Muscat Green Days

Dunes

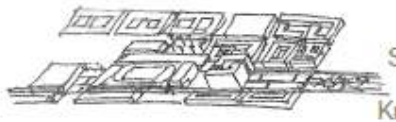
Gravel Sand Expanding Machine

Research Valley Light Lake Lake

Molecular Waterfall Geometry

Canyon

Fluid



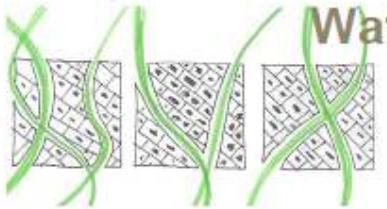
Space within Walls Bioclimatic Zoning

Strata

Knots Gas Falaj Wadi

Screen Tradition

Symbol

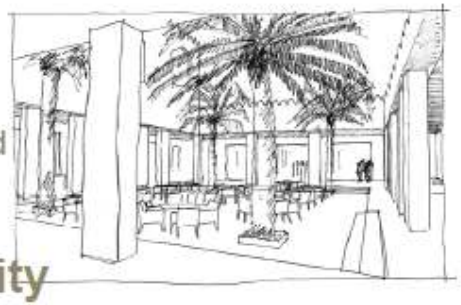


Water RWTH

Dust

Rocks Grid

Organic Technology



Discipline Functionality

Wind

Wideness Sustainability

Sun

Well Net Point of View

Growing Line Machine

Silicon Valley

Artificial Green

Sand Light

Water Curtain Rationality Courtyard

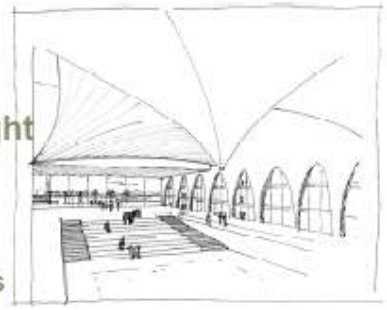
Well

Courtyard Artificial Green

Oasis

Oasis

Dry Lake Water Curtain



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Basic Planning and Conception Ideas

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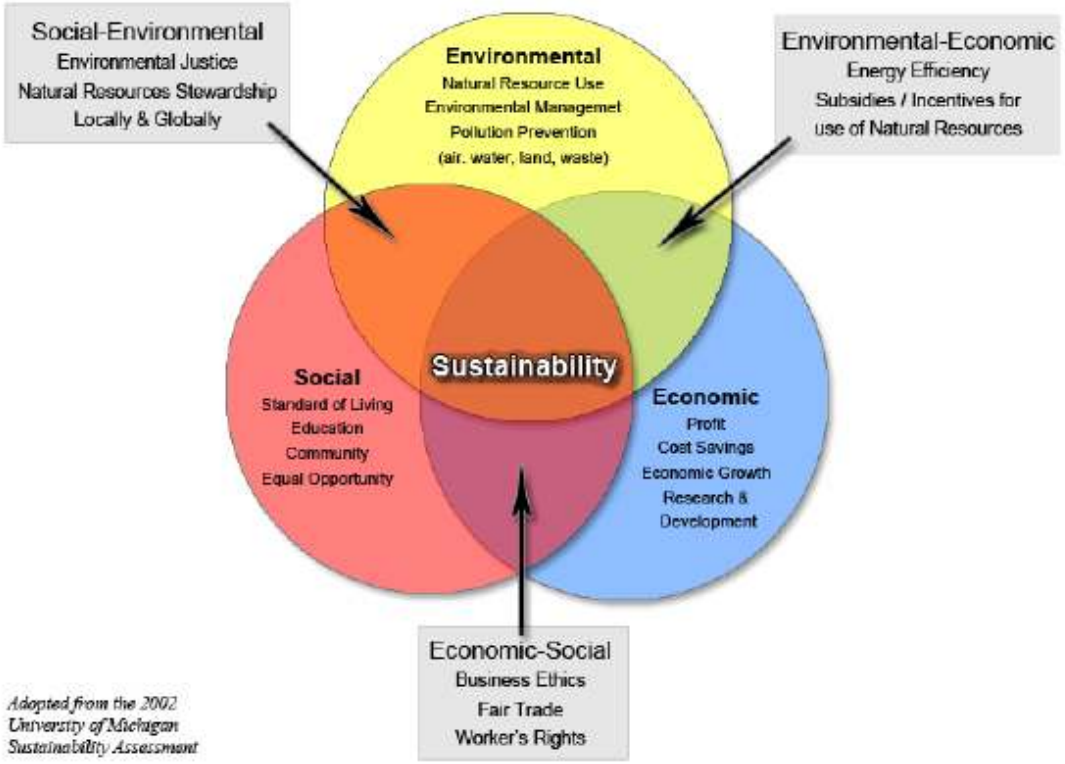


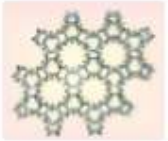
The Three Spheres of Sustainability


adaptable building skin in layers, short and long term storage
for energy and water transport with minimal energy

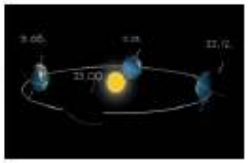

water consumption reduction,
sewage treatment with minimized consumption


humidity collection from dew


building skin as energy collector,
adaptation on external conditions, living in the shadow

scheduling depending on outside conditions,
large surface for re-radiation

adaptation to the annual cycles


reforestation of palm and local trees on site,
minimized water consumption and local treatment,
Bio mass increase,
Micro climate

Further Principles for Learning from Nature

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sustainability requires balance between the social, economic and ecologic aspects

Guideline #01

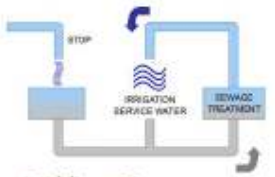
target is to reduce energy consumption for building operation by 50% compared to today standards

Guideline #02

metering of energy and water consumption per apartment and institute to increase awareness and costs related to consumption.

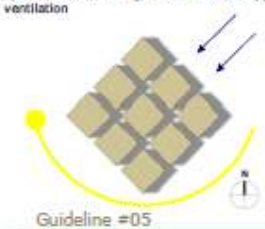
Guideline #03

sewage treatment with minimized consumption



Guideline #04

city grid should be 45° rotated towards north to optimize selfshading and wind supported ventilation

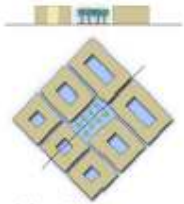


Guideline #05

cross ventilation of the campus by wind is welcome during cooler period but pushes hot and humid wind into the campus in summer. this can be reduced by vegetation

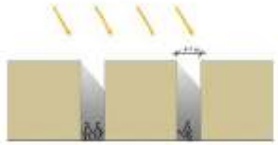
Guideline #06

compact building group can support microclimate



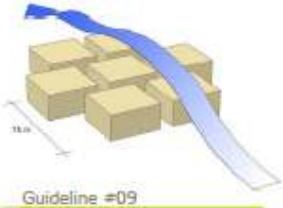
Guideline #07

narrow 4 -5 m wide streets can provide shading for circulation



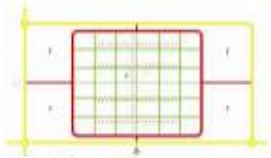
Guideline #08

avoiding of continuos streets in main wind direction. after bounding the urban structure the wind swirl lowers after 75 m



Guideline #09

motor traffic should be kept out of the campus to optimize air quality and allow reduced cross ventilation during hot periods



Guideline #10

heat accumulation above the roofs creat hot air layer above the campus

Guideline #11

buildings should therefore preferably have a homogeneous height without big steps to prevent redirection of hot air by the wind into the streets

Guidelines for achieving sustainable Architecture (1)

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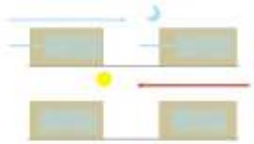
vegetation (trees) reduces temperature, wind speed and filters pollutants

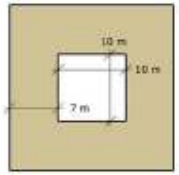
Guideline #12

night ventilation and nighttime reradiation to the sky can allow to create "cold island" with lower temperatures then outside



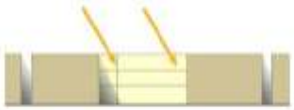
Guideline #13

courtyards should be about 10m x 10m



Guideline #14

daylight supply mainly from courtyard spaces

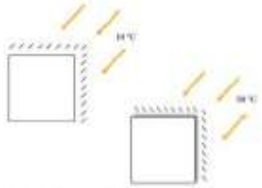


Guideline #15

forestation of palm and local trees on site with minimized water consumption and local treatment. biomass increase microclimate

Guideline #16

scheduling depending on outside conditions. large surface for re-radiation



Guideline #17

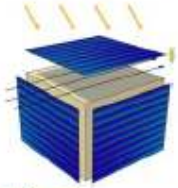
shadowing by ventilated roof, roof integrated energy collection, layering below the shadow roof, using the ground for energy buffering

Guideline #18

adaptable building skin in layers, short and long term storage for energy and water, transport with minimal energy

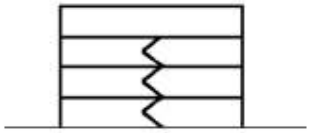
Guideline #19

building skin as energy collector adaptation on external conditions, living in the shadow



Guideline #20

building with 4 to 5 floor don't need elevators and reflect a good relation between energy consumption and energy collection areas

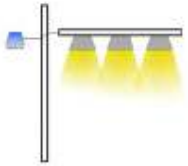


Guideline #21

waterless urinal, water saving fixtures, water saving strategies like central laundry, gray water collection from showers and sinks for pretreatment and reuse for irrigation and reuse

Guideline #22

daylight controlled artificial lighting



Guideline #23

Guidelines for achieving sustainable Architecture (2)

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Sandstorm crossing the Oman Shoreline

Special Weather Conditions

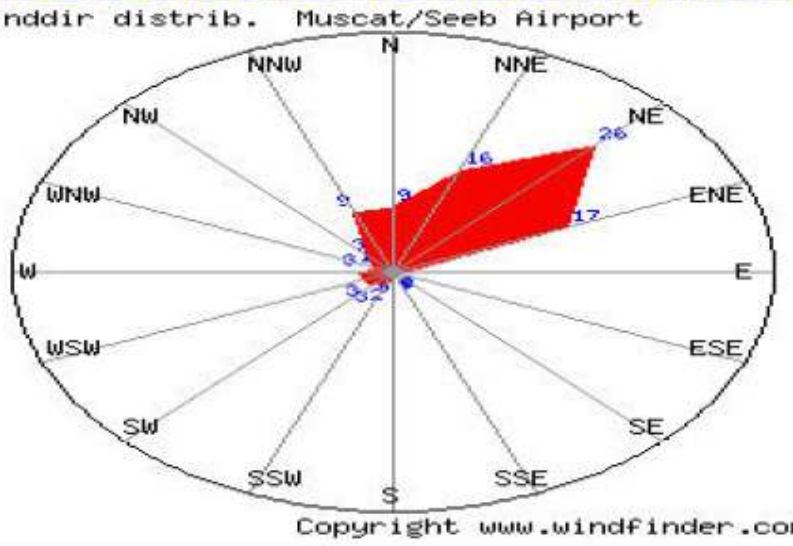
Wind Statistic | Wind Report | Forecast

Muscat/Seeb Airport (SEEB)

Stats based on observations taken between 5/2003 - 6/2008 daily from 7am to 7pm local time.

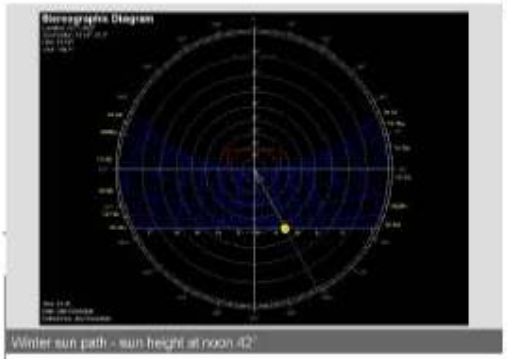
Month of year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	SUM
	01	02	03	04	05	06	07	08	09	10	11	12	1-12
Dominant Wind Dir.													
Wind probability > = 4 Beaufort (%)	12	15	14	18	20	20	24	16	14	9	9	11	15
Average Wind Speed (kts)	7	7	7	8	8	8	8	8	7	6	6	6	7
Average Airtemp. (°C)	22	24	28	32	37	37	35	33	33	32	29	25	30
Select Month (Help)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year

Wind direction distribution (%)

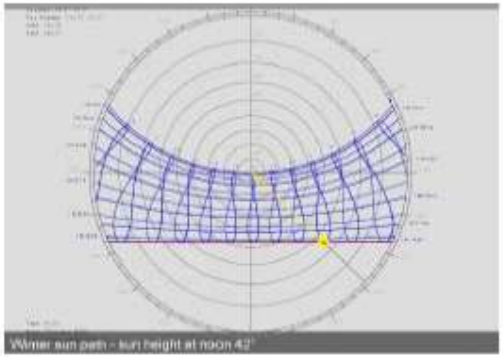


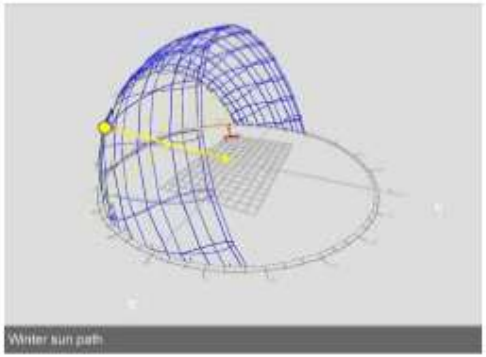
Wind Conditions

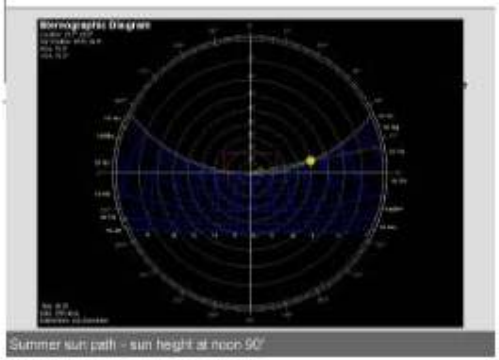
Muscat Green Days



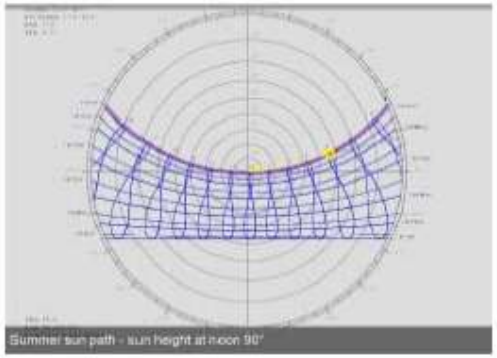
Winter sun path - sun height at noon 42°

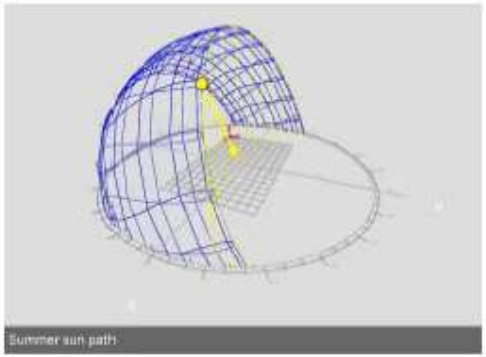

Winter sun path - sun height at noon 42°


Winter sun path



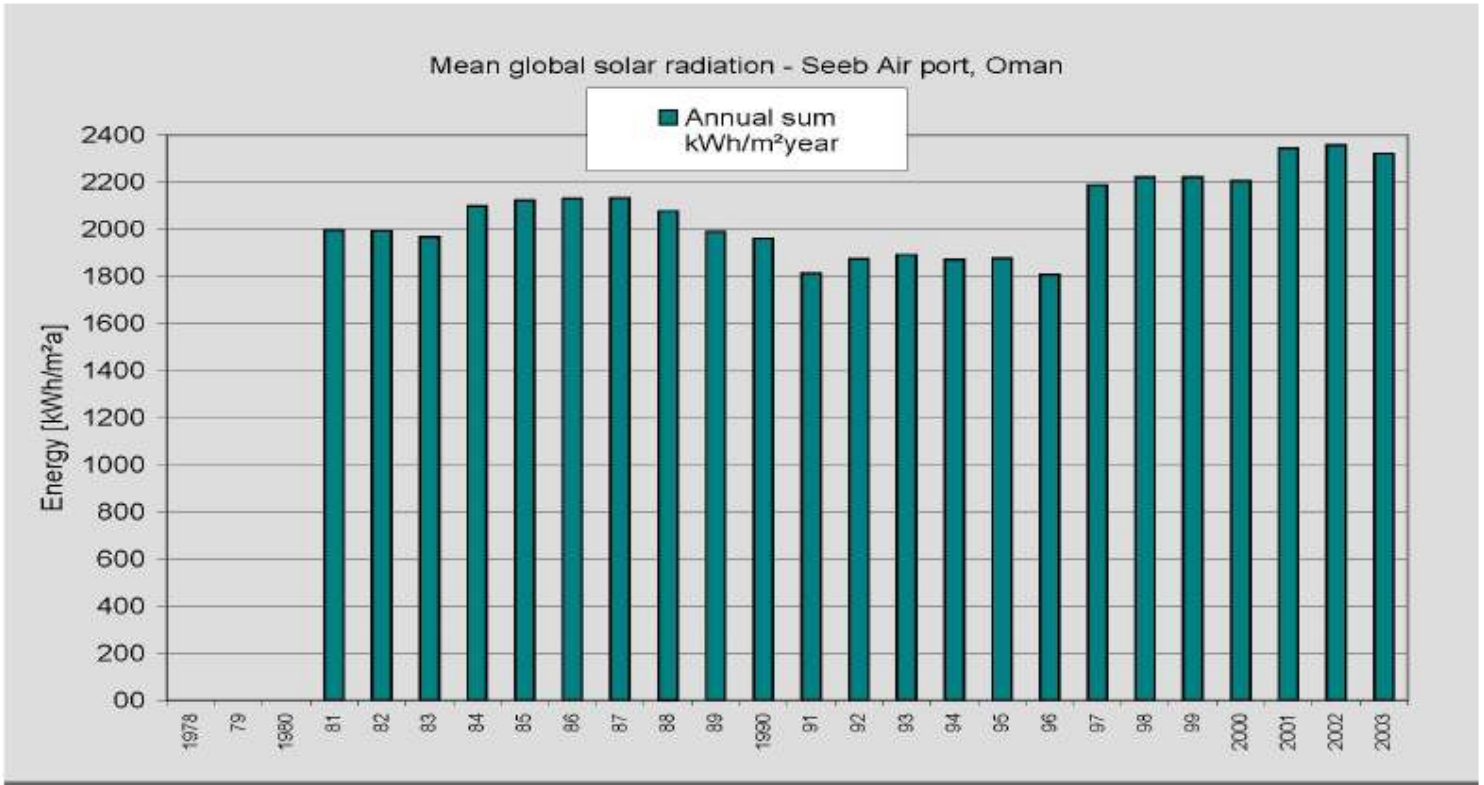
Summer sun path - sun height at noon 90°


Summer sun path - sun height at noon 90°

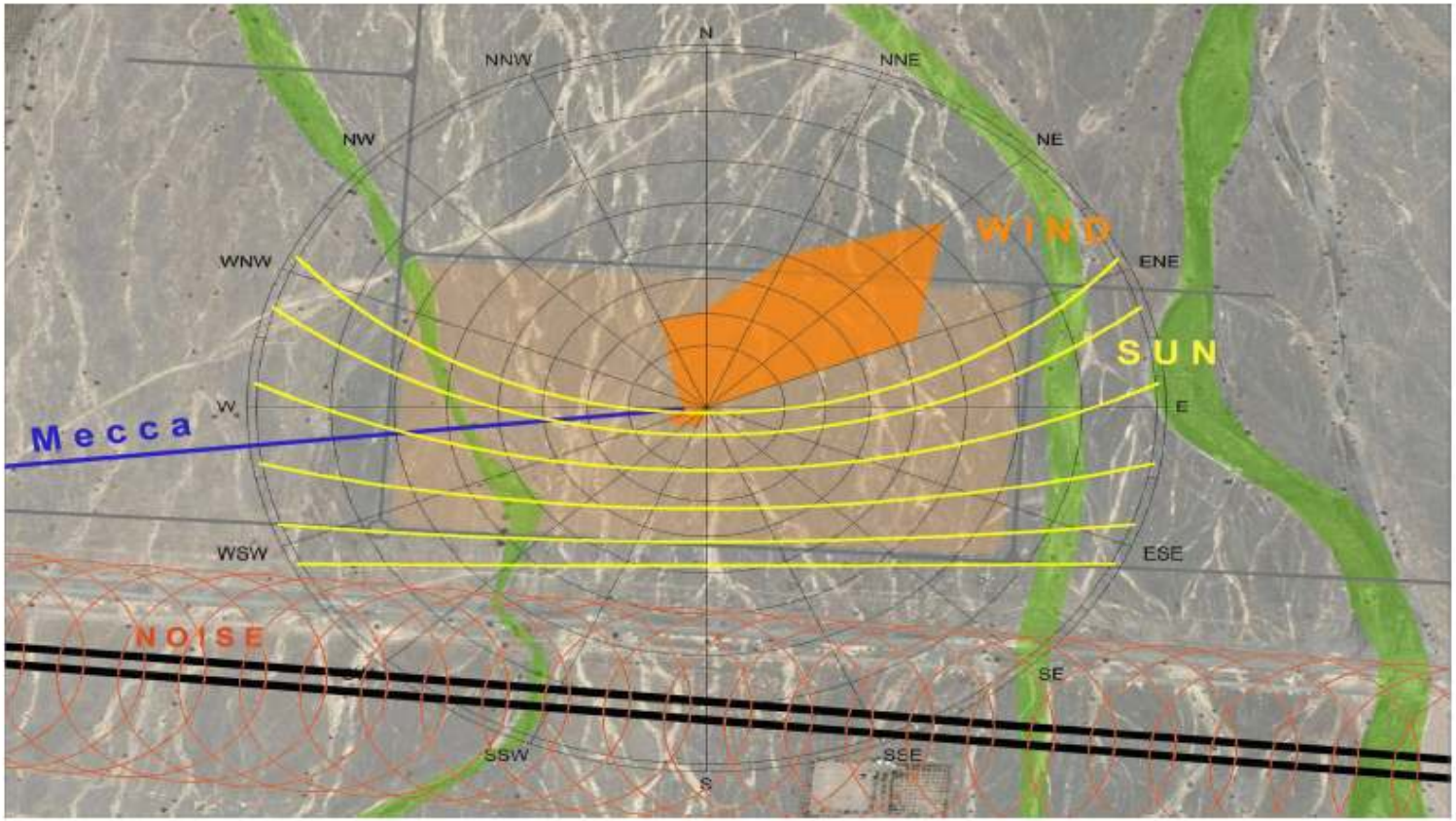

Summer sun path

Monthly Mean

Sunshine Hours

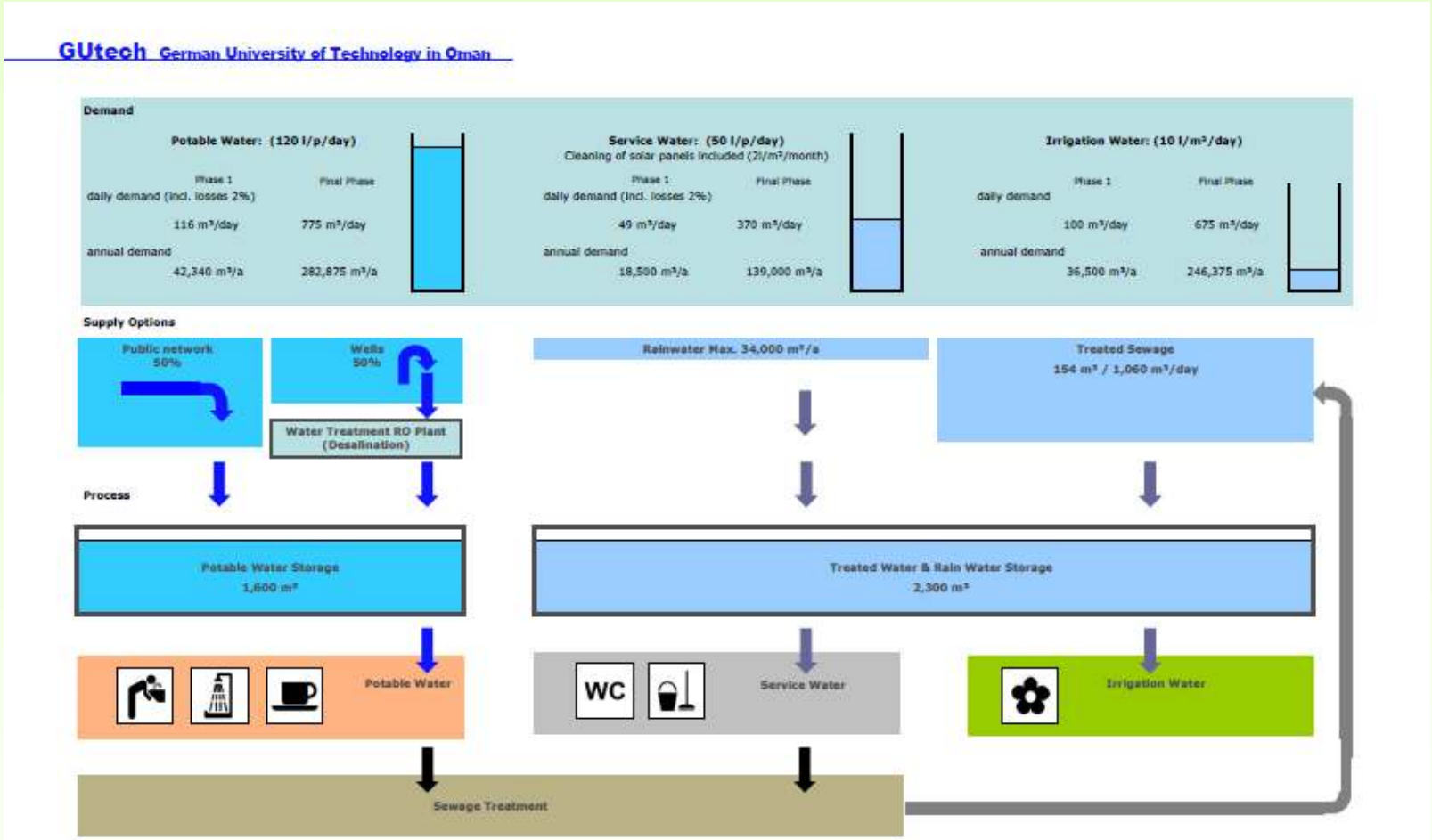


Annual solar radiation on a horizontal surface



Design Influencing Factors

The Five Columns of Support



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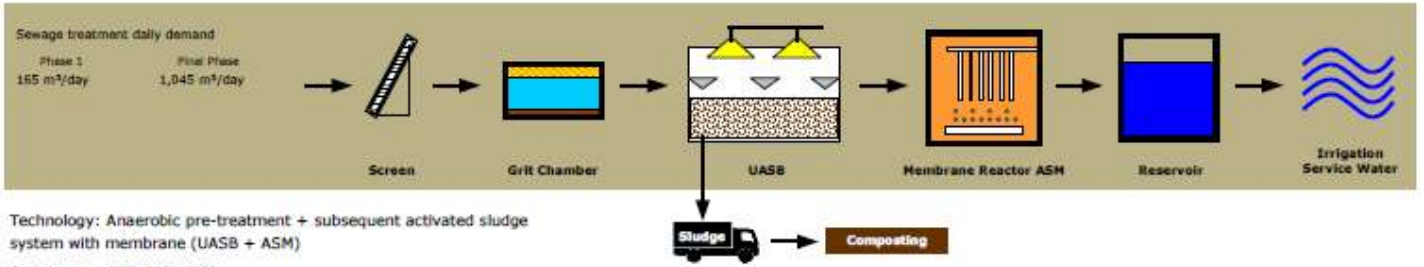
Sewage Treatment Plant UASB (upflow anaerobic sludge blanket) + **ASM** (aerobic sludge membranes)



Technology: Anaerobic pre-treatment + subsequent activated sludge system with membrane (UASB + ASM)

Capacity: (55) 500 m³/d

Characteristic: compact technology, waste air can be used for combustion air of IC-engines

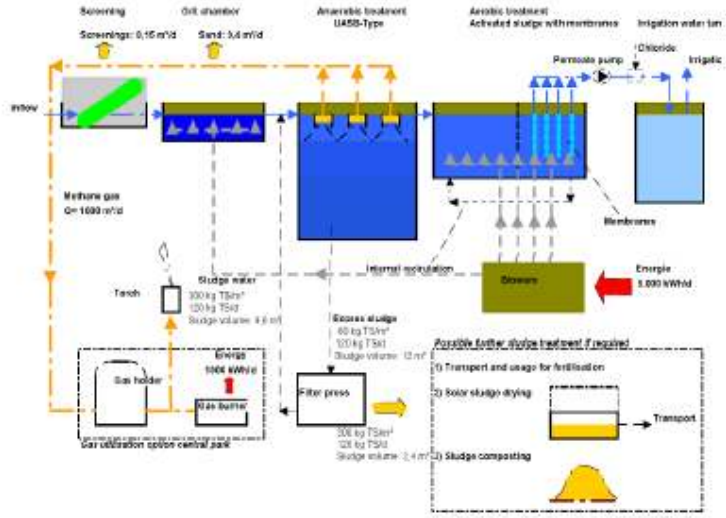
Sludge drying: Filter process for sludge dewatering

Sludge use: Composting

Sewage Treatment Plant ASM Module

Advantages: Compact solution requiring less construction works

Solid-retention and hygienisation in one treatment step instead of secondary sedimentation, rapid sand filtration and hygienisation



Principle of Sewage Recycling

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Sewage Treatment

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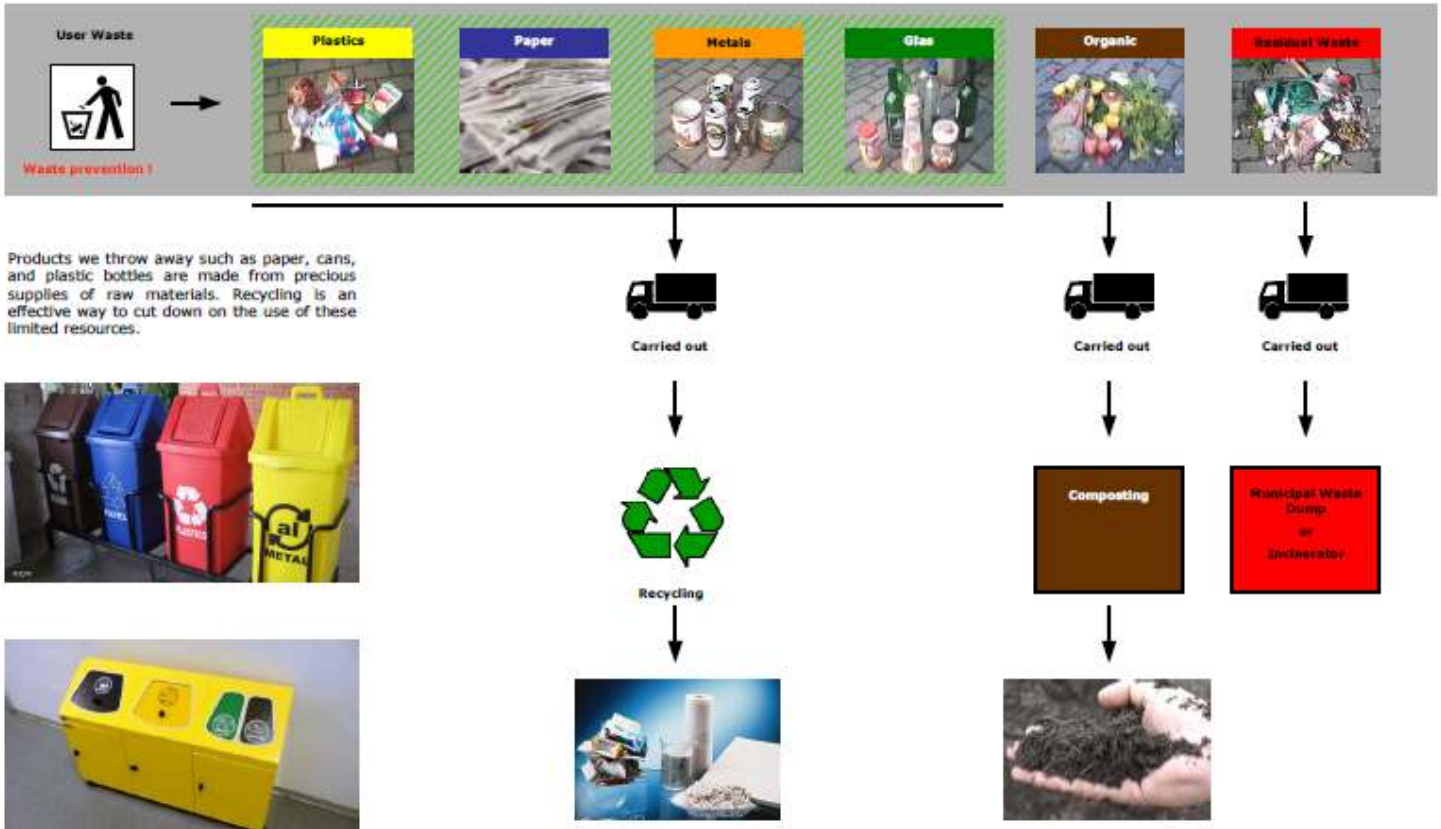

Products we throw away such as paper, cans, and plastic bottles are made from precious supplies of raw materials. Recycling is an effective way to cut down on the use of these limited resources.

Principle of Waste Recycling

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Waste Disposal

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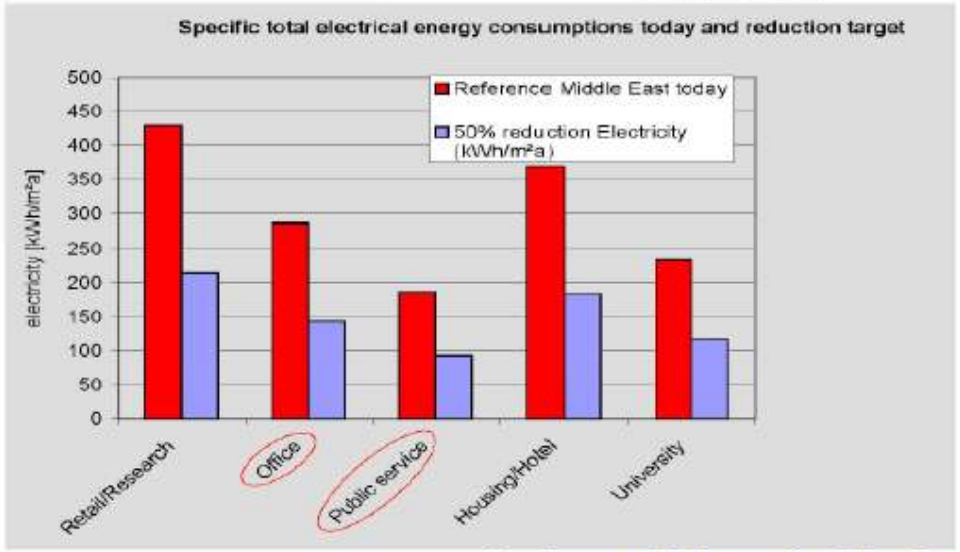
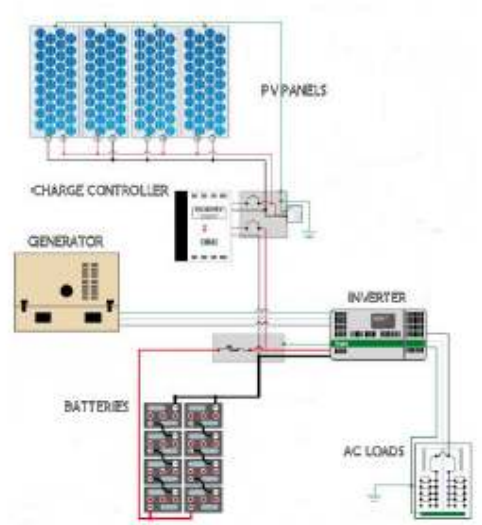
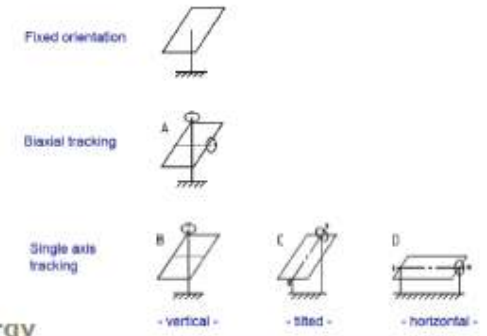
- Conventional PV technology based on silicon and crystalline structures as active layer of the PV cell.
- PV cell structures:
  monocrystaline silicon (efficiency 13 – 16%),
  polycristalline silicon (efficiency 12 – 15%)
  amorphous cells (efficiency < 10%).
- PV industry has shown an impressive growth over the past six years
- PVGIS estimates of solar electricity generation for some countries:

  Oman: 1,680 kWh/kWp
  Spain: 1,400 kWh/kWp
  Germany: 860 kWh/kWp



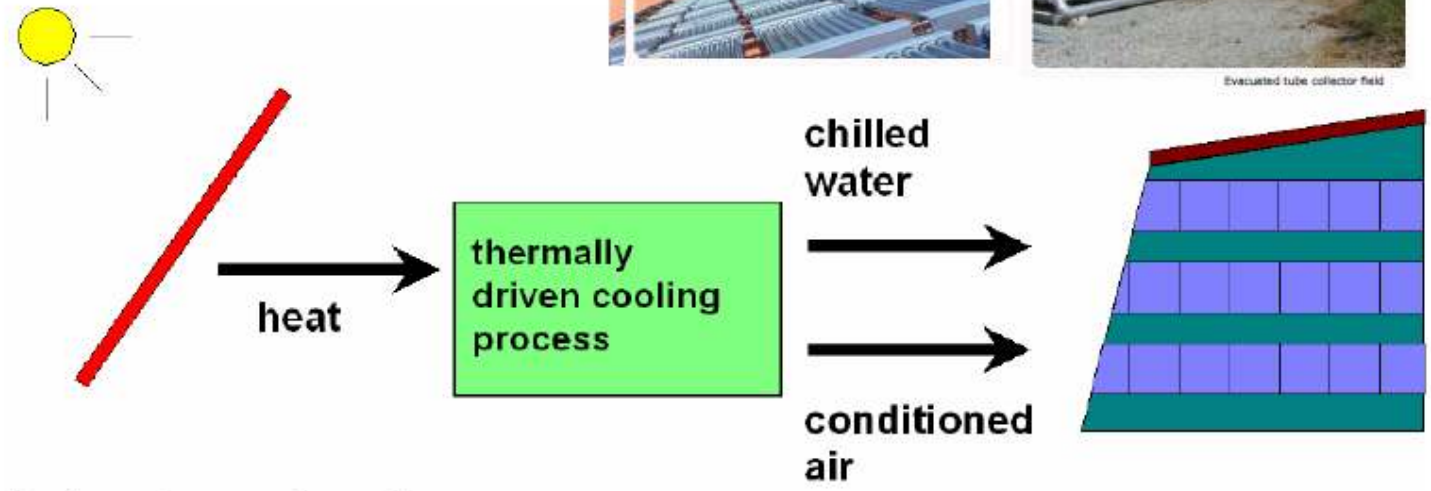




Numbers and Figures for Solar Energy

Photovoltaic

Evacuated tube collector field



Basic systems categories

- Closed cycles (chillers): chilled water
- Open sorption cycles: direct treatment of fresh air (temperature, humidity)

Flat plat collector field

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View to Main Building

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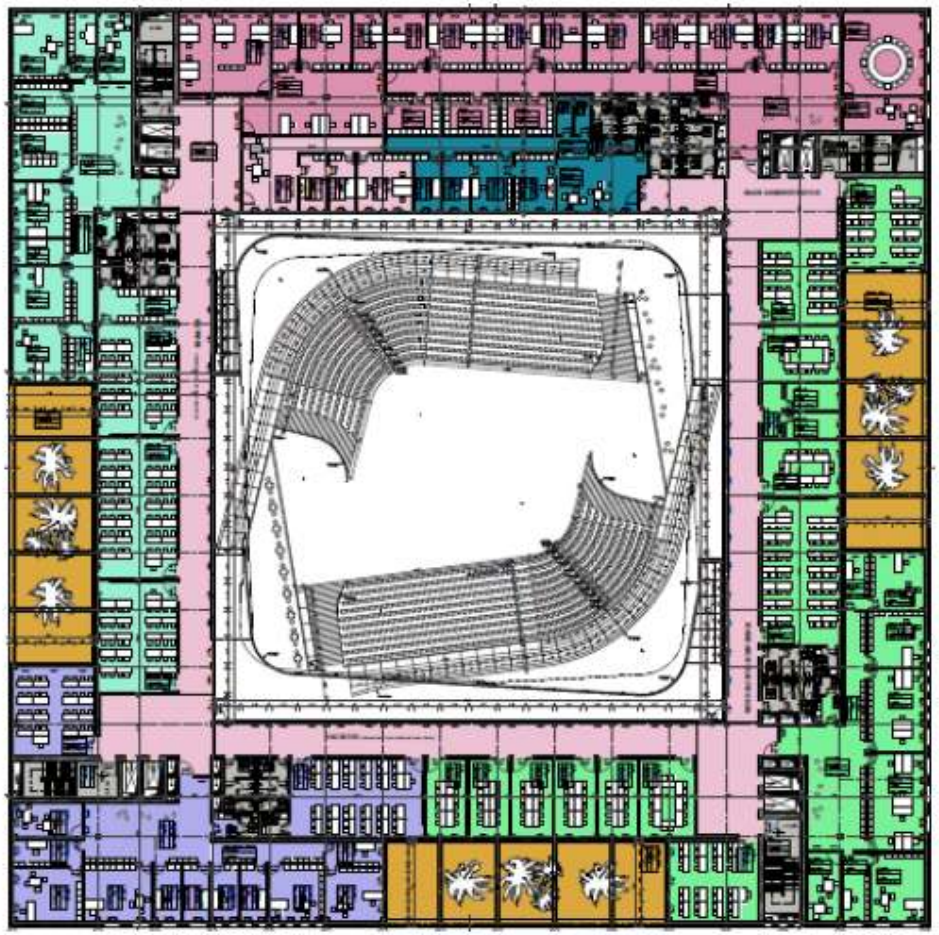

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Floor Plan Main Building

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View to Main Building Amphitheatre

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View to Main Building Amphitheatre by Night

narrow foot pathes and water court

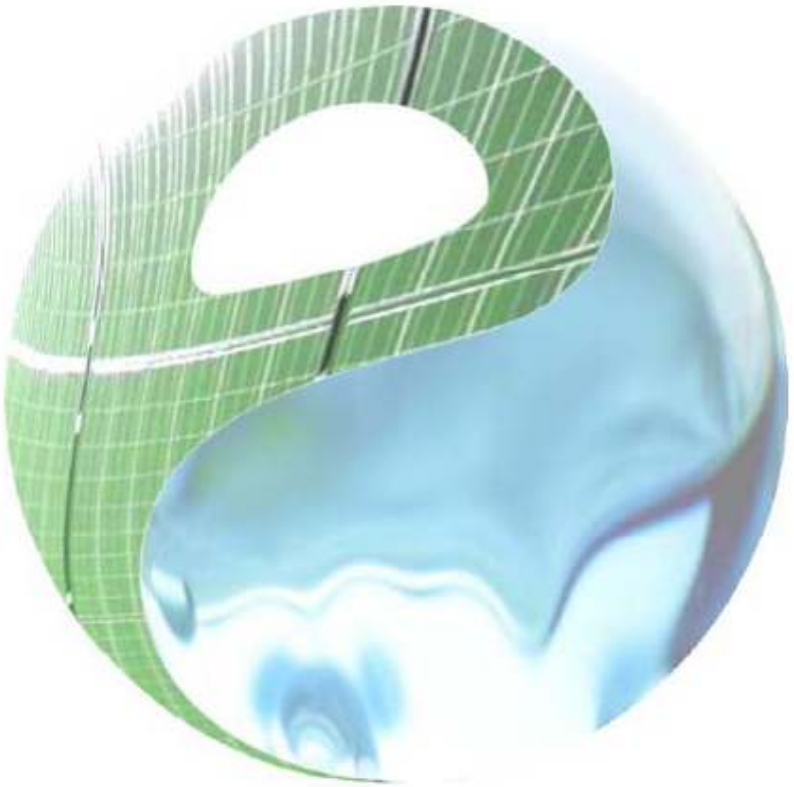
PAEW Headquaters Building

Two primary energy carrier

electricity - generated by photovoltaik

water - natural art of power

Electricity + Water



Logo design for PAEW

Concept

Inspired by the dual system of the two primary energy carrier as basic principle of the public authority of electricity and water the design of its headquaters building is reflecting this dialectic by its figurale building typlogy.

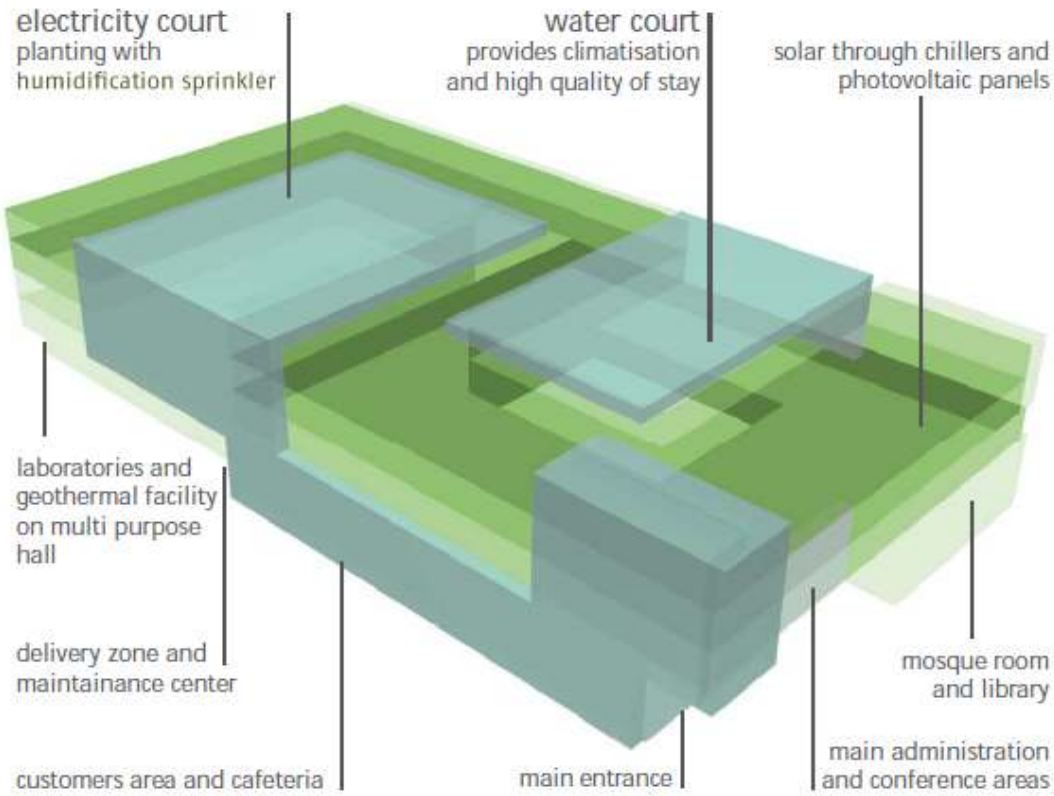
In allusion to the designed PAEW Logo of the "shake hands" of the two primary energy carriers the building design can be read as following: as two sources of energy (electricity and water) joining to an energetic foundation the building transforms this idea with two conceptional indoor court elements penetrating the building volume: the water court and the electricty court.

Both offer the public a conceptional dialog through haptic and operative usage of the primary energy sources. The geothermal stakes or the informational LED-curtain as well as the moistening water fall and humidification sprinklers or the shadings of photovoltaik paneels stage interior quality of stay and provide convenient workplaces. Furthermore the east – west direction of the courts subdivide the building in terms of urbanistic shadow for indirect natural ventilation and exposure to light.

Design Philosophy

PAEW Headquaters Building

Embracing voids and volumes



The facade is keeping this dialectic and articulates the building masses into a membran structure for ornamentic applications and a grid structure with passepartouts for functional office glazings. Both facade typologies embracing in a sculpural way all strong spatial eements. On one hand the volumes of voids as courts and entrances or partially required shading zones for laboratories and communication areas; on the other hand the massiv space volumes with its need for regular functional office facades.

The PAEW Headquarters Building is technicaly configured with a balanced usage of regenerative energy sources for a sustainable energy budget. In Addition to an efficent local public infrastructure supply self-generating and self-reducing energy prinziples are concidered: next to high-technical components (solar trough chillers, photovoltaic paneels, humidification sprinklers, floorslab coolers and geothermal stakes...) the building design follows relevant basic essentials for energy reduction (a compact area-volume-ratio, simplicity of vertical transportation and foundation, indirect daylight exposure and ventilation, self-shadowing, airtower effect with high-roofs, regulated night cooling, artifical light timing, functional and thermal symbiosis by i.e. back-to-back-principle...)

PAEW Headquaters Building

Main Entrance View

Visualization

PAEW Headquaters Building

Main Hall View

Visualization

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Muscat Green Days

PAEW Headquaters Building

Planted Court

Visualization

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Muscat Green Days

Thank you for your attention
Vielen Dank für Ihr Interesse

GENERAL CONTRACTOR PLANNING SERVICES

Hoehler & Partner LLC

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