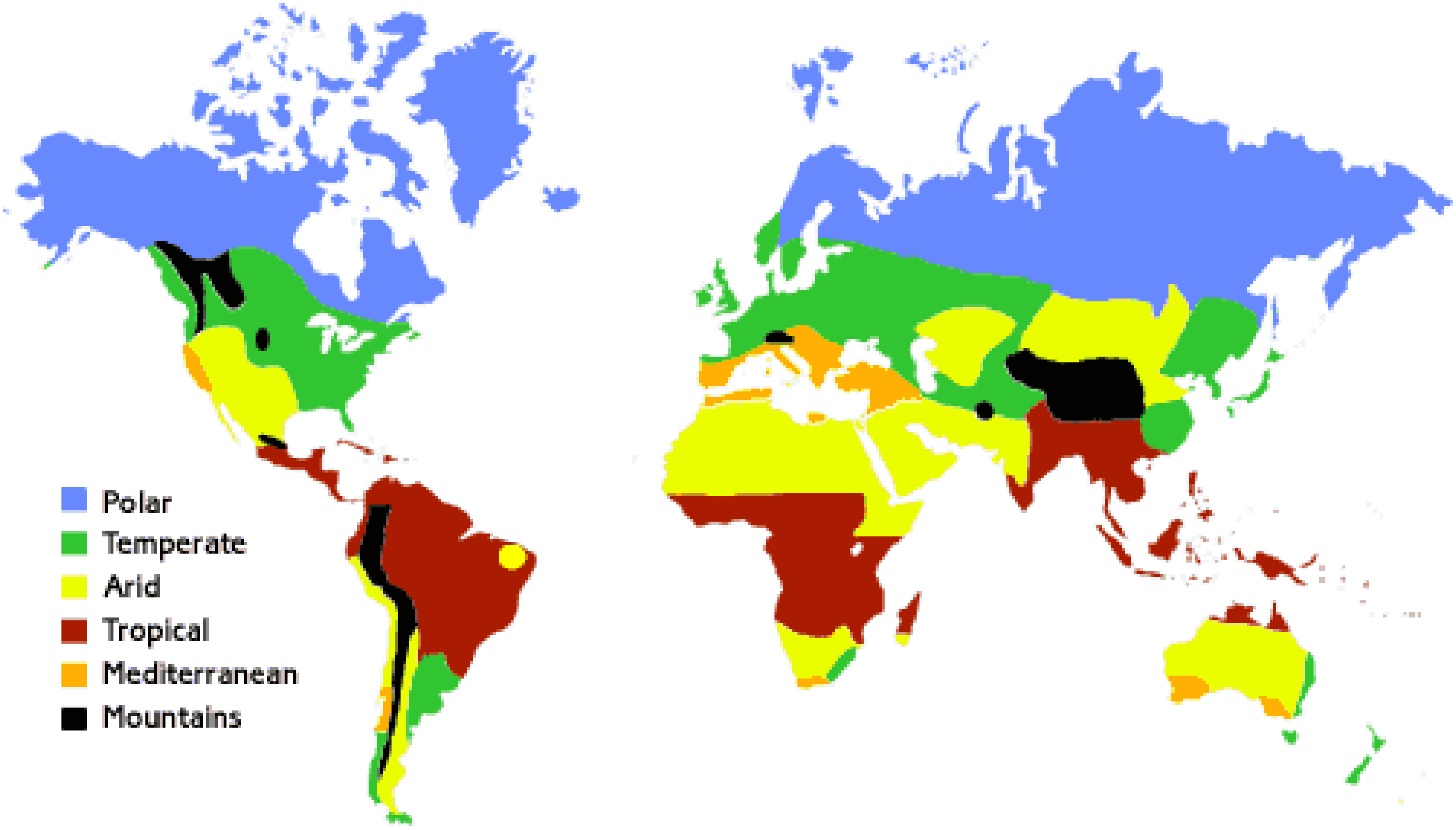
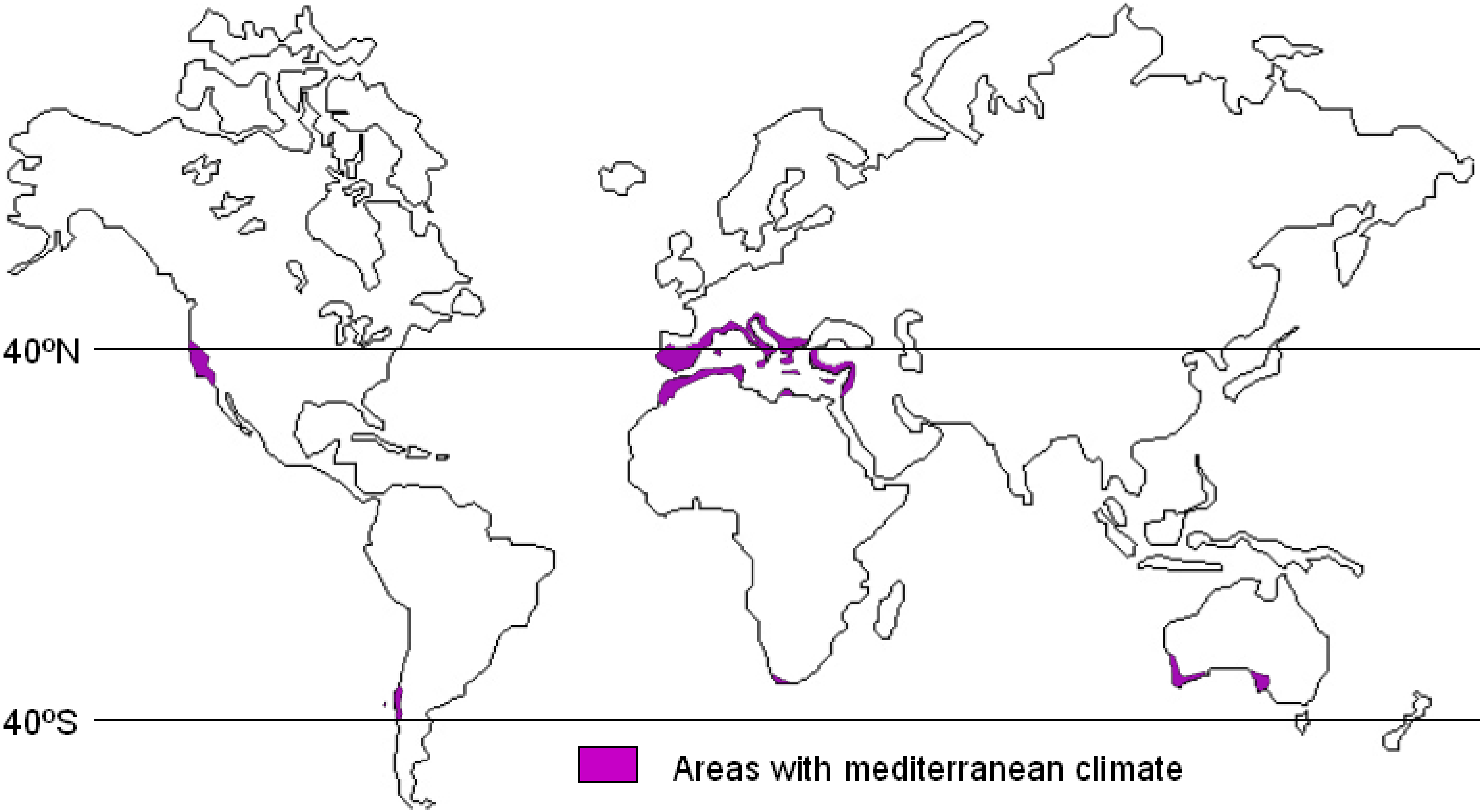
ITALIAN CLIMATE ANALYSIS

KÖPPEN CLASSIFICATION MAP

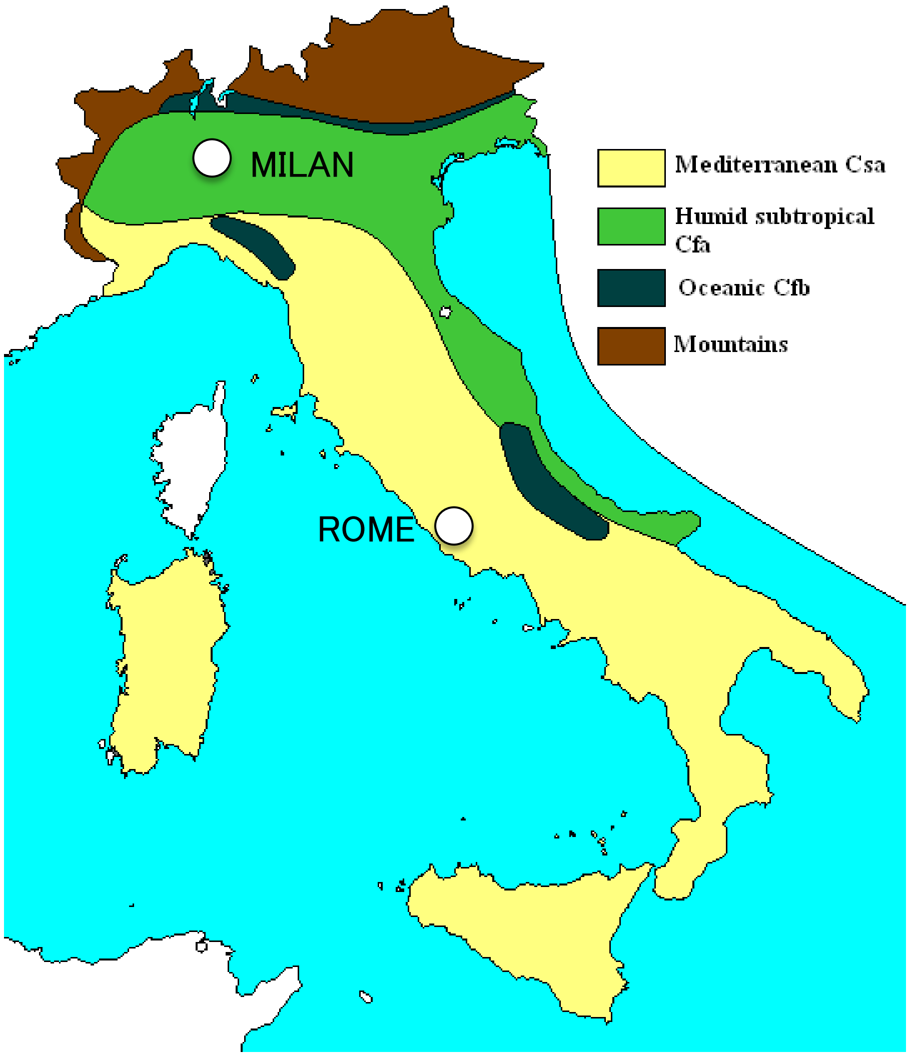


ITALIAN CLIMATE

MEDITERRANEAN WORLD AREAS

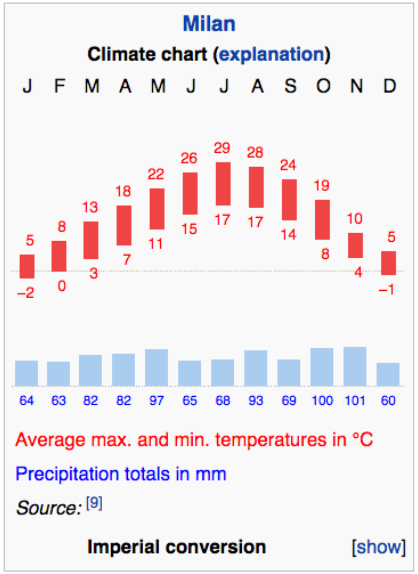


KÖPPEN CLASSIFICATION MAP IN ITALY



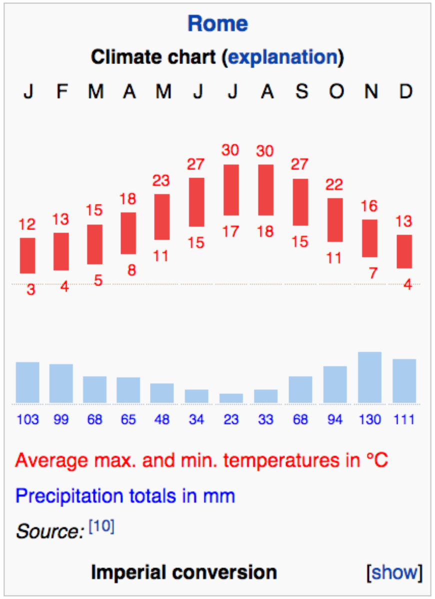
MILAN

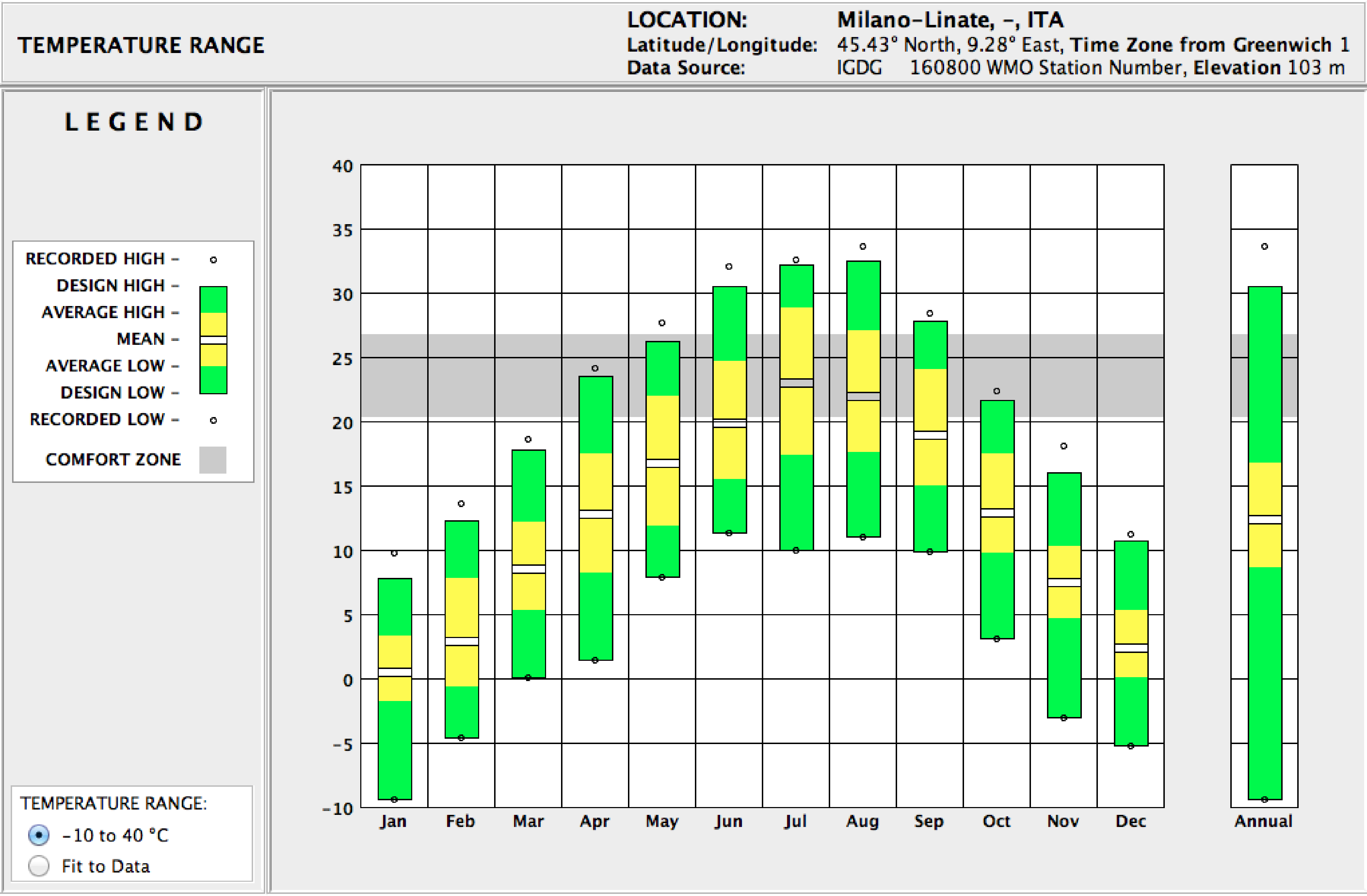
- Humid Subtropical Climate
- Wet summer, mild winter



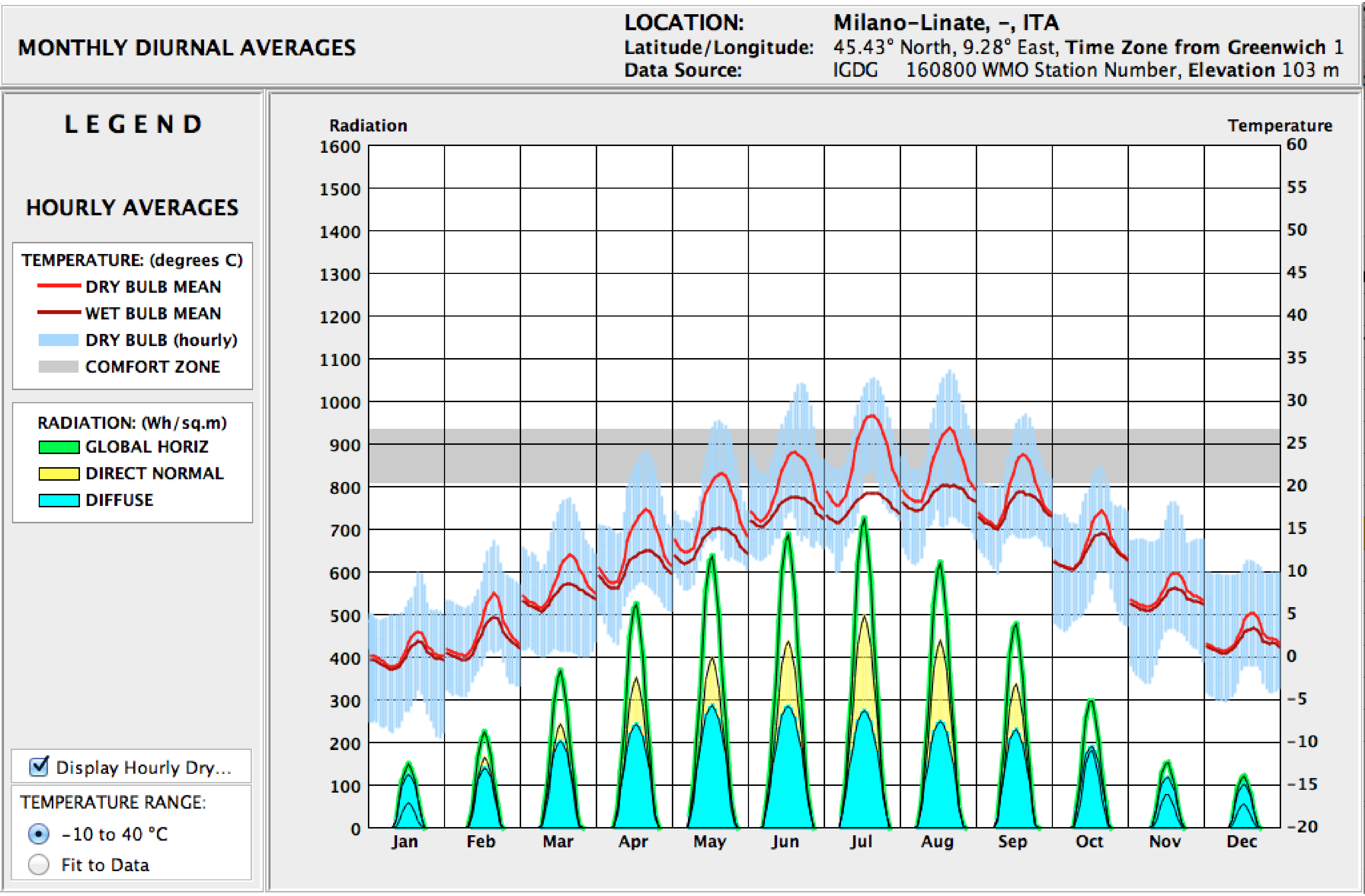
ROME

- Mediterranean Climate
- Temperate climate, dry summer, wet winter

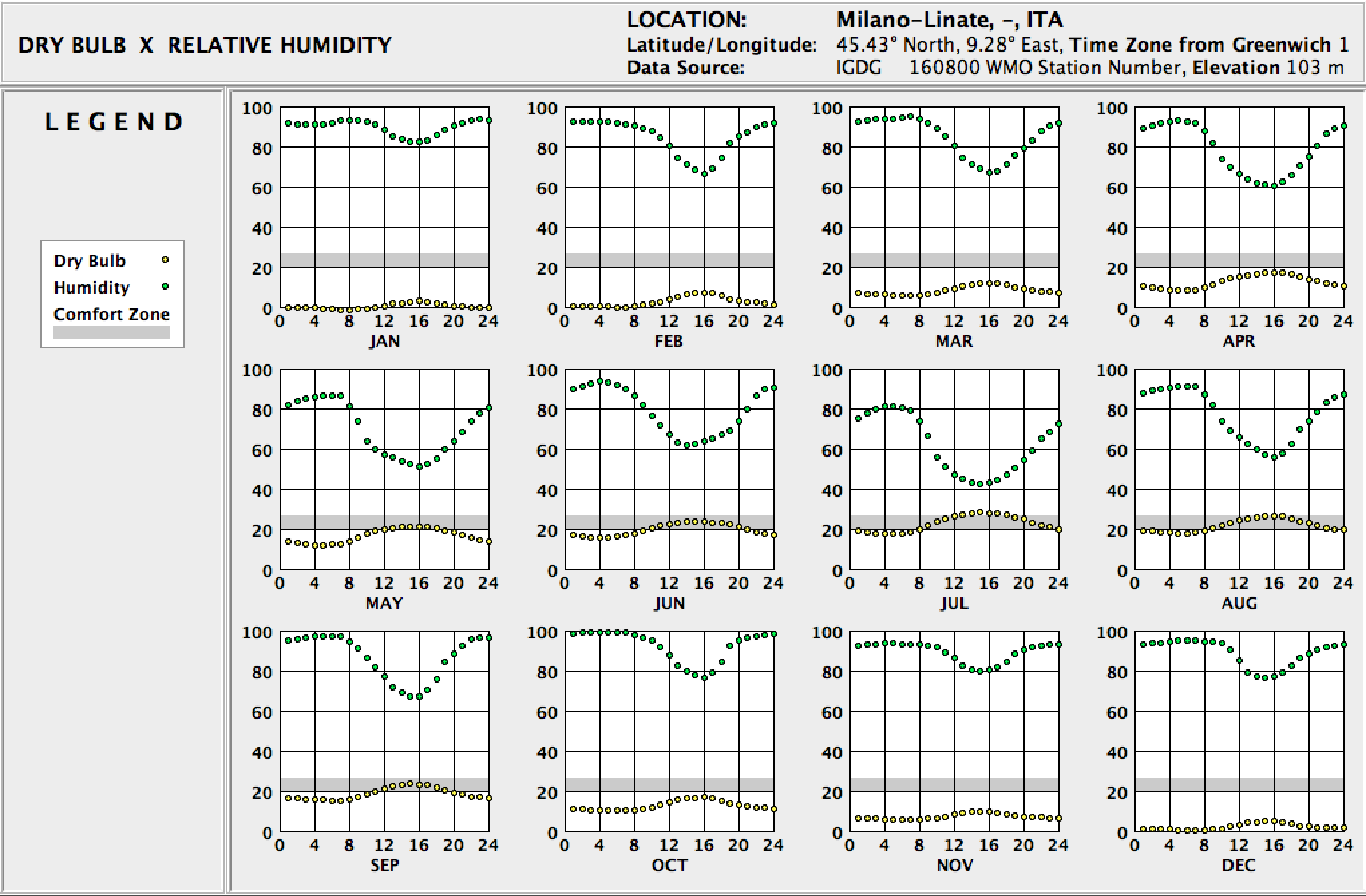




ITALIAN CLIMATE



ITALIAN CLIMATE



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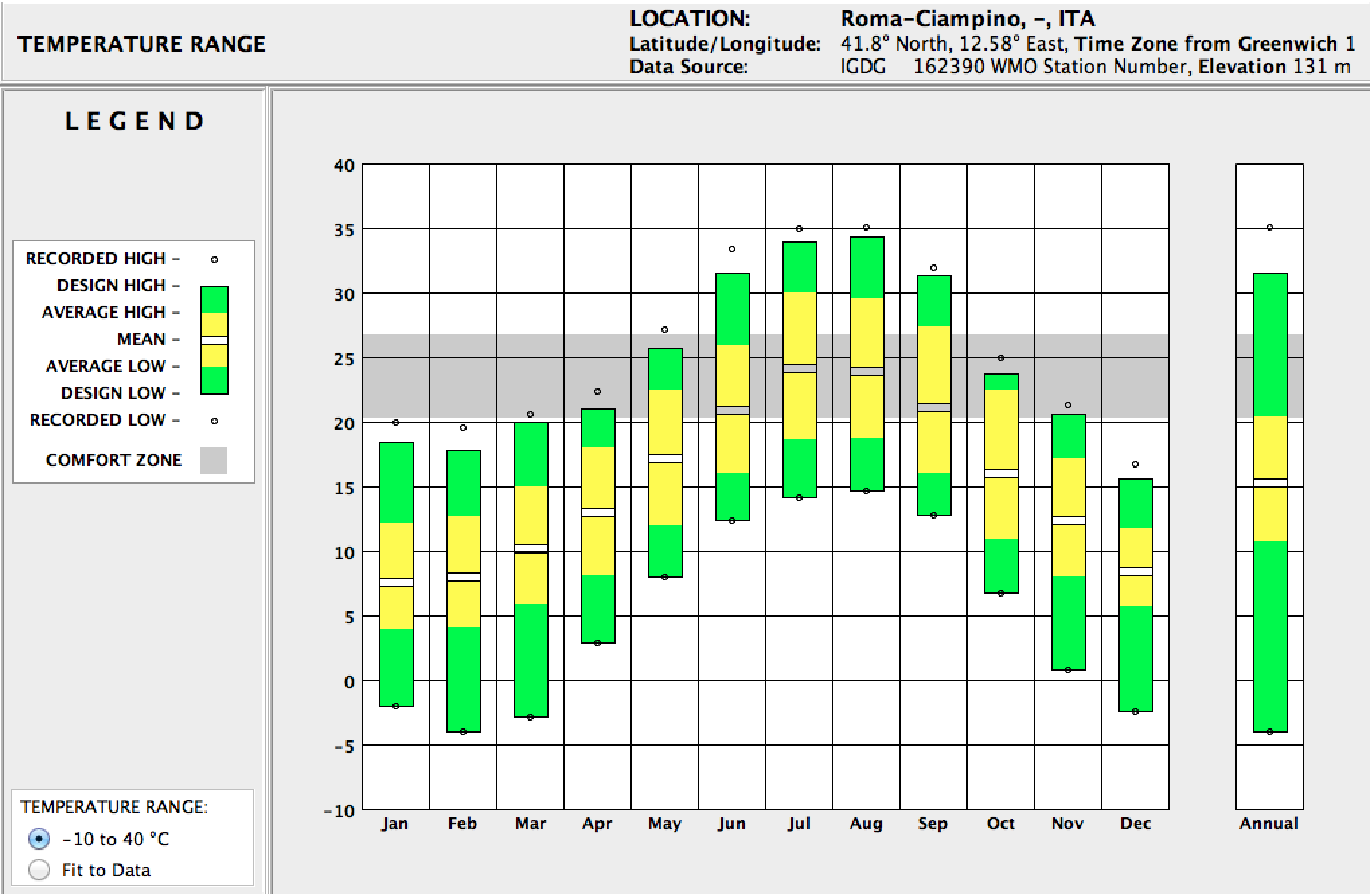
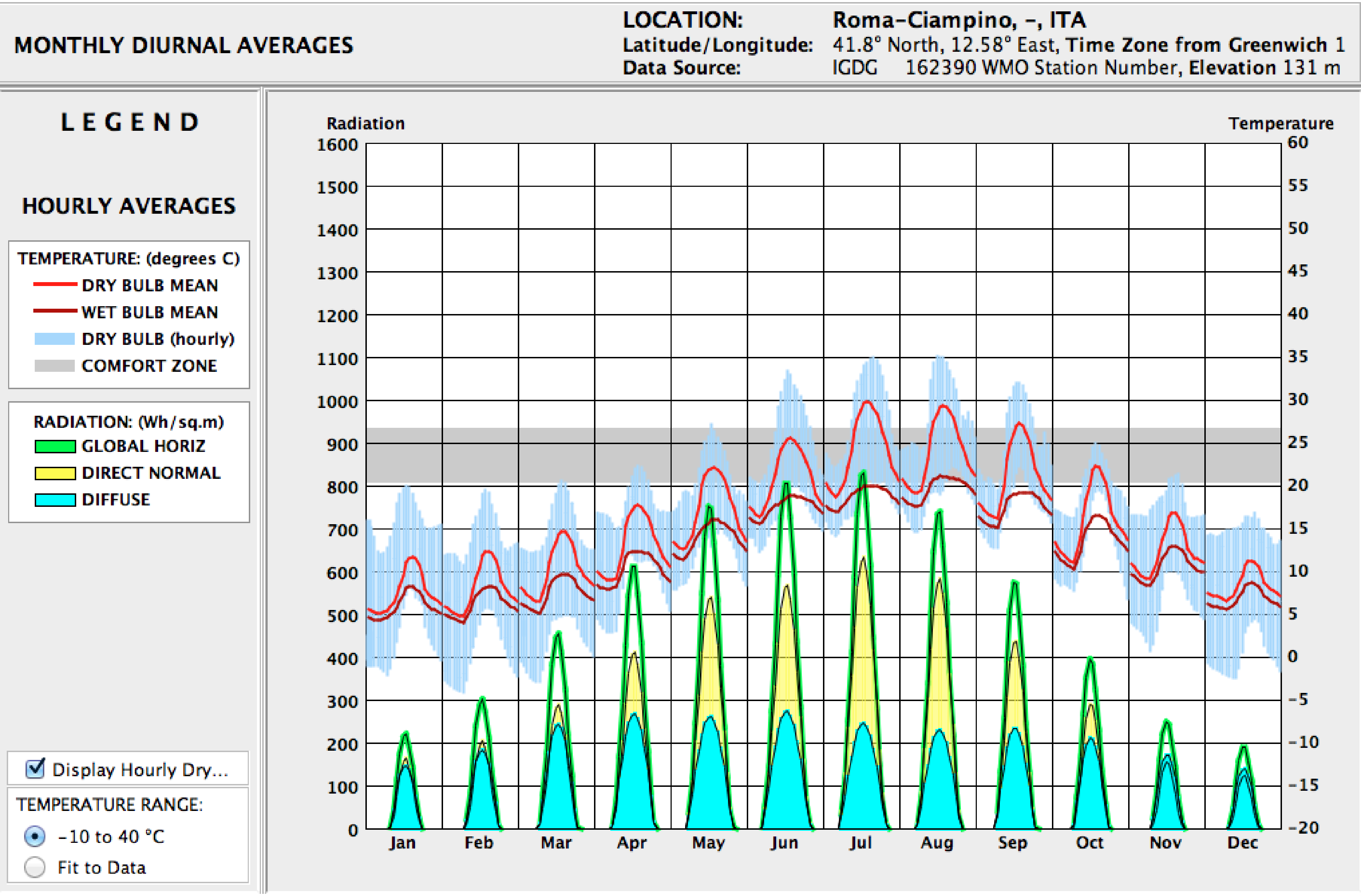
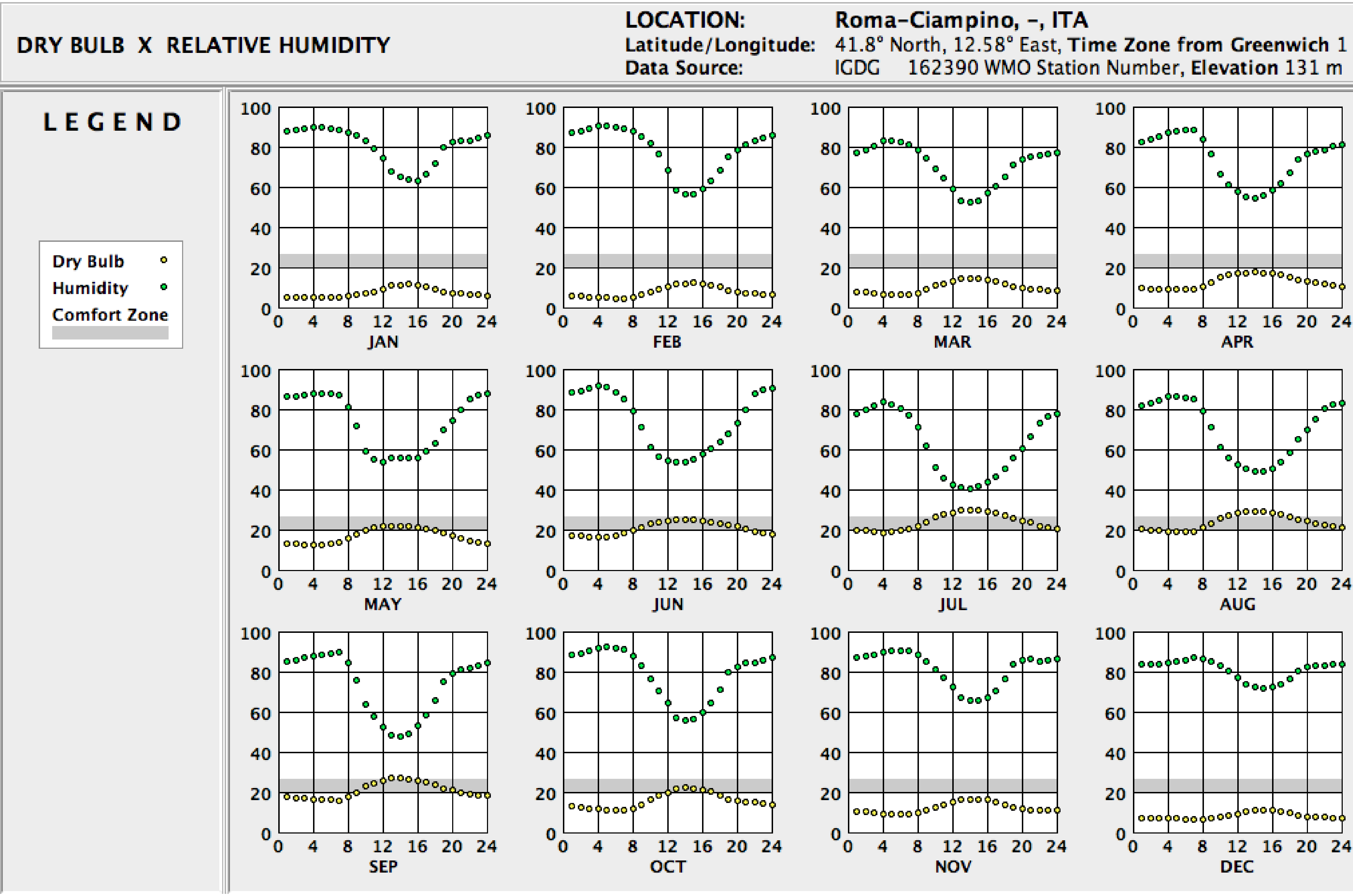


ITALIAN CLIMATE



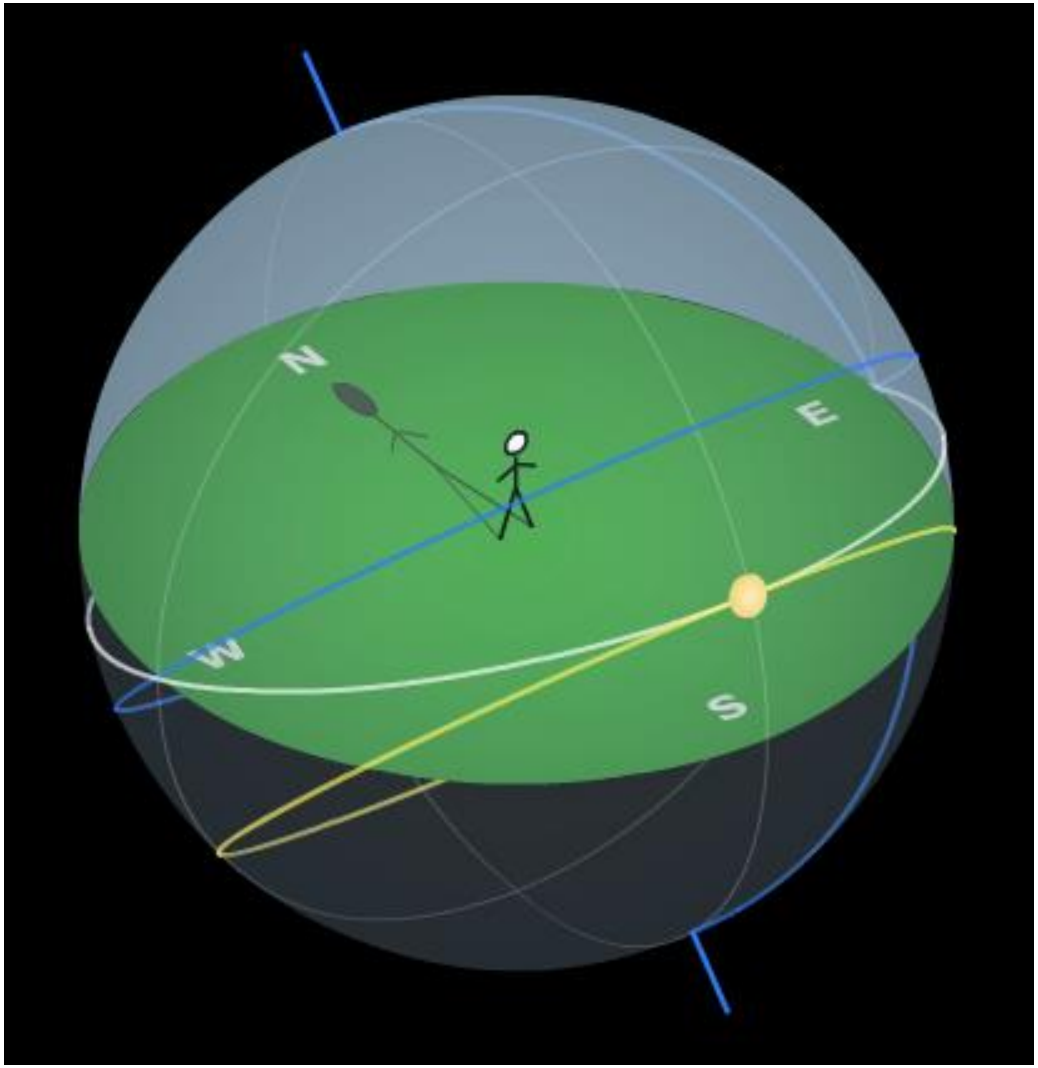
ITALIAN CLIMATE



ITALIAN CLIMATE

SOLAR PATH

UT date and time of equinoxes and solstices on Earth[1]								
event	equinox		solstice		equinox		solstice	
month	March		June		September		December	
year	day	time	day	time	day	time	day	time
2010	20	17:32	21	11:28	23	03:09	21	23:38
2011	20	23:21	21	17:16	23	09:04	22	05:30
2012	20	05:14	20	23:09	22	14:49	21	11:12
2013	20	11:02	21	05:04	22	20:44	21	17:11
2014	20	16:57	21	10:51	23	02:29	21	23:03
2015	20	22:45	21	16:38	23	08:20	22	04:48
2016	20	04:30	20	22:34	22	14:21	21	10:44
2017	20	10:28	21	04:24	22	20:02	21	16:28
2018	20	16:15	21	10:07	23	01:54	21	22:23
2019	20	21:58	21	15:54	23	07:50	22	04:19
2020	20	03:50	20	21:44	22	13:31	21	10:02

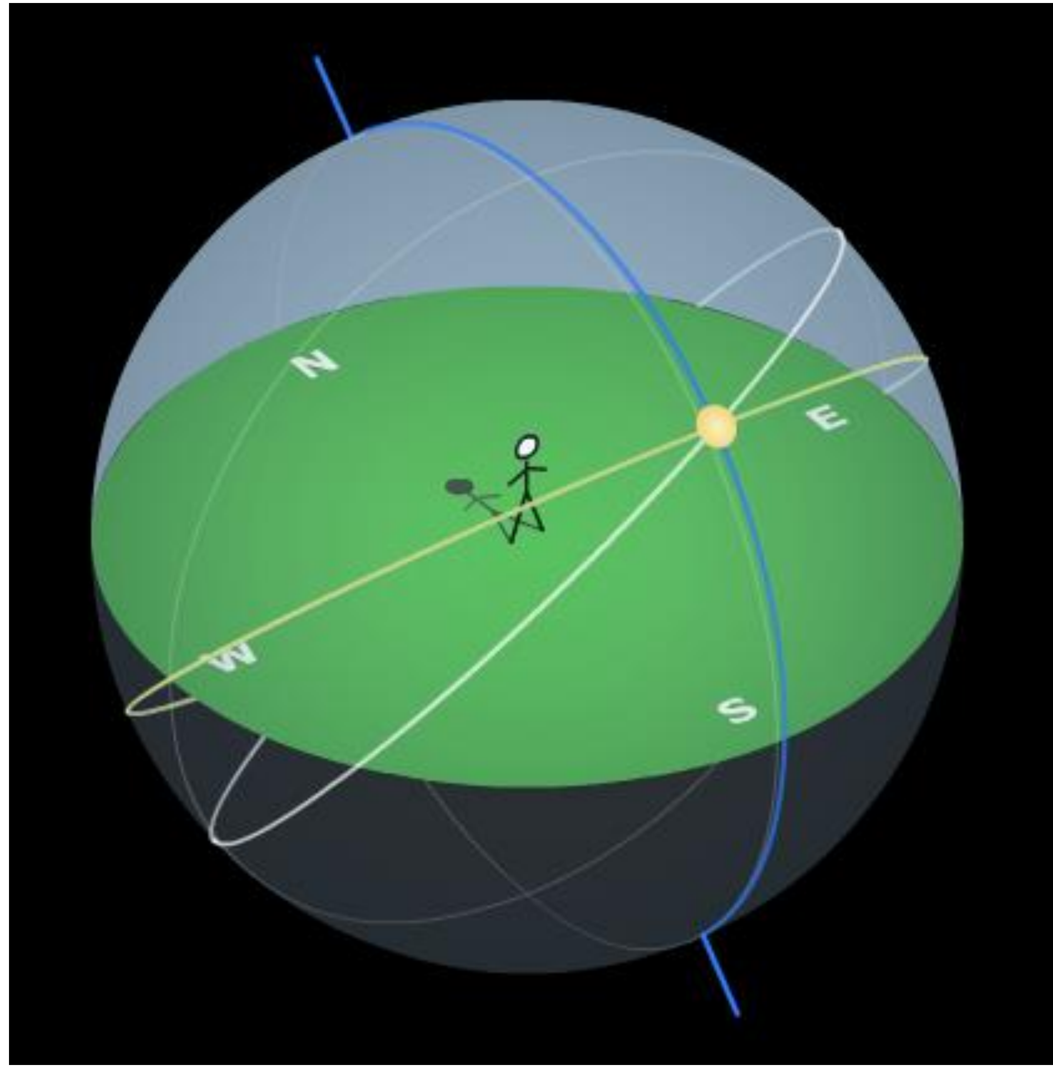


MILAN LATITUDE 45.4° N –

21,3°

SOLAR PATH

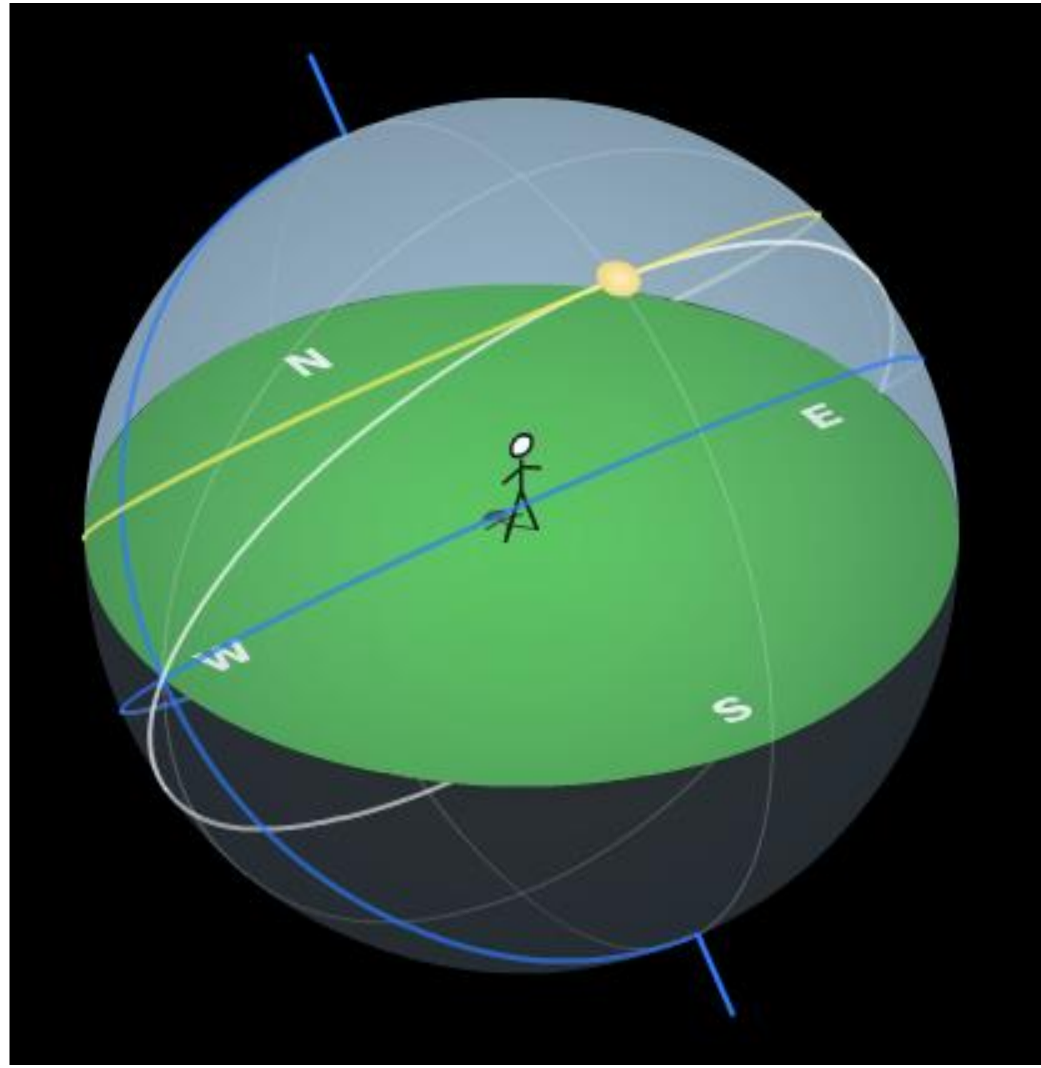
UT date and time of equinoxes and solstices on Earth[1]								
event	equinox		solstice		equinox		solstice	
month	March		June		September		December	
year	day	time	day	time	day	time	day	time
2010	20	17:32	21	11:28	23	03:09	21	23:38
2011	20	23:21	21	17:16	23	09:04	22	05:30
2012	20	05:14	20	23:09	22	14:49	21	11:12
2013	20	11:02	21	05:04	22	20:44	21	17:11
2014	20	16:57	21	10:51	23	02:29	21	23:03
2015	20	22:45	21	16:38	23	08:20	22	04:48
2016	20	04:30	20	22:34	22	14:21	21	10:44
2017	20	10:28	21	04:24	22	20:02	21	16:28
2018	20	16:15	21	10:07	23	01:54	21	22:23
2019	20	21:58	21	15:54	23	07:50	22	04:19
2020	20	03:50	20	21:44	22	13:31	21	10:02



MILAN LATITUDE 45.4° N – 44,6°

SOLAR PATH

UT date and time of equinoxes and solstices on Earth[1]								
event	equinox		solstice		equinox		solstice	
month	March		June		September		December	
year	day	time	day	time	day	time	day	time
2010	20	17:32	21	11:28	23	03:09	21	23:38
2011	20	23:21	21	17:16	23	09:04	22	05:30
2012	20	05:14	20	23:09	22	14:49	21	11:12
2013	20	11:02	21	05:04	22	20:44	21	17:11
2014	20	16:57	21	10:51	23	02:29	21	23:03
2015	20	22:45	21	16:38	23	08:20	22	04:48
2016	20	04:30	20	22:34	22	14:21	21	10:44
2017	20	10:28	21	04:24	22	20:02	21	16:28
2018	20	16:15	21	10:07	23	01:54	21	22:23
2019	20	21:58	21	15:54	23	07:50	22	04:19
2020	20	03:50	20	21:44	22	13:31	21	10:02



MILAN LATITUDE 45.4° N – 67,9°

http://astro.unl.edu/naap/motion3/animations/sunmotions.html

LIFE STYLE

ITALIAN CLIMATE

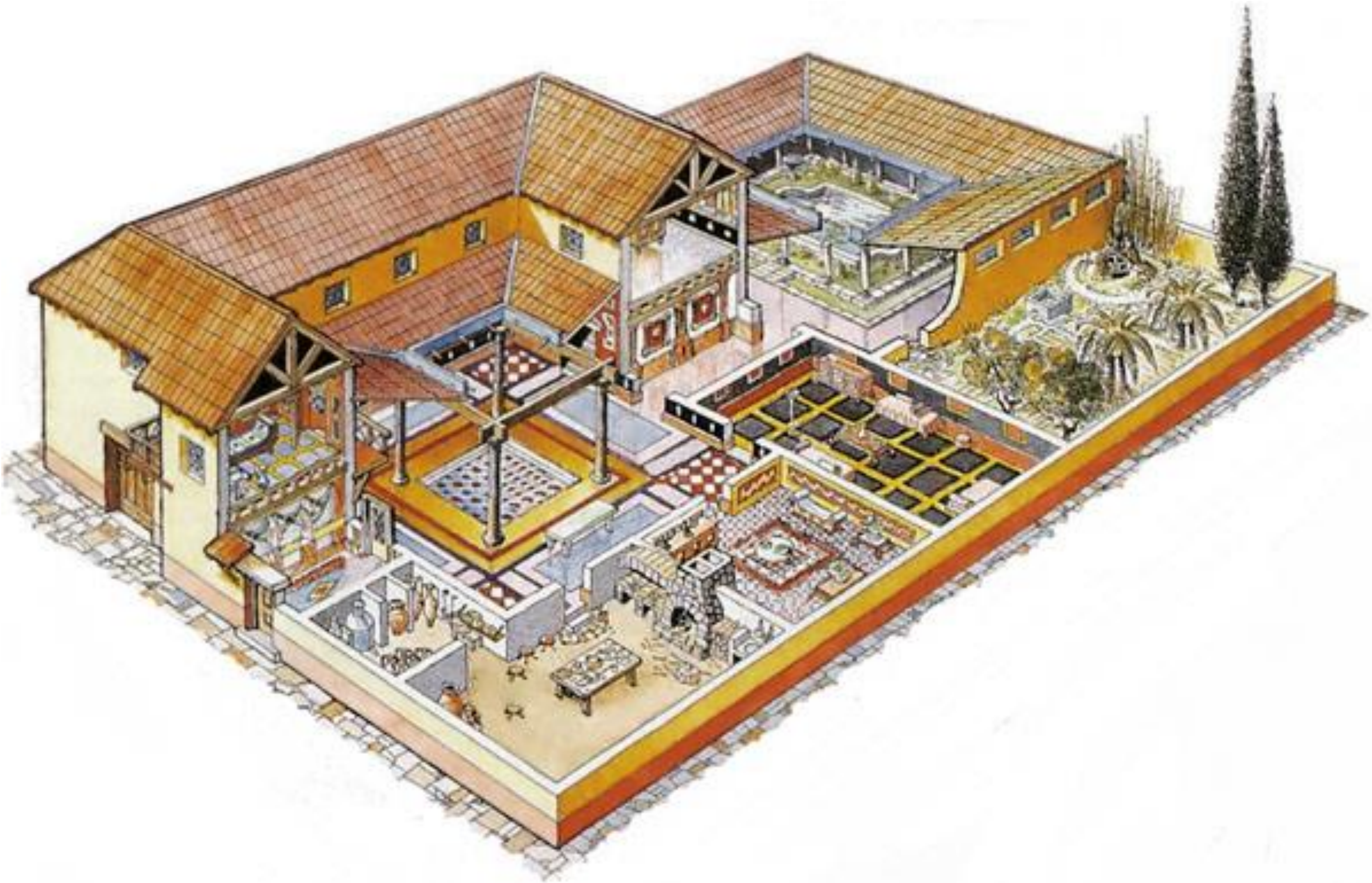
RURAL HOUSE

RURAL HOUSE

RURAL HOUSE

VERNACULAR ARCHITECTURE

MEDITERRANEAN HOUSE



ITALIAN CLIMATE

VERNACULAR ARCHITECTURE

MEDITERRANEAN HOUSE

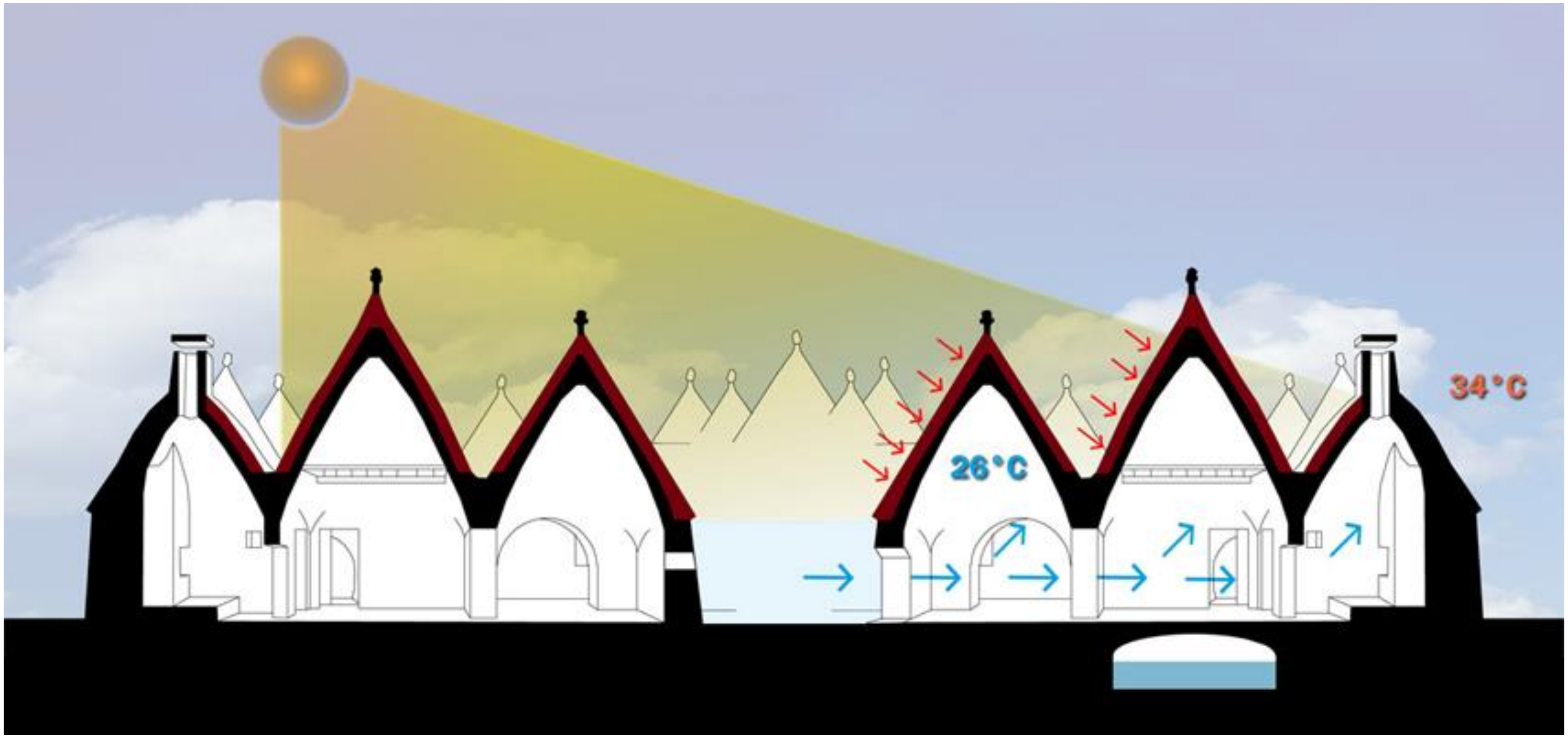
ITALIAN CLIMATE

VERNACULAR ARCHITECTURE

TRULLI OF ALBEROBELLO

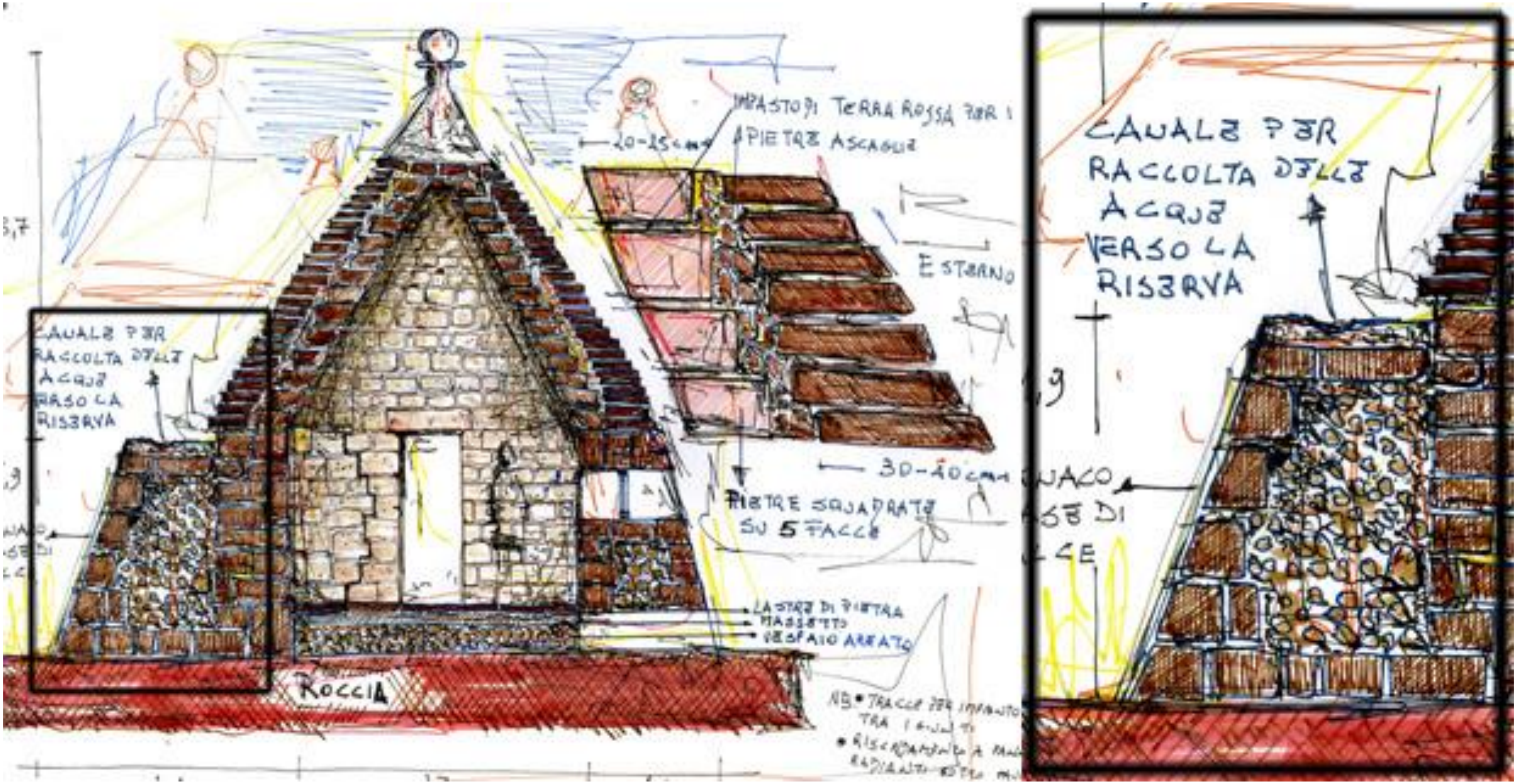
ITALIAN CLIMATE

MEDITERRANEAN HOUSE



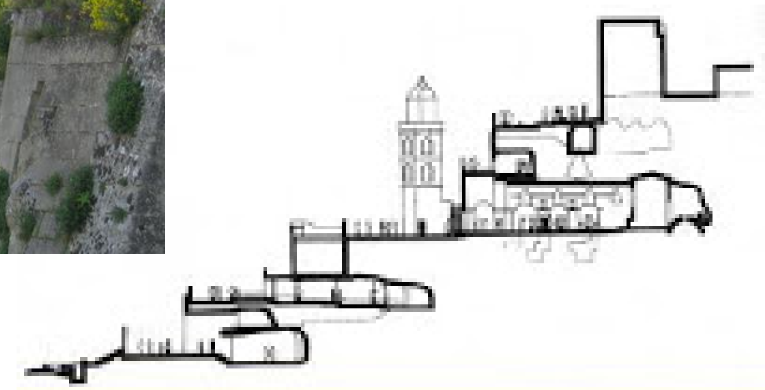
VERNACULAR ARCHITECTURE

MEDITERRANEAN HOUSE



ITALIAN CLIMATE

CAVE ARCHITECTURE – MATERA CITY



MILAN BASED ITALIAN ATELIER

STEFANO BOERI

BOSCO VERTICALE

SOLAR DECATHLON

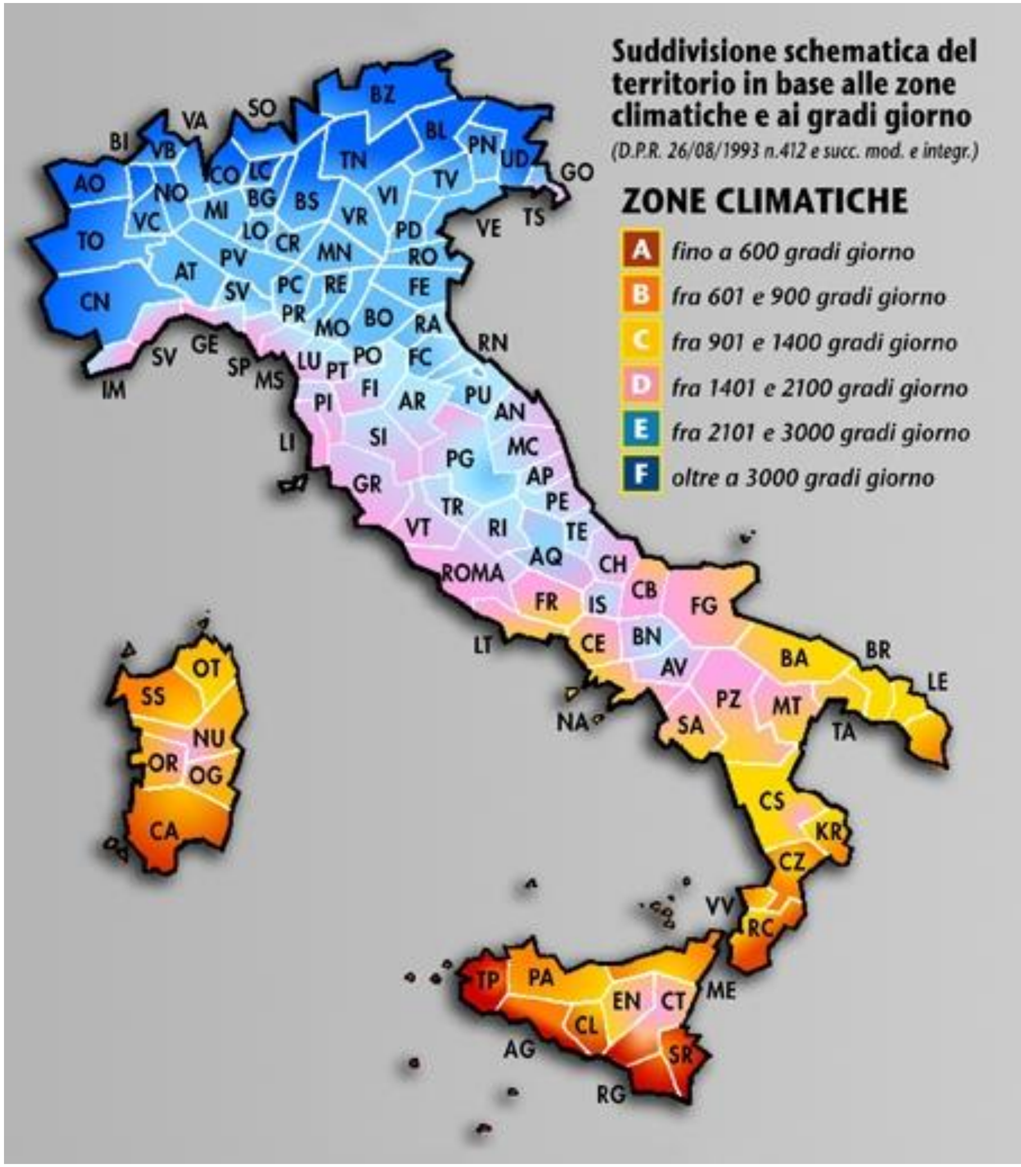
RHOME FOR DENCITY WINNER OF SOLAR DECATHLON EUROPE 2014

CONTEMPORARY ARCHITECTURE

MARIO CUCINELLA

SUSTAINABLE ITALIAN FIRM

ITALIAN CLIMATE



ITALIAN CLIMATE

Climate Zones

CDD: Cooling Degree Days
HDD: Heating Degree Days

	CDD	HDD
Climate zone A	Not available	< 600
Climate zone B	Not available	601-900
Climate zone C	Not available	901-1400
Climate zone D	Not available	1401-2100
Climate zone E	Not available	2101-3000
Climate zone F	Not available	> 3000

Energy Requirements

Total energy consumption

Energy performance requirements for heating, air-conditioning

(kWh/m²/year)	Floor area to volume ratio < 0.2	Floor area to volume ratio > 0.9
Climate zone A	8.5	36
Climate zone B	12.8	48
Climate zone C	21.3	68
Climate zone D	34	88
Climate zone E	46.8	116
Climate zone F	46.8	116

End-uses considered

Heating, Hot water

Thermal comfort

Temperature 20°C for heating (+ 2°C), 26°C for cooling
Relative humidity 50%

End-uses considered

Heating, Hot water

Thermal comfort

Temperature 20°C for heating (+ 2°C), 26°C for cooling
Relative humidity 50%

Insulation

U-Values (W/m².K)	Floor	Roof	Walls	Windows
Climate zone A	0.65	0.38	0.62	4.6
Climate zone B	0.49	0.38	0.48	3
Climate zone C	0.42	0.38	0.4	2.6
Climate zone D	0.36	0.32	0.36	2.4
Climate zone E	0.33	0.3	0.34	2.2
Climate zone F	0.32	0.29	0.33	2

Airtightness: Not available

HVAC: Not available

Hot water: Not available

Lighting: Not available

Skylights: Not available

Windows: Not available

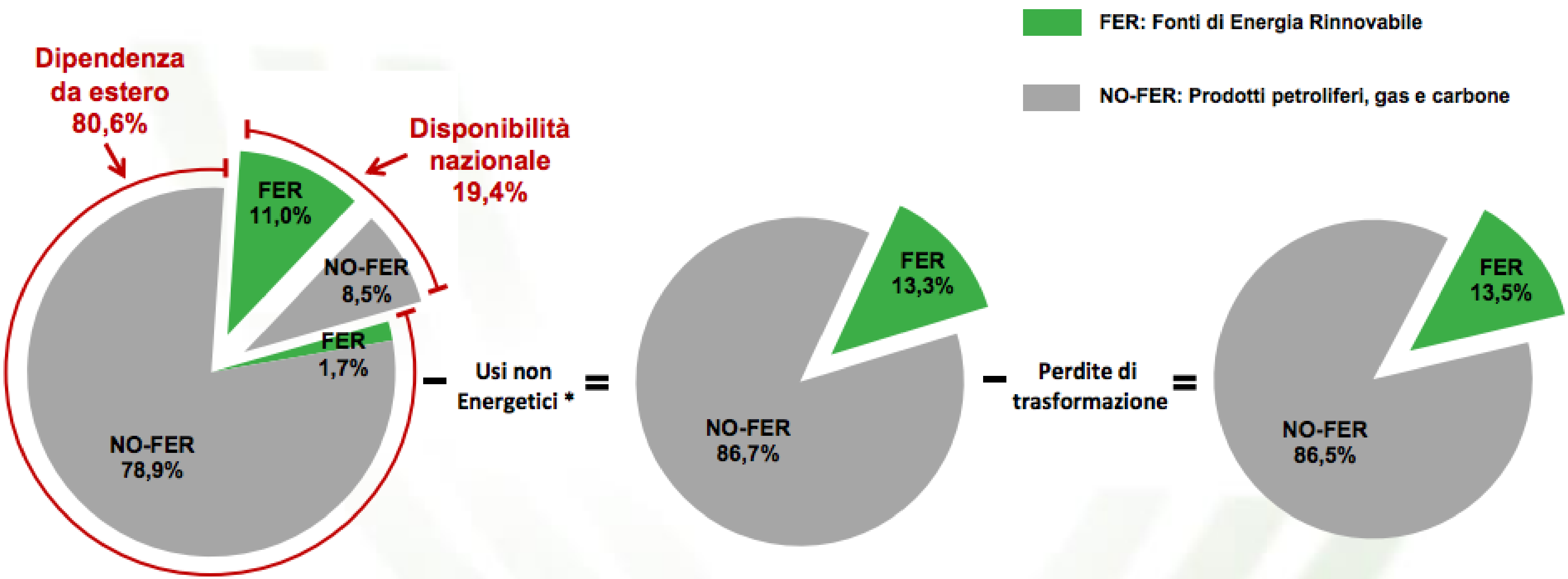
Renewable energy: Solar thermal energy or other renewable for water heating

ENERGY CLASSIFICATION

End-uses Considered	Heating, Hot water, Lighting
Energy Rating	An efficiency scale based on primary energy. Calculated for whole energy performance and single end uses. EPi = energy performance for heating only. L = region

Class	
A	≤ 0.50 EPiL + 9 kWh/m^2.year
A+	≤ 0.25 EPiL + 9 kWh/m^2.year
B	≤ 0.75 EPiL + 12 kWh/m^2.year
C	≤ 1.00 EPiL + 18 kWh/m^2.year
D	≤ 1.25 EPiL + 21 kWh/m^2.year
E	≤ 1.75 EPiL + 24 kWh/m^2.year
F	≤ 2.50 EPiL + 30kWh/m^2.year
G	> 2.50 EPiL + 30 kWh/m^2.year

ENERGY DATA



163 Mtep
Consumo interno lordo

Fabbisogno complessivo nazionale di prodotti energetici

155 Mtep
Consumo interno di energia primaria

Grandezza di riferimento per la Direttiva «Efficienza energetica» (2012/27)

124 Mtep
Consumo finale lordo

Grandezza di riferimento per la Direttiva «Fonti Rinnovabili» (2009/28/CE)

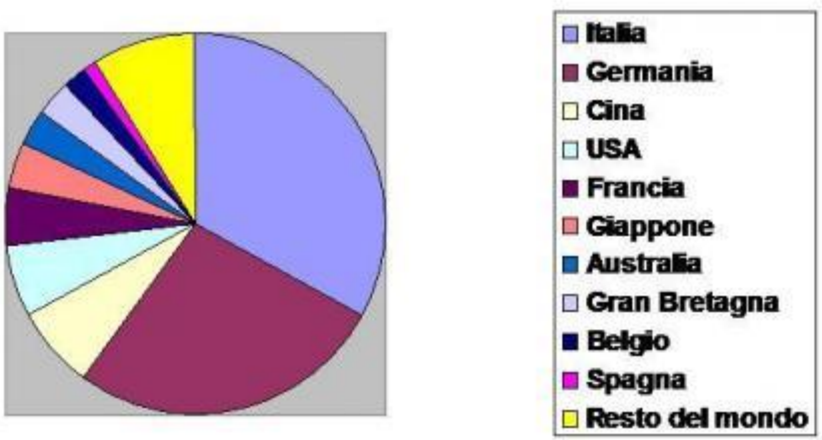
Costo elettricità per clienti residenziali per diversi scaglioni di consumo annuo (€cent/kWh)

scaglioni di consumo annuo	600 kwh/anno		1200 kwh/anno		3500 kwh/anno		7500 kwh/anno	
paesi	lordo imposte	netto imposte	lordo imposte	netto imposte	lordo imposte	netto imposte	lordo imposte	netto imposte
Austria	19.4	14.0	16.6	11.8	13.9	9.5	13.1	8.8
Belgio	21.2	16.7	18.1	14.1	14.3	11.0	13.7	10.5
Danimarca	34.1	18.4	27.5	13.1	23.2	9.6	21.9	8.6
Finlandia	19.3	15.0	13.6	10.4	10.4	7.8	8.7	6.4
Francia	16.7	12.8	14.8	11.1	11.9	9.1	11.6	8.8
Germania	27.8	21.9	22.5	17.4	18.0	13.5	16.7	12.4
Grecia	8.7	8.0	8.1	7.5	6.9	6.4	7.9	7.2
Irlanda	32.3	24.5	23.1	18.3	14.4	12.0	12.9	11.0
Italia	**10.0**	**8.2**	**10.3**	**8.6**	**20.1**	**15.1**	**19.0**	**14.1**
Lussemburgo	27.9	25.3	20.6	18.4	15.0	13.1	13.6	11.8
Norvegia	54.9	42.6	31.6	24.0	16.3	11.8	12.1	8.4
Paesi Bassi	22.9	21.5	20.9	15.2	19.6	11.1	19.3	9.9
Portogallo	14.3	13.5	16.2	15.4	13.8	13.1	12.3	11.7
Regno Unito	13.3	12.7	12.0	11.5	9.3	8.8	9.3	8.9
Spagna	10.0	11.5	14.0	11.5	11.0	9.0	10.1	8.3
Svezia	28.8	20.5	19.5	13.0	13.3	8.1	12.3	7.3
media europea ponderata	**20.9**	**16.7**	**17.0**	**13.3**	**14.1**	**10.6**	**13.2**	**9.0**
Italia: scostamento dalla media	*-52.4%*	*-50.7%*	*-39.3%*	*-35.6%*	*42.5%*	*42.0%*	*43.7%*	*42.9%*

Elaborazione AEEG su dati Eurostat (Enea 2007)

Net cost of energy 165,8 €/MWh (1place). Normal 120 €/MWh

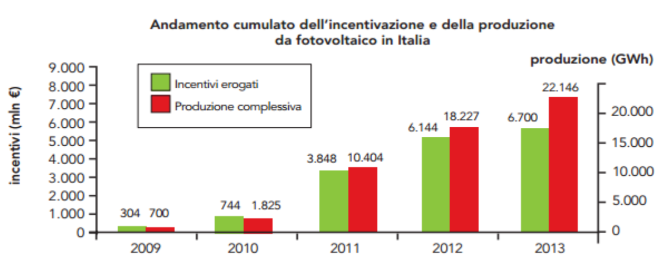
PV INSTALLED IN 2011



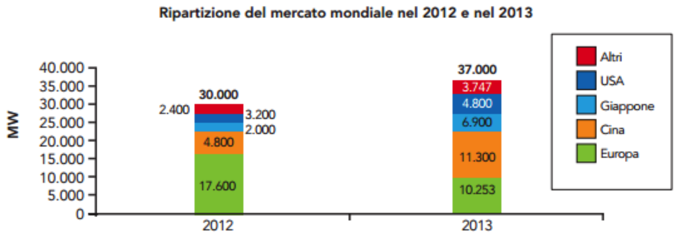
N1 PV INSTALLED IN 2011
N2 PV IONSTALLED IN 2012
(AFTER GERMANY)

STATE POLICY THAT PAYS A PART OF YOUR INSTALLED SYSTEM

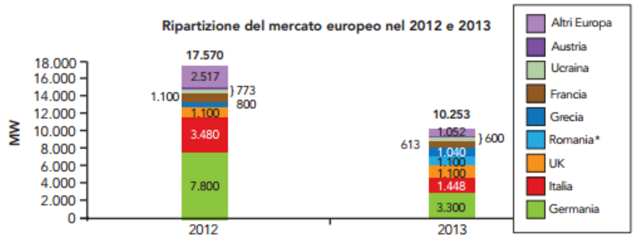
Il costo dell'incentivazione al fotovoltaico in Italia



Il mercato mondiale nel 2013

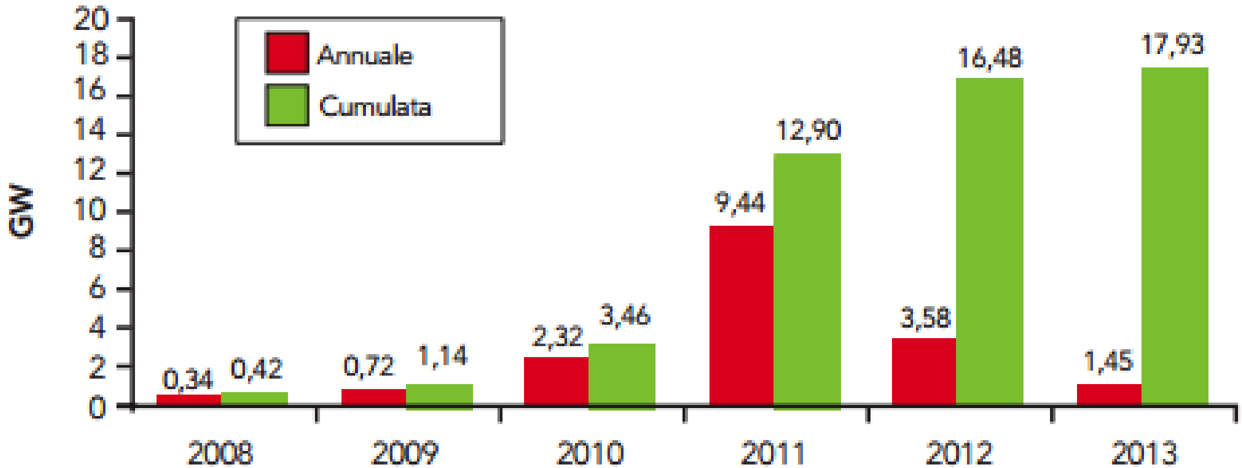


Il mercato europeo nel 2013



Il mercato italiano

Andamento della potenza entrata in esercizio in Italia tra il 2008 e il 2013



THANK YOU

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Seoul, Korea

November, 4, 2014

Hyun Bae Kim

Contents

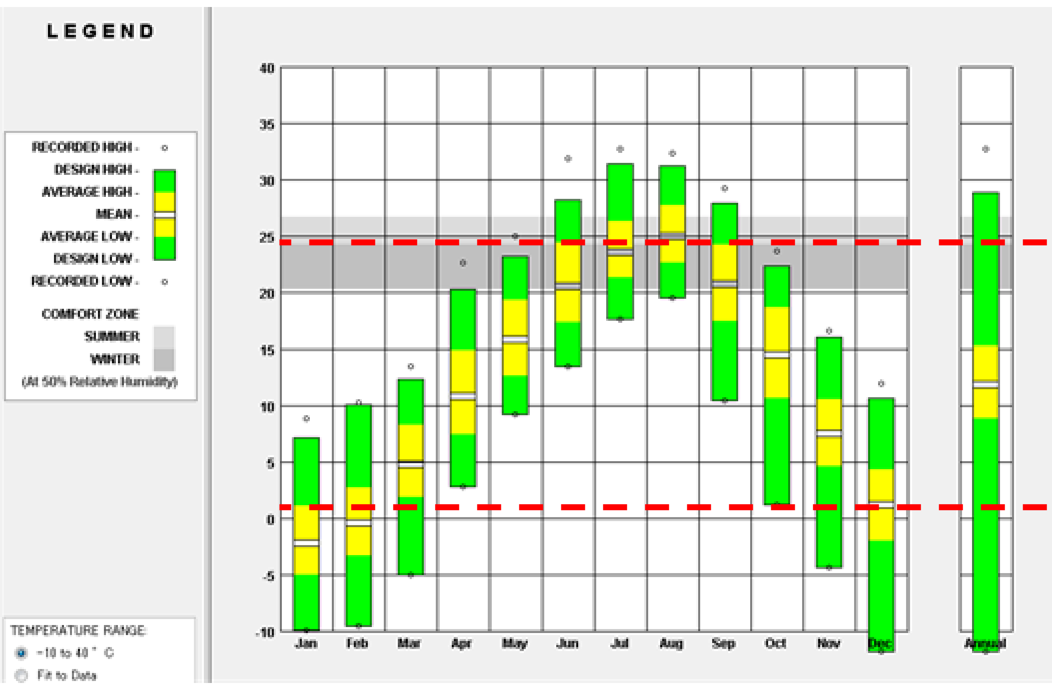
- **Analysis of weather in Seoul**
- **Heating system of Korea**
- **Energy consumption of Korea**
- **Building energy policy of Korea**
- **Status of Photovoltaics**

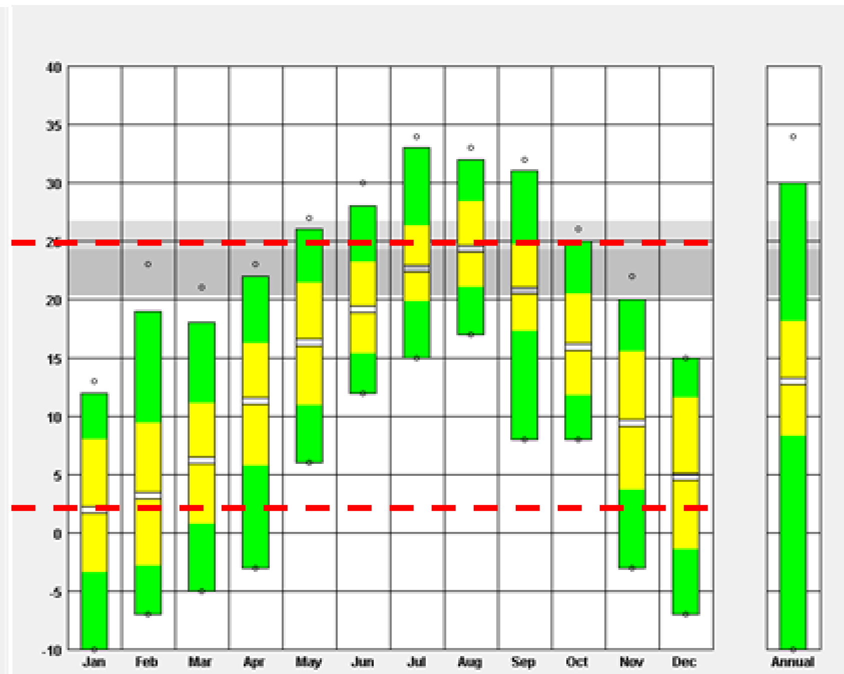
Seoul, Korea


China
Russia
North
Korea
South
Korea
SEOUL
East
Sea
West
Sea
Korea
Bay
Japan
P'YONGYANG
Pusan
Taegu
Inch'on
Wonsan
Hamhung
Kaesong
Kwangju
Cheju
Vladivostok
Shenyang
Dandong

Analysis of weather in Seoul

- **Seoul**
- **Tokyo**

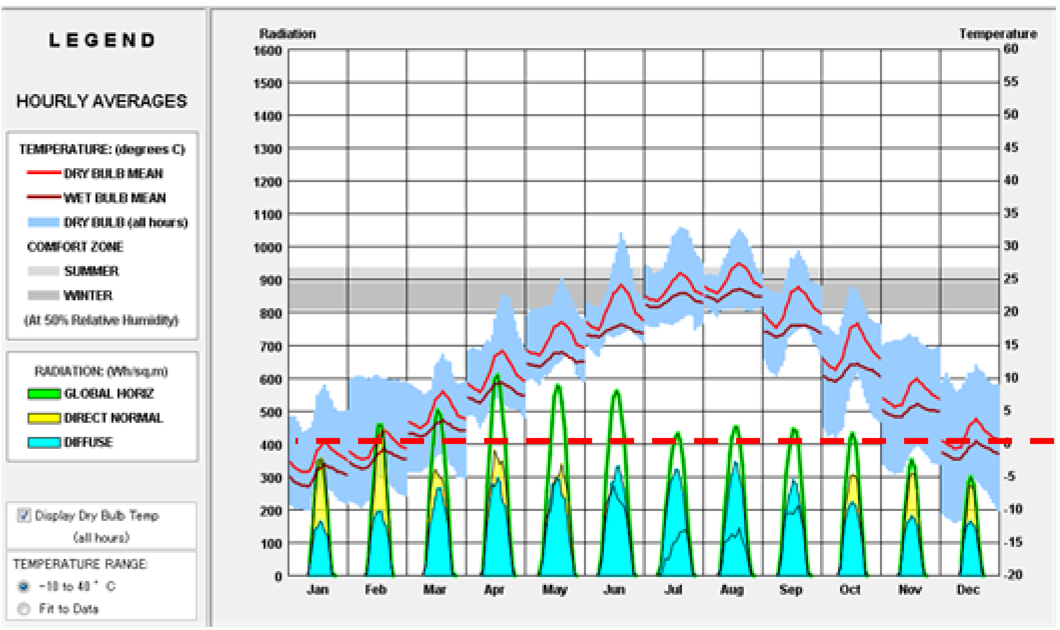


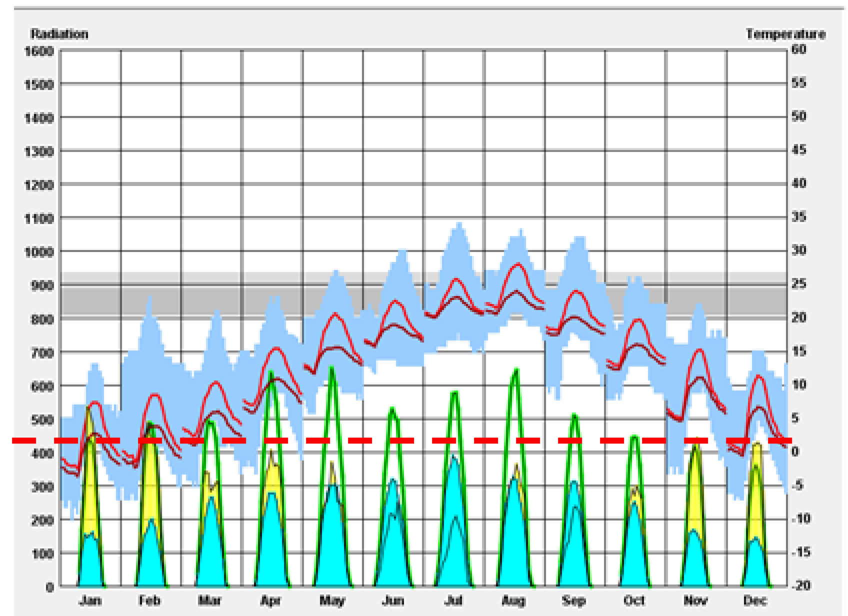


Relative Humidity (Avg Monthly)	46	61	65	69	72	73	86	83	72	66	67	59	percent
Relative Humidity (Avg Monthly)	64	67	68	72	81	88	91	83	84	84	82	75	percent

- Seoul and Tokyo are very similar to the annual mean temperature. But winter season Seoul`s temperature is lower than Tokyo.
- Tokyo is much more high humidity than Seoul all seasons. It means sensible temperature is higher.

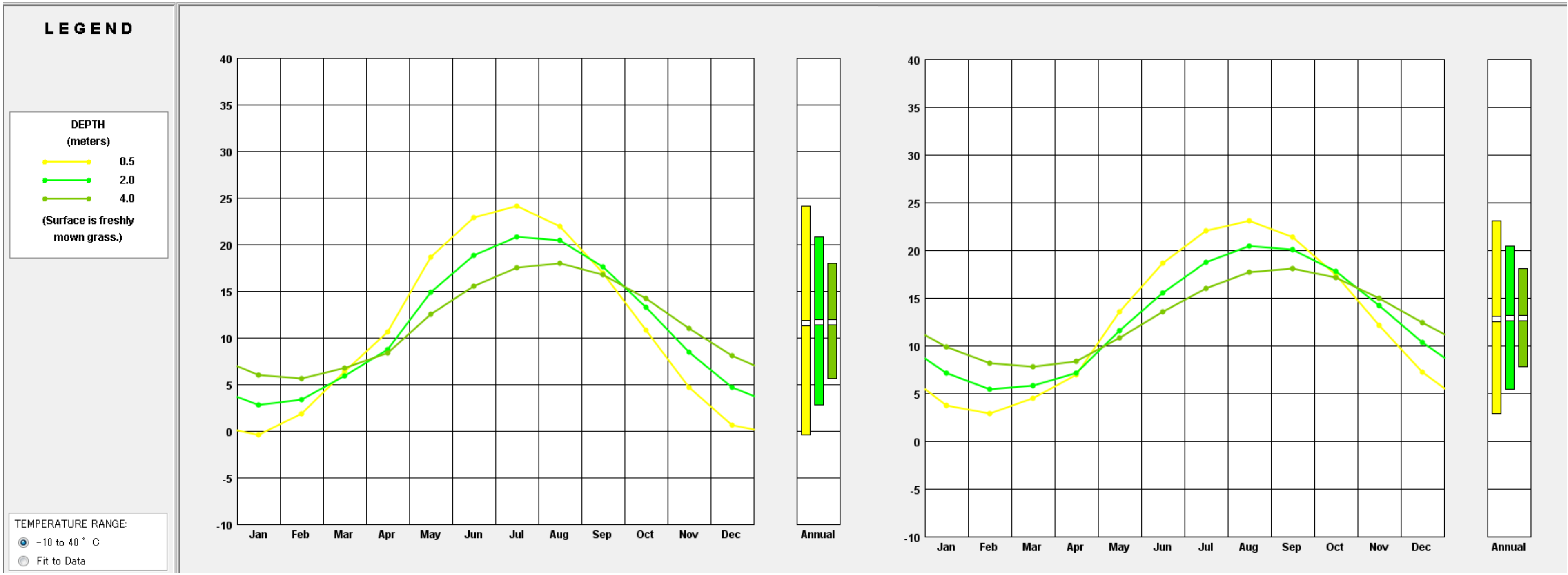
- **Seoul**
- **Tokyo**





- Tokyo is high solar radiation than Seoul winter seasons. It means easy to using solar energy when heating in winter season.

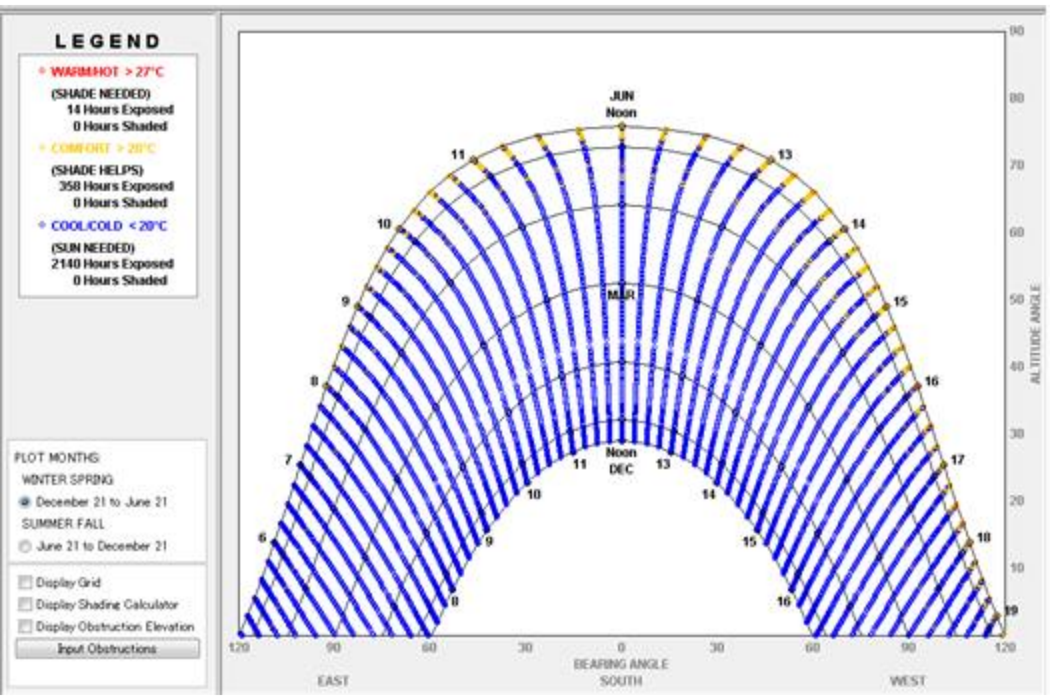
- **Seoul**
- **Tokyo**

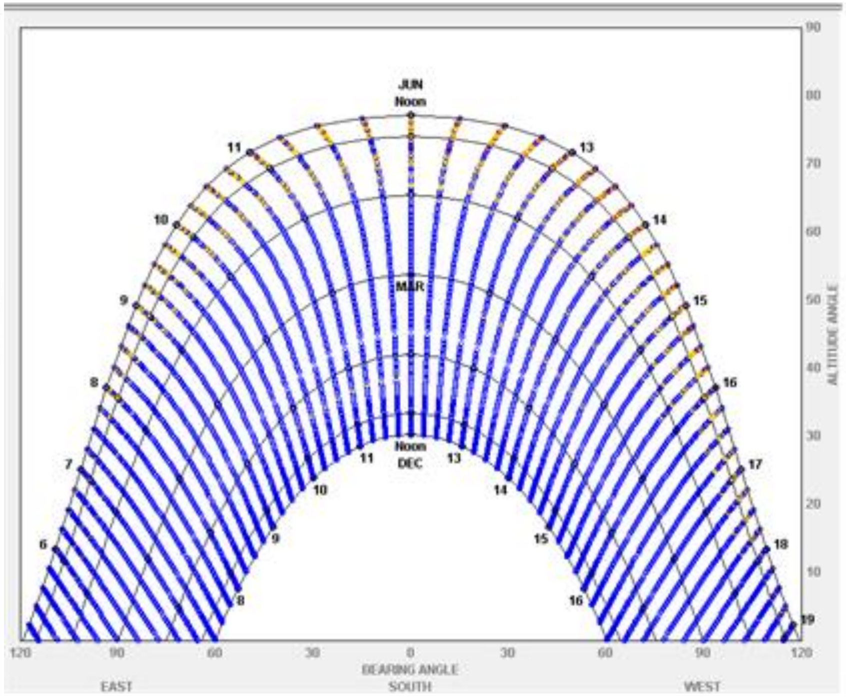


- Ground temperature is similar to Seoul and Tokyo which is based on air temperature.

- **Seoul**

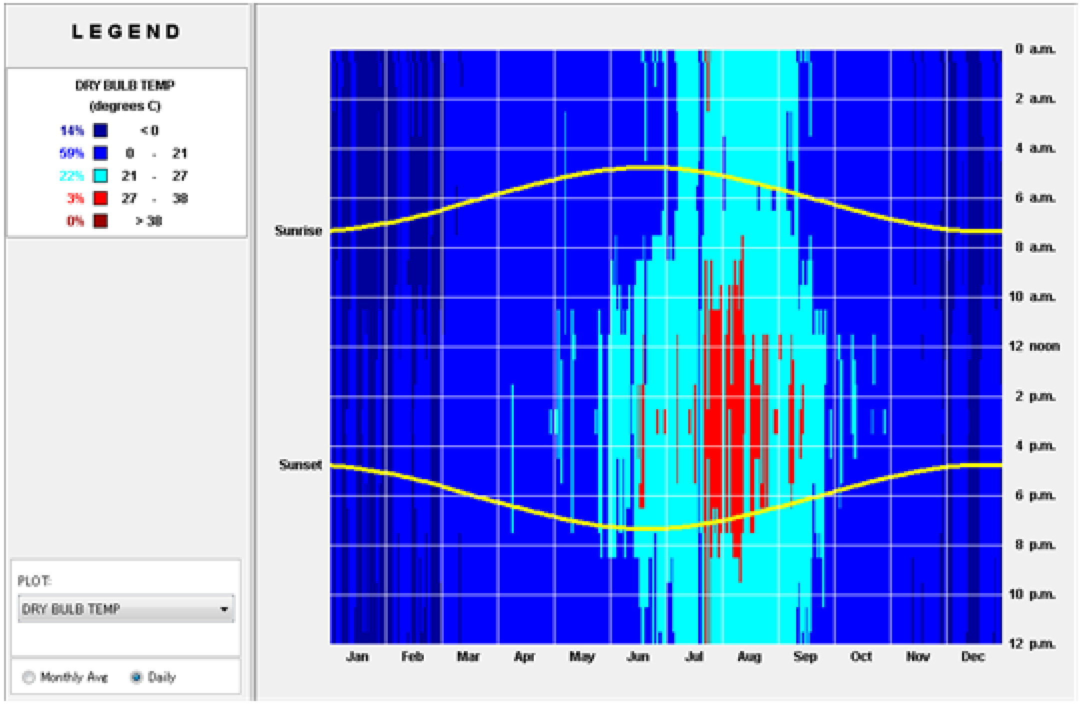
- **Tokyo**

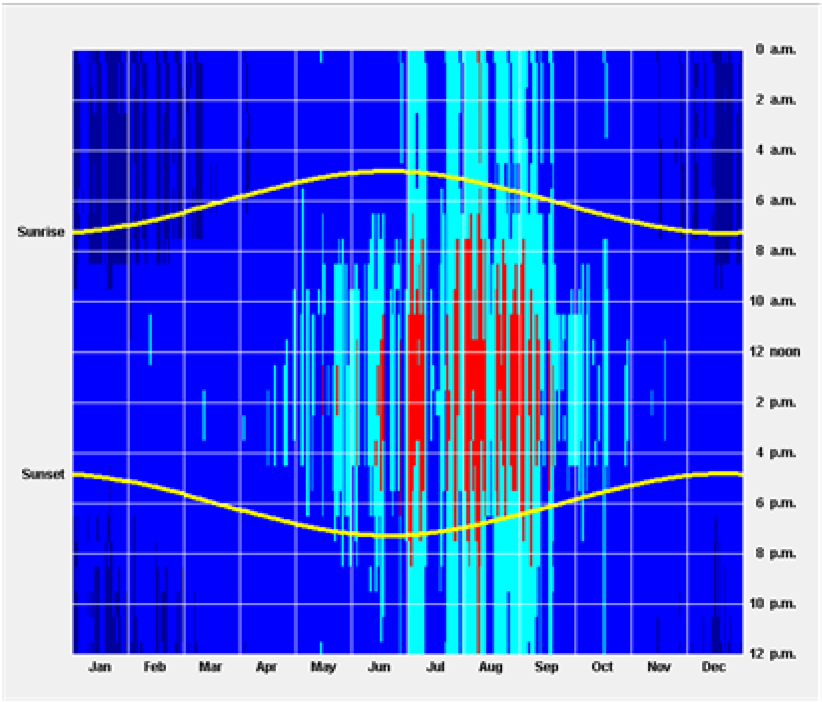




- Seoul and Tokyo are located similar latitude. Therefore, similar to the movement of the sun.

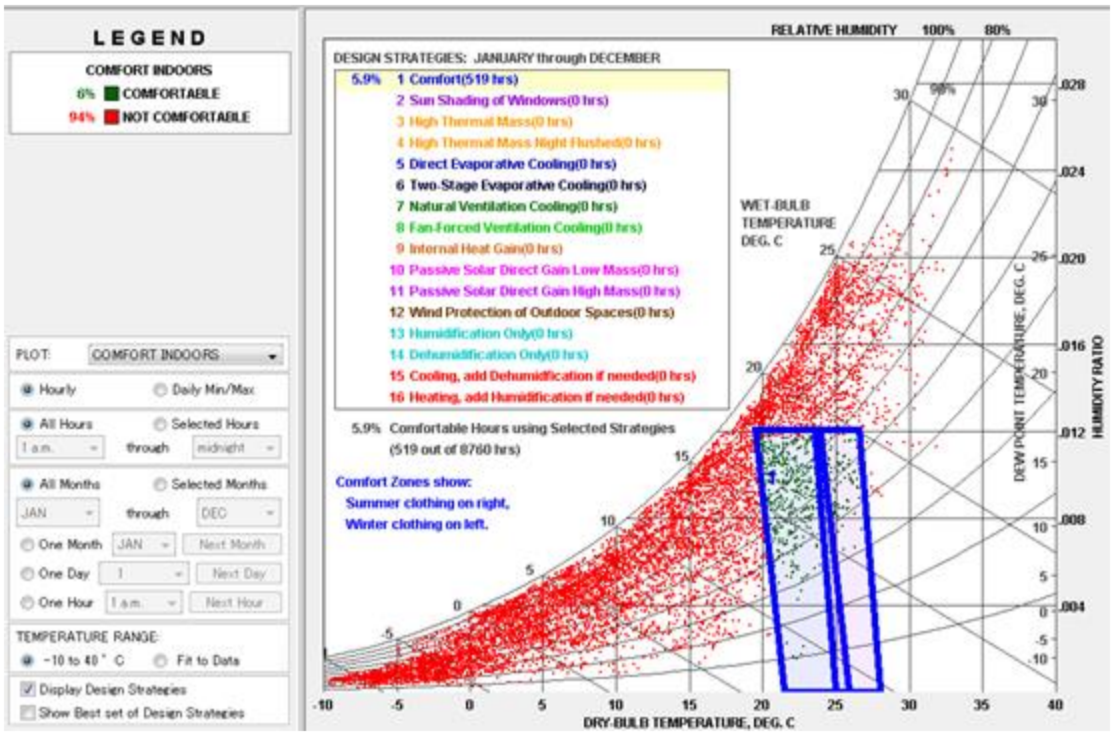
- **Seoul**
- **Tokyo**

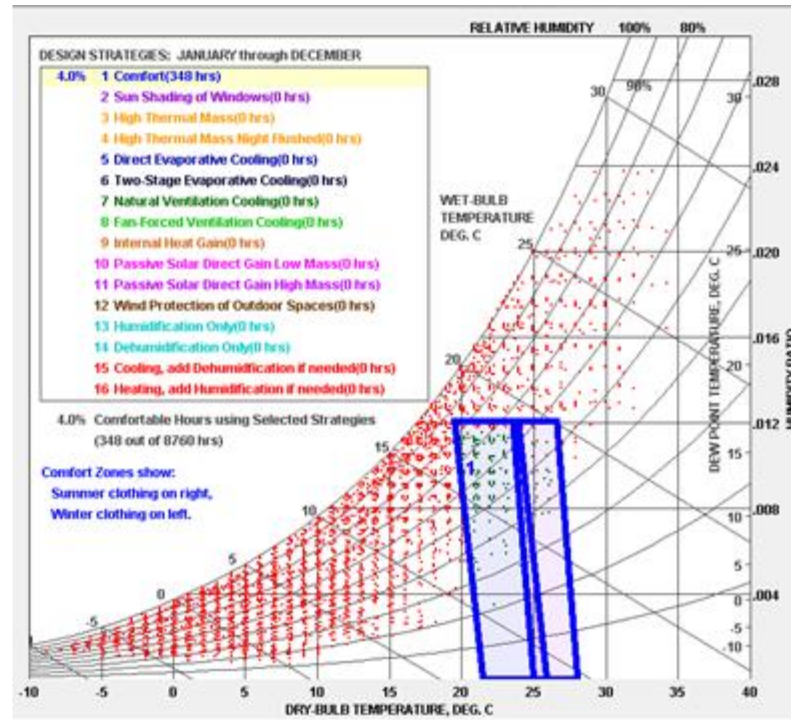




- Seoul is longer below zero time in winter season .
- Tokyo is longer over 27 ° temperature in summer season.

- **Seoul**
- **Tokyo**





- Left graph shows consideration of heating is needed in winter season.
- Right graph shows consideration of dehumidification is needed in summer season.

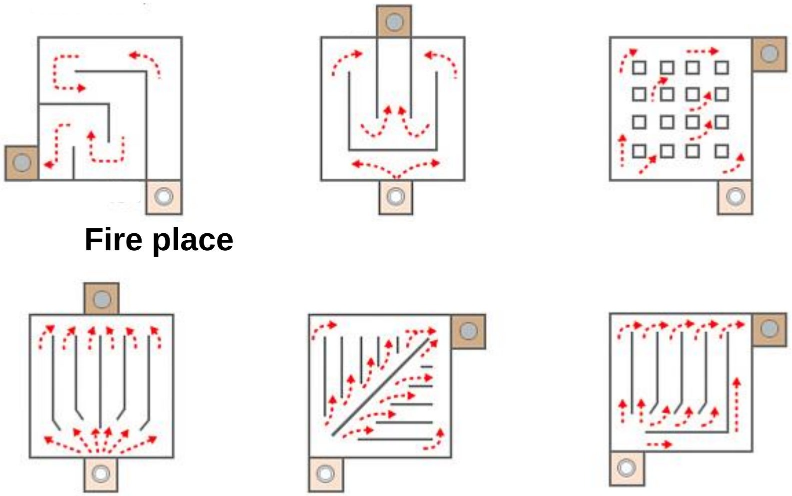
Traditional house

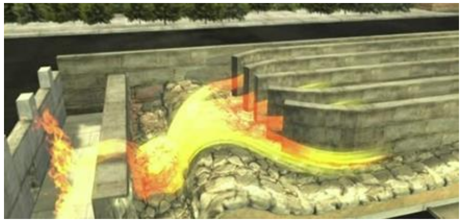



- Appearance of traditional houses

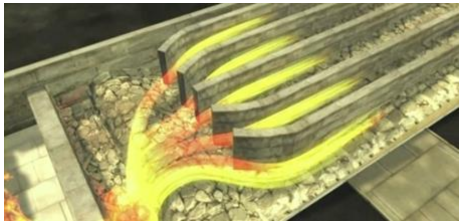
Heating system of Korea

- **Traditional floor heating system**





Convection



Bernoulli's principle

현대

Modern

- **Diffusion ratio of house 102%, Apartment is 59%, more than half**

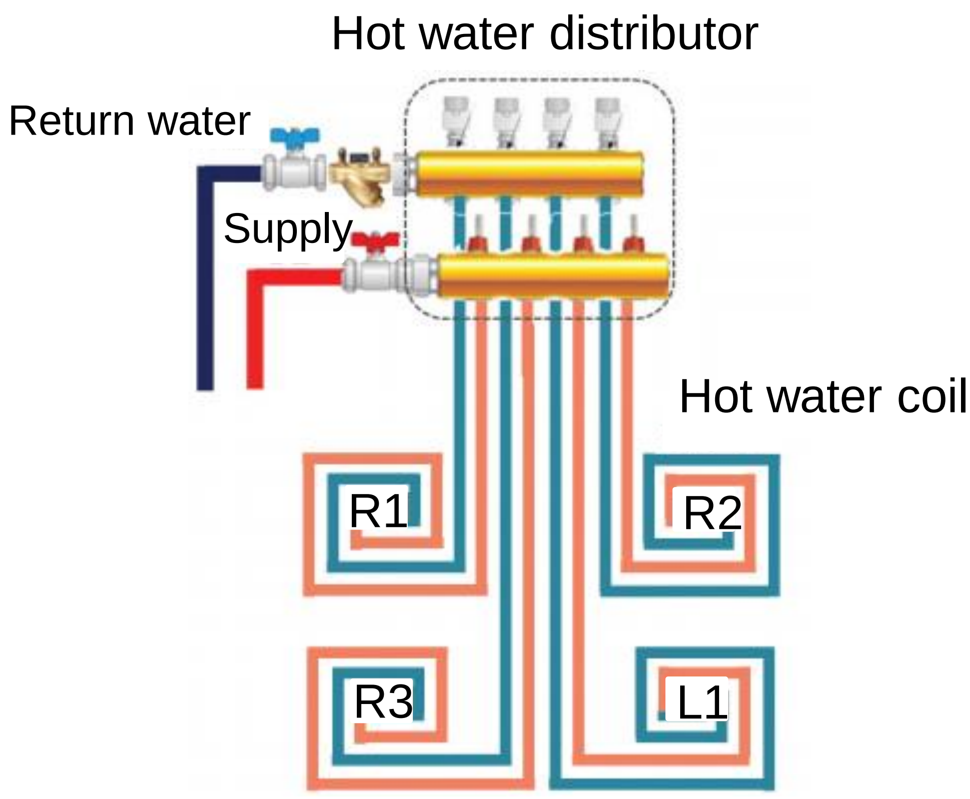
1950,60s

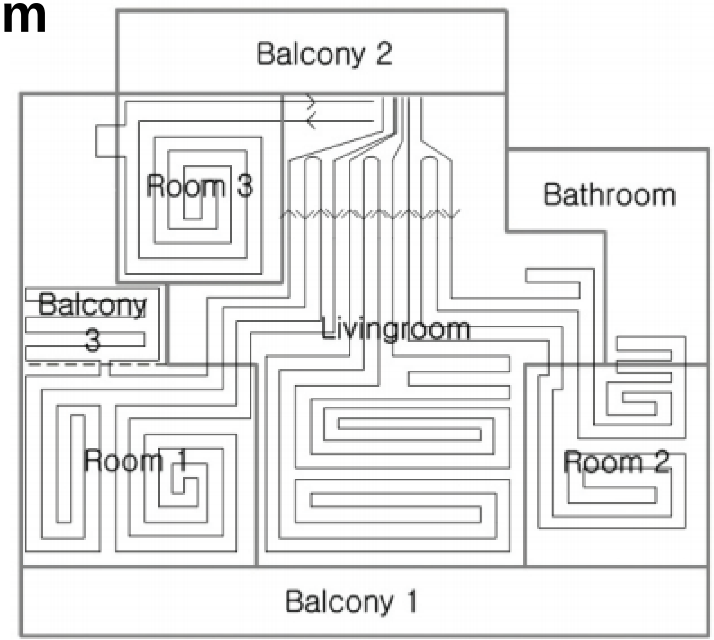
1970s

1980,90s

2000s

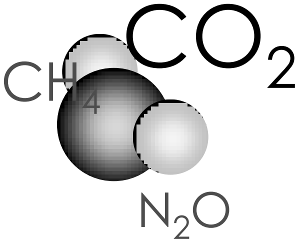
- **Contemporary floor heating system**



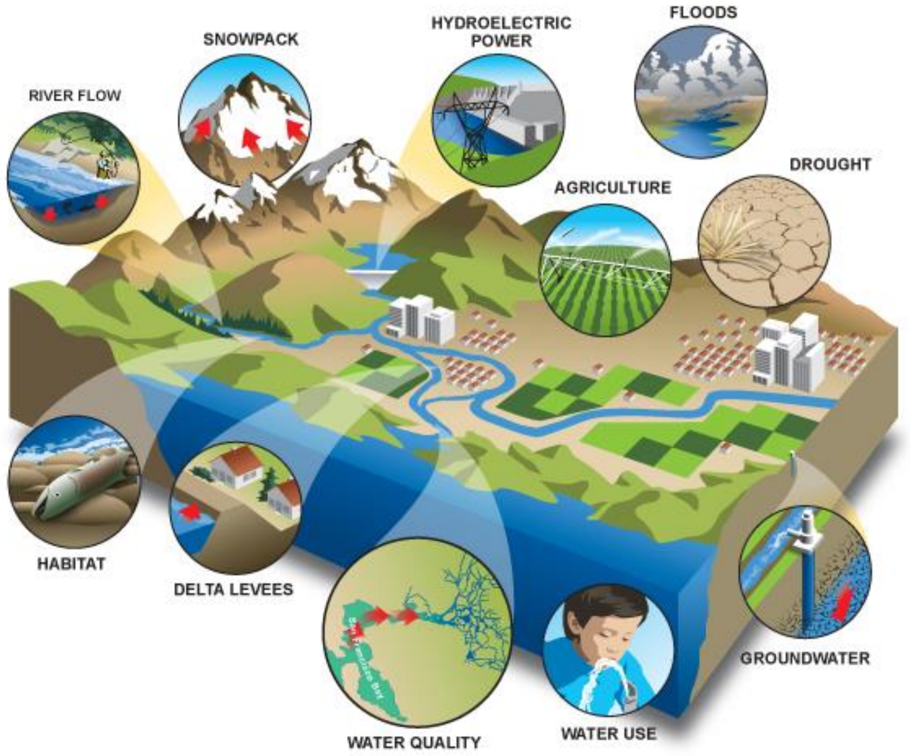


Energy consumption of Korea

Global warming

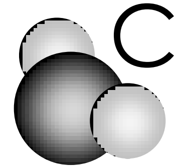


Climate change



Climate Change Convention

Kyoto Protocol, 1997



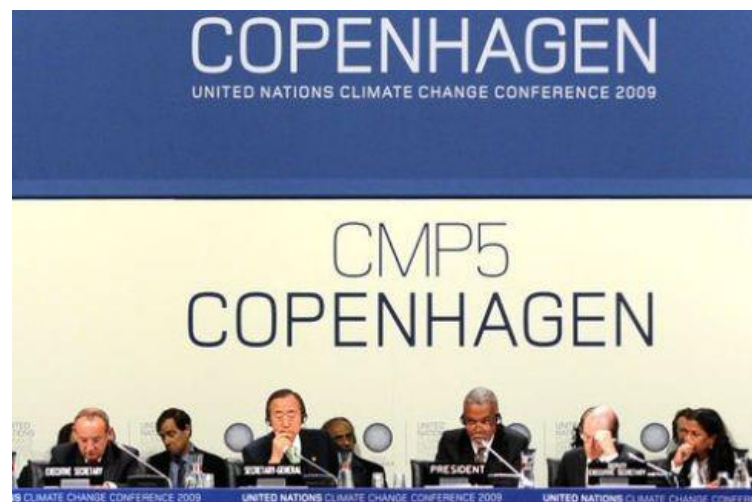
CO_2 ⬇

vs

Pre-industrialization todays

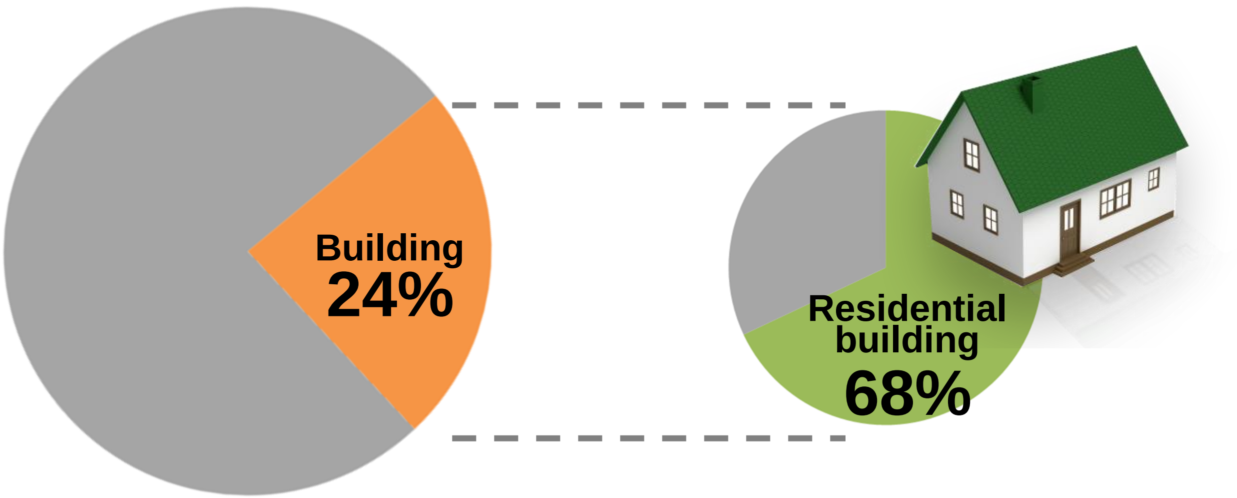
Temperature increase

$\Delta T<2℃$



Copenhagen Accord, 2009

Energy consumption

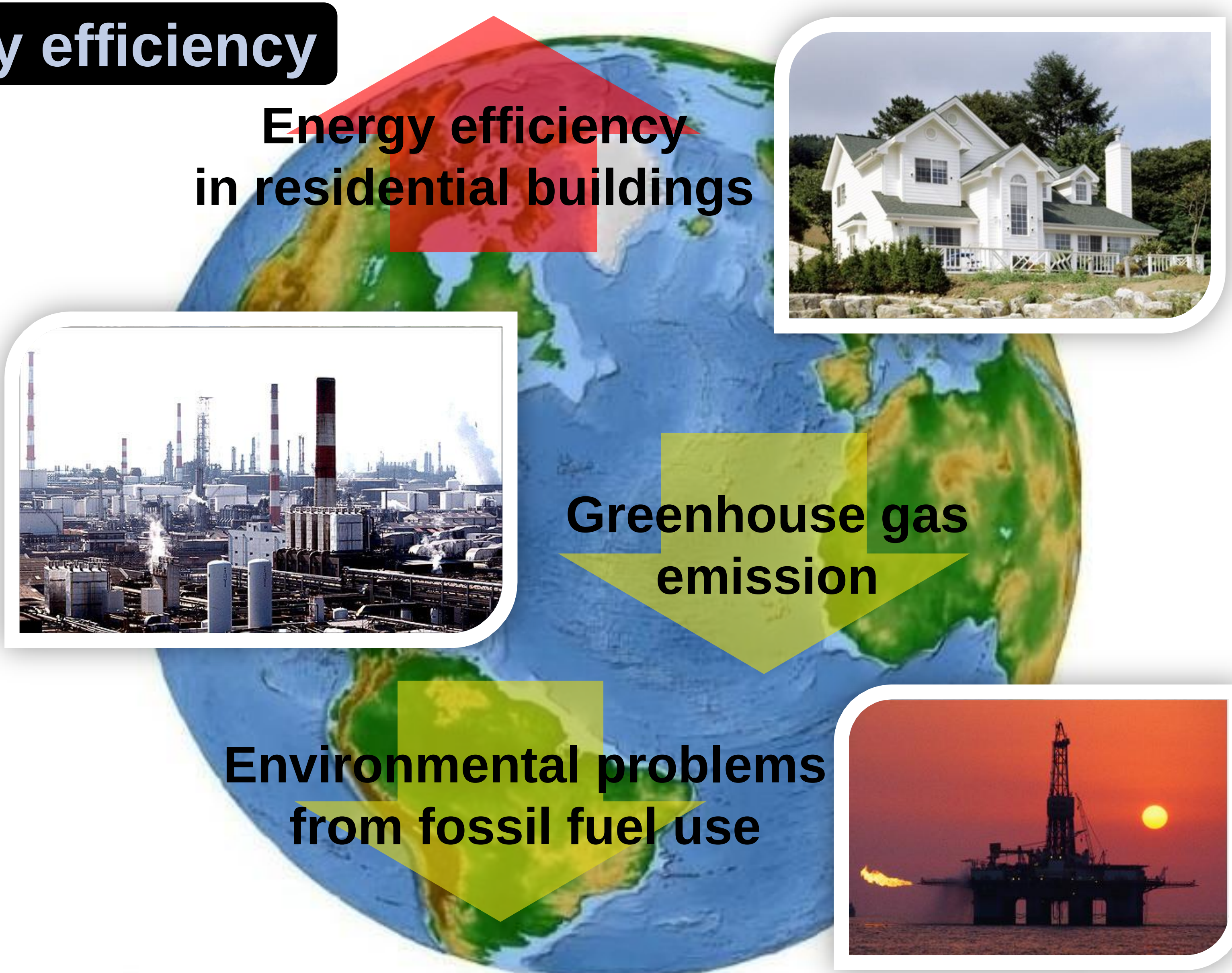


Energy consumption in Korea

Energy consumption in buildings

The energy consumption statistics in 2005
from KEMC(Korea Energy Management Corporation)

Energy efficiency



Building energy policy of Korea

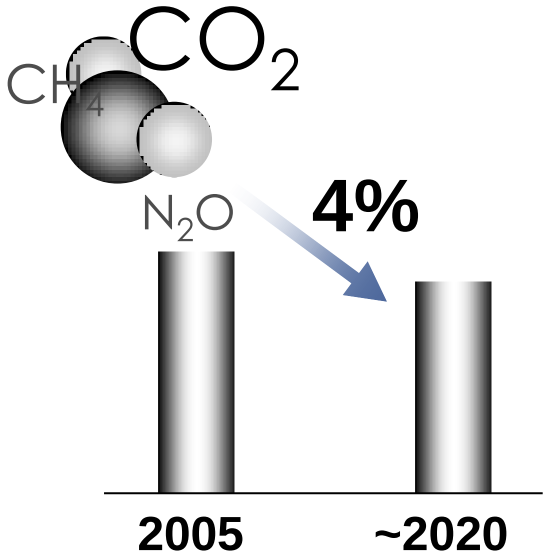
Energy using and CO2

Energy using
World10th

CO2
World 9th

The International Energy Agency
(IEA, 2002)

Korean government

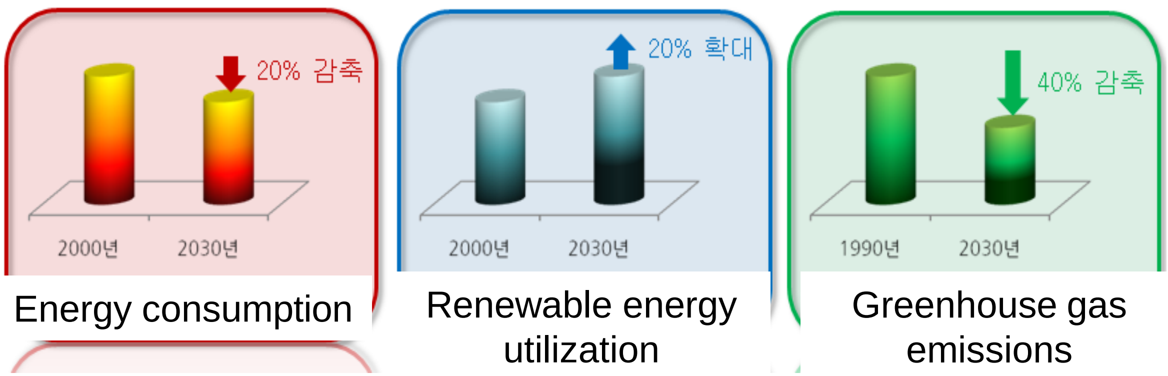


Greenhouse gas emission

Building energy policy of Korea

‘2030 Green design Seoul」 of the goal of building sector

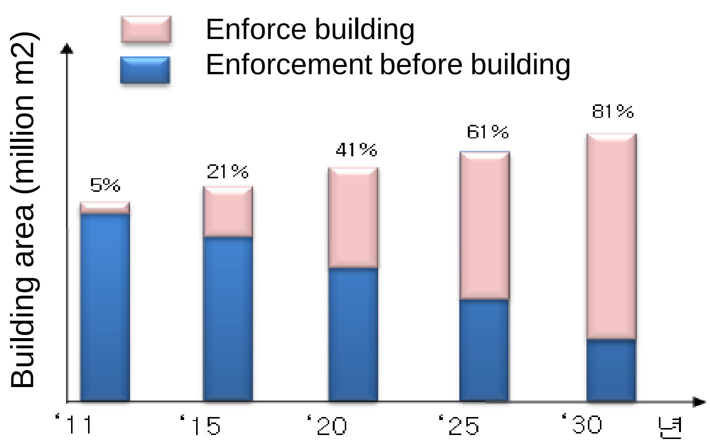
- **Energy consumption reduced by 40% (in 2000 8,920 thousand toe⇒7,140 thousand toe)**
- **Renewable energy utilization 20% expansion (in 2008 190 thousand toe⇒1,430 thousand toe)**
- **Greenhouse gas emissions reduced by 40% (in 1990 24,880 thousand ⇒14,930 thousand toe)**



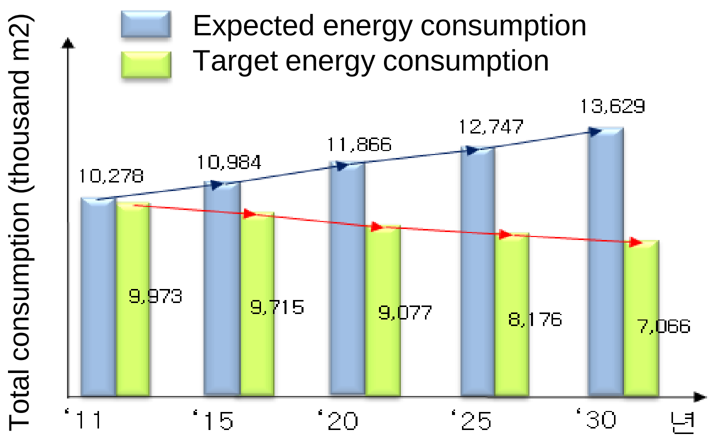
• Seoul, building energy regulation of total emission

(5 years and the total energy consumption reduction target suggested for the unit)

Ratio of energy regulation of total emission



Annual energy consumption



• Energy regulation of total emission (BESS)

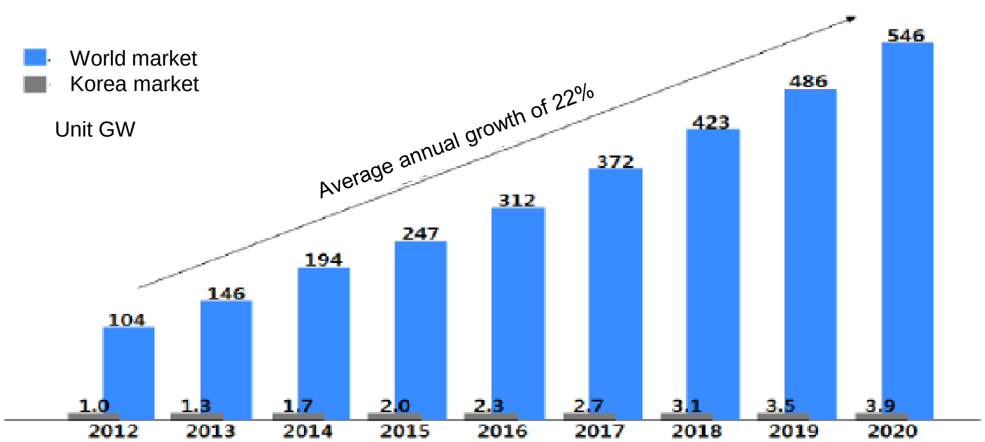
(Simulation results submitted before construction-free building energy simulation)

Status of Photovoltaics

Growing global photovoltaic market

- 2014 global photovoltaic market installations standard 43 ~ 49.1GW, based on amount of 1,200 one hundred million US dollars attrition by 27% year-on-year growth forecast
- By 2020, about 350GW installed an additional $ 150 billion more than expected this year market formation

Photovoltaic Market Status




Thank you

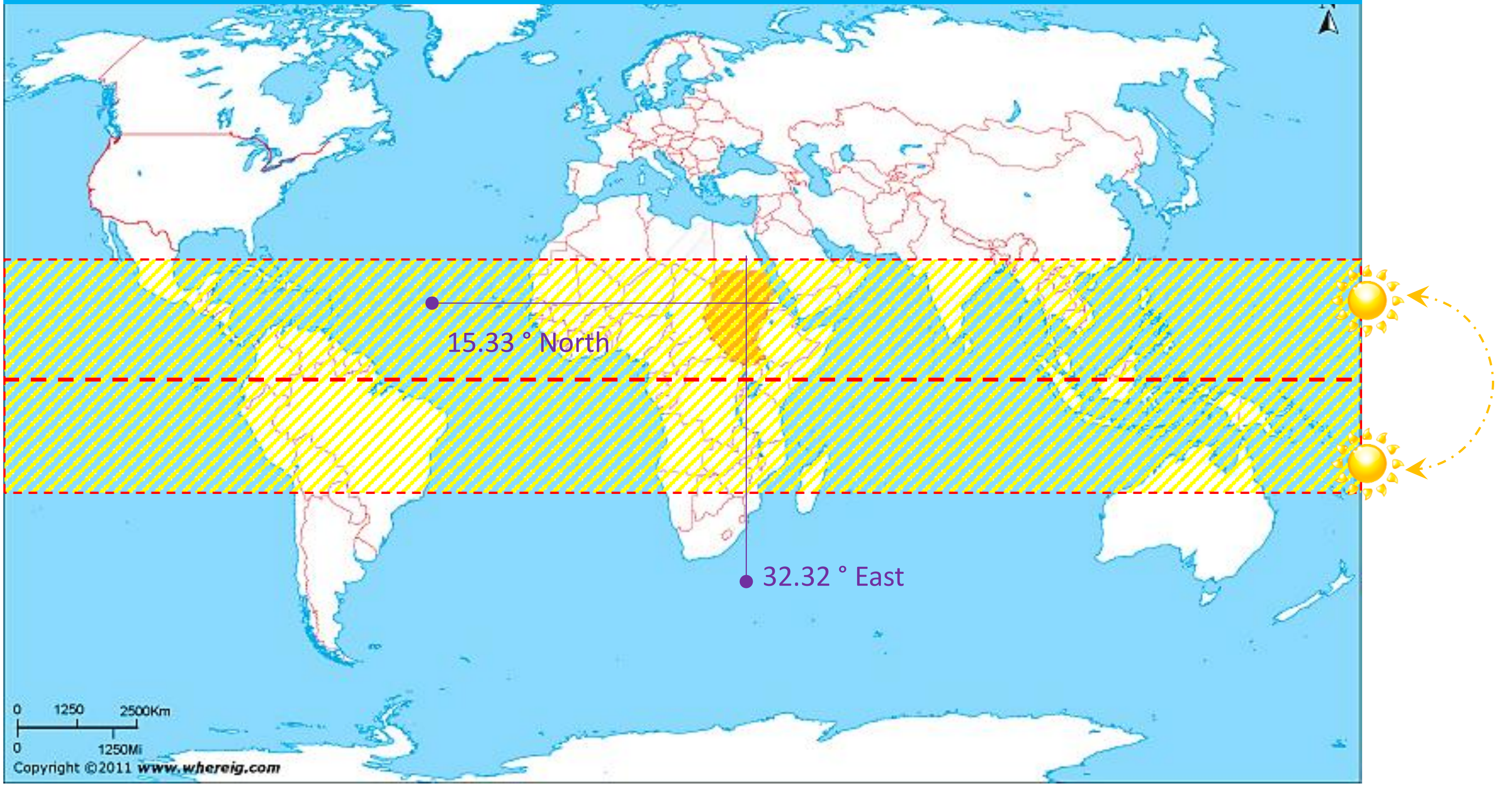
Climate & Built Environment of

SUDAN - Khartoum

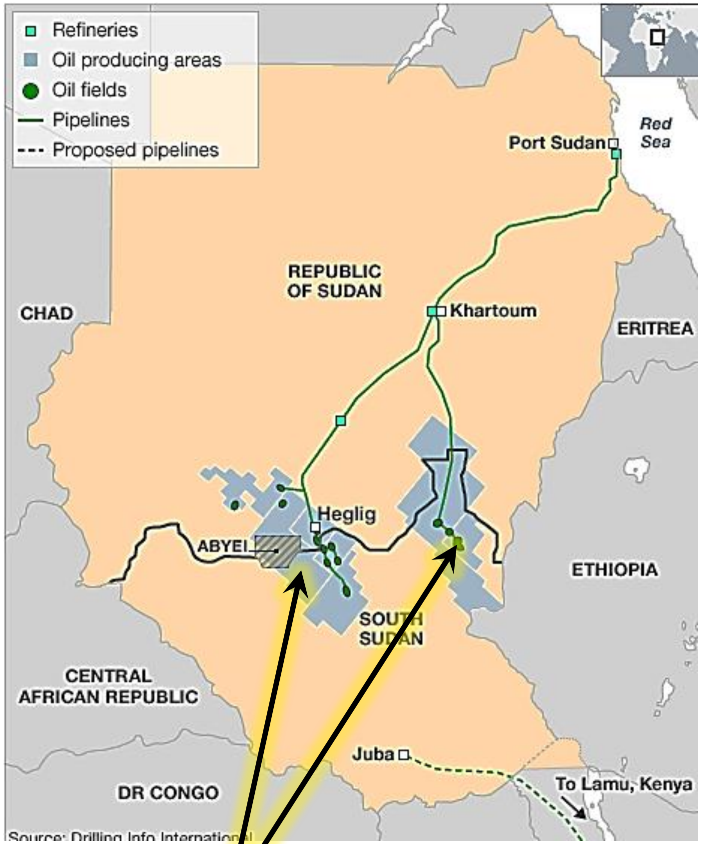
Mae LAB.

4.Nov.2014

Khartoum Location



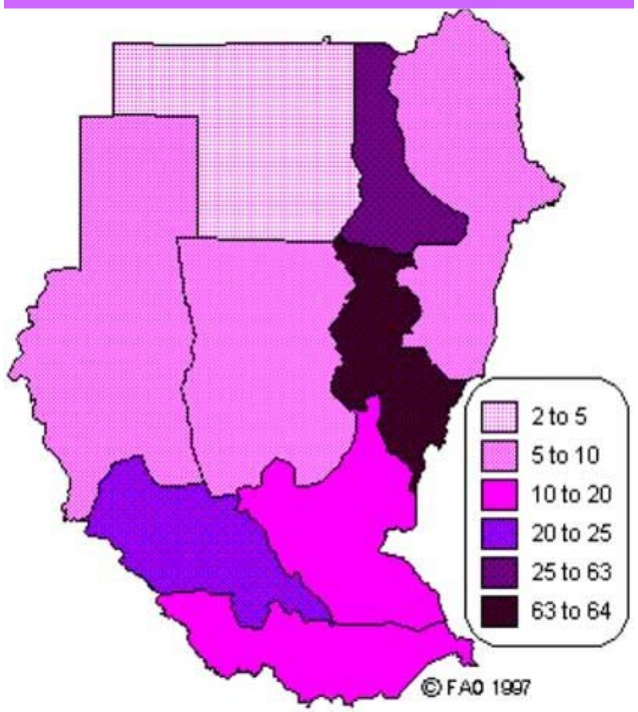
2011 Secession of Southern Sudan



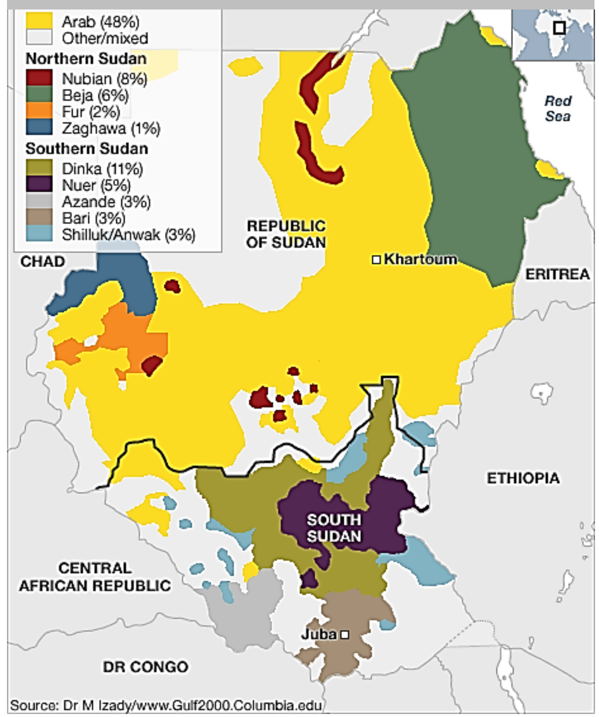
75 % of the country's oil production

Sudan is also subject to comprehensive US sanctions

Population density inhab./km2



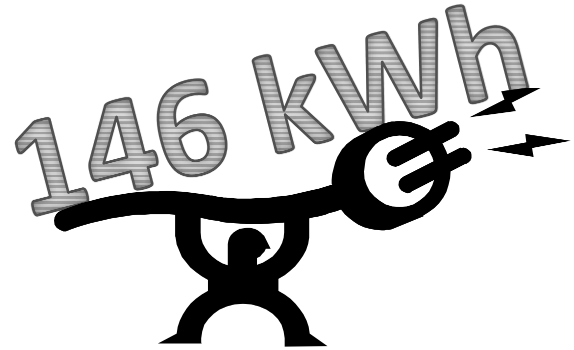
Distribution of Ethnic Groups



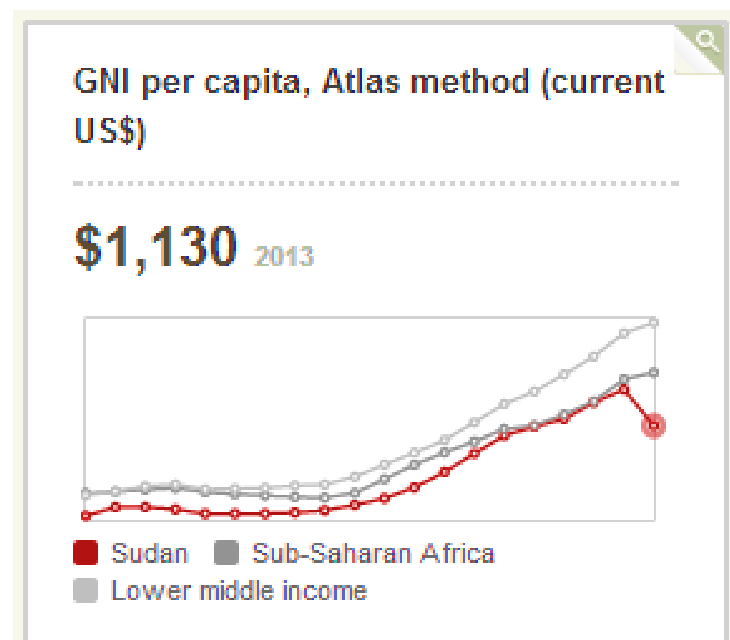
People's Energy consumption and burden of cost.

the electricity bill is quite expensive $0.1 (in 2012) when compared to the very low income rate (GNI/capita $1460) in 2012,

It means … in 2012
With all your fortune .. You can only buy



its even getting worse



Compared to countries in region ($ / kWh)

Egypt 0.01 - 0.08
10 ~ 1.25 X

Saudi Arabia 0.03
3.3 X

Ethiopia 0.04
2.5 X

Sudan 0.1 $ / kWh

Energy generation types

in 2012, total electricity generation in Sudan and South Sudan was 9.7 billion (kWh)

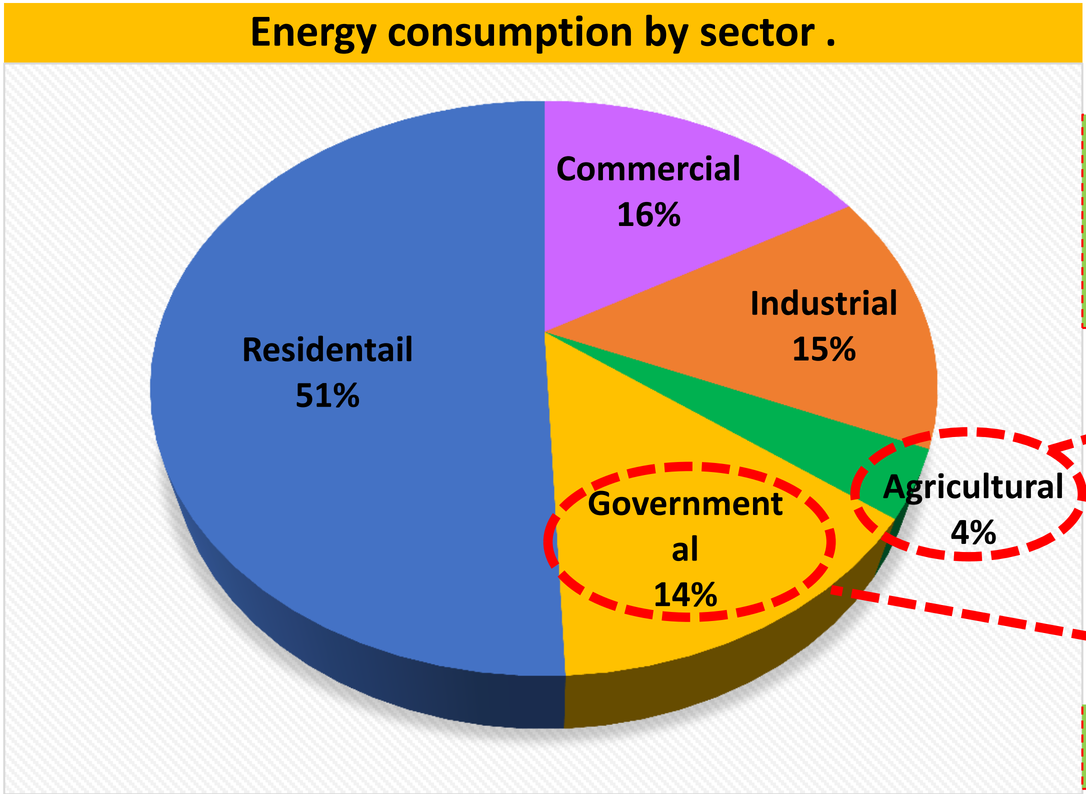
Hydroelectricity 68 %

diesel and heavy fuel oil (27%)

biomass and waste (5%)

But...

only 29% of Sudan's population had access to electricity in 2011



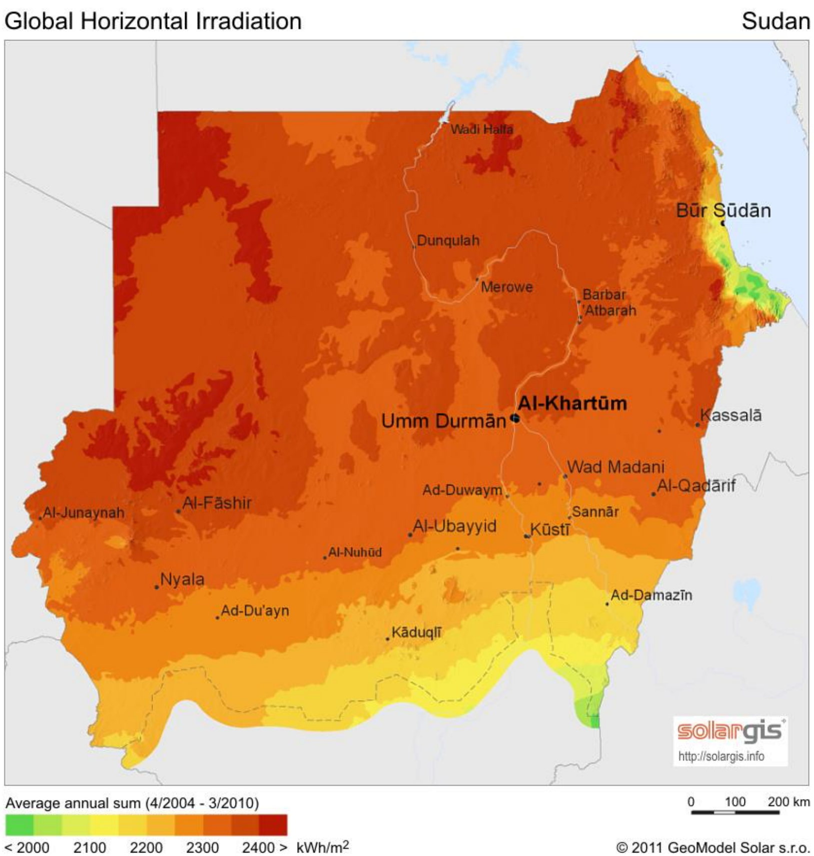
Only 4% although it accounts to:
30 % of national income
80% of employment

This sector should not exceed **5%**

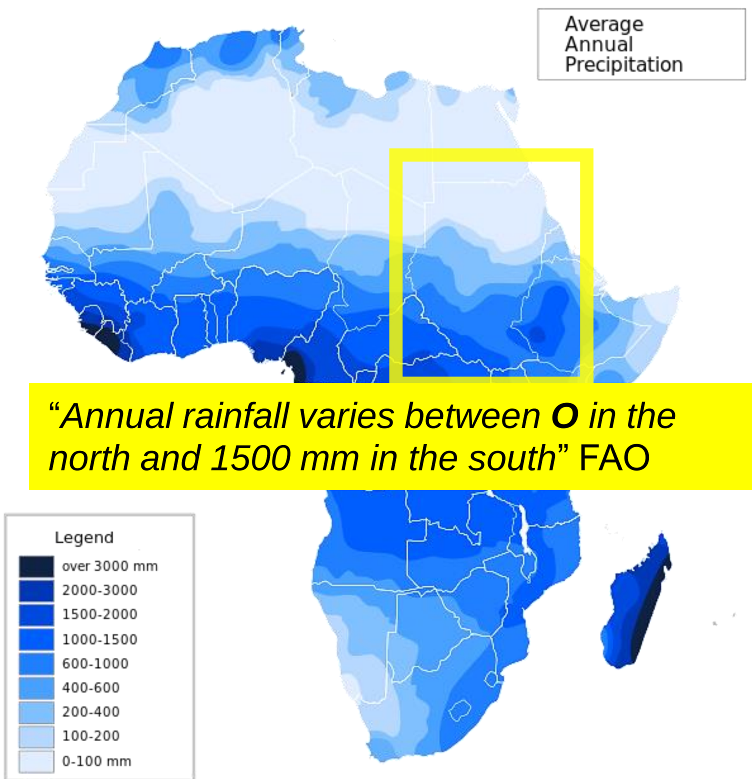
Disorder in distribution priorities

Solar Irradiation & precipitation , climate classification , climate analysis,

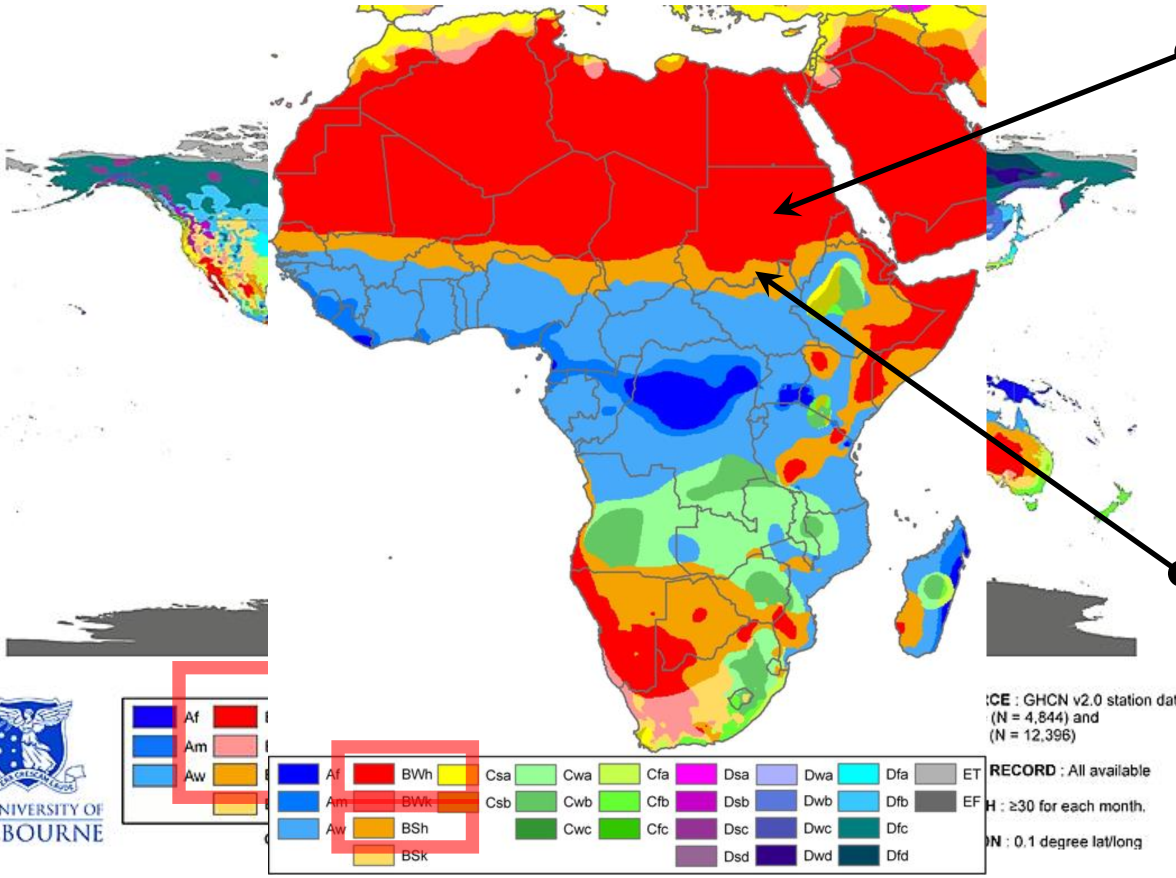
Solar Exposure



Rainfall



*"Annual rainfall varies between **O** in the north and 1500 mm in the south"* FAO



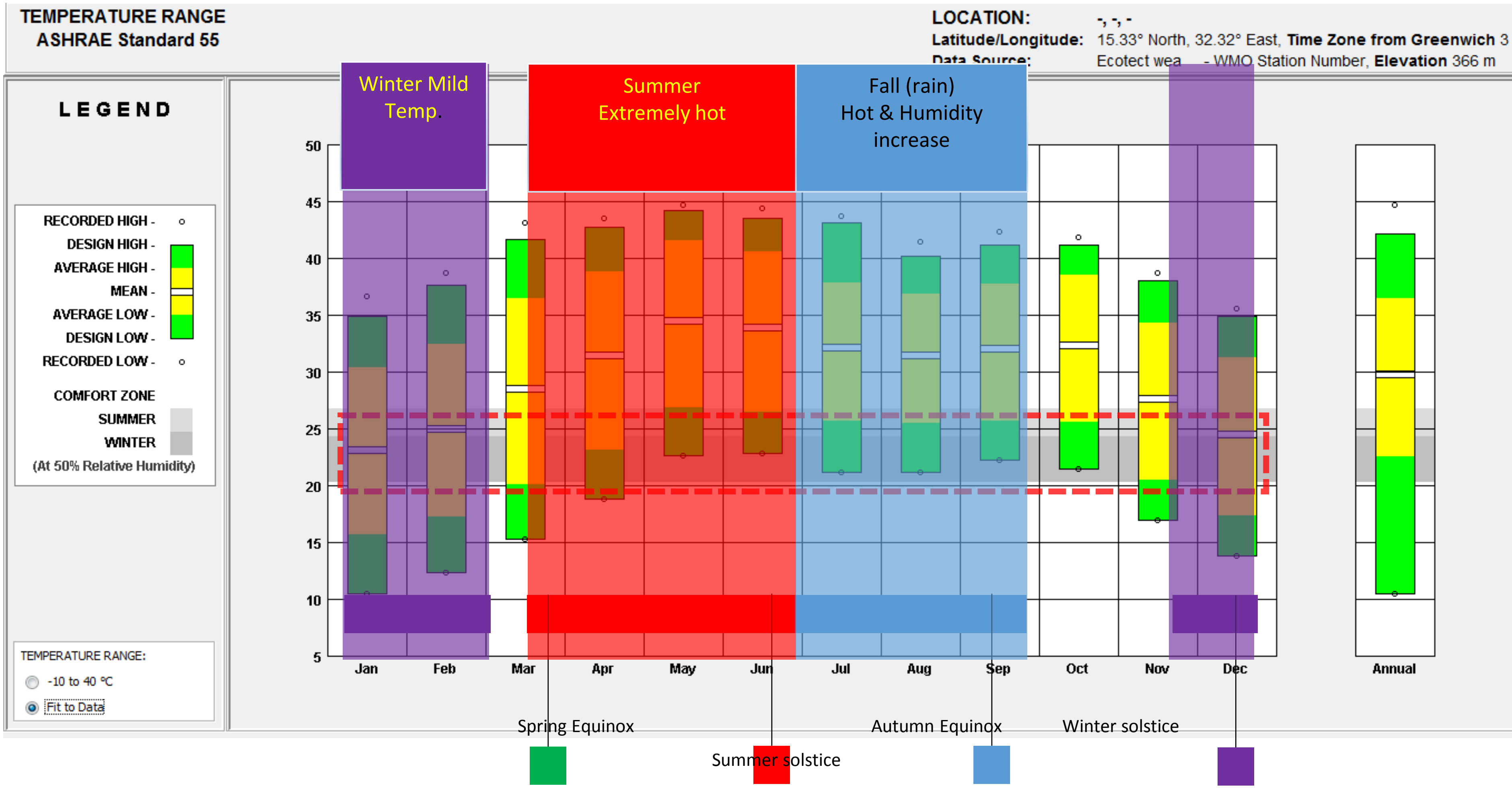
THE UNIVERSITY OF MELBOURNE

Desert climate
classification ***BWh* and *BWk***, sometimes also ***BWn***),
also known as an **arid climate**, is a climate that does not meet the criteria to be classified as a **polar climate**, and in which **precipitation is too low** to sustain any vegetation at all, or at most a very scanty scrub.

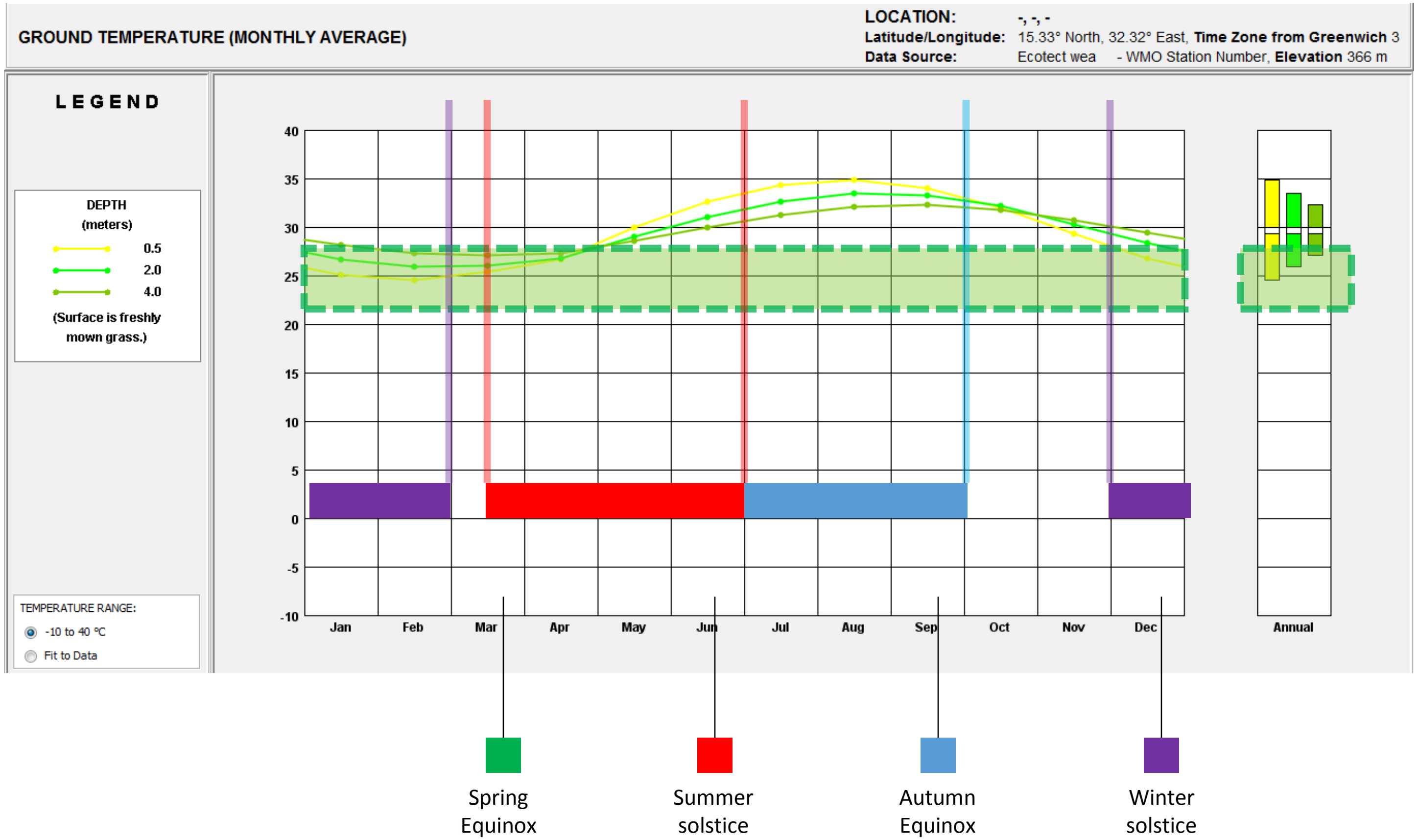
Khartoum is BWhw

A **semi-arid climate** or **steppe climate** are climatic regions that receive precipitation below potential evapotranspiration, but not extremely. (***BSk* and *BSh***) is intermediates between desert climates (BW) and humid climates

Annual Temperature Ranges



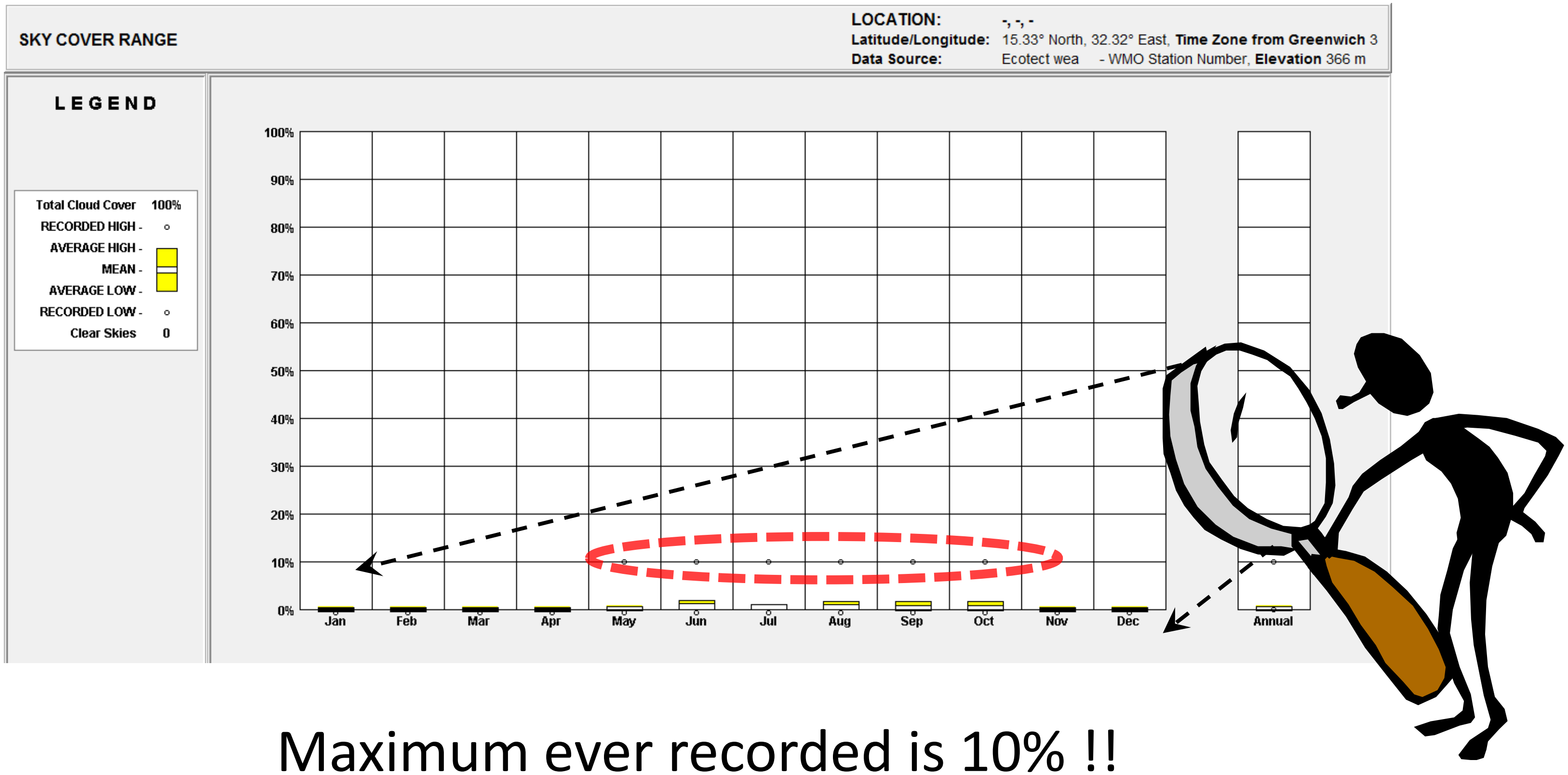
Annual Ground Temperature Ranges



But

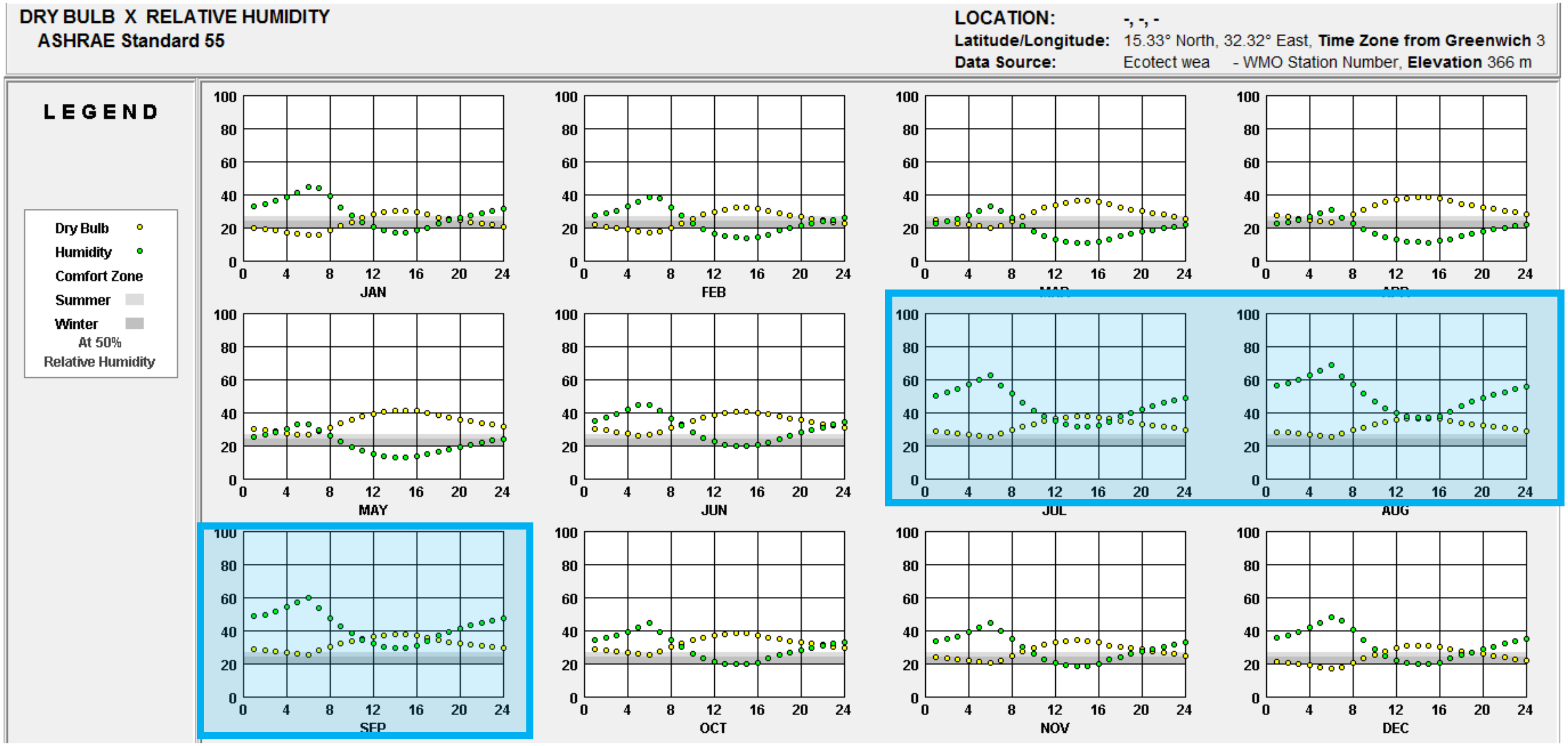
Why is the Temperature remains high ….?

Sky Cover Range

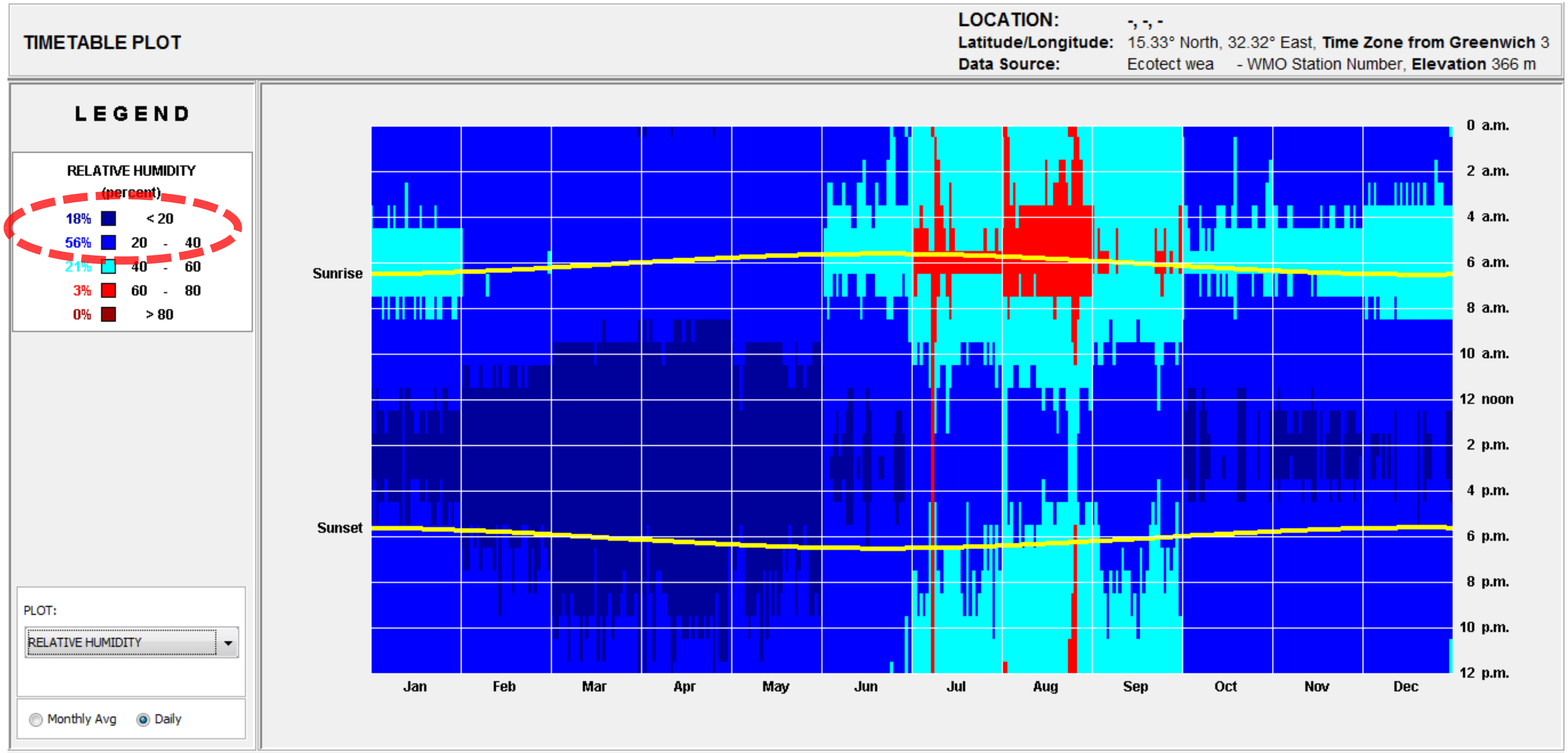


Maximum ever recorded is 10% !!

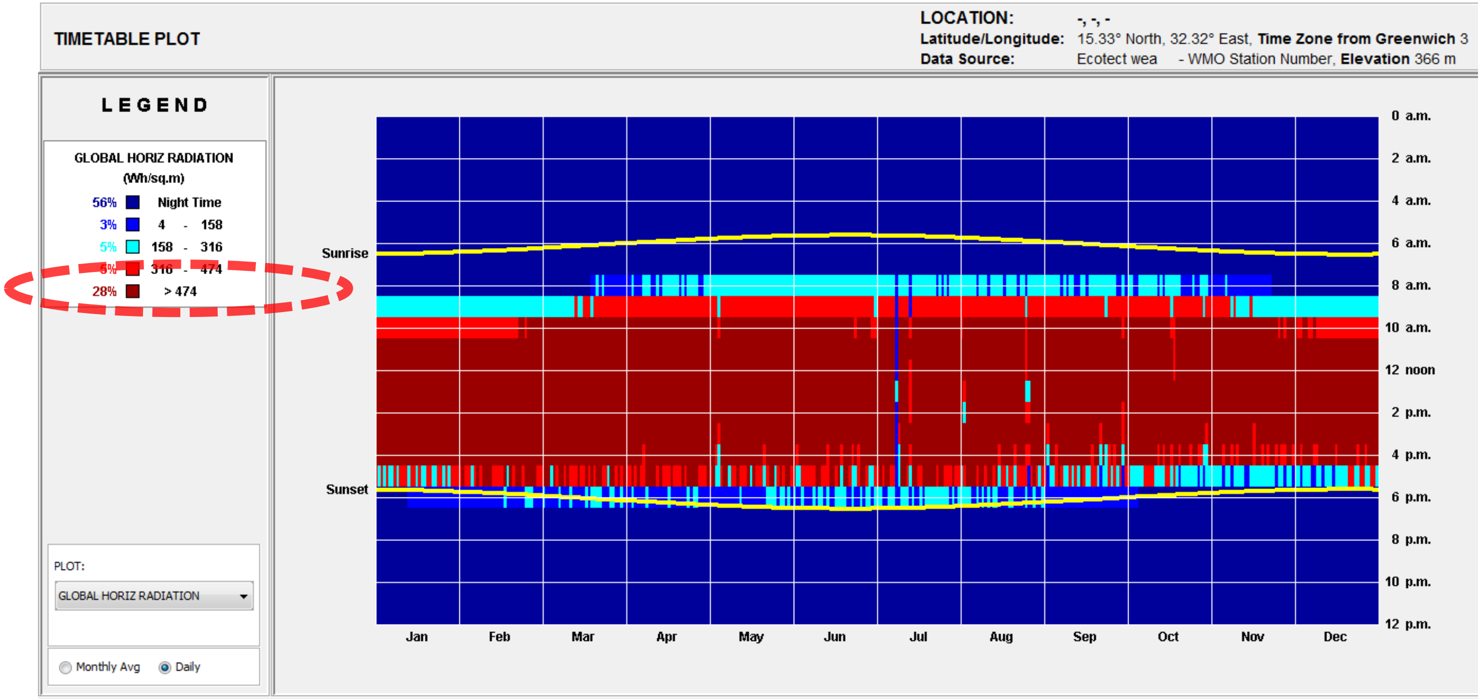
Dry bulb & Relative Humidity

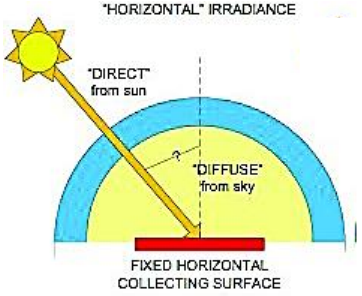


Humidity

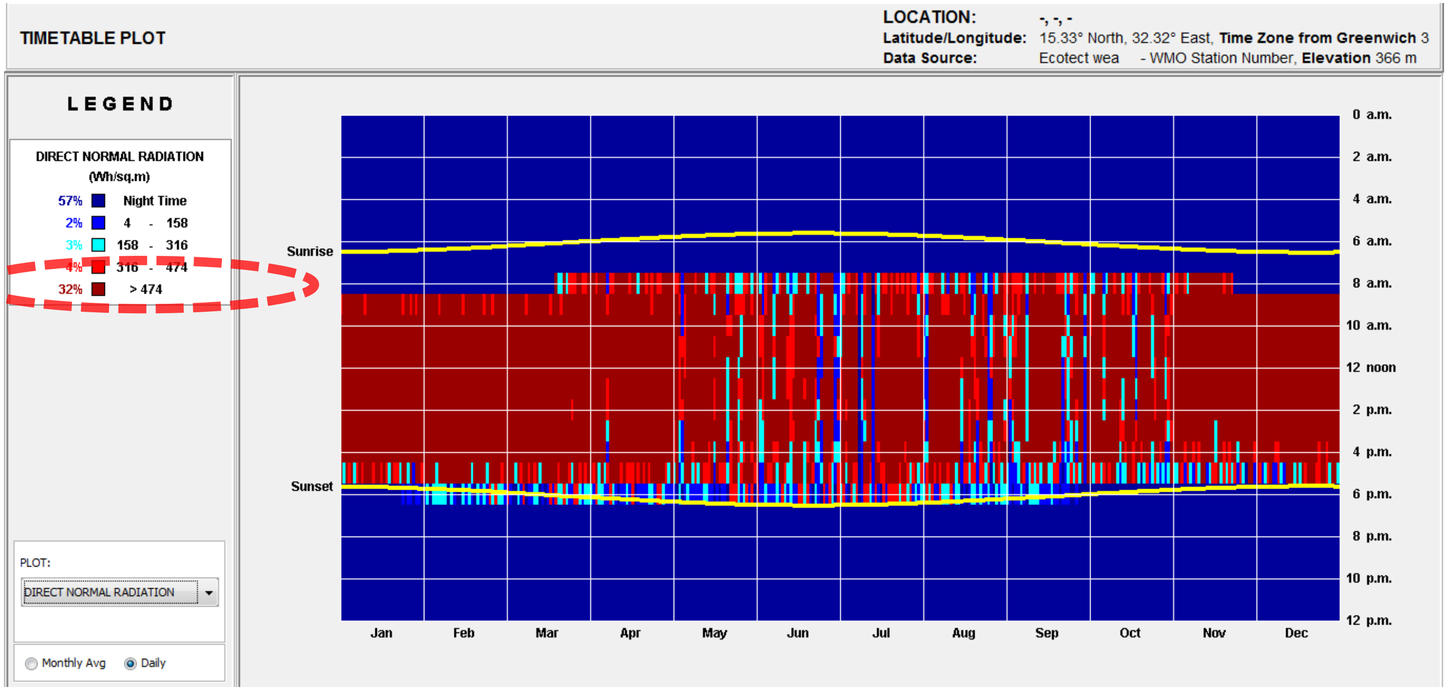

TIMETABLE PLOT
LOCATION: -, -, -
Latitude/Longitude: 15.33° North, 32.32° East, Time Zone from Greenwich 3
Data Source: Ecotect wea - WMO Station Number, Elevation 366 m
LEGEND
RELATIVE HUMIDITY
(percent)
18% < 20
56% 20 - 40
21% 40 - 60
3% 60 - 80
0% > 80
PLOT:
RELATIVE HUMIDITY
Monthly Avg
Daily
Sunrise
Sunset
0 a.m.
2 a.m.
4 a.m.
6 a.m.
8 a.m.
10 a.m.
12 noon
2 p.m.
4 p.m.
6 p.m.
8 p.m.
10 p.m.
12 p.m.
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec

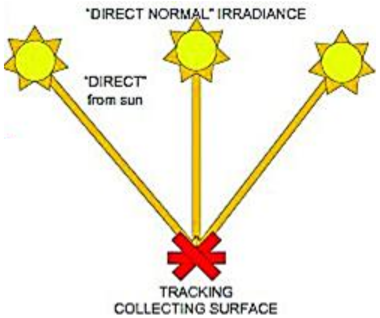
Exposure to sun – Global Horizontal



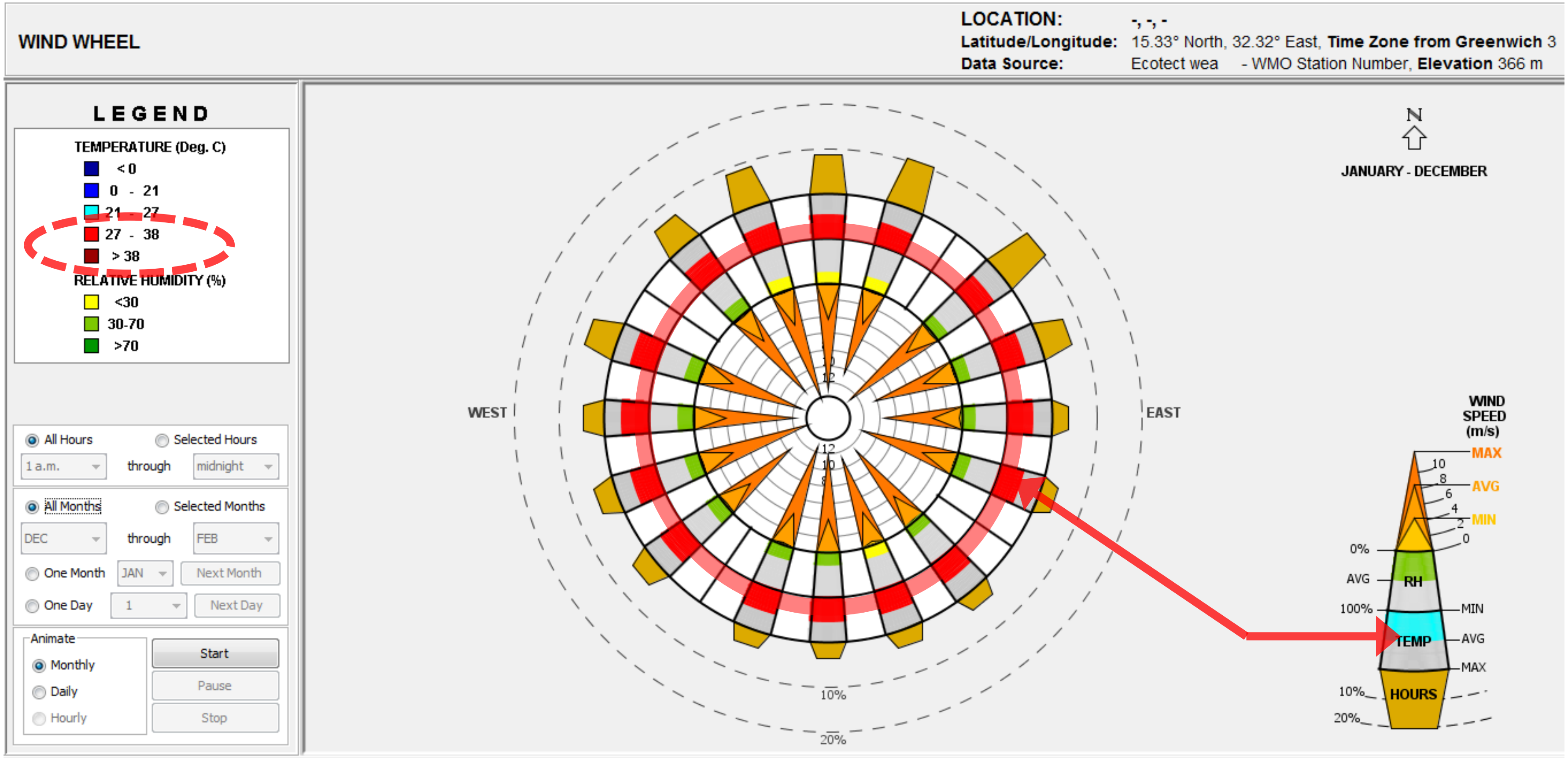


Exposure to sun – Direct Normal

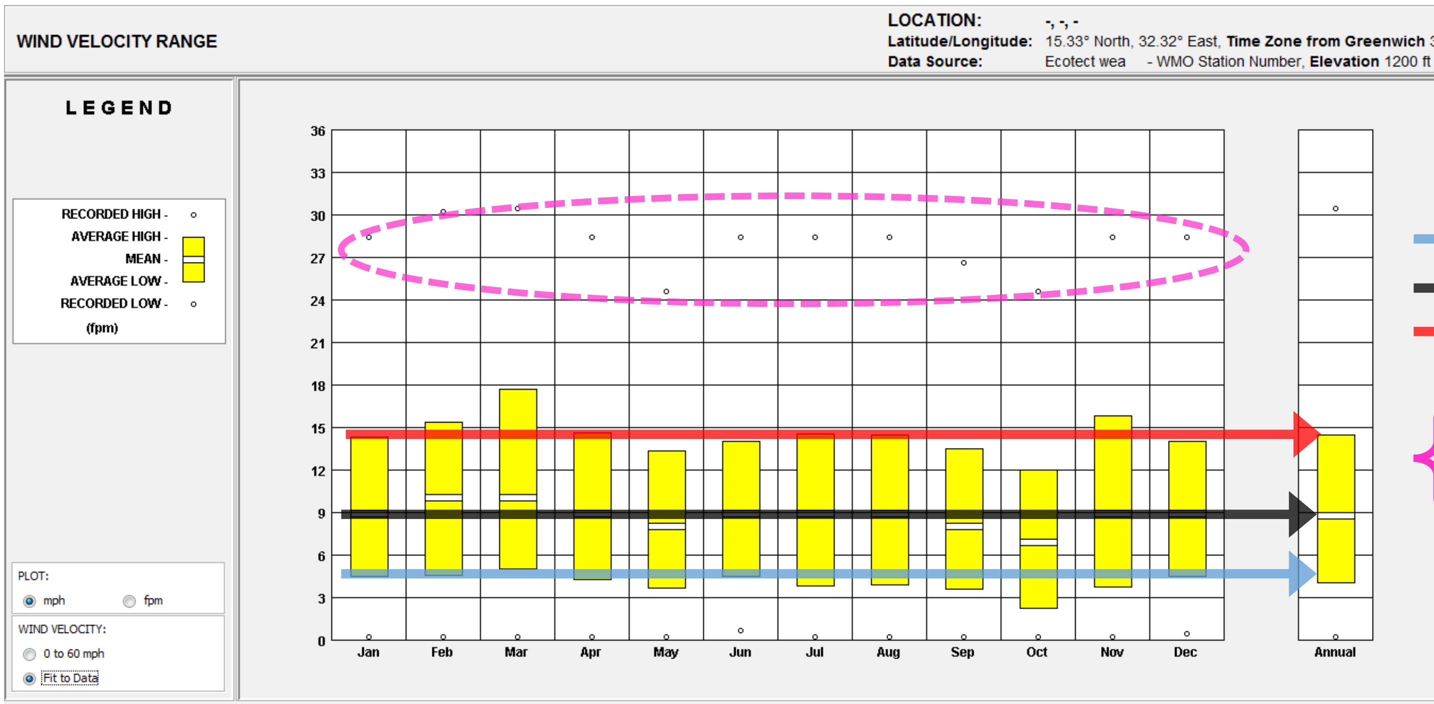


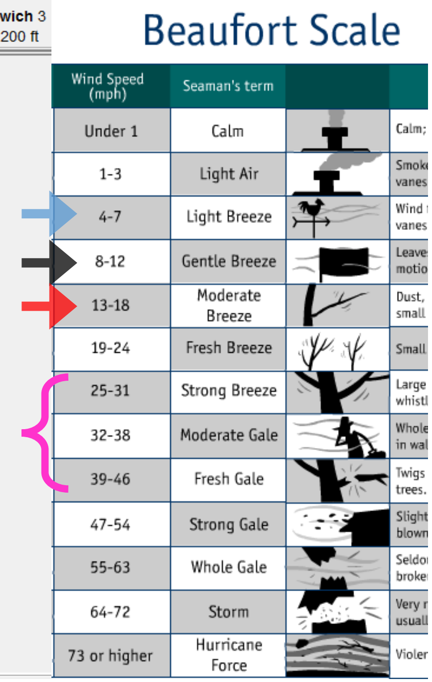


Wind parameters



Wind parameters

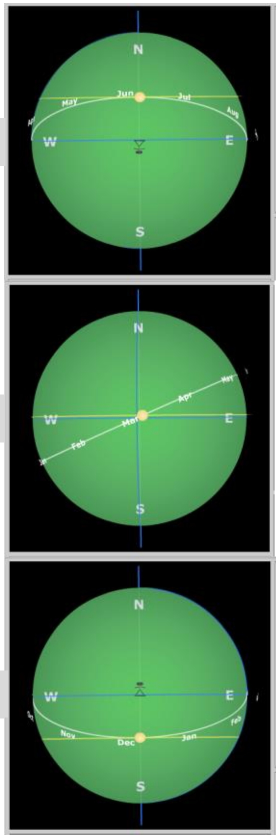


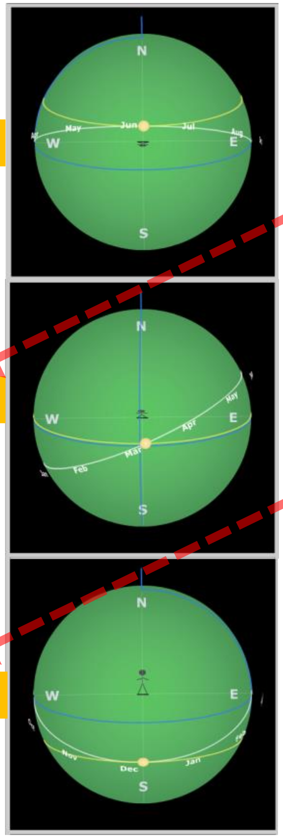


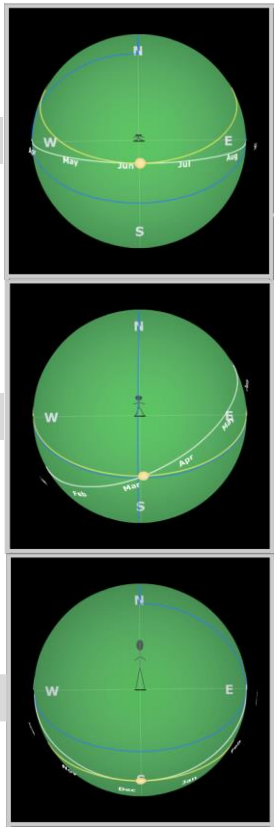
Sandstorms likely to occur in autumn (June)

Sun-path & shading study , geometry and adaptive comfort, case studies.

	equator	Tropical – Khartoum (15.33°)	High latitude – Tokyo (35.69°)
Summer Solstice	66.5°	81.9 °	77.7 °
Spring Equinox	90°	75.9 °	55.6 °
Winter Solstice	66.5°	51.3 °	30.9 °







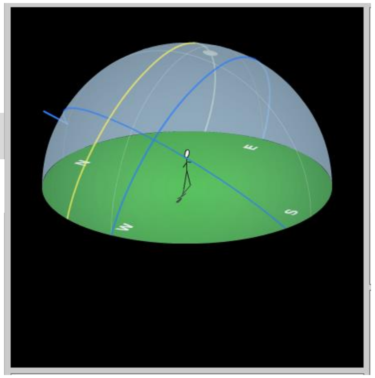
Sun-path & shading study , geometry and adaptive comfort, case studies.

Summer Solstice

9:00

46.4^{o}

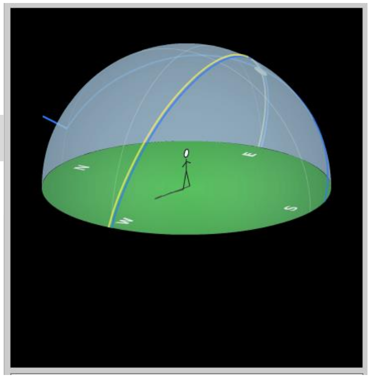
Azimuth = 71.9^{o}



Equinox's

41.9^{o}

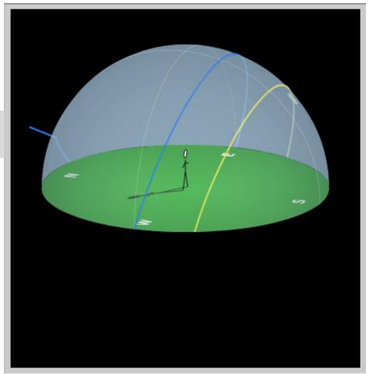
Azimuth = 102.4^{o}



Winter solstice

31.5^{o}

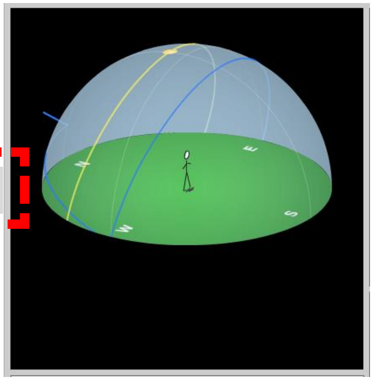
Azimuth = 130.6^{o}



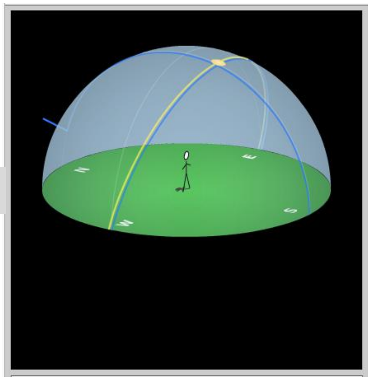
12:00

81.9^{o}

N

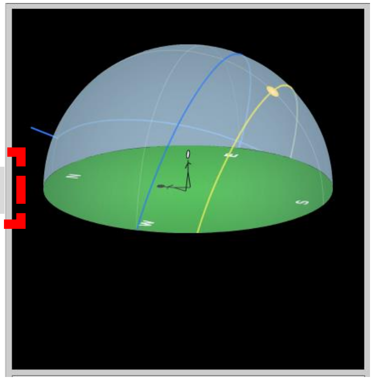


75.9^{o}

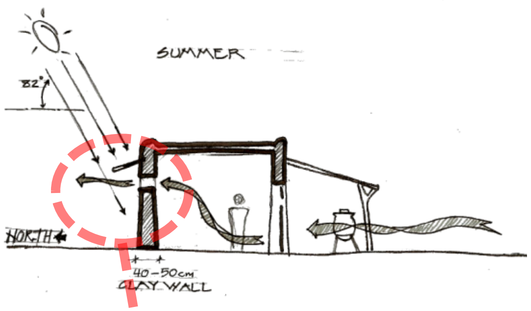


51.3^{o}

S



typical Sudanese vernacular house

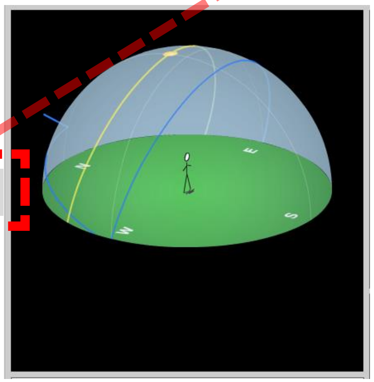


Northern façade small windows on thick walls openings can provide enough shading

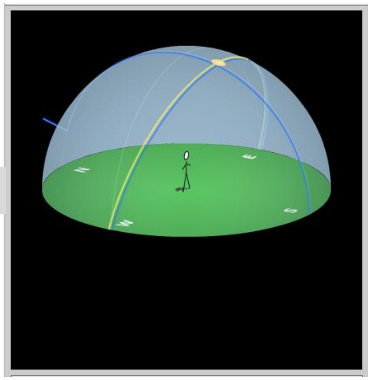
12:00

81.9°

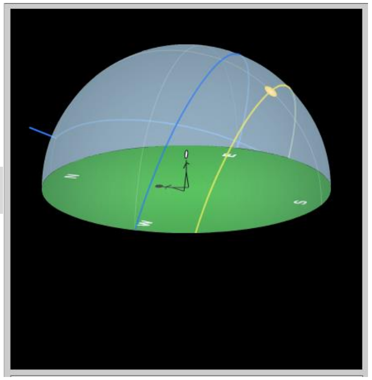
N



75.9°

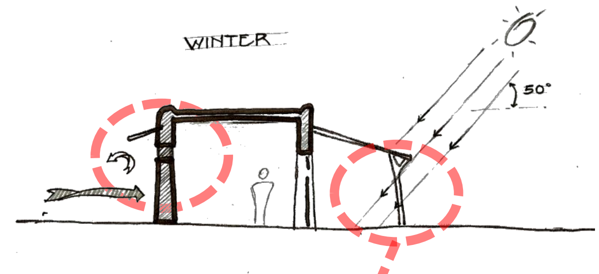


51.3°



Typical Sudanese vernacular house

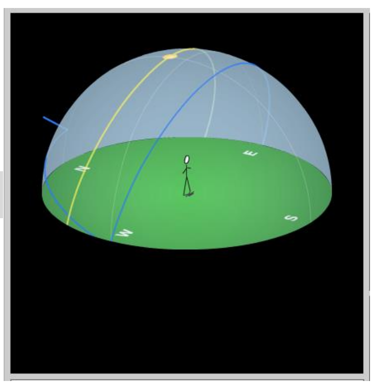
And people **migrate** to the veranda during the winter day



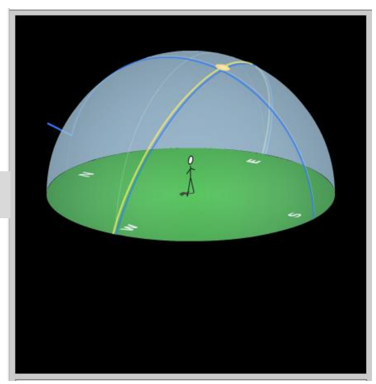
The small window is closed to prevent the cold and dry storms

12:00

81.9°

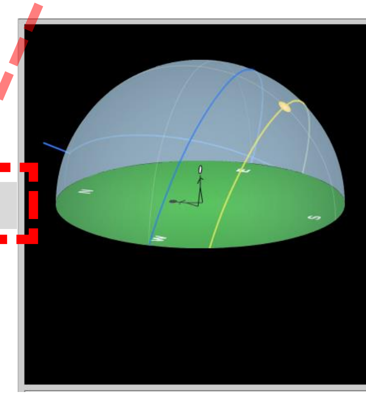


75.9°



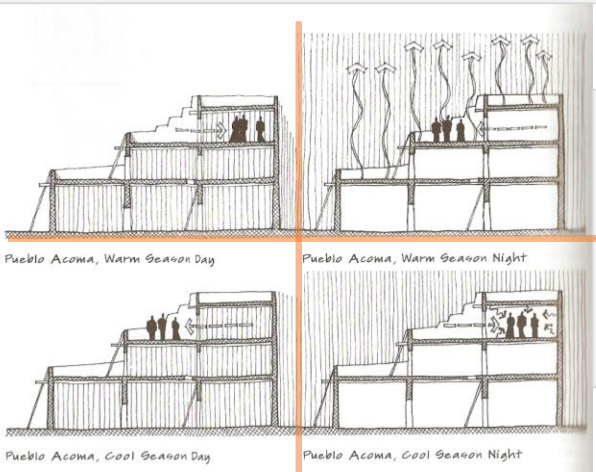
51.3°

S



Migration is a global adaptive concept

Migration in Iraqi house
source: Sun , Wind & light



Summer

Winter

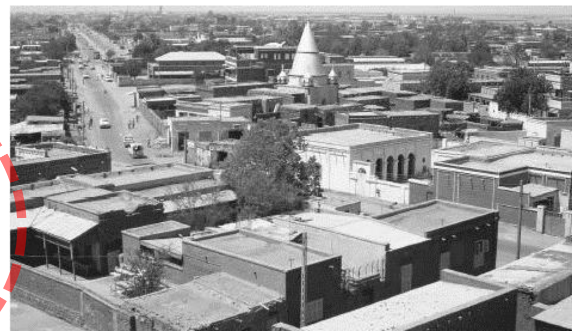
Day | Night

Sudanese adaptive lifestyle

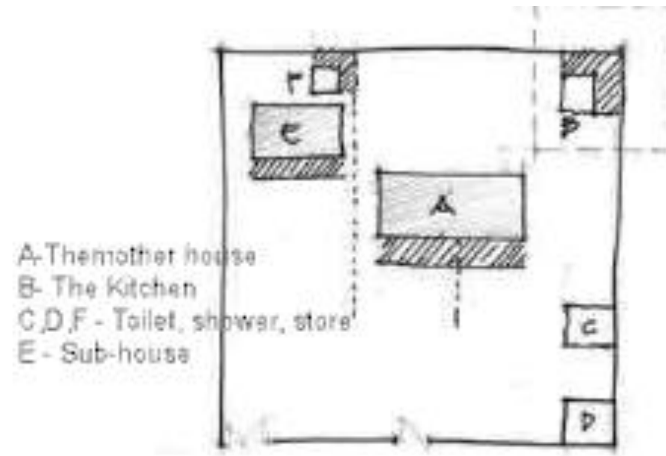
Typical Sudanese House Incorporate spaces with different thermal behaviors (light /heavy weight , open/shady/closed), which facilitate migration.

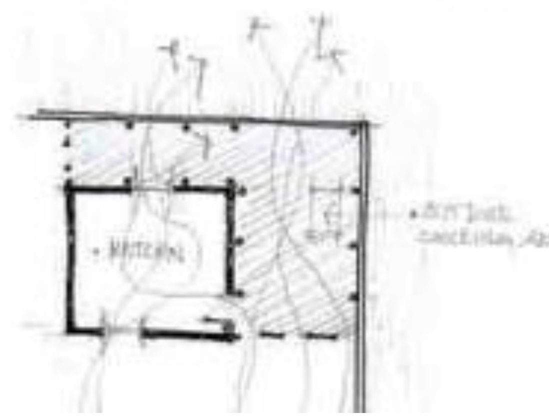
The house geometry

House Zoning



The house is formed by cluster of units , the gender segregation is the main influence of the units layout , but kitchen location helps in reducing heat gain form cooking.

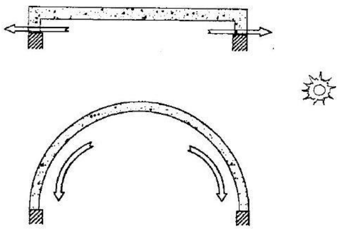




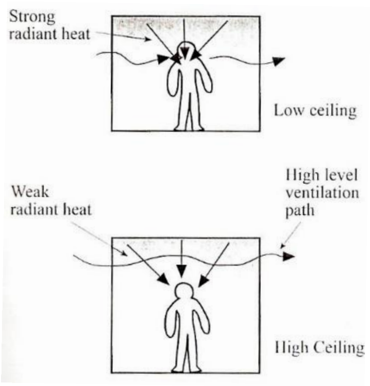
The house geometry

Roof systems	Unit Height

Another advantage of the non-flat roofs (vaulted, domed , pitched) that its
Always have partial shading.



Thermal expansion of flat and vaulted roof, source:(Bakr,2003).

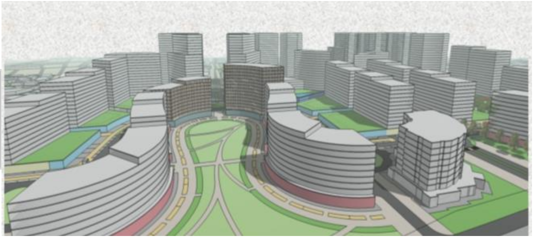


Increasing roof height improves the thermal comfort. source (Nicholls,2002)

Contemporary architecture

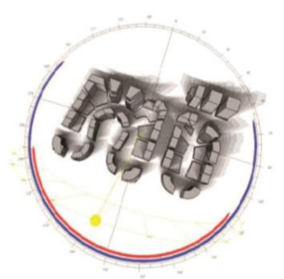
Tamassociati projects

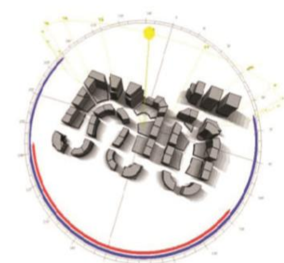
Mushairib residential complex

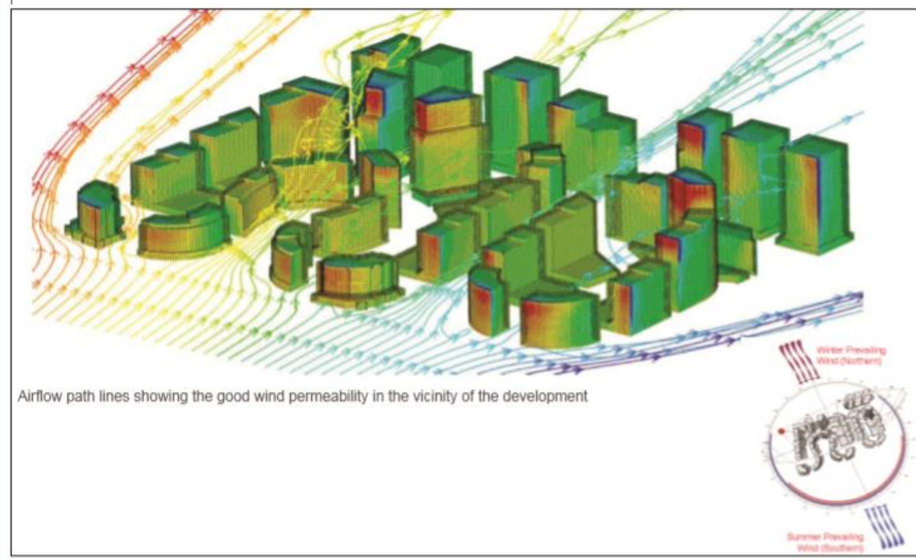


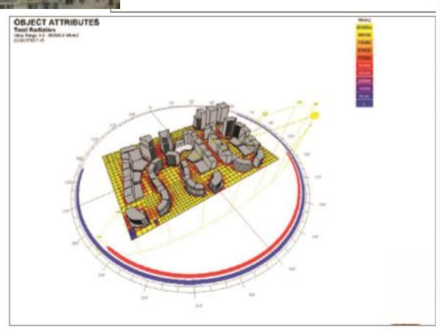
National Telecom Headquarters

RMJM Mushaireb project

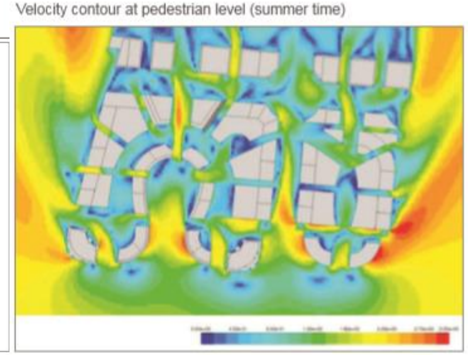




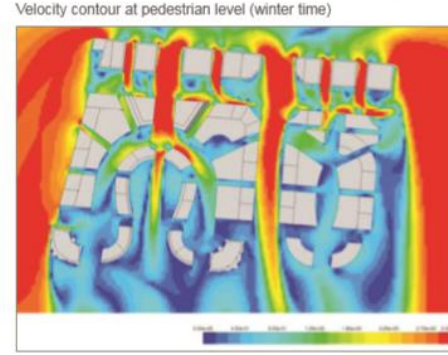

Airflow path lines showing the good wind permeability in the vicinity of the development



Velocity contour at pedestrian level (summer time)



Velocity contour at pedestrian level (winter time)



National Telecom Headquarters

AIN international (Sudan) & GAP (Turkey).

In May 2007, a prestigious 2,300 m2 project was started in Khartoum, the capital of Sudan. **Sapa** supplied aluminium systems for BIPV that were integrated in the office tower of the National Telecom Headquarters of Sudan.

Project facts:

aSi standard panels		
Opaque	600 panels	83.8 Wp
See-through	600 panels	81.0 Wp

aSi corner panels		
Opaque	100 panels	30.0 Wp
See-through	100 panels	27.9 Wp

Total installed capacity	104.67 kWp




tamassociati

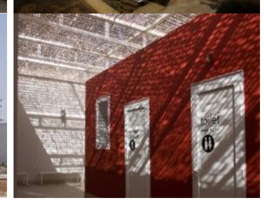
Awards of projects in Sudan

- Curry Stone Design Prize 2013_Decade-long collaboration with Emergency ngo building clinics in war-torn regions, winning project
- Giancarlo Ius Gold Medal 2013_Port Sudan Paediatric Clinic, winning project
- Aga Khan Award for Architecture 2013_"Salam" Centre for Cardiac Surgery, winning project
- Italian Architecture Gold Medal 2012_Container Compound, honorable mention in the "Architecture and Emergency" category
- 12th Venice International Biennale of architecture exhibition 2010, Italian Pavilion_"Salam" Centre for Cardiac Surgery
- Middle East Architect Awards 2010_"Salam" Centre for Cardiac Surgery 1° prize as: "Sustainable Project of the Year"
- Smart future minds award 2010_Emergency Pediatric Clinic in Darfur, Sudan, 2° prize
- "Sustainable Architecture" Fassa Bortolo Prize 2010_Container Compound, shortlisted
- "Best of Green Award" 2010 (Treehugger_Discovery Company, USA)_Container Compound, selected
- Italian Architecture Gold Medal 2009_Salam Cardiac Centre in Sudan, commented
- Detail Prize 2009_Prayer and Meditation Pavillion in Sudan, shortlisted
- "Dedalo Minosse" International Awards 2008_Salam Cardiac Centre in Sudan, special prize
- The Architecure Review Award for Emerging Architecture (UK) 2008_Prayer Meditation Pavillion in Sudan, highly commended

Paediatric Centre in Port Sudan


Salam Centre For Caridac Suregry


Paediatric Centre Nyala, South Darfur

Container Medical Compound, Khartoum

Prayer And Meditation Pavilion

UNICEF SUDAN COUNTRY OFFICE

tamassociati

Local material and skills utilization





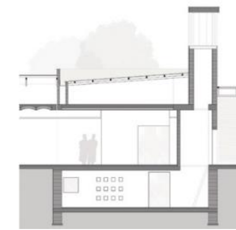


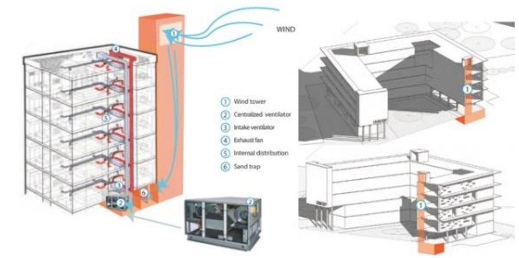



tamassociati

External skin (White colour, small openings, shaded corridors)

Energy resources and passive techniques





Thank you

…

Resources

- https://en.wikipedia.org/wiki/History_of_Sudan
- http://www.whereig.com/sudan/
- http://www.waterforsouthsudan.org/news/
- http://www.bbc.com/news/world-africa-12115013
- http://www.fao.org/docrep/004/ab390e/ab390e02.htm
- http://solargis.info/doc/free-solar-radiation-maps-GHI
- https://en.wikipedia.org/wiki/Climate_of_Africa
- https://en.wikipedia.org/wiki/K%C3%B6ppen_climate_classification
- http://www.seco.cpa.state.tx.us/publications/renewenergy/solarenergy.php (global horizontal, and direct normal)

- Nicholls, Richard. 2002. Low Energy Design. s.l. : Interface Publishing, Great Britain, 2002.

References

- Nicholls, Richard. 2002. Low Energy Design. s.l. : Interface Publishing, Great Britain, 2002.
- Bakr, Najla M. W. 2003. Barrel Vault Roofs for Passive Cooling in Low Rise Buildings. King Abdul-Aziz University Periodical Journal. 2003, Vol. 14, pp. 66-71. (this Article is written in Arabic).

CLIMATE DATA

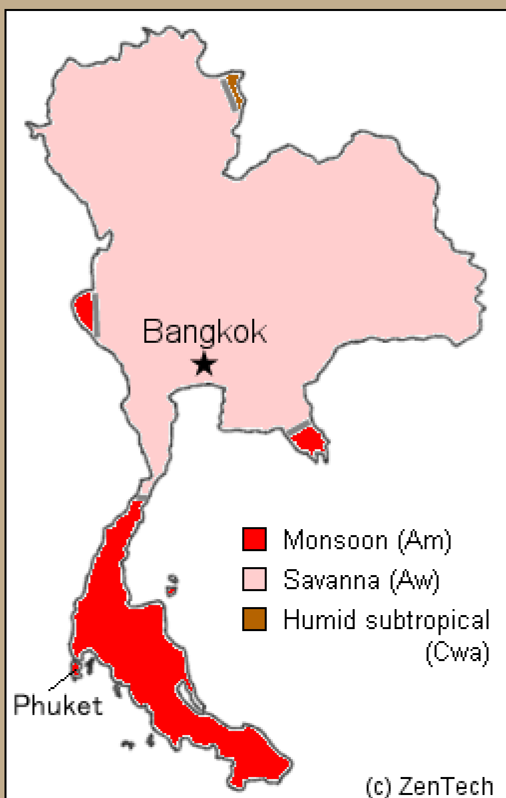
THAILAND

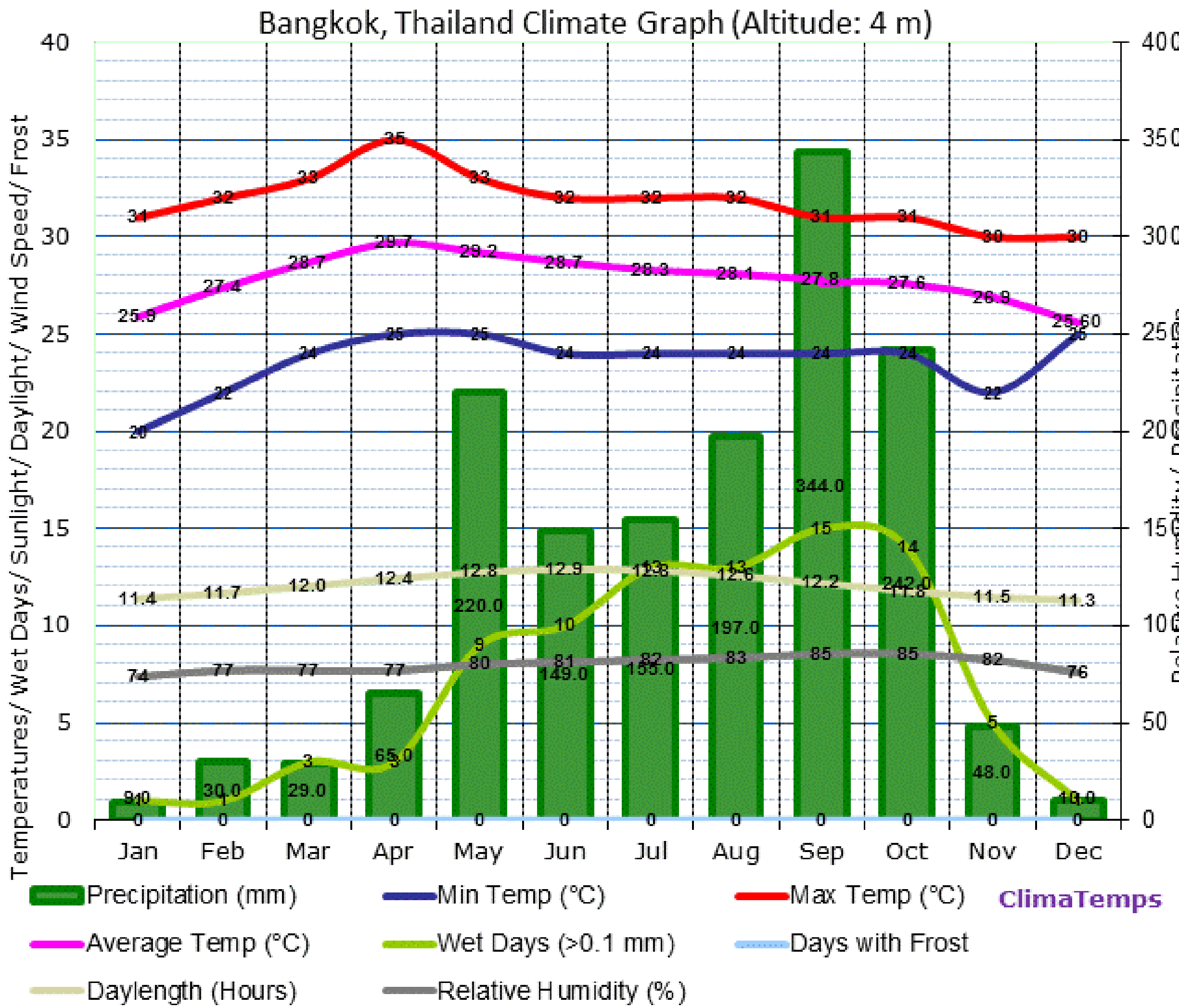
PRUDSAMON KAMMASORN

CONTENT

Analysis of temperature and humidity
Analysis of solar path
Typical Lifestyle
Example of vernacular architecture
Example of latest green architecture

CLIMATE CLASSIFICATION

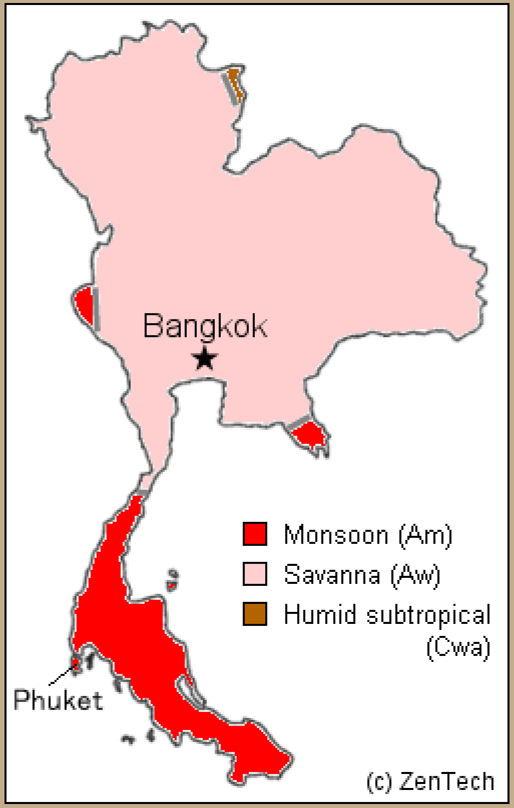


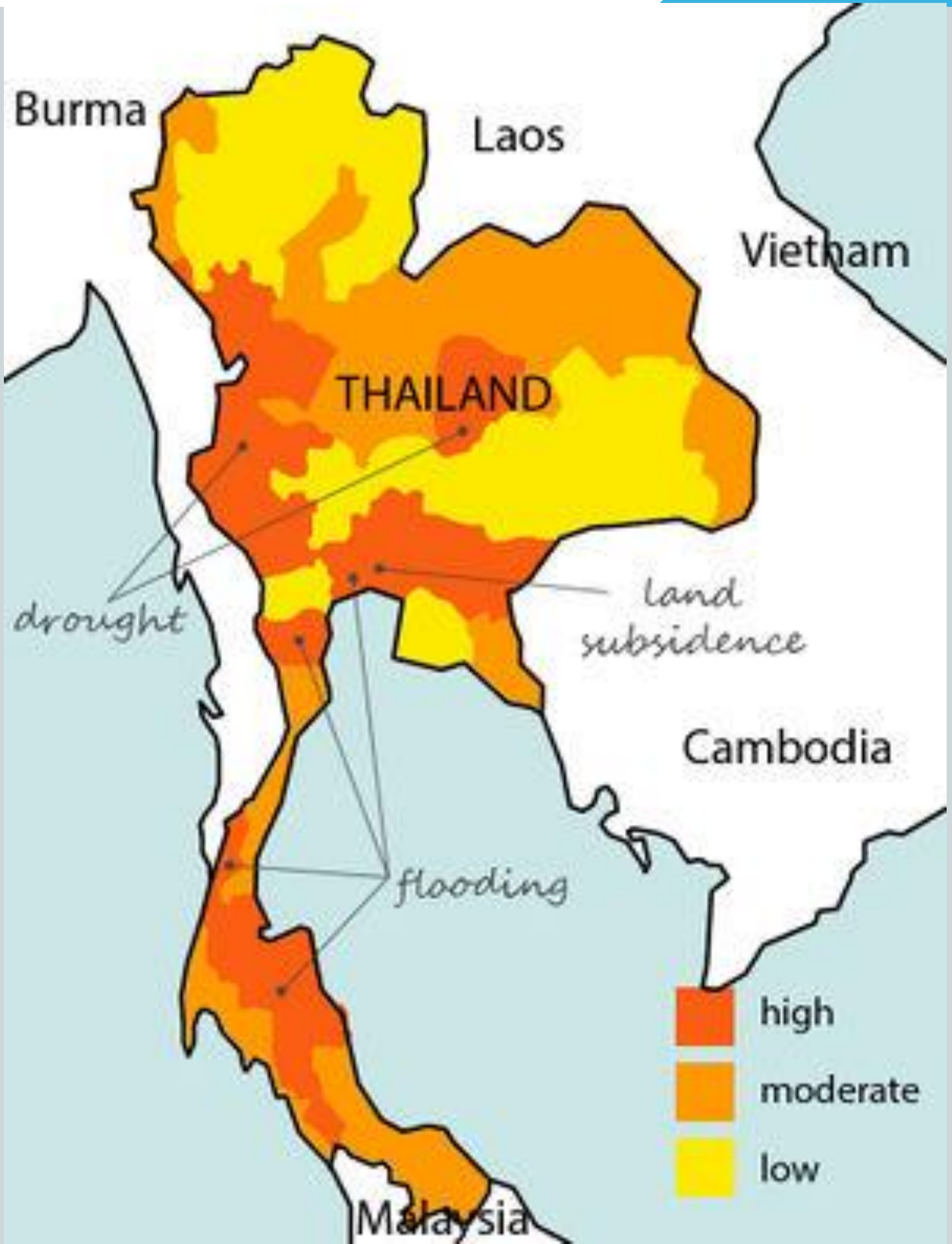


MEAN ANNUAL RAINFALL : RISK MANAGEMENT

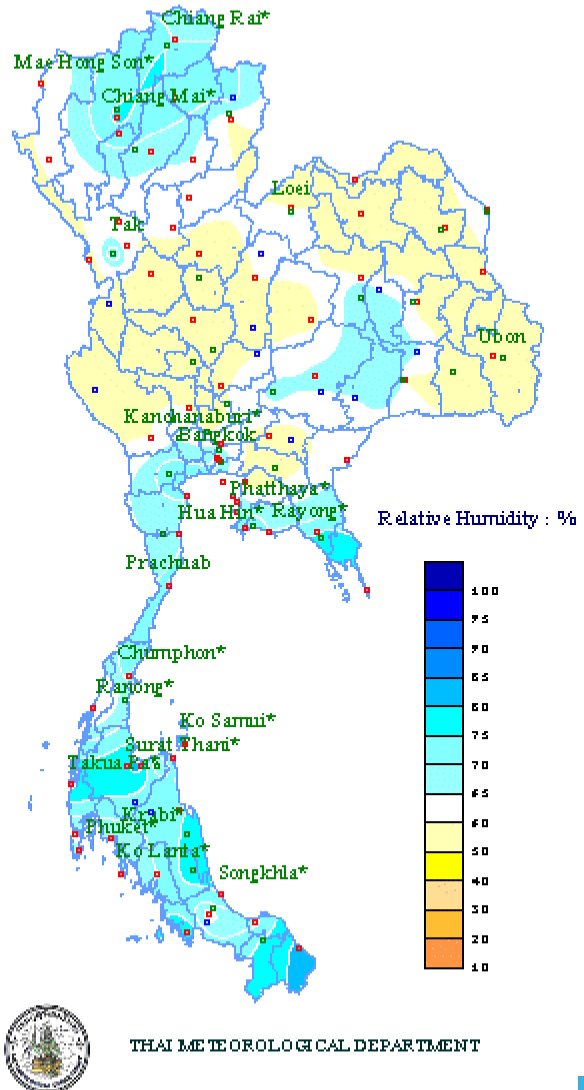
Analysis of temperature and humidity
Analysis of solar path
Typical Lifestyle
Example of vernacular architecture
Example of latest green architecture

CLIMATE CLASSIFICATION

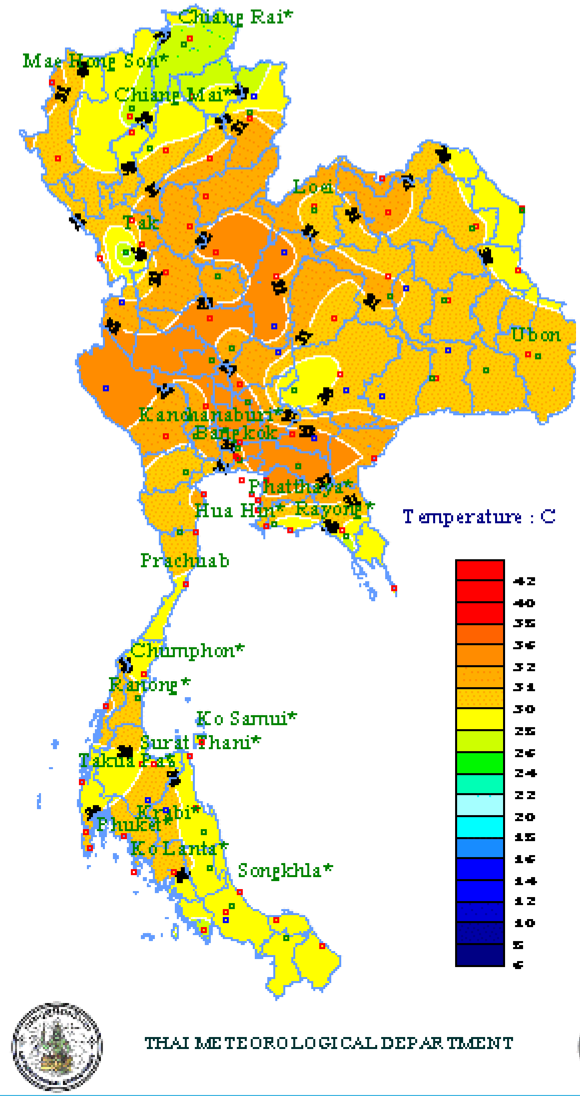




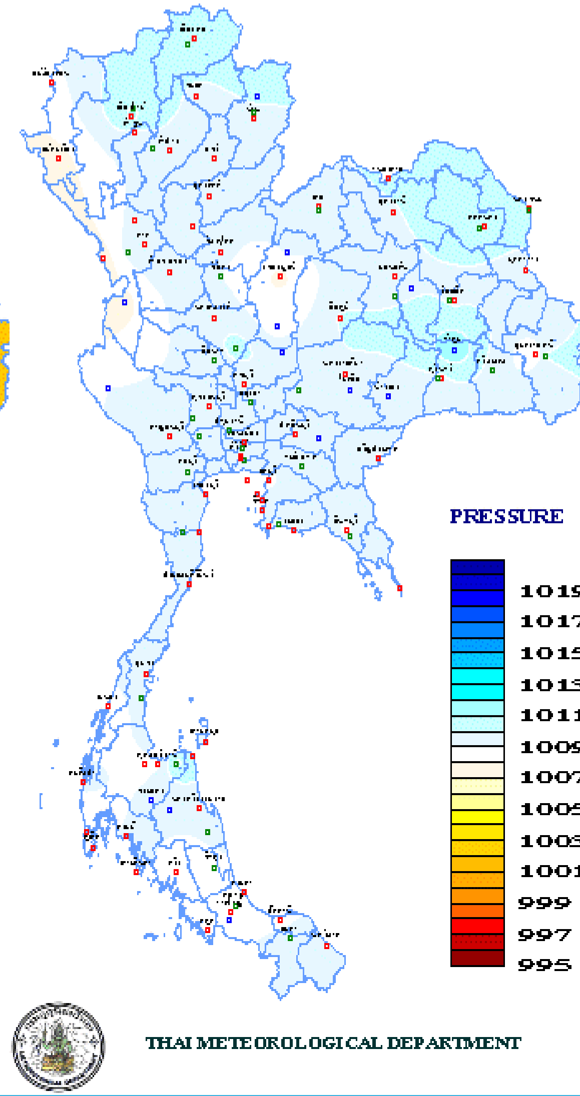
RELATIVE HUMIDITY
23 ตุลาคม 2013 16:00

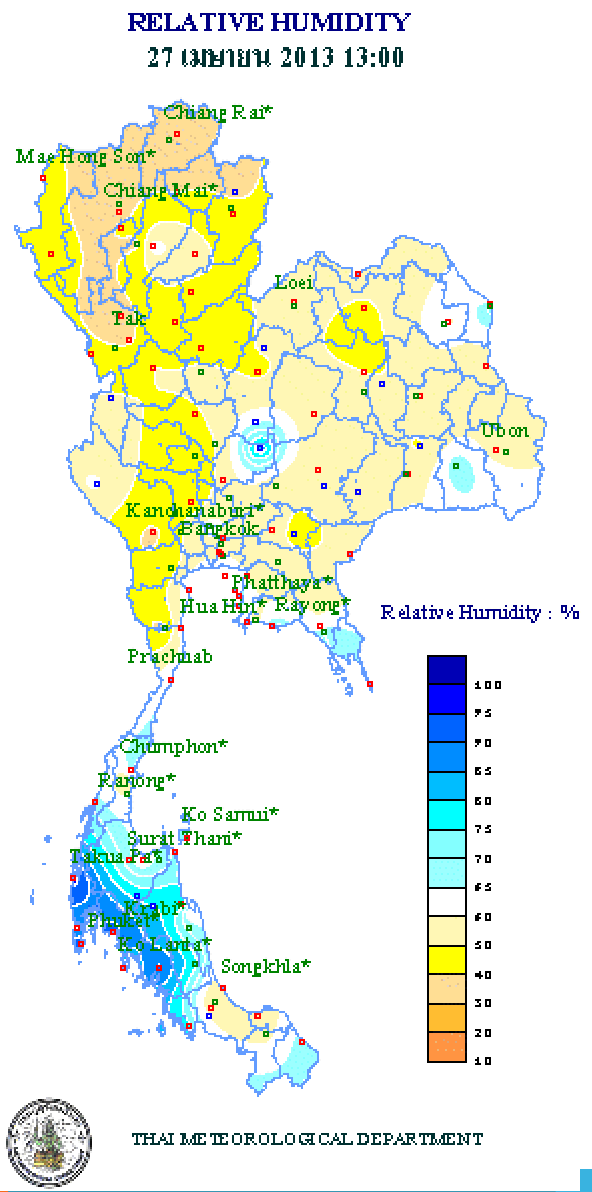


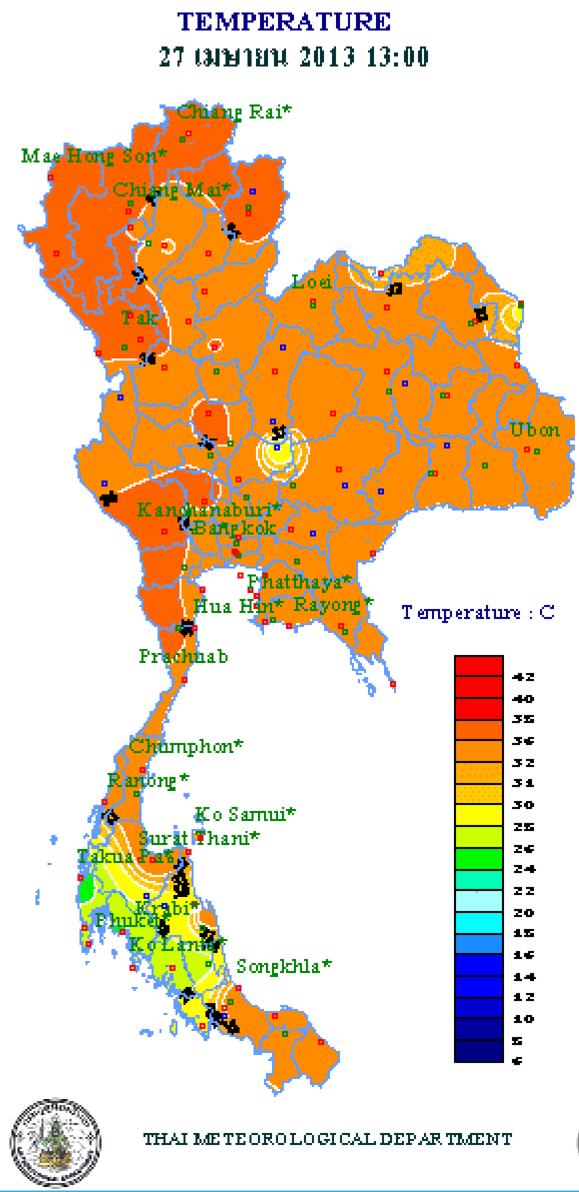
TEMPERATURE
23 ตุลาคม 2013 16:00

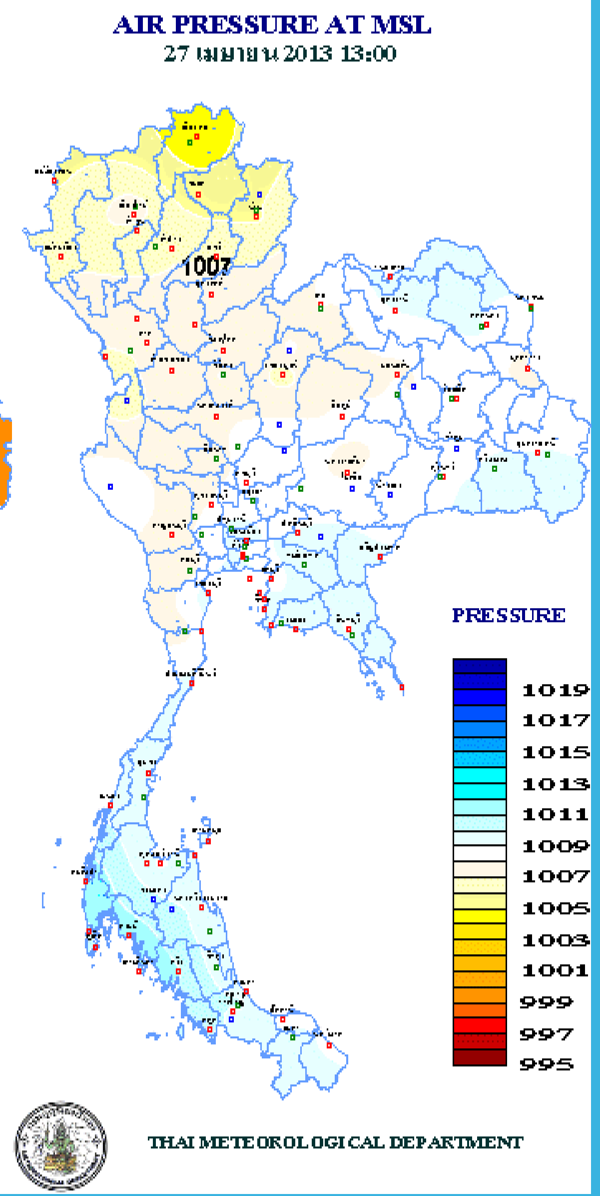


AIR PRESSURE AT MSL
23 ตุลาคม 2013 16:00



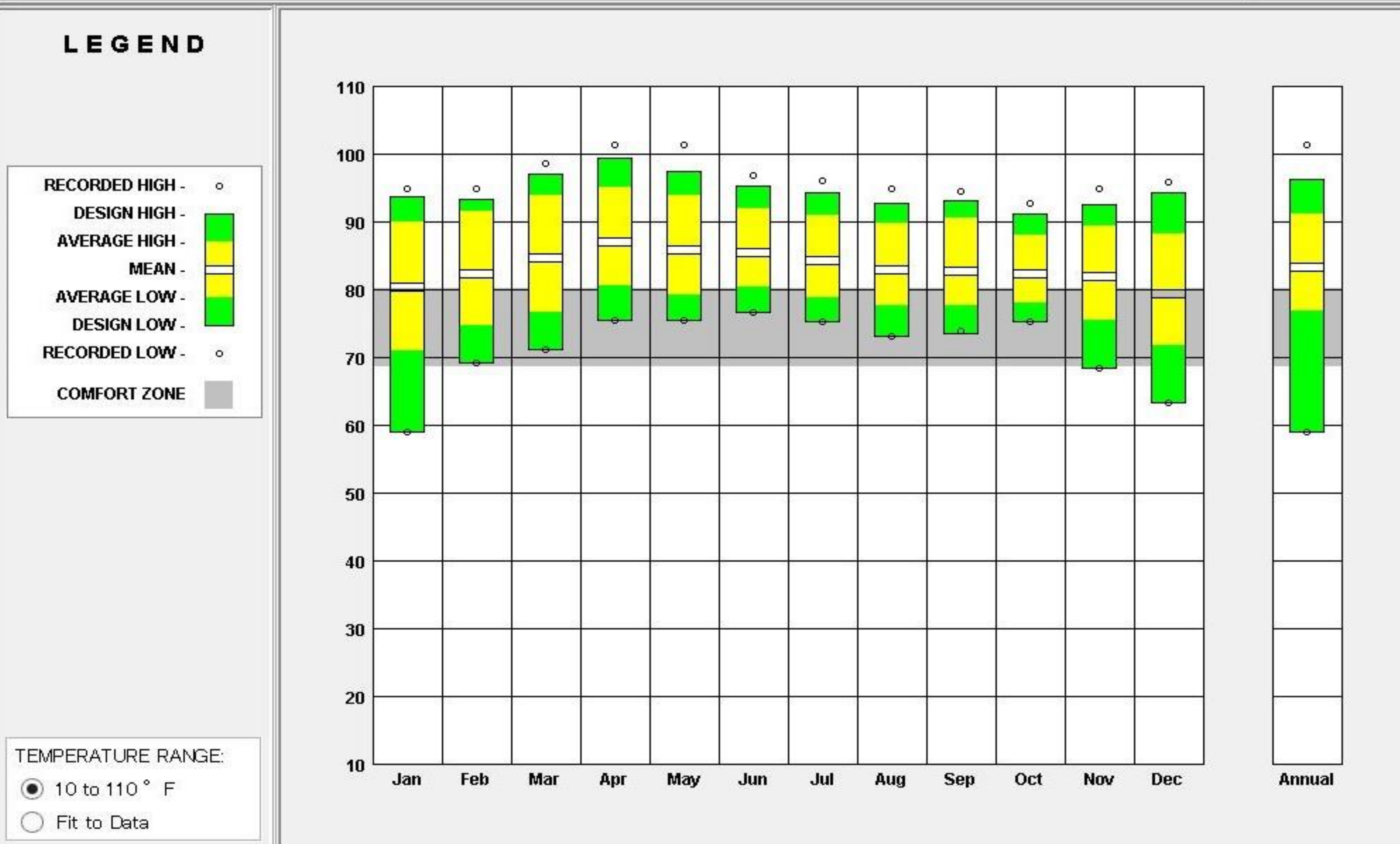

RELATIVE HUMIDITY
27 เมษายน 2013 13:00
Chiang Rai*
Mae Hong Son*
Chiang Mai*
Loei
Tak
Ubon
Kanchanaburi*
Bangkok
Phatthaya*
Hua Hin*
Rayong*
Relative Humidity : %
Prachuab
Chumphon*
Ranong*
Ko Samui*
Surat Thani*
Takua Pa*
Krabi*
Phuket*
Ko Lanta*
Songkhla*
THAI METEOROLOGICAL DEPARTMENT


TEMPERATURE
27 เมษายน 2013 13:00
Chiang Rai*
Mae Hong Son*
Chiang Mai*
Loei
Tak
Ubon
Kanchanaburi*
Bangkok
Phatthaya*
Hua Hin*
Rayong*
Temperature : C
Prachuab
Chumphon*
Ranong*
Ko Samui*
Surat Thani*
Takua Pa*
Krabi*
Phuket*
Ko Lanta*
Songkhla*
THAI METEOROLOGICAL DEPARTMENT

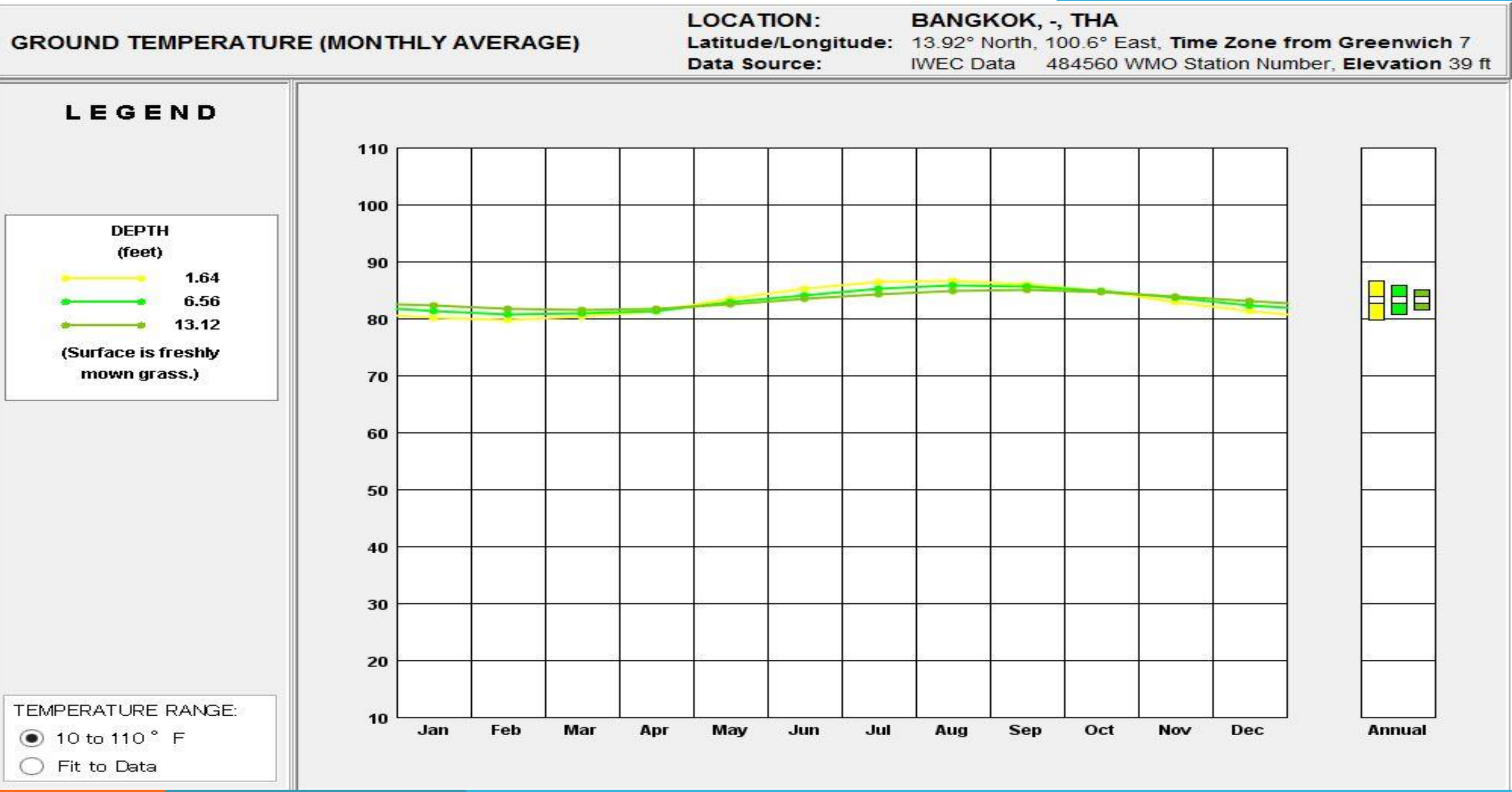

AIR PRESSURE AT MSL
27 เมษายน 2013 13:00
1007
PRESSURE
1019
1017
1015
1013
1011
1009
1007
1005
1003
1001
999
997
995
THAI METEOROLOGICAL DEPARTMENT

TEMPERATURE RANGE
ASHRAE Standard 55-2004 using PMV

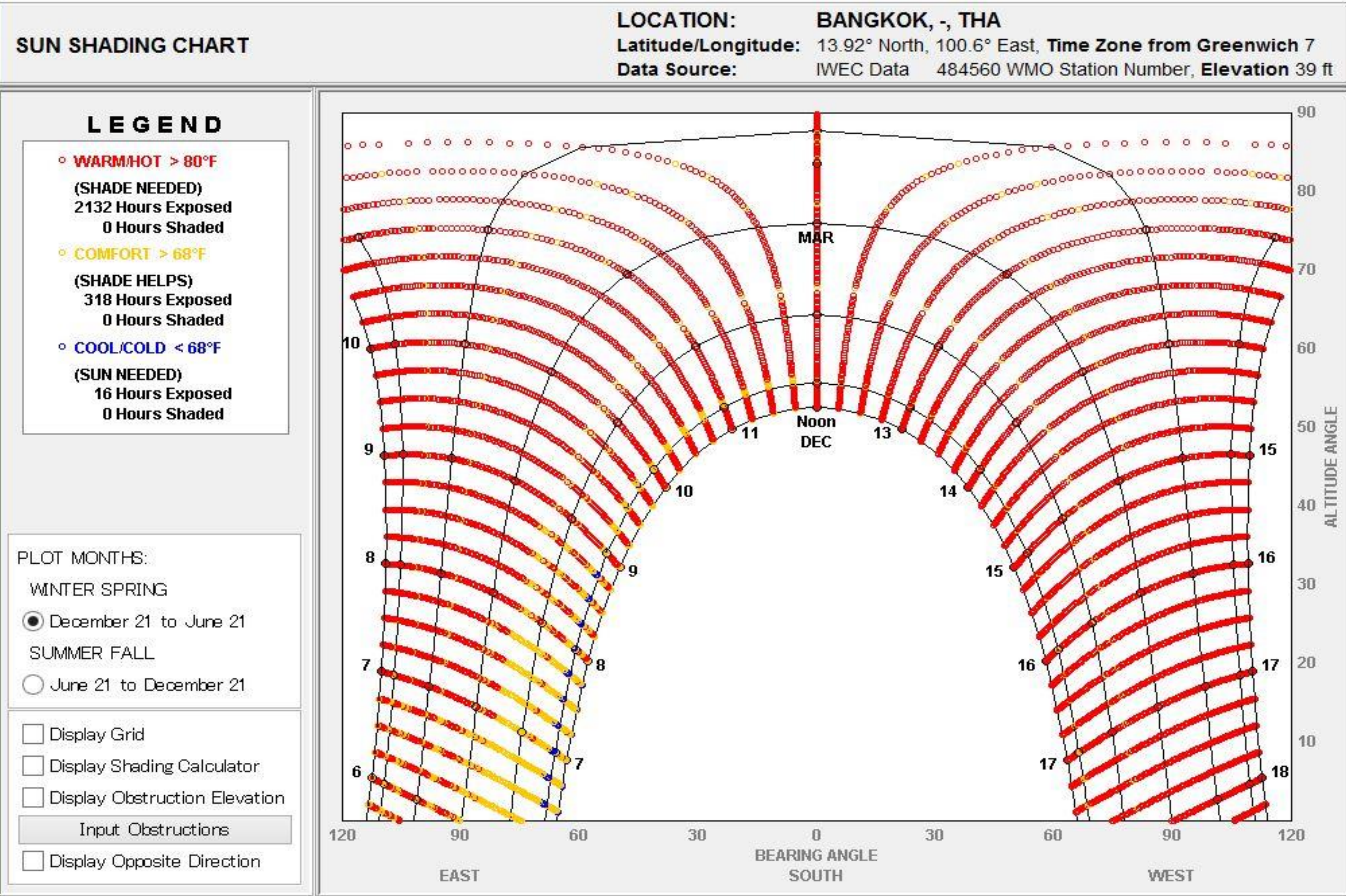
LOCATION: **BANGKOK, -, THA**
Latitude/Longitude: 13.92° North, 100.6° East, **Time Zone from Greenwich** 7
Data Source: IWEC Data 484560 WMO Station Number, **Elevation** 39 ft



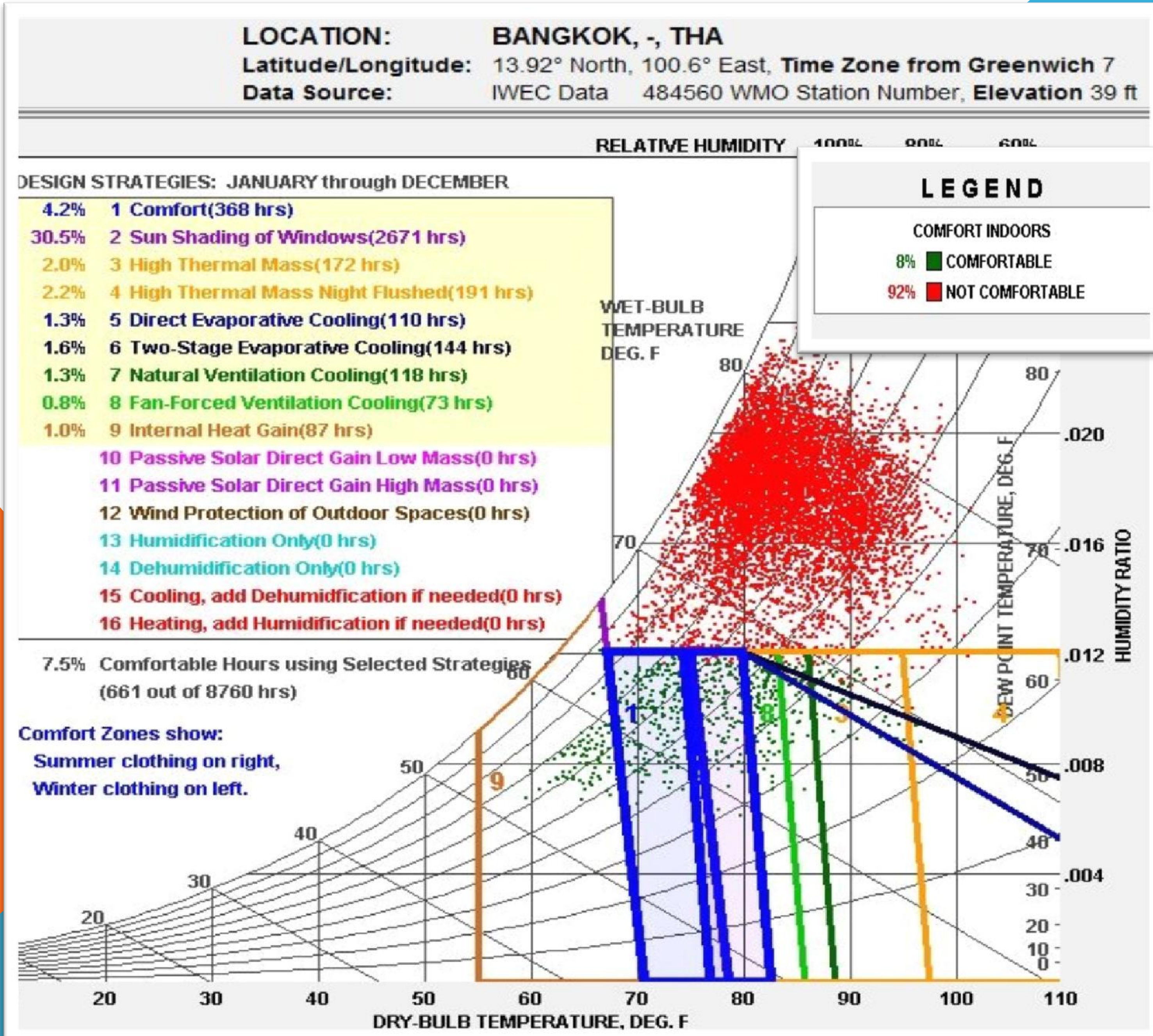
The Graph shows ground temperature level is average at above 26.6 degree Celsius



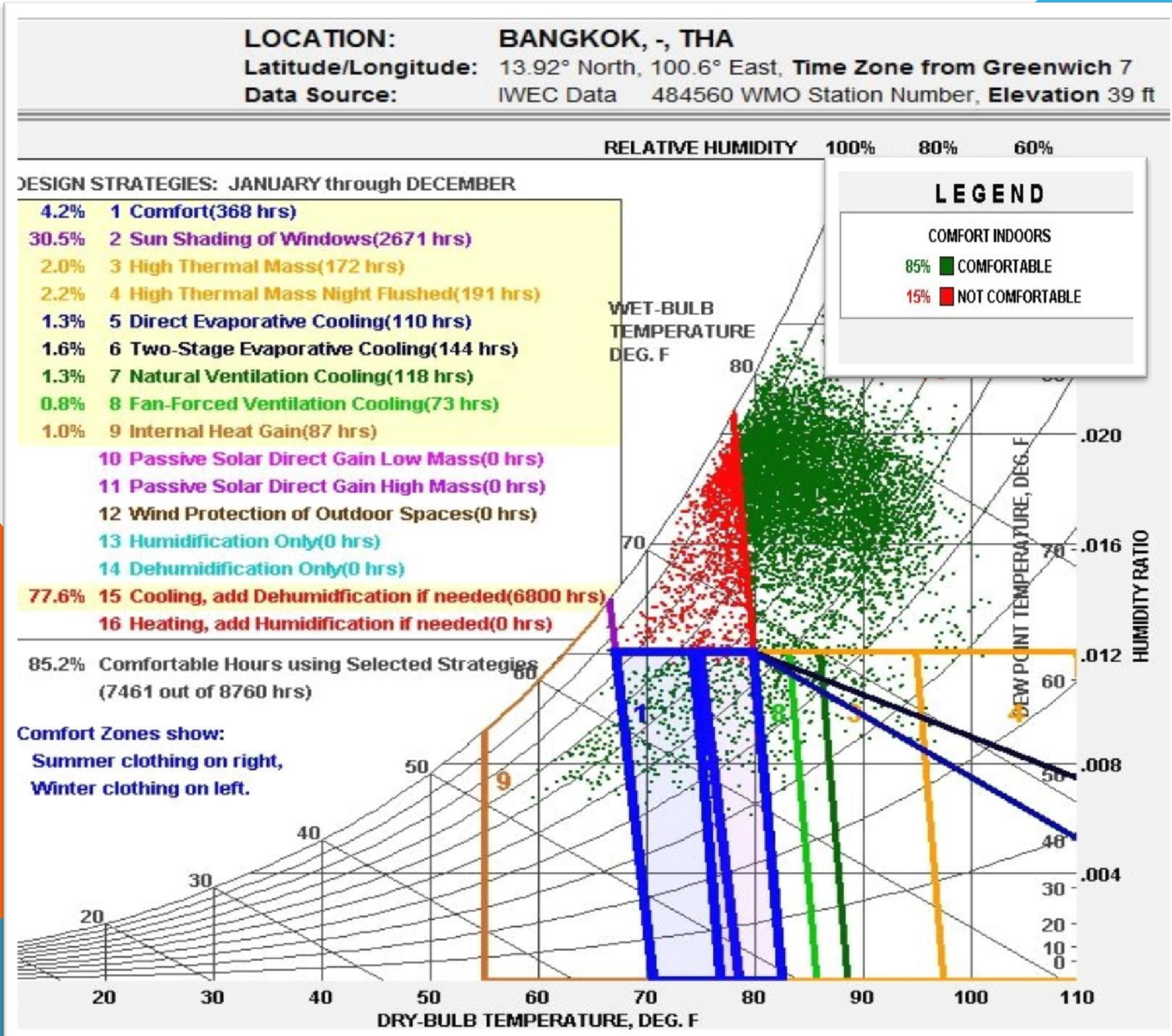
The red color in this graph show that Singapore and Thailand need SHADING SYSTEM for cooling this design.



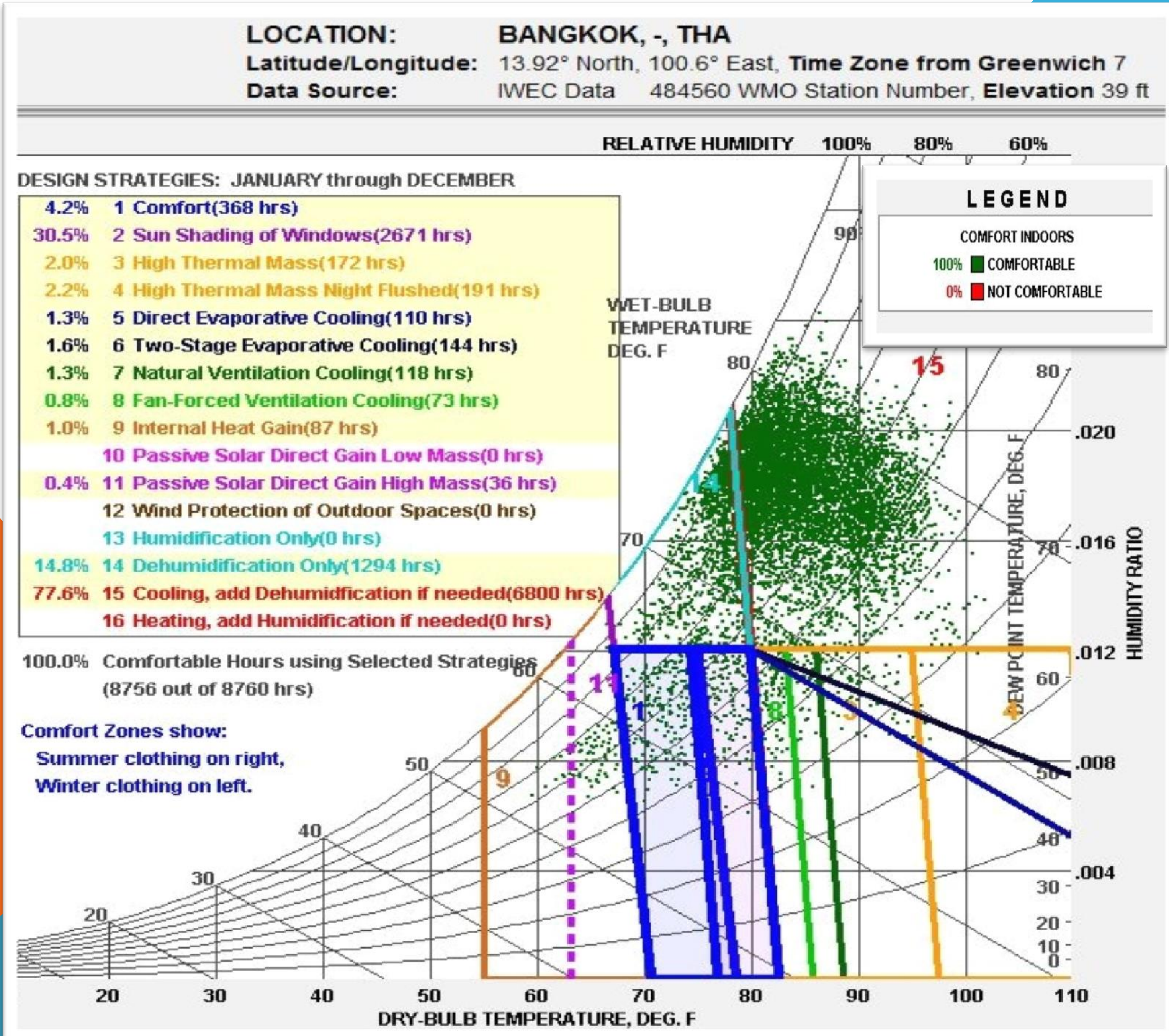
Climate Consultant : Without Cooling 15

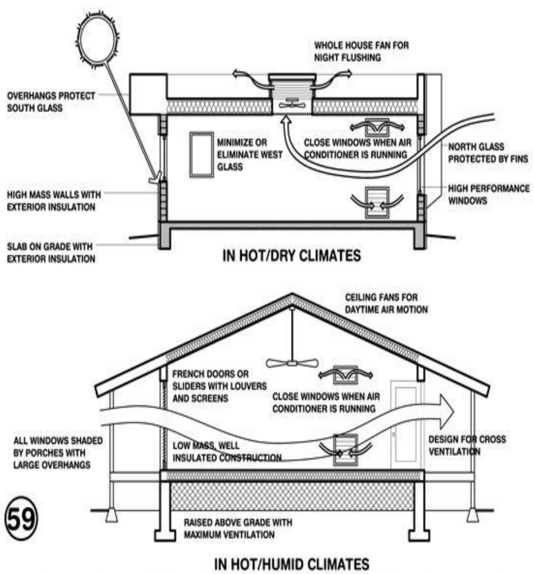


Climate Consultant : With Cooling 15



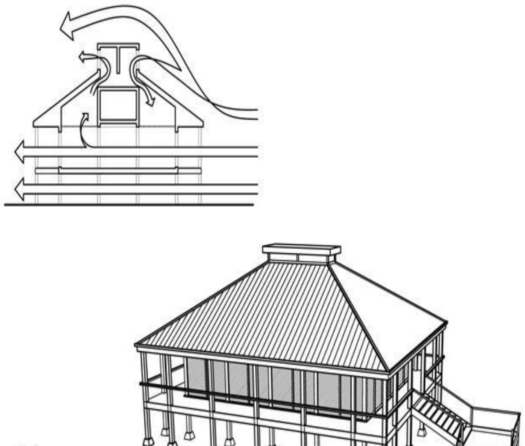
Climate Consultant : With Cooling + Dehumidification + Passive Solar Direct





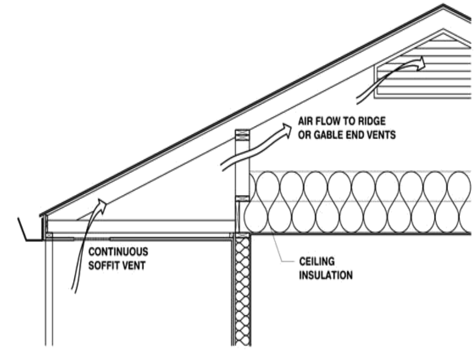
59

In this climate air conditioning will always be needed, but can be greatly reduced if building design minimizes overheating



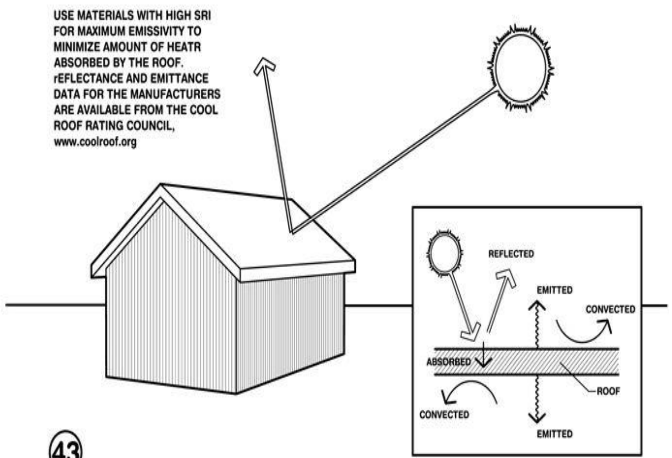
27

If soil is moist, raise the building high above ground to minimize dampness and maximize natural ventilation underneath the building



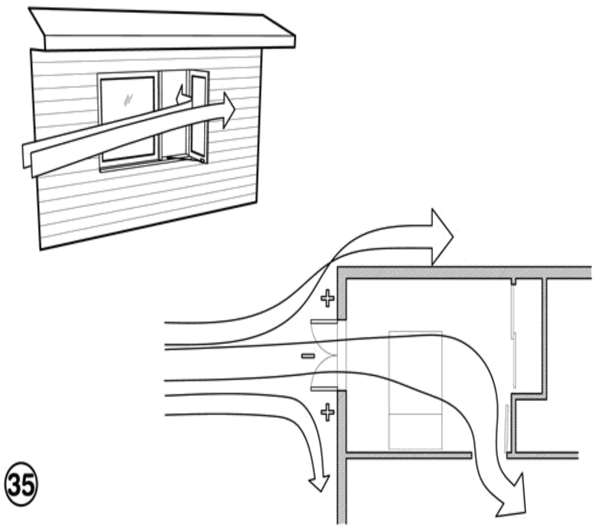
25

In wet climates well ventilated attics with pitched roofs work well to shed rain and can be extended to protect entries, porches, verandas, outdoor work areas



43

Use light colored building materials and cool roofs (with high emissivity) to minimize conducted heat gain

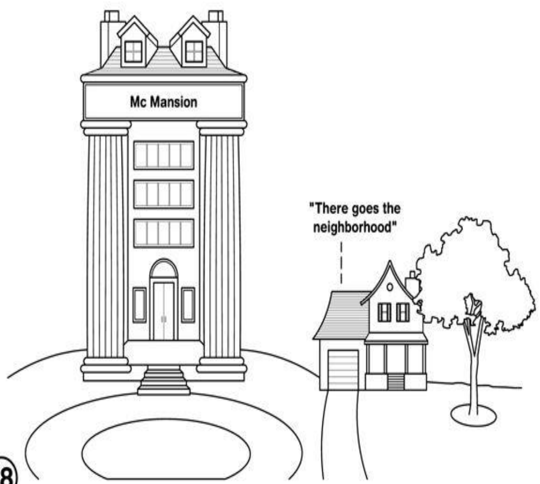


35

Good natural ventilation can reduce or eliminate air conditioning in warm weather, if windows are well shaded and oriented to prevailing breezes

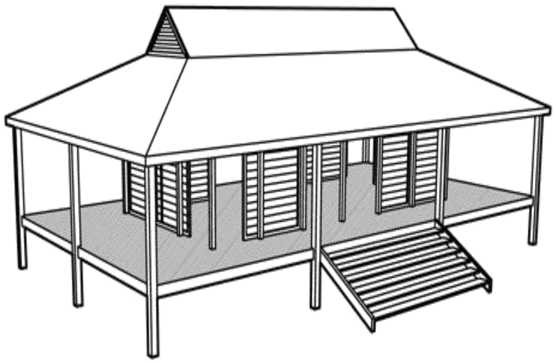
65

Traditional passive homes in warm humid climates used high ceilings and tall operable (French) windows protected by deep overhangs and verandahs



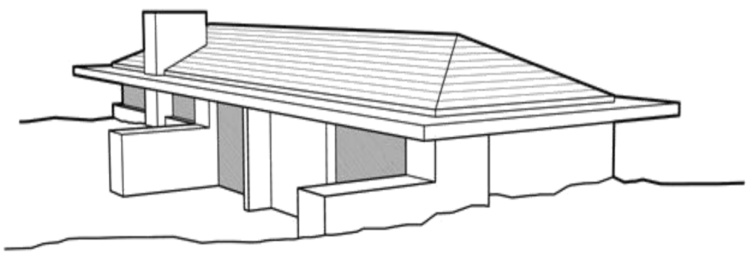
18

Keep the building small (right-sized) because excessive floor area wastes heating and cooling energy



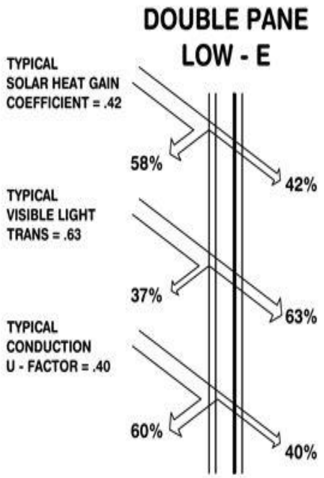
68

Traditional passive homes in hot humid climates used light weight construction with openable walls and shaded outdoor porches, raised above ground



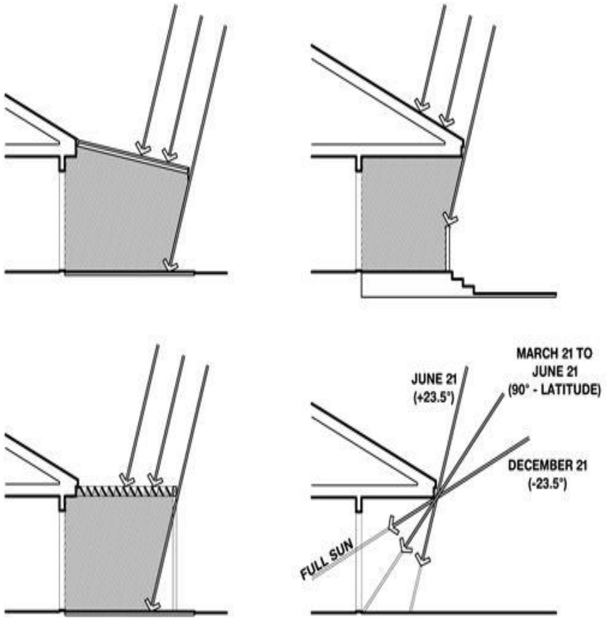
60

Earth sheltering, occupied basements, or earth tubes reduce heat loads in very hot dry climates because the earth stays near average annual temperature



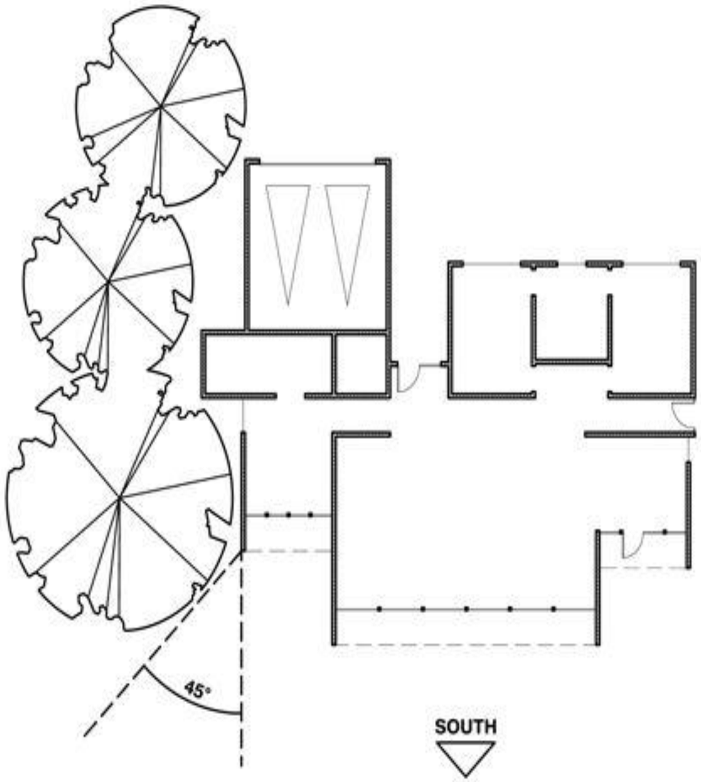
30

High performance glazing on all orientations should prove cost effective (Low-E, insulated frames) in hot clear summers or dark overcast winters



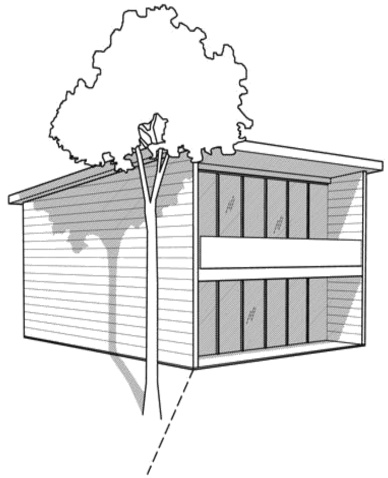
37

Window overhangs (designed for this latitude) or operable sunshades (awnings that extend in summer) can reduce or eliminate air conditioning



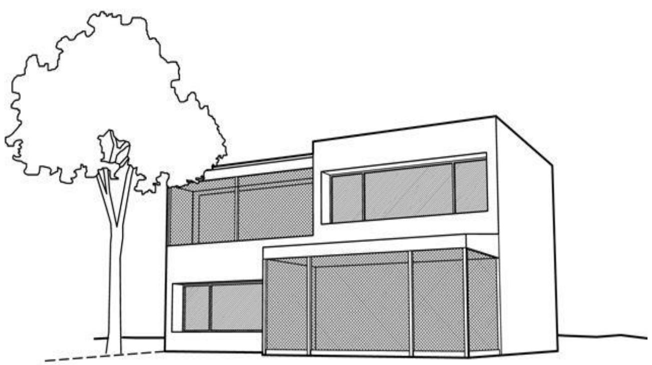
17

Use plant materials (bushes, trees, ivy-covered walls) especially on the west to minimize heat gain (if summer rains support native plant growth)



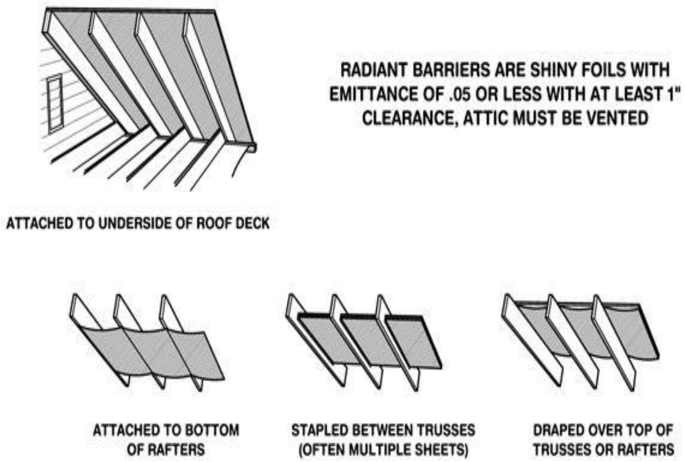
32

Minimize or eliminate west facing glazing to reduce summer and fall afternoon heat gain



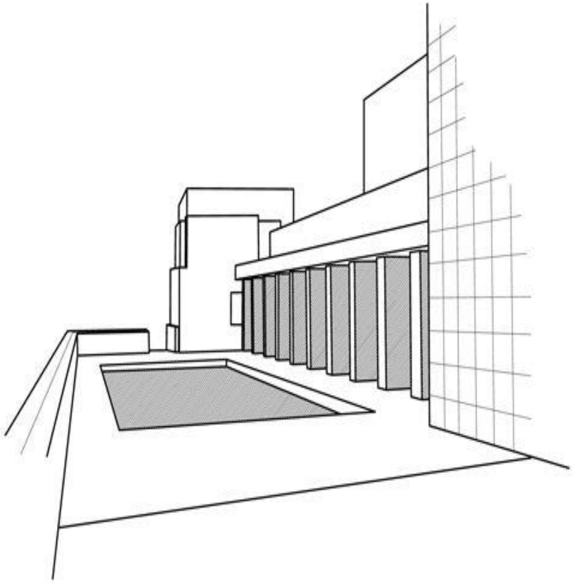
56

Screened porches and patios can provide passive comfort cooling by ventilation in warm weather and can prevent insect problems



26

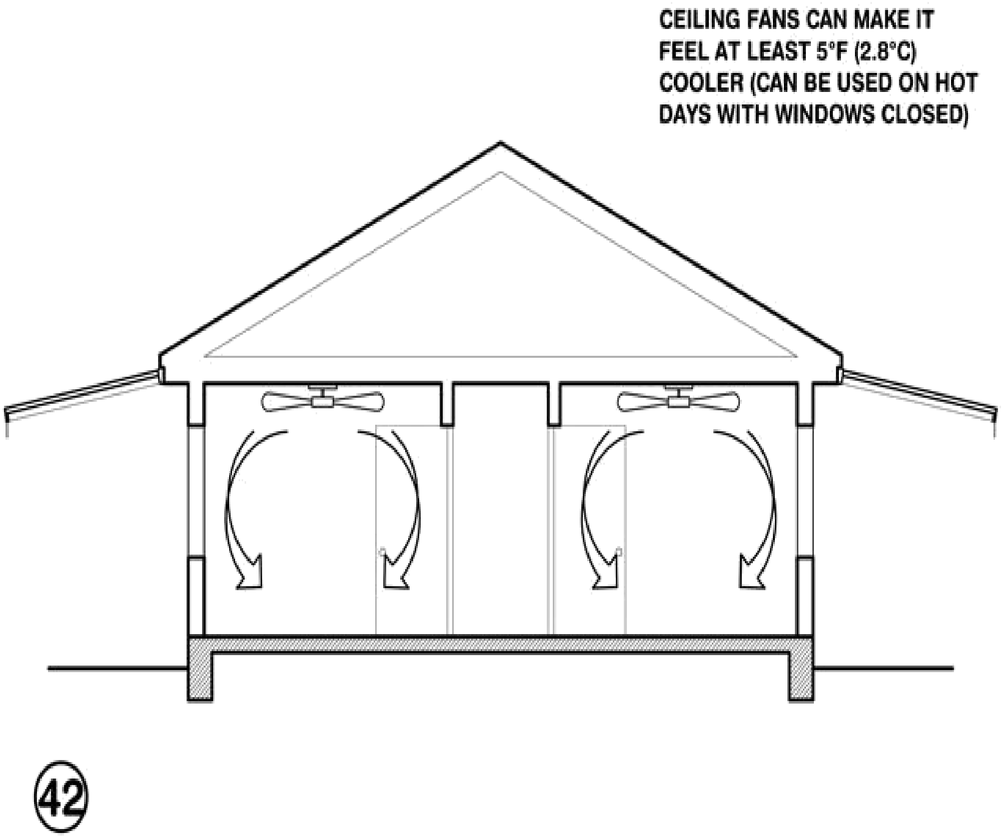
A radiant barrier (shiny foil) will help reduce radiated heat gain through the roof in hot climates



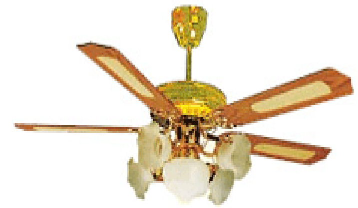
57

Orient most of the glass to the north, shaded by vertical fins, in very hot climates, because there are essentially no passive solar needs

Long narrow building floorplan can help maximize cross ventilation in temperate and hot humid climates



On hot days ceiling fans or indoor air motion can make it seem cooler by 5 degrees F (2.8C) or more, thus less air conditioning is needed



Luckymisu 56 inch.P 200V, 50 hz

Luckymisu 56 inch, P 200 V, 50 Hz, 330 - 340 round/m

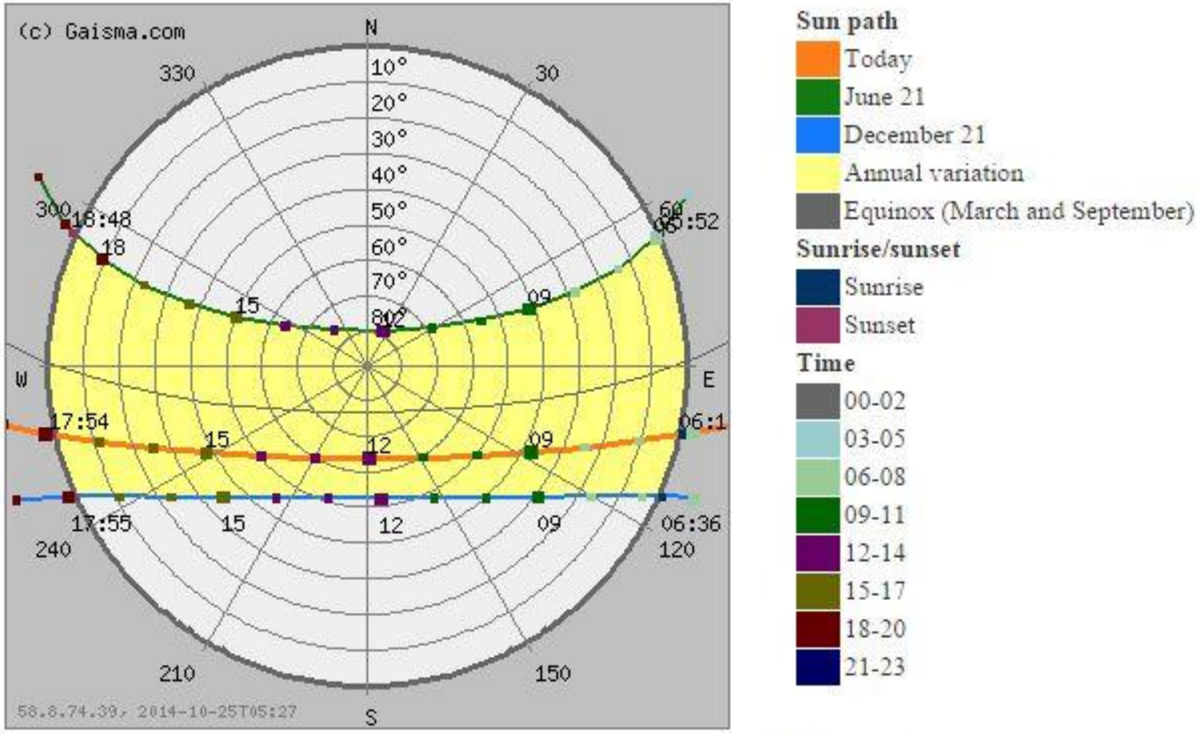
Aliexexpress

CONTENT

SOLAR PATH

Sun Rise Time : 6:10 AM
Sun Set Time : 5:53 PM

Bangkok, Thailand - Sun path diagram



Notes: • = Daylight saving time, * = Next day. How to read this graph? Change preferences.

CONTENT

AGRICULTURE / ART CRAFT





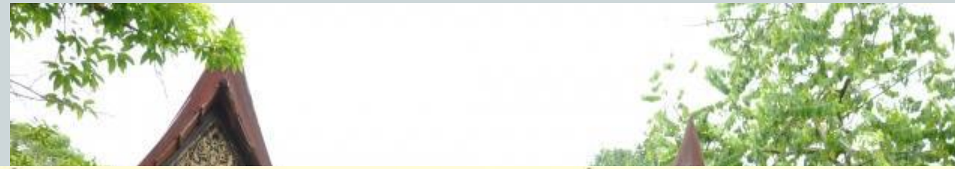


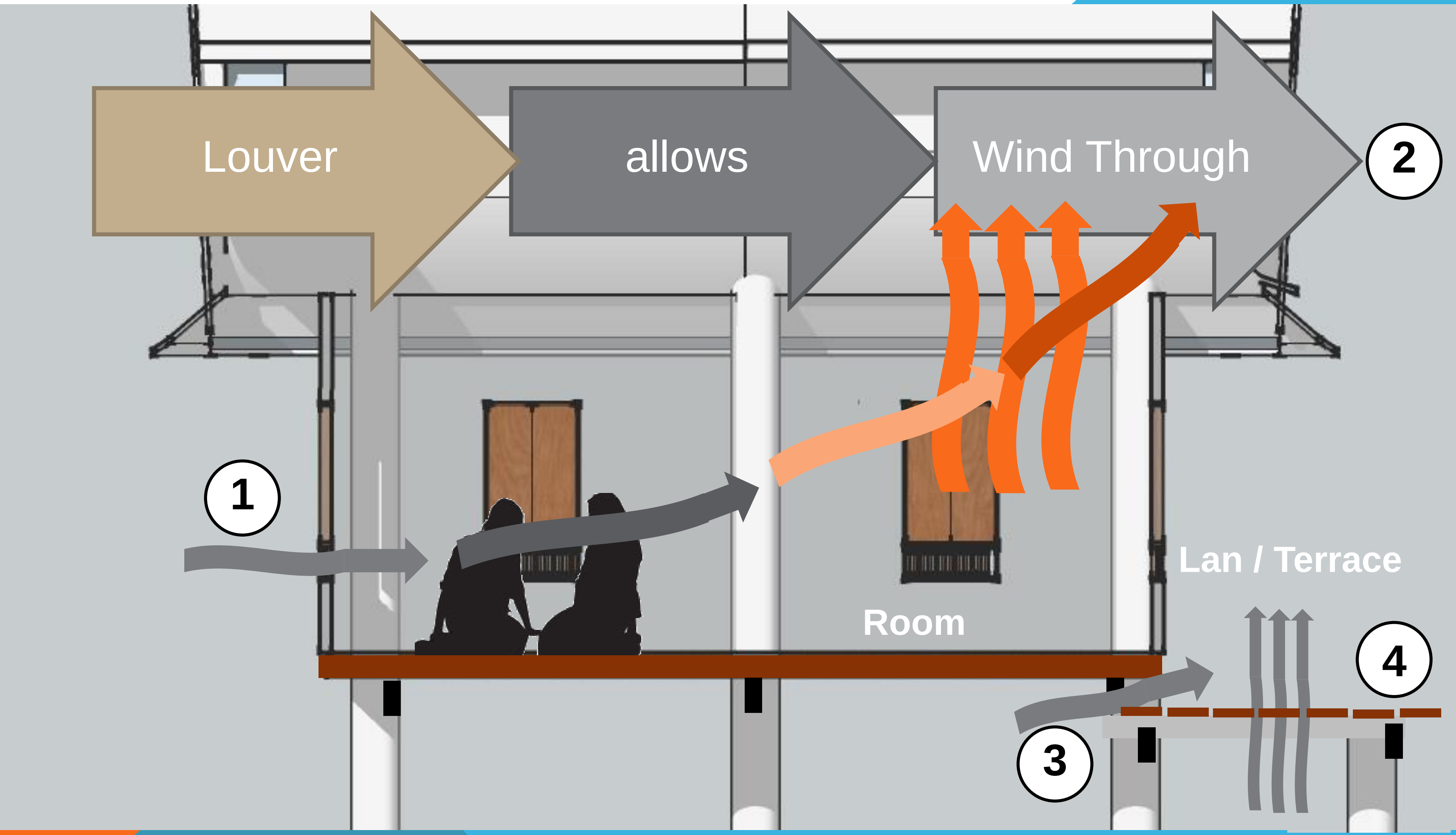
CONTENT

SUSTAINABILITY / BUSINESS CHANGING TO CITY LIFE

CONTENT

Thai Vernacular Architecture





Louver
allows
Wind Through
2
1
Lan / Terrace
Room
4
3

CONTENT

Analysis of temperature and humidity
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Example of latest green architecture

Thai Global Energy Co., Ltd.
บริษัท ไทย โกลบอล เอ็นเนอร์จี้ จำกัด

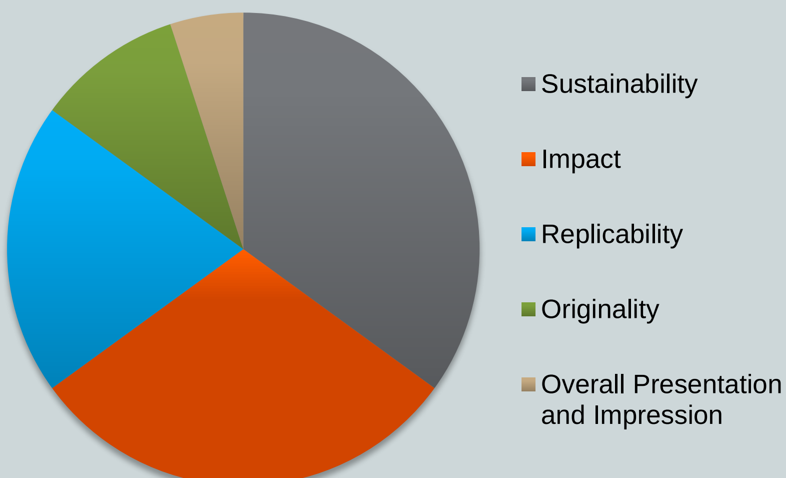
USGBC
Thai Global Green Energy (TGE)

GREEN ISSUE AND POLICY IN THAILAND

Energy Policy
and Planning Office
MINISTRY OF ENERGY

TGBI

1. TEA – Thai Green Buildings Awards
2. TREES Thai's Rating of Energy and Environmental Sustainability
3. AEA – ASEAN Energy Awards (AEA 2000 – 2013)
   A. Energy Efficient Building
   B. Renewable Energy Project
   C. Energy Management in Building and Industry



GREEN BUILDING IN THAILAND

1. TEA – Thai Green Buildings Awards
2. TREES Thai's Rating of Energy and Environmental Sustainability
3. AEA – ASEAN Energy Awards (AEA 2000 – 2013)
   - A. Energy Efficient Building
   - B. Renewable Energy Project
   - C. Energy Management in Building and Industry

A

B

C

ENERGY REGULATION IN THAILAND

ASEAN-JAPAN PROMEEC

ASEAN CENTRE FOR ENERGY

One Vision, One Identity, One Community

PROMOTION ON ENERGY EFFICIENCY AND CONSERCATION (PROMEEC)

Together with IEEJ
The Institute of Energy Economics, Japan - IEEJ

The Institute of Energy Economics, Japan

PROMEEC – Buildings
This sub-project aims to enhance and contribute to the awareness on environmental protection in the design and operation of the building sector of the ASEAN Member Countries. Activities included are:

1) establishment of a standardized evaluation criteria for energy conservation in buildings through the preparation of an in-house database system and technical directory;

2) awarding of model buildings that demonstrate energy savings and best practices

3) provide recommendations to improve and reduce energy consumption

4) conduction of national workshops for introduction and dissemination of energy conservation measures and technologies.

ENERGY REGULATION IN THAILAND

ASEAN CENTRE FOR ENERGY

One Vision, One Identity, One Community

Introduction | Activities | Event | News | Photo Gallery | Publication | Energy Bodies | Links | Contact Us

Ongoing Activities

- ASEAN - Japan Multi-Country Training Program on Energy Conservation for ASEAN Countries
- ASEAN Energy Business Forum
- ASEAN Energy Database
- ASEAN+3 Civilian Nuclear Energy
- ASEAN+3 Energy Security System
- ASEAN+3 Mitigation Programme
- ASEAN+3 Oil Price Database
- Renewable Energy Support Programme for ASEAN (ASEAN-RESP)

Completed Activities

- AADCP-RPS Project
- ASEAN - Japan Promotion on Energy Efficiency and Conservation

Home » Publication » 3rd ASEAN Energy Outlook »

Part of the Energy Supply and Security Planning in the ASEAN (ESSPA) Programme, funded by the Ministry of Economy, Trade and Industry (METI) of Japan
Joint output by the ASEAN Centre for Energy (ACE), the Institute of Energy Economics, Japan (IEEJ) and National ESSPA Teams.

Methodology applied for forecasting was econometric and used an engineering based model with software (MICROFIT and LEAP)

Published in July 2011
Cover all 10 ASEAN Member States
Enriched with an analysis of an alternative energy development path

Projection Scenarios:

1. Business-as-Usual (BAU)
   Based on GDP Growth Targets of the 10 Member States
2. Alternative Policy Scenario
   Based on Energy Saving Goals and Action Plan of the 10 Member States in primary energy demand and CO2 emissions

Download here

ENERGY REGULATION IN THAILAND

OTTV

OVERALL THERMAL TRANSFER VALUW

EDUCATIONCAL/OFFICE	• 50 W/SQ.M
THEATRE/ COMMERCIAL/PUBLIC USE	• 40 W/SQ.M.
HOTEL/HOSPITAL/;LARGE SCALE	• 30 W/SQ.M.

PERSONAL EXPERIENCE AND FEELING

OVERALL TEMPERATURE AND HUMIDITY

27 – 33 degree Celsius
60%-80% Relative humidity

In summer, Every April in the hottest month, skin burn and sweating all day, feel uncomfortable.

November to February is the most preferable period for Thai People and holiday.

PRUDSAMON KAMMASORN

THAILAND

どうもありがとうございます。
Thank you very much