APPENDIX E

ECO-DISTRICTS CASE STUDIES

SYSTEM MAPPING
Results of the research activity performed with the contribution of the student of Sustainable Multidisciplinary Design Process (SMDP) course. The selected Eco-District case studies have been investigated and compared using a matrix based on the structure of IMM Design Ordering Principles organised by system Determinants.

Case studies:

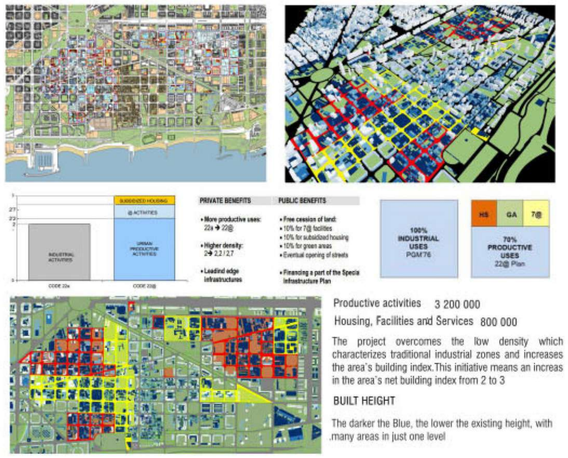
- 22@ Barcelona District, Barcelona (Spain)
- HafenCity Hamburg (Germany)
- Hammarbay Sjöstad (Sweden)
- Jätkäsaari Helsinki (Finland)
- Msheireb Doha (Qatar)

COMPARATIVE ANALYSIS
Visual comparison between eight Eco-Districts extracted from the thesis of Favaro (2015) and analysed also by Mauri et al. (2018) based on urban, architectural and energetic criteria.

Case studies:
- Ørestad Copenaghen (Denmark)
- Hammarbay Sjöstad (Sweden)
- Vauban Friburg (Germany)
- Solar City Linz (Austria)
- Eco-Viikki Helsinki (Finland)
- Bo01 Malmö (Sweden)
- Le Albere Trento (Italy)
- BedZed London (UK)

COMPACTNESS

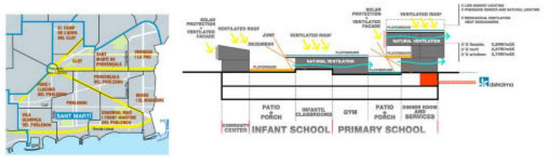
GROUND USE BALANCE



BUILDING COMPONENT OF A COMMUNITY ENERGY SYSTEM

SANTI MARTI Primary School and Adult Education Centre

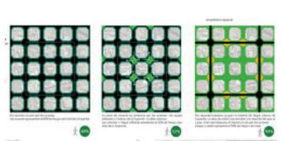
ventilated facades and roof .
solar shading
district heating
cooling system
all regarded to legal building codes



MEDIA TIC Building

Using innovative material such as ETFE an eco-efficient material that achieves perfect acclimatisation and energy saving above the worl average

WALKABILITY



COMPLEXITY

MIXED USED SPACES, COMMUNITY AND PUBLIC SPACES


BLUE MUSEUM


POBLENOU PARK


SOCIAL HOUSING


CCIB


DHUB


CMT

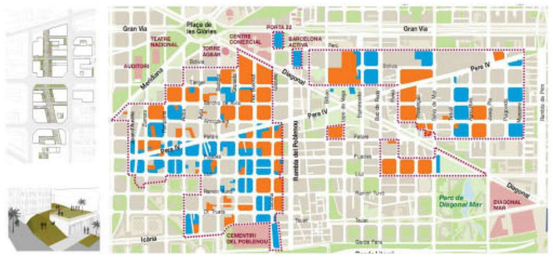

AGBAR TOWER


MEDIA TIC

The 22@Barcelona project is strongly in favor of mixing spaces with new housing in order to allow people to live close to their workplace, foster the development of local commerce and guarantee vitality in public spaces throughout the day

CONNECTED OPEN SPACE SYSTEM

The structure of the poblenou green areas has been proposed according to a sequence ofmeasurements in which the large open spaces- Litoral park, the future Placa de les Glories, Central Park,etc,- extend gradually toward squres and smaller .streets with houses, becoming true meeting places for residents




PARC DEL POBLENOU


PARC DEL Diagonal -Mar


PARC DE LA CIUTADELLA

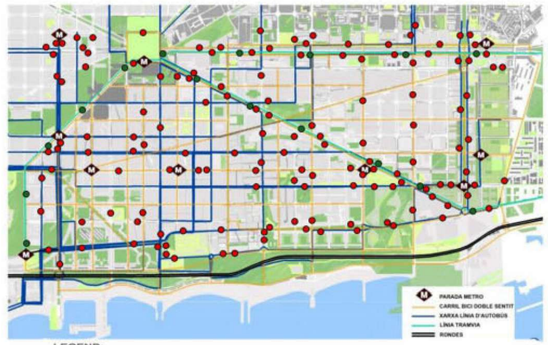
BIODIVERSITY AS PART OF URBAN LIFE

The 22@Barcelona project allocates 10% of what previously was industrial land to new green spaces while also establishing the highest, standards of quality for the district's streets and public spaces

Additionally, it brings nature to the city and makes it more fertile and also promotes nature-public territory connection

CONNECTIVITY

INTER-MODALITY AND TRANSPORTATION HUBS



LEGEND:
Metro station (L1, L4)
Bus station
Tramway station (Trambesos)

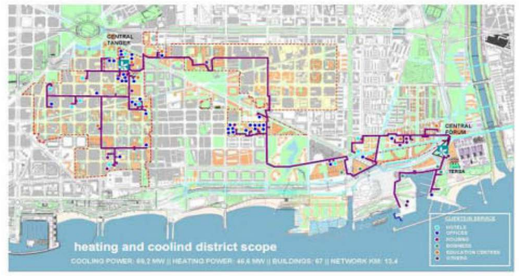
CYCLING IN OPEN SPACE

LEGEND:
Double way bicycle lane
Single way bicycle lane
(total 29 km)
Mechanical bicycle stops
No operating stop
recharging stations for electric vehicles (including bicycles)

PUBLIC TRANSPORTATION ROLE AND NETWORK

MANAGEMENT

ENERGY DISTRICT



- A policy of use and energy management using established solar thermal and photovoltaic energy. It will be an specific application to obtain hot water through solar thermal energy and electric energy through photovoltaic energy.


Photovoltaic (PV)


Thermal

FOOD MANAGEMENT

Parks and some private gardens produce organic food, so farmer 's market enable residents to buy local products

WASTE AND WATER MANAGEMENT

Inteligent urban waste management system composed by active sensor which tells how full the dumsters are and in real time transmites the information to the management applications of the service company running the waste collection service.

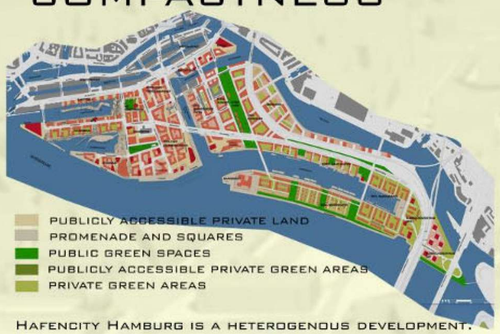
HAFENCITY HAMBURG

SMDP
TUTORIAL 4 (CASE STUDY)

POLITECNICO DI MILANO

COMPACTNESS

GROUND USE BALANCE



HAFENCITY HAMBURG IS A HETEROGENOUS DEVELOPMENT. MOST OF THE GROUND FLOOR VOLUMES ARE PUBLIC AND ARE CONNECTED TO THE GREEN AREAS.

1.32% BUILDING AREA
2.23% TRAFFIC AREAS
3.24% PUBLIC AREAS, SQUARES AND PROMENADE
4.14% OPEN SPACES (PUBLICLY ACCESSIBLE)
5.7% OPEN SPACES (NOT PUBLICLY ACCESSIBLE)

CONNECTIVITY

INTER MODALITY & TRANSPORTATION HUB

HAFENCITY 'S LOCAL TRANSPORT LINKSWERE SCHEDULED TO BE INTERGRATED INTO A NEWLY CREATED CITY STREETCAR NETWORK, POSSIBLTY COMPLEMENTED BY A PEOPLE MOVER SYSTEM.

COMPLEXITY

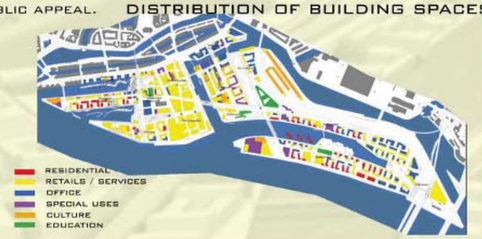
MIXED USE SPACES, COMMUNITY AND PUBLIC SPACES

THE CITY IS CHARACTERIZED FINE GRAINED MIXTURE OF USES- ACCOMODATION,WORKPLACE AND LEISURE ARE COMBINED INA CONFINED AREA TO AVOID SPATIAL SEPARATION OF USES.

40% OFFICES
36% RESIDENTIAL
15% ACADEMIC, CULTURE, LEISURE AND HOTEL
9% RETAILS, GASTRONOMY, GROUND FLOOR SERVICES

MANY GROUND FLOOR SPACES IN HAFENCITY ARE USED FOR USES WITH PUBLIC APPEAL.

DISTRIBUTION OF BUILDING SPACES



MANAGEMENT

ENERGY DISTRICT

CONNECTION TO THE DISTRICT HEATING SYSTEM, WITH ITS EXISTING PIPE INFRASTRUCTURE AND GAS POWER STATION PROVIDE ELECTRICAL POWER AND HEATING WHILST MINIMISING CO2 EMISSION AND CONSERVING ENERGY

DISTRIBUTION STATION

VATTENFALL FUEL CELL/PILOT PLANT

WALKABILITY

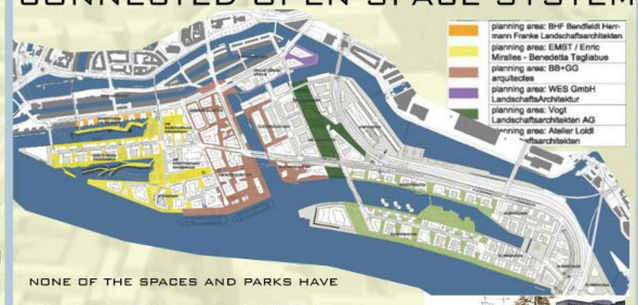
THERE IS AN EXTENSIVE NETWORK OF PEDESTRIAN AND CYCLE ROUTES FULLY INTEGRATING HAFENCITY WITH ADJECENT PARTS OF CITY CENTRE

THE AREAS OF PEDESTRIAN AND CYCLE ROUTE NETWORK IS A PART OF OPEN SPACE SYSTEM.

AROUND 70% OF CYCLING AND FOOTHPATHS RUN ON PROMENADES AND BRIDGES AWAY FROM AUTO TRAFFIC EMPHASIZING ON LOW ENERGY MOBILITY.

CYCLING IN OPEN SPACES

CONNECTED OPEN SPACE SYSTEM

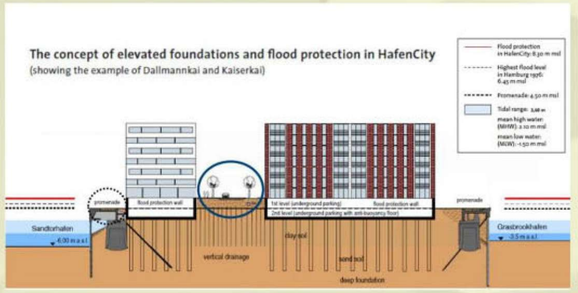


NONE OF THE SPACES AND PARKS HAVE ONE SINGLE FUNCTION. THE INTERPLAY BETWEEN BUILDINGS, OPEN SPACES, TREE-LINED STREETS, DENSER AND LESS DENSER DEVELOPMENT WILL RESULTIN ENERGETIC YET SOFISTICATED URBAN ENVIRONMENT ON THE WATERSIDE.

WATER MANAGEMENT

HAFENCITY USES ELEVATED FLOOD TECHNOLOGY. THEY CONSIDER A NEW TOPOGRAPHYOF TWO LEVELS, PROMENADE AND NEW ROAD BUILT ON PLAITS OVER 8M ABOVE THE HIGH TIDE LINE.

THEY HAVE A FLOATING WALKWAY THAT RISE AND FALL WITH THE WATER. THIS ALSO INCLUDES BRIDGES TO THE WALKWAY THAT BECOMES TEEPER OR FLATTER WITH THE RISE OF WATER.



COMMUNITY ENERGY SYSTEM

SOLAR THERMIC CONSTRUCTION ON TOP OF THE BUILDING

COMBINED HEAT AND POWER UNITS GENERATES ENERGY AND MAKES USE OF THERMAL ENERGY THUS PRODUCED BY FEEDING IT INTO A LOCAL DISTRICT HEATING SYSTEM.
DOUBLE FACEDE FOR EXTERNAL SUN PROTECTION, ETFL FOIL FOR PROVIDING WIND PROTECTION AND ALLOWING COOLING VIA WINDOWS.

VECTOR ROTORS ON TOP ON GREENPEACE HEADQUARTERS.

AQUARIUM GRADE CLASS WATERTIGHT WINODWS AND DOORS ARE USED TO PROVIDE A DIFFERENT APPROACH TO A FLOOD PROOF BUILDING.

PUBLIC TRANSPORTATION

TO EMPHASIZE PEOPLE OVER CARS, A SPECTRUM OF CHOICES IS OFFERED TO THE RESIDENTS :EXTENSIVE BIKE PATHS AND PEDESTRIAN AREAS, BUSES AND SUBWAY CONNECTIVITY.

BIODIVERSITY AS A PART OF URBAN LIFE

HARBOUR BASINS AND CANALS, INCLUDING THEIR EMBANKMENT, A HABITAT OF MANY LICHENS, MOSSES, FERNS AND OTHER VEGETATION ARE RETAINED.
EMPHASIS IS GIVEN ON TERRESTRIAL GREN AREAS WITH TREESM, SHRUBS AND RURAL VEGETATION.

WASTE MANAGEMENT

SEPARAETE COLLECTION AND RECYCLING
4 BINS FOR ALL HOUSEHOULD: BIO, PAPER, PACKAGING, RESIDUALS.

BRING SYSTEM FOR VARIOUS FRACTIONS: 13 RECEIPT STATIONS, 1000 PUBLIC SITES CONTAINERS, MARKETING STRUCTURE FOR VALUABLE MATRERIALS.

REUSE: 3 SECONDHAND SHOPS, "STILBRUCH" (FURNITURE, BOOKS, CLOTHS ETC.)

BIG INDUSTRIAL TREATMENT PLANTS: INCINERAION, FERMENTATION, SORTING

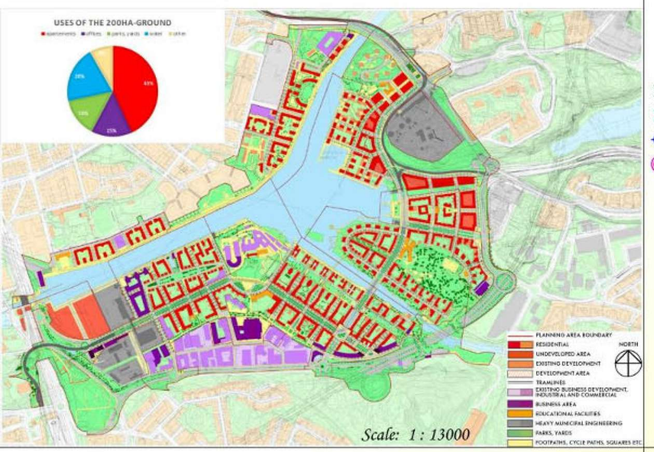
SUBMITTED BY :LAVANYA NAYAK

GROUP 7

DATE : 16-10-2018

Compactness

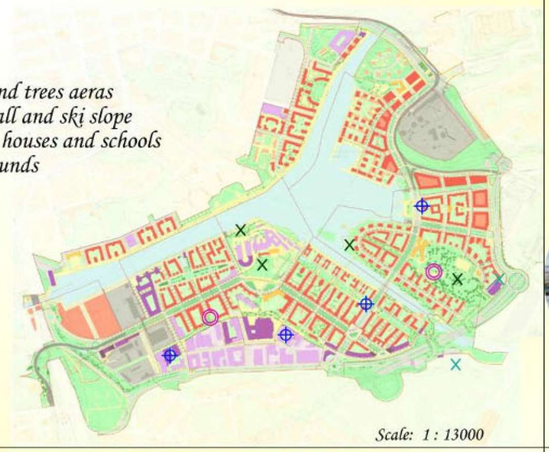
Ground use balance



Complexity

Mixed used spaces, community and public spaces

- Parks and trees aeras
- Sport hall and ski slope
- Culture houses and schools
- Playgrounds



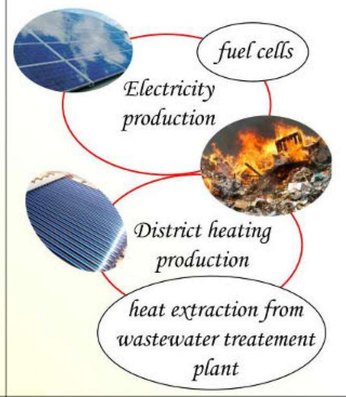
Connectivity

Inter-modality and transportation hubs

free for people and bikes

Management

Energy Disctrict (production strategy)



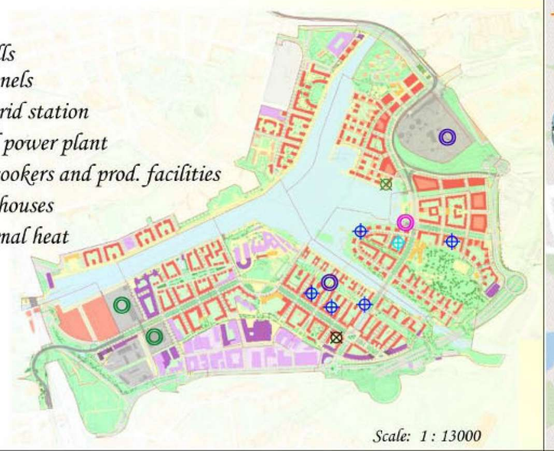
District cooling production

waste product from the heat production

Goal: producing half of all the energy needed by the residents

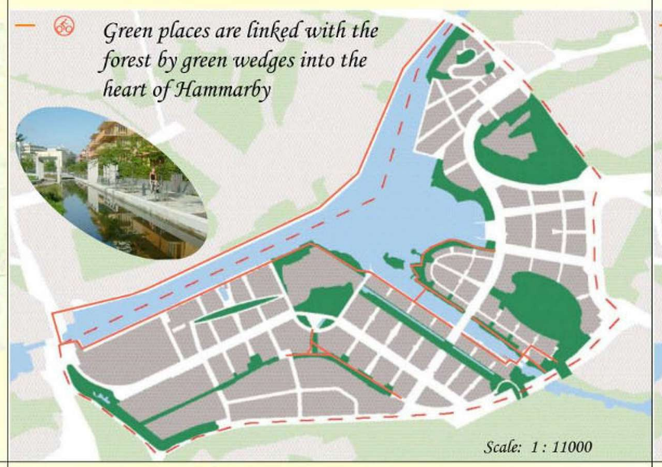
Building component of a Com. Energy System

- Solar cells
- Solar panels
- Power grid station
- Thermal power plant
- Biogas cookers and prod. facilities
- Passive houses
- Geothermal heat



Connected open space system

Green places are linked with the forest by green wedges into the heart of Hammarby

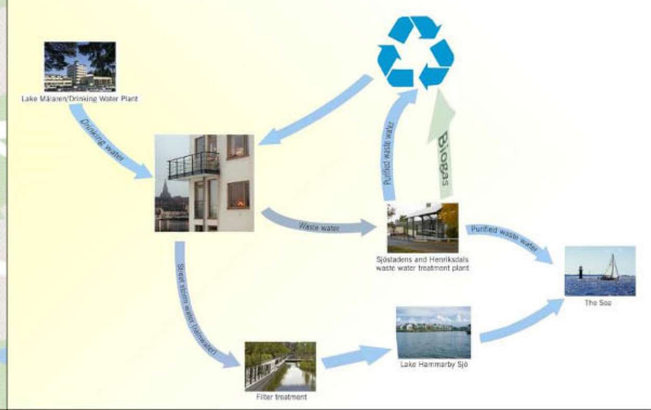


Cycling in open spaces

Food producer

No food production, but street-market by local producters

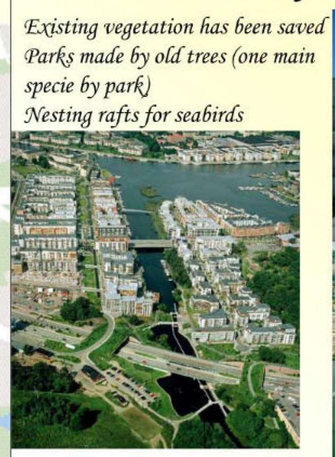
Water management



Walkability

Biodiversity as part of urban life

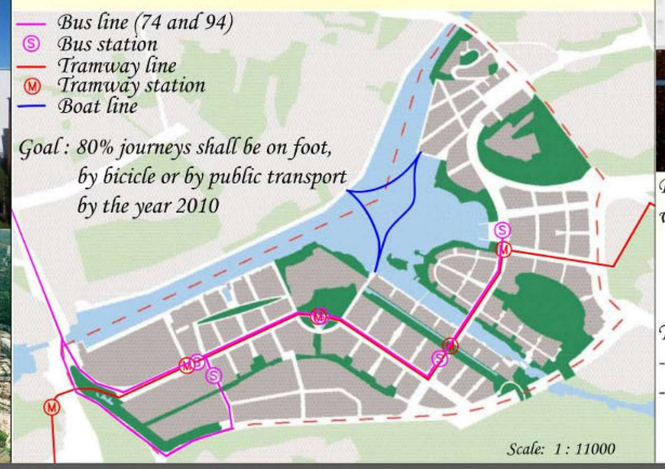
Existing vegetation has been saved
Parks made by old trees (one main specie by park)
Nesting rafts for seabirds



Public transportation role and network

- Bus line (74 and 94)
- Bus station
- Tramway line
- Tramway station
- Boat line

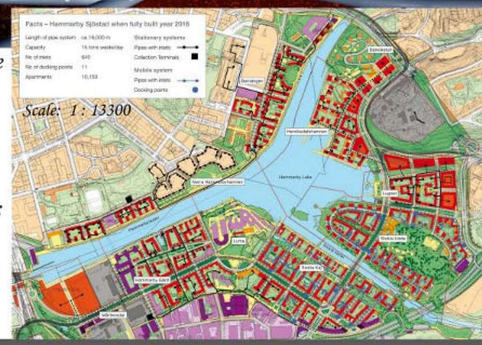
Goal : 80% journeys shall be on foot, by bicicle or by public transport by the year 2010



Waste management

By vacuuming, the waste is collected

Then, the waste is:
- recycled
- burnt to produce useful energy

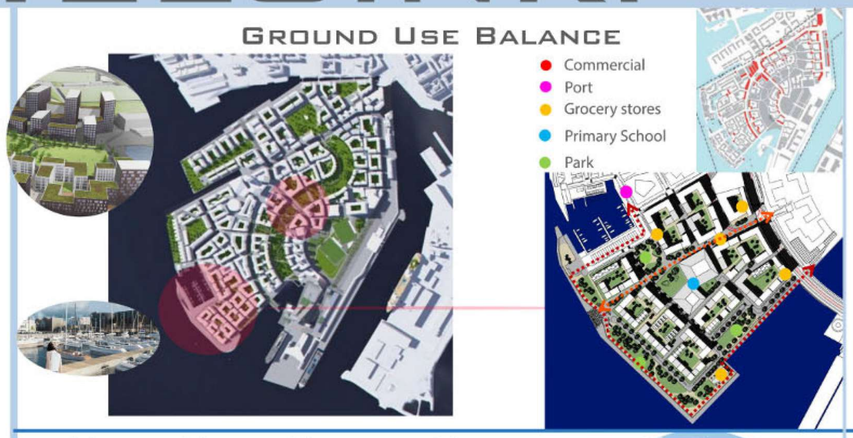


HELSINKI

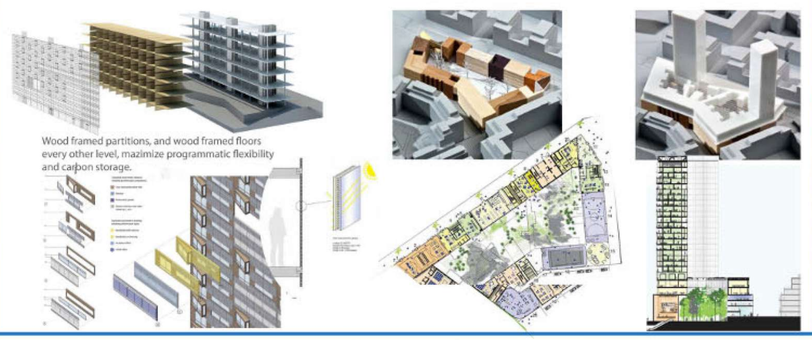
S.MOHAMMAD AYAT TUTORIAL 4 VII

COMPACTNESS

GROUND USE BALANCE



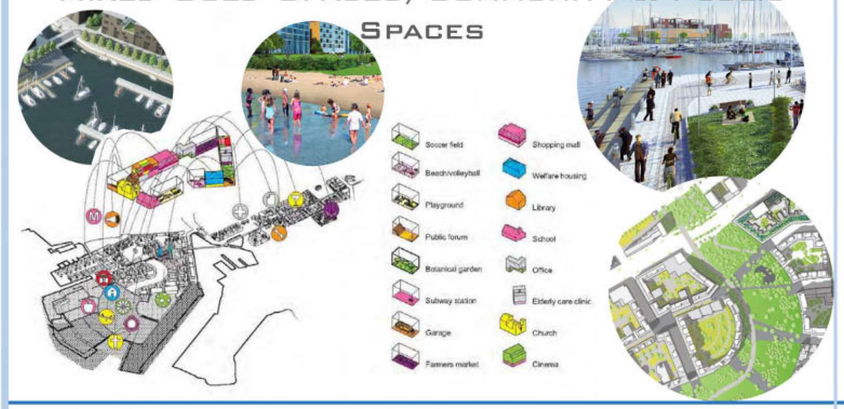
BUILDING COMPONENT OF A COMUNITY ENERGY SYSTEM



WALKABILITY

COMPLEXITY

MIXED USED SPACES, COMMUNITY & PUBLIC SPACES

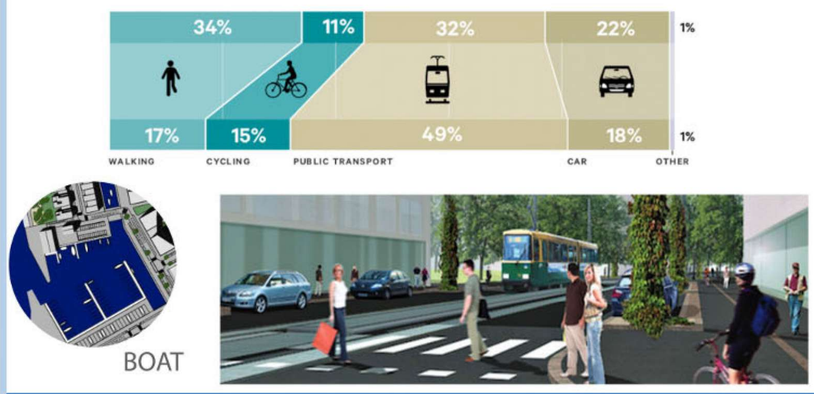


CONNECTED OPEN SPACE SYSTEM

BIODIVERSITY AS PART OF URBAN LIFE

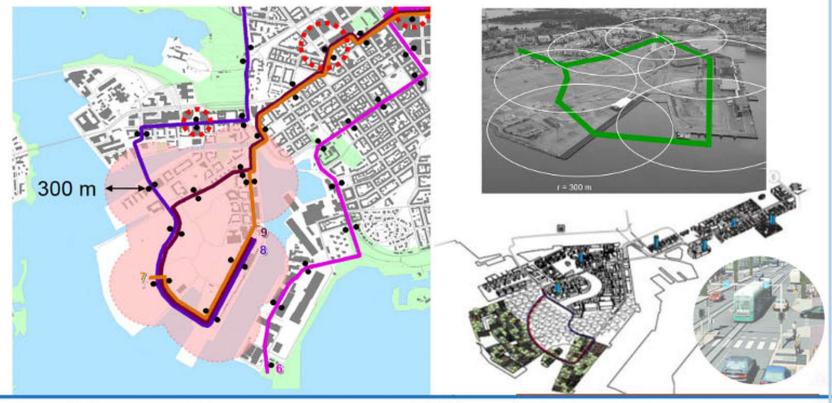
CONNECTIVITY

INTER-MODALITY AND TRANSPORTATION HUBS



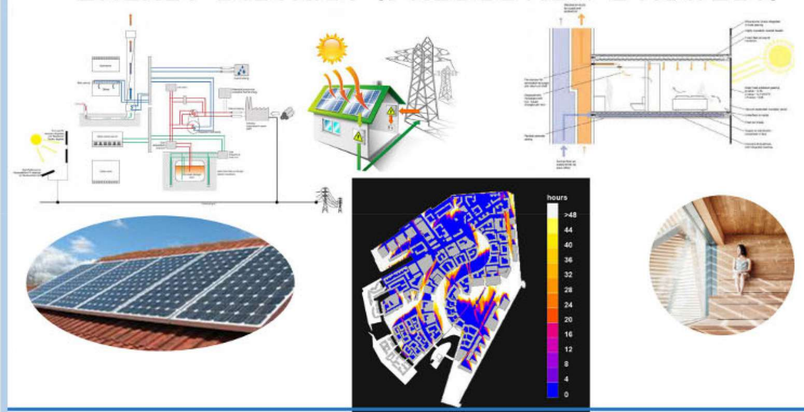
CYCLING IN OPEN SPACES

PUBLIC TRANSPORTATION ROLE & NETWORK

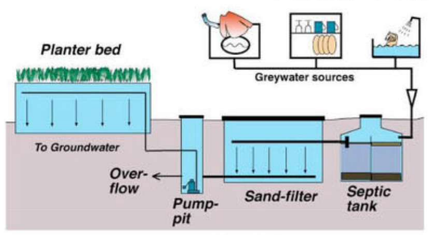


MANAGEMENT

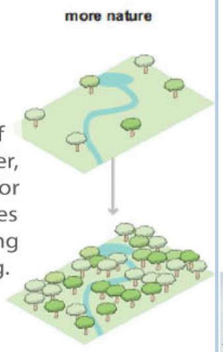
ENERGY DISTRICT (PRODUCTION STRATEGY)



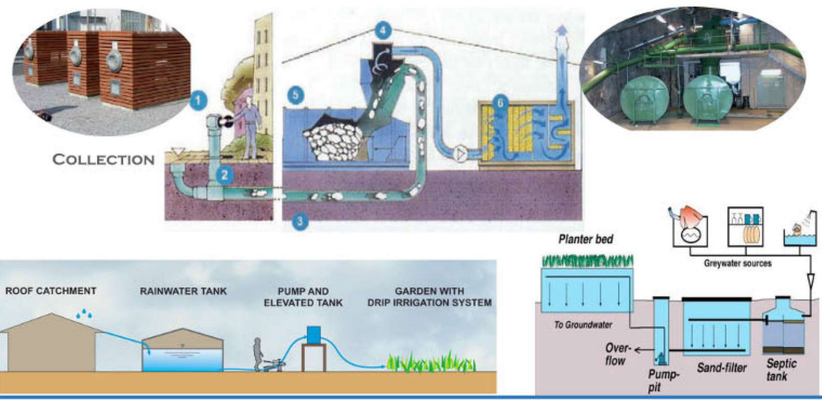
FOOD PRODUCER



By the advantages of using gray water, it can be used for several purposes such as irrigating and gardening.



WASTE MANAGEMENT/WATER MANAGEMENT



IV MSHEIRAB DOHA

POLITECNICO MILANO 1863

GROUND USE BALANACE

TOTAL PROJECT AREA : 31000000 SQM

COMMERCIAL & GOVERNMENTAL OFFICES : 280000 SQM 36.9 %
RETAIL : 94000 SQM 12.3%
HOTEL 117000 SQM 15.4 %
RESIDENTIAL : 222000 29.2 %
COMMUNITY, CULTURAL, SCHOOL, MOSQUES, MUSEUM : 47000 SQM 6.3 %
TOTAL LAND USED AREA : 760000

- RETAIL QUARTER
- MIXED-USE & RESIDENTIAL
- BUSINESS GATEWAY
- HERITAGE QUARTER
- DIWAN AMIRI QUARTER

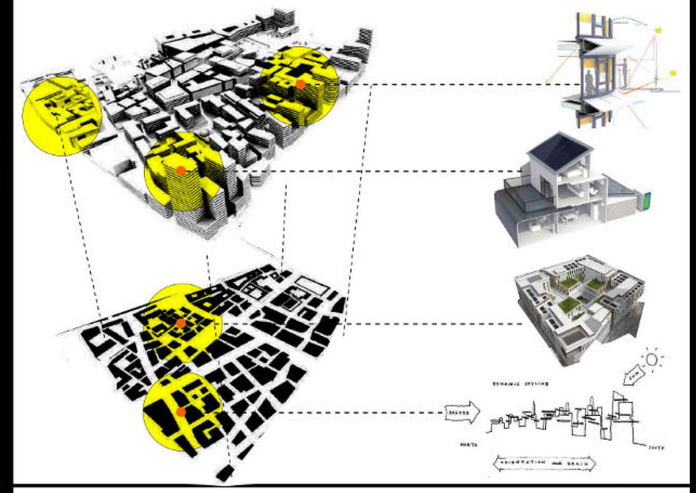
MIXED USED SPACES
COMMUNITY AND PUBLIC SPACES

- HOTEL
- SCHOOL
- MOSQUE
- METRO STATION (METRO)
- HOSPITAL

INTER-MODALITY AND TRANSPORTATION HUBS

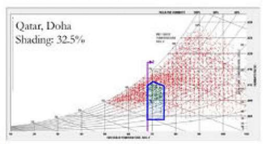
THERE IS NOT ANY SPECIFIC PLAN FOR THE BYCICLE OR BUS

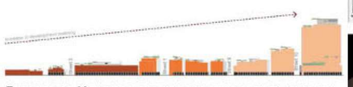
ENERGY DISTRICT
(PRODUCTION STRATEGY)



BUILDING COMPONENT OF A COMMUNITY ENERGY SYSTEM

- ALL BUILDING WILL ACHIEVE MORE THAN 30% ENERGY REDUCTION FROM THE STANDARD BASELINE TO EARN LEED CREDITS FOR OPTIMISING ENERGY PERFORMANCE.
- OPERABLE WINDOWS,FREESH AIR SUPPLY, APPROPRIATE CONTROLS AND POST OCCUPANCY COMFORT MANITORING
- ENERGY EFFICIENT LIGHT FIXTURES, OCCUPANCY SENSORS & BUILDING SYSTEMS FOR EFFICIENT OPERATION.





STREETS OF MSHEIRAB ARE FORMED TO GET COOL BREEZES FROME THE PERSIAN GULF AND MAKE SHADED SPACES AND WALKWAYS FOR PEOPLE FROM THE HARSH SUN.
ALSO BUILDINGS ARE DESIGNED IN A WAY TO COVER THE PEOPLETO PROTECT THEM FROM SUN AND COLOURED TO DIMINISH THE COOLING REQUIREMENT.
SOLAR PANELS ACTS AS A ELECTRICITY AND WATER GENERATOR FOR BUILDINGS. THEY ARE PLACED ON THE ROOFS

CONNECTED OPEN SPACE SYSTEM

THE MASTER PLAN HAS BEEN BROKEN DOWN INTO 22 SUPERBLOCKS TO PROVIDE A MANAGEABLE STRUCTURE FOR IDENTIFYING DEVELOPMENT PARCELS AND TO STRUCTURE LAND USES ACROSS THE SITE. ALL BLOCKS ARE IDENTIFIED BY PRIMARY AND SECONDARY ROADS, HAVE HIERARCHY OF OPEN SPACES, AND MAINTAIN PERMEABILITY FOR PEDESTRIANS. SOME OTHER PRINCIPLES WERE ALSO CONSIDERED. TO ENSURE CITYWIDE LEGIBILITY AND CONNECTIVITY BETWEEN BLOCKS, A NETWORK OF PEDESTRIAN ROUTES ARE WOVEN THROUGH EACH BLOCK TO LINK ONE TO THE OTHER.

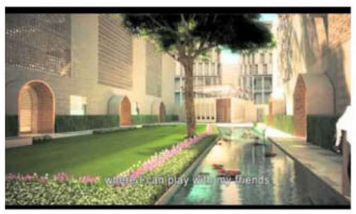
CYCLING IN OPEN SPACES

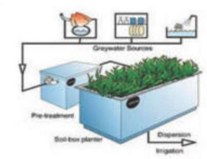
BUT THERE IS NOT AVAILABLE INTEGRATED PLAN FOR IT

THE PEDESTRIAN AND BICYCLE WAYS ARE WELL CONNECTED

FOOD PRODUCER

City agriculture
Thabks to the technology the city town uses the public and private green areas for city agriculture and growing foods

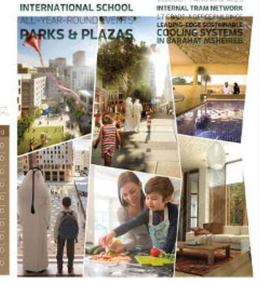




WALKABILITY

A COMBINATIONS OF SIKKAS (WALKWAYS) AND BARAHAS (PLAZAS) ARE ALSO INTEGRALLY PLANNED TO THE NEW URBAN FORM WHERE LOCAL RESIDENTS AND VISITORS ARE ENCOURAGED TO WALK WITHIN THE SOCIABLE MIXED USE NEIGHBORHOOD.
IT IS EXPECTED THAT THE RESULTED ENVIRONMENT WILL BE PEDESTRIAN ORIENTED WHERE THE DOMINANCE OF CAR IS REDUCED.

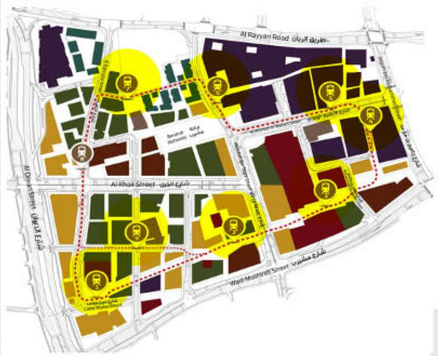
BIODIVERSITY AS PART OF URBAN LIFE



Overall Site (Ha.)	31
No. of Buildings	100+
Total Parking	10,000+
No. of Basement Levels	3-6
No. of Floors (Range)	G+2 to G+29
Residential Population	2,100
Employee Population	20,000
Visitors per Day	50,000

Usage	GFA (sqm)
Residential	197,000
Commercial	193,000
Retail	105,000
Hotel	118,000
Cultural	28,000
Mosque	8,000
Community	8,000
School	15,000
Governmental	100,000
TOTAL	784,000

PUBLIC TRANSPORTATION ROLE AND NETWORK

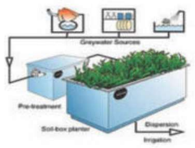


- TRAM STATION
- TRAM WAZS

WASTE AND WATER MANAGEMENT

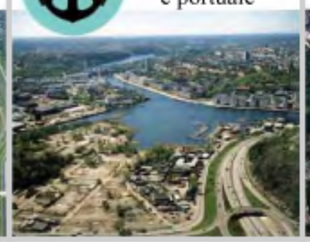
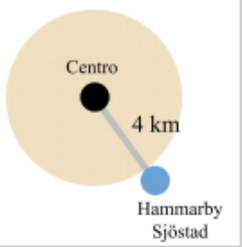
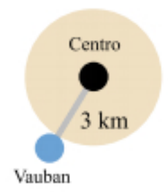
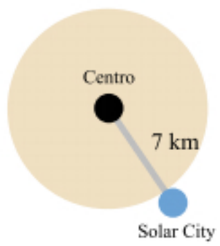
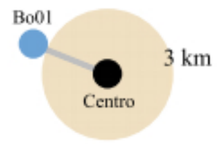
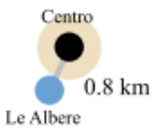
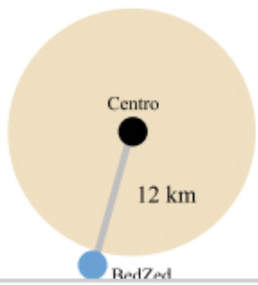
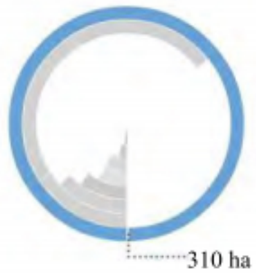
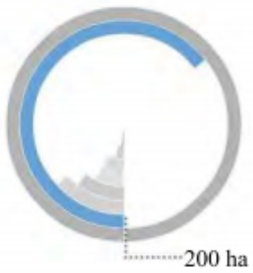
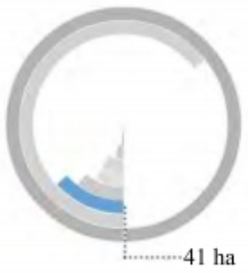
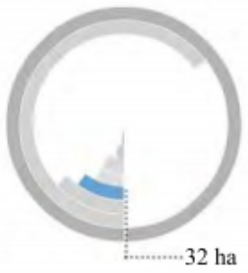
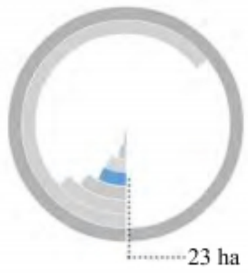
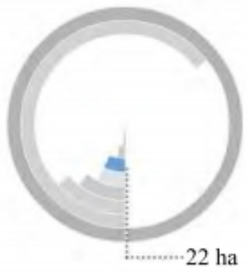
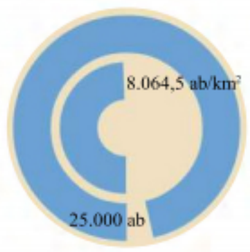
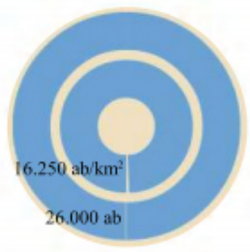
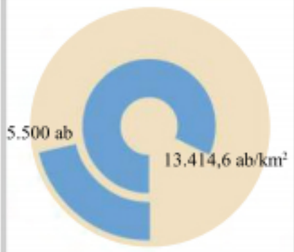
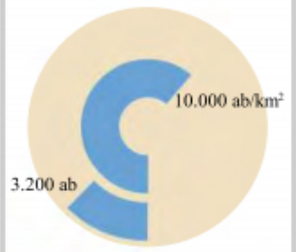
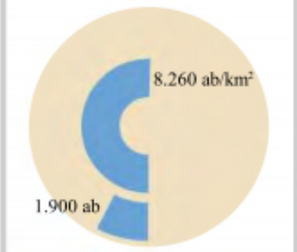
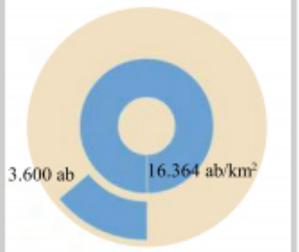
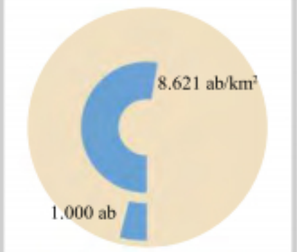
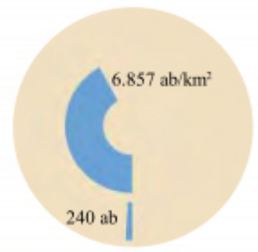
Water management
1)The Msheireb Downtown Doha non-potable water system will further treat municipality supplied Treated Sewage Effluent (TSE) so it is pure enough to be used in the District Cooling System
2). The system will earn water efficiency credits under the US Green Building Council's Leadership in Energy and Environmental Design (LEED) Rating System.

Waste management
The waste management is defined by the deployment of an Automatic Waste Collection System (AWCS), to replace old fashioned refuse rooms and bins with underground vacuum technology. This will reduce many of the usual problems associated with waste, including unwelcome odours – a particular concern in a hot climate like that of Qatar.

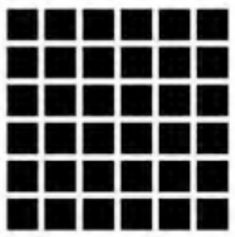
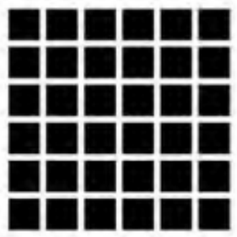
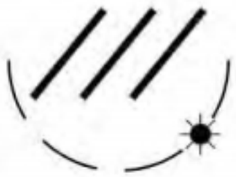
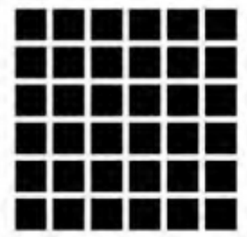
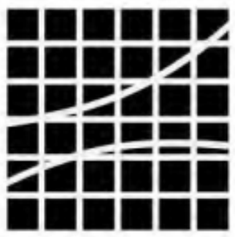
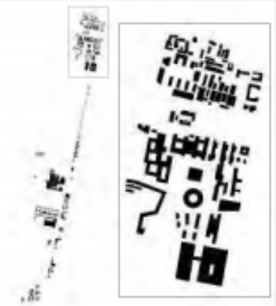
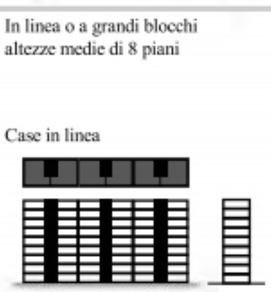
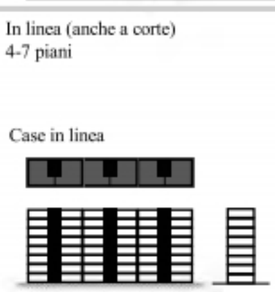
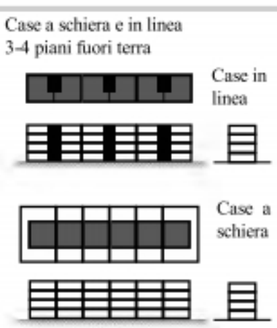
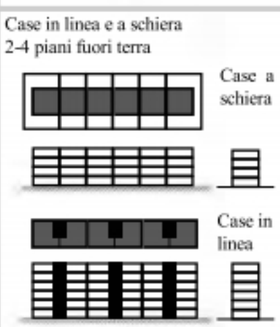
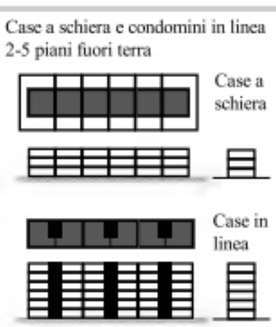
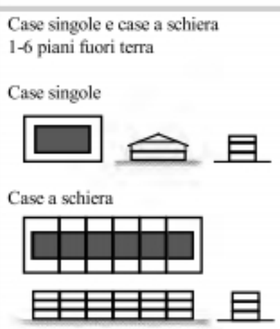
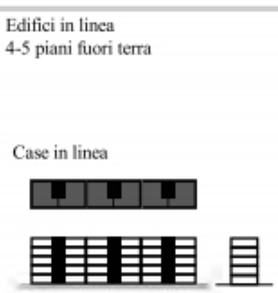
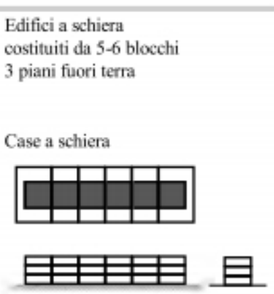
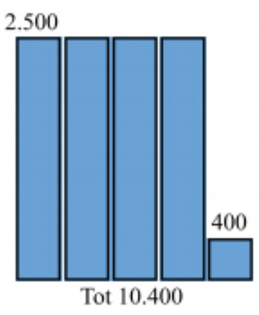
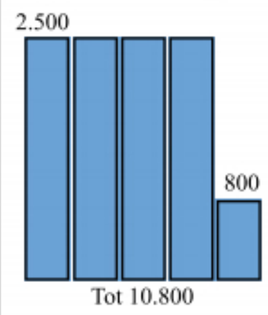
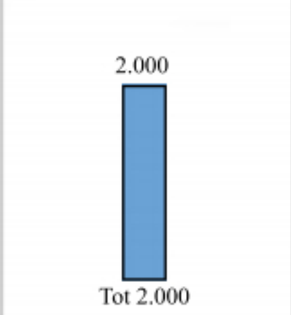
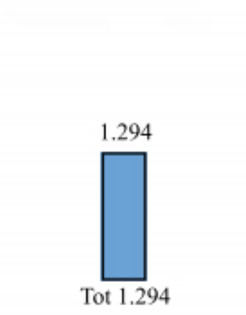
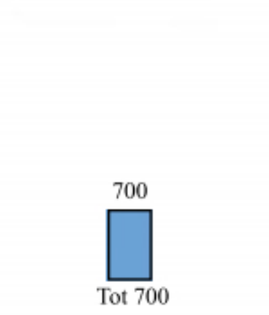
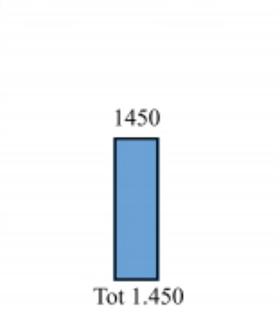
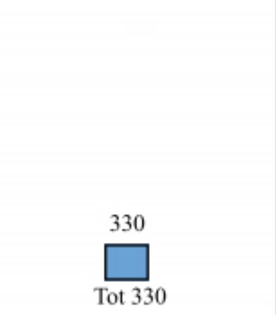


COMPACTNESS | COMPLEXITY | CONNECTIVITY | MANAGEMENT

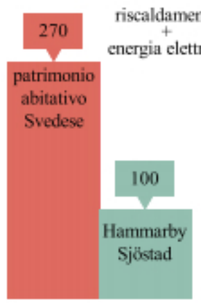
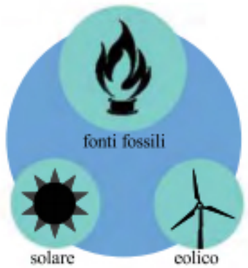
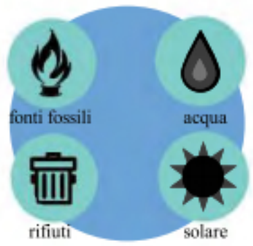
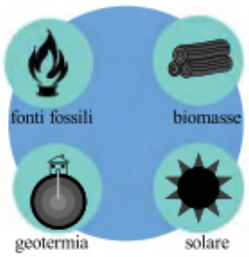
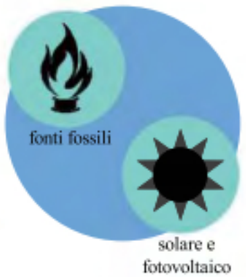
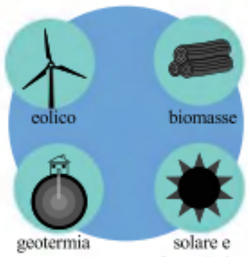
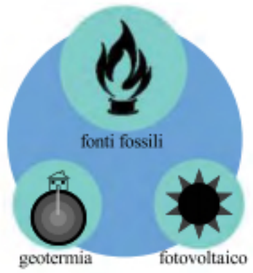
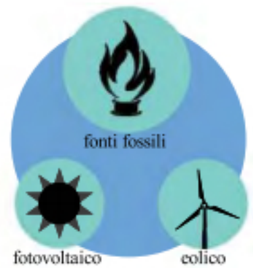
2.11.1 Analisi comparativa urbana

	ØRESTAD	HAMMARBY SJÖSTAD	VAUBAN	SOLAR CITY	ECO-VIIKKI	BO01	LE ALBERE	BEDZED
TERRENO	Terreno verde 	Ex area industriale e portuale 	Ex area militare 	Terreno agricolo 	Terreno agricolo 	Ex area portuale e cantieristica 	Ex area industriale 	Ex impianto di trattamento acque reflue
DISTANZA DAL CENTRO								
SUPERFICIE								
ABITANTI DENSITÅ								
PROGETTO REALIZZATO								

2.11.2 Analisi comparativa architettonica

	ØRESTAD	HAMMARBY SJÖSTAD	VAUBAN	SOLAR CITY	ECO-VIIKKI	BO01	LE ALBERE	BEDZED
TIPO DI INIZIATIVA	Pubblica 	Pubblica 	Pubblica con partecipazione 	Pubblica 	Pubblica con partecipazione 	Pubblica con partecipazione 	Privata 	Privata 
STRUTTURA URBANA DI RIFERIMENTO	Maglia reticolare 	Maglia reticolare 	Per singoli lotti 	Città razionalista 	Spazio aperto strutturante 	Maglia reticolare 	Misto: struttura reticolare e curvilinea 	
EDIFICATO								
TIPOLOGIA EDILIZIA	In linea o a grandi blocchi altezze medie di 8 piani 	In linea (anche a corte) 4-7 piani 	Case a schiera e in linea 3-4 piani fuori terra 	Case in linea e a schiera 2-4 piani fuori terra 	Case a schiera e condomini in linea 2-5 piani fuori terra 	Case singole e case a schiera 1-6 piani fuori terra 	Edifici in linea 4-5 piani fuori terra 	Edifici a schiera costituiti da 5-6 blocchi 3 piani fuori terra 
N° ABITAZIONI								

2.11.3 Analisi comparativa energetica

	ØRESTAD	HAMMARBY SJÖSTAD	VAUBAN	SOLAR CITY	ECO-VIIKKI	BO01	LE ALBERE	BEDZED
CONSUMO ENERGETICO fabbisogno medio per il riscaldamento inkWh/m²anno								
FONTI								
TRATTAMENTO RIFIUTI		 **Raccolta differenziata** mediante un sistema di tubazioni pneumatiche interrate **incenerimento** del residuo non riciclabile; i rifiuti organici vengono trasformati in biogas e concime.	 **Raccolta differenziata;** i rifiuti solidi domestici sono trasformati in biogas	 **Raccolta differenziata;** **compostaggio** del rifiuto organico	 **Raccolta differenziata;** **compostaggio** del rifiuto organico	 **Raccolta differenziata;** i rifiuti organici, raccolti attraverso appositi condotti pneumatici, sono trattati da una centrale per la produzione di biogas e fosfati fertilizzanti	 **Raccolta differenziata** mediante bidoni posti al livello -2 di ogni edificio	 **Raccolta differenziata;** **compostaggio** del rifiuto organico e vegetale
TIPO DI RISCALDAMENTO	 **RISCALDAMENTO CENTRALIZZATO DI QUARTIERE (TELERISCALDAMENTO)** centrale termica alimentata a gas metano e altre sorgenti rinnovabili	 **RISCALDAMENTO CENTRALIZZATO DI QUARTIERE (TELERISCALDAMENTO)** alimentato da: combustione olio biologico (16%) trattamento acque di scarico (34%) incenerimento rifiuti (47%)	 **RISCALDAMENTO CENTRALIZZATO DI QUARTIERE (TELERISCALDAMENTO)** impianto di cogenerazione ad alta efficienza (CHP) alimentato da: gas naturale (80%) trucioli di legno (20%)	 **RISCALDAMENTO CENTRALIZZATO DI QUARTIERE (TELERISCALDAMENTO)** alimentato da gas, petrolio e dall'impianto di cogenerazione a biomassa	 **RISCALDAMENTO CENTRALIZZATO DI QUARTIERE (TELERISCALDAMENTO)** alimentato da fonti fossili. I collettori solari installati sul tetto di ciascun codominio contribuiscono al fabbisogno energetico per riscaldamento (dal 30 al 50%)	 **RISCALDAMENTO CENTRALIZZATO DI QUARTIERE (TELERISCALDAMENTO)** centrale di energia e pompe di calore in falda e in mare. Inoltre sugli edifici vi sono pannelli solari tradizionali e di collettori solari tubolari	 **RISCALDAMENTO CENTRALIZZATO DI QUARTIERE (TELERISCALDAMENTO)** centrale a trigenerazione (energia elettrica, termica e frigorifera) alimentata a gas metano	 **RISCALDAMENTO CENTRALIZZATO DI QUARTIERE (TELERISCALDAMENTO)** centrale termica alimentata a gas metano
EMISSIONI CO_2 STIMATE