Urbanizarion – an inevitable phenomenon happening in 21st century, in which every cities and urban areas are visualizing a high probability of rapid urban growth . , Maseru, the capital of landlocked country ,lesthotho. Is also in the same track . Thus, the need of the hour, is to devise mechanism to accomodate the change however, in a way that satisfies current and future needs for a better quality of life but without compromising the environmental and social damage. Thus, as urban growth calls for affordable urban housing solution of future, it needs to be environmentally, socially, culturally and economically responsive aiming, towards a sustainable future .

As, the habitation of the place evolved and developed through its historical layers, much of the strategies that fits for the place has already been discovered through tried and testing all over the years. However, the task remains is to make it compatitible with the present and future set of challenges, i.e, re-contextualization : a process to reconfigure the past according to the present and future context. This, is the major philosophy that has been adopted to re-imagine the future housing prototype for Maseru, Lesotho.

In doing so, several parameters guided the development of the future housing prototype, Understanding the incribed spatial pattern embedded to the place, like having a sky space for shared activities, the circular geometry of traditional type, i.e the Rondavels, the conical thatch roofing etc guided the pattern for design initiation. Again, understanding the material availibilty of the region like, sandstone, mud and reed led to the understanding of built form constraints. The basic prototype pattern has been thought to be single storey in order to minimize the structural cost and also due to non availability of structural material for beam and slab in the local vicinity.

The plan form, being evolved from the syntax of spatial usability of the traditional type, however, breaking the rigid geometry of Rondavel, so as to maximize heat gain and minimize construction cost. The plan form also conceptualizes its growth pattern into a socially cohesive self sustainable vommunity. The built form has been conceptualized all with locally available material i.e sandstone, reed & earth. It has been developed in a fashion that responds to the cold winter through capturing and trapping the sun's heat, and distributing it all over the house and retaining it till night . Adaptable interial volume strategy helps in adating the volume as per the climatic condition. The summer heat is restricted through mud brick wall which acts as a heat sink, and thus makes cool nights comfortable. The movable interior walls helps in adapting the house as per different social needs. The foldable roof helps in experiencing a private open space as and when required. The water tank is fitted in north side, to make the water hot for use by using the sun heat.

Thus, overall, the spaces are adaptable to become responsive to climate, nature, social behavior, however, celebraring the identity of the place. This is what, the future urban housing prototype of Lesotho, wishes to be...

THE FUTURE URBAN HOUSING PROTOTYPE

MASERU, LESOTHO

Responsive to climate,nature and environment

Adaptable to human behaviour

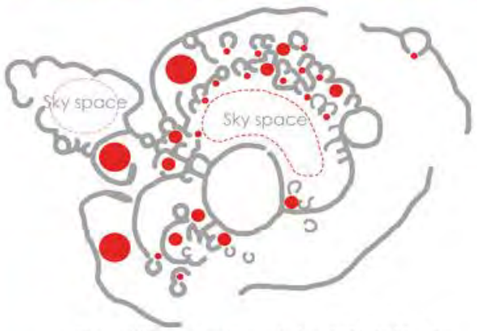
Scalable to forn socially inclusive community

Celebrating the traditional identity

Affordable in construction & operation

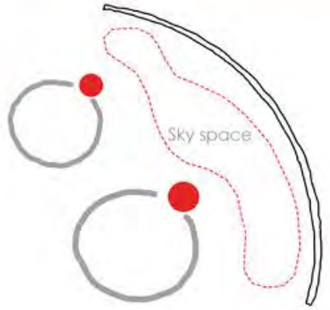
Strategies for developing the spatial pattern

Understanding the inscribed spatial pattern of Lesotho through the layers of History



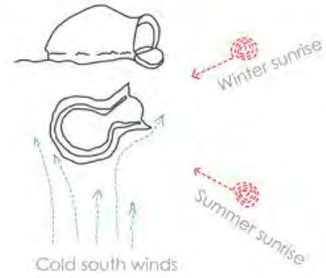
The settlement pattern during 1400-1600 AD

The settlement pattern during 1600-1800 AD



Settlement that fosters social bonding

Insight of a traditional house : the rondavel



Traditional built form developed responsive to climate

Understanding the phases of evolution of space in Lesotho, through historical layers, informs, that the major settlement pattern that shaped the character of housing is private dwelling sharing an ample sky space where people shared the space for performing different activities. Those spaces made the settlement socially cohesive and led to the cultural development of the region. As outdoor enviroment remains comfortable for most part of the year, this pattern can be treated as a well performing strategy that inscribes the basic housing pattern of Lesotho. An insight to the private spaces informs that, all the activities of dwelling was distributed around a central space. Thus, it can be infered that, the basic pattern of dwelling celebrates the centre as the focal point of activities. The built form, which has been evolved throughout the historical layers, is majorly circular, treating it most efficient towards climate responsiveness. Thus, circular geometry dominates the cultural and environmental relevance of the place. However, there are opportunities to make it more efficient, that responds to the present and future contextual needs. Thus, the task remains is to develop strategies that re-contextualizes the historical patterns to tackle the present and future set of challenges. The concept of performing the said task is what this project about and is discussed in the following sequences.

Strategies for re-contextualizing the spatial pattern : dwelling unit

The spatial arrangement syntax

Derived from the syntax of **traditional type**
Celebrating the central space as the **focal point**

The organization pattern

Maximizing **solar heat gain** potential
Breaking the whole into parts for **contour adaptive**

The geometric pattern

Minimizing wall perimeter for affordability
Celebrating the **traditional** geometry

The orientation pattern

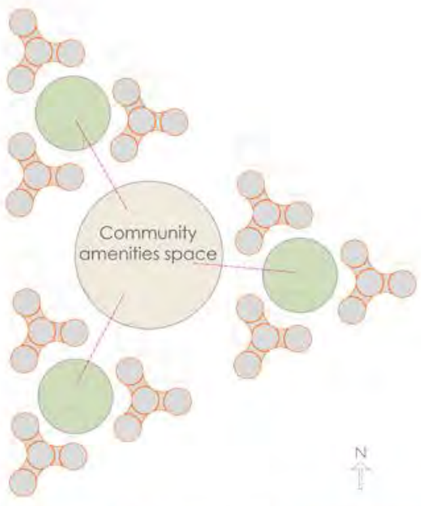
Maximizing sun path facing for heat gain
Maximizing wind flow & ventilation path

The expansion pattern

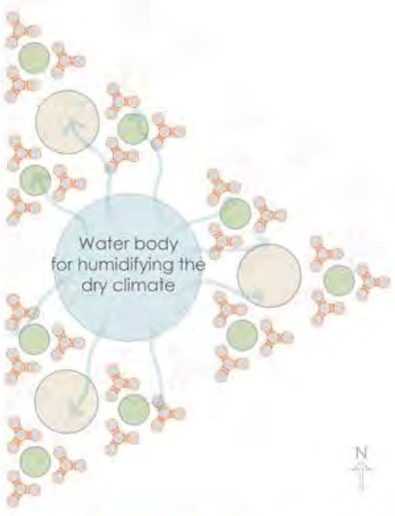
Maximizing addition options for expansion
Addition **strongly connected to centre**

Strategies for re-contextualizing the spatial pattern : Community settlement

The 3 side acessibility of the unit helps in creating **shared sky space**



Each courtyard connects to form a larger **community space**



The pattern grows to form a **central water body** that helps in **humidifying dry air**

Strategies for re-contextualizing the built form

Heat transfer strategy through wall

Heat transfer from sun-lit side to leeward side

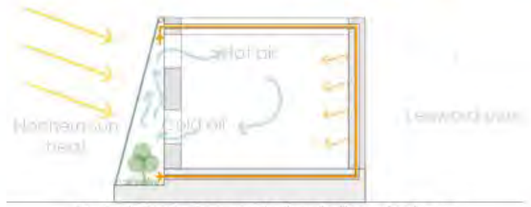
Strategy application location

The mechanism

Brick module and its arrangement for the mechanism

The wall has been conceptualized with straw reinforced earth bricks, which captures the heat during day and release at night. Using these brick modules helps in transfering the heat to leeward side.

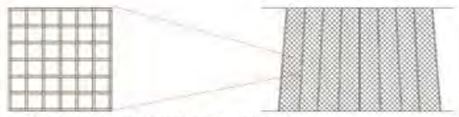
Green house strategy to trap heat



Hot air trapping and circulation strategy

Strategy application location

The horizontal layer



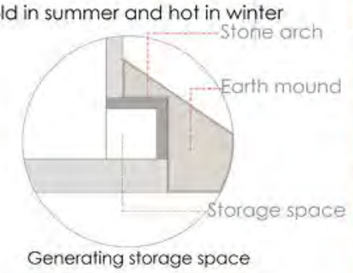
Reed weaved bioplastic module

To trap the maximum heat, green house strategy has been adopted to conceptualize a trombe wall mechanism in the areas receiving direct sun light. The glass has been replaced by reed weaved bioplastic

Earth shielding strategy for relative comfort

Earth being relatively cold in summer and hot in winter

Strategy application location

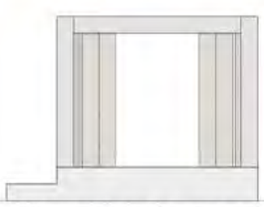


Generating storage space

The sandstone arch and its arrangement for structural stability

As eart is relatively hot during winter and cold during summer, as compared to air temperature, earch shielding strategy has been conceptuslized to make the interior comfortable. It also generates storage space too.

Reed movable interior walls



Reed movable walls helps in generating spatial flexibility

Strategy application location

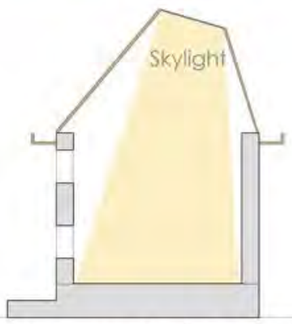
Understanding in plan

Panel construction strategy

The movable wall

Interior walls have been proposed with reed panel to minimize space wastage and it has been conceptualized to be movable for maximizing flexibility in spatial usage.

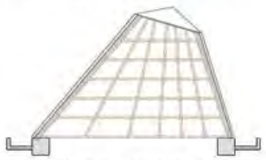
Re-contextualizing the basotho roof style



Strategy to re-conceptualize the basotho roof

Strategy application location

Form derivation

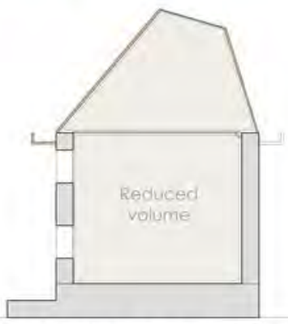


Structural concept

The roof style developed

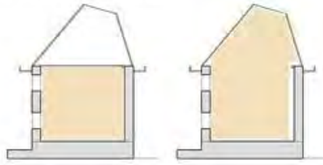
The roof has been re-conceptualized from basotho conical roof to capture ambient light in the interior.

Adaptable interior volume strategy



Dividable volume strategy

Strategy application location



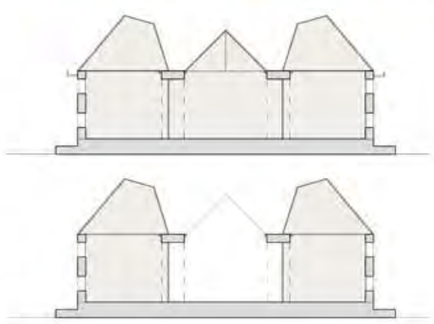
Adaptable volume concept

The movable mechanism

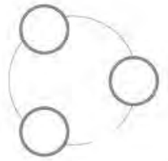
The strategy of movable ceiling

The ceiling has been conceptualized movable to change the volume when to retain interior heat.

Foldable roof strategy for private skyspace



Strategy application location

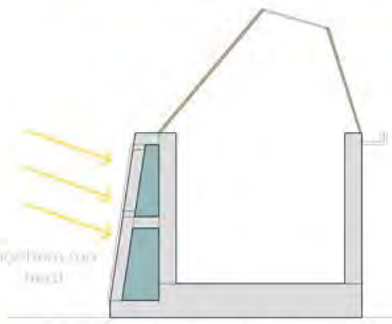


Derived from traditional pattern

The movable mechanism

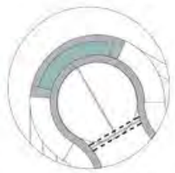
The roof of above the central space has been conceptualized to be collabsible for releasing excess heat.

Passive strategy for water heating

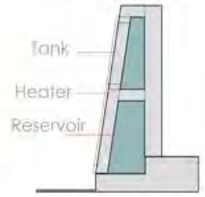


The solar water heater with wall strategy

Strategy application location



Understanding in plan



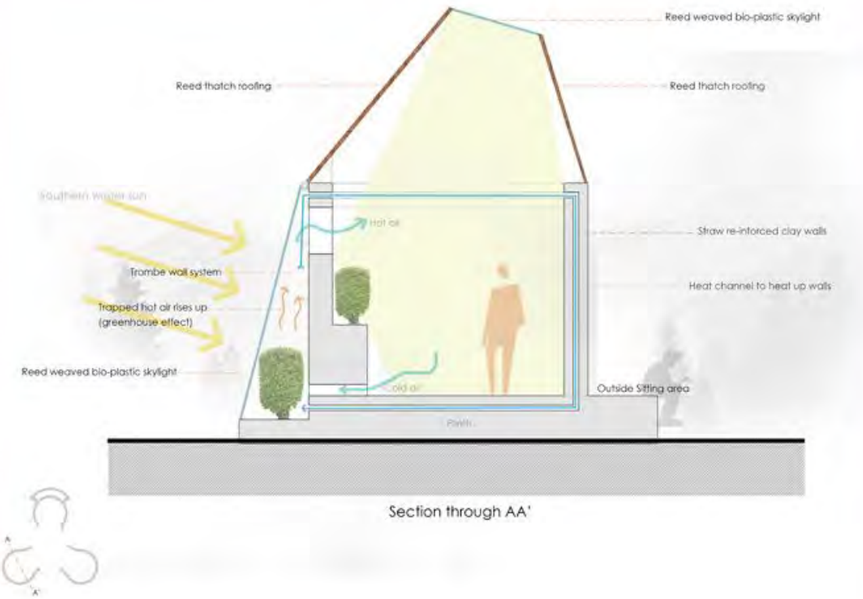
Spatial division

The black painted passive heater

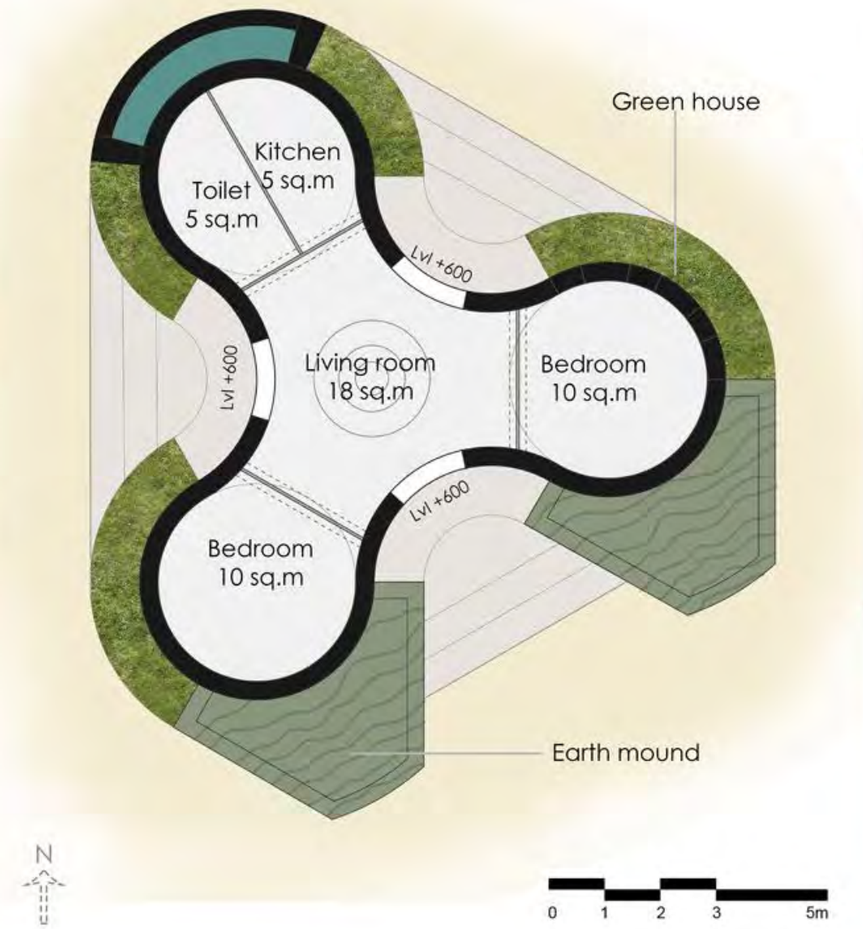
The water tank has been prosed on northern side with wall to capture heat and dissipate it

Visualizing the spatial behaviour : Environmental responsiveness

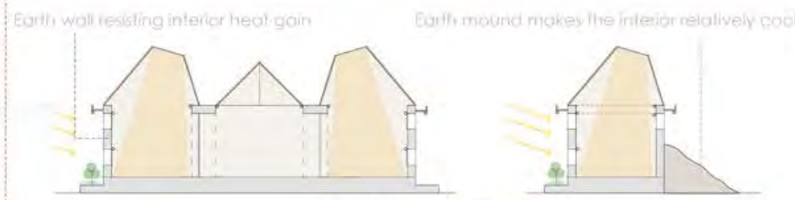
Construction with materials having minimum embodied energy



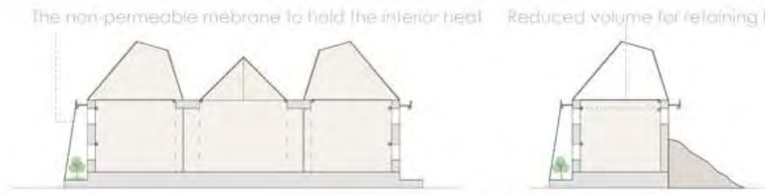
Biophilic space celebrating nature



Climate responsive spaces



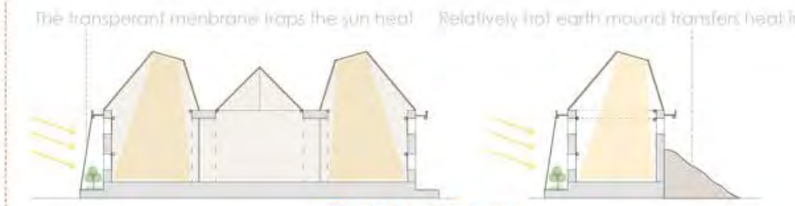
During summer day



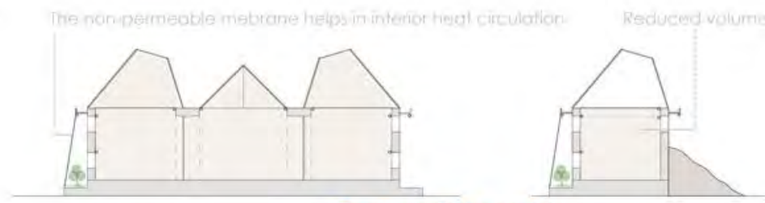
During summer night

During summer evening

During rainy season

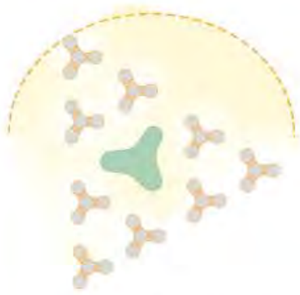


During winter day



During winter night

Community planning responses



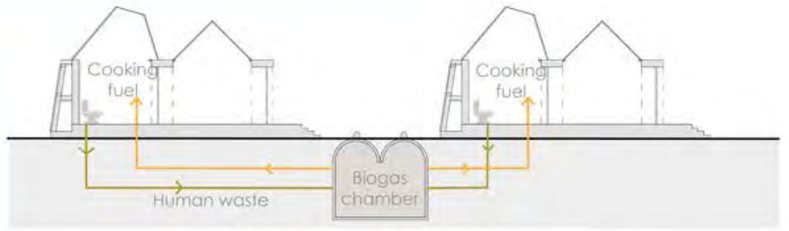
Sun and buildings

Summer breeze path

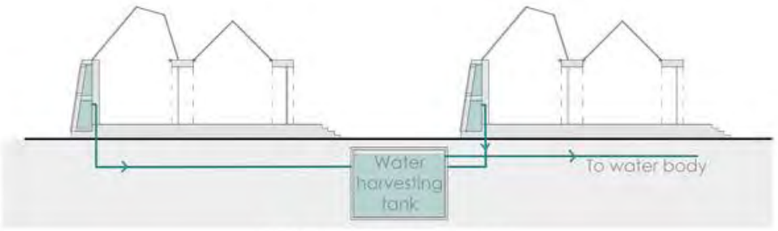
Winte wind buffer

Humidifying dry air

The deal with waste and rain water



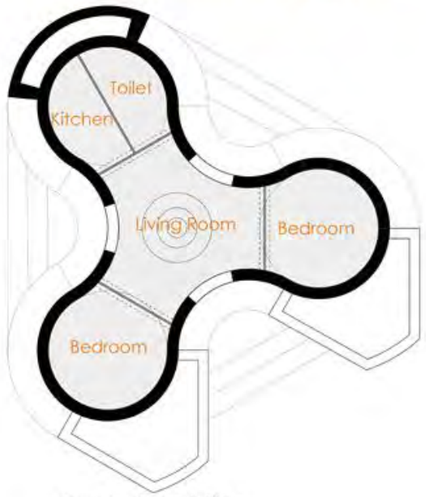
Organic waste management



Rain water harvesting

Visualizing the spatial behaviour : Social responsiveness

The space adaptive to varied social needs



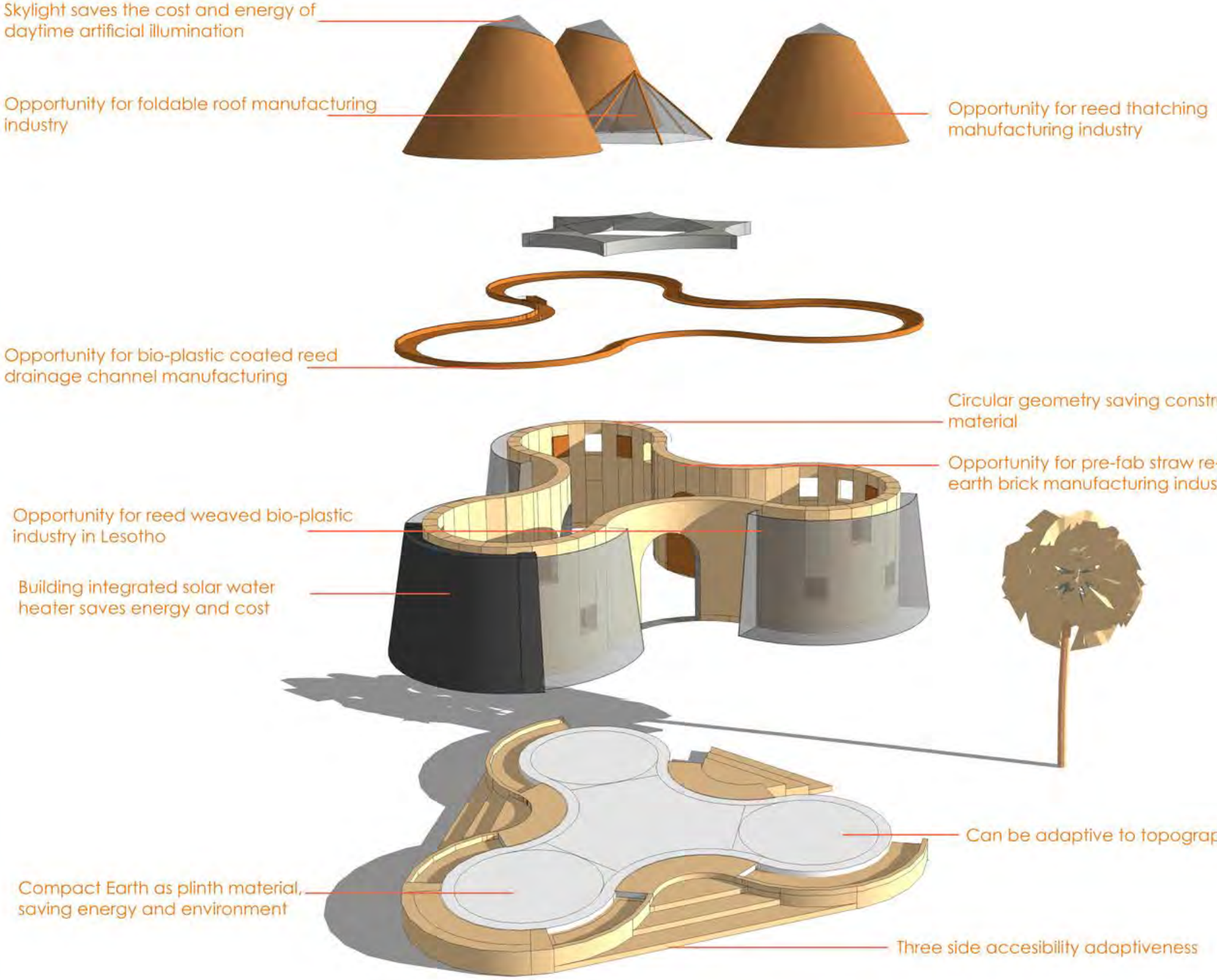
Normal usability

Adaptable when required larger living

Adaptable to a private social meet/celebration space

Expected social, environmental and economical impacts of the design

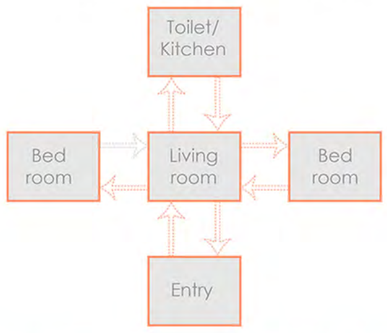
IIncluding cost saving of use, energy saving for environmental sustainability, the design also tries to foster enterpreneurship in opportunities in Lesotho by using innovative ways to create building materials from locally available resourves



An approach to create a sustainable future for the people of Lesotho as a whole...

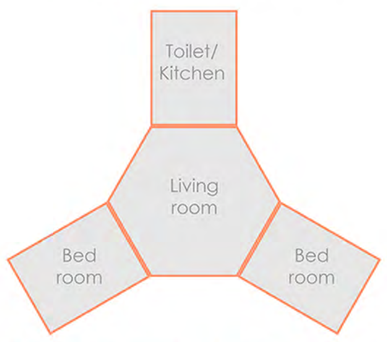
Architectural solution for affordable urban housing, Maseru , Lesotho

The spatial arrangement syntax



Derived from the syntax of traditional type
Celebrating the central space as the focal point

The organization pattern

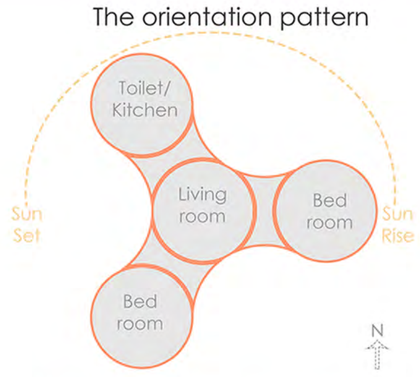


Maximizing solar heat gain potential
Breaking the whole into parts for contour adaptive

The geometric pattern

Minimizing wall perimeter for affordability
Celebrating the traditional geometry

The orientation pattern

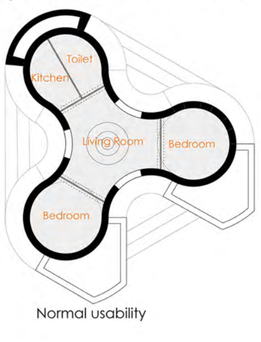


Maximizing sun path facing for heat gain
Maximizing wind flow & ventilation path

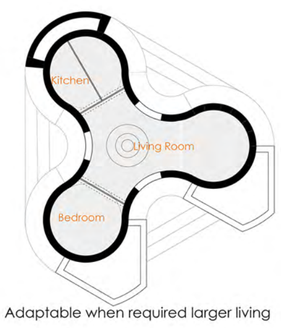
The expansion pattern

Maximizing addition options for expansion
Addition strongly connected to centre

The spatial form developed:



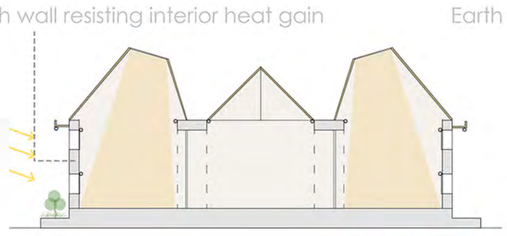
Normal usability



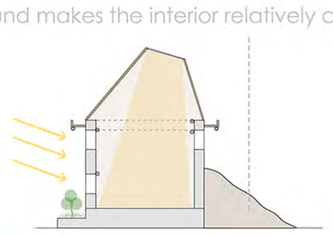
Adaptable when required larger living

Adaptable to a private social meet/celebration space

Earth wall resisting interior heat gain

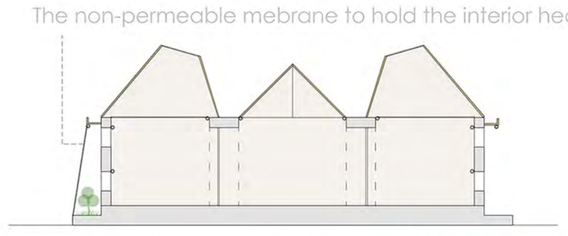


Earth mound makes the interior relatively cool

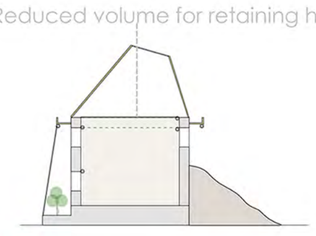


During summer day

The non-permeable mebrane to hold the interior heat

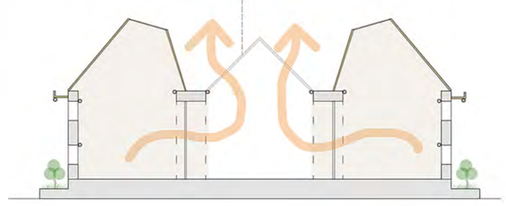


Reduced volume for retaining heat

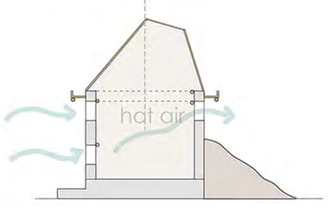


During summer night

The openable roof helps in rel;easing excess heat



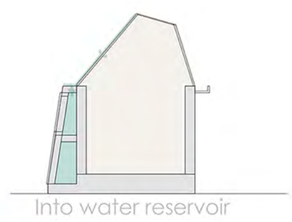
Air circulation releasing out hot air



During summer evening

The rainwater collection

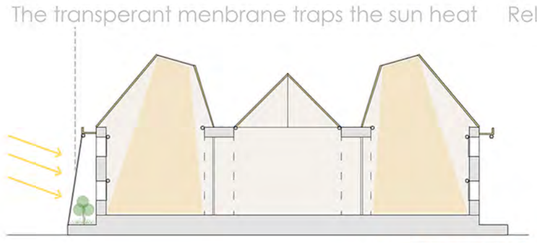
The rainwater Channel



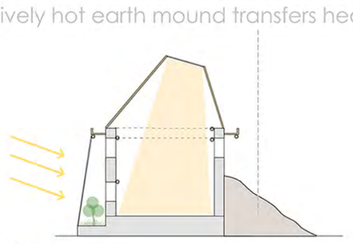
Into water reservoir

During rainy season

The transperant menbrane traps the sun heat

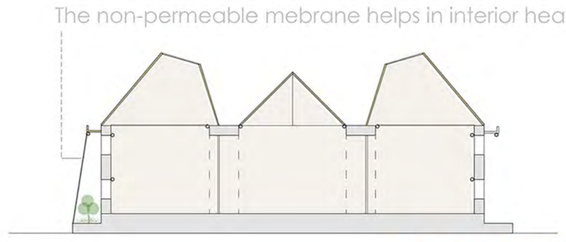


Relatively hot earth mound transfers heat interior

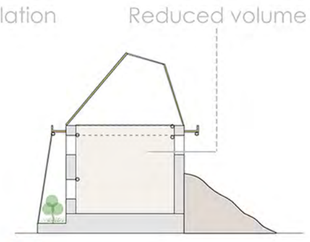


During winter day

The non-permeable mebrane helps in interior heat circulation



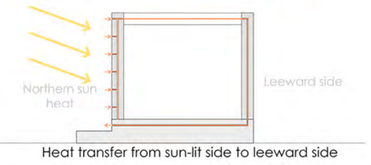
Reduced volume



During winter night

The details:

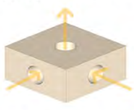
Heat transfer strategy through wall



Heat transfer from sun-lit side to leeward side

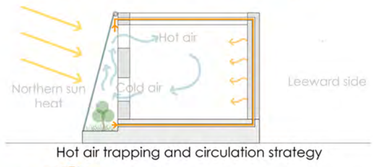
Strategy application location

The mechanism



Brick module and its arrangement for the mechanism

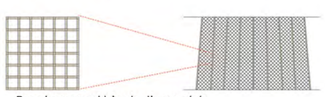
Green house strategy to trap heat



Hot air trapping and circulation strategy

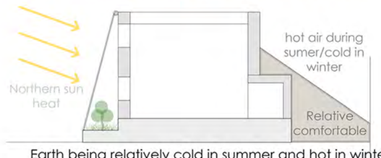
Strategy application location

The horizontal layer



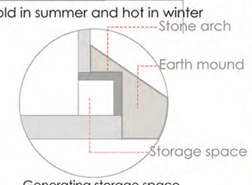
Reed weaved bioplastic module

Earth shielding strategy for relative comfort



Earth being relatively cold in summer and hot in winter

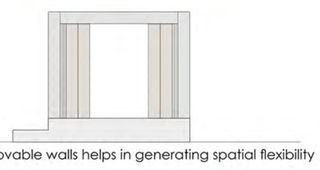
Strategy application location



Generating storage space

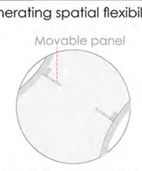
The sandstone arch and its arrangement for structural stability

Reed movable interior walls

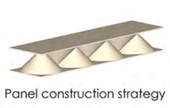


Reed movable walls helps in generating spatial flexibility

Strategy application location



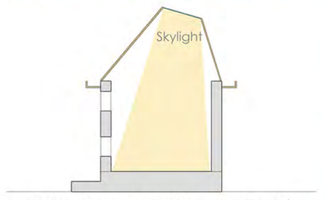
Understanding in plan



Panel construction strategy

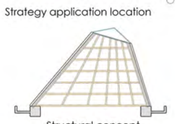
The movable wall

Re-contextualizing the basotho roof style



Strategy to re-conceptualize the basotho roof

Strategy application location
Form derivation



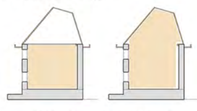
Structural concept

The roof style developed

Adaptable interior volume strategy

Dividable volume strategy

Strategy application location



Adaptable volume concept

The movable mechanism

The strategy of movable ceiling

THE FUTURE URBAN HOUSING PROTOTYPE

MASERU, LESOTHO

Responsive to climate,nature and environment

Adaptable to human behaviour

Scalable to forn socially inclusive community

Celebrating the traditional identity

Affordable in construction & operation

RISE IN THE CITY 2018

100 Word Statement :

As urban growth probability of Maseru, Lesotho, calls for an affordable urban housing solution of future, it must to be environmentally, socially, culturally and economically responsive, aiming towards a sustainable future. However, much of the strategies for it, has already been discovered throughout the phases of historical evolution of the place. But, the task remains, is to make it compatible with the present and future set of challenges, i.e, re-contextualization: a process to re-configure the past that responds, to the contextual changes. This, is the major philosophy that has been adopted to re-imagine the future housing prototype of Maseru, Lesotho.

RISE IN THE CITY 2018 - COST ESTIMATE

Sl.no	Particulars	Material cost	Labour cost	Total cost
1	Site preparation works			
1.1	Surveying	0	500 LSL	
1.2	Earth excavation	0	200 LSL	
2	Foundation & plinth works			
2.1	Sandstone foundation	3000 LSL	400 LSL	
2.2	Compact soil for plinth	0	200 LSL	
2.3	Mud Flooring	0	100 LSL	
2.4	Earth mound in southern side	0	100 LSL	
2.5	Earth Steps	0	100 LSL	
3	Super structure			
3.1	Exterior wall : Straw re-inforced clay	1000 LSL	500 LSL	
3.2	Sandstone Internal Arches : Door opening	1500 LSL	400 LSL	
3.3	Earth Internal Arches : Window opening	1000 LSL	400 LSL	
3.4	Sandstone Internal Arches : Storage units under mound	1000 LSL	400 LSL	
3.5	Water tank earth structure			
4	Roofing			
4.1	Fixed roof : Reed bundle structural member	500 LSL	200 LSL	
4.2	Fixed roof : Reed thatching	600 LSL	200 LSL	
4.3	Fixed roof Skylight : Reed framing	100 LSL	50 LSL	
4.4	Fixed roof Skylight : Bio plastic	100 LSL	50 LSL	
4.5	Movable ceiling : Reed panels	500 LSL	250 LSL	
4.6	Movable ceiling : reed rope movable mechanism	100 LSL	50 LSL	
4.7	Foldable roof : Reed Bundle structural member	200 LSL	100 LSL	
4.8	Foldable roof : Reed weaved bio-plastic panel	100 LSL	50 LSL	
4.9	Foldable roof : reed rope foldable mechanism	100 LSL	50 LSL	
5	Door and interior walls			
5.1	Movable partition wall : Reed panel	1000 LSL	500 LSL	
5.2	Movable partition wall : Fixtures	400 LSL	200 LSL	
5.3	Fixed partition wall : Reed panel	300 LSL	150 LSL	
5.4	Entry door : Reed panel	750 LSL	350 LSL	
5.5	Entry door : Fixtures	200 LSL	50 LSL	
6	Windows and foldable membrane			
6.1	Window : Reed panels	600 LSL	300 LSL	
6.2	Exterior foldable membrane : Reed bundle framing	400 LSL	200 LSL	
6.3	Exterior foldable membrane : Reed weaved bio-plastic	400 LSL	200 LSL	
6.4	Exterior foldable membrane : Foldable mechanism fixture	200 LSL	100 LSL	
6.5	Rain water channel : Circular reed panel	600 LSL	300 LSL	
6.6	Rain water channel : Water proof bio-plastic coating	200 LSL	100 LSL	
6.7	Rain water channel : Fixtures	100 LSL	100 LSL	
7	Plumbing and water heating			
7.1	Bio-plastic coated reed water pipes	300 LSL	150 LSL	
7.2	Solar heating panel for water tank	300 LSL	150 LSL	
8	Platering and rendering			
8.1	Earth render on exteior and interior walls	0		
8.2	Black tar coating in the exterior of water tank	200 LSL	100 LSL	