

Pattern Booklet

Patterns for vulnerable communities in Nouakchott

This Pattern booklet is an addition to the research report Yallah, including environmental and social patterns. Both categories are further organized depending on their main objective or opportunity they create.

Environment

Desert

Sea level rise

Pollution

Ecological Value

Social

Integration

Water

Economic Center

Access

Title

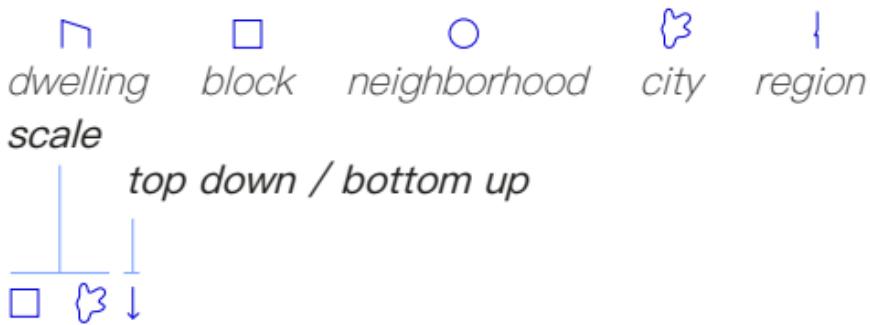
pattern identification #

sketch

*color indicates
ecological or
social pattern*

Hypothesis *What conditions will the pattern improve when used on its own*

pattern set:

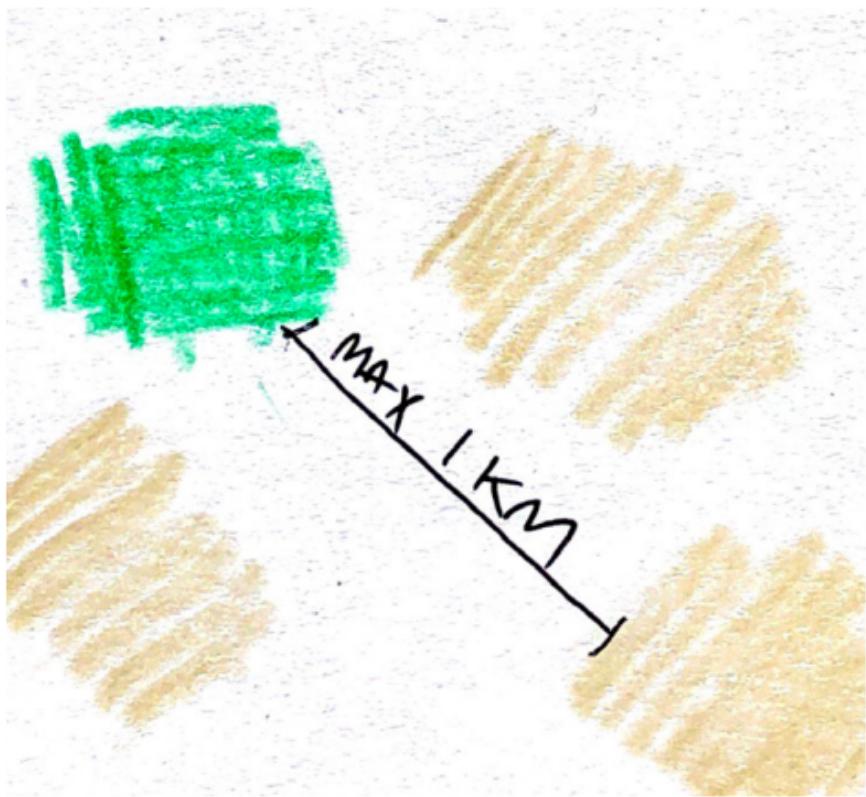


Statement about the **implementation** of pattern into space.

Pitfall: negative side effect or considerable issues a pattern might have

Green spaces

Desert 1



Greenery adds to the ecological value of a place and protects vulnerable communities against the forces of the desert.

pattern set: Community garden



© photo by author



Porosity can be found in any urban fabric. Re-purposing empty spaces by including more greenery improves the adaptive capacity of vulnerable communities against desertification. Note: implementation should happen within community

Green belt

Desert 2



Green spaces and living fences surrounding the city will protect and reduce shifting dunes

pattern set: Desert fight



© M. Ould Mohamed, 2010

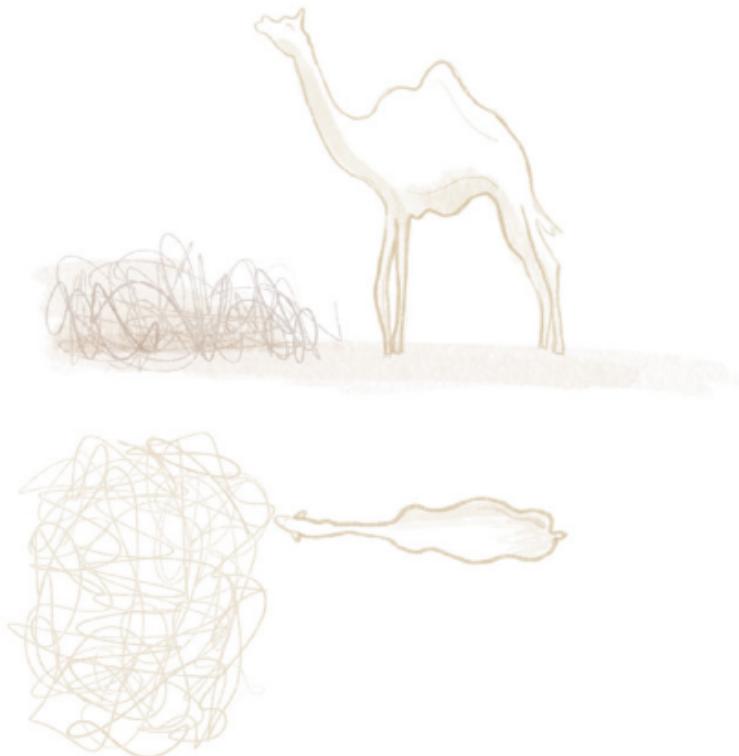


Building green windbreaks and living fences in combination with restoring and replanting lost greenery, and maintaining existing greenery.

Pitfall: In existing projects often invasive instead of native species are used

Sensible pastorials

Desert 3



In this fragile ecosystem, using indigenous pastoral practices creates a fusion between human and ecosystem, nurturing the landscape

pattern set:



© Tim Dirven, 2021

- ↑ The knowledge of indigenous practices reaches from protecting areas of the landscape that need to recover to zoning space for animals, creating a balance for human and ecosystem.

Dune fixation

Desert 4



To prevent dangerous drifting sand dunes we need to protect and recover fixed dunes through practices

pattern set: Desert fight



© Studio Kalangou, 2016



Dunes can be fixated using a construction made of tree branches
Pitfall: This practice is more useful in areas between ridges, other areas might suffer from wind erosion and sand burial.

Salt marshes

SLR 1



Areas threatened by SLR and groundwater flooding should be transformed into spaces for nature adapting to life with water.

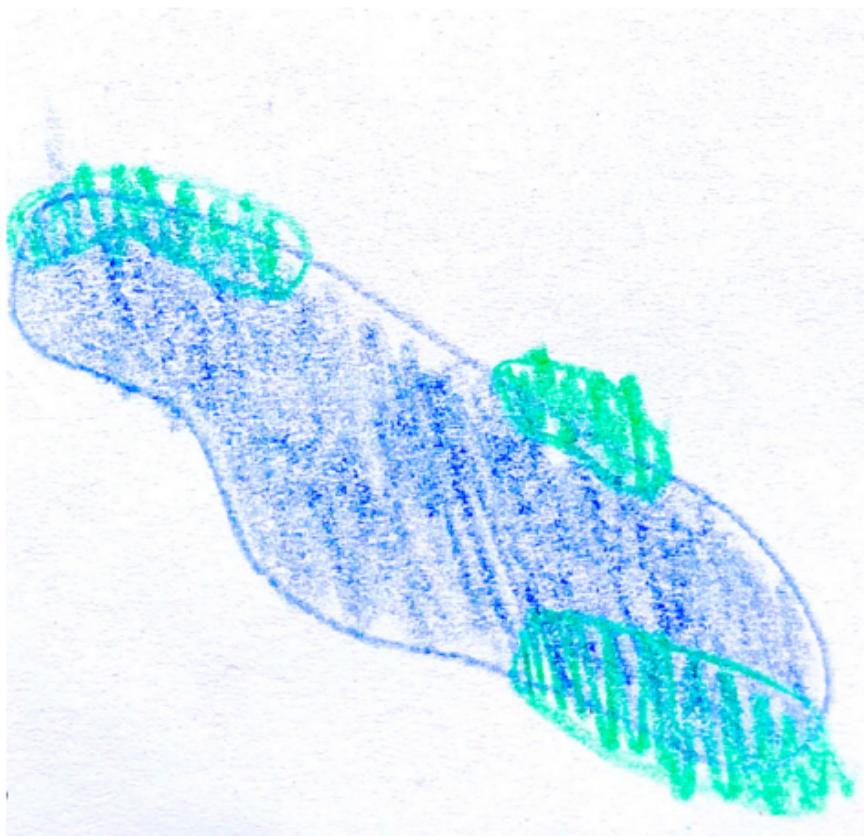
pattern set: Altered landscape – Living with water



The current landscape, especially in low laying terrain will change in the future. Salt marshes can be used to give areas flooded by brackish water a new purpose to restore biodiversity. Pitfall: Just like wetlands this might displace people

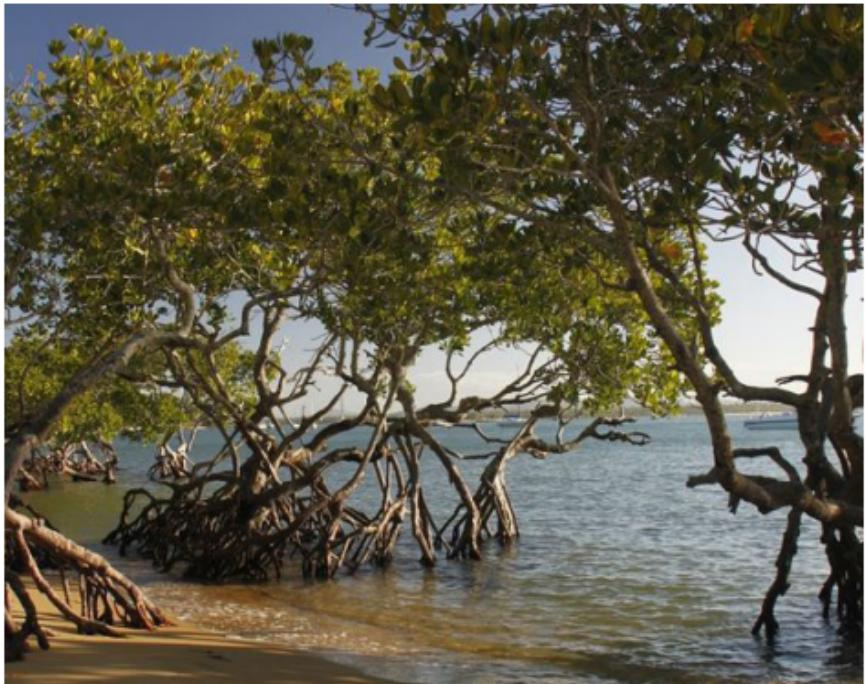
Wetlands

SLR 2



Wetlands add to the adaptive capacity of a place and conserve biodiversity.

pattern set: Altered landscape – Living with water



© Alexandria Gabb, 2020



Creating space for water through wetlands in flood prone areas. Protecting species and strengthening the ecosystem and habitat.

Pitfall: Flooding areas in an urban context leads to displacement

Wetland agriculture SLR 3



Wetlands can benefit surrounding community when they include agriculture that can sustain people.

pattern set: Living with water

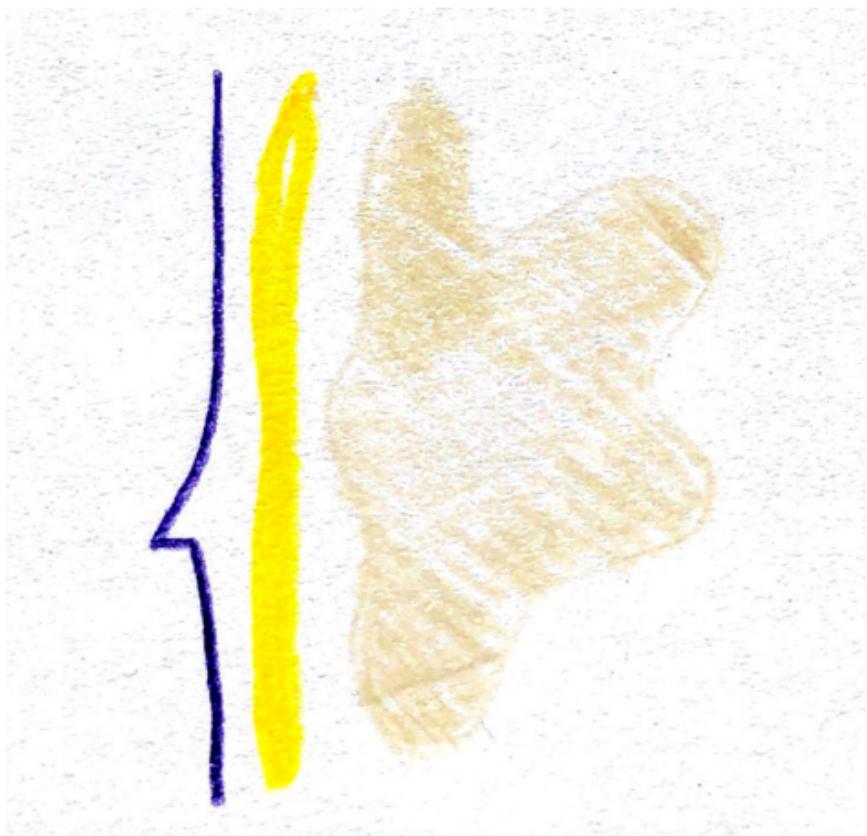


© Lo TEK, 2019

- ↑ Rice, yams, sugarcane and lotus are traditionally planted in wetlands and can benefit from this environment. Indigenous practices for aquaculture can cultivate fish.

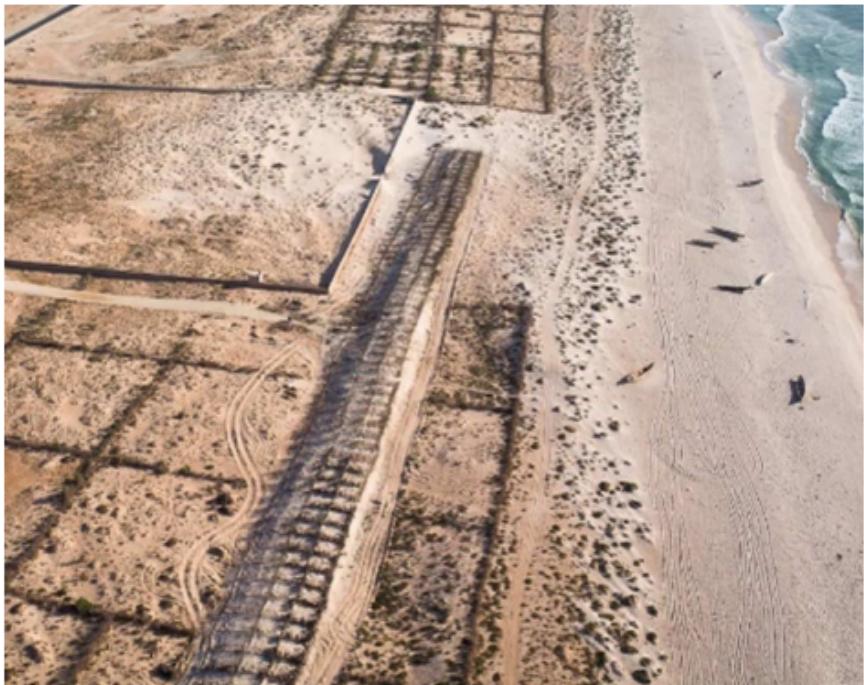
Dune protection

SLR 4



Restoring and protecting the coastal dune landscape is necessary to protect the city against rising sea levels

pattern set: Altered landscape



© En Haut

| ↓

Dune landscapes can be restored through greenery and fences catching sand to heighten dunes.
Pitfall: No measures will help as long as sand is exported and dunes destroyed looking for minerals

Built on stilts

SLR 5



Settlements in flooded areas can be adapted to living with the water by building on stilts

pattern set: Living with water



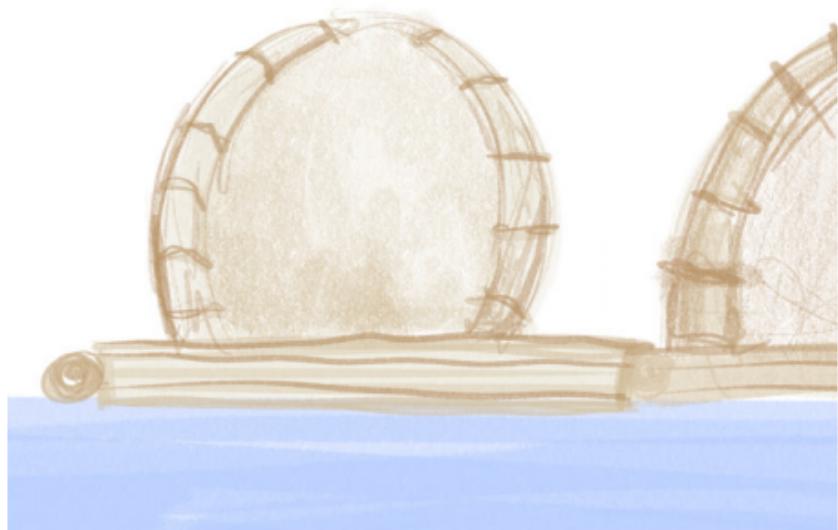
© Lo TEK, 2019



Informal settlements in flood prone areas are commonly adapted to rising water by building on higher levels. This improves the adaptive capacity of a shelter by being able to resist flooding

Mudhif

SLR 6



The mudhif is an indigenous practice, using reed to build floating islands and mesmerizing architecture in wet landscapes.

pattern set:



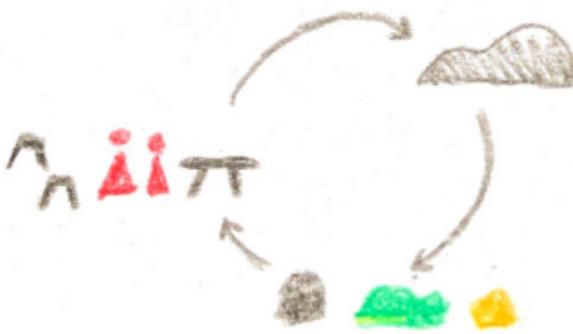
© Lo TEK, 2019



This housing typology can create buildings in otherwise unused space, creating a water that can be used by the public.

Recycling is cool!

Pollution 1



Separating waste and recycling plastic can improve the quality of the neighborhood and prevent further land pollution

pattern set: Healthy neighborhood



○ ↑

The work of separating waste should be payed for to support the neighborhood. Plastic waste can be recycled with different techniques, that can be mixed with local knowledge and traditional methods.

Waste management

Pollution 2



Waste has to be managed on different scales, including support by the government on a city scale

pattern set: Healthy neighborhood



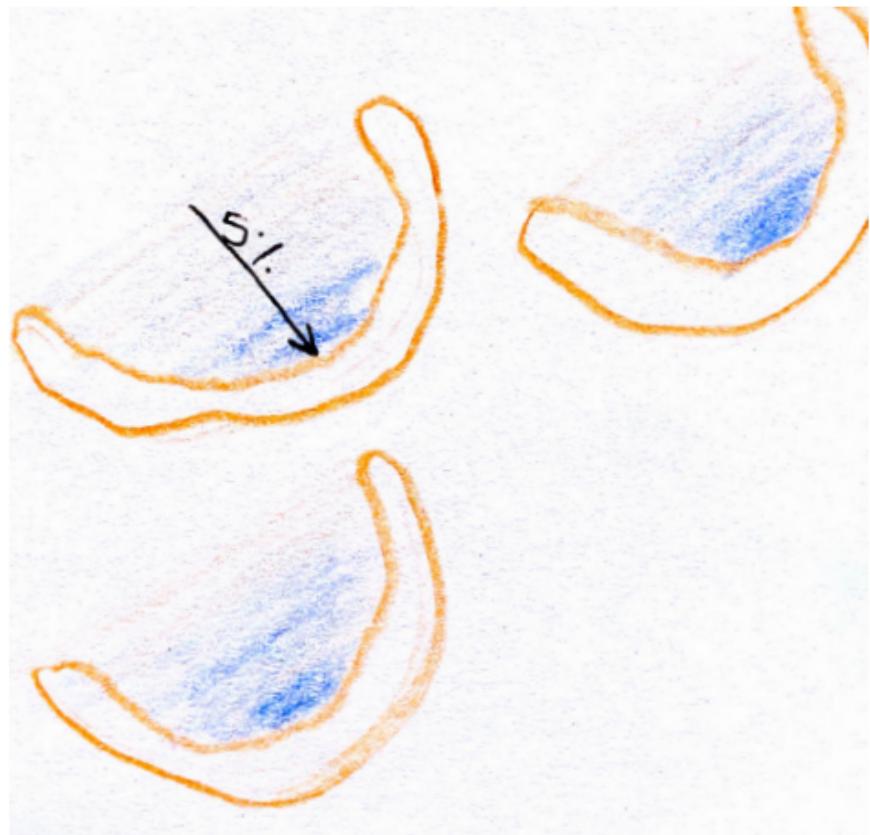
© Khadija Farah



Existing landfills have to be cleaned and properly disposed, new landfills have to be prevented through local organization

Zai Pit

Eco 1



Zai pits are an indigenous practice digging half moon shaped pits to recover soil quality in dry areas.

pattern set: Desert fight – Green education

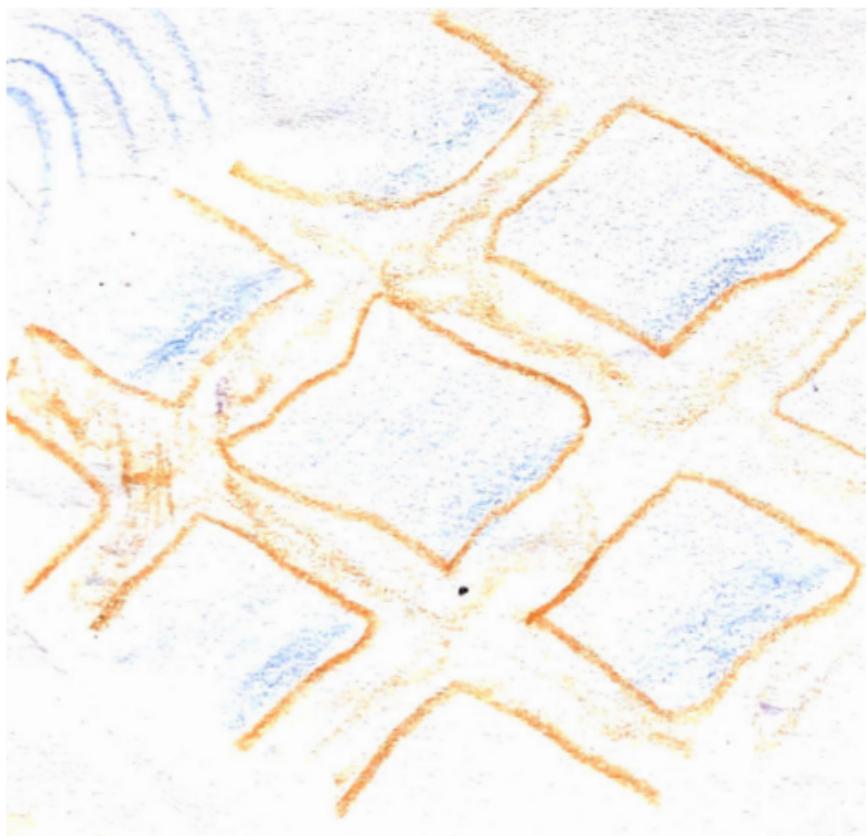


This practice is used in dry landscapes with little water resources. The half moon shape catches and preserves rain water, regenerating the soil.

Pitfall: It needs human maintenance and possibly water

Waffle gardens

Eco 2



This indigenous practice of the Zuni used in dry landscapes captures, stores and re-directs water in communal agriculture

pattern set: Community garden



© Lo TEK, 2019



The small sunken plots capture water close to plant roots, limiting water use. Used as community gardens they are traditionally build on a neighborhood scale.

Companion planting Eco 3



Companion planting is a method inter-planting species that support and benefit each other

pattern set: Community garden – Green education



© Parvatha Reddy

▷ O ↑

This practices is traditionally used in landscapes otherwise difficult for agriculture. The three sisters, beans, corn and squash, form a symbiosis supporting each other while preserving the soil.

Native species

Eco 4



Using native and non invasive species will help the ecosystem restore and thrive in the future

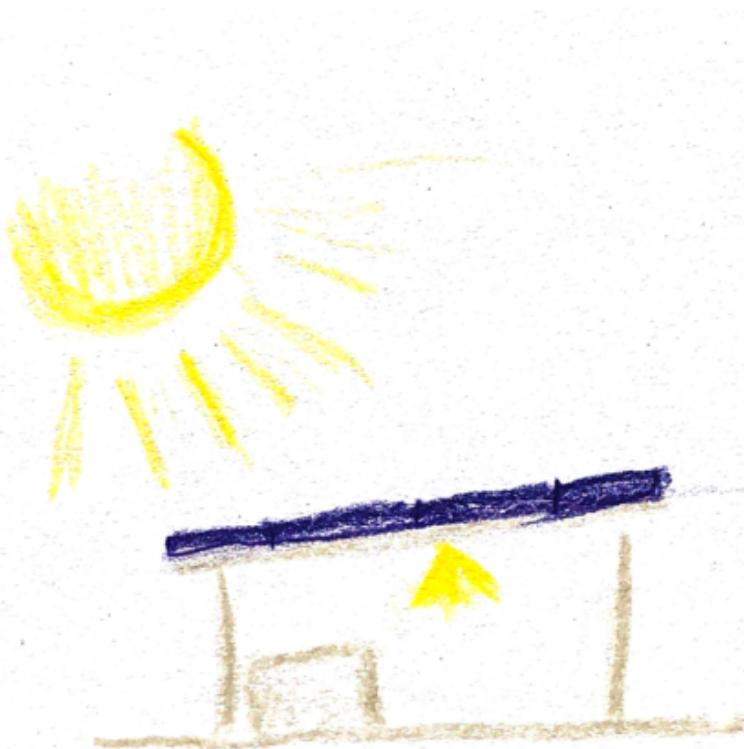
pattern set: Community garden – Desert fight – Green education – Living with water



Native plant species should be restored and protected. This includes acacia trees, euphorbia bushes, mangroves, salt reed Grass.

Solar support

Access 1



Supporting the investment in solar energy will increase accessibility and help the economy

pattern set: Home upgrade



© Azuri Technologies



Solar energy is an important energy source in Nouakchott. Implementing it can happen on different scales, supporting the region as a whole as well as small investments for solar energy in vulnerable communities.

Public bathrooms Access 2



Free public bathrooms will improve the sanitary situation in neighborhood with no water network

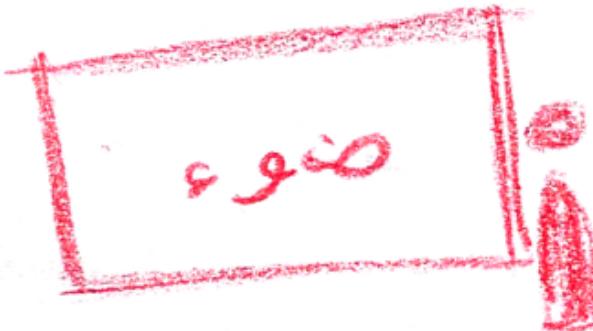
pattern set: Good public – Unite people through space



Not having access to running water and bathroom facilities causes sanitary and health issues, as well as increase insecurity especially for women. Public facilities on a neighborhood scale can improve this issue.

Education program

Access 3



Supporting education on all levels financially through the government will make it more accessible to all people

pattern set: Good public



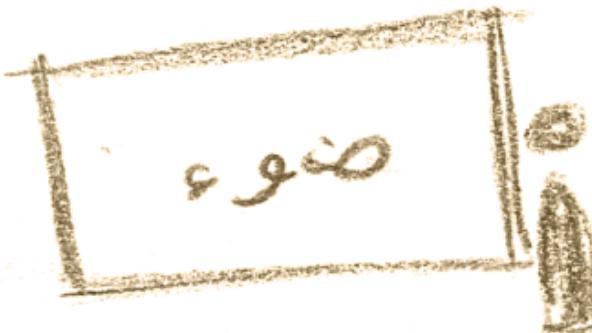
© Vincent Karcher



Proper education is one step to get out of multidimensional and generational poverty. It is important to support existing education institutions, as well as create new schools in inaccessible places.

Education on ecology

Access 4



Education on ecological practices will improve peoples use with the ecosystem, and include residents in process of transformation

pattern set: Green education



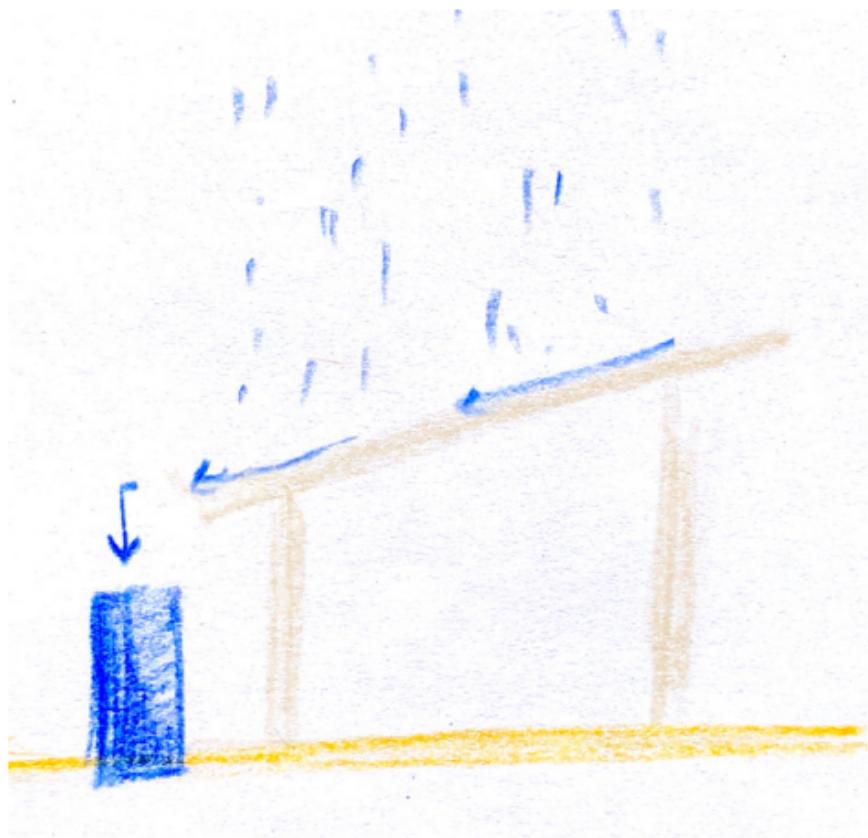
© Craig Mackintosh



In order to save water use for greenery people have to be educated on new practices. This should be a back and forth with the community, as existing indigenous knowledge is fundamental and can be adopted taught with new methods.

Collecting water

Water 1



Collecting rain water can save resources and help families become more self-sufficient

pattern set: Community garden – Desert fight
– Green education – Water for all
– Home upgrade



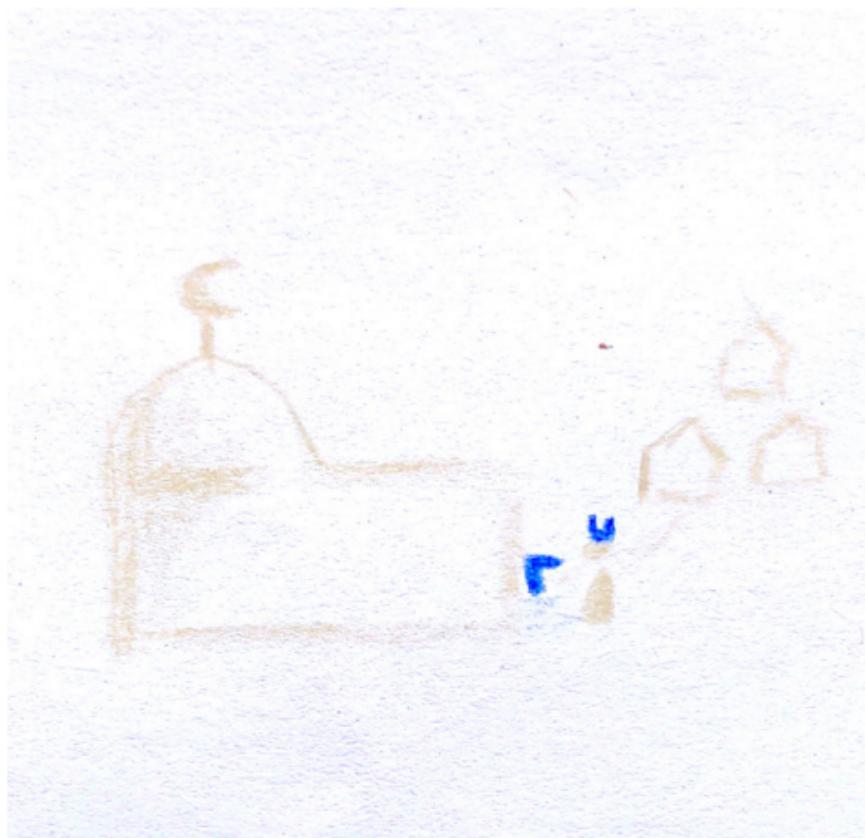
© BY-NC-ND



Using tilted roofs to catch rain water is a simple method to preserve and store water on a household scale. Larger roofs and tarps can be used to collect water for the neighborhood garden. Pitfall: this does not replace access to water

Public water

Water 2



Using public buildings connected to the cities water network as distribution centers for the neighborhood

pattern set: Good public – Water for all



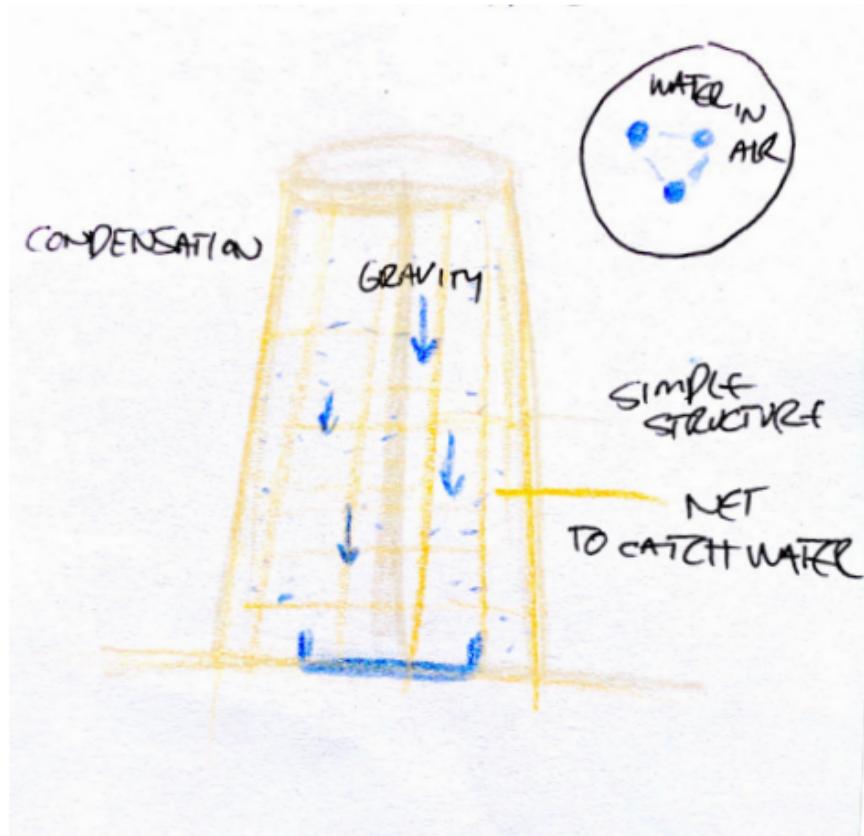
© Craig Burns



Using public functions that have access to water in a neighborhood to distribute water to residents with no access.

Fog collection

Water 3



This practice collects water through the humidity in the air, taking advantage of condensation and gravity

pattern set: Water for all – Unite people through space



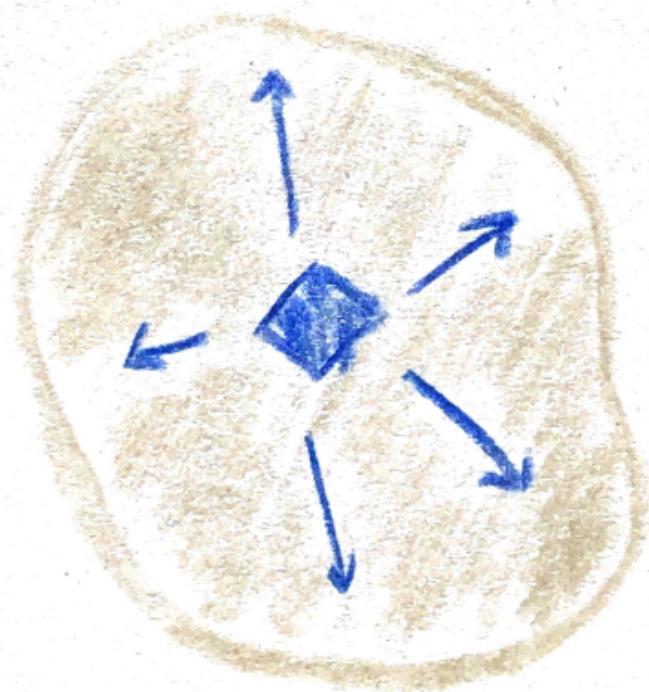
© Alsar Atelier & Oscar Zamora



Simple structures can be build with bamboo or any type of wood, a fine net, and a container catching the water.

Pitfall: although this is used in extremely dry landscapes, it has not been tested in this context.

Centralized water Water 4



Having centralized points for water around the city makes it more accessible for vulnerable communities

pattern set: Water for all

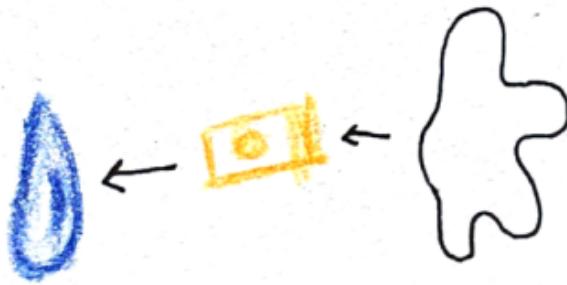


© Wikimedia

- ↓ Water sources have to be distributed fairly within the city, ensuring good quality access to water for everyone. To support water accessibility they should be placed strategically in vulnerable neighborhoods.

Fair water price

Water 5



Policies regulating water prices will close the price gap between water from taps and water transported with trucks

pattern set: Water for all



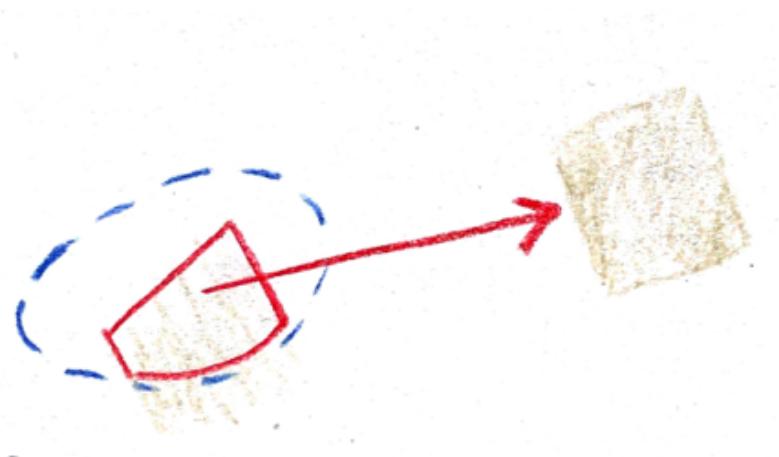
© Loes Schalekamp



Today, prices for water transported via trucks is much higher than the price for water via a tap. This directly affects vulnerable communities that do not have access to water taps and supports rich communities. Policies have to regulate these discrepancies.

Space for displaced

Central 1



When people are displaced for any reason, space has to be found near by to house them

pattern set: Altered landscape – Living with water



It is important for people's adaptive capacity to stay within their existing social network. Therefore, if people are displaced through disasters, space near by has to be offered to them

Local economy

Central 2



Shifting the economic center from one space to more divided, multiple centers will increase accessibility and fair distribution

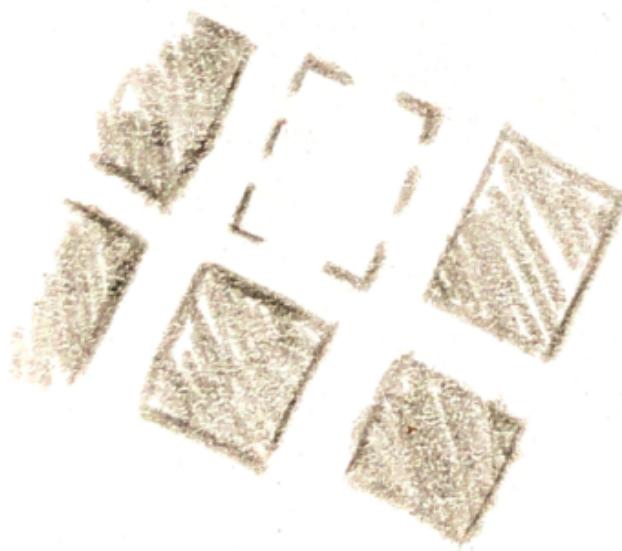
pattern set: Healthy neighborhood – Uncertainty



Creating more economic opportunities through local markets. This will increase accessibility to resources as well as improve peoples economic power without traveling long distances.

Reuse porosity

Central 3



Porosity within a city are spaces of future transformation. The goal is to find new purpose for these spaces, reusing the existing

pattern set: Healthy neighborhood



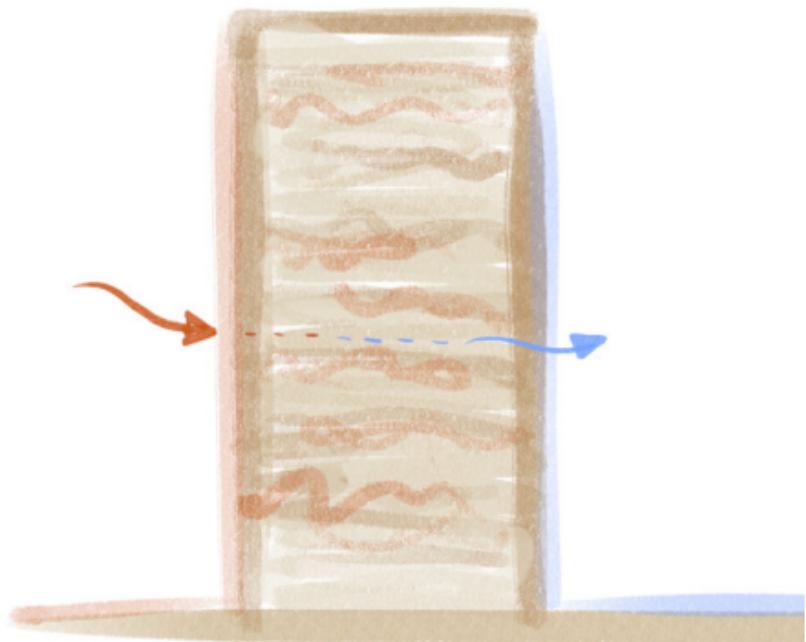
© Gertrud K.



Tempelhofer Feld in Berlin is a great example for re-purposing porosity. The former airport became a large scale park used for recreational activities. The old hangars were temporary housing for refugees and include exhibition spaces.

Local materials

Central 4



Using local material and building techniques such as clay bricks and rammed earth improves room temperature, sense of home and the local economy
pattern set:



© Michael Wahl



Traditional building techniques use sustainable materials. These can be used for plots that will be densified in the future. These create a cool room temperature in especially hot and arid climate.

Water economy Center 5



Aquaculture and processes to win salt create new economic opportunities in flood prone areas.

pattern set:



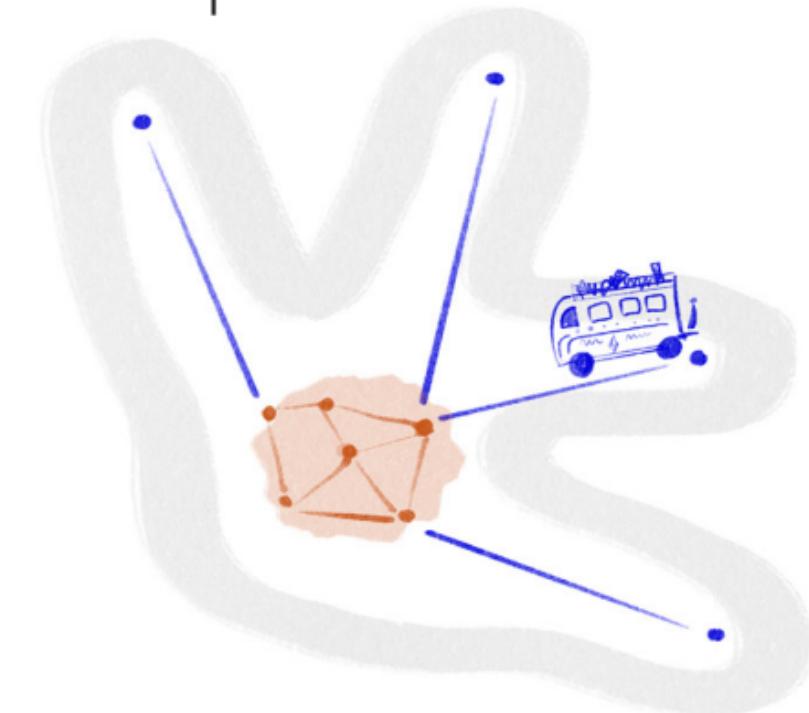
© Adrian Morris



These practices will vary depending on salt and water levels and will change with the seasons.

Pitfall: To implement these practices, the water must first be de-contaminated.

(In)formal public transport



Supporting and expanding the existing public transport especially into the cities outskirts to be more consistent

pattern set:



© Lucas Vallecillos



Informal public transport exists, but could be more reliable and improved, creating more stops into the outskirts of the city. This will improve peoples economic opportunity

Urban unplanned

Integration 1



Supporting informality where it proves to be valuable

pattern set:



Acknowledging that not everything can and should be planned and formalized in an informal context. This is relevant for especially when looking at informal economy, as well as top down approaches formalizing organic neighborhoods.

Support public functions

Integration 2



Supporting existing public infrastructure to improve their capacity will improve accessibility

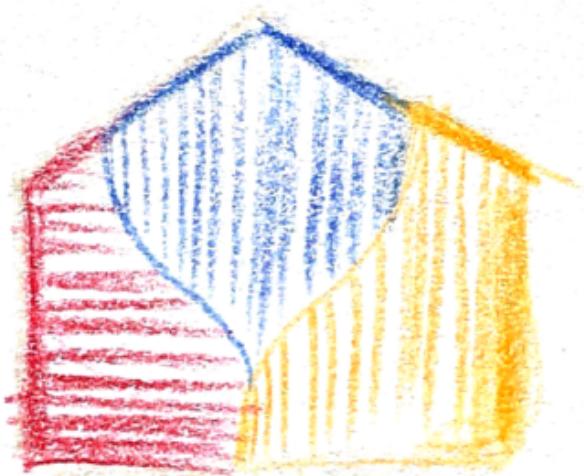
pattern set: Good public – Unite people through space – Sense of home



This includes supporting existing schools, hospitals, community centers, mosques and other public functions.

Shelter with meaning

Integration 3



Painting facades in informal settlements has proven to improve peoples feeling of belonging and reduce stigmatization

pattern set: Unite people through space –
Sense of home – Home upgrade



© Seb Toussaint



Informal neighborhoods are highly stigmatized by other inhabitants as their way of living is different from the 'formal' life. Coloring facades creates a sense of belonging and home for the inhabitants, as well as improve the judgment by others.

Khaïma

Integration 4



Communal spaces where people can meet and gather improve the social network and sense of belonging

pattern set: Unite people through space – Sense of home

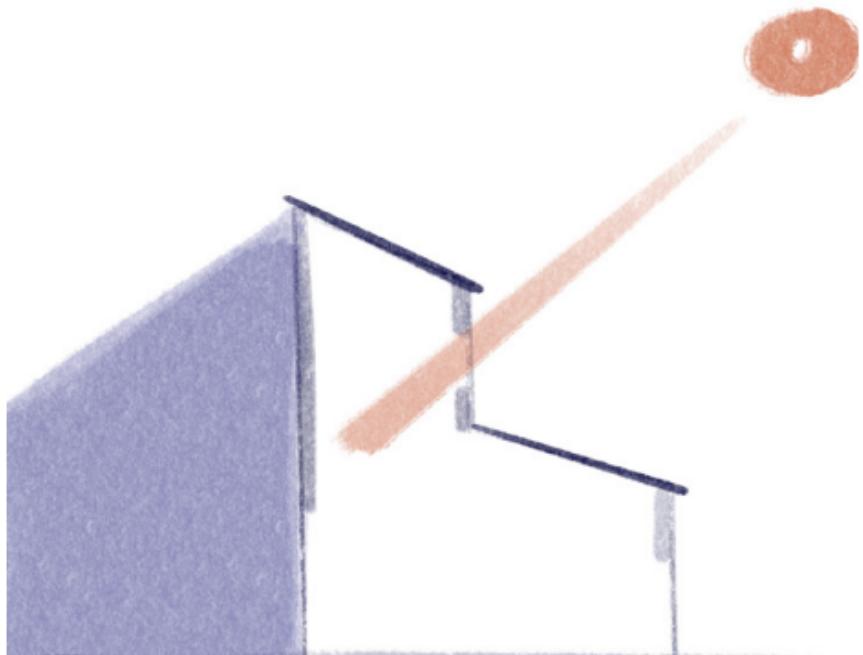


© Jody



In this climate a tree itself becomes a public spaces, a place where people meet and gather. The traditional nomadic tent can function as a place for the neighborhood to come together.

Shaded house Integration 5



Creating a new housing typology sensible to its context and location to provide housing for deisplaced while creating shade in open

pattern set:



© Christobal Palma



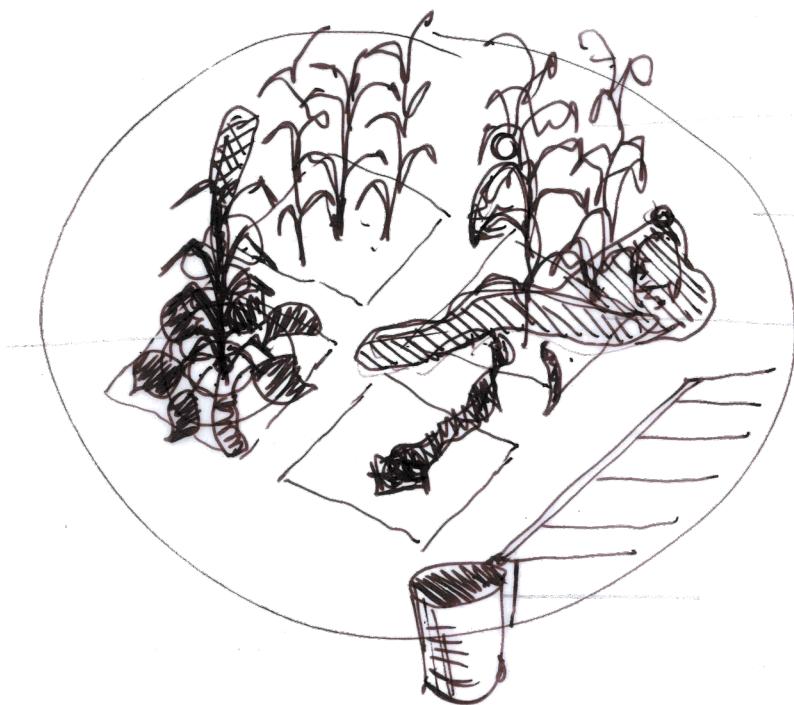
This incremental housing typology can be placed on edges to streets and in porosity. This densification method creates housing while providing a cooler environment through shadow. Orientation of the housing is important

PATTERN SETS

The represented pattern sets have been developed in an iterative process of alteration and testing the patterns on several locations. The following sets show a minor extract of possible pattern combinations. Focusing each set on a specific condition to confront has led to a variety of sets for diverse purposes. For the purpose of creating a clear approach to the development of sets, certain rules were set based on the exploration and assessment of combinations. First, sets must contain at least one pattern of each category, ecological and social, to create the desired synthesis of socio-ecological resilience and spatial justice. Second, sets must contain at least three cards. This limitation is intended to create meaningful sets with explicit purpose, instead of creating all possibilities. Setting these limitations deepens the understanding of each individual set, its spatial implications and guidelines concerning the placement. Each set is evaluated based on the vulnerability assessment criteria to identify the potential improvement pattern sets can have on a place.

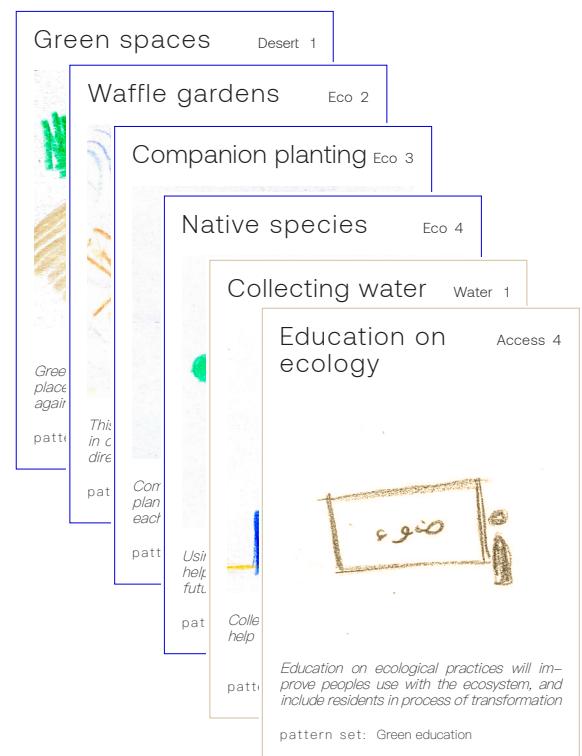
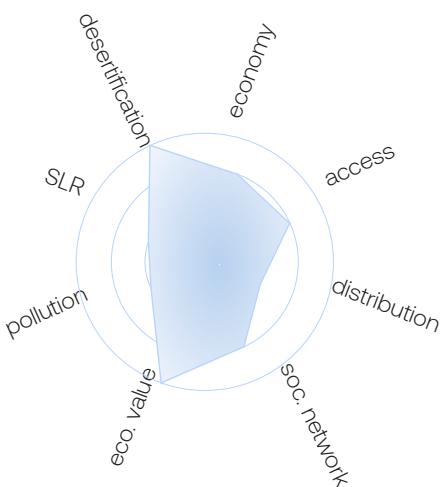
Community garden

□ ○ block to neighborhood scale ↑ bottom up



- E 4 Native species
- D 1 Green space
- E 2 Waffle garden
- A 4 Education on ecology

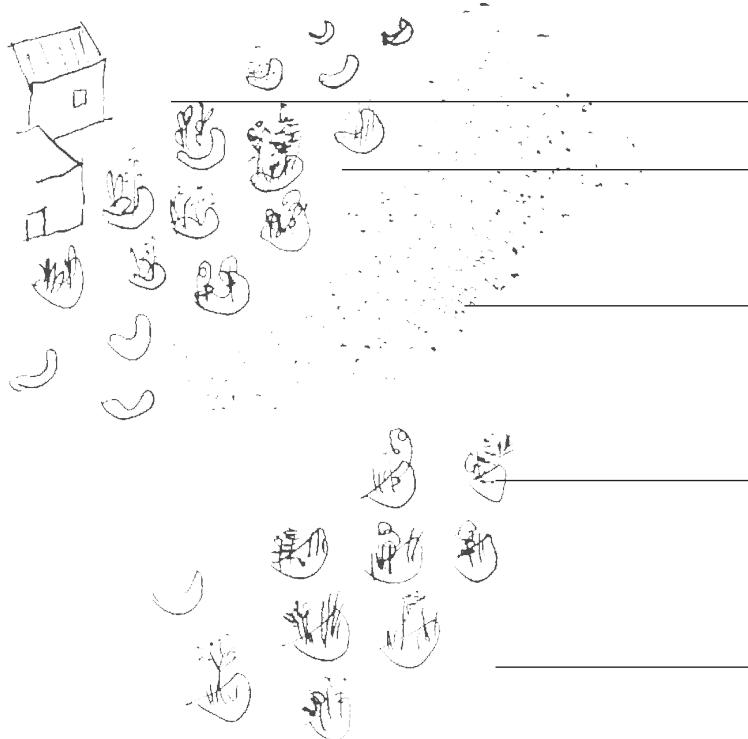
The community garden combines indigenous knowledge about planting in desert landscapes with a focus on native species that form a symbiosis with the ecosystem. A focus lays on the practicality and the users experience. In the Zuni culture, waffle gardens were community gardens led by women, ensuring harvest in areas with [limited] water and degraded soil. The sunken plots of the waffle gardens are dug into the ground, offering proximity to groundwater and keeping temperatures low. In addition, a layer of manure and gravel trap moisture in the soil and reduce water runoff (Watson & Davis, 2020). Using plant species that residents are familiar with, such as acacia nilotica, menthe longifolia, moringa stenopetala will utilize people's existing knowledge. These gardens are best placed in secluded, courtyard like spots within the neighborhood. They can also be developed bottom-up, provided that the technical know-how is shared.



Desert fight

○ ↗ neighborhood to city scale

→ both



W 1 Collecting water

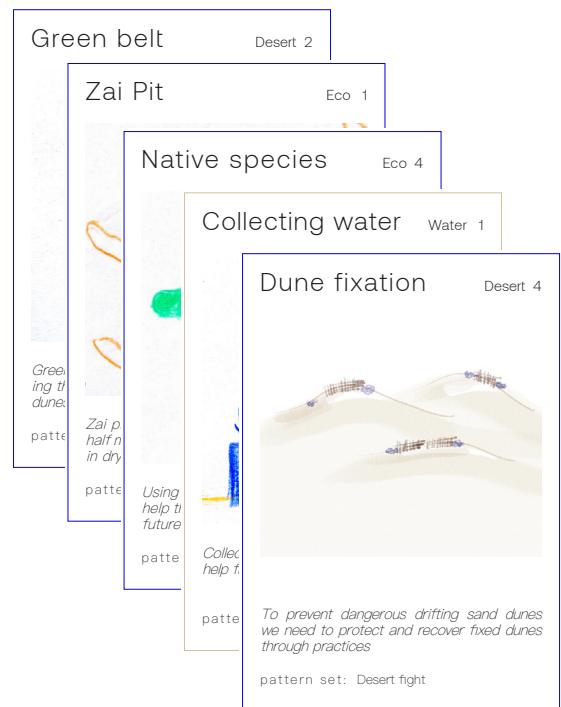
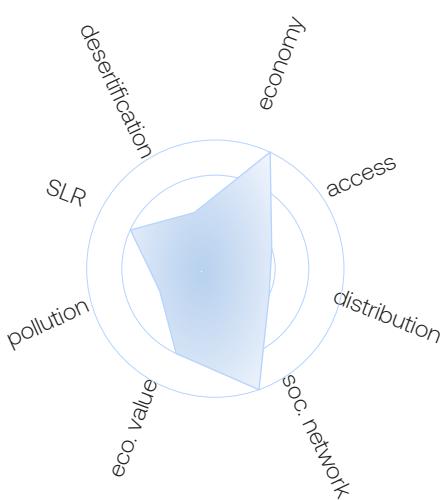
E 4 Native species

D 4 Dune Fixation

E 1 Zai pit

D 2 Green belt

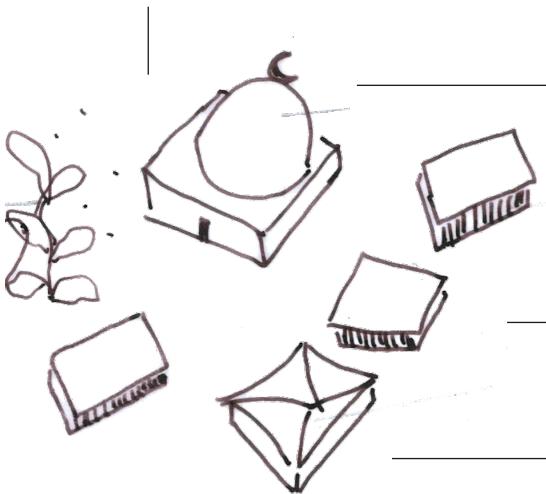
Desert fight is a strategic set of patterns formed to adapt the landscape to current and future challenges. Interacting with both the neighborhood scale and the city scale, it requires a somewhat higher level of organization and governance. This set utilizes the Zai Pit, a half-moon shape dug into the ground to capture rainwater and reduce run-off. This practice is already in use at the Green Wall Project, which operates on the scale of the entire continent to fight against desertification. Combining this practice with the planting of native plants and structures that can collect rainwater, this could provide relief for the city against the encroaching desert, as well as provide more employment opportunities for people in the outskirts of the city (FAO & MEDD, 2014: pp 111-115).



Sense of home

□ ○ block to neighborhood scale ↑ bottom up

D 1 Green Spaces



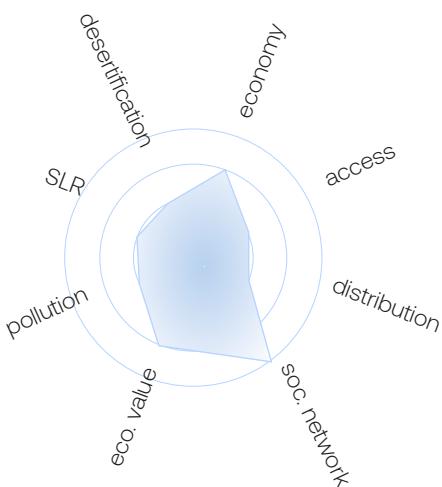
I 2 Support public functions

I 3 Shelter with meaning

I 4 Khaïma

A sense of home is a vital part in creating and maintaining a social network, especially in times of strife. This pattern set is geared towards the urban block and neighborhood scales, focusing on people's perception and use of public space. Many examples have shown that small and inexpensive interventions, like coloring the facades of buildings can provide a sense of identity to a neighborhood, as well as dismantle stigmatization and thus make residents feel more connected. It is also an act of repair towards the existing buildings, that if it is done with the assistance of a public institution may create better relations between residents and local government.

By supporting local public functions, such as schools or mosques, and with the integration of more communal spaces throughout the neighborhood in the form of the traditional Khaïmas, the local community can be strengthened.



Green spaces Desert 1

Support public functions Integration 2

Shelter with meaning Integration 3

Khaïma Integration 4

Greenery place and against the
pattern

Support improve
ability
pattern

Painting proven t
ing and
pattern

Communal spaces where people can meet and gather improves the social network and sense of belonging

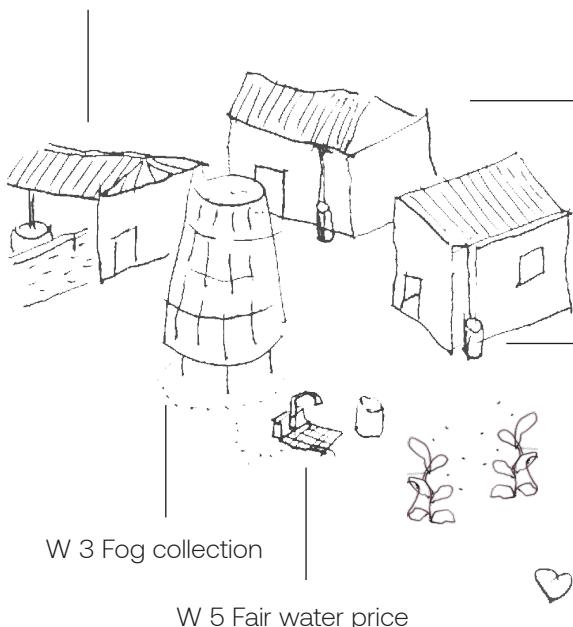
pattern set: Unite people through space – Sense of home

Water for all

○ ↗ neighborhood to city scale

→ both

W 4 Centralized water



W 2 Public water

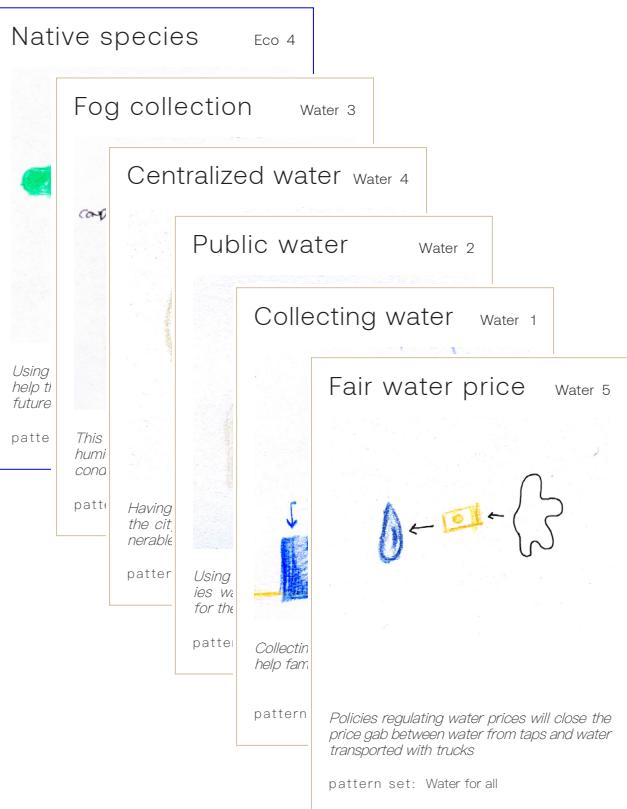
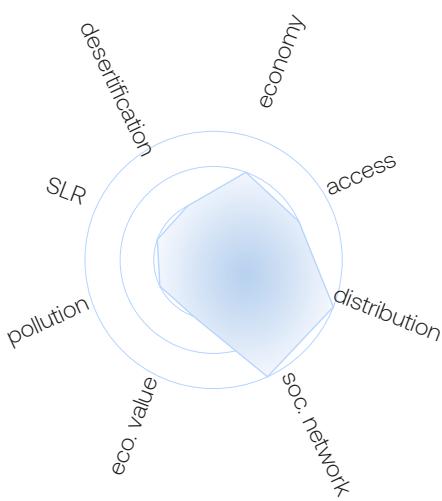
W 1 Collecting water

W 3 Fog collection

E 4 Native species

W 5 Fair water price

Water is the most precious resource for Nouakchott's residents, as it is both expensive and scarce – thus it is a necessity that it becomes a public good rather than a luxury. This pattern set establishes several principles for water use, in order to develop better availability and fair distribution. Most importantly, water prices need to be regulated in the form of policies from the government. Currently, water is far too expensive for people that are not connected to the central water network; however, such infrastructure can be costly and its construction very slow. In order to provide faster availability to water for all members of a neighborhood, this pattern set suggests the distribution through public functions. Making use of biophilic design principles, a fog collector in the form of a tower uses condensation and gravity, making water out of air. Each tower is easy to construct and lightweight, while it can also act as a local landmark.

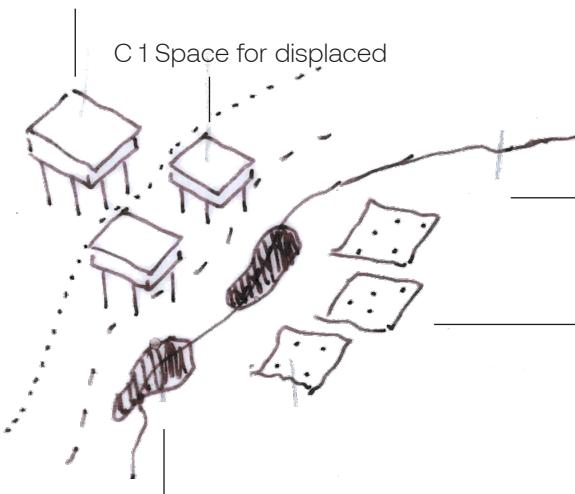


Living with water

□  block to city scale

→ both

S 5 Built on stilts

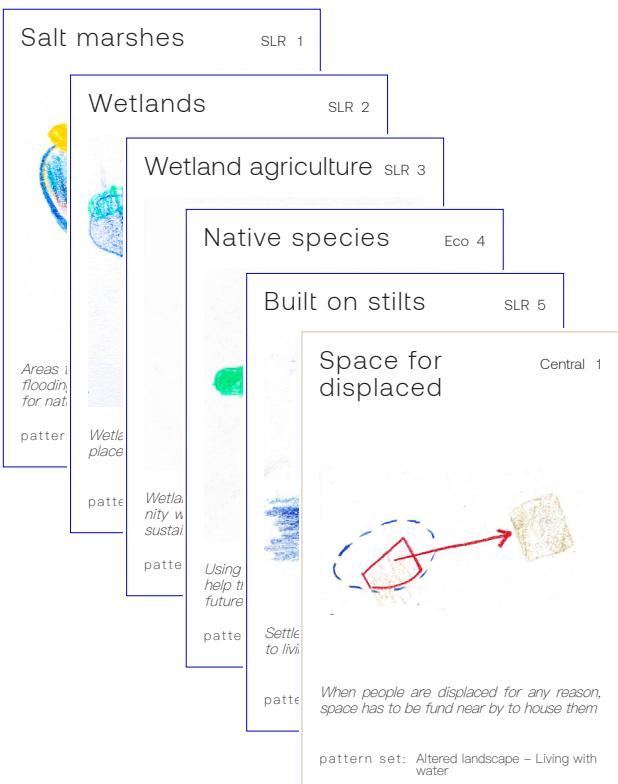
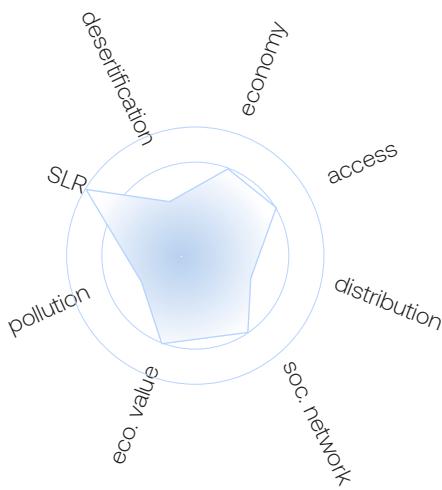


S 1 Salt marshes
S 2 Wetlands

S 3 Wetland agriculture

E 4 Native species

Much of the current territory is being confronted with issues of flooding and ground-water seepage, resulting in many people being displaced from the flooded areas. This pattern set arises from the urgency of dealing with this issue, but instead of trying to fight against it, it proposes to live along with the water. New housing types that utilize construction on stilts can be embraced to provide space for the displaced, but could also be expanded in the future, making new water-based neighborhoods. Caring for this emergent landscape through careful maintenance, planting of native plants that aid in water filtration, are important aspects to ensure a healthy environment for residents, as well as employment opportunities.

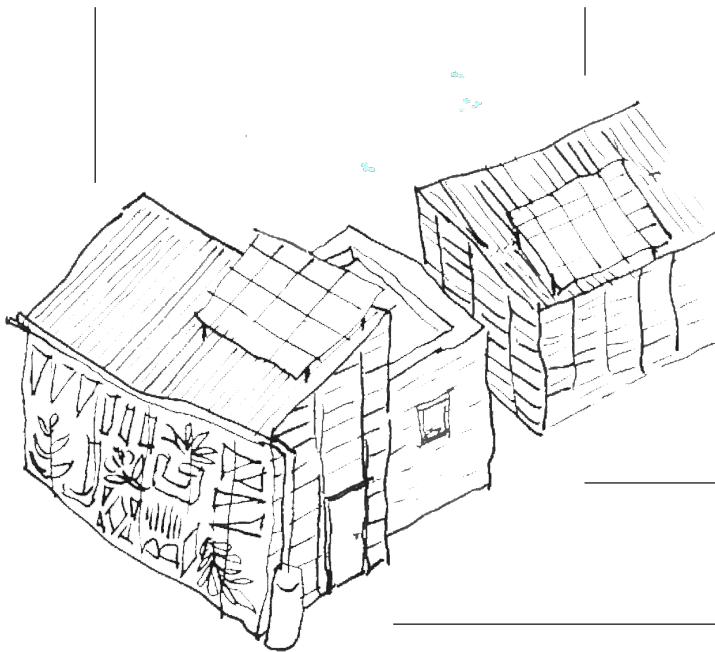


Home upgrade

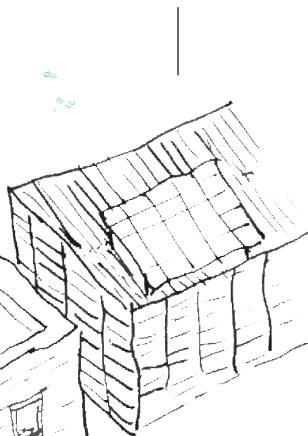
dwelling scale

both

I 3 Shelter with meaning



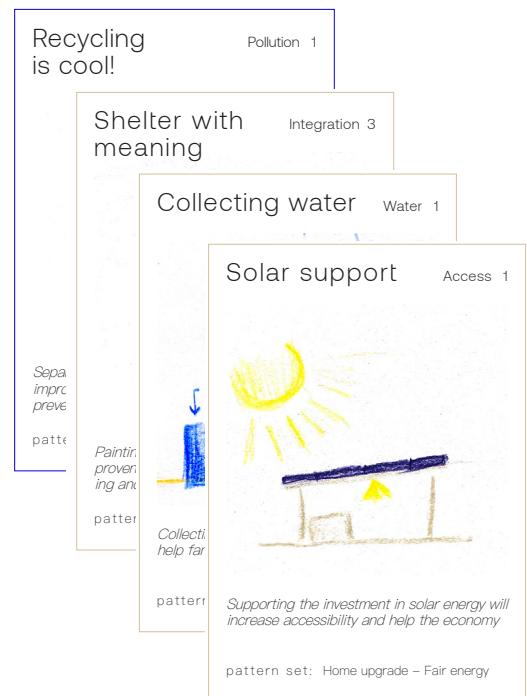
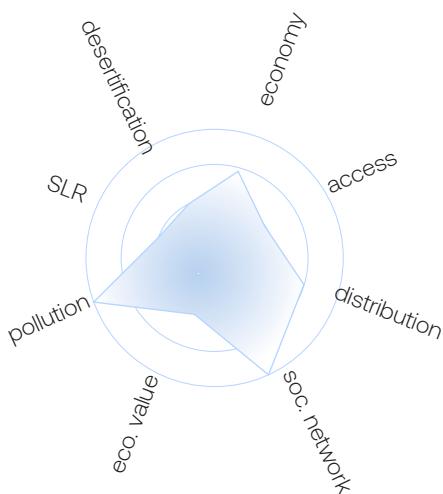
A 1 Solar support



P 1 Recycling is cool!

W 1 Collecting water

This pattern set is aimed towards the adaptation of the individual home towards energy and water sufficiency, as the majority of buildings at the outskirts of the city lack basic infrastructure. This can easily be done by solar panels at the rooftops of existing houses, as well as by constructing systems of rainwater collection – making use of recycled local materials. Neighbor and local community relations should be considered here, resulting in small-scale communities that share resources. Upgrading the facades of houses with simple paint can inspire a sense of belonging and community

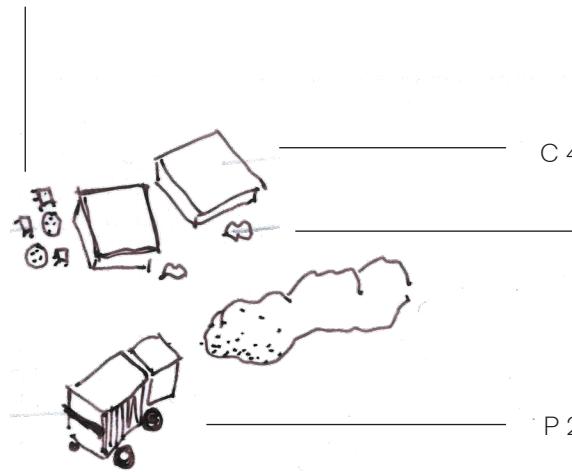


Healthy neighborhood

block to city scale

both

C 2 Local economy

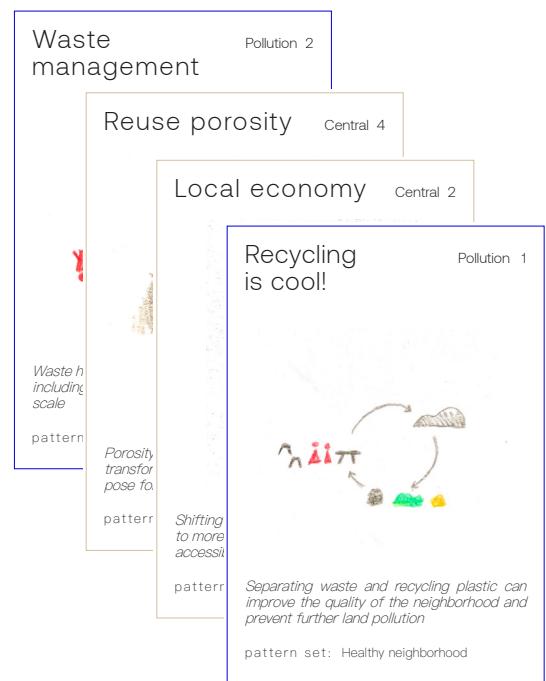
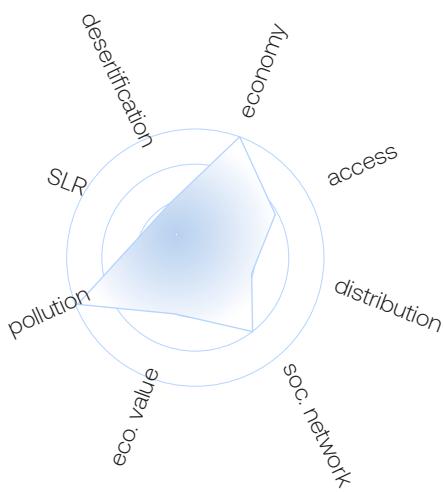


C 4 Reuse porosity

P 1 Recycling is cool!

P 2 Waste management

The current waste management system is lacking, with existing landfills being overcrowded creating serious health issues for the residents. This pattern set addresses this widespread issue of pollution by creating employment opportunities through it. By addressing the issue of waste management in the neighborhood scale throughout the city, the volume of trash that reaches the landfills would be reduced – making it easier to sort and recycle. This can be achieved by educating people on recycling practices and providing the necessary infrastructure. Moreover, job opportunities could emerge through the recycled materials, either in the form of new construction materials or crafts.

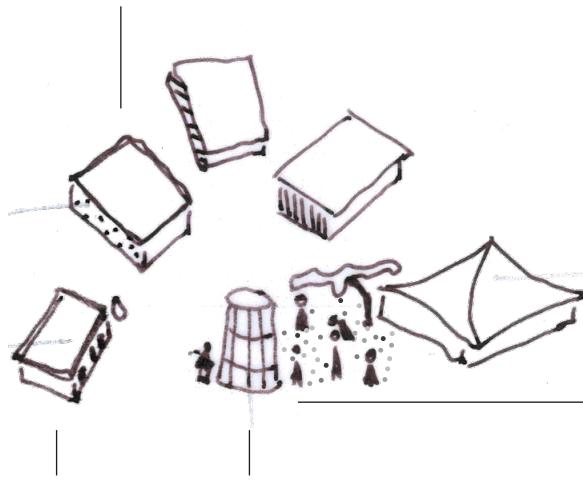


Unite people through space

□○ block to neighborhood scale

↑ bottom up

I 3 Shelter with meaning

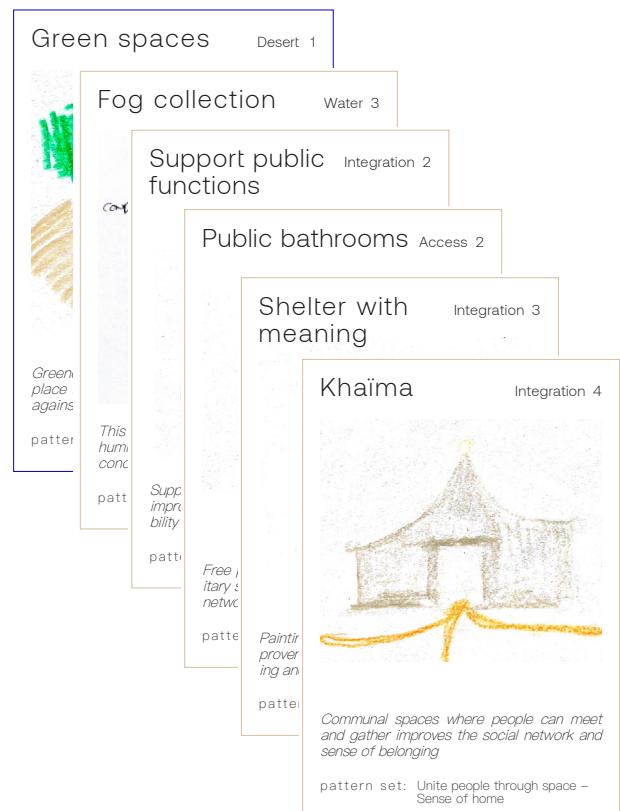
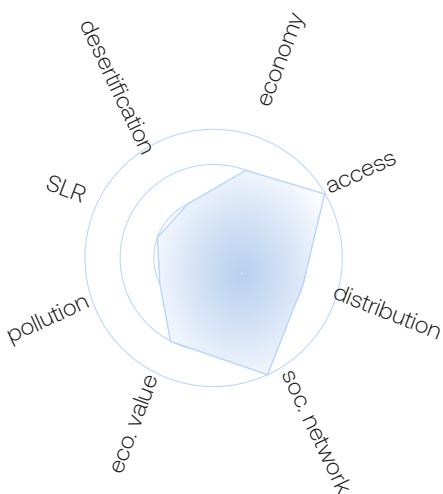


I 2 Support public functions
I 4 Khaïma

D 1 Green spaces

A 2 Public bathroom W 3 Fog collection

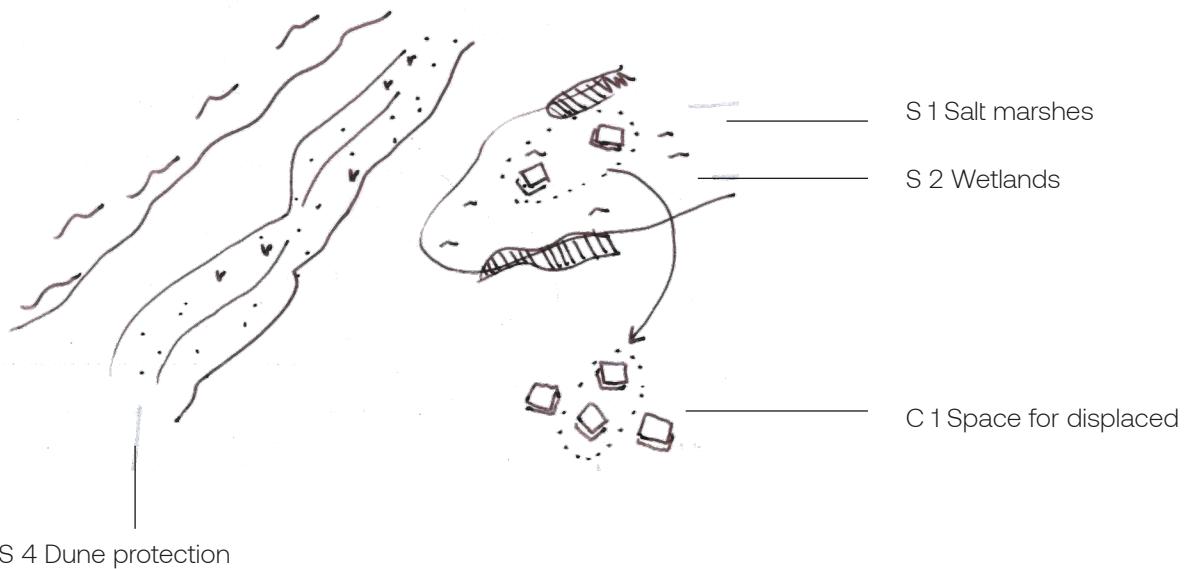
This pattern sets advocates for creating community spaces throughout the neighborhoods of Nouakchott, in order to aid in both urban and social cohesion. This can be achieved through the intensification of public services, like local water collection and distribution through the fog towers, access to public toilets, access to shade and public gathering through the Khaïmas, and access to public green. These nodes of unity should be placed at suitable locations, like courtyards, public squares or other existing open spaces throughout the city, ensuring accessibility for all residents.



Altered landscape

neighborhood to city scale

top down



The alteration of Nouakchott's landscape is inevitable. Addressing the single physical barrier between the city and the Atlantic Ocean, this pattern set focuses on the protection of the narrow dune strip. This requires consideration of both human and non-human agents – both the residents of the affected areas of corrosion but also the animal and plant ecosystems. Apart from restoration work of the dunes through groundworks and policies, the government needs to anticipate the formation of new salt marshes and wetlands, and take early action. This includes providing suitable space for the people that need to relocate, as well as thinking of new ways of living with water.

