



# Reshaping Palestinian urban structure towards sustainable urban development

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## Abstract

Palestine's urban structure in the West Bank suffers from limited available land, population growth, the lack of proper urban development, and the restricting political situation that resulted in an uncontrolled urban development that amounted to the creation of urban sprawls. Therefore, there is a need to develop a model for sustainable urban development. This paper presents the *Leaf*, which is a proposed vision that is based on two main concepts; balanced urban development and land resources sustainability. The *Leaf* is a long-term vision of Palestine that focusses on absorption capacity, accessibility, urban and rural developments. The *Leaf* proposes a national policy for urban development in Palestine analyzing spatial issues through the policy of urban corridors, new cities, and urban agglomerations.

**Keywords:** Sustainability; Leaf; Urban Planning; Transportation; Accessibility

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## 1. Introduction

Palestine consists of poorly planned areas that affect future urban planning and sustainable development. The limited area in West Bank of only 6150 km<sup>2</sup> is inhabited by over 500 communities where urban hierarchy and urban density are not shaped well. This is a result of uncontrolled development through history, including poor transportation and infrastructure planning and old zoning laws. The expansion of human population in Palestine is concentrated in one third of the country; while on the other hand, only 5% of the country's land (the Gaza Strip) is the place where 40% of the current total population is living. This means that Palestine suffers an urban sprawl and a scattered urban structure. This issue can be managed by smart growth policies that would produce a concept model for reshaping Palestinian urban structure for proper management of limited land resources and for sustainable development planning (Musallam and Abu Helu, 2012). Therefore, a Sustainable Traffic Improvement for urban road Intersections is a tool for this smart growth.

There are 546 urban agglomerations in the West Bank. The average community size in the West Bank is less than 5,000 inhabitants per community. The average gross land per community is about 10 square kilometers or 3X3 kilometers as an average space per community. This clearly indicates a scattered urban structure. Arguments behind such a structure are based on several facts: the main cities have been developed as commercial and services centers along the main roads while rural centers and villages occupy hilltops where they could be close to terrain and water for agricultural activities. One of the main cities in West Bank is Nablus. The downtown built in the central part of the Nablus city for instance, whereas the northern and southern parts of urban areas in Nablus city lying on mountains. (Al-Dabbeek and El-Kelani, 2008). Some cultural behaviors were the reason for continuous disengagements and new outputs formulations where fighting for water and land resources have been the main reasons for such behavior and resulted in a scattered rural agglomeration.

The main urban centers follow a more organized form along the main road corridors while the rural agglomerations followed a random structure depending on available resources and needs. The facts behind such structure result in village-to-city relations rather than village-to-village networks (Ghazi and Shuman, 2005).

The challenge of predicted population growth within a limited resource environment calls for the need of an alternative urban structure to end the current random urban sprawl. The current urban structure and its related networking systems may be described as unsustainable in terms of capacity, having low levels of services, and have limited potential for regional integration and economic development.

To prepare the Palestinian urban structure to be capable of handling the forecasted influx of returned population, natural growth and possible allocation from Gaza Strip; a scientific model considering the Palestinian context and planning players is necessary. This model will help to identify a clear vision of a sustainable Palestinian urban structure and networking systems where streets that represent a structural grid of interconnecting spaces (Hiasat and Alkurdi, 2017).

It is important to have a long-term vision to stay on track. Currently the Palestinian government with international donation agencies are implementing long term plan for reforming the water sector to gain more efficiency and service quality (Murrar, 2017). The urban structure in Palestine is also required for such reforming and reshaping. Many scenarios were proposed to this reforming. The proposals discussed the main elements of urban characteristic, such as planning structure and layout, where to locate new and existing population and how to connect and integrate the expected influx of population within a defined space at a specific period (Lin, 2012). This paper, through comparative analysis of previously proposed plans, introduces a new concept for a long-term vision of a Palestinian sustainable urban structure planning. The proposed model is the *Leaf* which is called so following its conceptual shape.

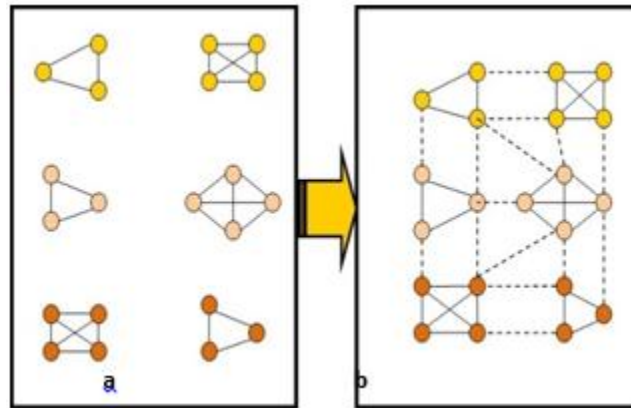
## 2. Smart growth and sustainable development

Smart growth is a series of strategies and initiatives designed to help communities plan for and accommodate urban expansion and population growth in ways that preserve their economic prosperity, environmental health, and community character, which could be projected over regional and national scales. In the Palestinian case, a massive urban growth is expected in a relatively short time. Therefore, smart growth should be considered to conserve the limited available resources, including water, open spaces, wildlife, habitat and recreational lands, and to provide transportation options and housing choices by expanding the range of transportation and take regional considerations of sustainability (Healey et al., 1997)

The concept of smart growth has several components for it to be achieved. Most importantly, it should be based on a vision or a planning scheme, which requires certain regulations to make it valid. Then the scheme should be designed in a way that maintains public infrastructure and investments (Naess, 2007).



**Figure 1.** An example of weak networks of Palestinian urban structure



**Figure 2.** Most possible combinations of simple clustered urban nodes and its completed network system



**Figure 3.** Existing urban pattern in the West Bank

The successive occupations and administrations who came through the history of the Palestine led to the creation of policies and regulations that resulted in constrained developments that are not in advantage of

the Palestinians. The networks have been designed and built to serve either the military or the occupations' settlements. For instance, the Israeli settlements in the West Bank have their own integrated networks and structure while the Palestinian communities stayed as a historical snapshot of the previous century. As an example, Figure 1 of three villages (Anza, Zawiya, and Sanour) within a 3 kilometers range that lacking direct connections.

Rout 1 (road No. 60) was re-designed to link major Israeli settlement in the region (Hamosh settlement with Ganim settlement) and rout 2 was designed to connect an Israeli military camp called near Sanour with road No. 60 which is an important main road in Israel. The tow routs, 1 and 2, were designed without giving any considerations to the accessibility needs of the three Palestinian villages that had to use them to connect to each other as they were the only choice they had.

In 2000, when the roads were closed in the face of the Palestinians during the civil resistance (Intifada), the existing network forced neighbor population with shared interests created new self-designed dirt routs to connect with each other. For instance, instead of using rout 1, which is about 18 kilometers in distance, they used an alternative route that is less than 3 kilometers where a simple "sustainable" system of services has been developed. Similar could be found almost all over the Palestinian Territories.

The result of such models is a cluster of urban communities or economic nodes or a mix of both. Such clusters could form together a cluster of clusters to end with a complicated but integrated urban-structure. For example, the clusters around Jenin city north of West Bank are connected through a major road network while the clusters themselves are partially connected through local road networks. As shown in Figure 2, the concept could be developed further to include most possible combinations of clusters (Figure 2.a) to be connected through a system of networks to form an integrated structure (Figure 2.b). All nodes within the system are linked in the most direct ways to the rest. This could form the ultimate theoretical network system.

### 3. Historical development of urban centers

Historically, changes in the main urban centers of the West Bank have been limited to the size of the built-up areas. Limited available records on urban development, due to political constraints, make it difficult to monitor such development. There are only three available records of built-up areas in Palestine; one during the last period of the British mandate (1917-1948), the other just at the starting period of the Palestinian National Authority (1994) and the last one is the most recent available one (2006), about 12 years after the Palestinian National Authority started its role in the Palestinian Territories. The maps show that no significant changes in the urban structure have been recognized and changes are limited to sizes of the urban agglomerations.

Through the period of the Palestinian National Authority and within about 13 years of its establishment, the built-up area has almost doubled. This requires some sort of planning and management of the development process; otherwise, there will be uncontrolled development as a result (Applied Research,

2001) The main driving force behind such an increase is related to the loosening of the Israeli restrictions on development, on the one hand, and to the hope of an economic boom on the other (Applied Research, 2007)

Yet, these records show that no new agglomerations have been developed for the last century whilst population doubled several times. On the contrary, the region of the West Bank has experienced an enormous change because of Israeli settlements. About 300 Israeli settlements have been built following the policy of 'land grab' in the West Bank. The result was a new independent Israeli urban structure following three politically driven accesses, two east-west accesses, and one along the eastern borders.

According to the Palestinian Ministry of Planning, the Israeli settlements will be integrated within the future Palestinian urban structure when possible. Some of those settlements may be demolished as they are built over highly sensitive land or could not be sustainable for Palestinians by any mean.

The sizes of the majority of those settlements are within the scale of minor Palestinian villages. Practically, those settlements may not have a major influence on the proposed Palestinian urban structure due to the following facts:

- Size is not economically feasible in term of running costs of services and infrastructures
- Urban topology is not consistent with Palestinian "urban culture" in terms of size and design
- Most of those settlements are in conflict with the protection plans and ought to be either demolished or changed in function
- Previous experiences in Sinai, Gaza, and Jenin have shown that Israelis would demolish their settlements prior to their withdrawal
- If any settlement construction continues to exist, then they could be dealt with as Palestinian villages and integrated to the new urban structure

The British started to develop the road network on both the national and regional levels since they also used to rule Jordan and Egypt beside the whole Palestine. They developed the base surveying maps and cadaster records. By the end of the mandate period in 1948, the British developed the major road corridors in Palestine. Those corridors still form the skeleton of the existing road networks. Changes of the main road networks were done in three different periods: the end of the British mandate in 1948, the beginning of the Palestinian National Authority period in 1994 and the last available data in 2006.

#### **4. Urban concentration and urban hierarchy**

The West Bank main agglomerations are mostly along the middle north-south ridge. Two cities, Qalqilya and Tulkarm, are on the western border while Jericho is almost on the other edge of the eastern borders with Jordan. Salbit and Tubas are also exceptions; they are located somewhere between the ridge and the borders.

Relative sizes and densities of urban centers of the West Bank sub-regions are shown in Figure 4. It is clear that the eastern part of the West Bank is almost empty. This part has great potential for development; it has land and water resources more than other regions. It also contains the lowest point in the world -the

Dead Sea- located at the southern end of this region where many tourists like to visit for medical or religious purposes and.

The urban hierarchy in the West Bank is not clearly defined. There is no sharp border between urban and rural agglomerations or between centers and sub-centers. The regional plan for the West Bank governorates suggests a system of three administrative urban levels composed of:

- Three regional centers comprising the largest agglomerations of the West Bank Governorates: Nablus, Jerusalem, and Hebron. "These centers will be developed as loci for economic activities, private and public, and administration. Jerusalem is anticipated to be the capital of the emerging Palestinian State." (Sadaqa, 1998).
- Four district centers (Jenin, Tulkarm, Qalqyia, and Jericho)
- Thirty local centers distributed over the West Bank Governorates. "Other local centers and rural communities are to follow a controlled natural growth so to end with minimization of urban sprawl" Ghazi and Shuman, 2005).

The Jerusalem regional center includes three district centers: Ramallah, Jerusalem, and Bethlehem. They form the base for a metropolis city. According to the same plan, Nablus and Hebron are also district and regional centers at the same time. However, the West Bank has 11 governorates with a nominated center to each governorate. Those centers functions as administrative centers as well. (Ahmad and Saleh, 2007).



**Figure 4.** Relative densities of West Bank sub-regions

## 5. Urban structure proposal

As a “virgin” region for planning and development and due to political circumstances, there are several trials by different bodies to propose physical plans for Palestine. All trails used to have short-term vision despite the fact of expected major and rapid changes in the region. Palestine faces risky challenges related to sustainability of its resources; mainly the land. This is due to the fact of the high population natural growth and expected returnees. Palestine has limited land available for urban development and already has a high population density. For this, it become more essential to explore the sustainability of such resources on the long-term. Below is an analysis of the main proposals in this regard; the Regional Plan for the West Bank and the Gaza Strip 1998, and the Arc 2005.

### 5.1. The regional plan: Short-term vision

In the period between 1994, and 1998, after the signing of the Oslo Accords, the Palestinian Ministry of planning and International Cooperation (MOPIC) prepared two regional plans for the West Bank and Gaza governorates with the pre-1967 borders. MOPIC prepared the first Palestinian regional plan when uncertainties of main planning elements (space, time and people) were high. Moreover, available data and planning indicators were too limited.

The regional plan has proposed three longitudinal axes for development in addition to two lateral axes. The plan was strengthening the main urban-ridge along the middle series of mountains where six of the eleven proposed governorate administrative centers are located. Moreover, the plan emphasizes the need for enhancing urban development along eastern and western edges of the West Bank region. Natural extensions for the center of the region (Jerusalem) to the east and another axis in the northern part had been proposed. The policy for urban development was based on balanced development with a high influence of political and environmental contexts.

The plan did not suggest future strategies to deal with existing and future urban sprawl and random development. It limited the treatment to the administrative implications of semi-decentralization structure by the proposal of the 30 sub-district centers.

### 5.2. The Arc: Shrinkage planning

The RAND Cooperation, an American company, introduced a planning and development concept for the Palestinian Territories. RAND sent a team of professionals in planning to visit Palestine and present their idea of a national plan for Palestine. The Arc is a proposed plan which is designed to link Gaza and the West Bank and unite them creating a corridor that goes through Gaza and the West Bank linking Rafah (Sothern Gaza) to Jenin (northern West Bank) in a 90 minutes' railway road in 2005 (Awadallah, 2009).

The planners advocated that the concept is more than a refugee-housing plan or an infrastructure project, but rather a built symbol of Palestinian aspirations (Adams et al., 2005). The main concept of the Arc was a linear urban network based on a high-speed train linking "shifted" Palestinian centers to each other and to



the Gaza Strip. The "arced" corridor is about 225 km including a railway, highway, open water canal and an energy network.

In general, one could say that the plan did not overcome the main challenges of the Palestinian spatial planning. The capacity of the plan was much below the near future expectations. The plan considered a total population of 5 million inhabitants including returnees. The West Bank population is expected to exceed this limit in about 20 years, excluding these returnees and in about 10 years including returnees. This ten-year period was the period needed to implement the Arc, which means that the proposed plan was "under-designed" on the opening day.



**Figure 5.** The RAND proposal for The Palestinian network

The plan does not deal with about 350 Israeli settlements in the West Bank. There are no assumptions related to mandate on resources as a main player for future development. Physically, the plan concentrated the population along the middle ridge of the West Bank leaving the majority of the land at geopolitical risk. The plan also neglected the development of territorial lands on the western side of the West Bank and directed the Palestinian development to the east, away from the Green Line and the border with Israel. It might best be described as 'shrinkage' planning.

The path of the Arc breaks the Palestinian landscape and the Palestinian natural reserves along the eastern West Bank terrains. The open water path proposed by the plan does not accord with the semiarid nature of the region.

The plan lacked the vision of "balanced development" of the territories. It limited the development on the ridge and for the 11 main urban centers neglecting the fact that there is more than 50% of the population

living in 550 scattered smaller communities. The plan suggested a future distribution of population growth along the existing main urban centers with no reference to their capacity in terms of space or infrastructure. There are no new agglomerations to enhance the absorption capacity or to achieve balanced development of the sub-regions (Figure 5) (Salingaros, 2005).

## 6. The *Leaf*: Towards sustainable urban development

As a result of the analysis made in points 4 and 5, there is a need to develop a new model, one that makes use of mentioned projects analysis and to overcome the threats of the existing plans. The new model is called the *Leaf*. The name refers to the shape of the proposed Palestinian urban structure and the related networks. The *Leaf* is based on two main concepts: *balanced urban development and land resources sustainability*. Moreover, the *Leaf* takes into consideration a long-term vision with regard to absorption capacity, accessibility, and rural development. (See Figure 6)

This proposal has a four-level model:

- Three regional centers (Nablus, Jerusalem, and Hebron) will form three main metropolises 12. (Maalem, 2003).
- The other four district centers (Jenin, Tulkarm, Qalqilya, and Jericho) will form new regional centers
- Another six regional centers are proposed based on the new model, the *Leaf*, are with harmony with the national policy and balanced development
- Other local centers and rural communities are to follow a controlled natural growth so to end with minimization of urban sprawl

The *Leaf* focuses on the Palestinian planning arena. It goes beyond the limit of other trials in more than the long-term vision and sustainability. For example, it converts some national policies for urban development into spatial issues. This is clear when the *Leaf* translates the proposed policy of urban corridors into new cities or urban agglomerations. The Palestinian protection plan is also considered when primary boundaries for such urban developments are proposed within the *Leaf*. Some main factors the *Leaf* considers are:

### 6.1. Population challenge and the *Leaf* sustainable capacity

Would the available land for urban development be able to accommodate predicted increase in population? The *Leaf* proposal achieves more capacity than other proposals in the medium and long-term. The flexible and high capacity of the *Leaf* accomplishes the sustainability concept. The plan is designed to "absorb" about 45 million inhabitants by the year 2100 without touching the upper limit of the potential land needed for urban development. This done by providing an urban density of about 20,000 inhabitants per square kilometer. This density is almost double the current density of some Palestinian urban centers like Nablus but much below the current density of some regional cities like Manhattan (about 30,000 capita per square

kilometers) and Cairo (about 32,000 capita per square kilometers). Such density is expected to be reached in some urban centers in about 10 years if the urbanization trends continue in the same manner (Tahinah, and Addasi, 2008). while other areas may not reach such density within the short-term but the outcome average is supposed to be close to the planned density. Such a density is supposed to be rational and it is required to achieve sustainability of land resources (Mulder, and Boumans, 2007).

Table (1) provides a comparative analysis of the urban capacities of different discussed proposals. As shown in the table below, MOPIC decided that the square meters per capita is 200m<sup>2</sup> which means that the density will be 5000 ca/km<sup>2</sup>. On the other hand, the Arc calculations of the future population shows that the share per capita is approximately 80m<sup>2</sup> with a density of 12,500 ca/km<sup>2</sup>. However, the table shows that the *Leaf* will be able to absorb the predicted 45 million in a sustainable manner, overweening the low capacity that the other proposals present.

If the assumption of one million returnees is over estimated, then the *Leaf* model will have extra capacity and less average density may be reached by the year 2100. On the other hand, more than one million return size implies an additional challenge, where the maximum capacity could be reached before the targeted year. In this case, extra population could be settled somewhere else or part of the reserved land for other purposes could be reassessed and utilized for urban development.

**Table 1.** Sustainability check of urban capacity of the Leaf compared to other proposals

	The Leaf	The ARC	MOPIC*
Proposed urban density ca/km <sup>2</sup>	20,000	12,500	5,000
Square meters per capita	50	80	200
Maximum capacity in 1000s (available land*density)	62,740	30,385	12,335
Gap	+17,740	-14,615	-32,665
Sustainability check	Sustainable	Not sustainable	Not sustainable

\* Ministry of Planning and International Cooperation (1998)

## 6.2. Balanced development

Urban centers within the *Leaf* are almost evenly distributed along the West Bank. There are two main objectives behind this concept: rural development and geopolitical concerns. Geopolitically, there is a national need to urbanize marginalized areas mainly along the eastern and western regions. The developments could serve as "urban barriers" against neighboring avidity for this land, which may be sharply noticed through the segregation wall and the colonized activities. (Sadaqa and Murrar, 2017).

The balanced distribution of urban centers is essential in order to offer a sort of "complete coverage" of central services for scattered villages and rural communities. Through the *Leaf* model, all rural communities' residences (about 50% of the West Bank population) will have access to central services within a relatively

close urban center. All communities are within a range of 15 kilometers distance from the closest urban center. According to this proposal, almost all communities will form a sort of suburbs to main centers.

### 6.3. Long-term vision

The *Leaf* plan provides integrated-full-coverage networks. The model is based on a semi-grid network connecting all proposed urban and economic nodes with a potential for regional corridors. The plan also considers historic urban centers by providing a major corridor linking the majority of such centers. The corridors within the *Leaf* are proposed to incubate all infrastructure installations based on a “holistic” approach. The major links are supposed to provide space to a major highway, a railway and national infrastructures.



**Figure 6.** The Leaf conceptual plan

### 6.4. Rural development

The outcome of the "semi-grid" concept creates sub-regions. Such system provides access to all rural communities within those sub-regions. Each of the existing and the proposed urban centers form a sub-regional center. All rural communities within the range of the predicted development boundaries of such centers will "melt" within those centers. Other rural communities will form suburbs of the closest urban centers.

### 6.5. Existing urban centers

According to the *Leaf*, all existing urban centers of different scales continue as urban centers in the long-term. Such centers are of historical and social value; the major corridor within the *Leaf* just bypasses the existing urban centers. The exact alignment of this corridor considers all planning and design indicators with no argument on the social and historical values of those centers. Other experiences may demonstrate the possibility of having an underground system to conserve the cultural and historical values of those centers on one hand, and to keep those centers values accessible to public and visitors on the other. Shifting transportation corridors away from such centers may result in gradual negligence through time. The proposed paths should consider both accessibility and traffic capacity of those corridors.

### 6.6. Existing networks

The proposed elements of the *Leaf* make use of existing networks, where possible. The plan also makes use of existing transportation corridors that go through historic urban centers. This does not ignore any necessary modifications needed for alignments.

The assigned paths of the *Leaf* are relatively flexible. A wide band reserved for those paths will give an opportunity to have the proper design for the corridor alignment. This could also make it possible to cope with existing network links when possible and when serving the overall concept.

### 6.7. National policy

National policies emphasize urbanizing the eastern region of the West Bank and propose urban development along the western part. The proposed urban centers within the *Leaf* comply with that proposed urban policy within the National Policies for Physical Development.

**Table 2.** Relative accomplishment by different proposals

	Regional Plan	The Arc	The <i>Leaf</i>
Capacity	-	-	+
Balanced development	+	-	+
Relevance to national policy	+	-	+
Long-term vision	-	-	+
Rural development	+	-	+
Existing urban centers	+	+	+
Israeli settlements	-	-	+
Existing networks	+	+	+
Accessibility/ coverage	-	-	+
Assumptions reliability	-	-	-

To conclude, the *Leaf* aims to overcome all visible threats of other proposals. A comparison matrix (table 2) summarizes relative accomplishment of basic indicators by different proposals. The negative mark (-) indicates lack of accomplishment for the items under discussion while the positive mark (+) indicates successful treatment of the item by the proposals. The *Leaf* as a new proposal targeted to overcome all other

proposals' threats is expected to have less negative marks. This may not indicate the ideality of the proposal but may indicate high accomplishment of the seen objectives.

The main threat of the *Leaf* proposal is that related to assumptions reliability and certainty. However, shifts in time horizon may not largely affect the basic concept. The assessed challenges are there but with different scales or timing.

## 7. Conclusion

The proposed areas for urban development in the *Leaf* can incubate population growth beyond the target year of 2100. The plan could be considered to be sustainable on the long-term. It allows a shift from urban sprawl to a designed urban structure that meets urban needs, national sustainability policies and theoretically approved systems. The *Leaf* upgrades the existing organic system to all-to-all structure.

The *Leaf* presents a fully integrated urban structure based on a theoretical approach: cluster-of-clusters and all-to-all linkages. It focuses on creating flexible sustainable urban capacity that is able to absorb a massive population growth. The holistic approach of networks and links handling all infrastructure and services tools beside its role in land and rail transportation. Furthermore, the *Leaf* provides well-integrated and flexible regional networks between the West Bank and Gaza considering major economic nodes and future developments in this regard.

The *Leaf* considers the vision of a long-term perspective. Like all long-term plans, the *Leaf* is subject to incremental implementation processes and requires periodical re-evaluation based on changes in planning entries. In all cases, the *Leaf* is intended to form a flexible concept plan for urban sustainability by reserving the needed resources for development and the multi-functional networks of high coverage and level of services.

The *Leaf* model is based on assumptions due to high uncertainty. Major changes within those assumptions could influence the proposed concept. However, the basic challenges and targeted solutions may stay valid in most of possible scenarios of state building.

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