bringing most of the population closer to the high voltage lines. These lines will integrate the system, enabling compensation for shortcuts in any area of Palestine. It will also enable the production of most Palestinian electricity in Gaza, which is close to the sources of gas and gasoline imports and to cooling facilities based on sea water. We believe that such an option will be cheaper than piping gas from Gaza to the West Bank in order to produce electricity in the West Bank based on air cooling systems.
- Upgrading local and regional networks and connecting them to the national carrier. Upgrading the existing networks, shortening the length of supply lines, reducing the number of consumers connected to each transformer, adjusting the cable's section to the expected demand in the line, and all other technicalities are required to provide normal and reliable electricity supplies. These steps may reduce about one third of losses in the electrical network.
- Reducing the major part of the losses requires a reorganization of the bureaucratic organizations that control and collect payments from users. The Palestinian Authority established four regional companies that failed to impose payment collection. Customers adjust the meters, by by-passing the meter or by connecting directly to the network without notifying the supplier (usually, the municipal authority, since the IEC sells electricity to the municipalities at bulks and then the municipality sells the electricity to the end users), to minimize the measured electricity counted. The problem can be solved through a combination of means.

First, a new metering technology, based on a prepaid system, should be implemented in order to increase the difficultly to bypass the control system. The whole process will be computerized and involve codes programmed to the meter,[21] ensuring no electricity income prevention. The suggested technological solution enables the electricity supplier to collect information regarding the regular electricity consumption readings and will trigger an alarm whenever irregularities, caused from income prevention, occur. These types of meters have been successful with handling electricity income prevention in other parts of the world.

Second, the authority must find ways to exercise its authority on consumers and supply the companies with effective mechanisms for mposing payments. The Palestinian Authority should impose one price on electricity throughout the entire country in order to supply all regions with equal opportunities for development. We recommend planning electricity as a closed market, in which profits will be used for further investments, and in developing the network and production capacities.

It may be that such challenges will be better met by a single united national company that will both produce and distribute electricity. The corollary of this development is that revenues from electricity sales will be retained in the sector, and applied to urgent and substantial rehabilitation and development needs, and the full payment for purchases of bulk power supply. The PNA will benefit from this change through a sharp and lasting increase in receipts of clearance revenue (upon restoration of payments), once the utilities improve bill collections from consumers – enabling them to pay their bills to IEC. Electricity consumers will receive better service over time as the utilities suppliers use revenues to upgrade their facilities.

- The Palestinians will have to produce part of their electricity independently. The power station in Gaza has land reserves for units that can produce about 560MW. However, for costs and environmental purposes, the station should be transformed from gasoline to gas (the current oil and gas prices being discussed by British Gas and the Israeli Government). The savings from using natural gas could reach $83 million per year.[22] Such a power station will not produce more than one quarter of the total demands in Palestine. Coal stations may be cheaper than gasoline but they require space consuming infrastructures that will be difficult to install in Gaza. They also have negative environmental impacts. Furthermore, coal stations are more efficient when large stations are built (800MW+).
- It is difficult to foresee how Palestinians will be able to make further investments in electrical production till the year 2020. Nevertheless, they will remain highly vulnerable to decisions made in Israel, Egypt and Jordan, countries already stressed to meet their own needs. Furthermore, alternative fuels like wind and sun cannot be used as major sources. Wind stations are predicted to be active only one-third of the year, due to the wind regime; and solar stations are too expensive for the Palestinian electricity system.
- Population growth vis-à-vis the scarcity of fresh water will eventually require establishing a desalination facility of the shores of the Gaza Strip. A desalination facility is electricity intensive. Assuming the capacity of the desalination facility built would be 100 million cubic meters, with an electric capacity of 100MW and the annual operation time to be 8000 hours; the facility's annual electricity consumption will amount to 800 million kWh. The desalination facility would, no doubt, be the major and most significant electricity consumer in the state. The production of desalinated water may be limited to the hours of low demand for electricity, reducing the burden on the electricity system and lowering the cost of water.
- The 65 remote rural municipalities, mainly in the El-Halil region, that are not connected to the electrical network should be supplied by electricity. In these areas the use of wind and solar sources should be considered.

4.
Forms of Cooperation

- The Palestinian Authority should strive to reach a long-term agreement with Israel for the supply of electricity. Due to the shortages in Israel it will be difficult for the Palestinians to significantly increase the current supply, despite the expected rapid growth in demands. It is also in Palestine's interest to reduce their dependency on Israeli electricity to about 50% of their total demands, in order to increase the security of resources.
- The next best option is to import electricity from Egypt. This requires the approval from the Egyptian government to private investors to build a gas power station in Sinai. We recommend that the Palestinian Authority enter negotiations with the Egyptian government concerning such an agreement.
- The Palestinian electricity network can be planned as a central element in a regional electrical network. Connection to the regional network would benefit Israel, since the completion from these regional producers would limit the monopoly of Israel's privatized production. Such a network will enable Palestine, Israel, Egypt, and Jordan, and through them additional countries, to benefit from trading electricity, mostly during times of repair, peak hours, etc.
- Cooperation in the use of gas. Palestinian gas reserves and demands are low to the degree that it is not economical to develop them for solely internal demands. Therefore, an agreement with the Israeli gas company may benefit both countries. Connecting to the Egyptian-Israeli gas pipe may enable even more flexible use of the gas for the benefit of all parties.
- Since Israel is subsidizing environmentally friendly electricity production, both sides may consider the production of solar energy in Palestine, mainly for Israeli consumption, in return for increased export of cheap Israeli electricity. A power station of about 200-250 MW could be built in the Jordan valley, close to the main line that connects Jordan, Palestine and Israel. It must be noted that such a project may be feasible only if the high investment will be donated by third countries, and if Israel commits to a long-term contract to buy the solar energy.

Strategic Scenarios

Benefits that arise through cooperation in the energy sector are already being reaped in other regions of the world. However, to achieve the desired level of cooperation it is imperative to have a sustained and high level of political support, and a regional coordinating body. Confidence building measures among countries in the region is necessary. In order to investigate future cooperation in the electricity sector, five key drivers have been selected. These are:

- Environment
- Cost
- Independency
- Technology Transfer
- Mutual Benefits

The research team agreed to discuss **four strategic cooperative alternatives.** These alternatives are briefly presented as follows:

Scenario I – Maintaining the status quo

In this scenario, Israel will remain the dominant provider of electricity to Palestinians. Some areas will be connected to the Jordanian and Egyptian networks (connecting Rafah with the Egyptian network, and Jericho with the Jordanian network).

In this scenario, Israel will have to account for the entire growth in Palestinian and Israeli electricity consumption. Since the IEC already operates near full capacity, with no long-term trade agreement, Palestine will face shortages. The IEC may also use its monopoly to charge the PA higher electricity prices.

Scenario II – Reducing Palestine Electricity Dependency Ratio to 50% and Constructing a Regional Electricity Network

This scenario assumes that Palestinians will build their own plant and strive to supply as much as 50% of the projected Palestinian electricity consumption in 2020. Israel will supply the marginal Palestinian demand for electricity.

In this scenario, pressure on electricity production capacity in Israel is reduced. Palestine benefits from the self-production and control of a basic infrastructural

resource, while reducing the excess burden of financing an extremely large investment. Israel gains as Arab entrepreneurs utilize the regional network to supply electricity to Israel.

Scenario III – Israel Cuts Electricity Supply to Palestine. Palestinians Fully Import their Electricity from Jordan and Egypt

In this scenario, Israel forces a cut from its electricity supply. Palestine will be unable to raise the necessary funds for self production. Therefore, Palestinians buy their electricity needs from the regional Arab countries. This scenario will be devastating to the Palestinian economy. Israel would lose a major electricity export destination.

Scenario IV – Palestinians Export Electricity to Israel

This scenario assumes that Palestinians will have the excess capacity to export electricity to Israel. Palestinians will use gas in Gaza and Egypt to produce the electricity.
This scenario requires massive investments that will cause Palestinian national debt to increase dramatically. Construction of such magnitude will make it impossible to finance any other capital intensive project.

Evaluating the Strategic Scenarios

Scenario II contains the most benefits for both Palestine and Israel.
This scenario could, in the future, evolve to scenario IV. However, given the current, poor starting point, we recommend reducing Palestine's electricity dependency ratio to 50% and constructing a regional electricity network.

Works Cited

- *Abu Alkhair, A. (2006). The Current Status of the Energy Sector in Palestine, with a Special Focus on the Electricity Sector, Geneva: University of Geneva.*
- *Faris Basim, A. (1936). Electric Power in Syria and Palestine, American University of Beirut, Social Science series No. 9, American Express.*
- *Gaza Power Generation Company (GPGC). http://www.pec-gpgc.com (accessed 1.3.2006).*
- *Israel Electric Company (IEC). (2006). http://www.israel-electric.co.il*
- *MEDA Program. (2002). Applications of Solar Thermal Energy in the Mediterranean Basin, Palestine, http://www.tecsol.fr/solarmed*
- *Palestinian Central Bureau of Statistics (PCBS). (2002). "Energy Statistics," http://www.pcbs.org/energy/2002tab15.aspx*
- *Palestinian Energy and Natural Resources Authority (PENRA). (2006). Losses of Israeli Incursion 2000-2003, http://www.menr.org*
- *Palestinian Energy Research Center (PEC). (1994a). Series of the Present Status of Electricity Services in Palestine, Priorities for Energy Authority, Institutional Structure for Electricity Sector.*
- *Palestinian Energy Research Center (PEC). (1994b). Status of Electricity Services in the Occupied Territories, Rural Electrification, Characteristics of Technical Attempts for Electrical Networks.*
- *Palestinian Energy Research Center (PEC). (1995). The Present Status of Electricity Services in the West Bank.*
- *Palestinian Energy Research Center (PEC) and Engineers Association. (1996). Energy and Environment Conference: Challenges for Development and Reconstruction.*
- *Suisman, D. (2005). "The Arc: A Formal Structure for a Palestinian State," RAND Report.*
- *United Nations Conference on Trade and Development. Transit Trade and Maritime Transport Facilitation for the Rehabilitation and Development of the Palestinian Economy, Page 4, http://www.unctad.org/gds/app/2003/1 World Bank, West Bank and Gaza Energy Sector Review, 2007.*

Notes

1. United Nations Conference on Trade and Development: http://www.unctad.org/gds/app/2003/1. Transit Trade and Maritime Transport Facilitation for the Rehabilitation and Development of the Palestinian Economy, Page 4.

2. Palestinian Central Bureau of Statistics, 2006.

3. Suisman, D. (2005). "The Arc: A formal structure for a Palestinian State", RAND Report.

4. Abu Alkhair, A. (2006). The Current Status of the Energy Sector in Palestine, with a Special Focus on the Electricity Sector, Geneva: University of Geneva.

5. Palestinian Energy Research Center (PEC). (1994b). Status of Electricity Services in the Occupied Territories, Rural Electrification, Characteristics of Technical Attempts for Electrical Networks.

6. Abu Alkhair, 2006.

7. Abu Alkhair, A. 2006.

8. MEDA program. (2002). Applications of Solar Thermal Energy in the Mediterranean Basin, Palestine.

9. Some critique has been raised about the accuracy of PCBS population figures. Therefore, per capita calculations may suffer a downward bias. (See, Bennett Zimmerman. (2006) The Million Person Gap: The Arab Population in the West Bank and Gaza, The Begin-Sadat Center for Strategic Studies, Bar-Ilan University).

10. MEDA Program. (2002). Applications of Solar Thermal Energy in the Mediterranean Basin, Palestine.

11. Palestinian and Israeli peak electricity demand:
    294MW in 1995 (equivalent to Israel, 1957)
    405MW in 1999 (equivalent to Israel, 1960)
    454MW in 2001 (equivalent to Israel, 1961)
    456MW in 2002 (equivalent to Israel, 1961)
    Source: IEC Statistic's yearbooks.

12. The figure is 3 .25 times greater than Palestinian consumption in the year 2000. As mentioned, this is similar to Israeli electricity consumption in 1961

13. Israeli electricity consumption in that period includes electricity intensive industry and water pumping. The adjustment is needed in order to correct the possible upward bias.

14. Notes and comments regarding forecasts based on average consumption per capita:
    a. This method of prediction was chosen due to insufficient data.
    b. Predictions are usually based on consumption and demand analysis of the different homogenous consumption groups. Typical dichotomy of these consumption groups is: residential, commercial, industrial, agricultural, water pumping and street lighting. The electricity demand of these consumption groups differ by the time of use at various seasons, weeks, days and daily hours. A consumption and demand forecast is usually obtained by collecting and analyzing data relevant to each consumption group.
    c. The basic electricity consumption, for lighting, refrigerating, etc. is fixed only to lower levels of income. Therefore, we assume the modernization and improvement of living standards will cause growth in the residential consumption relative to the industrial consumption.
    d. Reduction of the high rate of electricity transition losses may reduce electricity prices. The changing demand for electricity is relatively high. Therefore, the rate of growth in residential electricity consumption and demand will be affected by the degree of utilization of energy such as air conditioning. The rate of growth in industrial consumption is expected to

be slower due to the need to establish the industrial infrastructure and to the yet unclear nature of future industry.

e. During current (2004) economic conditions there was no clear difference in electricity consumption throughout the year. However, as more electric appliances will be used for heating/cooling clear differences are expected to be observed due to the seasonal highs and lows. The above comments affect the predictions of the peak electricity demands. The peak demand serves as a base for planning electricity production, transmission and tariff determinations.

15. The Palestinian Central Bureau of Statistics estimates 5,091,314 residents by the year 2015. The marginal production capacity needed for 1 million people is 383 MW (approximated cost $500 million for a coal power station or $270 million for a gas power station).

16. Load factor : the relation between the average annual production and the annual maximal demand.

17. Where consumption is basic, the correlation between the different elements responsible for creating the maximal demand is stronger.

18. This additional reserve is also required since the high probability that the rate of growth of future electricity consumption and demand in Palestine will exceed the average pace of growth in other electricity markets.

19. The subtraction of 25% from Israeli electricity consumption figures in 1970 adds an additional element of uncertainty.

20. Since current, suppressed demand already outstrips the 770MW supply, stretching current supply by a growth factor of 1 0% a year, implies supply requirements of 2716MW by the year 2020.

21. Another technology involves payments via a chargeable magnetic card.

22. World Bank, West Bank and Gaza Energy Sector Review, May 2007.