Local Building Cultures for sustainable and resilient habitats: some examples from Ethiopia

INTBAU Ethiopia Talk Series 2021

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ENRIQUE SEVILLANO GUTIERREZ

e.sevillano.gutierrez@gmail.com

Contributions by:
Olivier MOLES, Thierry JOFFROY, Eugénie CRETE, Philippe GARNIER, Florie DEJEANT,
Annalisa CAIMI, and the teams of CRAterre and CRAterre-ENSAG

INTBAU ETHIOPIA

CRAterre

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PRESENTATION

INTRODUCTION

http://craterre.org/

CRAterre

CRAterre is:

1. Non profit organization created by students at the Grenoble School of Architecture since 1979 (CRAterre)

+

2. Research Laboratory at the Grenoble School of Architecture since 1986 (ENSAG) (CRAterre-ENSAG)

Aim:

To recognize and make recognize the **potential of local building cultures** in order to respond to challenges related to the environment, cultural diversity and the fight against poverty.

Objectives:

- **Improve housing and living conditions**,
- **enhance cultural diversity** and
- integrate **local communities** in projects and make better use of **local natural resources**.

Activities (in collaboration with local or national partners):

- Analyse local contexts and local building cultures,
- support, initiate and conduct projects,
- develop and promote the use of local materials and local building cultures,
- encourage and support research,
- back up through consultancy and technical assistance,
- train and build capacities,
- disseminate,
- …

CRAterre

TEAM

Team

About 70 persons from more than 15 different countries. A multidisciplinary group mainly based at the National Superior School of Architecture of Grenoble (France):

- Architects
- Engineers
- Anthropologists
- Archaeologists…

Field activities

100 per year in average in a wide range of countries (around 40 countries per year).

Network

- Unesco Chair: International network with 100 partner organisations.
- More than 300 ex-DSA students around the world.

AXES

The activities of the 3 axes feed respectively. The 3 axes transcribe the life cycle of the building

Monumental + vernacular heritage

Research
Application
Training
Dissemination

Matter, materials, technique

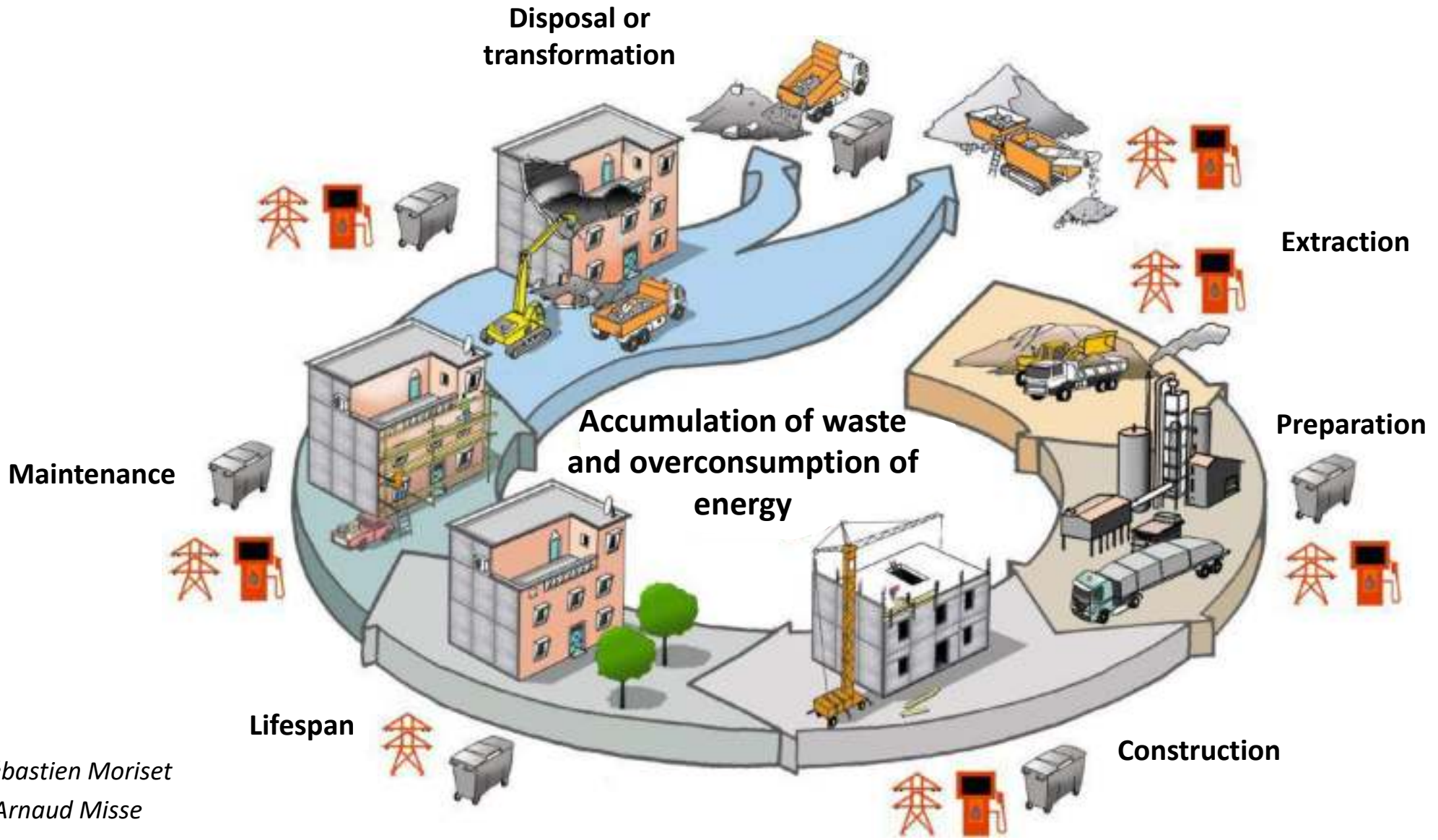
Research
Application
Training
Dissemination

Housing, habitat, settlements

Research
Application
Training
Dissemination

VISION

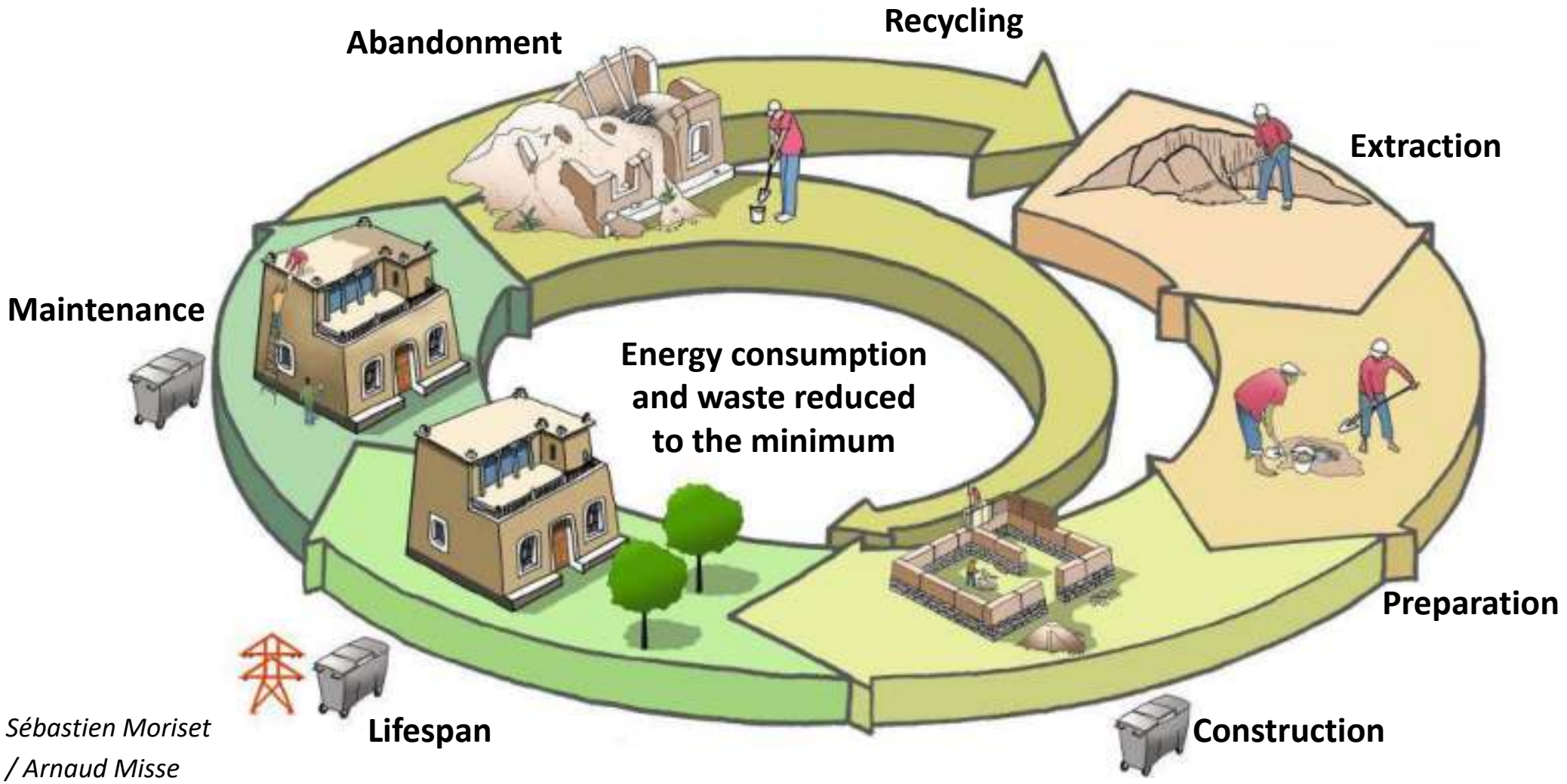
Vicious circle of construction with industrial materials



Sébastien Moriset / Arnaud Misse

VISION

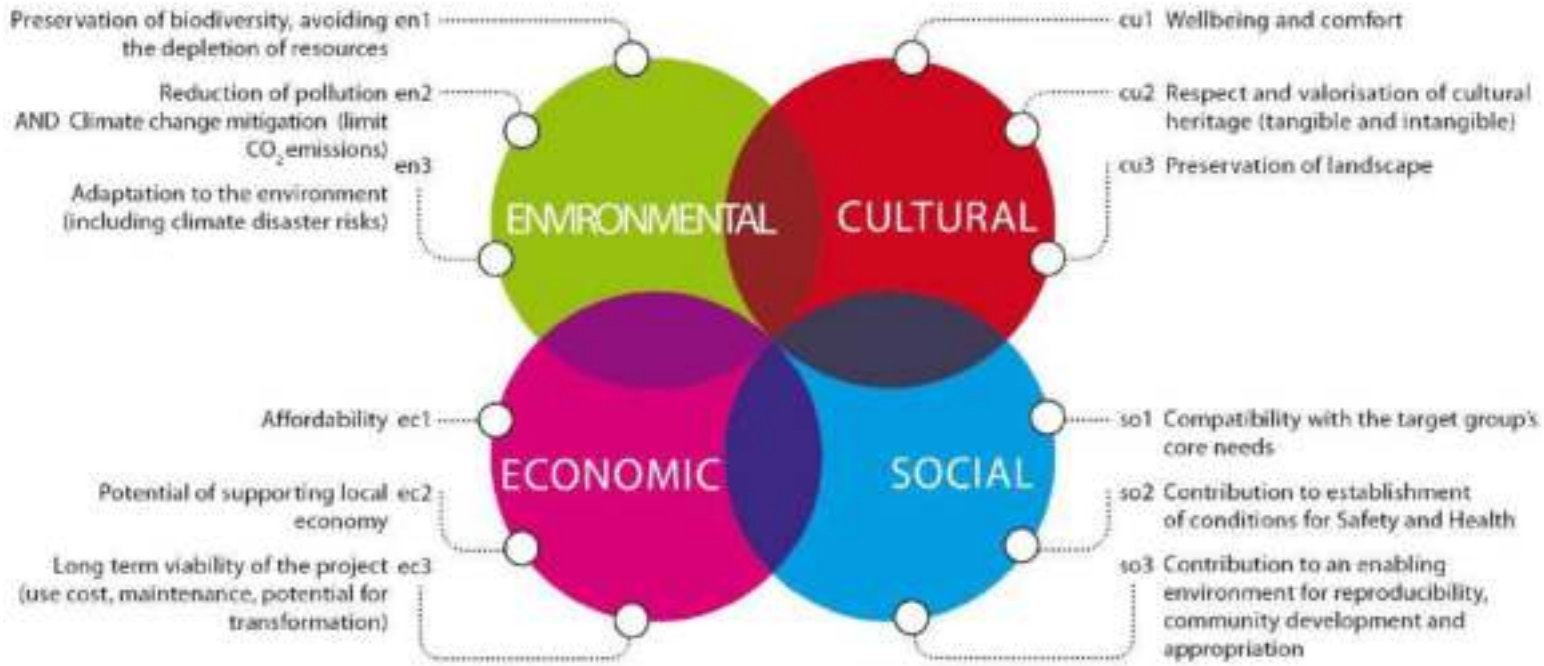
Virtuous circle of construction with local materials



Sébastien Moriset / Arnaud Misse

EVOLUTION

Projects built on the 4 pillars of sustainable development + GOVERNANCE



SHERPA for sustainable housing projects. Self-evaluation tool for project managers, communities, and other stakeholders involved in the planning, design, construction and assessment of housing projects. https://www.sherpa4housing.org/

ITERATIVE METHOD

Iterative method

1. Understanding the context / preliminary studies
2. Planning / design
3. Implementation
4. Evaluation

↓

Facilitates upscaling

2

LOCAL BUILDING CULTURES

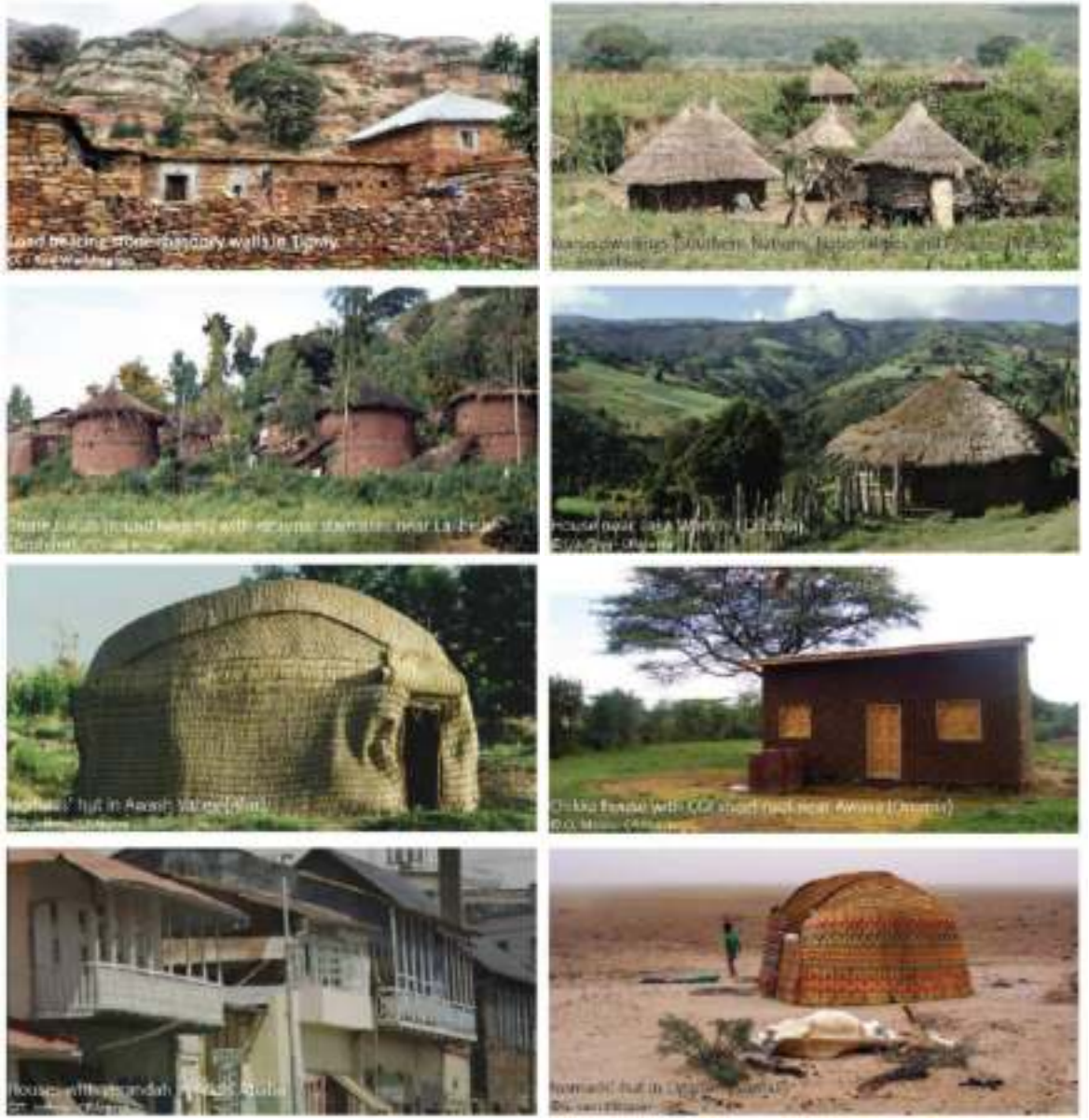
LOCAL BUILDING CULTURES

WHAT ARE LOCAL BUILDING CULTURES?

LOCAL BUILDING CULTURES

Local building cultures

- **Intangible dimension of a construction or a settlement** produced by humans to live, work, thrive, etc.
- Strongly **connected with the environment**.
- Related to **social, economic and cultural aspects**.
- Related to each phase of the building life cycle: **design, construction, use(s), maintenance, replacement, extension, adaptation**, etc.
- **Related to vernacular architecture, but not only**.
- **Genesis and evolution** closely linked to the environment and to the **specific history** of each territory.
- **Several building cultures can co-exist** in a single territory.



LEARNING FROM LOCAL BUILDING CULTURES

House

Behaviours
Architecture
Human and natural resources
Risk and vulnerability
Natural and built environment

LEARNING FROM LOCAL BUILDING CULTURES

Not looking at beauty of natural material

Not promoting heritage conservation

Round and square stone *tukuls* with thatched roofs near Lalibela. CC- Gordontour

Chikka rectangular house with CGI sheet roofing in Felasha village, near Gondar. CC- Beth

New *chikka* houses under construction in Amhara region. CC- Canned Muffins

LEARNING FROM LOCAL BUILDING CULTURES

India

New materials

Bangladesh

New know-how

LOCAL BUILDING CULTURES

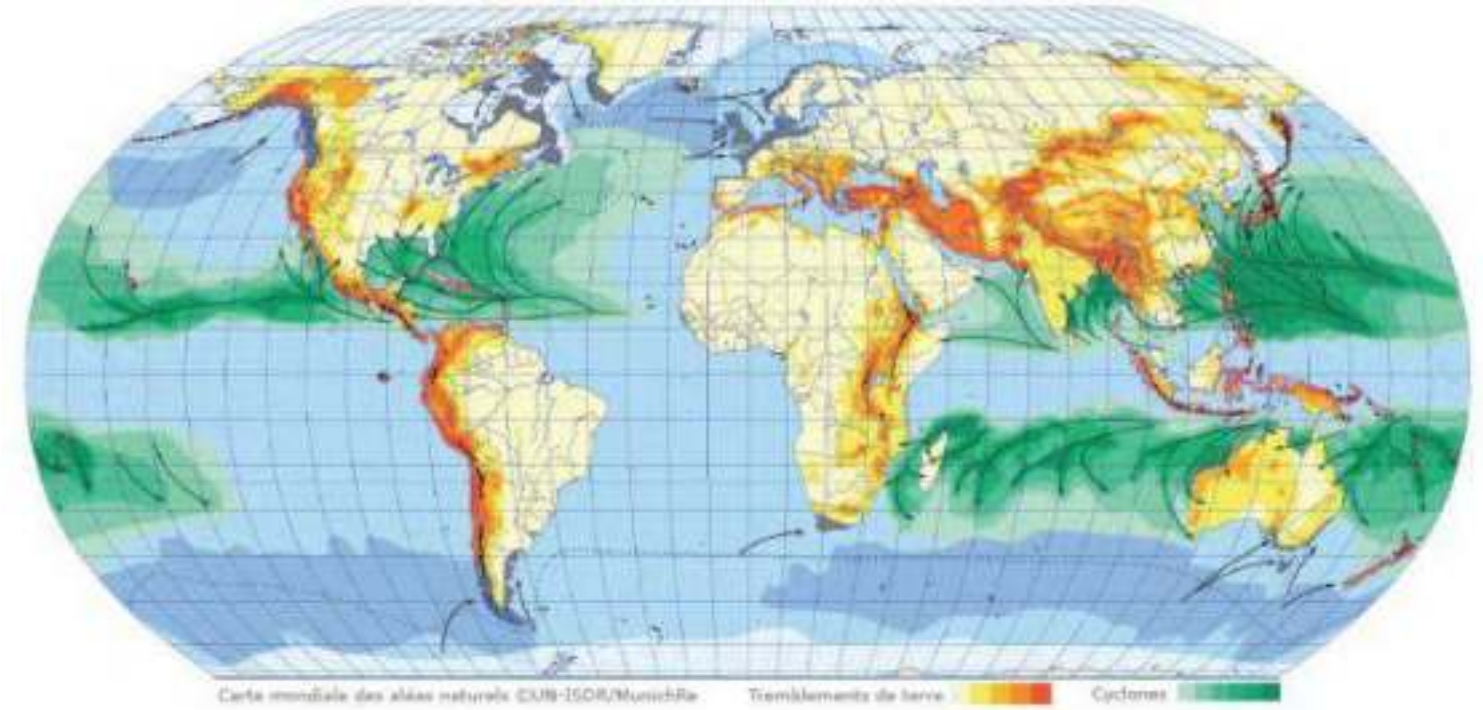
WHY ARE LOCAL BUILDING CULTURES VALUABLE TODAY?

RELYING IN LOCAL BUILDING CULTURES FOR RESILIENCE AND DEVELOPMENT

The importance of identifying local building cultures / practices

- Around 90% of the world population live and work in buildings built without architect/engineer -> **How can we have an extended impact in development projects?**

- After a disaster, only about 20% of the population receive assistance to rebuild -> **How can we impact the 80% of the population who rebuild by themselves?**



LOCAL BUILDING CULTURES

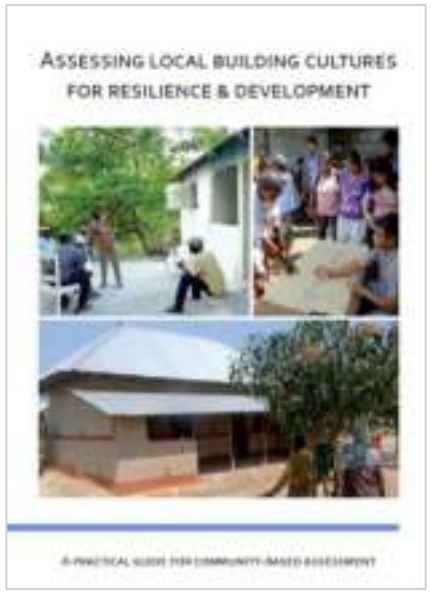
HOW CAN WE LEARN FROM LBCs?

THE TOOLS DEVELOPPED SO FAR TO HELP US TO LEARN

SHELTER RESPONSE PROFILES

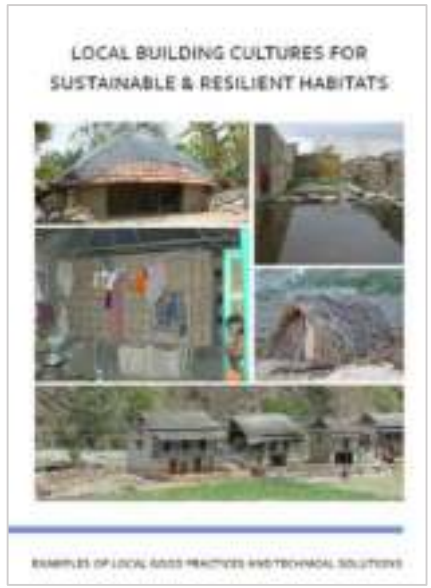
METHODOLOGICAL GUIDES FOR THE CONTEXTUALISED ANALYSIS OF LOCAL BUILDING CULTURES

https://craterre.hypotheses.org/999



CATALOGUES OF EXAMPLES OF LOCAL GOOD PRACTICES AND TECHNICAL SOLUTIONS

https://craterre.hypotheses.org/1774



SHELTER RESPONSE PROFILES

SHELTER RESPONSE PROFILES

- **Background:** The organisations backing these documents have been working for several years on the elaboration and the dissemination of an identification method for LBCs, especially in regard to their contribution to Disaster Risk Reduction (DRR).
- **Target audience**: Local, national, international, governmental, nongovernmental and civil society actors involved in the prevention, preparedness and response to natural and human-made humanitarian crises in the habitat and human settlements sector.
- **Objectives**:
  - Facilitate the identification of the strengths and weaknesses of LBCs and the opportunities they offer, in order to promote them – in an adapted version if necessary – in housing reconstruction, retrofitting or improvement projects.
  - Help actors in assessing Local Building Cultures and integrating them into their projects.
- **Output**: 40-80 pages documents. Free online access. https://www.sheltercluster.org/promoting-safer-building-working-group/library/shelter-response-profiles

Organisations producing and endorsing SRPs:

Global Shelter Cluster
ShelterCluster.org
Coordinating Humanitarian Shelter

CRAterre care IFRC UNHCR LABEX AE&CC ENSAG Communauté Université Grenoble Alpes CRS OXFORD BROOKES UNIVERSITY

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LEARNING FROM LOCAL BUILDING CULTURES

SOME EXAMPLES FROM ETHIOPIA

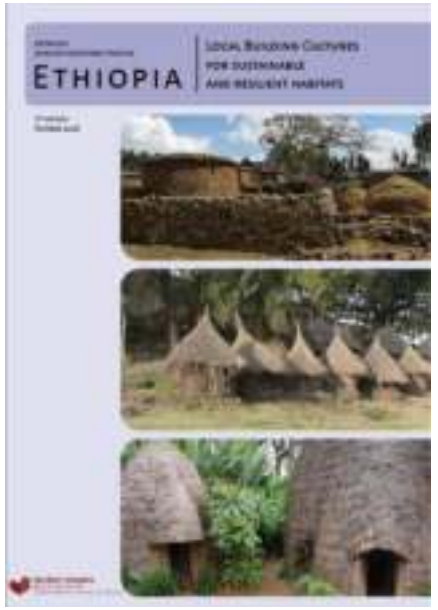
SHELTER RESPONSE PROFILE ETHIOPIA

SHELTER RESPONSE PROFILE

ETHIOPIA

Shelter Response Profile Ethiopia

- A 60 pages A4 document available online: https://www.sheltercluster.org/sites/default/files/docs/ethiopia_srp_-_final_version_-_2018_12.pdf
- Produced in 2018 after a request of the Shelter Cluster Ethiopia. Active participation of focal person in the national Shelter Cluster and of some organisations in the field.
- Review of around 70 documents: scientific papers, statistics, books, reports, official documents, regulations, etc.



Document prepared by: Enrique Sevillano Gutiérrez / Victoria Murtagh / Eugénie Crété

With contributions by: Dawit Abraham / Christèle Chauvin / Lara Davis / Lorenzo Fontana / Amanda George / Thierry Joffroy / James Kennedy / Muse Mohammed / Olivier Moles / Mohamud Omer / Addishiwot Samuel / Murielle Serlet / Beth Simons / Marina Trappeniers / David Zimmerman

Language review: Victoria Murtagh

SHELTER RESPONSE PROFILE

ETHIOPIA

2. COUNTRY PROFILE

2.1. GENERAL DESCRIPTION

A. LOCATION

Ethiopia is a landlocked country that lies on the Horn of Africa. Bordering the country are Sudan and South Sudan to the West, Djibouti and Eritrea to the North, Somalia to the East and Kenya to the South.

B. PHYSICAL AND TOPOGRAPHICAL DATA

Area: 1,104,300 sq km. Land: 1 million sq km. Water: 104,300 sq km.

Elevation: mean elevation: 1,330 m. Lowest point: Danakil Depression -125 m. Highest point: Ras Dejen 4,550 m.

Relief: Within Ethiopia is a vast highland complex of mountains and dissected plateaus divided by the Great Rift Valley which runs Southwest to Northeast and is surrounded by lowlands, steppes, or semi-desert. This diversity determines variations in climate, soils, vegetation and settlement patterns.

The altitude range of the country is divided into three zones: dega for the highlands, woina dega for the midlands and kolla for the lowlands.

C. CLIMATE

There are 5 climatic zones, closely associated with the varied altitude levels throughout the country: Kolla (Tropical weather), Woina Dega (Subtropical weather) and Dega (Cool weather), Bereha (Desertic) and Wurch (afro-alpine areas above 3,200m).

The Somali Region and the Danakil Depression in Afar have a hot, sunny and dry climate producing fully desert or semi-desert conditions. In the basins of the Sobat, the Tekezé and the Abay rivers the conditions are tropical and diseases such as malaria are prevalent. Over the greater part of Ethiopia as the Amhara and Oromia highlands the climate is healthy and temperate; in the uplands, the air is cool in summer and bleak in winter. On the higher mountains the climate is Alpine.

Rainfall per year: In Afar and Somali regions rainfall ranges from 81 to 500 mm per year, while it is above 1,000 mm in the West of the country, with places reaching 2,500 mm.

D. PROTECTED AREAS AND WORLD HERITAGE SITES

The World Database of Protected Areas (link in page 11) cites 104 Protected areas in Ethiopia. Protected areas are important biodiversity hotspots, as well as being the source of livelihoods and natural resources used for housing for the local communities. There are 58 National Forest Priority Areas, 18 Controlled Hunting Area, 13 national parks, 8 wildlife reserves and 4 sanctuaries. Moreover, there are 2 UNESCO-MAB Biosphere Reserves (Yayu and Kafa) and 1 natural World Heritage Site (Simien National Park).

Ethiopia also has 8 cultural properties inscribed on the World Heritage List (link in page 11): Rock-Hewn Churches, Lalibela (1978); Fasil Ghebbi, Gondar Region (1979); Aksum (1980); Tiya (1980); Lower Valley of the Awash (1980); Lower Valley of the Omo (1980); Harar Jugol, the Fortified Historic Town (2006) and Konso Cultural Landscape (2011).

E. ADMINISTRATIVE DATA

Ethiopia is a federal state subdivided into 9 ethno-linguistically based regional states (Tigray, Afar, Amhara, Oromia, Somali, Benishangul-Gumuz, Southern Nations, Nationalities and Peoples Region-SNNPR-, Gambella and Harari) and 2 chartered cities (the country's capital Addis Ababa and Dire Dawa). Each state comprises zones, districts (Woredas), cities, and neighbourhood administrations (Kebeles). [See link in page 11 for more information]

2.2. DEMOGRAPHIC, CULTURAL AND SOCIOECONOMIC DATA

A. DEMOGRAPHIC DATA

Total population: 105,350,020
Population density: 95.4 people/km²
Human Development Index (HDI): 0.463 (low)
Life expectancy: 62.6 years
Fertility rate: 4.99 children born/woman
Infant mortality rate: 48.8 deaths/1,000 live births
Median age: 17.9 years
Age structure:
0-14 years: 43.47%
15-24 years: 20.11%
25-54 years: 29.58%
55-64 years: 3.92%
65 years and over: 2.94%
Net migration rate: -0.2 migrant(s)/1,000 population
Urban population: 20.8%
Rural population: 79.2%
Urban population growth: 4.65% annual rate of change
Major urban areas:
Addis Ababa (capital city): 4,567,857
Dire Dawa: 1,374,869
Mek'ele: 480,717
Gondar: 958,257

B. LANGUAGES

Amharic (official national language): 29.3%
Oromo (official language in Oromia): 33.8%
Somali (official language in Somali) 6.2%
Tigrinya (official language in Tigray) 5.9%
Other languages: Sidamo 4%, Wolaytta 2.2%, Gurage 2%, Afar 1.7%, Hadiyya 1.7%, Gamo 1.5%, Gedeo 1.3%, Opuuo 1.2%, Kafa 1.1%, others 8.1%.
English (major foreign language taught in schools) and Arabic.

C. ETHNIC GROUPS

Oromo 34.4%
Amhara 27%
Somali 6.2%
Tigray 6.1%
Sidama 4%; Gurage 2.5%; Welaita 2.3%; Hadiya 1.7%; Afar 1.7%; Gamo 1.5%; Gedeo 1.3%; Silte 1.3%; Kefficho 1.2%; other 8.8%

D. RELIGION

Ethiopian Orthodox 43.5%
Muslim 33.9%
Protestant 18.5%
Traditional 2.7%
Catholic 0.7%
Other 0.8%

E. EDUCATION

Literacy rate: 49.1% (age 15 and over)
Youth (15-24 years) **literacy rate** 2008-2012. Male: 63%. Female: 47%
Primary school participation, Net attendance ratio 2008-2012. Male: 94.3%. Female: 85.5%
Secondary school participation, Net attendance ratio 2008-2012. Male: 15.7%. Female: 13.6%

F. HEALTH

Physicians density: 0.03 physicians/1,000 population
Hospital bed density: 0.3 beds/1,000 population
HIV: 610,000 people living with HIV (0.98%)
Major infectious diseases:
Food or waterborne diseases: bacterial and protozoal diarrhea, hepatitis A and E, and typhoid fever
Vectorborne disease: dengue fever and malaria
Respiratory disease: meningococcal meningitis
Water contact disease: schistosomiasis
Animal contact disease: rabies

G. ECONOMY (2017 est.)

GDP (purchasing power parity): $300.2 billion
GDP – real growth rate: 10.9% (annual average GDP growth of 10.3% a year from 2005/06 to 2015/16)
GDP – per capita: $788
GDP – per capita (PPP): $2,200
GDP – composition, by sector of origin: agriculture: 36.8%; industry: 22.2%; services: 42%
Labour force - by occupation (2015 est.): agriculture: 72.7%; industry: 7.4%; services: 19.9%
Child labour 5-17 years old (2015): Children working in child labour: 42.7% (15,948,175)
Children working in permitted forms of work: 8.3% (3,096,516)
Children non-working: 48% (18,288,047)
Population below poverty line: 29.6% (2014)
Inflation rate (consumer prices): 9.9%
Distribution of family income – Gini index: 33 (2011)
Other information: according to the CIA World Factbook, Ethiopia is a one-party state with a planned economy. For more than a decade Ethiopia has been one of the fastest growing states, driven by government investment in infrastructure and sustained progress in agriculture and in service sector.

Ethiopia has the lowest level of income-inequality in Africa and one of the lowest in the world. Yet, Ethiopia remains one of the poorest countries in the world, due to rapid population growth and a low starting base.

H. ACCESS TO INFORMATION

Telephones - fixed lines
Total subscriptions: 1,147,000
Subscriptions per 100 inhabitants: 1
Telephones - mobile cellular
Total subscriptions: 91,224,000
Subscriptions per 100 inhabitants: 49
Mobile phones are popular in Ethiopia, and in 2010, the Ethiopian government formed Ethio Telecom, the only phone, internet and mobile phone service provider (http://www.ethiotelecom.et/).
At the time of writing, the mobile phone network did not cover the entire country, so it is still necessary to use Satellite phones in the more remote areas.
Radio and television access
Radio is the most important source of news and information in Ethiopia. 4/5 Ethiopians use radio as a source of information.
Television in Ethiopia caters mainly for urban audiences. It is the most important source of news and information in the country after radio.
Internet users
Total: 15,751,741
Percent of population: 15.4%

TO FIND OUT MORE

CIA WORLD FACTBOOK
https://www.cia.gov/library/publications/the-world-factbook/geos/et.html

FAO
https://www.fao.org/countryprofiles/index/en/?iso3=ETH

WORLD BANK
https://www.worldbank.org/en/country/ethiopia

WORLD DATABASE OF PROTECTED AREAS
https://protectedplanet.net/country/ET

UNESCO WORLD HERITAGE SITES
https://whc.unesco.org/en/statesparties/et

REGIONS OF ETHIOPIA
http://www.worldstatesmen.org/Ethiopia_Regions.html

SHELTER RESPONSE PROFILE

ETHIOPIA

3. Analysis of housing

3.3. Tenure security issues

A. Legislation and administration

Constitution of the Federal Democratic Republic of Ethiopia (1994)

Article 40 of the Constitution states that:

- Every citizen has the right to the ownership of private property. Unless prescribed otherwise by law on account of public interest, this right shall include the right to acquire, to use and, in a manner compatible with the rights of other citizens, to dispose of such property by sale or bequest or to transfer it otherwise.
- The right to ownership of rural and urban land, as well as of all natural resources, is exclusively vested in the State and in the peoples of Ethiopia. Land is a common property of the Nations, Nationalities and Peoples of Ethiopia and shall not be subject to sale or to other means of exchange.
- Without prejudice to the rights of Ethiopian Nations, Nationalities, and Peoples to the ownership of land, government shall ensure the right of private investors to the use of land on the basis of payment arrangements established by law.

Land Administration and Land Use Proclamation No. 456/2005

- Regional states have autonomy in matters of land without contradicting of the Constitution and the national laws.
- The Rural land use right of peasant farmers, semi-pastoralists and pastoralists shall have no time limit. The duration of rural land use right of other holders shall be determined by the rural land administration laws of regions.
- Women's rights are considered and customary law is not supported. Nevertheless, big farmers and men are usually allocated larger plots than women and smallholders.
- Any holder of rural land shall be given holding certificate to be prepared by the competent authority and that indicates size of the land, land use type and cover, level of fertility and borders, as well as the obligation and right of the holder.

Urban Land Lease Holding Proclamation No. 721/2011

- Urban land may only be held on a leasehold basis with maximum lease periods varying depending on the use.

B. Tenure types and landlessness

Rural land tenure

Proclamation 456/2005 allows for three types of rural land tenure:

- private holdings,
- communal holdings,
- government holdings.

It also states that:

- Peasants have right to obtain land without payment and the protection against eviction from their possession. They also have to lease the land and, while the right remains in effect, to legate it to family members.
- Pastoralists have the right to free land for grazing and cultivation as well as the right not to be displaced from their own lands.
- Holding certificates are issued to the landholders. The person is using the land that ultimately belongs to the State.

Land is allocated regarding the number of household members. Factors as quality of land, size of family workforce and ownership of farm assets have less weight.

Informal markets exist where officially land is bought and sold without title. Land is also rented and sharecropping practices are common in rural areas.

Urban land tenure

Proclamation 721/2011 states that urban land may only be held on a leasehold basis with maximum lease periods varying depending on the use. The lease periods can be transferred and renewed.

- Lease for residential housing for a 99 year period (or government offices, charitable organizations, research and study).
- Lease for education, health, culture and sports for a 99 year period (50 in Addis Ababa).
- Lease for industry for an 50 year period (70 in Addis Ababa).
- Lease for commerce and all 'other' uses for a 70 year period (60 in Addis Ababa).

Housing tenure

Rental housing is the dominant tenure mode. Private ownership levels are low (e.g. in 2010 30% of owned houses in Addis Ababa).

C. Gender issues

Gender inequality

The Revised Family Code (2000) recognizes equality between women and men.

However in 2014 Ethiopia was ranked among the countries with high levels of gender discrimination in the SIGI Index (Social Institutions and Gender Index) by the OECD (ranked 73 out of 108 countries studied). This index takes into account discriminatory family code data, restricted physical integrity values, son bias, restricted resources and assets and restricted civil liberties for women. There is available data on women's access to land, credit, non-land property, and inheritance practices.

Moreover, in 2017 according to the Human Development Index by UNDP it is among the group of countries with very low equality in HDI achievements between women and men (group 5: absolute deviation of more than 10 percent).

A data not related to tenure issues but important to understand the situation of women is that in 2016, 65% of women age 15-49 are circumcised. The prevalence of female circumcision is highest in Somali (99%) and lowest in Tigray (23%).

In October 2018, the Government of Ethiopia appointed their first female President. In addition, the Prime Minister adjusted his cabinet to ensure that at least 50% of the Ministers were women, including the first female Defense Minister and Minister for Peace.

Property/use rights

Both women and men have use rights to land. The Family Code recognizes the equal rights of a married woman to the possession and administration of personal property. It also allows for joint ownership of land and property in marriage. Consent of both spouses is required for property transfers.

Despite the legal frame, rural women do not have effective access to land. In certain areas, such as the south of the country, land reforms have not yet been fully endorsed because of traditional patriarchal practices or beliefs centred on male domination, where women's access to land is not recognized.

Tenure issues are intensified by gender disparities. In 2005, 12 750 000 women were active in agriculture (45% of the agricultural labour force and 77% of all economically active women), but only 19.2% of agricultural holders are women.

In 2010, 50% of the women reported land ownership (sole or joint): agricultural or residential. Nevertheless, just over 1/3 of women who own a house report that there is a title for the house which includes their name. Moreover, 40% of women own land but only one in two of the women who own land say there is a title or deed in their name for the land.

Inheritance

The Civil Code (1960) declare that the children of the deceased are the first to inherit. Each descendant receives equal shares of the succession. "Sex, age and nationality of the heir shall not affect in any way the ascertainment of rights to succession".

D. Public measures to counter landlessness

The land is of public ownership. The land is provided free of lease charge for families. Farm size ranges from zero-landless to 10 ha, although the latter are very few in number and usually are found in the less densely populated regions of Somali and Afar. Despite the distributive nature of current land tenure systems, the mean size of farm holdings is about 1.02 ha per household.

SHELTER RESPONSE PROFILE

ETHIOPIA

4. DESCRIPTION OF LOCAL HABITAT

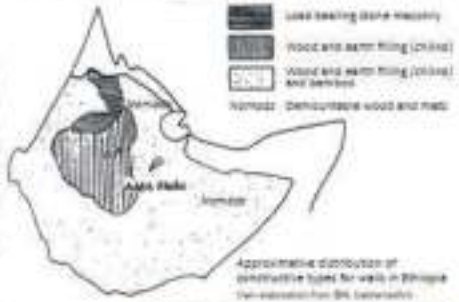
4.1. LOCAL HABITAT: GENERAL DESCRIPTION

A. LOCAL AFFORDABLE OR SELF-BUILT HOUSING

VERNACULAR HOUSING

Regarding the form, all around the country, round houses (tukul) with walls built in different materials and thatch roofs are very common. Rectilinear houses are less common, but they are gradually replacing round houses in order to make it easier the use of CGI sheets for roofing. Round houses with thatch roofs are known in the north of the country as *gorbet* (grass hut), while rectilinear houses with CGI sheets roofs are known as *agrocroclat* (corrugated hut).

Vernacular housing in Ethiopia can be shallowly classified into four categories depending on wall types:



Timber structure with earth and fibres filling (chikka)

Chikka houses are very common throughout the country (72% of houses had their walls in chikka in 1984). Their structure is built with wood poles of eucalyptus or other available timber measuring about 8 cm large. Wood is split in half if the diameter is too large. Eucalyptus, which is easily attacked by termites, is smoked and/or soaked in burnt oil. The poles are set vertically about 30 to 40 cm deep into the ground or on a stone or cement foundation. Foundations are then filled with stones and sometimes lime mortar up to 35 cm above the natural terrain. These main poles are then tied in place and diagonally braced when necessary. Wood elements with smaller diameters (about 5cm) are planted in the basement or on the ground and go up to the roof. They are braced by horizontal elements, the assembly being ensured by strings and/or belts of eucalyptus. Thinner eucalyptus elements (*zegha*) are attached to this structure to accommodate the chikka mixture, close enough to prevent excessive shrinkage of the chikka during drying.

The roof (thatch or CGI sheets) is put before applying the chikka mortars. Then, a mixture of earth, straw (usually teff straw, a common cereal in Ethiopian highlands) and water, is used as a filling for the wood structure. It is also used for plastering. The mixture is left to ferment between 3 days and 2 months for better adherence quality. It is stirred every 2-3 days for homogenization. Then the mortar is projected with force on the wood structure, so that it hangs well. Once dry, an extra layer can be applied. The layers on the inner side of the construction are made before those on the outer side. One or two layers are applied in the inner part and two or three in the outer side. The amount of straw in the mixture increases in the final layers. The last layer is usually to give a smooth finish. The walls can get to be protected by a relatively thick earth coating (15 to 20 mm). The final layer can then be coated or not (with lime or cement mortar) with an improvement of the hanging through stones embedded in the layers of chikka. To prevent cracking around wooden doors and windows, they are only fixed once the first layer of chikka is dry.

Houses in the highlands have thick chikka walls in order to get better inertia and control of humidity and so a better temperature inside the houses in this temperate region. On the contrary, these houses have less and less mortar in the walls in the lower tropical climate areas, and they permit ventilation and better comfort inside the houses. In some areas, almost no chikka is applied to the wooden structure and the walls are almost only made of wood.


Oromo chikka tukul near Langano lake (Oromia). CC-


Chikka house in Basketo Zone (SNNPR). © Enrique Sevillano


Decorated chikka house in the South Omo Zone (SNNPR). CC- Eric Gilbert

Chikka houses are usually round houses (tukul) covered with thatch, but more and more metal roofs are used and houses are becoming rectangular. Corrugated iron is growing as a roofing material as the price of thatching grass rises and skilled thatchers become harder to find. The roofs usually have an overhang to protect the walls. CGI sheets and straw are sometimes combined in the roof to have a better comfort.

Thatched roofs have the disadvantage of being flammable, but they also allow to cook inside the house without a chimney, as smoke can pass through the thatched roof. At the same time, smoke can treat the thatch against insect attacks.

These two typologies are built with the limited building materials and construction skills available in the rural areas. These constructions require regular maintenance. Thermal comfort is very recognized and appreciated.

Load bearing stone masonry walls with earthen mortar

This is found specially in Tigray and Amhara regions, but also in cities like Harar or Dire-Dawa.

In these regions, stone is an abundant resource. Houses are usually square or round and stone built. There are one single level square or round houses, and also two levels rounded houses.

Basalt is used for foundations. Walls are built with stones (grey trachyte). In square houses large stones well carved are placed at the corners with a filling of smaller stones for the rest of the walls. Mortar is made of earth and straw (*chikka* mortar). The collection of stones can last nearly 5 years, then the construction of the house typically takes 4 to 8 months. Openings and frames are in wood. Stone balconies can be found on the 1st floor, which protects the wall of the 1st level from the rain (*chikka* mortar).

The wooden posts supporting the roof are positioned all around the house, with no particular symmetry according to their height and section.

Flat roofs of wood covered with sods of earth and wide overhanging eaves are common, but also thatch roofs can be found. Recent houses often have CGI roofs (*corcora*) with gable ends as thatching grass becomes scarcer.

Ceilings are usually very decorated. The interior walls are often plastered with a mix of earth, straw and cow dung.

Bamboo and thatch walls

This technique is found in SNNP Region, especially in Dorze and Sidama people.

The structure is built with split bamboos sunk into the ground every 10 cm or so following a circle or oval form. The series of vertical bamboos are connected to each other, forming circles or ovals that have a diameter which diminishes as one goes up. The bamboo structure is then covered with bamboo leaves (sometimes also with grass and enset leaves). Small openings at mid-height are usual to leave the smoke out.

Dorze houses do not have central pole, while Sidama houses do have one and have a bigger surface.

Wood and mats huts from nomads

These houses are used by the nomads in Afar and Somali regions. They are erected, dismantled and loaded on to the camels by the women. Huts are owned by women. Men usually gather the materials to build the huts.

Both types are made of an armature of boughs bound with palm fibre and covered with mats. Each group of huts is usually surrounded by a hedge or wall to protect the animals from enemies. The Somali hut is called the *aqal*.

In some cases, there is an outer uncovered verandah.


Stone tukul in Lalibela in Amhara region. CC-Sam


Houses with stone masonry walls in Tigray. CC-Bernard Gagnon


Bamboo and thatch house (Dorze people-SNNPR). CC-David Stanley


Afar huts (Afar region). © Cathryn Chidlow

SHELTER RESPONSE PROFILE

ETHIOPIA

4. DESCRIPTION OF LOCAL HABITAT

PRECARIOUS HOUSING

People build more and more temporary structures out of cheap materials, whether to live in or to rent out. In cities, self-initiated extensions or houses are constantly being erected because of the acute shortage of affordable housing for low-income households. These constructions are commonly built using reused corrugated iron sheets and earth-plastered wood structures. They help accommodate the changing needs of tenants and generate cheaper alternatives for customers.

Data on the national stock of informal housing units is not available. The only data concerning informal housing dates back to the year 2000, when Addis Ababa had an estimated 60 000 informal 'squatter' units representing 20 percent of the city's housing stock.

Moreover, 80 percent of houses in Addis Ababa can be considered a slum according to the UN-HABITAT slum definition. 70 percent of these houses are government owned rental housing.

Precarious habitat in Adama (Oromia).

GLOBALISED HOUSING

More and more, houses are built with reinforced concrete frames and slabs. Cement sand blocks or fired bricks are used to infill walls.

Large multistorey buildings are being constructed with the same technique all over big cities, and more frequently in Addis Ababa.

Globalised housing project in Addis Ababa.

B. ACCESS TO WATER, SANITATION AND ELECTRICITY

Improved drinking water source:

Urban: 91% of population
Rural: 57% of population

Urban households rely on: water piped into the household's dwelling, yard, or plot (63%); water piped into a public tap/standpipe (13%); and water piped to a neighbour (12%).

Rural households obtain their drinking water mainly from public taps/standpipes (19%), followed by protected springs (16%) and tube wells or boreholes (13%).

Improved sanitation facility access:

Urban: 18% of population
Rural: 4% of population

One in three households in Ethiopia have no toilet facility (19% in rural areas and 7% in urban areas).

More than half (56%) of rural households use unimproved toilet facilities. More than one-third (35%) of toilet facilities are shared in urban households, whereas only 2% of rural households share their toilet facilities with other households.

In recent years, the Ethiopian Government has engaged in a Community Led Total Sanitation (CLTS) type sanitation exercise, in which whole rural villages and Woredas are targeted with sanitation awareness trainings and exercises to discourage random defecation.

Access to electricity:

Urban: 93% of population have access to electricity, though this is not always reliable. Many households and modern apartment blocks use automatic back-up generators. In Addis Ababa, the massive programme of construction and expansion in recent years, has put pressure on the electricity supply, causing frequent power-cuts.

Rural: 8% of population have access to electricity, mainly via generator or solar panels.

Housing characteristics	Households			Population		
	Urban	Rural	Total	Urban	Rural	Total
Electricity						
Yes	93.3	8.4	28.6	93.0	7.1	30.4
No	6.7	91.6	71.4	7.0	92.9	70.2
Housing material						
Earth, sand	33.9	94.7	80.2	33.2	93.9	80.3
Dung	9.7	58.1	39.6	9.3	58.2	39.7
Mud/adobe	0.3	5.1	3.2	0.3	5.1	3.2
Palm/bamboo	0.8	1.7	1.4	0.8	1.7	1.4
Plywood or planked wood	1.1	0.1	0.4	1.1	0.1	0.4
Mud or asphalt strips	32.1	7.2	14.6	31.3	7.0	14.2
Ceramic tiles	4.1	0.1	1.6	4.3	0.1	1.6
Cement	10.1	1.9	4.4	11.2	1.8	4.1
Carpet	10.9	1.4	4.8	11.4	1.4	4.9
Rooms used for sleeping						
One	65.2	71.8	70.3	63.8	68.9	68.4
Two	29.4	23.1	24.6	30.4	26.2	27.3
Three or more	5.4	5.1	5.1	5.8	5.0	4.3
Place for cooking						
In the house	14.2	92.1	78.6	15.4	94.0	87.9
In a separate building	79.4	48.1	57.3	79.8	48.4	59.9
Outdoors	6.4	11.2	11.1	4.8	10.6	11.2
We have cooked in household	0.8	0.5	1.0	0.9	0.7	0.5
Other	0.1	0.2	0.1	0.1	0.1	0.1
Cooking fuel						
Electricity	20.3	0.3	5.0	19.3	0.3	4.0
LPG/Natural gas/biogas	1.3	0.3	0.6	1.3	0.3	0.6
Kerosene	0.1	0.0	0.0	0.1	0.0	0.0
Charcoal	35.3	2.1	7.9	37.8	1.9	8.8
Wood	38.1	85.6	75.1	40.3	86.9	85.0
Straw/shrubs/grass	1.0	0.9	0.9	1.0	0.9	0.9
Agricultural crop	0.3	2.3	1.8	0.3	2.1	1.6
Animal dung	1.3	8.3	6.6	1.1	8.0	7.0
We have cooked in household	0.9	0.2	0.3	0.9	0.1	0.3
Prefer/plan using solid fuel for cooking	10.9	39.9	30.0	11.3	38.0	34.0
Frequency of smoking in the home						
Daily	4.4	9.2	8.0	4.2	8.0	6.9
Weekly	4.4	9.8	8.4	4.7	8.8	8.1
Monthly	0.8	0.3	0.4	0.8	0.3	0.4
Less than once a month	1.0	1.2	1.2	1.1	1.1	1.0
Never	89.1	89.4	87.9	89.3	89.7	89.1

Housing characteristics in 2016.
Percent distribution of households by housing characteristics.

C. HABITAT ORGANISATION AND CONDITIONS OF USE

The physical form of Ethiopian housing has been dominated by single-storey construction. In the 1994 census, 98.3% of buildings nationwide were single storied and the remaining 1.7% were multistoried buildings. This has changed ever since, but it shows the characteristics of most vernacular dwellings.

Habitats are further examined later in this chapter region per region. Nevertheless, some general characteristics tend to be shared throughout the country both in urban and rural habitats.

View of Addis Ababa.

URBAN HABITATS

Ethiopia is one of Africa's least urbanised countries. Cities in Ethiopia have traditionally been small. Nevertheless, more and more people live in cities (6.4% in 1960 and 20.8% in 2018) and cities are growing. In 2008, only 10 cities had more than 100 000 inhabitants; in 2018, there are 21 cities with at least this population.

In 1999, four materials were mainly used in urban areas: chikka, cement blocks, fired brick and concrete. There was a decrease in stone construction, even where it was abundant. Nevertheless, stone constructions are common in old cities. In urban areas, chikka constructions are often of poor quality. Chikka was mostly used by low-income households, while other materials were used by those who could afford them. In 1984, 80% of urban housing walls were made of chikka. Even today, behind concrete and glass buildings on the main streets of every city of the country there is a world of earth buildings. These structures can be as old as the cities themselves but they also continue to be built today. There is a very rich complexity of earth buildings and clusters which increases in the city centres.

Roofs are mostly built with CGI sheets. Today, around 23% of urban houses have earth or sand floors. Other 23% have carpets, and almost the same percentage have vinyl or asphalt strips. 16% have cement as flooring material and finally 9% have dung.

In 2008, the government estimated that 33% of urban solid waste was never collected, while only 10% of the population reported using a municipal waste collection system.

Concerning the conditions of use of the houses and their spaces, almost 2/3 of the households in cities have one single room used for sleeping, while 28% have two.

People usually cook in a separate building from the house (almost 60% of the population), while 28% cook inside the house and around 13% outdoors. 70% of the households use solid fuel for cooking, and 23% used electricity.

Security in urban areas has to do with permanent employment and with pension. To cope with their problems women in urban areas engage in construction work.

RURAL HABITATS

Almost 80% of the population of the country live in the rural areas. The structure of Ethiopia's economy largely depends on rainfed agriculture. The countryside in Ethiopia is covered with earth, stone, timber, bamboo and fibre buildings. They are usually round, but also more and more square and oblong. Unlike the urban ones, these units are often generously spaced from each other. Thatch roofs were very common, but they are gradually giving way to CGI roofing sheets. In some regions (e.g. Somali and Afar), people have usually held nomadic lives. In these places traditional houses are demountable.

In rural houses, earth and sand are used today in floors in 55% of the households, and almost 40% also use dung. The rest of materials are almost unknown for flooring purposes throughout rural areas of the country.

The great majority of households only has one room for sleeping (72%).

People in the countryside cook either in a separate building (48%) or inside the house (40%). Around 11% of the population cook outdoors. The vast majority of people uses wood for cooking (80%). A remaining 7% uses animal dung and around 6% charcoal.

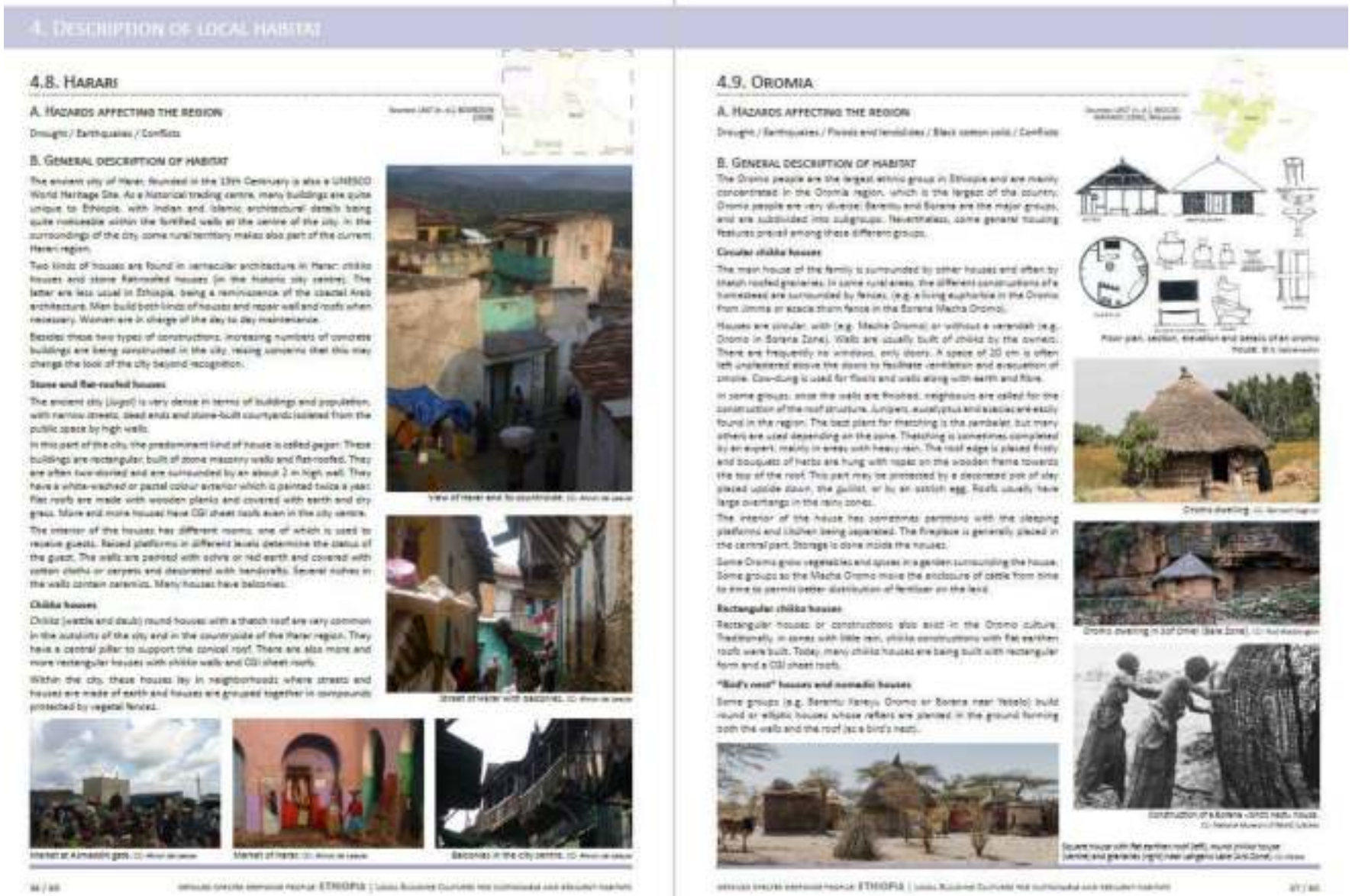
In rural areas security has to do with land and cattle. For the rural poor, the priorities are land, agricultural inputs, extension programs, and the problems of food security caused by drought and rainfall variability. To cope with their problems women in rural areas sell fire wood and cow-dung.

Usually, people share the interior of their houses with livestock in order to avoid the loss of animals. Mixed agriculture (crop and livestock production) is the mainstay of most rural population. The majority of rural households have a field associated to their house where they cultivate the necessary to support the family needs and sometimes to make exchanges with. Some industrial species have also rapidly evolved (e.g. coffee).

The conditions of use of the houses and their spaces greatly vary from region to region, as will be determined in the following sections.

SHELTER RESPONSE PROFILE

ETHIOPIA



4. DESCRIPTION OF LOCAL HABITAT

4.8. Harari

A. Hazards affecting the region

Drought / Earthquakes / Conflicts

B. General description of habitat

The ancient city of Harar, founded in the 13th Centruary is also a UNESCO World Heritage Site. As a historical trading centre, many buildings are quite unique to Ethiopia, with Indian and Islamic architectural details being quite noticeable within the fortified walls at the centre of the city. In the surroundings of the city, some rural territory makes also part of the current Hareri region.

Two kinds of houses are found in vernacular architecture in Harar: chikka houses and stone Rainrooted houses (in the historic city centre). The latter are less usual in Ethiopia, being a reminiscence of the coastal Arab architecture. Men build both kinds of houses and repair wall and roofs when necessary. Women are in charge of the day to day maintenance.

Besides these two types of constructions, increasing numbers of concrete buildings are being constructed in the city, raising concerns that this may change the look of the city beyond recognition.

Stone and flat-roofed houses

The ancient city (Jugol) is very dense in terms of buildings and population, with narrow streets, dead ends and stone-built courtyards isolated from the public space by high walls.

In this part of the city, the predominant kind of house is called gegar. These buildings are rectangular, built of stone masonry walls and flat-roofed. They are often two-storied and are surrounded by an about 2 m high wall. They have a white-washed or pastel colour exterior which is painted twice a year. Flat roofs are made with wooden planks and covered with earth and dry grass. More and more houses have CGI sheet roofs even in the city centre.

The interior of the houses has different rooms, one of which is used to receive guests. Raised platforms in different levels determine the status of the guest. The walls are painted with ochre or red earth and covered with cotton cloths or carpets and decorated with handicrafts. Several niches in the walls contain ceramics. Many houses have balconies.

Chikka houses

Chikka (wattle and daub) round houses with a thatch roof are very common in the outskirts of the city and in the countryside of the Hareri region. They have a central pillar to support the conical roof. There are also more and more rectangular houses with chikka walls and CGI sheet roofs.

Within the city, these houses lay in neighborhoods where streets and houses are made of earth and houses are grouped together in compounds protected by vegetal fences.

View of Hareri and its countryside. (c) Anon de Leeuw

Street of Hareri with balconies. (c) Anon de Leeuw

Market at Amaddin gate. (c) Anon de Leeuw

Market of Harar. (c) Anon de Leeuw

Balconies in the city centre. (c) Anon de Leeuw

4.9. Oromia

A. Hazards affecting the region

Drought / Earthquakes / Floods and landslides / Black cotton soils / Conflicts

B. General description of habitat

The Oromo people are the largest ethnic group in Ethiopia and are mainly concentrated in the Oromia region, which is the largest of the country. Oromo people are very diverse: Barentu and Borana are the major groups, and are subdivided into subgroups. Nevertheless, some general housing features prevail among these different groups.

Circular chikka houses

The main house of the family is surrounded by other houses and often by thatch roofed granaries. In some rural areas, the different constructions of a homestead are surrounded by fences, (e.g. a living euphorbia in the Oromo from Jimma or acacia thorn fence in the Borana Macha Oromo).

Houses are circular, with (e.g. Macha Oromo) or without a verandah (e.g. Oromo in Borana Zone). Walls are usually built of chikka by the owners. There are frequently no windows, only doors. A space of 20 cm is often left unplastered above the doors to facilitate ventilation and evacuation of smoke. Cow-dung is used for floors and walls along with earth and fibre.

In some groups, once the walls are finished, neighbours are called for the construction of the roof structure. Junipers, eucalyptus and acacia are easily found in the region. The best plant for thatching is the zambelet, but many others are used depending on the zone. Thatching is sometimes completed by an expert, mainly in areas with heavy rain. The roof edge is placed firstly and bouquets of herbs are hung with rope on the wooden frame towards the top of the roof. This part may be protected by a decorated pot of clay placed upside down, the guilliit, or by an ostrich egg. Roofs usually have large overhangs in the rainy zones.

The interior of the house has sometimes partitions with the sleeping platforms and children being separated. The fireplace is generally placed in the central part. Storage is done inside the houses.

Some Oromo grow vegetables and spices in a garden surrounding the house. Some groups as the Macha Oromo move the enclosure of cattle from time to time to permit better distribution of fertiliser on the land.

Rectangular chikka houses

Rectangular houses or constructions also exist in the Oromo culture. Traditionally, in zones with little rain, chikka constructions with flat earthen roofs were built. Today, many chikka houses are being built with rectangular form and a CGI sheet roofs.

"Bird's nest" houses and nomadic houses

Some groups (e.g. Barentu Yaneju Oromo or Borana near Yabelo) build round or elliptic houses whose rafters are planted in the ground forming both the walls and the roof (as a bird's nest).

Floor plan, section, elevation and details of an oromo house. (c) Anon de Leeuw

Oromo dwelling. (c) Bernard Hagenbach

Oromo dwelling in Sof Omar (Bale Zone). (c) Rod Waddington

Construction of a Borana «Gerri» hemi house. (c) National Museum of World Cultures

Square house with flat earthen roof (left), round prayer house (centre) and granaries (right) near Langano Lake (Arsi Zone). (c) Anon de Leeuw

SHELTER RESPONSE PROFILE

ETHIOPIA

5. LEARNING FROM LOCAL HABITAT

5.1. HAZARD-RESISTANT PRACTICES

A. FLOODS

(ALL ETHIOPIA)

- Elevated granaries to protect crops against moisture are found in some regions.
- The roof structure is sometimes borne by an independent timber or bamboo frame while the inside space is fenced by load bearing adobe or stone walls. In case of damage to the walls during floods or earthquakes, the frame can withstand autonomously, hence preserving the roof which is often the most expensive part of the construction. Moreover, the space under the withstanding roof can be used as an emergency shelter.
- Some constructions in flood prone areas (e.g. Amhara, Anuak in Gambela or Keri in SNNPR) start with the creation of an earthen platform. This is done by raising up an earthen mound whose edges work as a semifloat mass. This solution is very effective and it can be done at minor cost with earth from the site. However regular maintenance is required to ensure its effectiveness.
- Vegetation cover around the houses protect them from strong winds but also from floods effects thanks to the roots system.

(GAMBELA)

- The Nuer and Anuak peoples move from grassy flood-prone zones to higher places during the rainy season. Their villages are built in these higher zones. They have two kinds of houses, one made of grass for the dry season and others houses for the rainy season in villages.

(BENSHANGUL-GUMUZ)

- Raised platforms to store the grains and crops are common inside the houses in Berta and Gumuz societies.
- There also exist raised platforms to dry cereals outdoors (e.g. Berta people) which may reduce vermin attack.

(SOUTHERN NATIONS, NATIONALITIES AND PEOPLES' REGION)

- The Gurage have different spaces inside their houses that serve for storage of goods. The zones above the animal living areas in houses space (inside the main house) is covered by a mezzanine to store the firewood during the rainy season. Food is also kept inside from one year to the next as well as the tools for harvesting.
- The Alaba houses (SNNPR) have an earthen plinth with a step shape forming a circular bench around the house. This step serves to avoid damages from ordinary rains and even from ordinary floods.

Dari houses built on a mound with a mound verandah protecting the walls from the rain. (Debub Omo Zone in SNNPR). (cc- Richard Mortel)

Dassanech people flood damage on stilts (Debub Omo Zone in SNNPR). (cc- Richard Mortel)

Earthen plinth in an Alaba house (SNNPR). (cc- Lorenzo Cecchi)

Heavy ground floor and light upper floor in Harar. The upper parts of the walls have a decreased thickness and/or are built with materials lighter and more flexible than those used for the lower parts. (cc- Iwan)

B. EARTHQUAKES

- The roof structure is sometimes borne by an independent timber or bamboo frame while the inside space is fenced by adobe or stone walls. In case of damage to the walls during floods or earthquakes, the supportive frame can survive autonomously, hence preserving the roof which is often the most expensive part of the construction. Moreover the space under the resilient roof can be used as an emergency shelter.
- Some double story buildings in cities have the ground floor built with heavy materials such as stones and the upper floor built with lighter materials such as wood. Thanks to these greater lightness and flexibility, the upper portion is able to endure the movements produced by earthquakes without cracking. In case of partial collapse of the wall, the risk of serious injuries is considerably less, thanks to the reduced weight of the materials used.
- The round forms of tukuls provide better resistance to earthquakes.

Church with horizontal «ladder» timber bands or «monkey heads» in Debre Damo monastery in Tigray. (CC- Tewel Mitiku)

- Wooden structures have a good flexibility. They are more seismically resilient and rarely collapse in the event of an earthquake. Therefore they are also less likely to cause the loss of life of the inhabitants.

(AMHARA AND TIGRAY)

- In Tigray and Amhara regions, there are some examples of horizontal ladder-like timber bands. This technique called «monkey heads» is typical from the Aksumite period, and has later been used in vernacular architecture. This technique consists of stone and earthen mortar masonry walls where timber ladder-like horizontal bands are integrated with a varying distance depending on the buildings. Long squared timbers tie the entire building and are held by short round cross-pieces whose end is visible (the "monkey heads"). The horizontal beams tightly hold perpendicular walls together and bind the whole building at different levels, avoiding dissociation and strengthening of walls towards out-of-plane lateral forces during earthquakes.

Church of Yemrehanna Kristos with horizontal timber bands or «monkey heads» near Lalibela in Amhara. (cc- Ikiamlakwash)

«Monkey heads» technique. (© M. Kebede/Ma)

C. EROSION, LANDSLIDES AND RIVERBANK EROSION

- In many locations around Ethiopia, it has become common to implement terracing and reforestation activities so as to reduce erosion and landslides. This also helps to retain rainfall and replenish the underground aquifers.
- Surface drainage systems are usual. They are executed with simple means and contribute to the reduction of landslides by ensuring that water flows are managed and directed away from unstable areas.

Surface drainage system to prevent from erosion and flooding near Bahir Dar, Amhara. (© G. Wale)

TO FIND OUT MORE

- WORLD VISION (2014)
  Trip Report and Recommendations. Regreening Tigray
  http://floorhub.undp.org/wp-content/uploads/2014/02/Tigray-Regreening-Report.pdf

Stone barriers protecting plants against strong winds, improving water retention and infiltration and preventing soil erosion in Northern Hararghe (Oromia). Project developed with USAID. (cc- Hiwot)

Stone terraces preventing soil erosion and landslides near Dire Dawa. (cc- Ayo Kuka)

D. INSECT INFESTATION

(ALL ETHIOPIA)

- Farmers attempt a number of traditional control methods to control termite infestation, mostly plastic sheets and painting with used engine oil, but they were usually ineffective. (Debelo & Degaga, 2014).
- Eucalyptus, which is easily attacked by termites, is usually smoked and / or soaked in burnt oil.
- Termites are controlled by destroying their nests. When a termite nest is too close to habitation, it is common for the community to dig the queen out of the nest so that the whole colony moves away from the houses.
- Species such as *Tikil* (*Juniperus procera* Hochst) and *Kosso* (*Hagenia abyssinica*) have been traditionally used for the walls as they are very resistant to moisture and termites. Now they are very scarce. *Kuo*, in central Ethiopia, different kinds of wood species used in construction are more resistant to termites (people prefer them if available): *Dichrostachys cinerea* (Ader or Ergeti-dimmo in amhara language, Adesa in oromo language, Ehigder or Gelosi-sur in somali language), *Acacia abyssica* (Serew in Tigringa language), *Fluggea virosa* (no local names available) or *Acacia Senegal* (Gum arabic tree). However, care should be taken when purchasing timber, as native species are carefully monitored and licenced by the authorities.
- As mentioned before in the text, smoke acts as a treatment of thatch against insect attacks.

(SOUTHERN NATIONS, NATIONALITIES AND PEOPLES' REGION)

- The Gamo people (SNNPR) leave slight gaps between the ground and the vegetation covering of their houses in order to reduce the termite attack on these materials.
- Weevils are a beetle which consume bamboo. The Gamo people (SNNPR) traditionally cut bamboo depending on moon cycles (no specific information found on what particular moments are preferred). The Gamo people (SNNPR) smoke the bamboo firing different leaves in order to avoid the attack of weevils.

SHELTER RESPONSE PROFILE

ETHIOPIA

6. PROJECTS BASED ON THE EVOLUTION OF LOCAL BUILDING CULTURES

Examples that illustrate the **reinterpretation and valorisation of traditional architectural features** in low-cost housing to reduce their vulnerability to local hazards

TRANSITIONAL SHELTERS FOR SOUTH SUDANESE REFUGEES IN GAMBELA

Project by: IOM, Administration for Refugees and Returnees Affairs (ARRA), United Nations Higher Commissioner for refugees (UNHCR).

Contextual information:

Location:
- Region: Gambela
- Zone: Anuak
- Woreda: Itang special woreda
- Kebele: Pulliet Tharpam sub kebele
- Town: Tergam

Geographic information:
- Topography: mainly plain but hilly for the specific refugee camp
- Altitude: 450 m

Main ethnic groups: Nuer and Anuak

Climatic profile:

Description: The climate is tropical. The summers are much rainier than the winters. The average annual temperature °C.
- Average temp.: 27.6 °C
- Avg. Max. temp.: 28.7 °C
- Avg. Min. temp.: 19 °C
- Average rainfall: 933 mm

Project principles and scope:

The Gambela region is located in the Western of Ethiopia and next to the border with South Sudan. After the conflict erupted in South Sudan in December 2013 and caused massive displacement both internally and into neighbouring countries.

The region received the largest number of refugees fleeing the conflict in the eastern parts of South Sudan. Several number of camps were set up to receive a high influx of people seeking Protection and adequate shelter, along with access to food, water and basic services. The country lead actors are the Administration for Refugees and Returnees Affairs (ARRA) and the United Nations Higher Commissioner for refugees (UNHCR). IOM as one of the partners in the implementation of transitional shelters and refugee transportation from the border to the camps, has been active in the region since 2011.

The project had reached about 6,840 refugee households from the year 2014 to 2017 in the region. IOM also expands its shelter programming towards host community assistance in order to avoid any tensions between refugees and host community. In 2017, IOM has reached about 214 households in three different refugee camp neighboring Ilabalar through construction of shelters.

Design Considerations:

Design: the main actors have an engagement to the provision of transitional shelter to South Sudanese refugees. The decision was to provide it with harmonized houses based on vernacular designs. The design was adopted through the Shelter Working Group (SWG) with the inclusion of the Refugee Committee Council (RCC) which considered of the cultural and environmental acceptability.

The transitional shelter project promotes beneficiary's engagement towards the construction through cash for work that became more essential and involves active participation of refugee beneficiaries through mud plastering and thatching of their own homes thus increasing ownership of the process. The project is also a way to creating job opportunities through carpentry trainings to refugees as well as host communities.

Cost: was scaled- between 333 USD and 388 USD for the vulnerable homesteads.

Materials:
- Foundation: eucalyptus poles 10 cm diameter sunk to a minimum of 60 cm depth and stabilized with rubble stone and earth filling.
- Plinth: well compacted earth floor to an effective height of 150 mm above ground level
- Central post: eucalyptus pole
- Walls: shikke walls (wood and earth and straw plastering).
- Openings: Wood frame + CGI sheet door.
- Roof Type: Four pitched thatched roof
- Roof structure: wood.
- Bracings: Eucalyptus poles thickness of 8 cm diameter for rafters and tie beam. 6 cm diameter for wall pass
- Treatment (wood): eucalyptus poles are treated
- Roof cover: thatch, grass thatching

Transitional shelter for south Sudanese refugees.

Active participation of beneficiaries through mud plastering and thatching.

SUSTAINABLE RURAL DWELLING UNIT (SRDU)

Project by: Ethiopian Institute of Architecture, Building construction and City development (EIABC), Arthur Waser Foundation of Switzerland and ETH-Zurich North-South Centre

Contextual information:

Location:
- Region: SNNPR
- Zone: Gurage
- Woreda: Welkite
- Town: Gubre

Geographic information:
- Topography: hilly
- Altitude: 2 044 m

Climatic profile:

Warm and temperate. Rainy summers and dry winters.
- Average temp.: 18.5 °C
- Avg. Max. temp.: 27.9°C
- Avg. Min. temp.: 9.1°C
- Average rainfall: 1 221 mm.

Main ethnic groups: Gurage

Project principles and scope:

Draw lessons from the vernacular architecture of a rural area (Gurage). Implementation of housing types including the advantages of the traditional Gurage house and improving the aspects worth evolving, while maintaining the Gurage identity.

Capacity building through hands-on training on a one-to-one construction of housing units.

Phase: 1: documentation and study of the existing vernacular architecture and local building materials. Phase 2: construction of a single prototypology (SRDU) including the use of renewable energy. Phase 3: replication.

Design Considerations:

Design: SRDU I prototype is a house with dimensions of 7.51 m per 7.51 m each side and a height of 8.88 m. Ground floor with living room, kitchen and an independent barn. Mezzanine including two rooms. The house is square instead of the traditional round ones. It also has openings apart from the main door. WC and storage spaces are accessible from the exterior.

SRDU II has a round plan, like the vernacular Gurage constructions.

Cost: between 600 birr/m² (21.5 USD) if built by a local resident and 2,000 birr/m² (71.8 USD) if built by an outsider.

Materials (SRDU I):
- Foundation: stone gravel
- Plinth: stone gravel
- Central post: wooden pole
- Walls: sun-dried earth and straw blocks (adobe).
- Openings: Wood. SRDU I: 1 main door + 2 back doors + 2 windows in the ground floor. 4 horizontal windows in the upper floor.
- Mezzanine floor: light weight earth fill grained on a adobe block vault
- Roof Type: Four pitched thatched roof
- Roof structure: umbrella type structure
- Bracings: bamboo studs which connect the foundation with the wall
- Treatment (bamboo & wood): ?
- Roof cover: bamboo leaves

A Gurage village near Gubre.

SRDU I prototype.

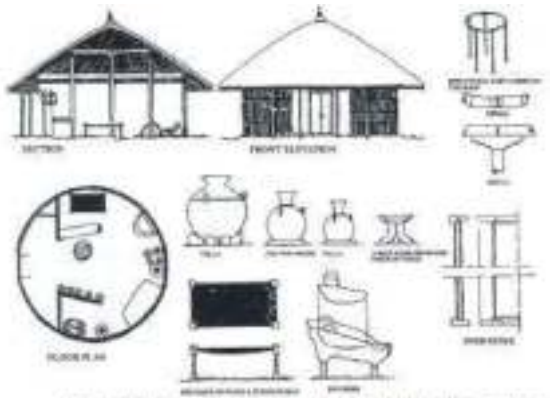
SRDU II prototype.

Interior of SRDU I prototype.

LEARNING FROM LBCS - SOME EXAMPLES FROM ETHIOPIA

SOME EXAMPLES OF LOCAL GOOD PRACTICES

LEARNING FROM LBCS - SOME EXAMPLES FROM ETHIOPIA



Floor plan, section, elevation and details of an oromo house. © N. Gebremedhin

Oromo dwelling. CC- Bernard Gagnon

Oromo dwelling in Sof Omer (Bale Zone). CC- Rod Waddington

Sidama people house built with a bamboo structure and a vegetal covering for walls and roof. CC- Maurits Vs.

Welayta people house built with a bamboo structure and a vegetal covering. © Todd McGowan

Gamo compound with round house, gardening zones and fence. © Ashley Tindall

Sections of a rectangular house in Tigray. © L. Bessemoulin

Stone house with two levels in Axum. CC- A. Davey

Stone house with one level in Axum. CC- A. Davey

Church of Abba Afse with «monkey heads» technique in the walls. Yeha, Tigray. CC- A. Davey

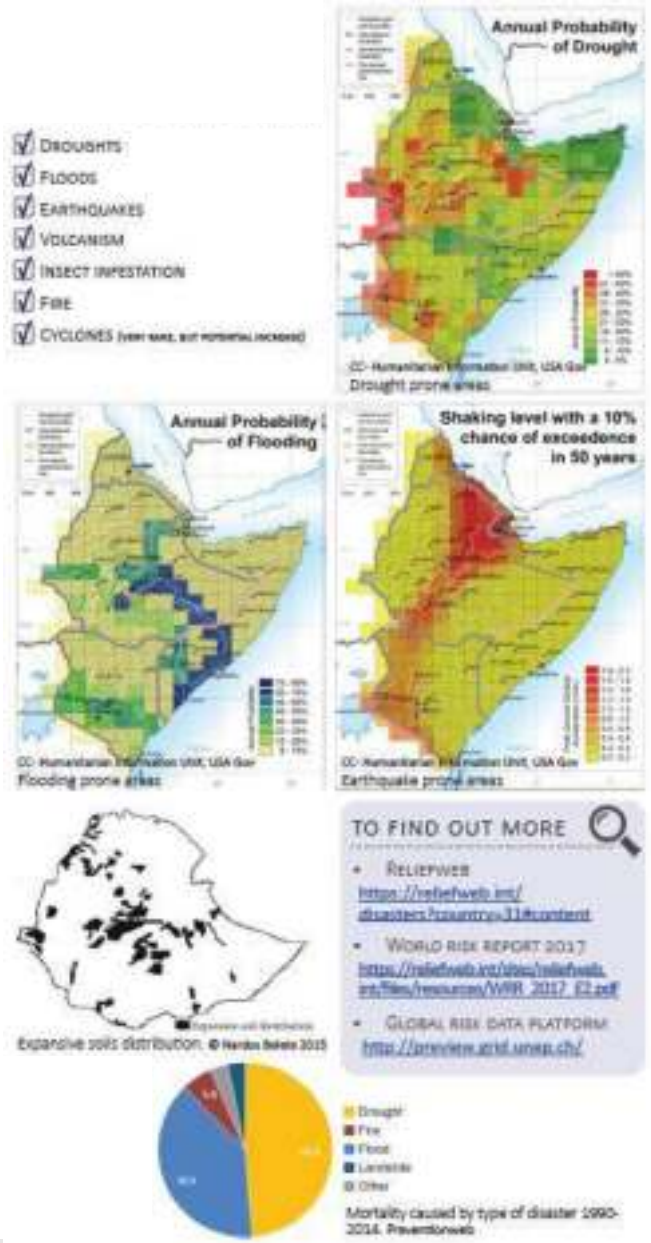
Afar nomadic camp with wooden barricade. © T. Joffroy - CRAterre

Afar nomadic hut. CC- J. Dia

Afar women building a nomadic shelter. © T. Joffroy - CRAterre

LEARNING FROM LBCS - SOME EXAMPLES FROM ETHIOPIA

Hazard-resistant practices



LEARNING FROM LBCS - SOME EXAMPLES FROM ETHIOPIA

Hazard-resistant practices

Aari houses built on a mound with a round verandah protecting the walls from the rain. (Debub Omo Zone in SNNPR). CC- Richard Mortel

Some constructions in flood prone areas start with the creation of an earthen platform. This is done by raising up an **earthen mound whose edges work as a sacrificial mass**. This solution is very effective and it can be done at minor cost with earth from the site. However, regular maintenance is required to ensure its effectiveness.

LEARNING FROM LBCS - SOME EXAMPLES FROM ETHIOPIA

Hazard-resistant practices

[SOUTHERN NATIONS, NATIONALITIES AND PEOPLES' REGION]
The Alaba houses have an **earthen plinth with a step shape forming a circular bench around the house**. This step serves to avoid damages from ordinary rains and even from ordinary floods.

Earthen plinth in an Alaba house (SNNPR). © Lorenzo Fontana

LEARNING FROM LBCS - SOME EXAMPLES FROM ETHIOPIA

Hazard-resistant practices

Anuak house on an earthen mound, with verandah and mural paintings in Gambela. CC- Gill Pennes

The **roof structure is sometimes borne by an independent timber or bamboo frame** while the inside space is fenced by *chikka* or stone walls. In case of damage to the walls during floods or earthquakes, the supportive frame can survive autonomously, hence preserving the roof which is often the most expensive part of the construction. Moreover, the space under the resilient roof can be used as an emergency shelter.

LEARNING FROM LBCS - SOME EXAMPLES FROM ETHIOPIA

Hazard-resistant practices

[GAMBELA] The **Nuer and Anuak peoples move from grassy flood-prone zones to higher places during the rainy season**. Their villages are built in these higher zones. They have two kinds of houses, one made of grass for the dry season and *chikka* houses for the rainy season in villages.

Anuak houses in Gambela. CC- Gill Penney

LEARNING FROM LBCS - SOME EXAMPLES FROM ETHIOPIA

Hazard-resistant practices

In areas of the Amhara region, some houses are built with **wooden palisade load bearing walls, protected by stone masonry walls on the ground floor**. These stone walls ensure the **stability of the overall structure** (by bracing the wall) and allow the vertical load transfer from the upper part of the building to its base.

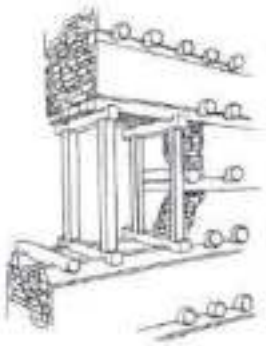
Also, in some areas buildings have heavy materials in the ground floor and the main construction is built with lighter materials. Thanks to these greater **lightness and flexibility**, the building is able to endure the movements produced by **earthquakes without cracking**. In case of partial collapse of the wall, the risk of **serious injuries is considerably less**, thanks to the reduced weight of the materials used.

Two story house with stone plinth, *chikka* walls and balcony in Gobgob village, Amhara region. CC- Kelley Lynch USAID

LEARNING FROM LBCS - SOME EXAMPLES FROM ETHIOPIA

Hazard-resistant practices

Church of Yemrehanna Kristos with horizontal timber bands or «monkey heads» near Lalibela in Amhara. CC- Travel Aficionado



«Monkey heads» technique. © N. Gebremedhin

In Tigray and Amhara regions, there are some examples of horizontal ladder-like timber bands. This technique called «**monkey heads**» is typical from the Axumite period, and has later been used in vernacular architecture. The technique consists of **stone and earthen mortar masonry walls where timber ladder-like horizontal bands are integrated** with a varying distance depending on the buildings. **Long squared timbers tie the entire building and are held by short round cross-pieces whose end is visible** (the “monkey heads”). The horizontal beams tightly hold perpendicular walls together and bind the whole building at different levels, avoiding dissociation and strengthening of walls towards out of-plane lateral forces during earthquakes.

LEARNING FROM LBCS - SOME EXAMPLES FROM ETHIOPIA

Hazard-resistant practices

Avoiding any risk of water content change in the soil that supports the building is a good strategy when building in **black cotton soils** (expansive soils). In some buildings, the **corridor space between the interior earth wall and the wooden exterior wall avoids the risk that the moisture changes associated with rain affect the soil under the hard walls**. This soil will remain drier, and consequently this design will prevent the cracking of the rigid structure.

This church (Bura, Amhara) lies on an earthen mound to protect against floods. There is a corridor between the interior earth wall and the wooden exterior wall. These two elements prevent from the effects of black cotton soils expansion if the platform is built with inert earth, and so cracking of walls is avoided. © L. Davis

Church in Bura (Amhara) with an inner block built with *chikka* protected by a roofing with a very large overhang that creates a verandah surrounding the entire building. An eucaliptus screen helps proctect the chikka mortar and the foundations of the inner block from black cotton soils cracking. © L. Davis

This enclosed verandah around the church is the area for menstruating women to stand and be able to listen to the religious service, as they are not allowed in the main area of worship at that time.

LEARNING FROM LBCS - SOME EXAMPLES FROM ETHIOPIA

Lifespan and maintenance

Dorze houses. CC- Richard Mortel

Dorze house being moved by the whole community in SNNPR. Bamboo structure is visible. © H. Mengitsu

[SOUTHERN NATIONS, NATIONALITIES AND PEOPLES' REGION]

The lower part of the bamboo walls of the **Dorze house** is unprotected and is therefore attacked by termites and humidity. When **lower parts of the bamboo structure start to get too rotten, the base of the housed is trimmed and woven to hold it in place, then the structure is reduced in height**. Each time this happens, (approximately every 4-years), the height of the building is reduced by about 20 cm. Each house will begin life at about 6m in height, and it can take about 40-years before the house is too short for habitation, at which point it will be demolished and rebuilt.

If the termites are a local problem, the entire community may be called upon to lift the house and move it to a new location away from the termites.

LEARNING FROM LBCS - SOME EXAMPLES FROM ETHIOPIA

Green design, comfort and health features and beauty

Decorated house, South Omo Zone (SNNPR). cc- Rita Willaert

Decorated house in Gambela. © Muse Mohammed - IOM

Houses are **richly decorated** in different zones of Ethiopia. Interior decorated ceilings appear in the north of the country, while exterior mural paintings appear in the south and west.

LEARNING FROM LBCS - SOME EXAMPLES FROM ETHIOPIA

Green design, comfort and health features and beauty

[SOUTHERN NATIONS, NATIONALITIES AND PEOPLES' REGION]
In the Alaba house, the **top of the wall under the roof is left without plaster** for 40-50 cm. This provides **ventilation** in the house, making it fresher and letting smoke from cooking out.

Ventilation is made possible thanks to the absence of plaster in the upper part of the walls in the Alaba houses (SNNPR). © Lorenzo Fontana

LEARNING FROM LBCS - SOME EXAMPLES FROM ETHIOPIA

Sociocultural practices fostering resilience

Public covered space in a Konso village (SNNPR) called *moora*. These traditional places are very important for coviviality and are common throughout the country.
CC- Rod Waddington

Traditional **spaces of conviviality** are important for establishing and maintaining community links. These public places appear in several cultures such as the Konso (SNNPR). The term *moora*, in the local language, indicates a well-defined typology of public space, and, for each village there are many of them, from ten to twenty, with different functions, shapes and attributes. It's the place of social and spiritual life, where children play, youngsters sleep and spend their time, the elders meet and discuss, women pass and can participate in some of the happenings. (Capurro et al., 2011).

LEARNING FROM LBCS - SOME EXAMPLES FROM ETHIOPIA

Sociocultural practices fostering resilience

[BENISHANGUL-GUMUZ]
Working parties play an important role in Berta society. When somebody wants to build a house or cultivate a field, they call their **neighbours for help** and provides beer and food as a form of payment.

Berta houses in Asosa Zone. CC- Ben Rohrs

4

CONCLUSION

LEARNING FROM LOCAL BUILDING CULTURES

Advantages of local building cultures:

- Housing and habitat **adapted** to people's needs, wills and habits
- Rational and frugal use of **locally available resources**
- Existing knowledge and **know-how** locally mastered

LEARNING FROM LOCAL BUILDING CULTURES

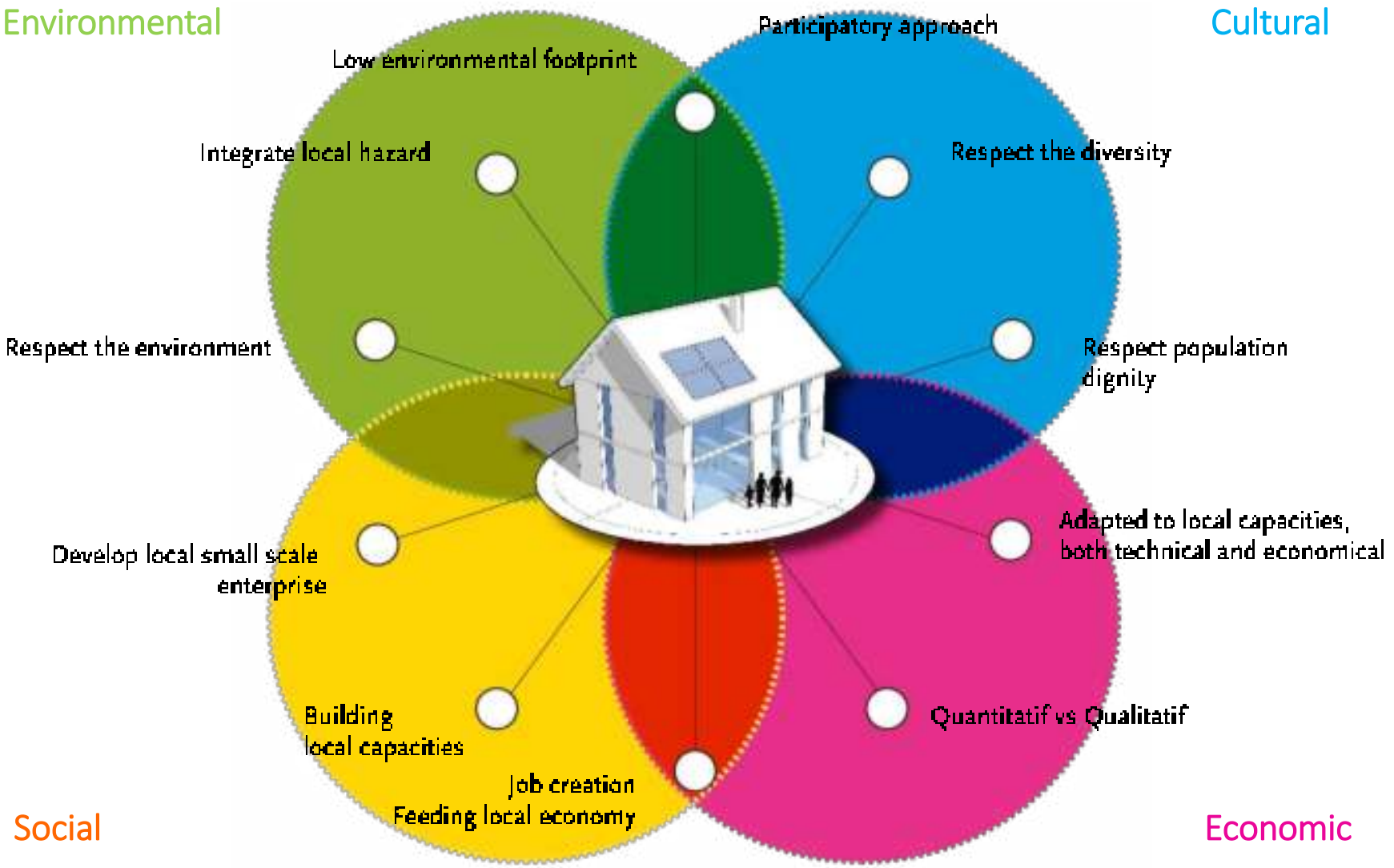
Use this knowledge and know-how to:

- **Invest locally** and develop local resources and skills and **improve living conditions** of populations.
- **Quickly have shelter** for more people.
- Keep **reasonable construction costs** and techniques and this facilitate the **replication** of constructions.
- Encourage self-sustainability and **bottom-up development.**
- Ensure cultural adaptation and **good functionality** of spaces.
- **Reduce** the **vulnerability** of inhabitants in the **long term.**

Transitional shelter for South Sudanese refugees. © Muse Mohammed - IOM

Active participation of beneficiaries through mud plastering and thatching. © Muse Mohammed - IOM

LEARNING FROM LOCAL BUILDING CULTURES



LINK BETWEEN LOCAL BUILDING CULTURES AND PROJECTS

Local building cultures are **continuous and evolving processes**. **Local dynamics** should be considered and accompanied to allow people to access to new knowledge and new materials and improve the existing.

Take advantage of **existing local resources**, **local building knowledge and practices**, **local coping mechanisms**, and **local dynamics** in order to design **contextual projects** that are able to **strengthen local capacities** and **resilience**

IF YOU EVER HAVE TO IMPLEMENT A SHELTER OR HOUSING PROJECT, PARTICULARLY IN THE HUMANITARIAN OR DEVELOPMENT SECTORS

BEFORE PLANNING, DESIGNING OR DOING ANYTHING…

OPEN YOUR EYES:
UNDERSTAND THE CONTEXT

OPEN YOUR EARS:

LISTEN TO PEOPLE AND ASK QUESTIONS BEFORE GIVING ANSWERS

OPEN YOUR MIND

BECAUSE YOU WILL FIND MANY ANSWERS IN PEOPLE'S PRACTICES AND IN THE INTELLIGENCE OF LOCAL SOLUTIONS

THANKS FOR YOUR ATTENTION

TIME FOR DISCUSSION