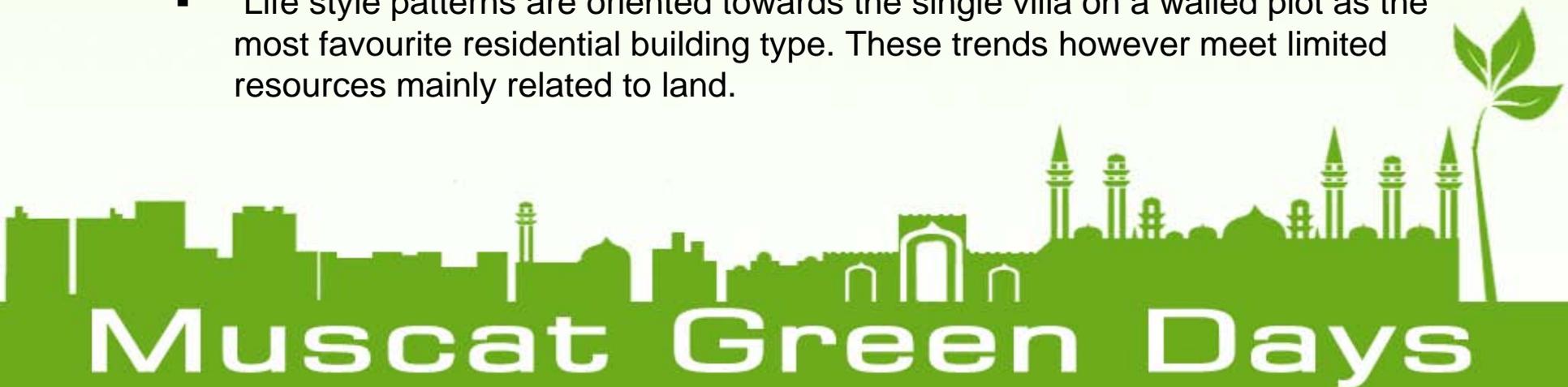


Urban Growth in Muscat from *Patchwork* to *Sustainability*

Hamad Al Gharibi / *M.Arch.* PhD Candidate at TU Berlin
Head of Planning Department, MoHousing

Urban growth in Muscat is characterized by the following attributes:

- Extreme land consumption;
- Low densities particularly at peripheries;
- Private automobile dependency with absence of viable public transport;
- Fragmented open space, wide gaps between development and scattered appearance;
- Lack of choice in housing types and prices;
- Separation of uses into distinct areas;
- One to two story buildings as a default form of development ;
- Large lots;
- Commercial buildings surrounded by acres of parking and
- Lack of public spaces and community centers
- Life style patterns are oriented towards the single villa on a walled plot as the most favourite residential building type. These trends however meet limited resources mainly related to land.





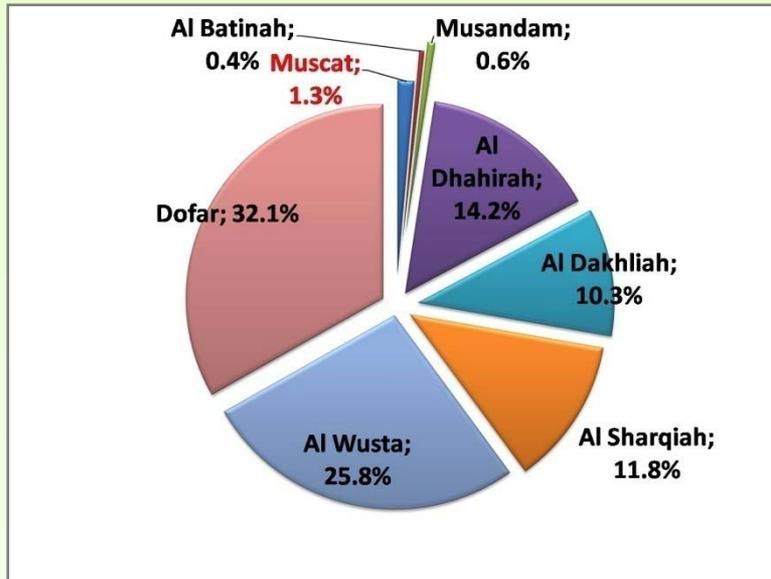
▪ Since the oil revolution, 40 years ago, Muscat, the capital of the Sultanate of Oman has been under of **massive waves of rural migration** because of better employment vacancies, better services, and better lifestyles.

▪ Urbanisation in the whole country has reached 84 % in 2009 according to UN statistics. (United Nations Population Division 2001).

Rank	Territory	Value
1	Brunei Darussalam	63
2	Gaza Strip & West Bank	47
3	Mauritania	45
4	Saint Lucia	44
5	Kuwait	41
6	Saudi Arabia	40
7	Oman	38
8	Rwanda	35
9	Equatorial Guinea	34
10	Afghanistan	33

Territory size shows the proportion of all extra people that will start living in urban areas between 2002 and 2015.

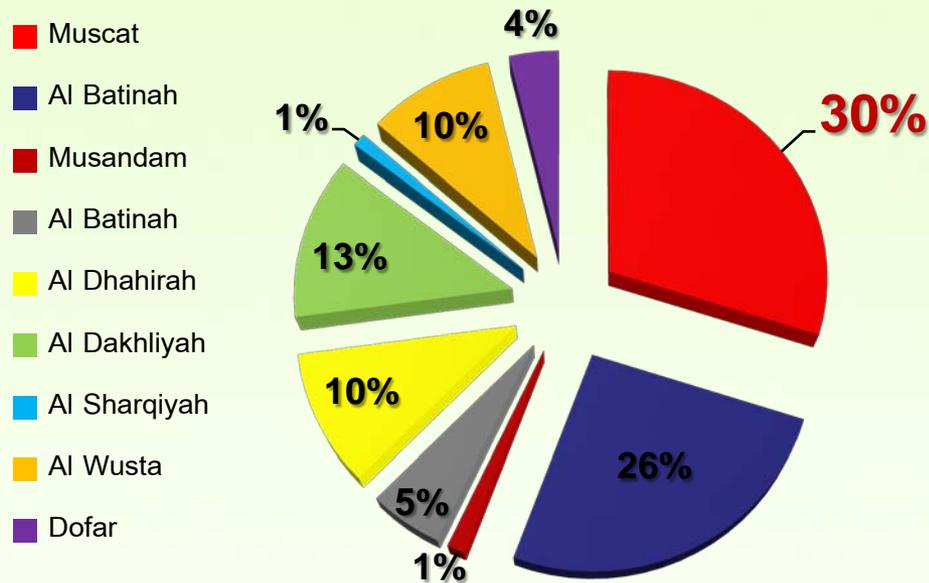
Source: UN statistics



Though the total area of Muscat is merely 1.3%, the second smallest area in Oman.

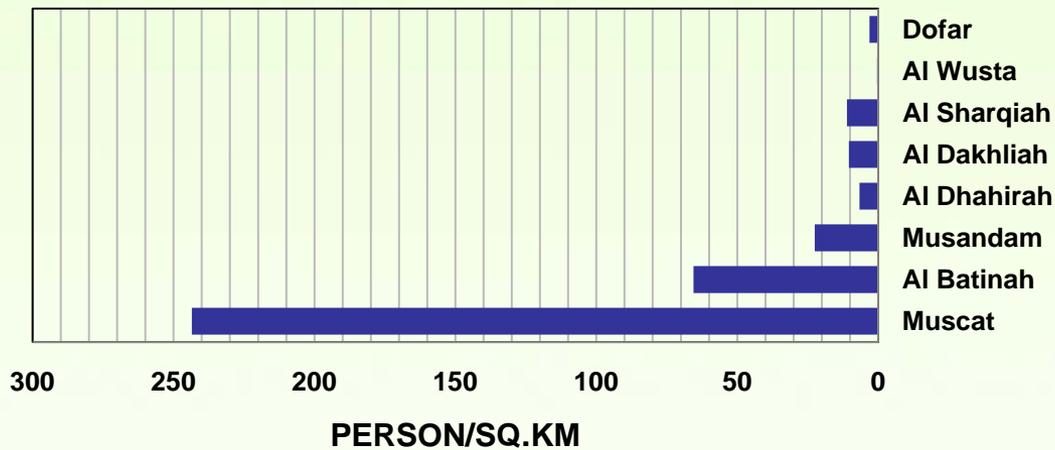
Muscat Green Days

Total Population by Governorate & Region (Mid - Year Estimate 2009)

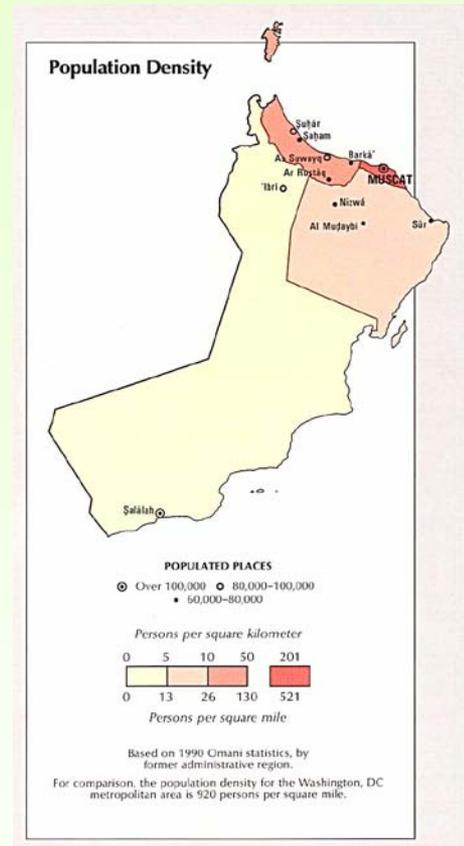


It holds nearly one third of the total population of the Sultanate.

Population Density by governorate person/sq.km



And the highest population density in Oman with 243.5 person/sq.km



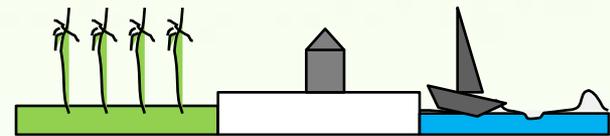
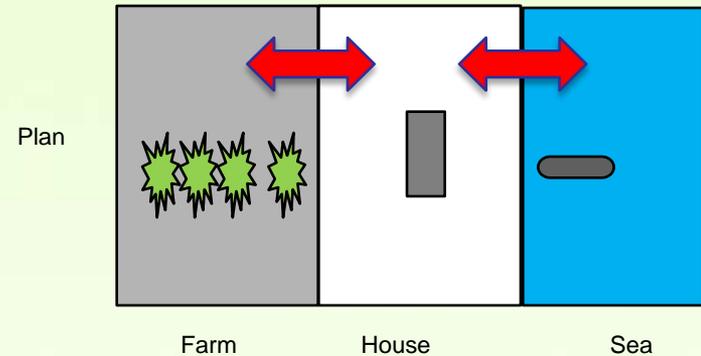
Muscat Green Days

Urban Transformation in the whole country emerged by three categories

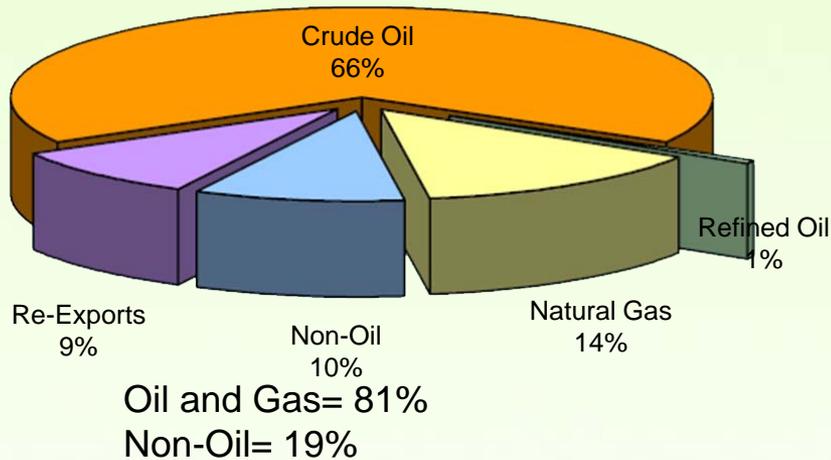


Before oil age

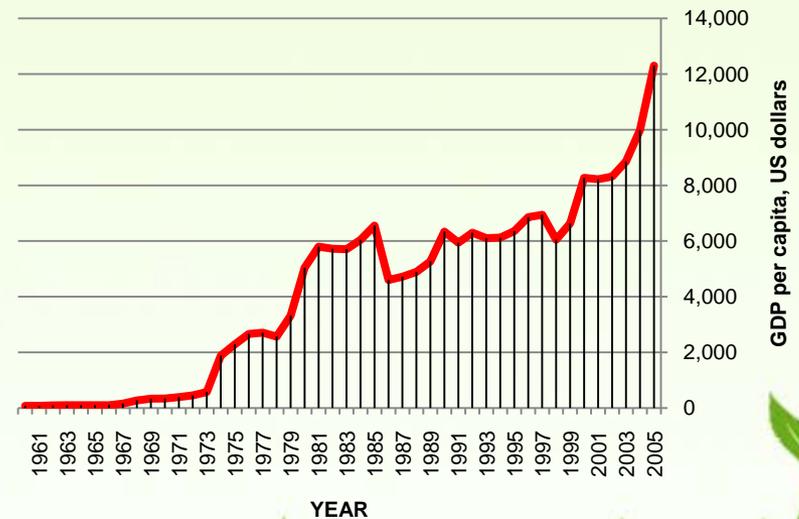
- 70% of economic depended on agriculture and fisheries,
- Most People worked at agriculture and fish sector.
- 70% of products were local



Since oil revolution



- More than 80% depend on oil incomes and 2.6% for agriculture
- Most of national workforce are in public sector.



Source: Annual Data 2006 Review of the Economy of the Ministry of National Economy, Sultanate of Oman

SOURCE: Development Data Group, The World Bank. 2008. *2008 World Development Indicators Online*. Washington, DC: The World Bank. Available at: <http://go.worldbank.org/U0FSM7AQ40>.

Economical transformation > Social transformation > Urban form transformation



Social transformation

– Local immigration

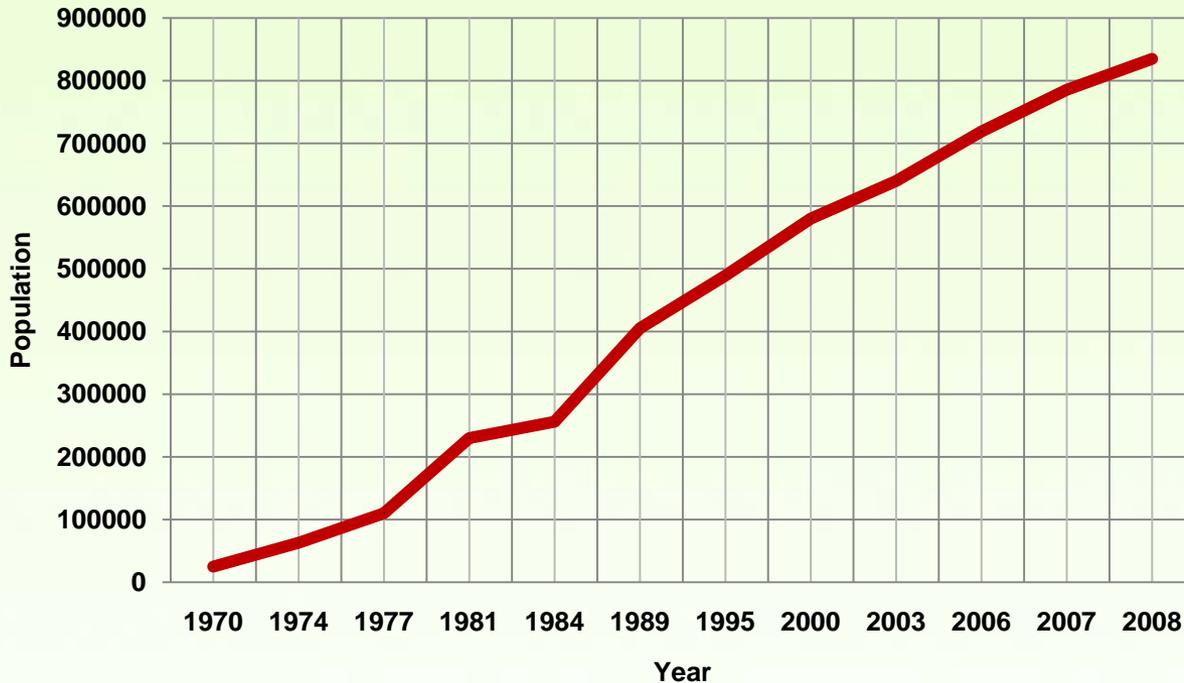
- Muscat where it contained better technology and basic infrastructure received the most massive flows of local immigrants.
- The rapid immigration happened in 1980s and 1990s to Muscat incorporated with a lot of urban and environmental problem.

Muscat Green Days



Population Trend in Muscat

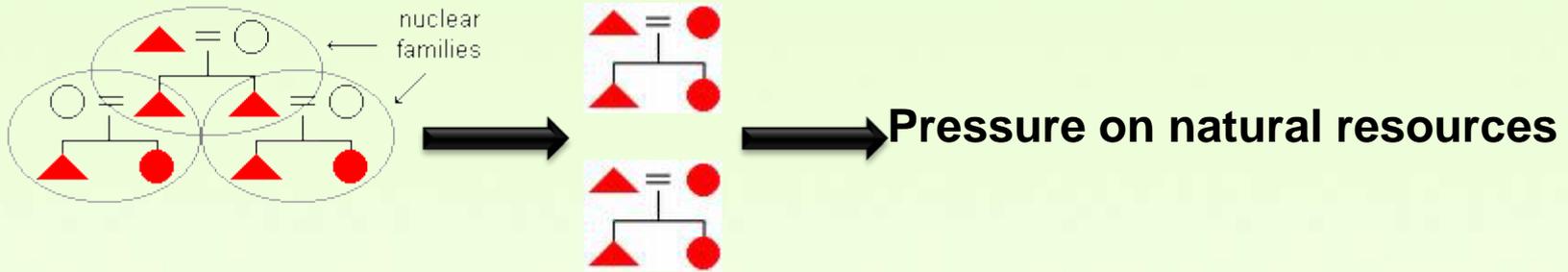
Population Change in Muscat in 1970-2008



- At less than 40 years, the population of Muscat has doubled more than 32 times.
- According to the last 2 years population growth rate, in **2030**, population of Muscat will reach approx. **2 m.**

Source: Ministry of National economy, Oman

Change of family structure



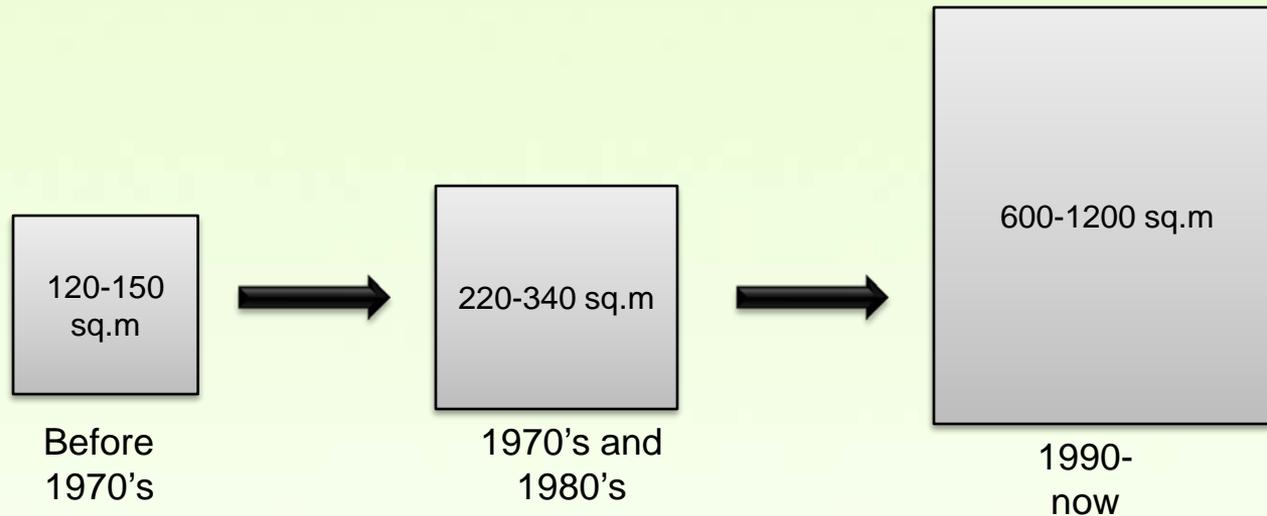
▪ Most families include cousins, aunts and uncles were living together aside of parents with their children forming an 'extended family'. They **were all living in one house sharing all its domestics**. They were also sharing their work and their production forming a very strong cooperative society.

▪ Since the oil revolution, the extended families have changed dramatically into a smaller families forming a 'Nuclear families'. Every family now has their own life and living in a single detached house.

• Currently Average local family structure in Oman 8.2 person (in urban 8.0, in rural 8.8)

• Source: Ministry of National Economy, 2009

Plot transformation



The dramatic change in family structure followed also by the change of **the plot size**. The size of the plot was not exceeding **150 m² before the oil revolution**, but **now it reaches 1200 m²**. It is clear now of how much lands are consumed. The rapid profitable demands on lands caused to invading the farmlands which were the only source of food with fish before the oil revolution.

Economical transformation > Social transformation > Urban form transformation

Plot transformation

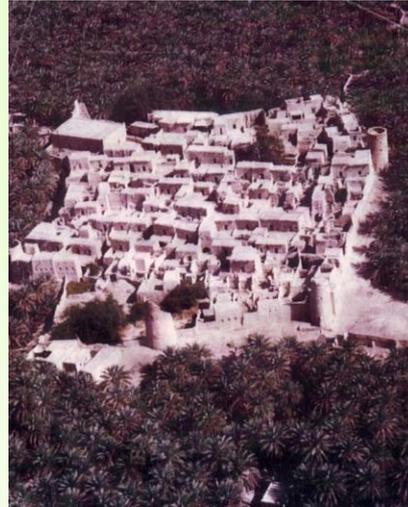
Large lots



Muscat Green Days

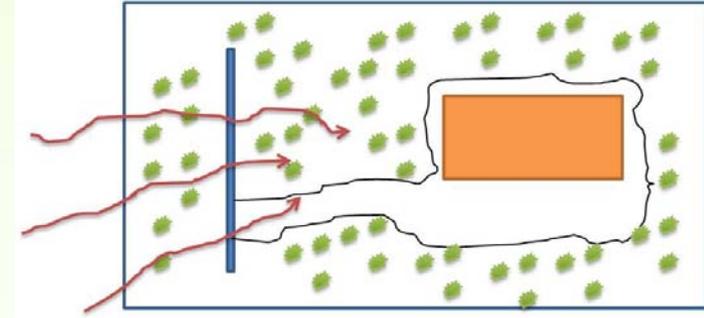
Economical transformation > Social transformation > Urban form transformation

Pre-oil age Compact urban form inside green



- As Islamic city, old Omani city characterised as a **“CENTRALIZED CITY”**.
- It had been characterized by a small, dense environment, often walled and generally not being much more than five kilometres from one end to the other.

▪ With security reason, this form was developed because of the need for all destinations to be within a reasonable walking distances.



Muscat Green Days

Economical transformation > Social transformation > Urban form transformation

Pre-oil age Compact urban form near food sources



Bilad Sayt, Oman

Source: www.flickr.com

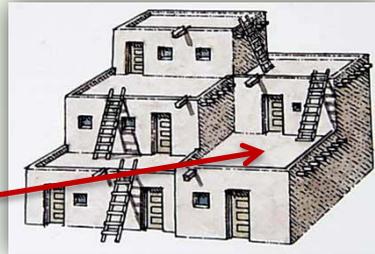
- The traditional buildings in Oman were built stacked to each other forming an integrated urban form.
- This built form ensures the maximum protection against climatic conditions such as high or low temperature.



Photo by: Ahmed Al-Shukaili

Adobe constructions

- Shades
- Out door space



- Adobe houses are closed-built structures which allow saving energy.
- The single unit is consisted of multiple rooms and terraces which form a climatically homogeneous model
- The terraces are used as sitting and sleeping areas in fair climate.
- The concept of various massing heights is to create shading areas to be used as outdoor living space.



Economical transformation > Social transformation > Urban form transformation

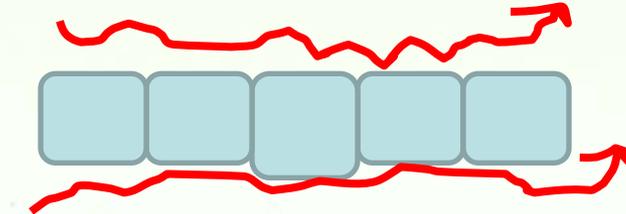
Before oil Revolution Built form transformation



- The external walls exposed to the air flows are kept as minimal.

Traditional Compacted Dwellings

Hot air circulation



Muscat Green Days



Built form transformation

Before oil Revolution External wall

Traditional building external wall



40-60 cm wide

The width of external wall is not less than 50 cm to delay the heat transmission to the interior in Summer time and delay the warming loss to outside in winter time.

Built form transformation

After oil Revolution External wall



- The 20cm-wide concrete wall without thermal insulation cannot protect interior space from heat flows without A/C.
- The heat flows tend to go through the inner space in short time in summer while the heat gain inside can be easily lost to outside in winter time.

Lack of thermal insulation in buildings leads to more energy consumption.



Economical transformation > Social transformation > **Urban form transformation**

From compact high density urban form



Density
→

To patchy high low density urban form



Notice that the pictures taken with the same scale

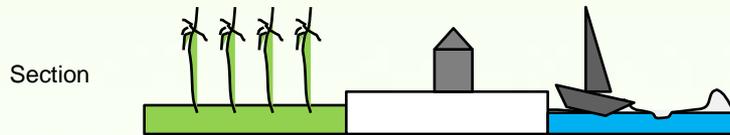
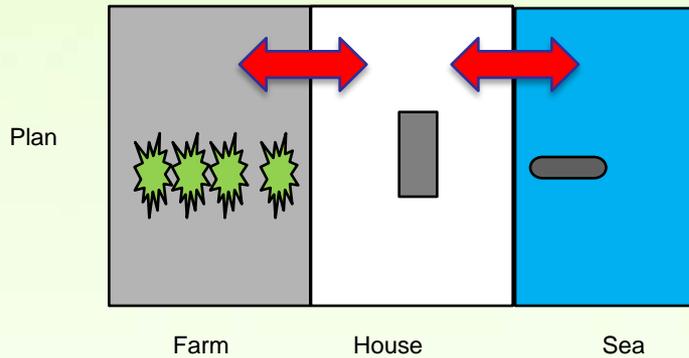


Economical transformation > Social transformation > Urban form transformation

Built form transformation

Before oil Revolution

Coastal cities



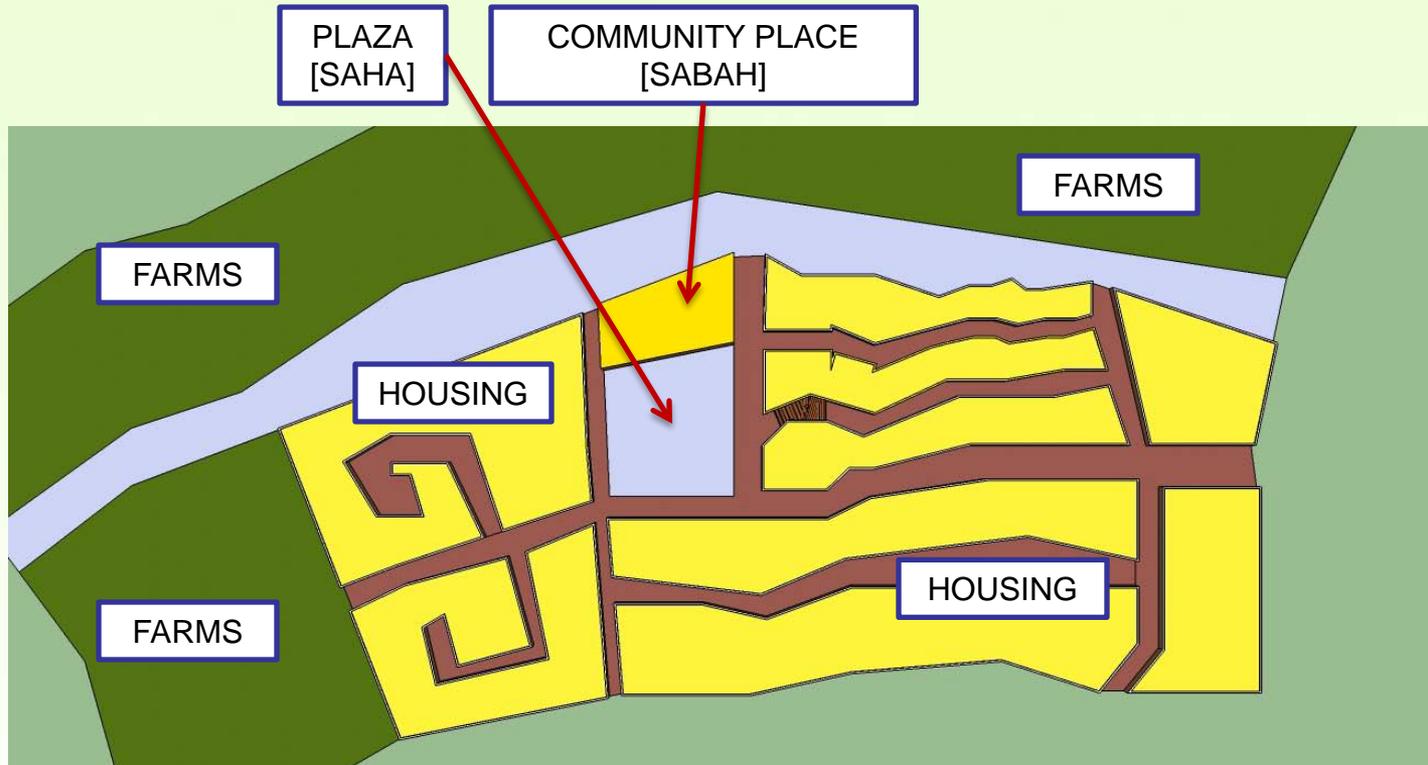
Muscat Green Days

Economical transformation > Social transformation > Urban form transformation

Built form transformation

Before oil Revolution

Interior cities



Muscat Green Days

Economical transformation > Social transformation > Urban form transformation

Before oil revolution Built form transformation



Interior cities

This open space leads to narrow streets-locally called *sikka*.

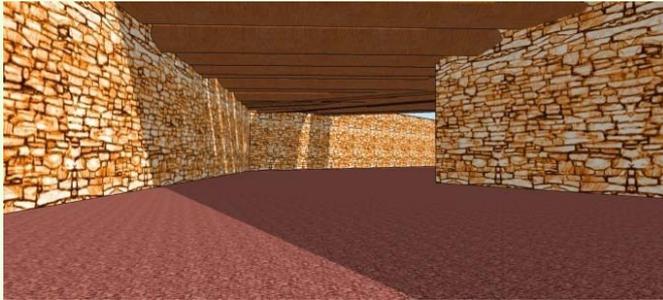


Muscat Green Days

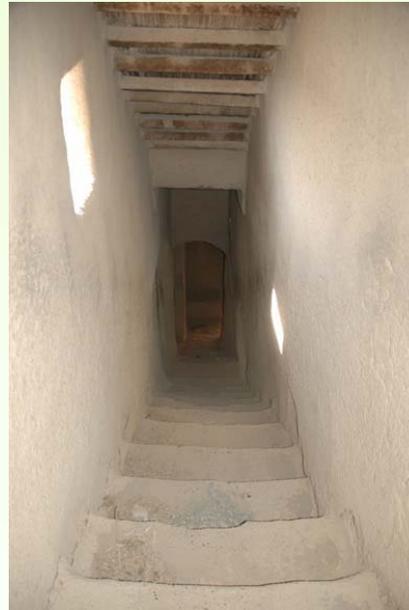


Economical transformation > Social transformation > Urban form transformation

Before Revolution Built form transformation **Interior cities**



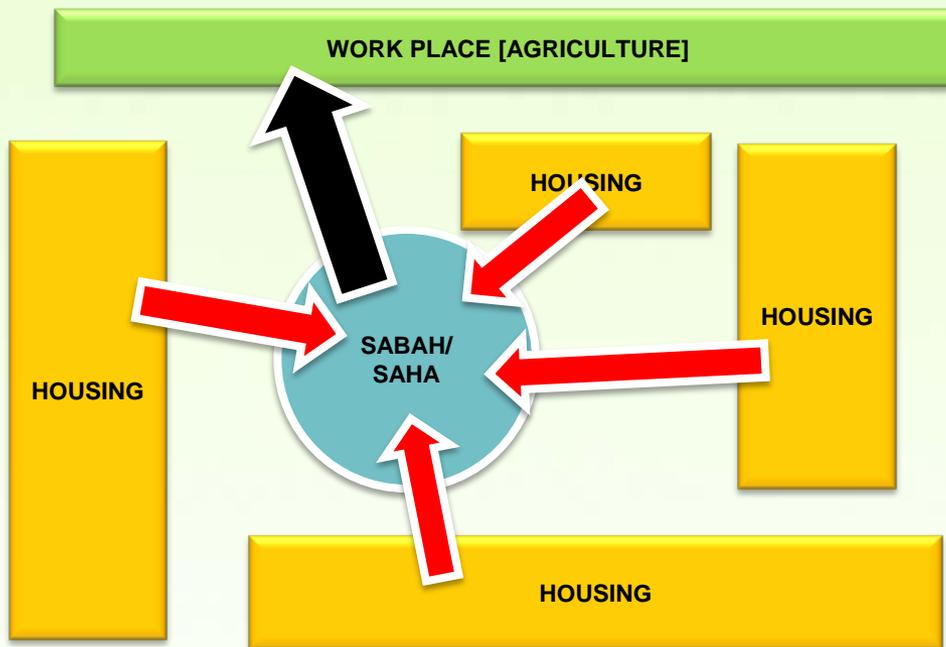
Mostly, these passages were sheltered by palm fronds and leaves to cast shadows at the day time



Muscat Green Days

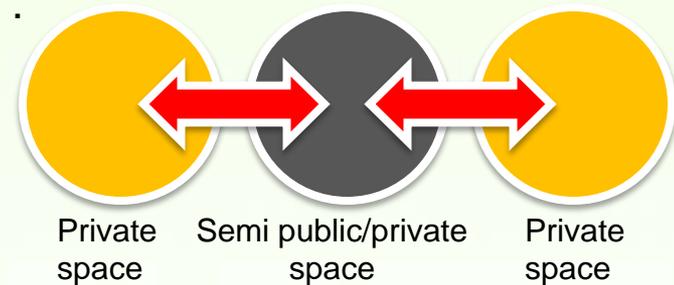


After oil Revolution Built form transformation



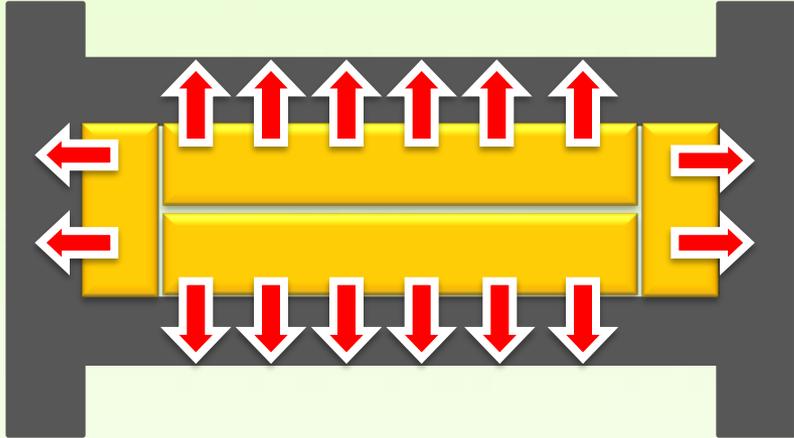
▪The open public space-locally called “Saha”- was always centered the neighborhood where people gathered every early morning before they went to their work.

▪The spatial hierarchy is viable.



Economical transformation > Social transformation > Urban form transformation

After oil revolution Built form transformation



- In contrast the modern built form layout ignores the common public space which was working as a collective social space at every traditional neighborhood.

- The spatial hierarchy is absent.

- The Planning Authority established a sort of planning framework to regulate the property and its relationship with the surrounding public spaces such as roads and neighborhood houses:

Private space



Public space

- the house must be a central unit on its plot;
- Specified set-backs for the house from its boundary walls according to the plot area;
- restricted floor heights, and
- a limited built up area for each plot according to the plot area.

Economical transformation > Social transformation > Urban form transformation

After oil Revolution Built form transformation



▪ In contrast the contemporary built form which is mainly a single family detached house is completely failing to defeat harsh climate.



- This free standing cubic house is only habitable with powerful air-conditioning.
- Thus, the energy and water consumption are extremely high especially when we realize that this building is placed in a very low density area.

Muscat Green Days

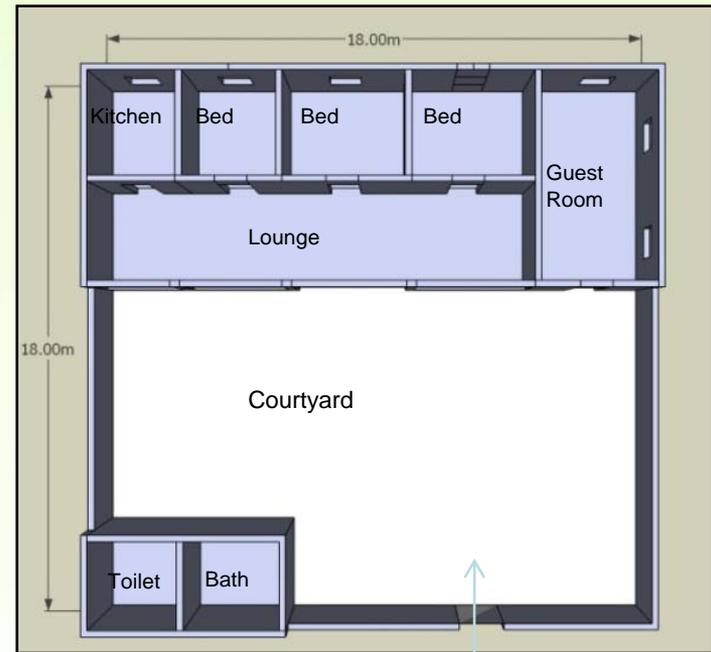
After oil Revolution Built form transformation

In 1970's and 1980's

- In 1970's and 1980's the plot layout was characterized by an area of **324m²** (18mx18m) as a standard dimension.

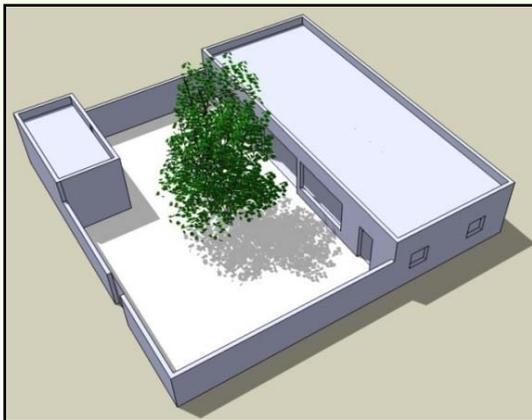
- Most of building design in this period was typical, the rooms were in one half of the plots where as the other part remained as **a courtyard** to be open to air and sun.

- In front of the room, a space called locally '*Liwan*' means lounge. The whole house surrounded by a compound wall with height ranged from 2-2.5 m.



After oil Revolution Built form transformation

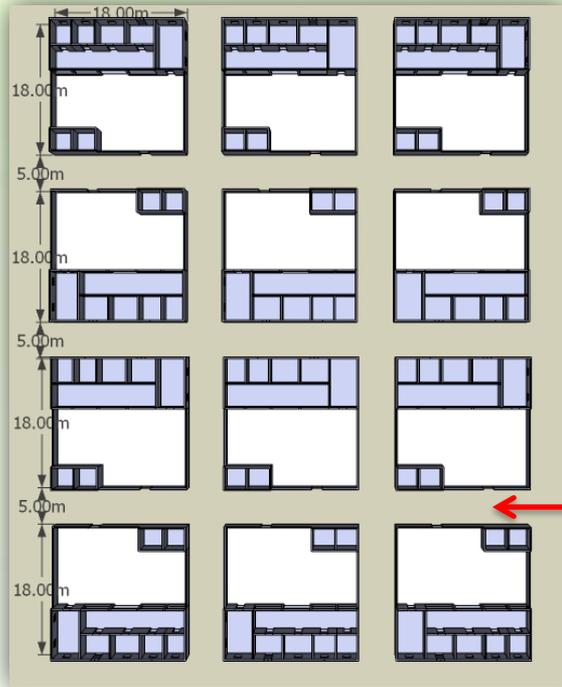
In 1970's and 1980's



- Most people plant a big tree in the middle of the courtyard which created shadows in the afternoons and people tended to spend much time under this tree enjoying the breeze and fair weather.

- In this period people rarely used air-conditioning although it was viable in every house. They preferred gathering in the courtyard and sometimes sleeping at evening time particularly at fair weather.

After oil Revolution Built form transformation



In 1970's and 1980's

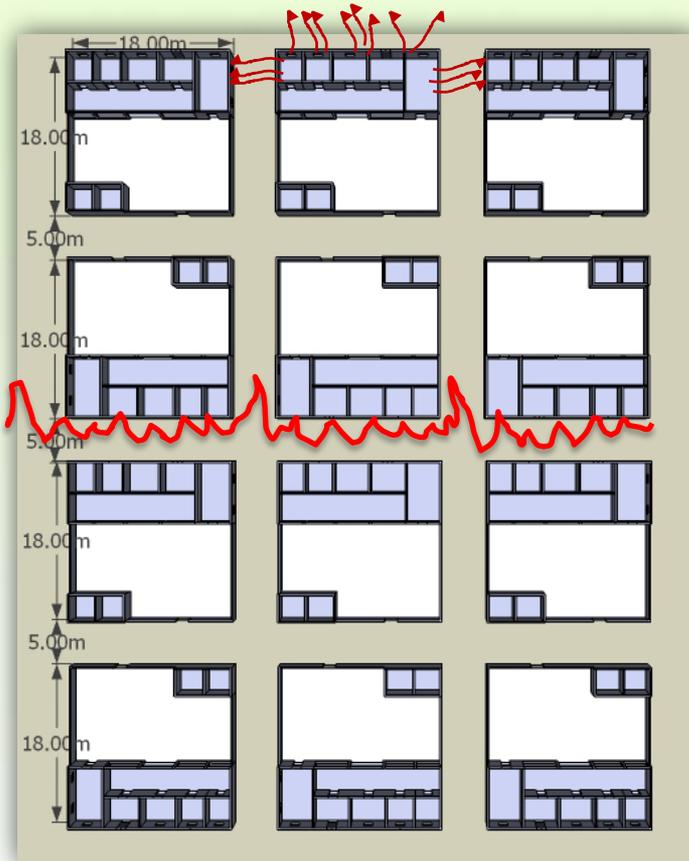
- The disadvantage of this type of housing design is the planning layout which all housing are separated from each other by 5 meter- wide gap.
- This gap-locally called 'Sikkah'- is a wasted area (about 90m² for each gap) and some times are used as garbage places.



- This gaps are neither used for car parks nor public spaces because of narrow width.

After oil Revolution Built form transformation

In 1970's and 1980's

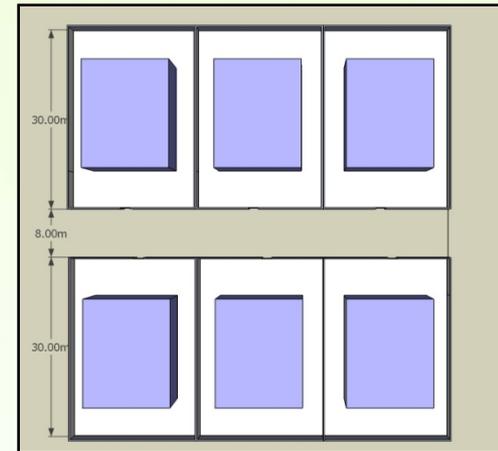


- Environmentally, this kind of building model affects the macro ecosystem, because most people use window-air-conditioning type which its hot air is exhausted in the 5- meter gap creating an extreme hot zone which afterwards infiltrates to other parts of the district leading to rise the local temperature and therefore consuming more energy.

After oil Revolution Built form transformation

- This period is characterized by a luxurious period because the plot layout has been under a lot changes in relation to size and the built form.
- The plot's area has exceeded from 324m² to an average of 600m², whereas some plots' areas reach more than 2000 m²
- The house is often laid at the centre of the plot and surrounded by 2-2.5 meter high compound wall to ensure the maximum level of privacy.
- The court yard now becomes a short of left-over space between the wall and the building.

From 1990's up to now



RESULT

Rapid land consumption

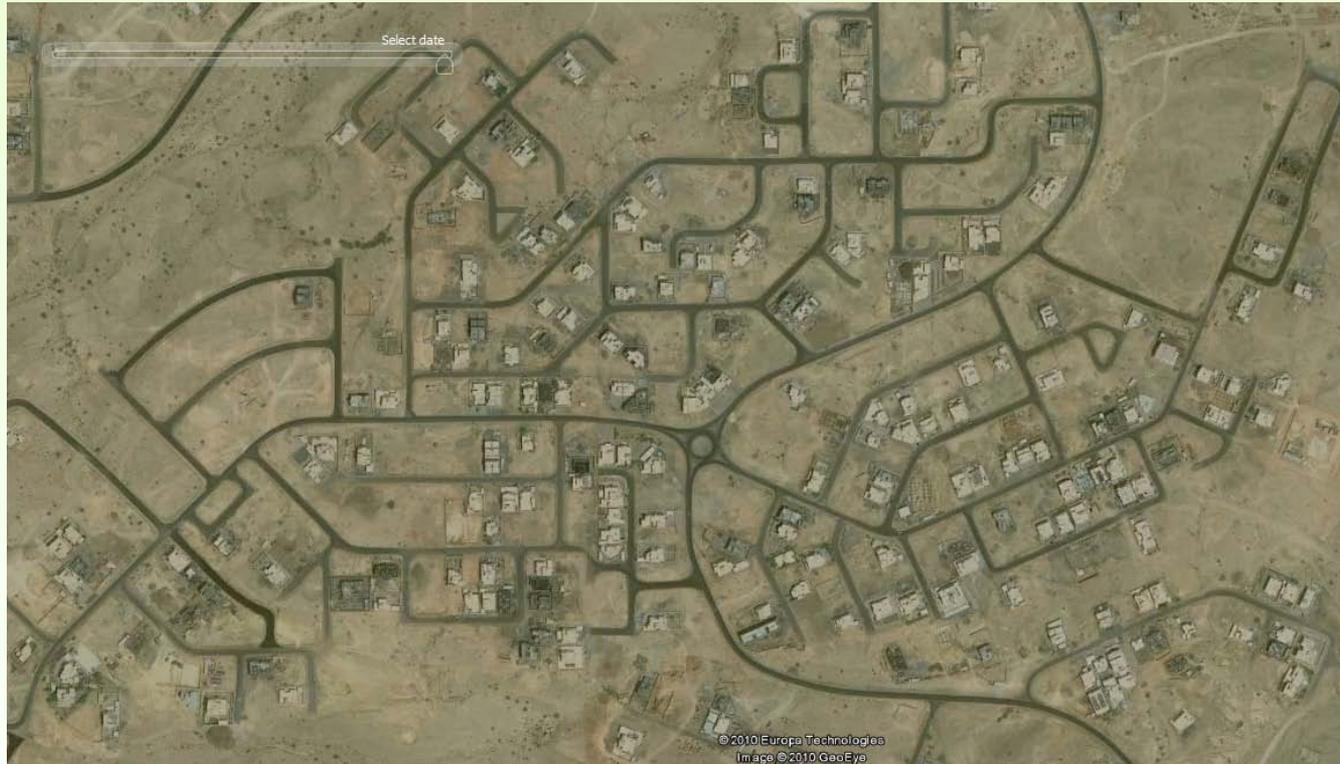
2001



RESULT

Rapid land consumption

2008



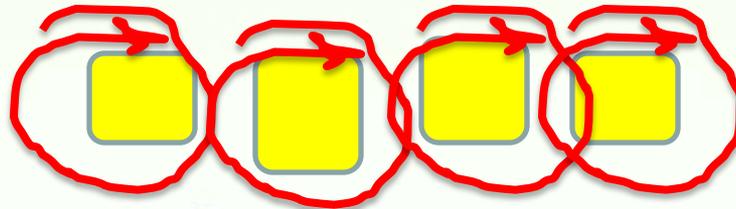
Muscat Green Days

RESULT



**Contemporary
fragmented
Dwellings**

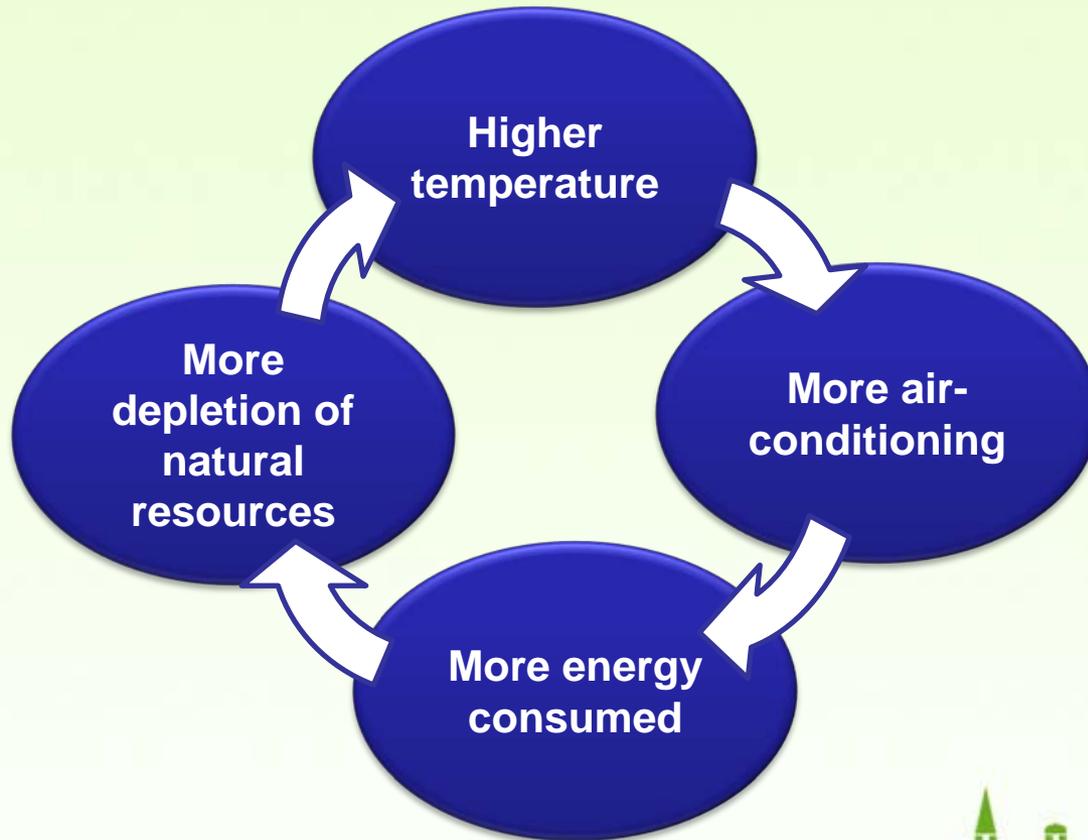
Hot air circulation



Muscat Green Days



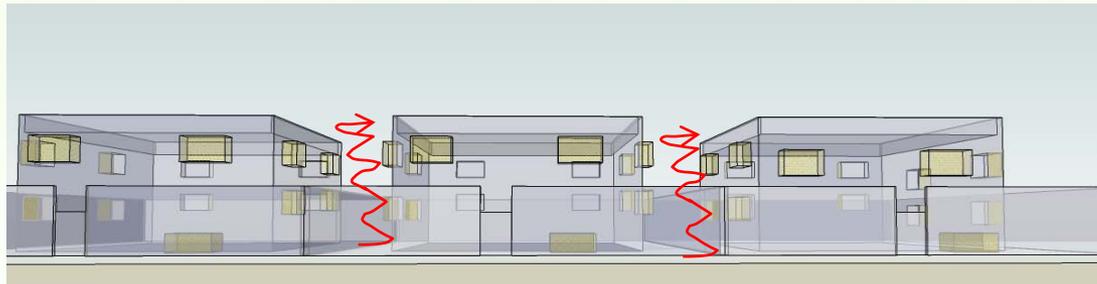
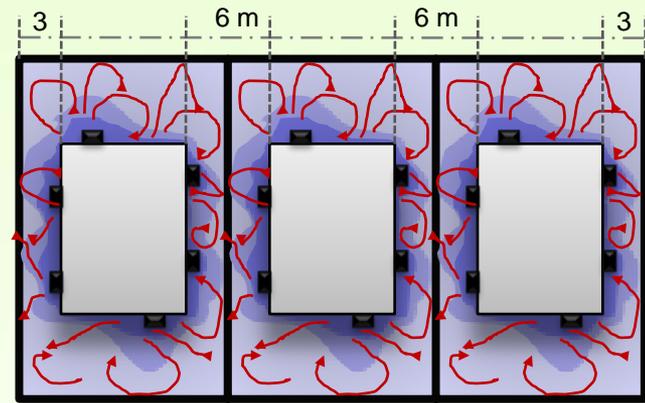
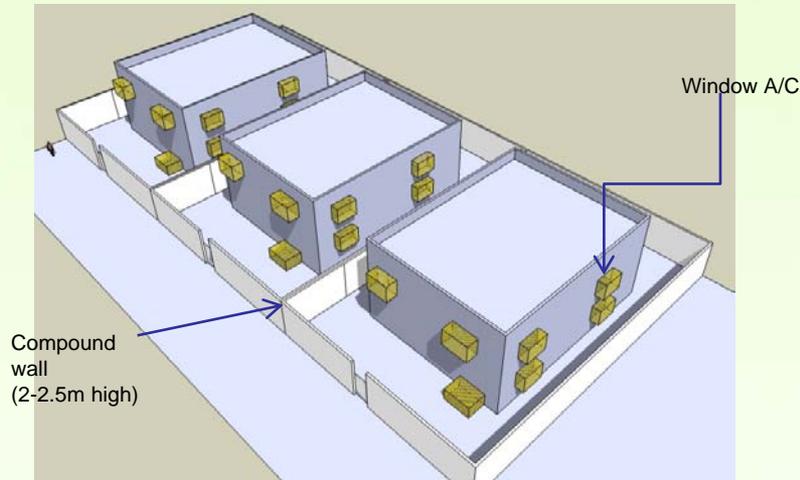
RESULT



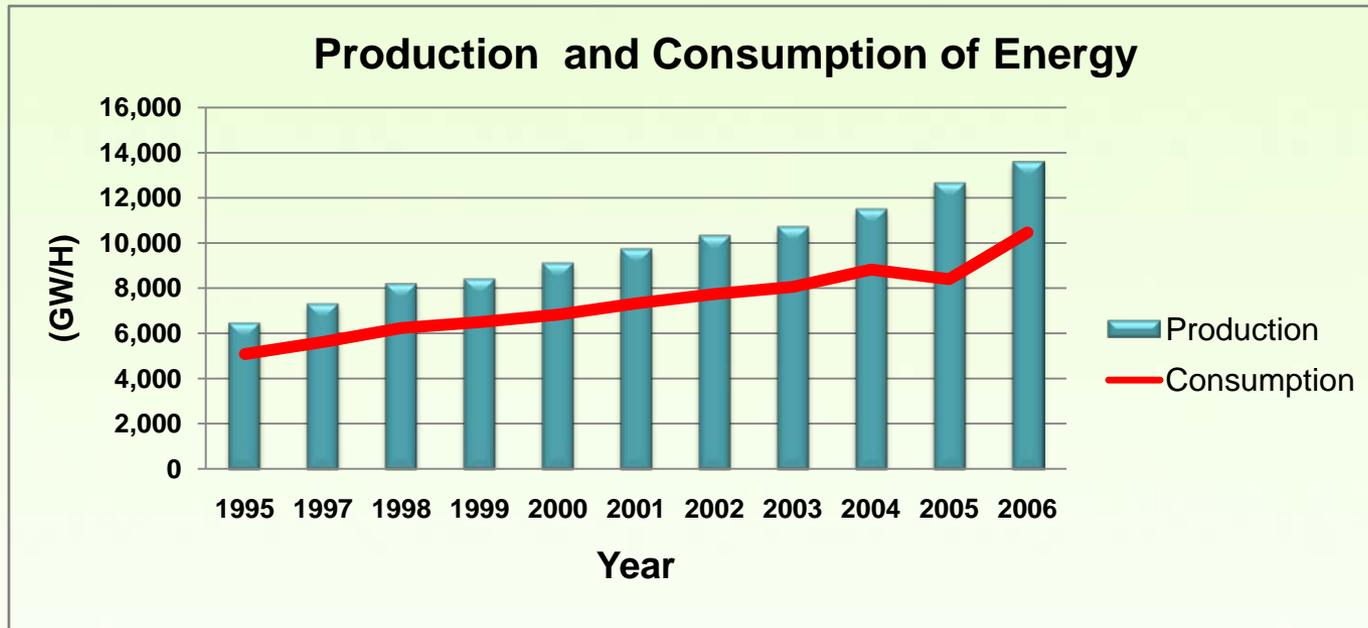
Muscat Green Days

RESULT

“Extreme Hot Island” >> increase energy consumption



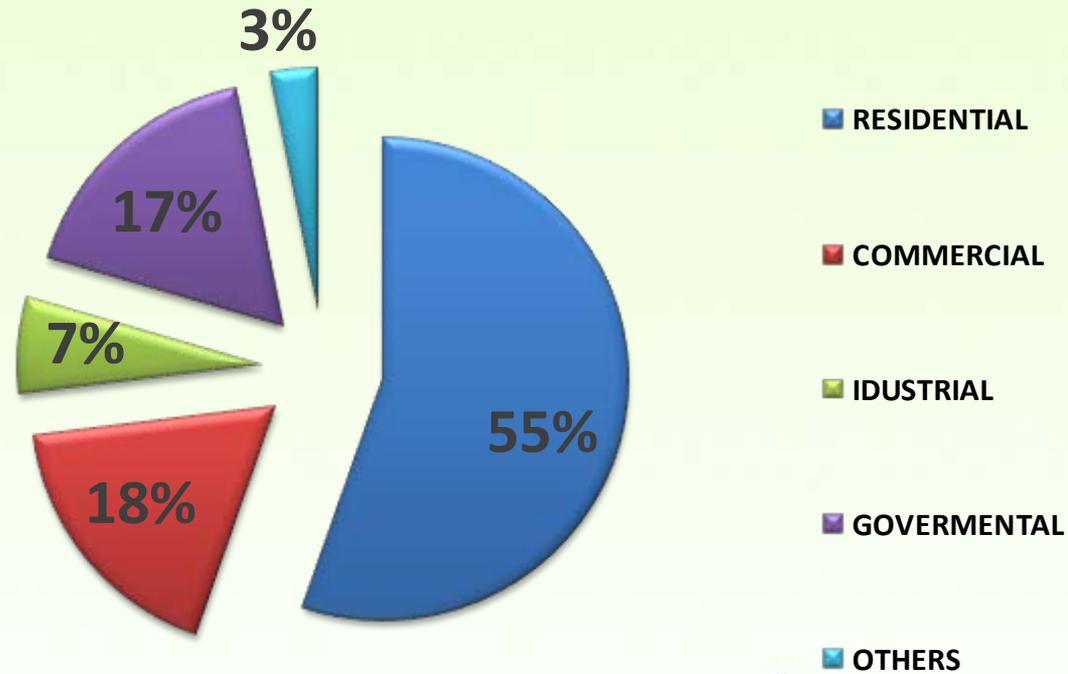
RESULT



***Source:**
2006 Review of the Economy of the Sultanate of Oman,
Ministry of National Economy

RESULT

ENERGY CONSUMPTION IN OMAN BY SECTOR IN 2006



RESULT

Very low spatial quality



- Only car accessible-
- Public spaces are not emphasized..
- The pedestrian and cycling paths are not emphasized.

Muscat Green Days



RESULT



Water Degradation



Desertification



Drought



Muscat Green Days

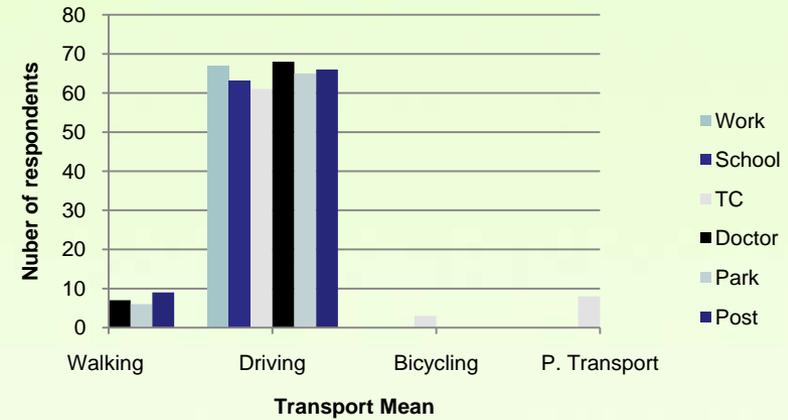
RESULT

Patchy urban layout.



Such urban development makes its residents highly dependent on the private car

NUMBER OF RESPONDENTS BY TYPE OF TRANSPORT IN MUSCAT



RESULT

Dispersal development



Muscat Green Days

RESULT

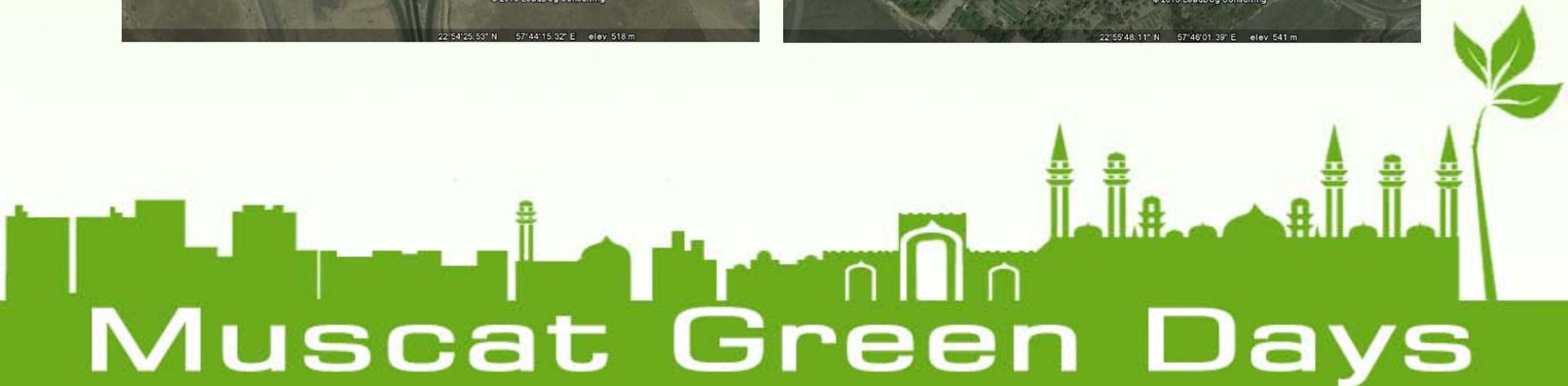


Very low density



RESULT

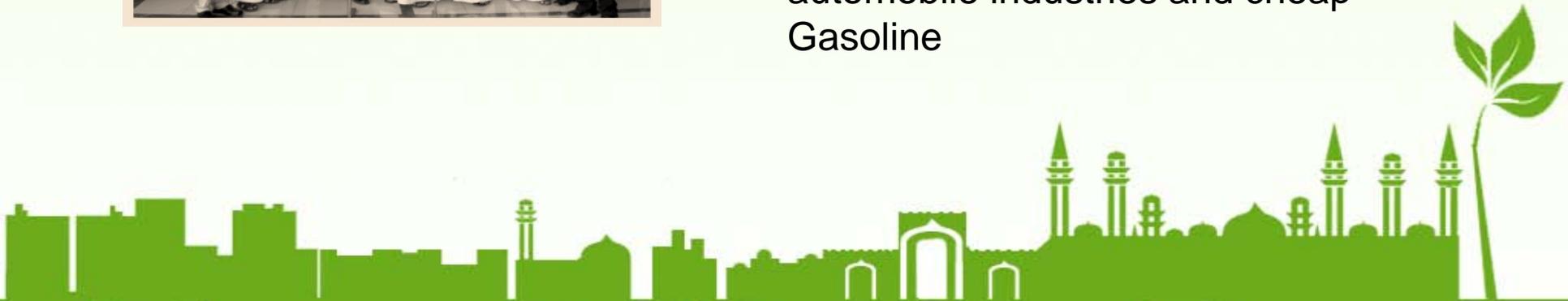
Land consumption on automobile pathways



RESULT



Patchy urban form, Seduction of automobile industries and cheap Gasoline

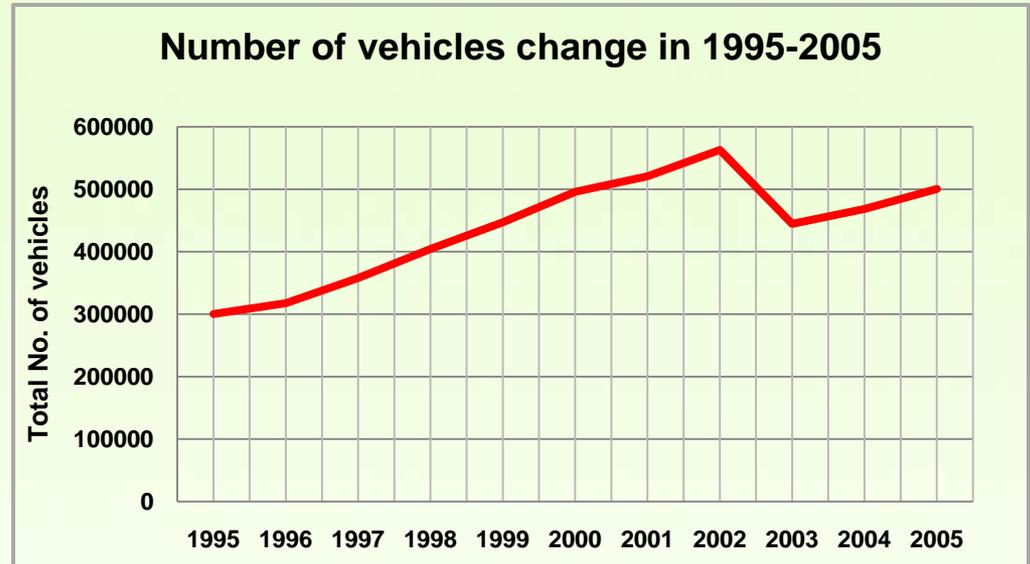


Muscat Green Days

RESULT

Increase in private vehicle ownership which could lead to

- changes in land use,
- more transport-related air pollution.
- Longer travel times
- poor traffic safety,
- increased energy use, and
- degradation of the urban quality of life.



Increase of private vehicle ownership in Oman

Source:

<http://www.rop.gov.om/arabic/trafficweek2006/main.htm>

Muscat Green Days

RESULT

Traffic jam



Muscat Green Days



RESULT

- Each year there are about 10,000 car crashes in Oman resulting in 680 deaths and 7550 injuries
- Oman's road traffic death rate is 28 per 100,000 population which is far higher than the global average of 19 killed per 100,000.

<http://www.car-accidents.com/>

- In 2005, Private vehicles ownership in Muscat 38,608 (per 100,000 persons)
(<http://www.rop.gov.om/arabic/trafficweek2006/main.htm>)
- In 2005, 731 accidents (per 100,000 persons) occurred in Muscat



Urbanization can destroy the basis of life for the whole region if not well managed in both environmental and urban levels.





From patchy to smart growth

- Employ intelligent methods
 - Generate energy by renewable sources.
- Adapting the notion of **‘Compact City’**

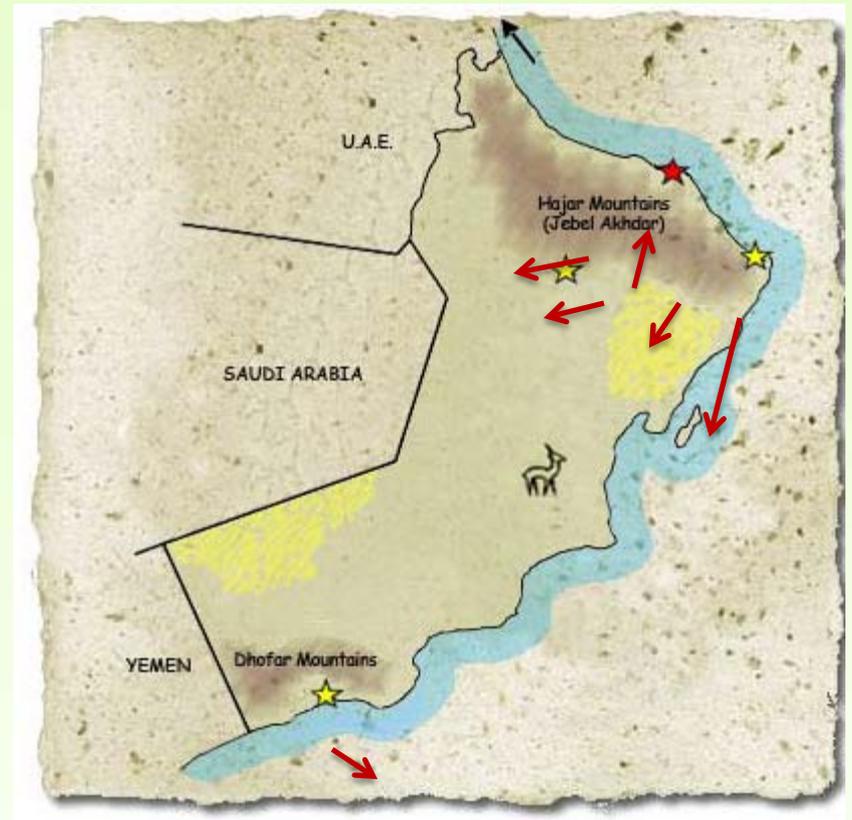
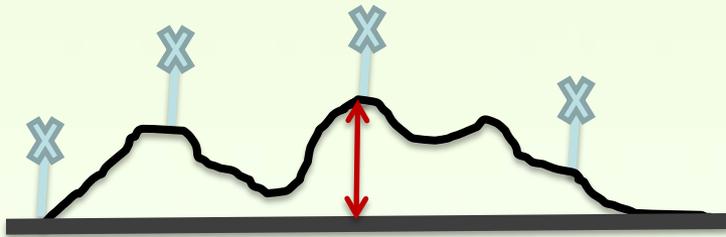


Muscat Green Days

Generate energy by renewable sources

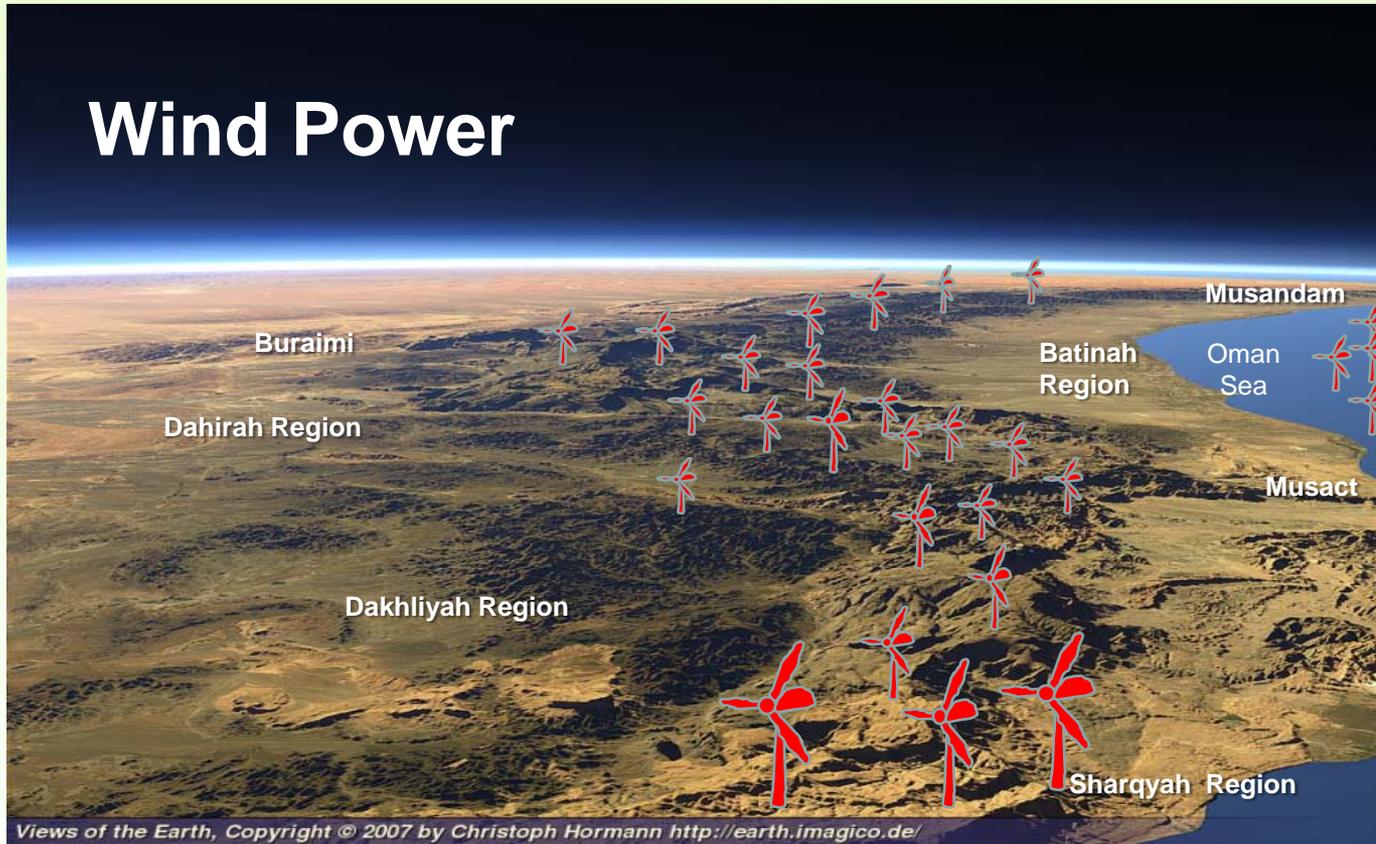
1. Wind Power

- Wind power generation increases with higher altitude. In Oman, mountains reach 8000 feet high, cover 15% of total area.
- Offshore wind speed is ~90% greater than that of land [1]



Height up to 8000 feet

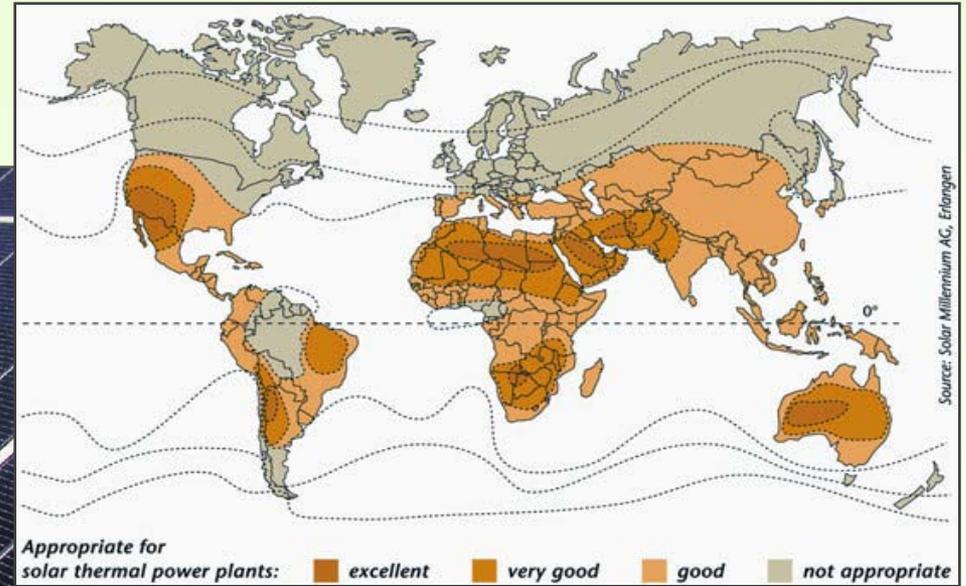
15% mountains



Generate energy by renewable sources

2. Solar energy

- Most daytimes are clear shiny sky

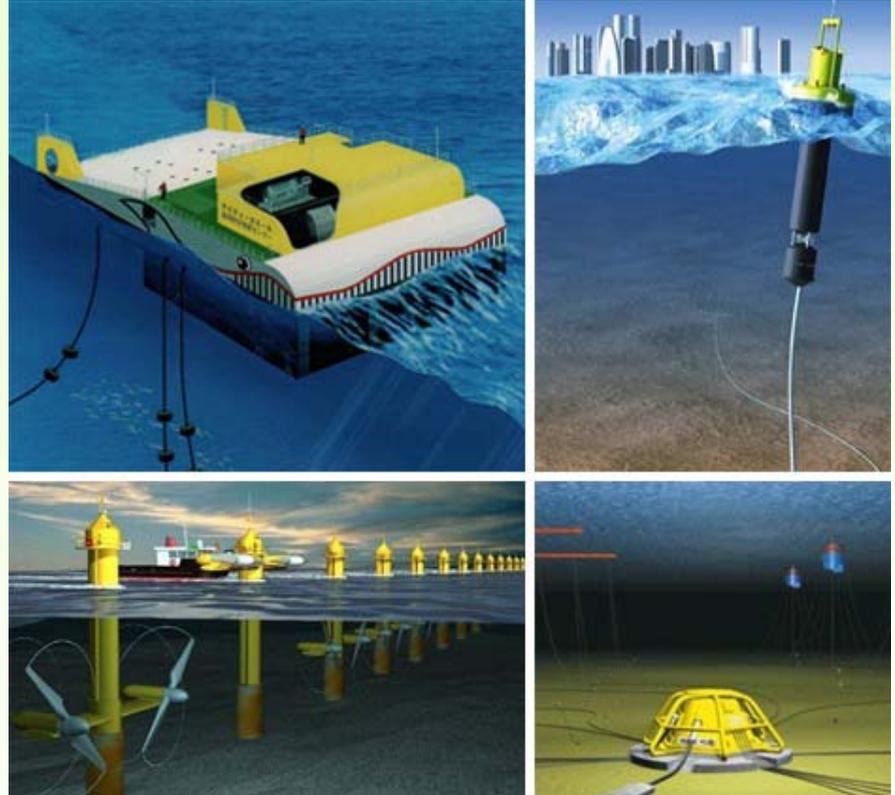


Generate energy by renewable sources

3. Tides power

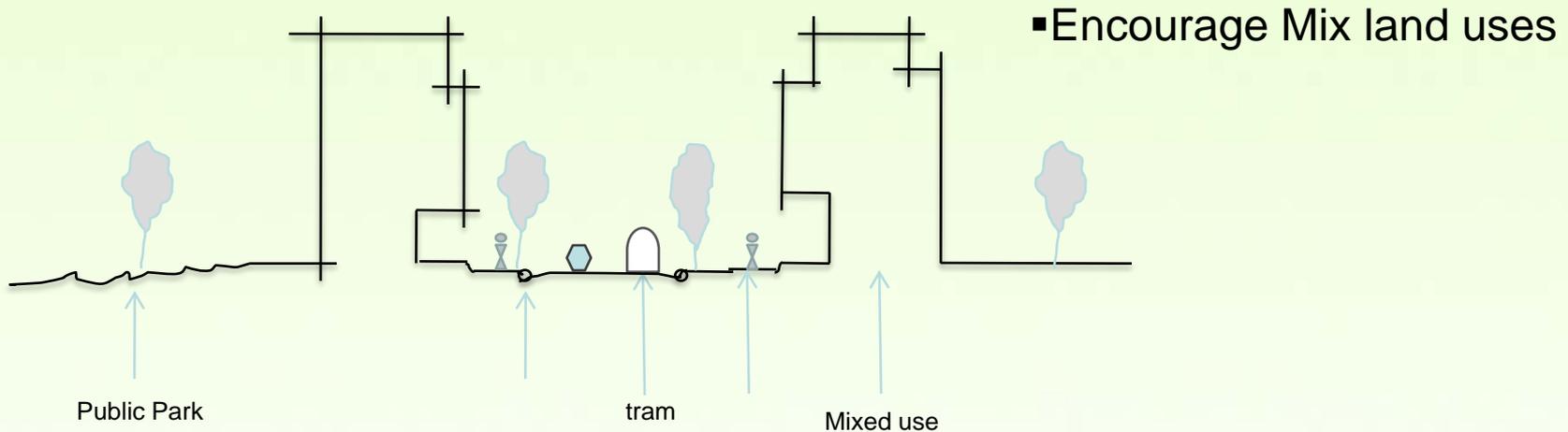
Energy in water can be harnessed and used.
Since water is about 800 times denser than air.^[1]

- 3200 km long coasts



[1] Richard Shelquist (18-Oct-2005). [Density Altitude Calculator](#).

Compact development for smart growth



-This diagram shows is the typical **mixed use** and **high density** with
-**efficient Public transport and comfortable cycling and pedestrian paths.**

Range of housing opportunities and choices

Apartments with
various size



Villas



Two Bedroom Town House ,The Wave, Muscat



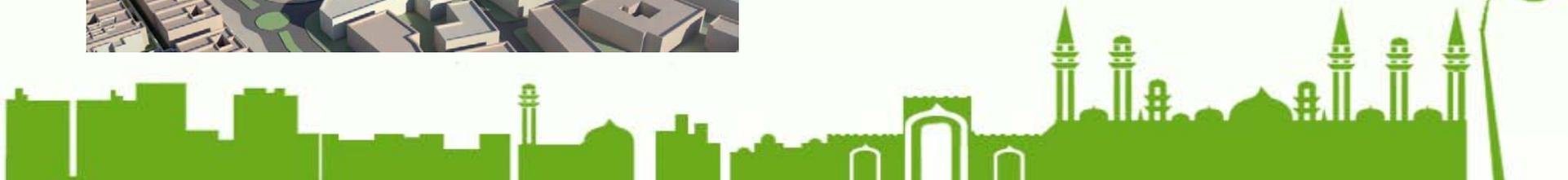
Muscat Green Days



Compact high density building design



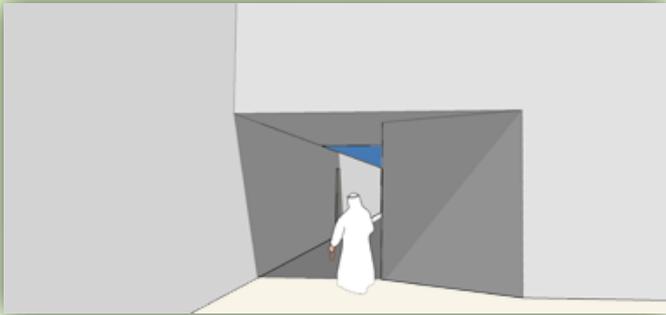
Muscat Green Days





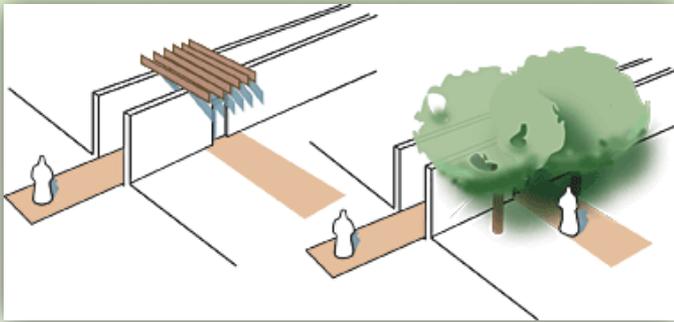
- Attractive communities with sense of space.
- Preserve open space, green areas, natural places,





▪Walkable neighborhoods

Creating pedestrian paths which can encourage walking.



They should be shaded by trees or shelter

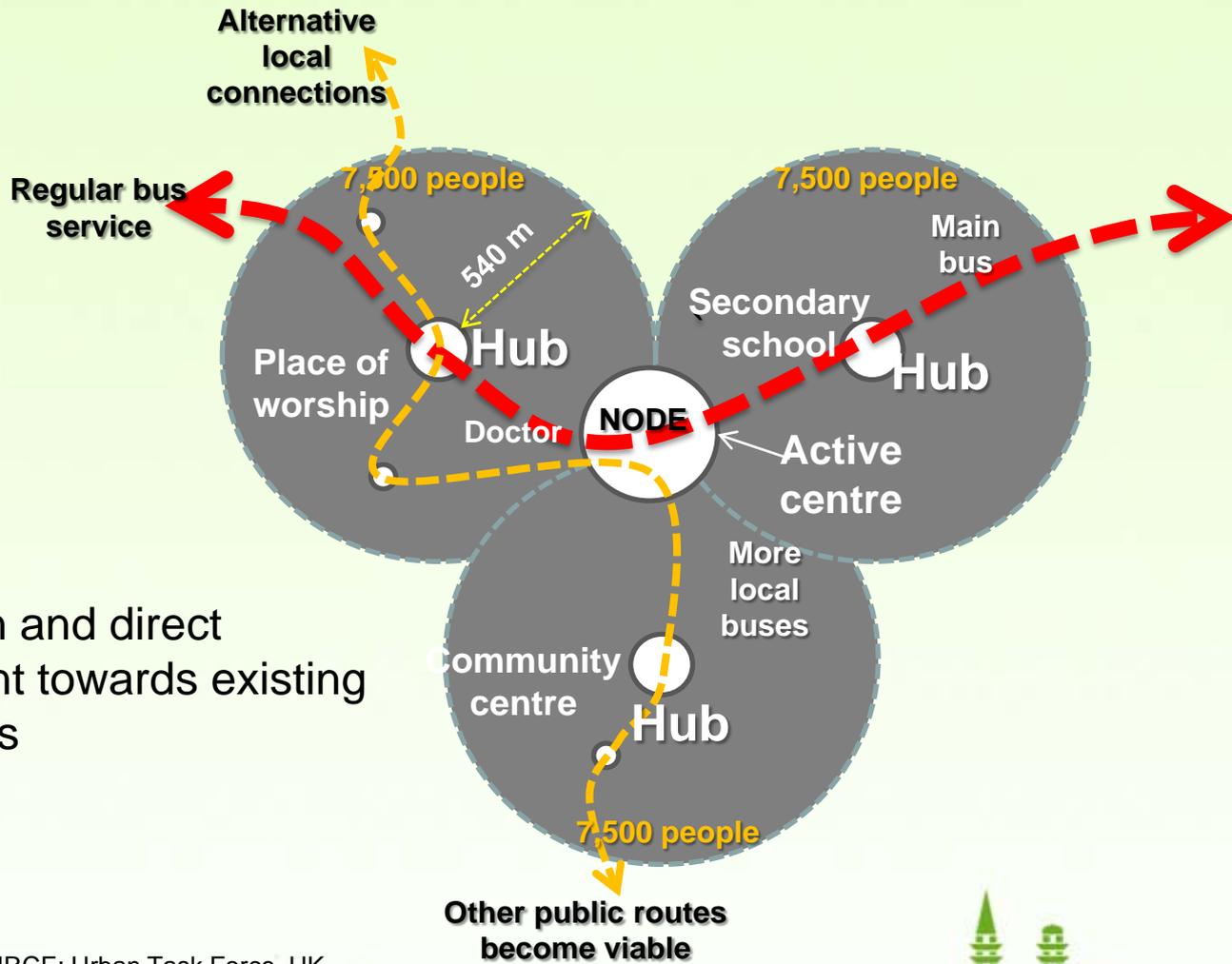




- Provide a variety and viable public transportation.

Muscat Green Days



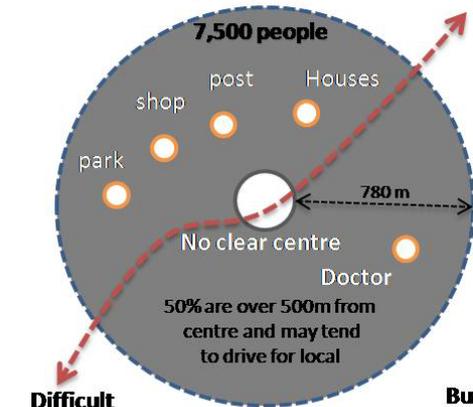


Strengthen and direct development towards existing communities

SOURCE: Urban Task Force, UK

Assume 5ha of communal area/400 dwelling at 2.2 persons per dwelling is 42ha of communal space/7,500 persons

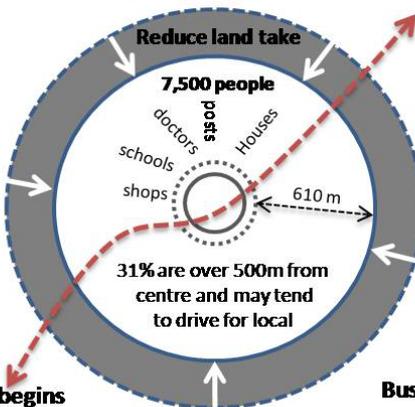
Gross development density of 50 people per hectare



Difficult to justify bus

Large land take
Dispersed Facilities
Bus may not be viable
Population to support good neighborhood facilities

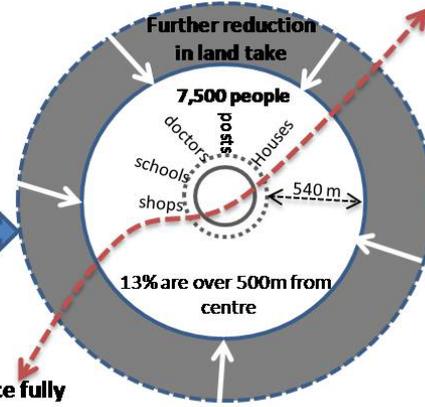
Gross development density of 100 people per hectare



Bus service begins viable

Reduce land take
Clear central facilities
Bus should be viable
Good public transport needs adequate density

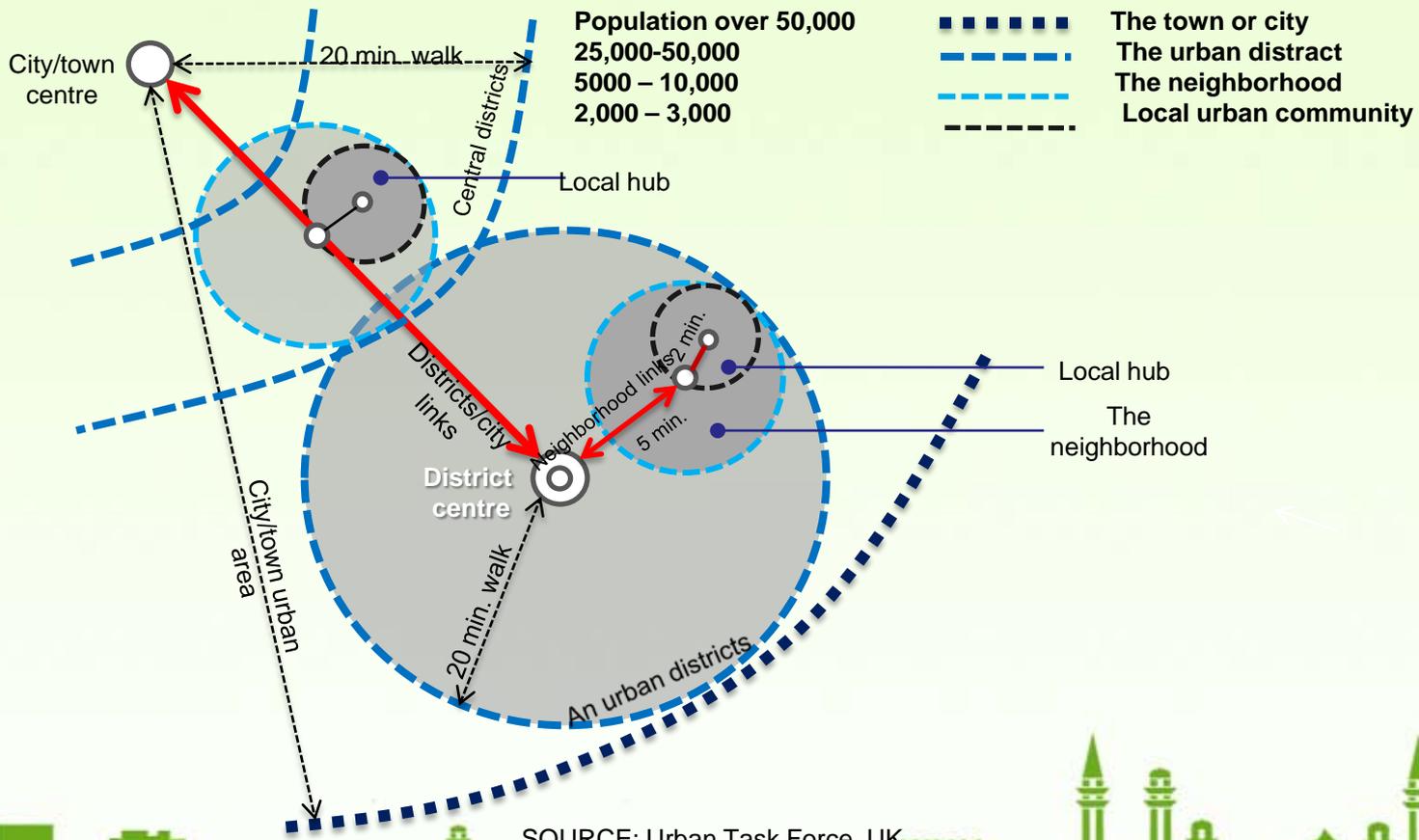
Gross development density of 150 people per hectare



Bus service fully viable

Everyone can walk
Usage of local facilities increases
Bus routes are more regular
Everyone should be able to walk in their local centre

SOURCE: Urban Task Force, UK



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- Unique design of the sustainable city has to save the cost of living. People have to live adjacent to their work, education, worship places and recreational places to limit their movement costs and reduce the burden of natural resources.
- Encourage community and stakeholder collaboration in development decisions



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- THANK YOU....



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