BUILD GREEN

Charter for Sustainable Building,
Neighborhood Design
and Urban Mobility in Tropical Countries


Sunshading


Daylighting


Local building materials


Energy generation

UN HABITAT
FOR A BETTER URBAN FUTURE

UN environment programme

Urban Pathways

gef

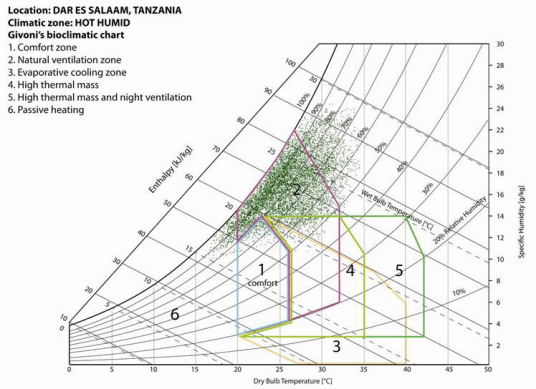
www.unhabitat.org www.urban-pathways.org www.eebea.org

Charter for Sustainable Building and Neighborhood Design in Tropical Countries

Here are 30 important strategies to be considered when designing, constructing and using green buildings and when planning green neighborhood

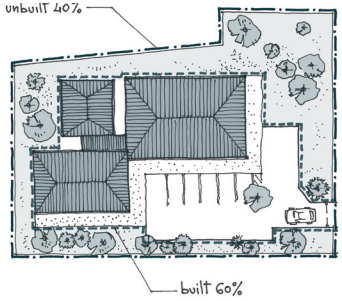
01 Site analysis (context, topography and climatic data)

- Retrofit existing poor buildings and give preference to brownfield sites over undeveloped green fields.
- Assess the local context including the topography of the site.
- Collect data on temperature, relative humidity, wind's speed and direction, precipitations over at least one year and solar path and radiation.
- Establish the bioclimatic chart for the location using data of temperature and relative humidity.



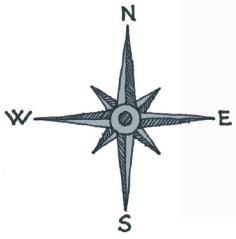
02 Building footprint

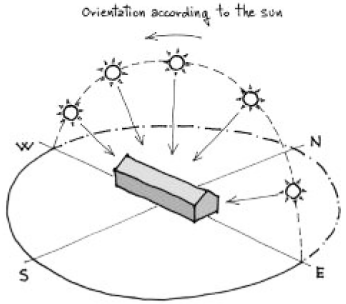
- Conform to the permitted ground coverage and should ideally cover not more than 60% of the plot.



03 Building orientation

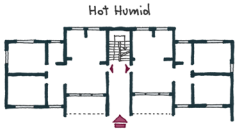
- Design the long axis of the building to be along East-West to minimize direct solar radiation penetration in the building and reduce heat gain.
- Always indicate the North direction in all plans.

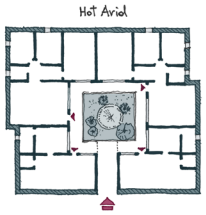




04 Building form / shape

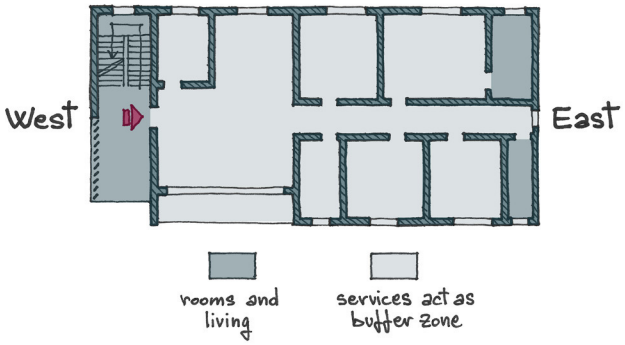
- Design according to climatic zone.
- For hot-humid region, use narrow plans to maximize natural light, cross-ventilation and minimize heat gain
- For hot-arid regions, use compact forms with courtyards to retain cold air in the building and minimize heat gain.
- Give preference to multi-story building to increase density and maximize resources.





05 Allocation of spaces within the building

- Services e.g. toilets, staircases, lifts, lobbies, kitchens etc. to be located on the East and West facing walls to act as buffer zones against heat gain but benefiting from daylighting.

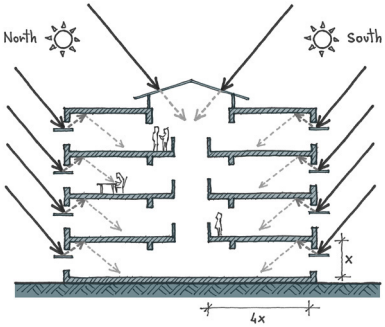


06 Openings

- Window sizing to be designed according to prevailing climatic conditions, and placement preferably on North and South walls; wall to windows ratio should not exceed 40%.
- Gazing walls should be avoided, unless using special treated glass.

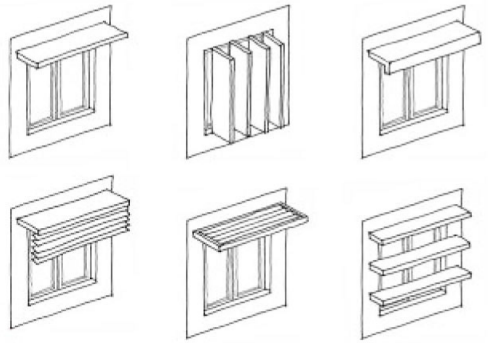
07 Daylighting

- Design buildings according to climatic region, with openings on North and South walls, narrow plans to maximize daylighting, use clerestories & light shelves in deep spaces; staircases, toilets, & kitchens to be day-lit.
- Window area should be at least one tenth of the floor area.
- The depth of the room should not exceed 2.5 times the window-head-height.



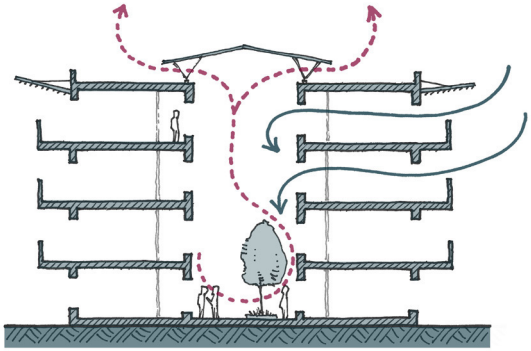
08 Solar protection

- Use sun shading devices e.g. roof overhangs, vertical & horizontal shading elements, balconies, screens, & vegetation (green walls) to minimize heat gain.



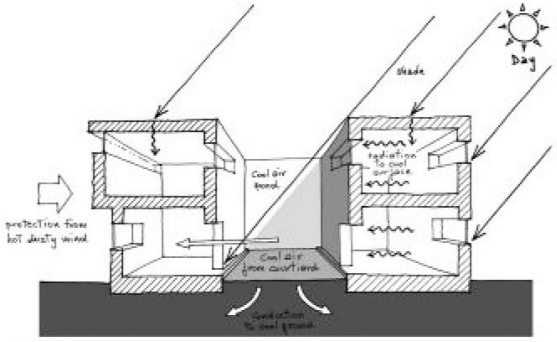
09 Natural ventilation

- Ensure that both cross and stack ventilation are provided by the openings.
- Make use of roof vents and openings, thermal chimneys and clerestory windows.
- Make use of insulation materials under the roof sheet and design ventilated roofs.



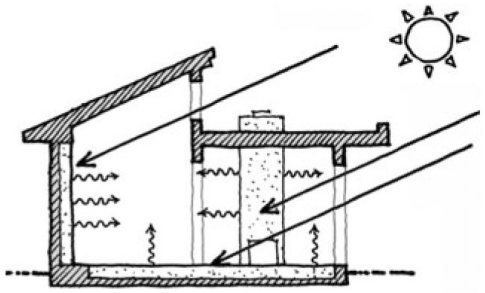
10 Cooling

- Integrate passive cooling systems by designing water bodies and features for evaporative cooling in hot and arid regions.
- Ensure that buildings using air conditioning appliances are well insulated to limit heat gain and reduce energy



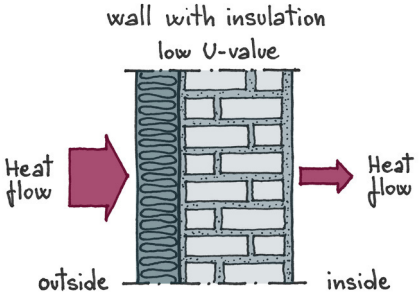
11 Heating

- Suitable for highland regions where passive heat gains through direct solar radiations are welcome in the building during the cold seasons.
- Design passive solar heating strategies to ensure maximum sun penetration during cold seasons.



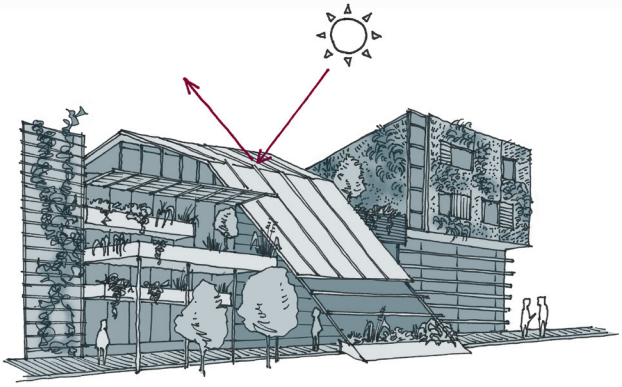
12 Building envelope and materials

- Always consider the carbon footprint content while choosing building materials.
- Give preferences to locally available building material that are more appropriate with low energy content.
- Consider recyclable and re-usable materials with low toxic emissions.
- Give preference to envelops (wall and roofs) with low U-value or low heat transmittance properties.



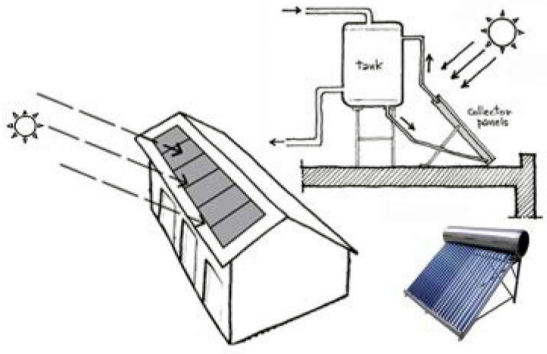
13 External finishes

- Make use of light-colored materials on external facades and roofs to reflect excessed solar radiation, while also incorporating green and living walls, vertical gardens provided with vegetation that grows on the facades.



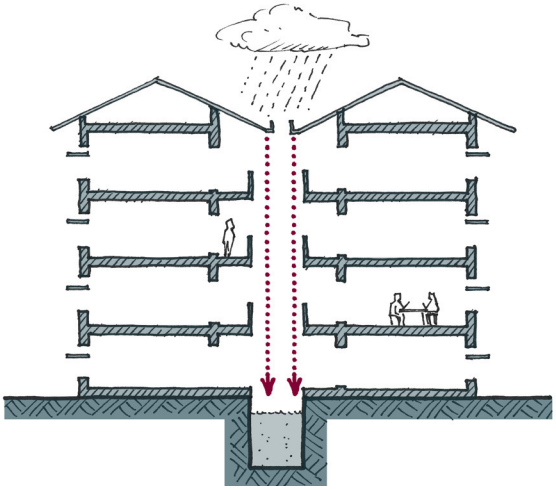
14 Renewable energy

- Integrate solar energy (thermal and electricity) such as photovoltaic and solar water heaters; wind energy, biogas and other available renewable energy systems into the building design.



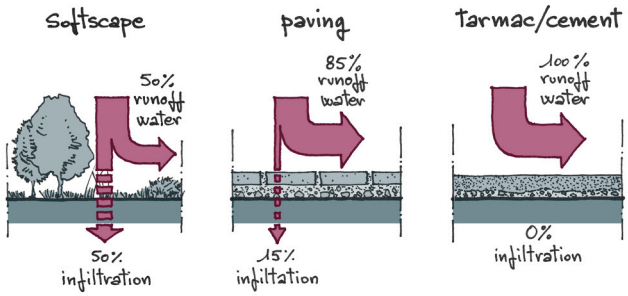
15 Water conservation and efficiency

- Design rainwater harvesting systems.
- Recycle grey water.
- Use water efficient appliances and water-saving fixtures



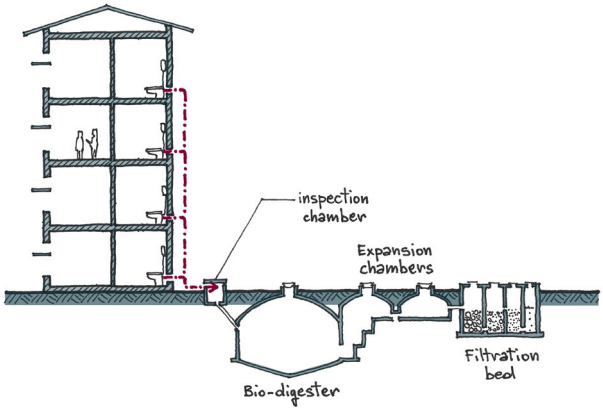
16 Drainage

- Provide appropriate drainage technique to mitigate storm water run-off and facilitate replenishment of water table through rainwater infiltration.



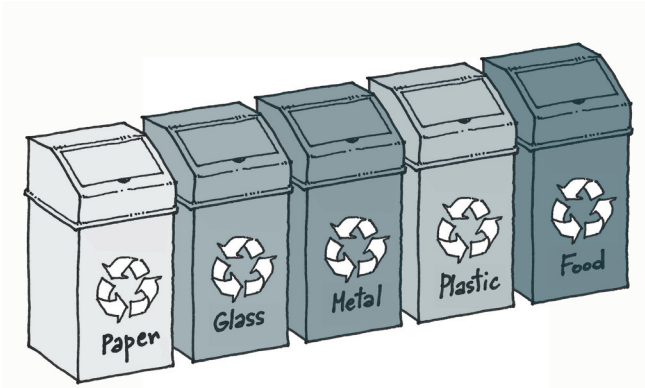
17 Sanitation

- In the absence of municipal sewage system, design on-site waste water treatment systems with production of biogas, compost and re-used of water for irrigation.



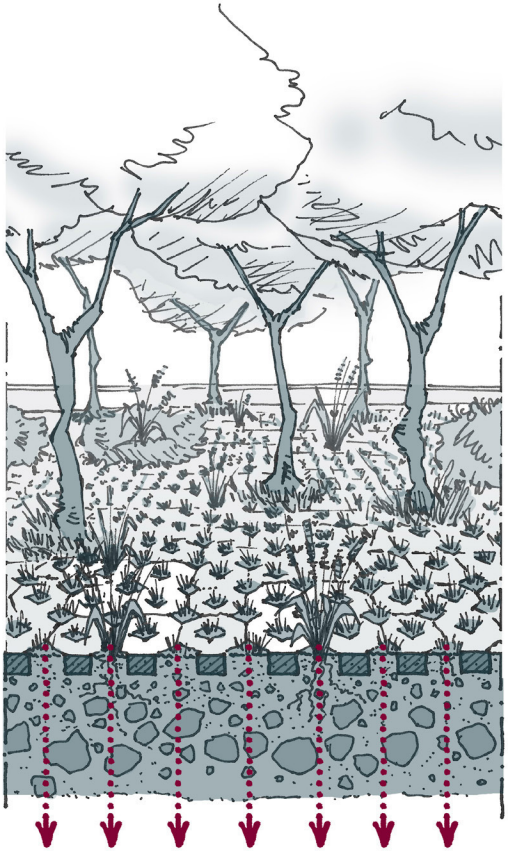
18 Solid waste management

- Design provisions for waste separation with on-site sorting facilities. Introduce innovative systems that encourage the 3R actions: Reduce, Recycle and Reuse.



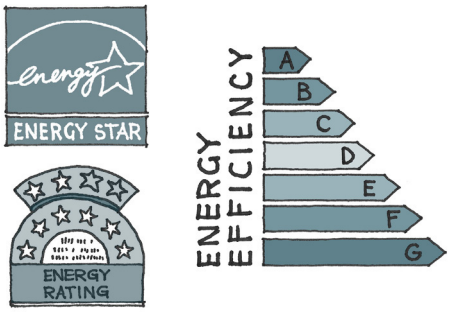
19 Landscaping

- Design soft landscaping (greening site) with indigenous plants that require minimal irrigation and hard landscaping with paving materials that allow rainwater permeability.
- Limit paved areas around the building to reduce heat island effects.

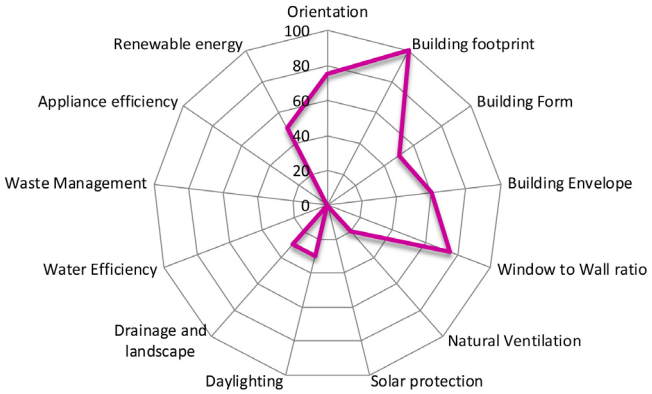


20 Energy-efficient appliances and Energy demand management

- Incorporate energy saving appliances in the building design.
- Make use of energy-saving bulbs, light level sensors, occupancy & motion sensors.
- Encourage behavior change.
- Ensure that energy demand management principles are given top priorities by the building occupants.



A radar chart to assess the sustainable performance of the building



KEY

0 - 25	Sustainable design measure not considered
26 - 50	Sustainable design measure considered but not effective
51 - 75	Sustainable design measure considered and effective
76 - 100	Sustainable design measure considered and combined with secondary function / innovative

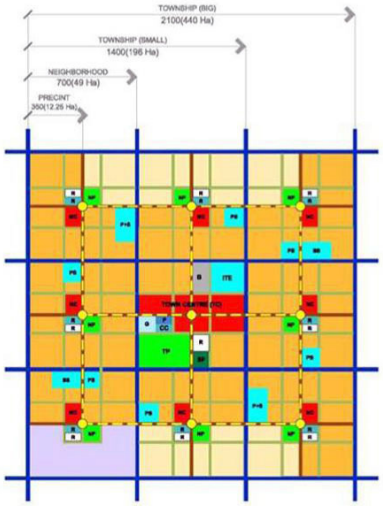
Neighborhood
planning and design

21 Well balanced public spaces

- 50% of spaces should be allocated to streets, roads, public spaces, gardens and parks (30% for streets, 15% open space).

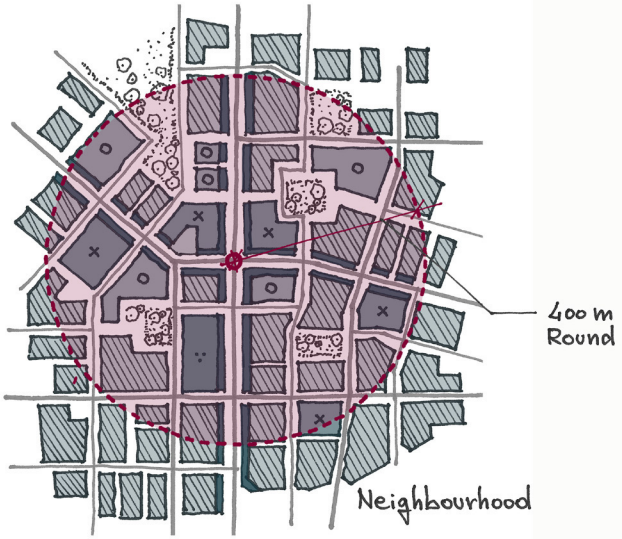
22 Mixed land use

- Avoid zoning by combining economic, administrative and residential activities.
- This reduces the need to travel and ensures the use of public space



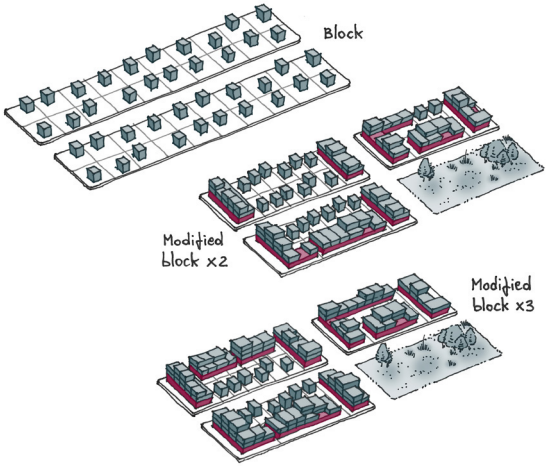
23 Mixed social structure

- Promote social integration and diversity.
- Encourage cosmopolitan values and the need to live together and avoid gated communities.
- 20 - 50% of residential space should be allocated to affordable housing.



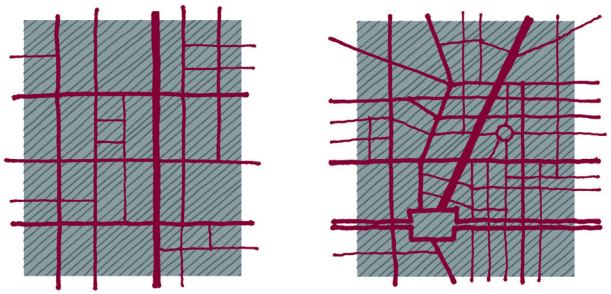
24 Adequate density and compact design

- High density neighborhoods that are enough to trigger economies of scale and ensure livability.



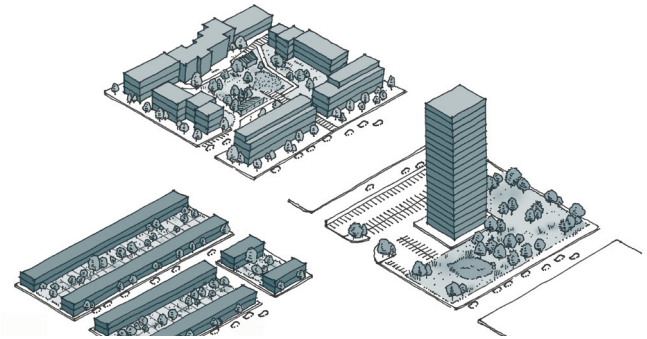
25 Connectivity

- Design street patterns and networks that connect the different parts of the city and eases access to goods and services.



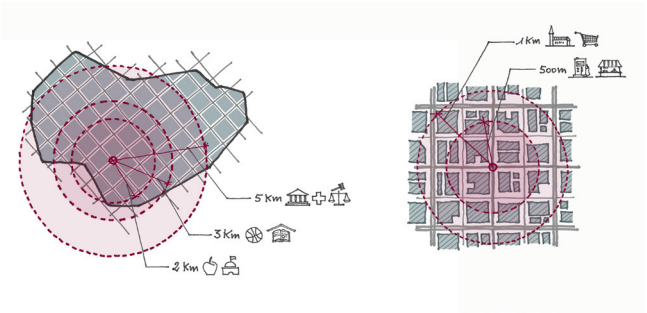
26 Urban Form Matters

- Support mixed use, street life and walkability by designing compact blocks and buildings.



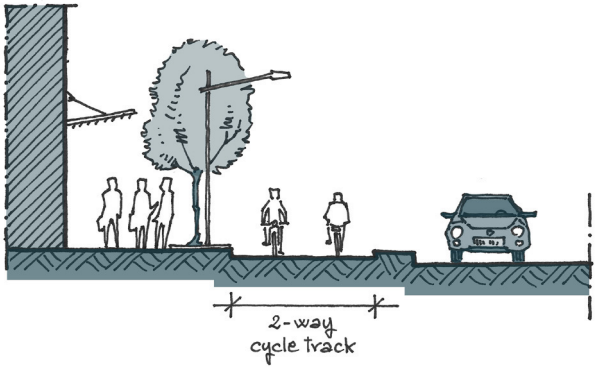
27 Walkability

- Favor pedestrian mobility by emphasizing on walking distances, mixed use and public transport.



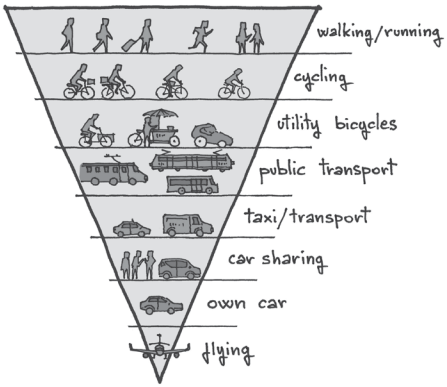
28 Active Mobility

- Street design should provide for pedestrians and cyclist lanes.
- Cycling extends reach of public transport.



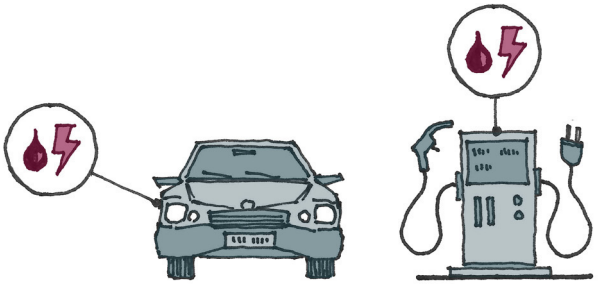
29 Promote the "shift"

- Encourage modal shift from energy intensive modes (cars) to walking, cycling and using public transport. Make cycling and walking safe and attractive.



30 Pomote vehicle efficiency

- Promote green transport by promoting the shift from fossil fuel dependent vehicles to hybrid and electric car



Here are 30 important strategies to be considered when designing, constructing and using green buildings and when planning green neighborhood

1. Site analysis (context, topography and climatic data): Retrofit existing poor buildings and give preference to brownfield sites over undeveloped green fields. Assess the local context including the topography of the site. Collect data on temperature, relative humidity, wind's speed and direction, solar path and radiation, over at least one year.

2. Building footprint: Conform to the permitted ground coverage and should ideally cover not more than 60% of the plot.

3. Building orientation: Design the long axis of the building to be along East-West to minimize direct solar radiation penetration in the building and reduce heat gain. Always indicate the North direction in all plans.

4. Building form/shape: Design according to climatic zone. For hot-humid region, use narrow plans to maximize natural light, cross-ventilation and minimize heat gain. For hot-arid regions, use compact forms with courtyards to retain cold air in the building and minimize heat gain. Give preference to multi-story building to increase density and maximize resources.

5. Allocation of spaces within the building: Services e.g. toilets, staircases, lifts, lobbies, kitchens etc. to be located on the East and West facing walls to act as buffer zones against heat gain but benefiting from daylighting.

6. Openings: Window sizing to be designed according to prevailing climatic conditions, and placement preferably on North and South walls; wall to windows ratio should not exceed 40%. Gazing walls should be avoided, unless using special treated glass.

7. Daylighting: design buildings according to climatic region, with openings on North and South walls, narrow plans to maximize daylighting, use clerestories & light shelves in deep spaces; staircases, toilets, & kitchens to be day-lit. Window area should be at least one tenth of the floor area. The depth of the room should not exceed 2.5 times the height of the room.

8. Solar protection: use sun shading devices e.g. roof overhangs, vertical & horizontal shading elements, balconies, screens, & vegetation (green walls) to minimize heat gain.

9. Natural ventilation: Ensure that both cross-and vertical ventilation are provided by the openings. Make use of roof vents and openings, thermal chimneys and clerestory windows. Make use of insulation materials under the roof sheet and design ventilated roofs.

10. Cooling: Integrate passive cooling systems by designing water bodies and features for evaporative cooling in hot and arid regions. Ensure that buildings using air conditioning appliances are well insulated to limit heat gain and reduce energy demand.

11. Heating: Suitable for highland regions where passive heat gains through direct solar radiations are welcome in the building during the cold seasons. Design passive solar heating strategies to ensure maximum sun penetration during cold seasons.

12. Building envelope and materia Alsl:ways consider the carbon footprint content while choosing building materials. Give preferences to locally available building material that are more appropriate with low energy content. Consider recyclable and re-usable materials with low toxic emissions. Give preference to envelops (wall and roofs) with low U-value or low heat transmittance properties.

13. External finishes: Make use of light-colored materials on external facades and roofs to reflect excessed solar radiation, while also incorporating green and living walls, vertical gardens provided with vegetation that grows on the facades.

14. Renewable energy: Integrate solar energy (thermal and electricity) such as photovoltaic and solar water heaters; wind energy, biogas and other available renewable energy systems into the building design.

15. Water conservation and efficiency: Design rainwater harvesting systems. Recycle grey water. Use water efficient appliances and water-saving fixtures.

16. Drainage: Provide appropriate drainage technique to mitigate storm water run-off and facilitate replenishment of water table through rainwater infiltration.

17. Sanitation: In the absence of municipal sewage system, design on-site waste water treatment facilities with production of biogas, compost and re-used of water for irrigation.

18. Solid waste management: Design provisions for waste separation with on-site sorting facilities. Introduce innovative systems that encourage the 3R actions: Reduce, Recycle and Reuse.

19. Landscaping: Design soft landscaping (greening site) with indigenous plants that require minimal irrigation and hard landscaping with paving materials that allow rainwater permeability. Limit paved areas around the building to reduce heat island effects.

20. Energy-efficient appliances and Energy demand management: Incorporate energy saving appliances in the building design. Make use of energy-saving bulbs, light level sensors, occupancy & motion sensors. Encourage behavior change. Ensure that energy demand management principles are given top priorities by the building occupants.

21. Well balanced public spaces: 50% of spaces should be allocated to streets, roads, public spaces, gardens and parks (30% for streets, 15% open space).

22. Mixed land use: Avoid zoning by combining economic, administrative and residential activities. This reduces the need to travel and ensures the use of public space

23. Mixed social structure: Promote social integration and diversity. Encourage cosmopolitan values and the need to live together and avoid gated communities. 20-50% of residential space should be allocated to affordable housing

24. Adequate density and compact des iHgnig:h density neighborhoods that are enough to trigger economies of scale and ensure livability.

25. Connectivity: Design street patterns and networks that connect the different parts of the city and eases access to goods and services.

26. Urban Form Matters: Support mixed use, street life and walkability by designing compact blocks and buildings.

27. Walkability: Favor pedestrian mobility by emphasizing on walking distances, mixed use and public transport.

28. Active Mobility: Street design should provide for pedestrians and cyclist lanes. Cycling extends reach of public transport.

29. Promote the "shift": Encourage modal shift from energy intensive modes (cars) to walking, cycling and using public transport. Make cycling and walking safe and attractive.

30. Promote vehicle efficiency: Promote green transport by promoting the shift from fossil fuel dependent vehicles to hybrid and electric cars.

For more information contact:

Vincent Kitio
Chief, Urban Energy Unit
Urban Basic Services Branch
UN-Habitat
P.O. Box 30030 Nairobi 00100, Kenya
Tel: +254-20-7624343
Vincent.Kitio@unhabitat.org