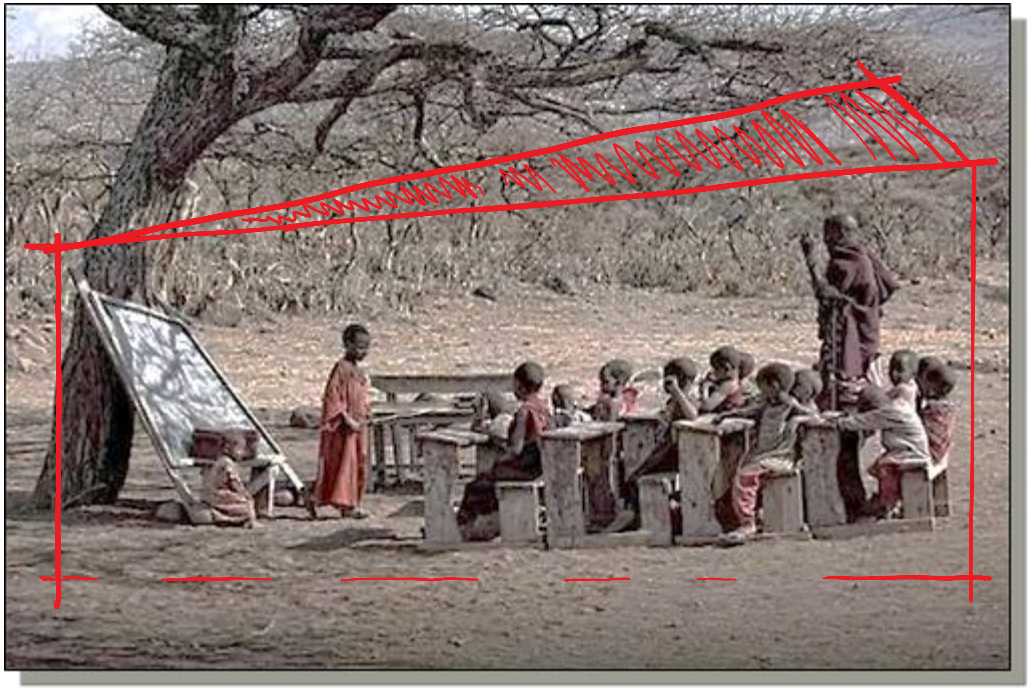
MASTER THESIS

2014/2015 academic year

Master of International Cooperation
Sustainable Emergency Architecture

Student: Nerea Pérez-Arróspide Navallas
Supervisor: Sandra Bestraten and Emili Hormías
Date presented: 18/05/2015

uic barcelona



Rethinking educational facilities in development scenarios

The case of Casamance in Senegal

ABSTRACT

The current performance of educational facilities in development scenarios faces major challenges. They do not achieve the minimum aspects of comfort nor integrate traditional values about the culture and climate.

The purpose of this research is to explore the architectural mechanisms that can enhance the performance of the facilities by examining five development schools in the southern area of Senegal, the Casamance region.

Comparing the different aspects and actors involved in the design and construction processes will provide a series of guidelines to rethink the way development projects are conceived and analyse their efficiencies.

The achievement of a qualitative space assures a suitable education towards a self-dependent future of the local communities. Most importantly, the findings of this research can inform the creation of local capacities, obtaining an adequate comfort ambience and cultural integration will reinforce their ownership and identity.

ACKNOWLEDGEMENTS

This thesis is only signed by one person, but I would not have been able to make it without the help of many people. I would like to begin by expressing my gratitude for all the persons that have supported me to get all the way here.

First of all, thanks to Sandra Bestraten and Emili Hormías for their patience and for giving me the most stimulating advice to build the knowledge for this research. It is with them that we have grown through the year and learned about cooperation and about ourselves.

I would also like to thank the teachers and colleagues from the Master of Cooperation for a very enriching year. Especial love and appreciation to Hanna, Mona and Thaisa for being such great friends, it is thanks to their care and kindness that this assignment has been really enjoyable, always providing a happy smile, a useful tip and better company.

Thanks to Carles Muriana, Miquel Sitjá and Adama Dieme, whose information was crucial to get to know the case studies. It was a pleasure collaborating in this process and learning from their passion for the projects and the culture.

I am very grateful to my friends Laura and Mamadou for showing me the authentic Senegalese culture and making me love this beautiful country that has provided us with so many interesting adventures.

Lastly, I would like to express all gratitude for my pillars in life, my parents and sister, for raising me with all their love and for being such amazing role models. Without their trust and support I would not be the person I am today and would definitely not be so passionate about making the most of every moment and opportunity.

I would finally like to dedicate this work to all the people who, with a great example of integrity and solidarity, try to get the best out of every situation.

To Popy, Martita and Joaquín "Djiby" for having the courage to overcome the toughest situation of our year without losing their positivity.

To my grandpa Jesús who passed away just before I decided to start this Master. Together with my uncle Jesús Mari, they believed in me and always showed me the values to become a better self.

And to the people of Senegal who have faith in their country and try to contribute day by day to its own prosperity.

"Be the change you want to see in the world".

TABLE OF CONTENT

Theoretical background

Research

NOTE FROM THE AUTHOR

It is universally acknowledged that Education is the key to an enhanced future. Access to knowledge is a contributing factor to worldwide equity and should, by now, be a mandatory right in every country. Unfortunately, the developing countries of the world suffer from an inconsistent educational system that seems to have become a privilege; consequently stagnating their development.

Education in developing countries (WordPress, 2012) (F.1)

The first step towards universal equality is the presence of adequate facilities to assure a suitable education that will strengthen the capacities of the local communities. As many local governments in developing countries do not currently have the capacity to provide educational necessities, one of the principal focuses of *international assistance* is precisely this sector, since it is determinant in a self-sustainable future.

The school is a cultural and cohesive asset in any given community. If architecture takes into considerations traditional criteria and guarantees a good comfort performance of the facility, it will enhance the learning process of the students.

Although educational facilities are crucial for a good learning environment, they need to be accompanied by an adequate training program and motivated educators that will enhance the children's capacities.

This research will focus on the *architectural characteristics* of the facilities but correspondingly acknowledges the importance of the mentioned pedagogical program.

If *children* worldwide become instructed, they will be able to grow into thoughtful leaders to guide their countries towards a better future.

THEORETICAL BACKGROUND

1. Introduction

"Architecture is the thoughtful making of space".

Louis Kahn

1.1 Architecture = design + construction

Architecture is an essential part of our lives. As architectural critic Paul Goldberger stated in his publication *Why Architecture Matters (2011)*, we could not live without architecture.

Principally, it provides shelter to protect us against the external elements, which constitutes one of the immediate basic needs including food, water and clothing (Denton, 1990). Subsequently, it adds some characteristics that other disciplines cannot accomplish: it affects our quality of life. Even if we are not entirely conscious, the surrounding architecture has an effect on us: it makes us feel, it makes us think. No matter if it's a hut or a masterpiece building, it does create an experience (Goldberger, 2009).

As Ludwig Mies Van der Rohe said in 1959 "Architecture starts when you carefully put two bricks together. There it begins". This indicates that it goes beyond construction as he introduced the concept of purposely being thoughtful about it (Craven, 1999).

Relating to Paul Goldberger's statement, it can be argued that architecture is what happens when people build with awareness that they are doing something beyond reaching practicality: "Architecture begins to matter when it goes beyond protecting us from the elements, when it begins to say something about the world" (Goldberger, 2009, p.x).

This implies that architecture is more than just a construction product, a summation of materials placed together to cover a physical need. The problem is that sometimes we are so familiar with the architecture around us that we are not even aware of its impact in our lives. So consequently we do not see its potential.

"A building is not just a place to be but a way to be".

Frank Lloyd Wright

Likewise, architecture is a form of culture. Hassan Fathy even ventured to say that it may be the most important element of culture because it envelops man, it is where life is created and developed (Fathy, 1978). "Places are full of intangible material linked to the life experiences of their inhabitants", explained the Catalan geographer Joan Nogué (Nogué & de San Eugenio, 2011). Those intangible experiences are an additional element that contributes to shaping the space together with proportion, scale, texture, material, form and light.

All of these aspects matter in the conception of the spatial quality because they impact how you feel when you occupy a space. Philip Johnson named the experience of moving through a building as a procession, the experience of space being the most important factor. He called it the architecture's "subliminal influence on people", going beyond its mere function (Benjamin Blankenbehler, 2011).

"Not only space, but its production".

Lefebvre

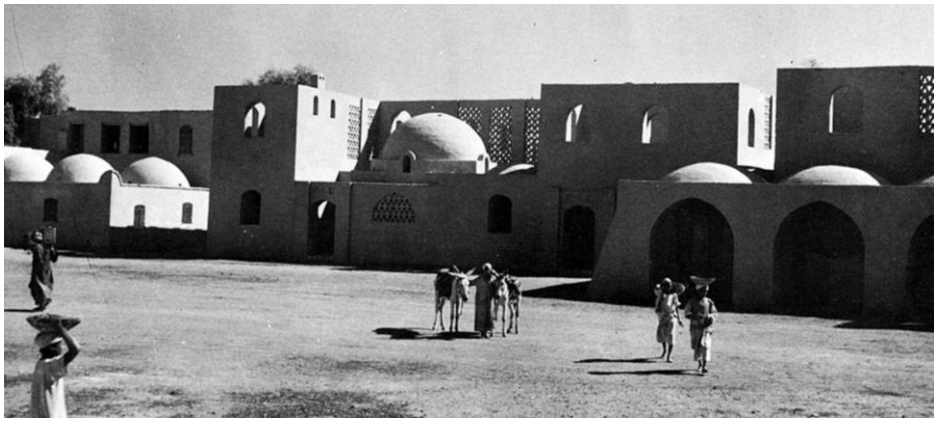
1.2 Importance of the social role of Architecture

Since architecture has such an important role in people's livelihoods, it should be at the service of a better world. Multi-disciplinary teams -architects, sociologists, anthropologist, environmentalist- have the responsibility to contribute to an improvement of people's life conditions with their technical knowledge and holistic vision of problems.

Contemporary philosopher Karsten Harries (1998) talked about the ethical approach: architecture matters because it has responsibilities to society that are far broader than the making of beautiful forms and shapes. She claims it can provide a model for a way to live, be a source of solutions for social problems (Harries, 2000).

Due to the fact that architecture has an influence on people, it constitutes a powerful transforming tool towards change, from the smallest scale to the largest. But for it to be successful, it needs to respect the environment, utilize existing resources and be the service of the people. The previous statement could not be more meaningful: in the end, we build because we believe in a future. And we build *well* because we believe in a better future (Goldberger, 2009, p.40). Architecture leaves a lasting legacy that represents the people, their values and their perceptions. If the world's problems should be undertaken from a global social perspective, architecture is one of the elements that has to be considered, from the building to the city, the country, the continent and ultimately the planet.

"Architecture has an ethical function in that it calls us out of the everyday, recalls us the values presiding over our lives as members of a society, it beckons us toward a better life, a bit closer to the ideal" (Harries, 1998, p.105).



New Gurna from the first year, 1948

(Photo by Roger Viollet, Courtesy University of Chicago Press) (F.2)

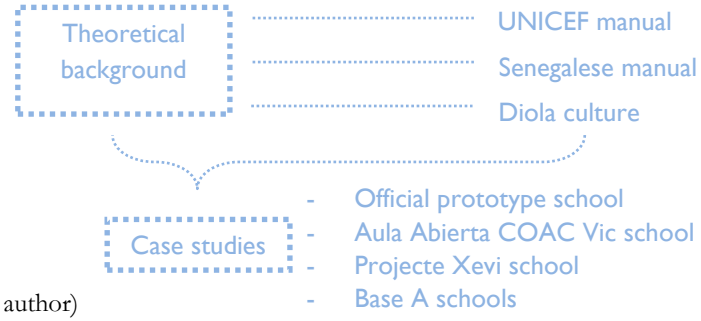
1.3 Objective

Nowadays, it is becoming common practice to manage development projects without the collaboration of technical specialists; this was observed while working on the field in Africa.

The following research is focused on demonstrating the role of technical professionals in both the design and construction processes in development scenarios and drawing conclusions to justify the relevance of their profession.

The main objective is to achieve the appropriate quality of educational facilities, definitive to reach a good global education. The specific objectives are to create local capacities, a comfortable building and an urban strategy for the isolated rural areas, key factors in a successful facility.

One of the challenging factors to be overcome in this work is the lack of relevant literature. I personally want to contribute to the development of useful guidelines that could improve the performance of development projects.



Methodology followed
(Source: made by the author)

1.4 Limitations

The main limitation encountered was the lack of access to pertinent information, which is precisely quite complex in development scenarios. On one hand, part of the data was restricted; and on the other hand most of the projects were located in isolated areas where communications were limited. One of the organisations contacted was not willing to share its material, so much for claiming cooperation.

Furthermore, the absence of technical data was a great obstacle to overcome since most of the Senegalese territory does not benefit from any urban planning or mapping. Most of the projects are implemented without actual physical plans.

Children crossing a hand-made structure in Casamance, Senegal
(Photo taken by the author, 2014)

2. Concepts

2.1 Development

Since the colonization era, developing countries have been under the control of global powers. After World War II, the world began to be conscious of the unfair situation in which they lived in and introduced the concept of *development cooperation* to assist countries in need through the creation of the United Nations (UN). Action towards equality started to be taken but there is still a major effort to be done in order to reach global self-development. The intergovernmental organization manifests that:

> "Humanity stands at a defining moment in history. We are confronted with a perpetuation of disparities between and within nations, a worsening of poverty, hunger, ill health and illiteracy, and the continuing deterioration of the ecosystems on which we depend for our well-being. However, integration of environment and development concerns and greater attention to them will lead to the fulfilment of basic needs, improved living standards for all, better protected and managed ecosystems and a safer, more prosperous future. No nation can achieve this on its own; but together we can in a global partnership for sustainable development". (United Nations, 1992)

The goal is to reach an equitable world through collaboration between all countries. Development assistance is the implemented mechanism which comprehends all the interventions to support the economic, environmental, social, and political improvement of developing countries, focusing on alleviating poverty in the long term (World Health Organisation, n.d.).

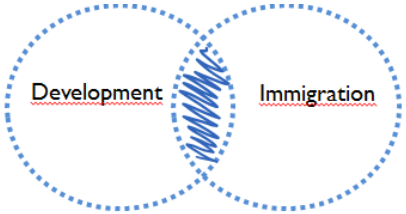
Eight millennium development goals (United Nations, 2010)

In order to plan these interventions, eight time-bound and quantified targets were established, the Millennium Development Goals (MDGs), for addressing extreme poverty in its many dimensions -income poverty, hunger, disease, lack of adequate shelter, and exclusion- while promoting gender equality, education, and environmental sustainability. They were born to support the basic human rights to global health, education, shelter, and security (United Nations, 2010).

Among them is the accomplishment of global primary education as a development cooperation key objective. Attaining this objective efficiently will contribute to create self-sustainable countries.

Co-development

Complementing the previous definition of development, a new concept has been recently from the connection between development and the growing phenomenon of immigration, which can contribute to the self-development of local communities.



Co-development diagram

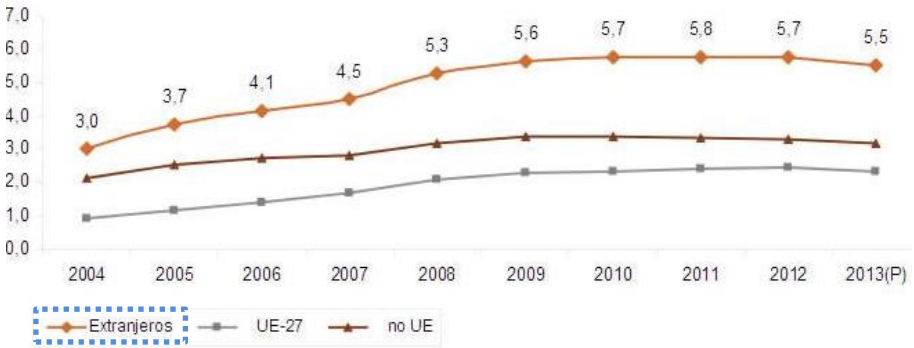
(Source: created by the author)

In 1997 Sami Naïr, sociologist in charge of the Inter-ministerial Mission on Migration of the French External Affairs department, defined the concept as "a proposal for integrating immigration and development in a way that migration fluxes will benefit both the country of origin and the country of destination. This is, a consensual relationship between two countries that will allow migration to the country of destiny not to imply an equivalent loss in the country of origin" (Naïr, 1997).

The particularity of this idea is that it includes the immigrants as a *factor* of contribution to the development of their home countries. Through the experience of living in two different realities, they are able to link integration within the host society with assistance to their original community. The goal is to encourage a constant knowledge transfer between both entities for training and construction of infrastructure (Demanesse, 2006).

Essentially it constitutes a *network* of solidarity among the people away from their communities. In the Senegalese culture this principle of kinship is very important as it is part of their *identity;* therefore it constitutes an asset towards supporting developing countries. They call it the local *teranga* or hospitality.

Spain is one of the most active countries in co-development due to the high amount of immigration from Africa. The increasing number of Senegalese migrants has created countless opportunities for bilateral cooperation between both countries (Vidal, Albaig, & Mart, 2009).



Foreign population evolution in Spain, by millions

(Agencia EFE, 2013) (F.3)

Co-development could be the solution for a more adequate implementation of development projects since the managing entity would understand the beneficiary's cultural values and integrate them into the designing processes.

2.2 Education

Going deeper into the matter of education as one of the main policies of development, it has been calculated that on any given day, more than a billion children are in primary or secondary school around the globe: 689 million in the first and 513 million in the second. Schools can be established in permanent or temporary buildings, in tents or under trees, but sharing the experience of learning and enriching their lives is what matters (Wright, Mannathoko, & Pasic, 2006).

To understand why *education* is such a crucial factor towards eradicating poverty, it can be noted that it gives people the skills to provide for themselves and their families, contributing to personal and economic growth. It also promotes good practices for better governance by creating opportunities towards a self-sustainable future free from external assistance.

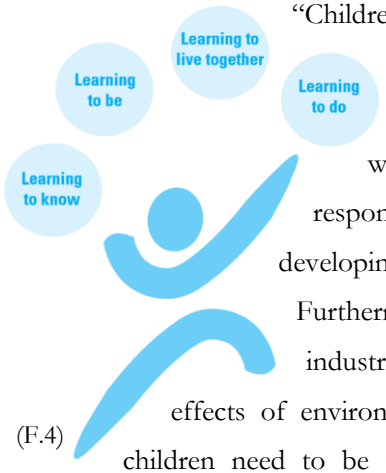
In order to accomplish the second MDG regarding universal primary education, the Education for All (EFA) movement was created in 1990 as a global commitment to provide a basic qualitative education for all children, youth and adults by 2015. Governments, development agencies, civil society and the private sector are currently working together to reach these goals (UNESCO, 2000). The construction of educational facilities is framed into this initiative to fulfil the needs in developing countries with the help of the international community.

Article 28 Children have the right to a good quality education. Children should be encouraged to go to school to the highest level they can.

Article 29 Children's education should help them use and develop their talents and abilities. It should also help you learn to live peacefully, protect the environment and respect other people.

Regarding the Convention on the Rights of the Children (UNICEF Canada, 2008).

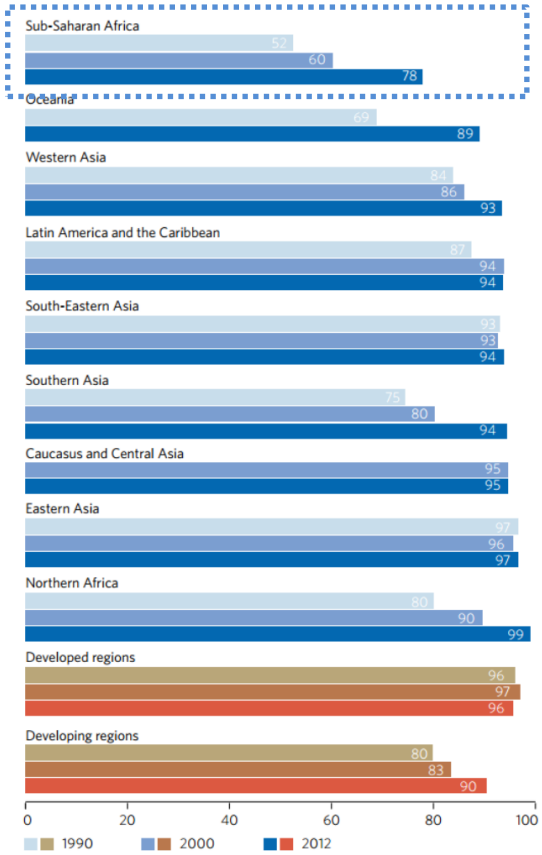
Putting children first is important because they are the future generation as the UN Río conference of 1992 emphasizes (United Nations, 1992, p.25):



(F.4)

"Children constitute the future generation of the world and need to be taken care of, as an essential element for the eradication of poverty worldwide. Children not only will inherit the responsibility of looking after the Earth, but in many developing countries they comprise half the population. Furthermore, children in both developing and industrialized countries are highly vulnerable to the effects of environmental degradation. The specific interests of children need to be taken fully into account in the participatory process on environment and development in order to safeguard the future sustainability of any actions taken".

According to the latest MDG's report, developing regions have made substantial progress towards reaching universal primary education between 2000 and 2012, with the enrolment rate in primary education increasing by 7 percentage points, from 83 per cent to 90 per cent (United Nations, 2014).



Adjusted net enrolment rate for primary education chart -number of pupils of official school age for primary education enrolled, expressed as a percentage of the total population in that age group-
(United Nations, 2014)

One of the greatest improvements was precisely in sub-Saharan Africa where this research is based. The number of children enrolled in primary education more than doubled between 1990 and 2012, nevertheless there are still 33 million children of primary school age who are not in school. The area still faces the challenge of rapid population growth, which will increase the necessity of educational facilities in order to host the new children.

Children attending primary school in Senegal
(Photo taken by the author, 2014)

2.3 Educational facilities

Fulfilling the education goals planned by the EFA movement requires not just getting all children into school, but making sure the facilities works in the best interest of the children entrusted to them. This means providing safe schools staffed with trained teachers, appropriately equipped and designed for a good learning environment. Schools have to be suitable for helping the children's brain development. Infants deprived of a visually interesting environment cannot accomplish a positive progress, consequently school buildings are indeed an important part of the growing process (Wright et al., 2006).

Hassan Fathy declared that inside the school, it is the children's soul that grows, and the building must invite them to go further:

> "With a few fateful lines on his drawing board, the architect decrees the boundaries of imagination, the peace of mind, the human stature of generations to come. As long as his school shall stand, its walls and windows will speak to little children at their most unprotected age. He has the grave duty of creating in a building a source of love and encouragement for these children and must let nothing come before it".
>
> (Fathy, 1973, p.83)

UNICEF stated that when the school's architecture is a reflection of the community's culture, natural environment and family; it is more than just a physical structure, reinforcing Fathy's idea.

Putting this in relation with the premise that a building is more than just an object but also a space where things happen; schools designed with the child at its centre become interactive places of life recognised by the community. In fact, it becomes an integrated system that retro feeds itself from the surrounding elements and reinforces the local identity (UNICEF, 2006, chap.2 p.10).

It concludes that the *spatial component* of educational facilities has a very important role in children's development and must be carefully designed for the best possible performance.

Primary school classroom in Senegal

(Photo taken by the author, 2014)

2.4 International regulations

The international community has established some global standards for the design and construction of educational facilities.

2.4.1 UNICEF standards

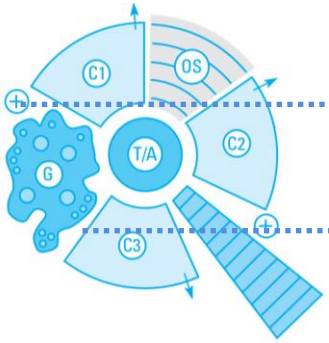
UNICEF, the UN body for the protection of childhood, has compiled a complete manual to create *child-friendly schools;* defining from the pedagogical system to the technical characteristics. Child-friendly schools can vary among countries since cultural and community aspects have to be taken into account, and their implementation depends on locally available materials and skills.

Since this research is focused on the architectural aspect of the facilities, criteria such as location, design, operation and maintenance will be discussed. As further presented in the attached table, the main features emphasize the durability, environmental criteria and comfort performance of the building. Elements such as natural lighting, ventilation, temperature regulation and acoustic performance have to be integrated in the design to create a good ambience. Furthermore the manual also takes into consideration the cultural context where the facility is located. To complement the basic health standards besides water and sanitation, additional components are discussed like flexible spaces that can be transformed for the improvement of the learning experience or open areas to be in contact with nature in a more dynamic environment (Wright et al., 2006).

Structure	The building is to be structurally stable, weatherproof according to local environmental conditions, climatically comfortable, easily exited in case of emergency and well integrated with the environmental and cultural context.
Administrative offices	Separate space for faculty/administrative personnel gives privacy to students and teachers and maximizes the use of classroom space, enabling staff to work separately from students. Proximity between classrooms and administrative offices is recommended to monitor students' activities and create 'safety through transparency'.
Safe water	Fresh potable water should be available to students within the school. Proper plumbing infrastructure allows for the distribution of safe water. If such a setup is not possible, a borehole/well should be included in the school compound. This can be augmented with a rainwater catchment system in the roof as appropriate.
Hygiene facilities	A separate space should be provided with water and soap or other cleaning agent for children to wash their hands.
Toilets/latrines	Separate toilets or latrines should be available for girls and boys. Privacy, cleanliness and safety are major considerations when planning location and design of facilities.
Light, air, sun, dust, glare, reflection, humidity, noise and odour	Classrooms need good fresh-air circulation to avoid heat and excessive humidity. To ensure adequate daylight, a minimum of 20 per cent of the classroom floor area should be window area. Electricity or another means of power is needed to provide light and to operate equipment. Classrooms must be sufficiently shaded from direct sunlight, glare (direct light) and reflection (indirect light). Schools should not be located close to sources of excessive noise (traffic, railways, industries, informal sector activities) or excessive pollution or odours (waste belts, abattoirs). When this is not possible, design measures should be used to minimize the impact of these problems.
Colour	Materials and finishes should be the light, natural colours of the materials themselves, selected in harmony with warm natural hues as accents (reds, oranges, maroons, ochres and linen/khaki/off-whites) dictated by local, cultural preferences. For example, timber may be finished using clear varnish to preserve the natural beauty and warmth of the material. Or brighter accents can be used for play corners, decks, corridors and furniture. Learning spaces should be light and relaxed in colour, not gloomy, dull or dark.
Power (electric or alternative)	The school should have a power source to provide light, connectivity for communication equipment (computers, radios, television) and other appliances (refrigerators, stoves). Alternative sources of energy (solar, wind and biogas) can be integrated into the design of schools where appropriate.
Safety provisions	Fire prevention and emergency evacuation plans must be part of the design process and built into the school programme. Combustible materials should not be used for structural purposes unless treated to resist fire. Construction materials should be free of components or elements that can be hazardous to children. When construction is finished, school sites should be free of all fluid, solid and gaseous wastes. Schools should not be located close to industrial or other hazards.
Health provisions	At a minimum, schools should have a first-aid kit or medicine cabinet for basic emergencies or accidents. Proximity to a clinic enables health personnel to visit the school periodically and permits children to be taken to the clinic for treatment of health problems. This proximity is accomplished in many developing countries through clustering the main social service facilities in the same location.
Library	A designated space where books and learning resources are available in a proper reading environment is central to learning and teaching activities. The library or resource room needs to be strategically located within the school for easy access, but away from noisy areas for a greater degree of quiet.
Landscaping	School grounds form an integrated, holistic unity with school buildings and their users, but in conventional school planning they are often neglected. Trees are vital for filtering sun, dust and noise and for beautifying the school. Indigenous trees, shrubs and flowers should be planted in the school compound along with edible plants meant to teach children food production and conservation. Trees also have a softening and calming effect on the learning environment and its users. Planning the school landscaping is a good way to involve children in the realization of a child-friendly school.

Basic planning standards for educational facilities (UNICEF, 2006, chap.3 p.4)

The size of schools –adequate to the number of students enrolled-, the location where they are placed –discussed with the community and within walking distance for all children- and the spatial arrangement have an influence in creating a liveable space for the learning process of children. These considerations should be determined by the physical needs of each facility. Nevertheless the manual defines some ideal arrangement of school spaces integrating it with the outdoors environment.



Intermediate spaces (e.g., corridors) linking the outdoors with the indoors

Direct access from the classroom to the outdoors

Nature

C	Classroom
T/A	Teachers/administration
+	Intermediate spaces
G	Garden
OS	Open stage

Ideal spatial arrangement for child-friendly schools (Wright et al., 2006)

Some of these aspects will be reflected in the case studies below. They will have to be adapted to the specificities of every project to build a safe environment with the collaboration of the local communities. It is through the participation and support of the families that the children will develop a sense of belonging to the community.

Flexible spaces	Flexible spaces increase child participation in class and allow teachers to provide a more dynamic environment for learning and teaching. Such spaces provide opportunities for group activities, areas for manual projects and easy access to open spaces. Individual classrooms or other facilities that create outdoor space between structures give students a chance to be in open areas when in transit between classes. Classrooms should be accessible for all children; ramps and wide doorways should be provided for less mobile children.
School library and resource room	In child-friendly schools, the library and resource room is likely to have some connection to the local community. Where it is feasible and in line with school practice, these facilities should be located and designed so they are accessible to the community. In other cases, skilled and knowledgeable persons in the community may be considered resources for learning about local culture, history and handicrafts.
Bathrooms	Teachers need to have separate facilities for men and women. For pupils, designated separate bathrooms for boys and girls within or close to the classrooms are the most practical and safest arrangement. These facilities can also be designed and located so that they are shared among clusters of classrooms to protect younger children.
Relaxation rooms close to learning areas	At the nursery and lower-elementary level, rooms where children can relax are appropriate in the design of child-friendly schools. In general, homelike elements next to learning spaces provide a friendly, inviting atmosphere for this age group.
Individual spaces	Along with flexible learning spaces for large and small groups (project-based learning/teamwork), individual learning spaces should also be provided, since individual children have their own learning styles and some will need space to be on their own at times to study or reflect.
Open spaces	Easy access to open spaces from classrooms allows children to be in close contact with their environment and to engage in physical activities. Open spaces can be designed as play yards for sports, school gardens and orchards, decks or verandas for outdoor learning activities, open performance spaces, wide corridors and courtyards, trellises, canopies, shaded pavilions, niches, alcoves, play lofts and enclosed backyards. In typical child-friendly schools, the community would be allowed to use some of these spaces after school hours for town meetings, local gatherings and other events.
Kitchen	Space for school meal preparation should be designed and provided with equipment and furniture that ensure food is kept fresh and away from flies and other pests that undermine food quality.
Clinic	Where there is a campus or cluster of social services, having the school near a clinic provides students with general health services and allows for the care of children in need of permanent monitoring of health conditions. Such a health facility would normally serve the entire community, either after school or by providing separate access for school and community patients. This basic link provides a connection between school, community and the family, revolving around the child's well-being.
Protective	The protective element of child-friendly school design has two main aspects: • To counteract bullying and abuse, teachers and parents must be trained in non-violent, child-based discipline strategies and interventions. This means no beatings, canings or other humiliating forms of punishment. Designing classrooms and other spaces so that activities are readily visible from the outside can deter child abuse. • Depending on location and context, the enclosure and boundaries of schools can vary in form and function. The goal is to find a balance where a fence can provide protection to the child from outside elements (such as traffic, animals), can define boundaries to keep children within the school and can also serve to section off an area for gardening and orchards.

Additional functional elements for a child-friendly school (UNICEF, 2006, chap.3 p.5)

2.5 The role of technicians

Technicians acquire an important role in development scenarios since they can contribute to the creation of a good efficient educational space. They are capable of gathering all the essential information and transforming it into a coherent design method, thus the facility itself becomes a stimulating element inside the community.

These professionals possess altogether a technical and human ability which becomes very important when conceiving a project. Different factors engage into this statement:

- In any project, the focus has to be on the *process* and not only the result per se. This implicates a significant work of previous architectural diagnosis to obtain the most valuable data.
- On another front, technicians are able to incorporate *technological innovations* into any project according to its own characteristics. This will imply a knowledge transfer to the local community that will increase their abilities towards self-sufficiency.
- At the same time, they attempt to use the lowest possible *budget* by choosing suitable materials and maximizing the construction schedule, which nowadays can be a determinant considering that we are facing a profound global economic crisis and funding for development projects is becoming scarce.
- Moreover, another meaningful task is to identify local *leaders* that will be able to maintain the project once humanitarian aid withdraws. Emphasizing on this aspect is crucial since they are not only delivering a product -the facility itself- but trying to create *capabilities* among the community so that they strengthen their training for the future.

- Related to expanding local capacities, a technician involved with the community adds additional personal value to the daily work, contrary to an external construction company who may be more focused on financial objectives than the community's learning. Awareness has to be raised among entities to take responsibility into these matters and prevent the creation of urban replications that have nothing to do with the place, the people or the culture.

"The way that a community builds tells you, sometimes,
all you need to know about its values".

Paul Goldberger

- Finally, the contribution of the people in the community is necessary. Technicians can integrate participatory processes during the diverse phases of the project (design, execution and use) and work with the beneficiaries. Hassan Fathy debated about "bridging the gulf between folk architecture and architect's architecture" since each actor has a decisive part to play in the creative process (Fathy, 1994).

"Development without self-help is an impossibility".

Hassan Fathy

These arguments will be revisited in the conclusions.

Although the role of technicians cannot be understated, *sociologists, anthropologists* and *environmentalists* have complementary roles in understanding the particularities of the history, the culture and the communities themselves. If all these approaches are integrated, the project will be more adequate at an overall level.

2.5.1 Architects as a social actors

The architect, as part of the technicians described above, can become an important actor in development scenarios.

If ever there was an architect that considered the social role of architecture, it would be the Egyptian architect Hassan Fathy. During his professional life, he succeeded in considering people's needs in relation to the urban scale. He claimed that there had to be an alliance between the poor and the architect for a greater result. The poor had to contribute with labour and material -mostly the earth they lived in as an uncostly material- and the architect added other matters they could not achieve, such as aesthetics. The fact that he was designing for the poor with scarce resources did not mean that it had to be ugly. He believed that if these designs were true to their materials, their environment, and their daily job, they would necessarily be beautiful. "Men need beauty as much as protection" (Fathy, 1973, p.foreword).

This collaboration leads to a more coherent design methodology. Without the architect, the result may become uglier, more inappropriate and more expensive. Without the cooperation of the people, the project will be sterile, unloved and untended (Fathy, 1973).

The architect has a cross-disciplinary approach that enables the integration of certain variables into a project that no other professional can incorporate, such as a holistic urban perspective of the project or a higher degree of efficiency; presenting many advantages towards a better outcome.

RESEARCH

3. Field study definition: Senegal

3.1 Justification of choice

The main reason for selecting Senegal as a location for the following case studies is that I have a personal connection to the country. My professional experience led me to this African nation where I was able to practice my technical training and collaborate in development scenarios projects.

I had the chance to integrate the culture of the community and learn their traditions through the concept of Senegalese *teranga* which welcomes selflessly any outsider into their daily lives.

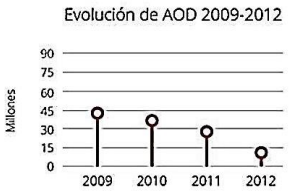
My knowledge of the local way of thinking and working can be an asset upon discussing the development projects' characteristics.

3.2 Priority country

On top of my personal relation to the country, Senegal is a priority beneficiary of assistance and funding for the main management body of the Spanish Cooperation Agency (AECID), which tries to combat poverty and work towards sustainable human development since 2001 (AECID, 2013).

Spanish cooperation in Senegal
(Source: AECID, 2013)

As introduced in the 2005 Master Plan for Spanish Cooperation, the Sub-Saharan area has been earmarked for a considerable increase in aid due to its endless possibilities of development (Olivié, 2007, p.3). Senegal has historically been a country of first importance for Spain assistance because they both have an important volume of economic and commercial exchanges in addition to good diplomatic relations since the independence of the first in 1965 (Oficina de información diplomática de España, 2012).



Destino por sectores de actuación - Desembolsos AOD (euros)

SECTORES PRIORIZADOS	2011	2012	2012%
Infraestructuras y Servicios Sociales	**9.643.024**	**2.547.026**	**24,90%**
Educación	1.732.267	1.065.355	10,41%
Salud y Salud Sexual y Reproductiva	1.352.851	959.456	9,38%
Agua y Saneamiento	207.642	265.339	2,59%
Gobierno y Sociedad Civil	4.092.419	80.476	0,79%
Inst. para la igualdad de las mujeres	283.173	159.200	1,56%
Otros Servicios Sociales	1.974.673	17.200	0,17%

Official development aid Spain-Senegal (AECID, 2013)

The cooperation activities revolve principally around rural development and childhood protection, two of the most neglected sectors whose relevance and struggle mechanisms are investigated through this dissertation. As mentioned beforehand 5.718 Senegalese citizens came to Spain in 2004, and by 2012 it was estimated that 60.000 will live inside Spanish territory (Olivié, 2007, p.15).

This migration process has become over the years a significant socio-economic phenomenon leading to an increase of development and pioneering co-development projects without precedent. It is through these kinds of initiatives that educational facilities will have the possibility of being implemented in countries in need.

3.3 Geographical characteristics

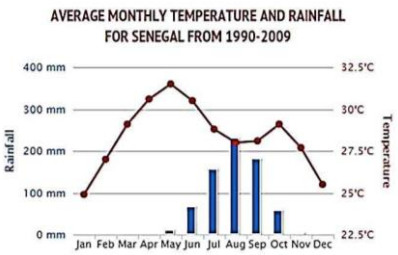
Proceeding to the introduction of the country, Senegal is located in the west end of Sub-Saharan Africa. It has a surface of 196.190 sqkm divided into 14 regions and 45 departments. The current population is 14.130.000 inhabitants with a 72 hab/sqkm density (Oficina de información diplomática de España, 2012, p.1).

The *territory* borders the Atlantic Ocean on the westernmost point of the continent, sharing a border line with Mauritania in the North, Mali in the East, and both Guinea-Conachry and Guinea-Bissau in the South.

The *topography* is almost flat but ascends gradually up to 581m towards the southeast.

African continent
(Source: Google Maps, 2015) (F.5)

Senegal has a tropical *climate* characterised by average high temperatures and a long dry season. The rainy season goes from May to November, often accompanied by short-lasting torrential rain storms that can lead to flooding in certain areas (Berg, Wan, & Lau, 2009).



Climate data (The World Bank Group)(F.6)

Senegalese territory
(Source:
Google Earth)

04/10/13
Lat. 14º29'50.65" N
Long. 14º27'08.51" O
Elev. 52m
Alt. 637.95km

The typical *vegetation* is semi-desert from the Savannah –baobab- in the northern region and subtropical –mangroves- in the southern river estuaries.

Concerning its *hydrography*, Senegal is flowed through by five rivers: Senegal, Falémé, Saloum, Gambia and Casamance (Oficina de información diplomática de España, 2012, p.1). Even so access to water in remote areas is problematic.

3.4 Socio-economic factors

While Senegal has accomplished a solid *economic performance* and a steady growth over recent years, the population's living standards are still very low. It is listed in the 154th position in the Human Development Index (HDI) -according to the PNUD report in 2013 over 186 countries-. Therefore it is considered a country with low human development (The World Bank Group, 2015).

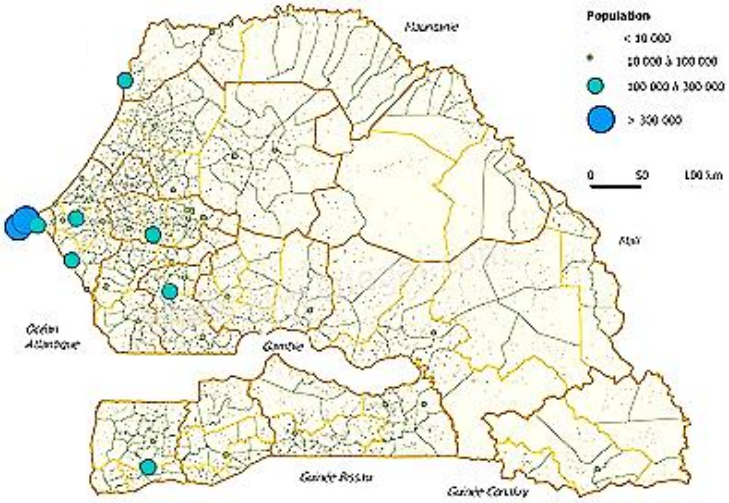
The *population* can be defined as young since 63% is under 25 years old; which qualifies as a lot of potential for development. However the country retains a 40% adult literacy rate and the schooling rates are still to be improved: 71% of six to thirteen years old are enrolled in primary education and only 16% of over thirteen years old in secondary education (AECID, 2013, p.3).

There is a large *ethnic and linguistic diversity* -researchers give figures around a thousand different dialects- Wolof (43.3%), Fula (33.8%), Serer (14.7%), Diola (3.7%) and Malinké (3.0%) being the dominant groups (Oficina de información diplomática de España, 2012). Speaking about *religion*, Senegal is a secular state where various beliefs coexist peacefully. The society is structured around three powerful Muslim brotherhoods: the Qadiriyya, the Tidjane, and the Mouride -84% of population-. Christianity is the larger minority, specifically based in the region of Casamance together with the local Animist practices (AECID, 2013). All of this constitutes the social capital of the country.

3.5 Importance of rural areas

70% of the population live in rural areas. The infrastructure is not only deficient but scarce, and the local government is not able to fulfil the current necessities. The rural territory is essential for the development of the country since one of the main economic activities is agriculture -60% of population work in the sector-. Locating schools in these dispersed areas serve as a cohesive element to bring together the community and establish centres of activity. Families tend to work close to their children to guarantee a safe environment therefore it is around educational facilities that villages are developed.

These are the reasons why there is an urgent need of intervention in rural areas: to provide the adequate services and control exodus towards urban areas that are becoming overcrowded. Poverty is most prevalent here therefore international assistance is required to reduce the present inequalities (AECID, 2013, p.14).



Rural population in contrast to urban population in Senegal (Programme Solidarité Eau.) (F.7)

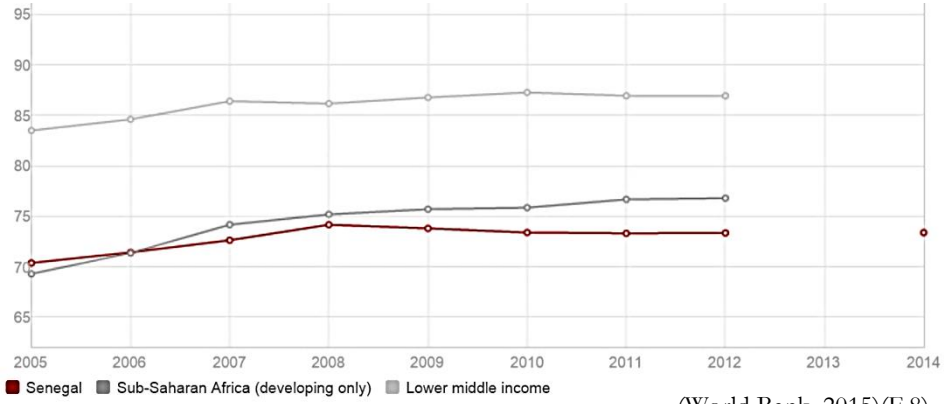
3.6 Schooling context in Senegal

Regarding the matter of education in Senegal, it is the government's responsibility to guarantee the schooling system to its citizens. It has been a declared right from the very beginning as stated in the 2001 Senegalese Constitution -articles 21 and 22-. The State recognizes the access to primary education to all its children (from 6 to 12 years); therefore educational facilities have to be prepared sufficiently to host the program.

However, the fulfilment of this premise is not easy in a country as poor as Senegal where the majority of villages have precarious temporary structures as schools (Campamentos solidarios, 2008). According to the World Development indicators, the Senegalese ratio of schooled children is still below the Sub-Saharan standards. The EFA development data confirms that the rank held by Senegal is far from satisfactory: it is 118th out of the 129 countries for the calculated index (L. Kane, Diop, & Sy, 2010, p.6).

In spite of these negative statistics, the education sector holds a central position amongst the priorities of the local government and its foreign partners. The volume of public resources mobilised for this purpose has expanded massively since the start of the 2000–2010 Ten-Year Programme for Education and Training (Programme décennal pour l'éducation et la formation 2000–2010 - PDEF) in order to fulfil the needs. The aid from the external partners still plays an irreplaceable role in financing the sector (L. Kane et al., 2010, p.3).

Ratio of children in official school age enrolled in school related to the population of the corresponding official school age



(World Bank, 2015)(F.8)

Since its independence in the 60's, the country has made considerable progress in providing access to primary education. One of the main enabling factors has been the improvement of school facilities, for instance the number of operational schools has greatly increased from 4.751 in 2000 to 6.460 in 2005 –an overall growth rate of 36%- (L. Kane et al., 2010, p.50).

Nevertheless, there are continuing obstacles to schooling. Besides the low level of school coverage, fees are also an impediment for many families. But the main problem is the disparity between urban and rural milieus. The possibilities of attending school in rural areas are fairly complicated due to the long distances to traverse on foot. Children in rural households remain at a disadvantage in school access policies, particularly girls -victims of early marriage and housekeeping chores- (L. Kane et al., 2010, p.7 and 49).

Hopefully Senegal will be on the right path to meeting the EFA standards but there are still needs to be satisfied and existing schools to be improved all over the country.

The construction of efficient and accessible schools is the initial factor towards delivering a good schooling together with an instructed network of teachers.

Women walking to work after leaving their children at school in Casamance

(Source: photo taken by the author, 2014)

3.7 Local regulations

The Senegalese government has no material capacity to provide the necessary educational facilities so they require international support to keep improving into this matter.

To do so the National Education Department with the support of the French Development Agency has created a local regulation for implementing a qualitative educational system, defining the pedagogical programs and the technical characteristics of the projects. These guidelines emphasize on the facilities themselves, school governance, educational programs, teacher's training and student's learning process. It is divided in specifications according to the four levels of the educational process -childcare, primary, secondary and superior education- looking for an optimal performance.

As to the technical specifications, there are certain standards measurements that have to be adhered to. For instance each classroom should not be smaller than 67 sqm for an adequate learning space and the number of students should be maintained fewer than 50 (Ministère de l'éducation nationale, 2013, p.26).

Although these are the ideal figures, the reality on the field shows that in most of the cases the number of pupils is typically much higher, with an average of 3 or 4 per desk in order to host all the children coming from different parts of the region (Campamentos solidarios, 2008, p.5).

Nursery school measurements

Infrastructures	Indicateurs		Valeurs
Salles de classe	Dimensions	longueur	9 mètres
		largeur	7,5 m
		hauteur	3,5 m à 4 m
		surface	67 m² à 68 m²
	Niveau d'aération des salles		bon
	Effectif normal /éducateur		35 élèves
Cours	Surface pour une école de trois classes		300 à 500 m²
Cours	Surface pour une école de cinq classes		500 à 700 m²
Espace de repos	Surface requise		35 m²
Boxe toilettes	Nombre de jets ou lavabos (collectif et adapté à la taille des enfants)		08 à 10
	Nombre de douche / section		01

Primary/secondary school measurements

Infrastructures	Indicateurs		Valeurs
Salles de classe	Dimensions	longueur	8 à 9 mètres
		largeur	6,5 à 7,5m
		hauteur	3,5m à 4m
		surface	67 m²
	Nombre d'élèves /classe (effectif normal)		45 à 50 élèves

Comparison of dimensions in school facilities infrastructure according to the local regulations

(Ministère de l'éducation nationale, 2013)

This regulation re-examines some aspects already debated in the UNICEF manual such as the importance of ventilation or the presence of at least 300 sqm of open spaces as a complementary element for a 3 classroom module. On the contrary it says nothing about other comfort criteria such as lighting, temperature or acoustic performance.

In addition to the previous specifications, there needs to be minimum equipment related to the facility. A school is a combination of elements working together for the child to grow in a healthy environment. Water and sanitation are fundamental for a hygienic well-fare and it is also ideally required to have a nutritional program for an efficient learning. If the students are not well nourished, they will not be able to perform correctly (Campamentos solidarios, 2008).

An interesting section emphasizes *context* as a tool for shaping the project. Senegal is a multicultural country. Therefore the daily life can vary according to the region –particularities in traditions, violence, gender issues, literacy, familiar situations-. It is not the same to design an educational facility in the northern area or in the southern because the reality changes. There are also areas of conflict that have to be planned carefully so they do not become excluded, particularly concerning security matters. At the same time, disparities between urban and rural areas have to be considered to prioritise the location of the facility; which should ideally be less than 3km away at walking distance from the main villages it will serve –to avoid absenteeism among students who may not be able to reach the school due to transport complications- (Ministère de l'éducation nationale, 2013, p.43).

Local construction tradition in Casamance (Source: Base A)

These guidelines come as a complement to the international UNICEF child-friendly schools regulations but actually prevail over the former when implementing projects inside the country. From a technical point of view, the local regulation is quite scarce. That is the reason why together with this document is enclosed an architectural prototype that proposes a basic module to be replicated around the country by local builders. The main issue is that this model does not consider either geographical or cultural disparities in a country as diverse as Senegal, which contradicts the original regulation. The module will be examined as one of the case studies.

From here on, it will be up to the technician to design the best possible facility, following the local regulation as a starting point and complementing it with technical innovations and context peculiarities learned through the community.

4. Case studies

4.1 Selection criteria

The selection criteria for the case studies is based on the different characteristics of each project that will allow a common basis for comparison in order to reach useful conclusions. From the official prototype defined in the local regulation to a project entirely designed and implemented by an international non-profit organisation (NGO), the analysis of the different architectural typologies and technical resources of the five cases follows below.

Complementing this is the fact that a high number of education projects in Senegal are implemented by Catalan entities –very active in matters of aid fundraising- which provides a close source of information.

The area of study is located in the South of Senegal, the Casamance. The reason for choosing this particular region is because of its specific and appealing context regarding language, religion and cultural traditions, different from the rest of the country.

Additionally, it is one of the principal beneficiaries of development projects due to the scarcity of infrastructure, despite having a majority of the natural resources (AECID, 2013). Consequently, it is one of the main sources of experience for educational facilities in development scenarios.

Woman transporting wood in Casamance
(Photo taken by the author, 2014)

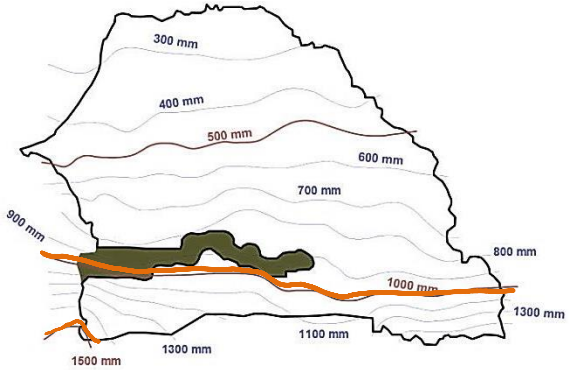
Area of study

KASA MAHN-SAH

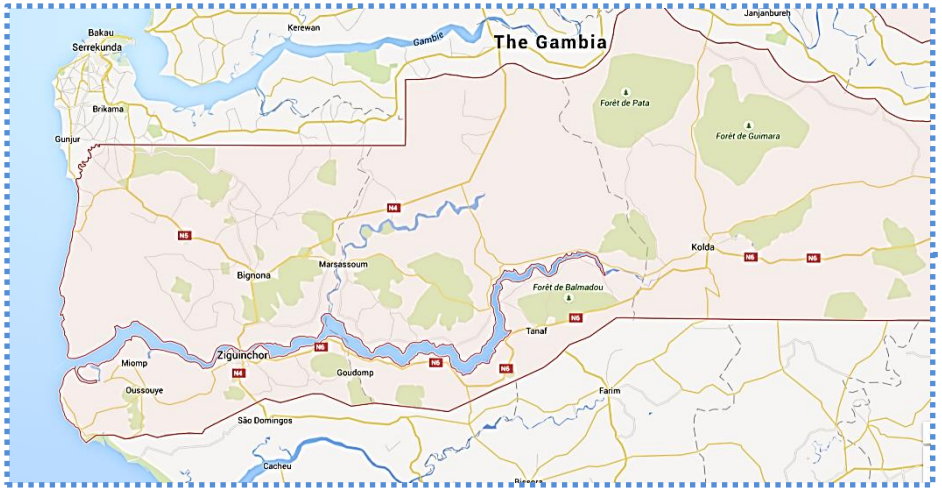
Population: 1.369.000 inhabitants

Surface: 28.350 sqkm

Climate: tropical savannah



Rainfall: 50 in/1270 mm average annually (Source: Programme Solidarité Eau, n.d.)



Map of the Casamance region (Source: Google Maps, 2015) (F.9)

Map of the Senegalese territory (Source: Google Maps, 2015) (F.10)

4.2 The geography of Casamance

Casamance is the richest natural region of Senegal. Due to its climate characteristics, it is also the greenest because the area has greater average rainfall than the rest of the country during the summer period

Woman working in the rice fields in Casamance (Photo taken by the author, 2014)

Separated from the rest of the country by The Gambia, it constitutes a narrow piece of land in the *southern territory of Senegal* extendeding over 29.000 sqkm. It is limited by the Atlantic Ocean on the West, the Kuluntu River on the East and Guinee-Bissau in the South. Crossed for more than 300 km by the Casamance River, it is divided in three territories: Basse-Casamance, Moyenne-Casamance and Haute-Casamance (Federation of the Free States of Africa, 2007).

The majority of the *population* lives in rural areas, where the organic soil is very rich for agriculture -the main activity in the region, particularly rice cultivation-. The whole family works in the crops, since most of the cultivation is destined for self-consumption. During the harvest season, the population increases due to the return of family members that migrated to the urban areas looking for opportunities. This migration affects women and girls especially, who leave progressively younger and subsequently become less educated.

Religious tolerance influences the daily life in the community as an example of successful cohabitation. To illustrate this, Muslims -26,9%-, Christians -38,6%- and local Animists -34,5%- are even buried in the same cemeteries (Amics Escola Pia Senegal, 2004).

4.3 Strong cultural identity: Diola

The name of Casamance derives from the King Mansa -*mahn-sah*- of Kasa, who ruled in the region when the Portuguese arrived. The oldest local inhabitants are the *Diola*. They are strongly independent people, many of whom still follow traditional Animist beliefs, resisting colonisation and conversion (Berg et al., 2009, p.8).

Traditional "fetiche" in Oussouye
(Source: photo taken by the author, 2014)

The *social structure* is organised in small groups of public interest in order to fulfil the social obligations that determine the well-being of the community. They take charge of the construction of necessary facilities such as schools, clinics or farms, assuring their ownership and maintenance over time.

Diola *traditions* are quite different from those of other Senegalese ethnic groups. Their society is based on village self-rule, searching for an egalitarian power. They are governed by two main forces: public opinion and a belief in spirits that rule nature, with whom they dialogue through the offering to the *fetiches*, ceremonial elements of protection placed in strategic spaces. The moral authority is embodied in the leading figure of the King, a secret identity that takes decisive decisions for the resolution of community problems (Berg et al., 2009, p.9).

The official *educational model* granted by the government shares its prevalence with the traditional education based on oral traditions, historical beliefs and games. Children learn by experiencing and socialising inside the community. The defining moment is the initiation ceremony inside the sacred woods and in presence of the King; which signifies that the child has become a full citizen of the society (Tomàs, 2005, p.340).

Local inhabitants live in connection with the surrounding *nature* and their fellow villages. A central element in every Diola village is the presence of a *"fromager"* –Ceiba tree-. According to the local knowledge, it is probably the first *urbanistic element* that marks the oldest human settlements in the area. Any place where people settled, they planted a Ceiba in order to provide shadow and protection.

It soon became the meeting square and an orientation reference for travellers; who could know where to find refuge. Its wood is also used as a commercial asset to build the traditional fishing boats and coffins.

Nowadays, Ceibas are a symbol of good luck and create a space to pray to the spirits and place *fetiches*. In relation to schools, the first temporary ones were settled under the *fromager* which provided cover. Today's educational facilities are usually located close to these elements as a reference to the importance of education and a marked *sacred* space for children's development.

"Fromager" marking the central square in a Diola village

(Photo taken by the author, 2014)

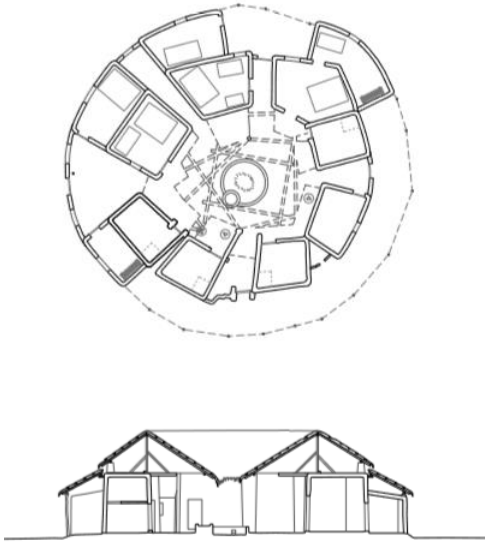
4.4 Traditional architecture: impluvium model

The architectural model in Casamance is very illustrative. The houses follow the traditional impluvium circular typology, whose particularity is an open central area. The roof is inclined to collect the rain water in the central space where there is usually a water collection basin (K. Kane, 2010, p.252).

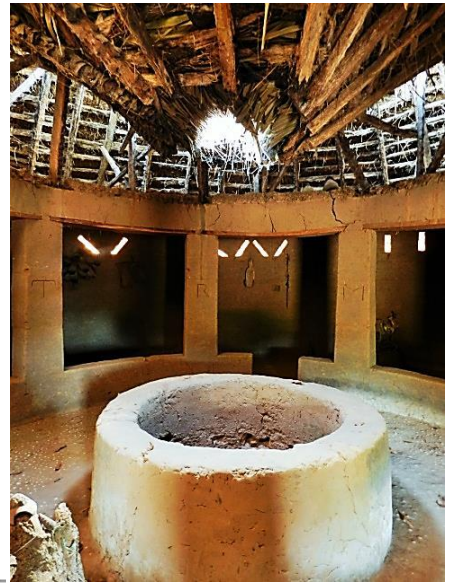
Central open space in the impluvium typology (Photo taken by the author, 2014)

This fascinating typology provides many advantages. Primarily, the house is always kept dry. Moreover it allows the collection and storage of rain water for the drought seasons, which is very helpful for personal consumption and agricultural purposes. As stated by the local inhabitants, this model was crucial during war periods in order to protect the women and children. In African culture, they are the ones in charge of providing water, which led to multiple kidnaps and killings as they left the house to fill the pitchers. With the *impluvium* construction, they did not have to abandon the house and therefore were kept safer.

From an *architectural point of view*, the typology allows for advanced parameters of comfort and welfare. For instance, natural diffused light comes through the roof aperture providing the house with an excellent lighting quality. It also allows a good transversal ventilation of the space since air is constantly being renewed, maintaining a comfortable temperature inside the buildings. Lastly there is a constant visual connection inside the dwelling space which facilitates circulation and makes the space seem larger.



Traditional local impluvium plan
(Source: Universitat Sense Fronteres)



Water collection in the impluvium model
(Photo taken by the author, 2014)

This traditional model is being recovered in the past years as an efficient architectural typology; due to its numerous advantages and the recognition of the community's identity. Although it has not yet been applied to educational facilities, it is already being explored in other scenarios and certain organisations are working towards adapting schools into this model (Base A, 2012b).

4.5 Schooling problem in Casamance

A major problem in the Casamance area is the precarious educational system. The State continues to pay limited attention to the children displaced by the former conflict. Consequently the region is home to the highest amount of out-of-school children (L. Kane et al., 2010, p.7)

In order to understand the origins of the already *extinct conflict* and its negative repercussions, further discussion is required. Despite being a democratic country, the southern region has been involved in an independence claim since the 80's.

The local population has a history of resistance, first against oppressive colonial powers and then against a central government that never invested in the region. Their search for self-governance originated in an armed struggle that caused a large number of civil casualties. An agreement towards stability was finally reached in 2004 after long years of negotiations (Berg et al., 2009, p.28).

As a consequence of this separatist struggle, the region has been neglected concerning social and economic development, causing a major gap in infrastructure, education and healthcare between Casamance and the rest of the country (Amics Escola Pia Senegal, 2004).

Nowadays this issue is being amended thanks to foreign aid and investment in development projects to satisfy these needs. International organisations are working together with the government and the communities to implement the necessary facilities adequate to the specificities of the region.

Panoramic view of an agricultural facility in Casamance (Photo taken by the author, 2014)

4.6 Presentation of selected case studies

4.6.1 Research methodology

The methodology employed consists in *compiling* a series of concepts from different reading sources in a theoretical background and *applying* the principles learned into five practical cases of study; in order to *extract* a series of useful conclusions that will contribute to *re-examine* the role of the architect in development scenarios projects.

In addition to the literature consulted, the knowledge gathered from *interviews* with both Catalan technicians on site and people from the local community are utilized as evidence of the matters discussed.

Lastly, the information and footage collected in Senegal while working on the field during the years 2013 and 2014 are consulted as additional testimony.

The case studies will be examined from four different perspectives:

- Architectural scale.
- Technical scale.
- Urban scale.
- Anthropological scale.

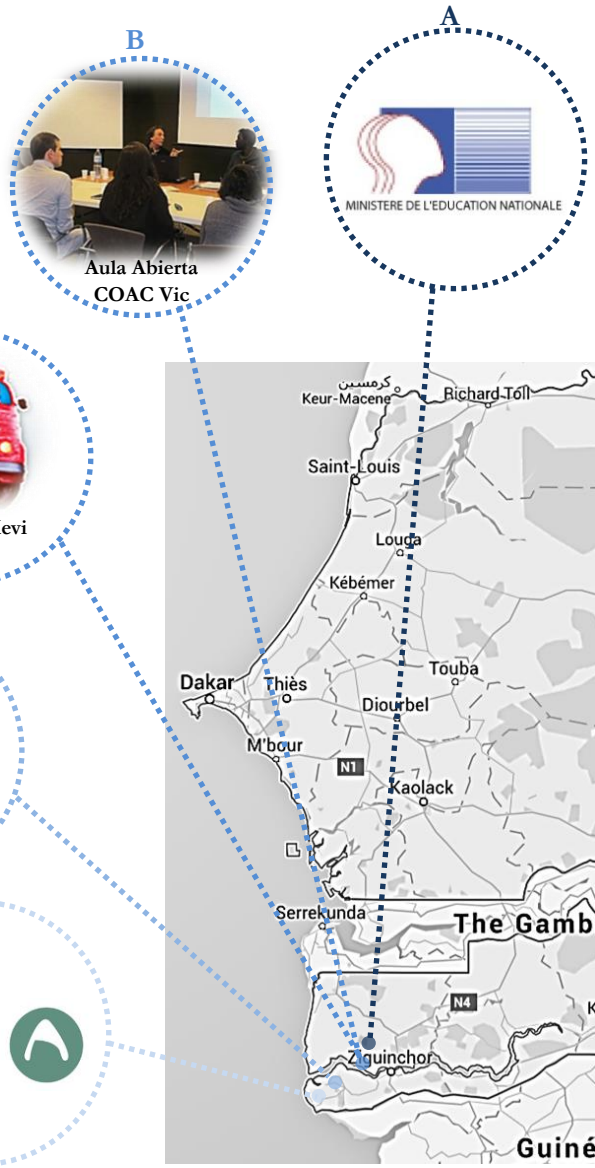
The following analysis will *investigate* and *compare* diverse architectural aspects - defined in the table below- within five educational projects in the Casamance region implemented by development assistance during the last years:

Portrait of a local religious leader painted on a facility

(Source: photo taken by the author, 2014)

A) Primary school *Official prototype*
B) Primary school *Aula Abierta COAC Vic*
C) Secondary school *Projecte Xevi*
D) Primary school *Base A*
E) Nursery *Base A*

Map of case studies



Sources pictures and logos:
A_Miquel Sitja
B_Miquel Sitja
C_Carles Muriana
D_Base A website
E_Base A website

Source map:
Google Maps, 2015 (F.10)

4.7 Analysis

Organisation	A	B	C	D	E
	Senegalese department of Education	Aula Abierta COAC Vic	Projecte Xevi	Base A	Base A

Case Study A belongs to the Education Department of Senegal. As a governmental public division, its duty is to guarantee the access to education to all citizens; therefore they created an *official prototype* of school building complementary to the local regulations previously explained. The project defines all the technical aspects for the construction of a school facility, from the budget to the use of materials, in order to be replicated equally all over the country. The purpose of the prototype is to be built without the necessary supervision of a technician as a response to the scarcity of educational facilities.

Case Study B belongs to the Catalan group Aula Abierta –Open Classroom-. Created in the Catalonian municipality of Vic and sponsored by the Architects' Association of Catalonia (COAC) as an open work group for architects who wanted to contribute selflessly to cooperation projects, this initiative brought together a collective of architects in order to design a new school project, based on the local models that were already in place but reconsidered from a technical point of view.

Case Study C corresponds to Projecte Xevi, a Catalan development cooperation organisation for the Third World. The non-profit organisation (NGO) was created by a private family and expanded over time. Their main objectives are to promote the local culture and to support initiatives that will help to improve the living conditions of the most disadvantaged. In this case, even if they do not have design technicians in the organisation, they organised the fundraising to support the local community's project of constructing a school in the village, which had an educational deficiency. The NGO managed the project while the community was in charge for the building process.

Case Studies D and E are both designed by the same organisation Base-A, a collective of young architects and students who view architecture as a tool for social transformation. Within the scope of cooperation and education, they perform activities in areas related to construction, rehabilitation and urban planning from the viewpoint of sustainable and inclusive development. They firmly believe in the use of local sustainable materials, a technological transfer through direct participation of the beneficiaries in the projects, and a design that optimizes the resources and reduce the costs of maintenance. In this occasion they implemented first a primary school then a nursery deviating from the established pattern to explore further into the culture and local traditions.

Location	A	B	C	D	E
	Diatok	Diatok	Tendouck	Ourong	Kabrousse

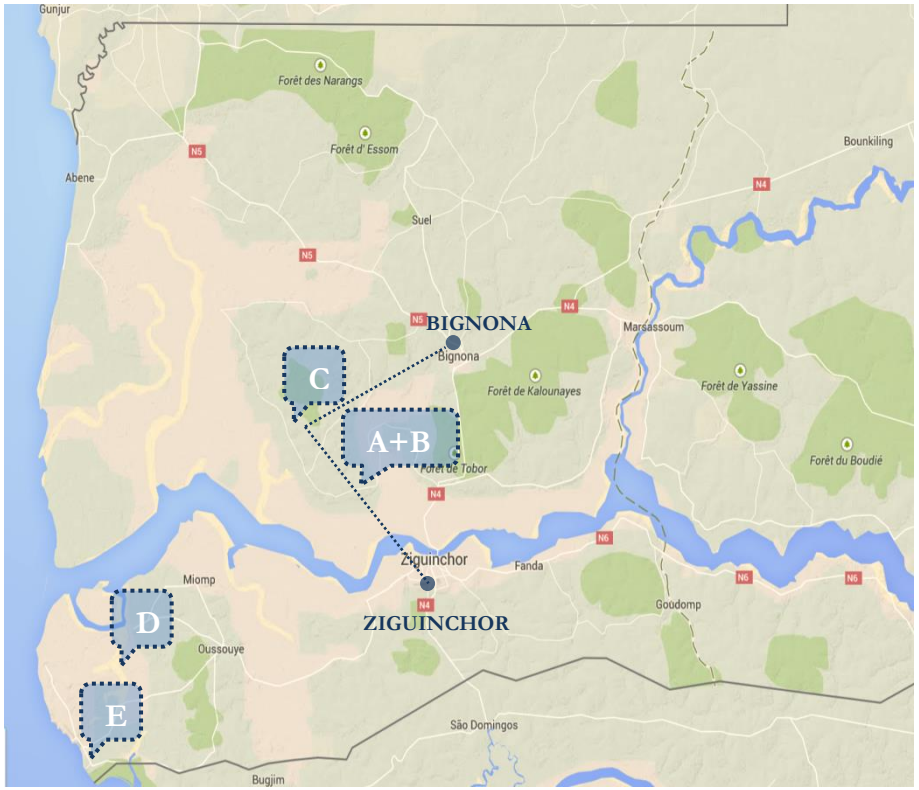
The *location* of any educational facility is an important factor. A school is a cohesive element that contributes to improving the livelihood in the villages, since it attracts neighbouring inhabitants who develop the area. It is around them that the villages expand. Unfortunately, urbanistic parameters for choosing the most suitable plot are very difficult to incorporate into any project since there are no maps available of the areas. There is a generalised lack of urban planning in developing countries, specifically when speaking about rural dispersed areas, that lead to a disorganised growth. The facilities are usually implemented in the most valuable villages according to good access and adequate commuting distances from the surroundings, but the plot is not thoroughly studied, they are simply built wherever it is available.

Projects A, B and C cover the educational program of that specific zone providing primary and secondary education to the surrounding villages. Once the students have finished the first education level in Diatok, they can continue to the adjacent town of Tendouck for the second one.

Cases D and E are established in the southern region, one of the most neglected areas regarding infrastructures. Its economy runs primarily on tourism, since the region is rich in typical Diola architecture and beaches, but there is not enough investment in local problemas such as education.

The whole family works in the leisure industry in order to subsist, leaving aside their children's education and preventing them from a possible better future.

Location of the facilities in the Casamance region (Source: Google maps, 2015) (F.9)



A+B_ They are both located in the rural village of Diatok in the Ziguinchor region, concretely above the Casamance river. Both projects are complementary modules inside the same compound.

Since this is a rural area with dispersed populations, school facilities are uncommon. Soon after the government built their prototype school, it was overcrowded with students coming from the whole region. Adapting to this, Aula Abierta group decided to expand the existing school in order to satisfy the needs.

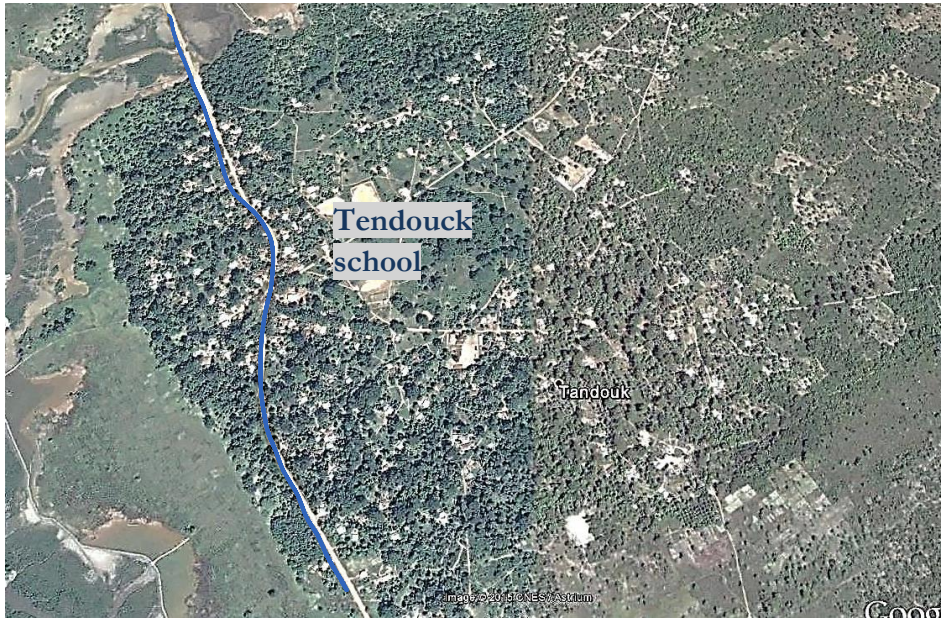
The school complex is positioned next to on the main road to facilitate ease of access, next to a forested area.

Source: Google Earth
11/26/14_Lat. 12º42'27.05" N_Long. 16º24'31.45" O_Elev. 24m_Alt. 1.03km

C_ It is located in Tendouck (sometimes written Tandouk, Tanduk or Tindouk), a 45 sqkm village in the region of Ziguinchor. The population nowadays is approximately 2842 inhabitants with a 189 h/sqkm density.

It is situated along one of the many arms of the Casamance River, almost equidistant by 30 km to the main town of Bignona -by road- and to the capital of the region Ziguinchor -by river-. Due to its geographical location, Tendouck is an important intersection where the main roads of the district converge.

The school is located in the centre of the village next to the main access road.



Source: Google Earth
11/09/13_Lat. 12º45'47.38" N_Long. 16º29'17.02" O_Elev. 13m_Alt. 14.99km

D_ It is located in the village of Ourong, in the southern region of Basse-Casamance. It has around 300 inhabitants, among which 90 are girls and boys of school age.

Being a small island, the area is very isolated and causes a great challenge in accessibility and transportation, both in terms of materials and children.

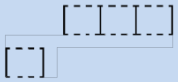
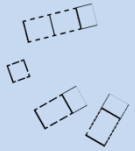
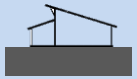
According to the organisation on site, the conditions of school classrooms in the village are deplorable; consequently the settings for a learning environment are not considered suitable.

Source: Base A organisation

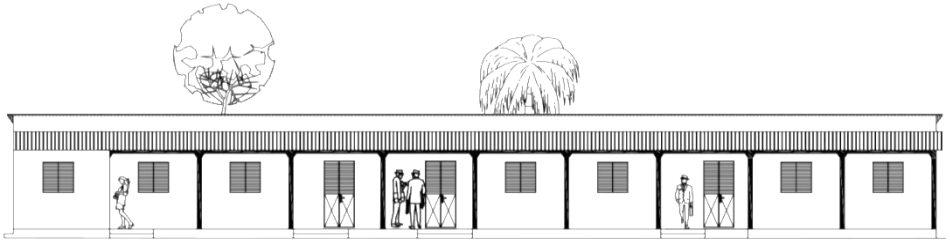
E_ It is located in Kabrousse, a coastal village in the Basse-Casamance. According to the Water and Sanitation Program for the Millennium (PEPAM), there are presently 1352 people and 188 households. The coastline concentrates all the facilities focused on tourism but the inland benefits from far less advantages. It is also a conflicted area since it is located very close to the border line, and has also a history of armed attacks that still occur from the separatist conflict.

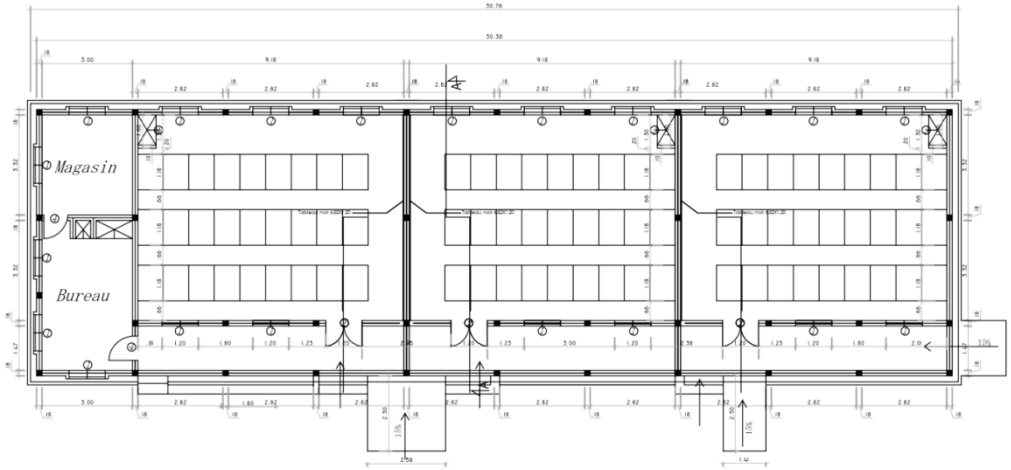
The facility is situated in the interior part of village integrated into the urban fabric, where parents can bring their children on their way to work.

Source: Google Earth
11/15/13_Lat. 12º21'07.58" N_Long. 16º42'59.19" O_Elev. 18m_Alt. 1.02km

	A	B	C	D	E
Typology	1 linear block	2 linear blocks	1 linear block	Multiple linear blocks	Circular blocks
Plan					
Section					
Building measures	285 sqm	260 sqm	229,5 sqm	111 sqm	124 sqm
No. classrooms	3	3	3	1	1
Class measures	68 sqm	65 sqm	58,5 sqm	61 sqm	62 sqm
Architectural elements	Porch 1,5 m Plint Ramps x3	Porch 3 m Plint Ramp x1	Porch 1,5m Plint	Drop ceiling Plint	Porch Plint Structural benches
Ensemble components	Office Storage room	Computer room Soccer field	Toilets Showers	Semi-open classroom Library	
Open spaces	Playground	Playground	Nature	Covered outdoors area	Nature

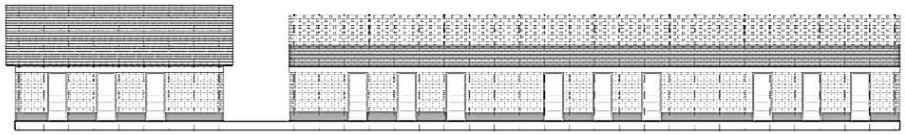
A_ The prototype is composed of a single linear building containing three classrooms where the interior spaces are connected by a narrow covered corridor, allowing a protected entrance to the building. The access is facilitated by three ramps of a 15% inclination.

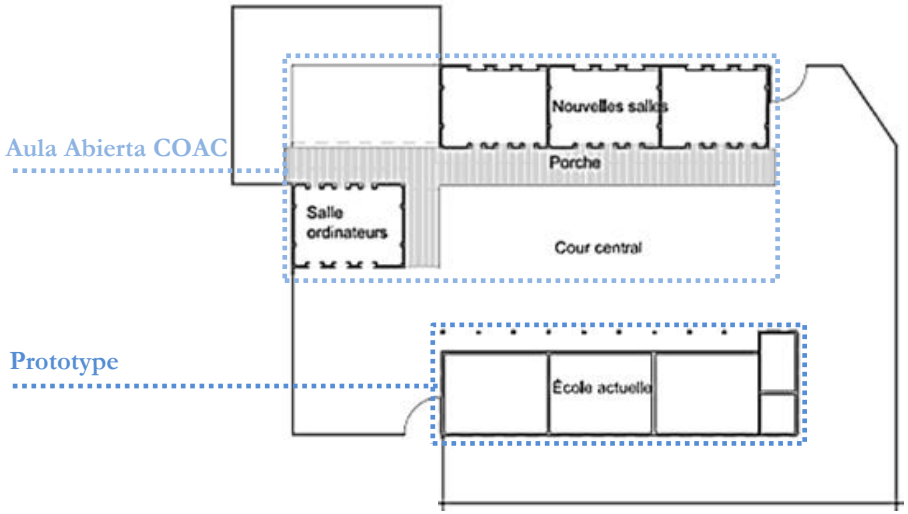




School plan and elevation (Source: Senegalese government)

B_ The project consisted of the expansion of the official school previously introduced, adding three more classrooms in front of the three existing ones. There are two perpendicular modules, connected by a wide porch, one containing the three additional classrooms and the other one established as a computer laboratory. The access is created by an adjacent ramp to the computer module and straight into the porch.

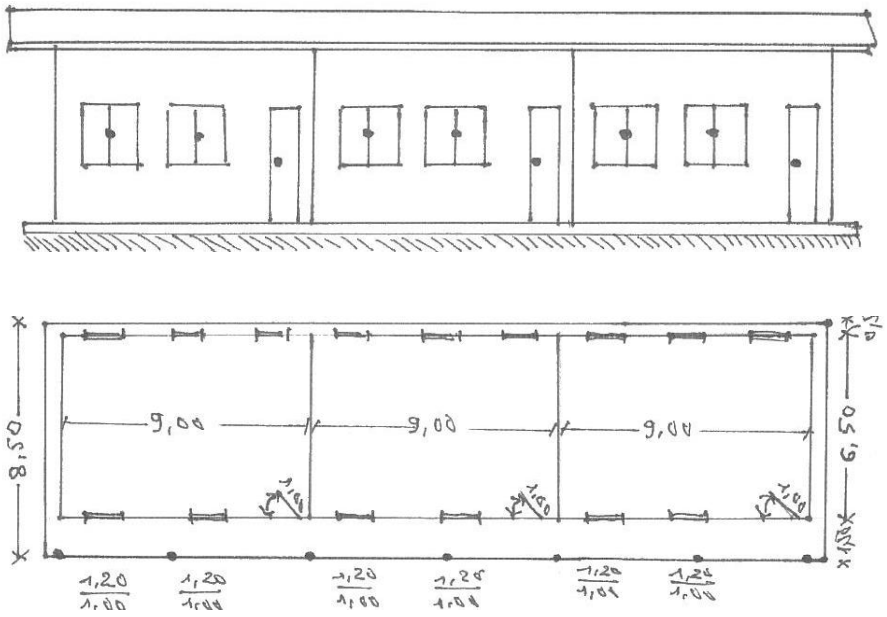




School compound plan and elevation (Source: Miquel Sitja, Aula Abierta COAC Vic)

C_ The original local school was a temporary shelter comprised of four modules made of cane and palm leafs. The plan was to create a more permanent facility for secondary education.

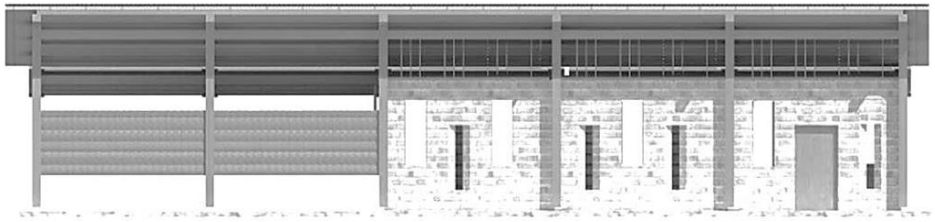
The renovation project replicates the local prototype and consists of a linear block with three classrooms. The rooms are accessed from a narrow corridor that traverses the building longitudinally. In addition to the classrooms, another module containing four toilets and showers was constructed.

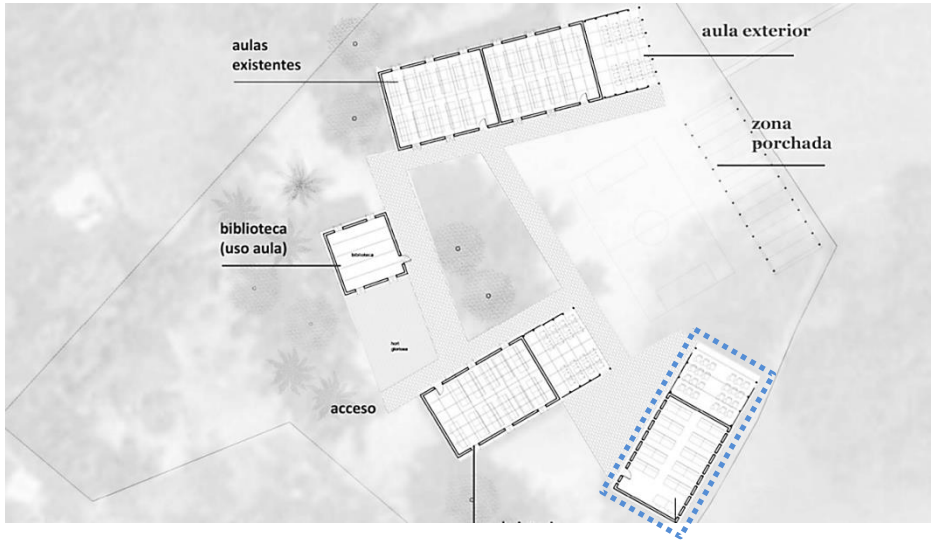


Elevation and plan (Source: Projecte Xevi)

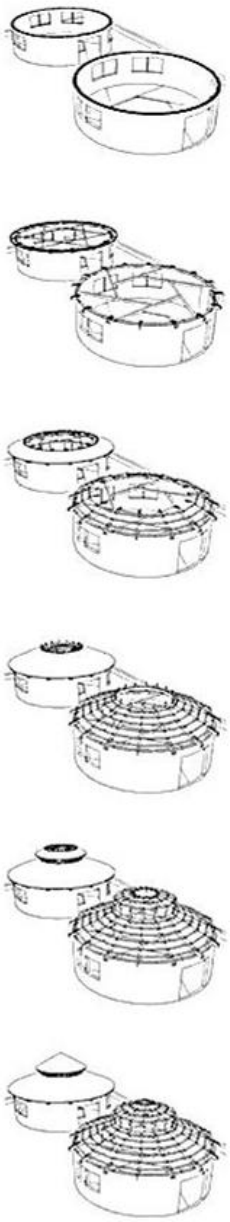
D_ The original primary school was composed of three classrooms but were so deteriorated that students had been forced to attend class outside of the building in a self-constructed temporary room.

The new project was established to renovate the damaged facilities and complement them with a new module formed by a closed classroom and an adjacent semi-open classroom.



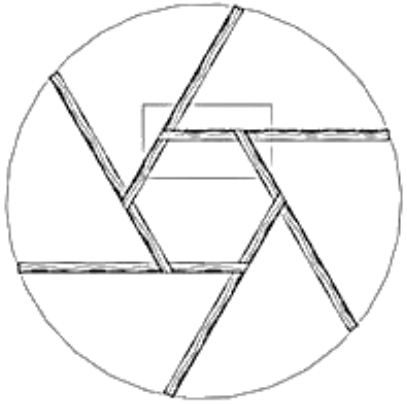


Elevation and site plan (Source: Base A)



E_ The project takes a step further in the implementation of local architectural traditions and follows the *impluvium* model typology, whose main characteristic is the central space.

The circular module is conceived as a continuous space covered by a thatched rice-straw roof and timber beams. There are no vertical elements since the roof structure supports all of the weight; as a result there is a visually connected space that allows the toddlers to experiment different sensations.

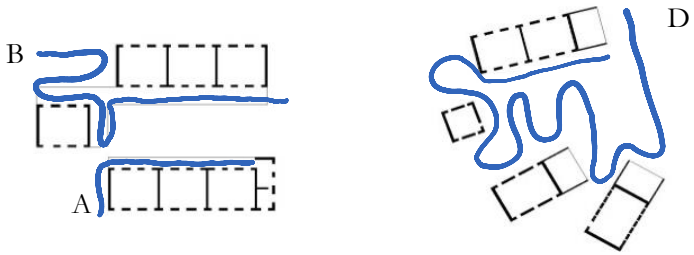


Nursery plan and hexagonal structure (Source: Base A)

Module perspective and roof structure (Source: Base A)

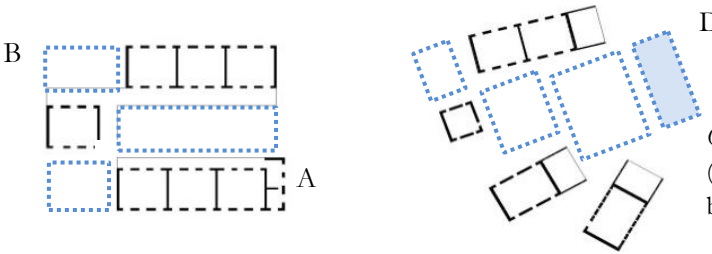
In comparing the different typologies, it can be noted that the *measurements* of all classrooms typically follow the standards of 65-68 sqm established in the official regulation. It is an appropriate measure if the number of students is controlled, but most cases schools are overcrowded.

The fact that the projects evolve from a linear *typology* to a dispersed module led to more interesting interstitial spaces. For instance, in project B the itinerary around the school is more stimulating than in project A and C since the two separate modules interact between themselves and the outdoors area creating different patterns of circulations.



Circulations (Diagrams made by the autor)

In combination with the *open spaces*, the diversity of modules allows playing with its disposition and creating different intermediate spaces: playing, growing an orchard, etc…

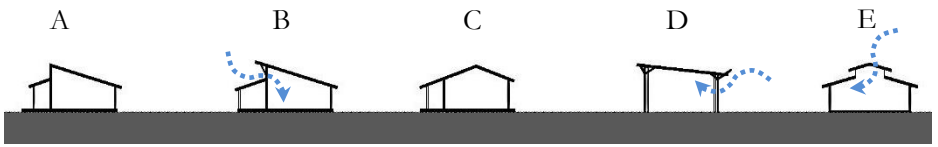


Open spaces (Diagrams made by the autor)

African *culture* has a strong connection to the *natural elements*, but in order to be able to stay outside there has to be some protection against the intense sun and rain. Therefore porches and covered spaces are highly valued and utilized. In project D there is an effort to connect the learning environment to the outdoors through the semi-open classroom -which provides a flexible space that can be extended to the outside-, helping the stimulation of children's brains. Project B also enlarges the circulation corridor transforming it into a porch where people can temporarily pause and stay.

Temporary school structure in Casamance (Source: Base A)

Typologies of the sections (Diagram made by the author)



As to the section, projects A, B, and D all share a mono-pitch roof over the classroom and a separate cover for the porch area. In the case of project B, the architects take advantage of the height difference between the two roof sheets to create a ventilation and lighting entrance that goes straight to the central space of the classroom. In project D, the air and light entrance comes from the separation between the roof and the wall structure.

Project C has a gable roof that does not benefit from natural lighting but creates a more compact structure.

Project E's roof is divided into two separate pieces shifted from each other, allowing for zenithal light and air entrance. The structure is braced by pillars that incorporate benches to reinforce their stability, and creating spaces where children can rest and wait for their parents.

Bracing benches for the structural pillars

(Source: Base A)

Design	A	B	C	D	E
Architect	No	Yes	No	Yes	Yes
Participatory process	No (government duty)	No	Yes (design)	Yes (recommendations)	Yes (recommendations)

In countries like Senegal, it is difficult to find *local qualified technicians* to take charge of the implementation of infrastructure. The possibility of this kind of knowledge depends on financial power and opportunities, very restricted. Consequently most people do not possess a proper training.

These days, the efforts of foreign assistance are focusing on training and creating local capacities that will ease this problem, so that local technicians can take ownership of their designing processes.

A_ The prototype does not benefit from a profound designing process. It is based on the official regulation that is very specific about technical considerations, but without much critical reflection about culture or climate.

The project is implemented by the local government as part of their obligation of providing global education and does not involve the community's input.

B_ Project B was designed by Catalan architects in Barcelona basing the official module as a reference but introducing some modifications according to their own design criteria.

The community was not fully involved in the design process but was crucial during the construction process.

C_ The design was made by the Union of Youth association of the village, including locals adolescents and in the diaspora who contribute to the social emancipation of the local youth. It was based on the official Senegalese module and regulations. The assisting international organisation provided the funding.

D+E_ Both projects were designed by the team of architects, focusing on respecting the local traditions and culture. Their method pursued the idea of transforming natural available resources into a meaningful architecture with a strong identity, achieving the lowest level of entropy and maximum benefit for the local population.

The participatory process was taken into account from the beginning. First they approached the community and explained how the works would progress; and moved on to local workshops so the community could organise itself –for instance, children drew their ideal school in order for the architects to understand their perceptions-. The beneficiaries were also the source of knowledge for any given decision such as where to get materials, how to negotiate, etc…

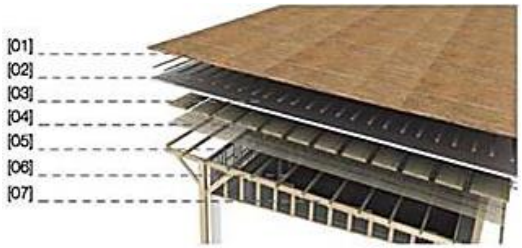
An example of remodelled classroom in Ourong (Source: Base A)

Environmental criteria	**A**	**B**	**C**	**D**	**E**
Materials	Concrete blocks Zinc sheet	CEB blocks Tile roof Red timber framework	Concrete Zinc sheet	CEB blocks Zinc sheet Straw panels Red timber structure	Red timber structure Straw cover Fabric
Transportation of materials	< 30 km	On site < 30 km	< 30 km	On site > 30 km	> 30 km

The typical schools in Senegal are made of concrete and metal sheet on a regular basis, as specified in the official prototype. This does not necessarily mean that they are the best choice for the local conditions.

Project B incorporates local materials that are more adequate to the climate of the region: *compressed earth blocks* (CEB) for the wall structure and micro-concrete tiles for the roof, which improve the inside comfort conditions of the facility.

Project D also incorporates low impact materials: CEB blocks as interprets the tradition to live in contact with the earth, timber structure as natural surrounding element, and a *multi-layer cover* that improves its properties.



Roof layers: 1.zinc + 2.timber tablets + 3.straw + 4.waterproof + 5.insulation wool + 6.timber tablets + 7.drop ceiling (Source: Base A)

Project E uses wood and straw as traditional materials formerly used, but the straw is protected by a waterproof layer to avoid decomposition of the material.

The *transportation* has to be taken into account when choosing the materials. Local materials like CEB blocks used in projects B and D are made on site with the existing earth and sand. In the case of project D this was an advantage since accessibility to the village is very complicated. The community itself built their own bricks gaining a training process. Likewise, using the local manufacturers contributed to the economic development of the village.

In the rest of the cases, materials were purchased in the nearby villages, especially Bignona or Ziguinchor that have the most prominent markets.

It is interesting to note, in the projects designed by architects such as in B, D and E; that the materials chosen are locally made and easily found and, additionally, improve the performance of the facility, as opposed to concrete which is not suitable for warm climate or metal sheet which is not adequate for rainy periods.

The fact that project B does not use the more convenient earth tiles is because the manufacture is quite complex and requires a high temperature oven which is not currently available in the area. In addition to this the process expels a high amount of energy that would cause a greater *environmental impact* so it was rejected.

In addition to this, the use of local materials develops local capacity among the community since they fabricated the materials, which will likely contribute to future self-sustainability.

Local materials manufacture

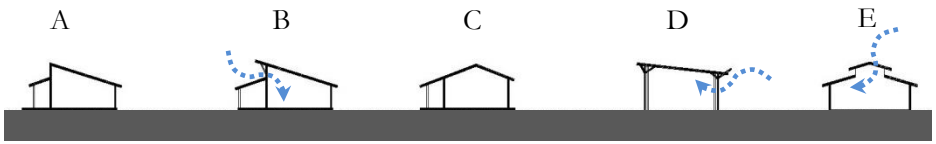
(Source: Base A)

Local community meeting

(Source: Base A)

Comfort	A	B	C	D	E
Lighting	Scarce natural light Artificial	Natural light	Scarce natural light Artificial	Natural light	Zenithal light
Ventilation	No	Yes	No	Yes	Yes
Acoustics performance	Regular/Bad	Good (tile roof)	Regular/Bad	Good noise damping (multi-layer roof)	Good noise damping (Straw roof)
Temperature regulation	Hot in the summer	Good regulation (breathable walls)	Hot in the summer	Good regulation (breathable roof and walls)	Good regulation (Straw roof)

In order to examine comfort issues, the facilities' sections are very illustrative in parameters such as ventilation and light entrance.



A_ The prototype does not have a very good performance concerning the inside comfort of the facility. There is no light entrance besides the side windows, requiring artificial lighting; air is unable to enter since the opening between the roof sheets is covered by a solid wall. Due to the use of zinc as roofing, it is almost impossible to teach inside during rainy periods since the noise is extremely loud. As for temperature regulation, zinc transmits radiation into the classroom and concrete prevents heat from evacuating; therefore the average performance of the facility is quite poor.

B_ The project's team realised the defects in the official module and introduced some improvement into the design. Firstly the opening between the roof sheets is a perforated wall that allows air and natural lighting into the building. Secondly the roof is made of micro-concrete tiles which upgrade the acoustics and thermic performance since it diminishes noise and prevents heat from coming into the facility. The breathable walls made of earth also contribute to the evacuation of heat and improvement of ventilation.

C_ Since the project follows the same specifications of the prototype, the performance is identical.

D_ Some of the criteria accomplished during the design process include a thoughtful ecological design. The enclosure walls are not completely closed at the top to allow constant crossed ventilation and oblique diffused lighting. In combination with the breathable walls, the multi-layer roof offers a good climatic impact. The use of insulation wool in the cover allows the heat absorbed by the zinc sheet to dissipate and also softens the noise.

E_ The light strip created by the double roof allows permanent ventilation and zenithal lighting entrance to the central space where the daily life activities take place.

Heat is also evacuated through this opening and filtrated to the outside through the straw roof, maintaining a comfortable inside temperature. Straw is a good noise dampening material as well.

Project D
interior space

(Source: Base A)

It is determined that in the cases where there is an architect in the design process, such as projects B, D and E; there is a clear intent to incorporate new variables besides the basic standards and to bring local materials into the project in order to make the quality of space better.

Project E
interior space

(Source: Base A)

Construction	A	B	C	D	E
Architect	No	Yes	No (NGO technician)	Yes	Yes
Community	Beneficiaries	Collaboration Training	Labour force Material manufacture Training	Material transportation Material manufacture Training	Collaboration Training

A_ The prototype was implemented by local builders designated by the government. The local community is the beneficiary of the facility.

B_ The construction works were directed and supervised by the Catalan architects on site. The community wanted the same linear building as the prototype since it was the typical typology around. The architects respected their aspirations but taught them how to make CEB blocks and the construction method so they could take responsibility for the process. The participation of the inhabitants was imperative for the organisation.

C_ Since the organization did not have a technical expert, they decided to hire a local builder to lead the works. He was in charge of teaching the community the necessary technical specifications so that they could build the facility by themselves. The NGO only provided the funding for the materials and a managing employee on the field in exchange of the inhabitant's labour force.

D+E_ The facilities were implemented by architects and architecture students volunteering on the field. The local communities were deeply involved in the construction phase. The villages came to life every day with the arrival of students who would benefit from the new schools and were eager to be part of the process. The enormous participation of the beneficiaries allowed them to create their own facilities and learn techniques for the future development of their villages. In the case of D, due to the location of the site, transportation was a major challenge. Both men and women helped equally, while the first transported the materials in their small boats, women and children collected seashells to be used in the concrete.

It is very interesting to see that the projects which benefit from a *technician on the field* –projects B, C, D and E- are the ones where the community was most involved and more importantly, *trained*. This way the cooperation entities are not only leaving a product, but creating capabilities towards self-sustainable communities. *Auto-construction* in developing countries is one of the major challenges: there is not a strong conscience about the need of good foundations – for instance to avoid cracks- or the protection of materials. Most of the times there is even no regulation about this unsafe method; that is why it is important for the community to work with skilled technicians in order to learn and employ technical innovations that will improve their own constructions.

Durability	A	B	C	D	E
	Good structure stability	Good structure stability	Good structure stability	Good structure stability Material protection	Good structure stability Material protection

A_ The durability of the prototype is appropriate, although concrete needs constant maintenance due to the appearance of cracks caused by the variations of temperature. The pillar structure is consistent and resistant.

B_ The CEB blocks were carefully composed and supervised by the technician in order to have the adequate quality. The tile roof is heavier than a metal sheet but well supported by the pillar structure and the walls.

C_ The construction of the facility is based on the same pillar structure as the prototype, therefore its durability is also sufficient if repairing the concrete damage due to usage. According to the community, since the school was built in 2007 there have not been any major damages except for the concrete floor due to permanent use.

D_ The tree–shaped pillars support the structure reinforcing its resistance and stability. Soft materials such as straw in the roof and earth on the walls are well protected and ventilated in order to avoid rotting or deterioration. The facility is well protected against possible building pathologies.

E_ The pillars of the structure are free-standing and support the momentums of the timber hexagonal roof structure. In order to assure its stability, the pillars are braced between themselves with horizontal elements used as benches in the porch area. The straw cover is also protected by a waterproof layer to avoid deterioration.

Project E exterior space

(Source: Base A)

Technicians on the field work based on *good practices* of collaboration with the local population so that they are able to improve the durability of their own constructions.

Vulnerability	A	B	C	D	E
Flooding	Plinth	Plinth	Plinth	Plinth	Plinth
Rain				Waterproof layer Drop ceiling	Waterproof layer
Microorganisms		Red timber		Red timber	Red timber

Considering vulnerability as the ability to withstand the effects of a *hostile environment*, the school facilities in this environment have to face risks such as water effects or termite and mold damage. Some of them have incorporated technical innovations to face these unwanted situations.

A_ The prototype is elevated on a plinth which resists flooding in rainy periods, since the Casamance region can experience torrential rains during summer time.

B_ The project is also elevated on a plinth to prevent the entrance of water in case of an overflow. Additionally, the wooden structure is made of local red timber which is resistant against thermite attacks, which are common in the area.

C_ The facility is erected on a plinth just as the prototype model.

D_ The proposal of an independent roof structure responds to the severe weather conditions of the rainy season. The cover has a waterproof layer that protects the earth walls and prevents the entrance of water into the facility. It also allows the evaporation of retained water and the ventilation of materials.

Nonetheless the facility cannot be too open because local users are not used to air flows and usually feel exposed and cold inside over ventilated spaces.

The building incorporates a drop ceiling, an uncommon element in facilities in Senegal but very efficient, in that it greatly improves the performance of the interior space of the classroom.

The wooden structure is also made of red timber against thermites.

E_ The project introduces a waterproof layer to protect the thatch straw roof and allow its ventilation -so that it does not have to be renewed constantly-. Precisely typical constructions in the area are in a very bad state due to the occurence of roof leaks that damage the roof.

The wooden structure is also made of resistant red timber.

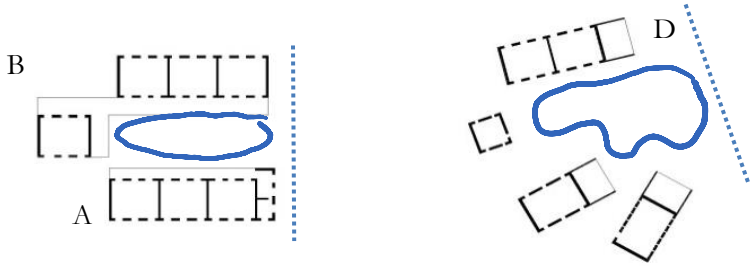
Security	A	B	C	D	E
	Fence Controlled playground	Fence Controlled playground	Fence	Fence Controlled playground	Fence

Security is not a major issue in Senegal since it is a non-violent country; nevertheless the projects are close to border areas so the architects have taken preventive measures.

All of the schools are provided with a *fencing area* to delimitate the facility plot.

In addition to this, in projects A+B and D, the module's disposition creates an intentional *barrier* around the open spaces that assures a controlled playground where children can play safely.

Going back to the subject of *urban planning*, selecting the most suitable plot allows for the school to be located close to the parents' working areas and near the city centres to avoid isolated dangerous areas. Given that there is a lack of urban information, this cannot be taken into account but should be researched.



Outdoors spaces protected by buildings' disposition (Diagrams made by the autor)

Community women collaborating in the construction of the school (Source: Base A)

	A	B	C	D	E
Management	Local Government	Aula Abierta COAC	Local Community	Base A	Base A
Funding	Public local funds	Public foreign funds (Vic's city council, Vic development cooperation council)	Private fundraiser Projecte Xevi NGO	Public and private funds (Kasamu Aku NGO, Centre cooperación per desenvolupament UPC)	Public and private funds
Budget	32.425 €	22.000 €	14.461 €		

A_ The prototype was managed by the local government and funded by the public budget assigned to the education department.

B_ The project was managed by the Catalan association who controlled the material's supply, the schedule and the hiring of local professionals.
Funding came from the municipality of Vic, a town in Catalonia, as part of their cooperation program to development. The fact that the project uses high quality tiles as a technical innovation raises the price of the facility. Even so, the cost is still *one-third less* than that of the official estimated budget.
C_ The Honnoro association, which includes all local organisations of Tendouck contributing to the socio-economic development of the village, was the entity responsible for managing the project.
The NGO collected in Catalonia the sufficient private funding to buy the materials. The facility is a replication of the official model but the correct management and local labour force resulted in an impressive price adjustment, exactly *half of the prototype budget*.

D+E_ The architectural organisation was the technical manager but working together with the cooperation of the community for cultural comprehension and work tasks elaboration. The funding came from both private and public donors and from the participation in development grants.

It should be noted that project B followed the same typology as project A but managed by a technician on the field results in a lower cost of the facility, from 32.000 to 22.000 euros. This shows that the technician can take decisions on the spot and choose adequate materials, saving both time and money.

Project C, which is the cheapest of all modules, was able to reduce its costs because they did not need to hire builders; the inhabitants were the construction staff following the instructions of the technician in place. Ultimately the community has understood the real cost of a school –effort, time and money-; making them more aware of the *importance of its maintenance* and *enhancing the ownership process*.

	A	B	C	D	E
Cultural elements	No consideration	Local materials Porch area	No consideration	Local materials Semi-open classroom Outdoors covered space	Local materials Traditional typology

Senegalese *traditions*, as in any given culture, have very particular characteristics and have to be considered when building a facility in order for the community to connect with the project.

As mentioned before Senegalese people spend much of their time outdoors so open spaces have a very important role inside the community. It is in them that they gather and spend most of their time with their families. It is apparent that projects B and D try to integrate these cultural elements into the design by incorporating protected semi-open areas where people can stay in good conditions, such as a porch area or an outside covered space complementing the classrooms.

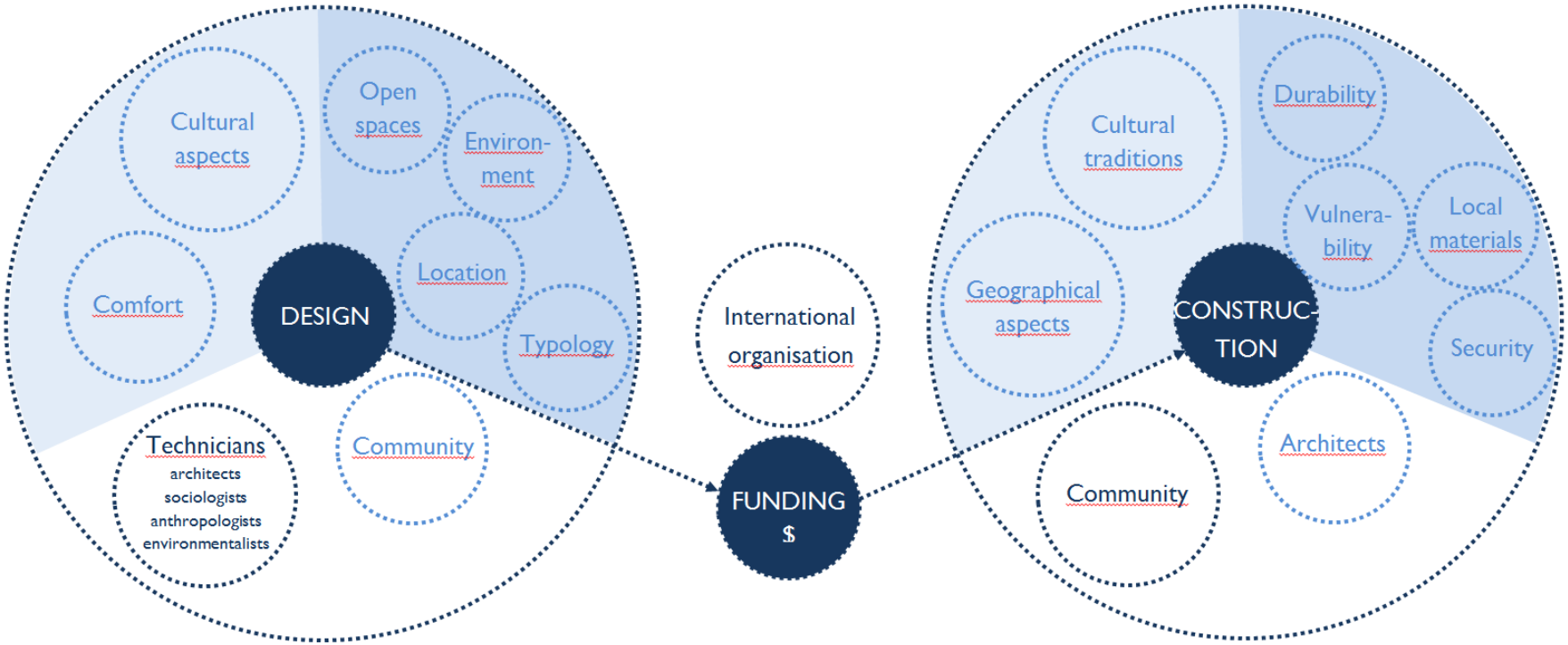
In the case of project E, the design goes a step further in re-introducing the traditional circular typology of the region and straw cover, where the uninterrupted circular space takes all the importance. This way the users can gather under the zenithal roof opening in a well-illuminated and visually connected space. The area can be re-arranged into smaller sections -entry, work, play- through the addition of pieces of fabric hanging from the structure; creating a mixture of light, textures and sensations for the children.

This organic shape is also familiar for the community therefore reinforcing their cultural *identity*. The objective was to create a pleasant space where children can develop their intellectual capacity and begin to unite with what will be their future community. It is the beginning of their citizenship.

In concluding this section, it should be emphasized that the projects that take into account the incorporation of cultural elements which help the facility to be recognised and embraced by the local community are the ones integrating an architect in its design.

Traditional African fabrics (Source: photo taken by the author, 2014)

As a recapitulation of the previous ideas, the following diagram shows the different actors and aspects that should be involved in the design and construction processes; and how available funding provided by international organisation allows the theoretical design to be built in practice.



Going from the designing to the construction process

(Source: diagram made by the author)

5. Conclusions

As the case studies have been further investigated, a series of conclusions and interesting evidences have developed.

When considering building educational facilities, the international organization UNICEF has a very complete *manual* for the implementation of child-friendly schools all over the world. It takes into account everything from technical specifications to cultural aspects in order to make the facility an element of possible transformation in the community.

In the case of Senegal, the governmental regulations in the matter prevail over the UNICEF manual; therefore there are certain deficiencies that need to be addressed. It has been acknowledged that the local guidelines elaborates deeply about the educational system but leaves aside the technical aspects. It is deficient at an architectural level providing only the construction specifications of the *government school prototype*. It has been proven that this model is *not* a valid solution: although the materials are durable and supposedly modern, it fails to provide an acceptable level of comfort and is costly. For instance the metal sheet is not an appropriate material for the country since it causes high temperatures during the whole year and high noise impact during rainy periods.

There is a more urgent need to implement educational facilities in the rural areas, but it is contradictory to build with materials that have to come from the city in poorly accessible areas, instead of the locally available.

About the studied projects:

The prototype A does not fulfil the comfort requirements for a good learning environment or build the local capacity of the community. The typology is too rigid and limited, and is also the most expensive of the projects with 114 euros per sqm. Since financial costs are crucial in development scenarios due to the scarcity of funding, achieving the lowest possible budget is a decisive aspect.
Project B has incorporated an architect in both design and construction consequently the prototype has been technically improved. As a result of this, the costs are reduced to 85 euros per sqm. There is also a considerable improvement in thermal and acoustic performance.
Project C follows the prototype model but thanks to the collaboration of a technician (no architect) on site during the construction, the labour force has been optimised and the community motivated into building the facility themselves. This has led to a significant reduce of the costs, achieving 63 euros per sqm.

Projects D and E have been managed and designed by architects, which has contributed to a better environmental impact and the constant collaboration with the local community. There has been an effort to incorporate traditional typologies, but the community still has many preconceived notions about the suitability of western linear typology.

Since we are talking about development scenarios, time less of a critical issue –as it would be in emergency- therefore *cultural values* should be integrated. As traditions and particularities are implemented into the design, the identity of the community is reinforced enhancing its implication in maintaining the facilities.

We can also conclude that in the projects where an architect is involved, there is a *training process* for the community behind that leaves *capabilities* for their own self-sustainable future.

In the cases of project B and project D, having an architect not only in the design but also in the construction contributes to the improvement of the *basic quality standards* and introduces new thermal and acoustics *technical innovations* such as the tile roof that improves the environmental performance of the zinc sheet, or the multi-layer cover combined with a drop ceiling for a better interior ambience. These solutions, when studied and applied to the particularities of each place, can become useful tools for self-efficiency in the local communities like, for instance, the creation of family micro-businesses of manufacture. Together with local materials it is the key to economic and social development.

One of the outstanding points is the *combination of efforts* between international organisations, local communities and architects towards an effective response. The three actors have a participative and complementary role in the process.

On one hand, the *architect* is not always correct nor has he the necessary knowledge, especially when working in development scenarios. On the other hand, the *community* does not always understand their immediate needs. Their collaboration would likely lead to the overall understanding of the appropriate project. The State currently does not have the capacity to fulfil the requirements of school facilities in the country; therefore *international organisations* need to intervene in order to respond to the high demand. This third actor introducing the necessary funding completes the collaboration process.

The architect is destined to be the mediator between money and needs, what provides the transition from the first to the materialisation of the second. He can take the particularities of a community and transform them into a qualitative project. Once the design is settled, it is time for the community to come forward and take ownership of the project in order to create a successful precedent.

To recapitulate the concepts discussed in the theoretical background, the aspects that *the role of the architect* can enhance in a development project are numerous. Beginning with a holistic perspective of problematics –*vision*- that allows a direct response to people's needs focused on a practicality of use -*needs resolution*-. Additionally, they can integrate the community and work together in the process –*participation*- providing specific knowledge that will contribute to the development of their capacities without external dependency –*training*-. On the technical side, they are an asset for maximum resolution in a minimum time frame -*technical innovations*- and are able to take decisions on site for the most adequate material choice according to climate issues; resulting in a final cost adjustment –*budget reduction*-. Complementary to this, the comfortable space inside the facility is likely guaranteed –*comfort*- and the local cultural elements integrated –*traditions*-; which will optimize the performance of the students at the school.

Ironically, the prototype was conceived to be implemented without the presence of an architect; but in practice it has been proved that it does not fulfil any comfort performance nor integrates the local cultural background. Moreover it is also expensive.

As to *the role of the community*, its involvement in the project guarantees a positive impact in the village. Only with their sense of ownership will they commit to the management and assure the maintenance of the facility.

When the beneficiaries participate in the design and construction processes with their own hands, they understand the human effort and costs of the project; therefore they recognise its value. They can also replicate the learned processes in the improvement of their own houses, eventually becoming self-sufficient.

The lessons learned about architect and community collaboration show that there is a constant durability and sustainability criteria exchange that contributes to a strengthening of their construction techniques. Together with the integration of bioclimatic considerations, it leads to a better performance of the facility. In addition, the learning of traditional materials manufacture provides opportunities for opening new business that will be able to provide the necessary materials for future constructions. All of the above include a cultural and language exchange that enriches the daily relationships.

One of the criticisms encountered during this research is the lack of *urban planning* in development projects. The urban fabric is not defined at all –in fact there are not even available plans of the cities- therefore there is no study of the urban location of facilities. Choosing the adequate plot to place the building is important and supposes an additional tough negotiation. Incorporating the urban strategy into the design is an aspect to be improved.

The relevance of this research is to emphasize that the manuals should recommend the incorporation of the architect into the design and construction processes for development projects since it is the only way to more likely guarantee a qualitative space at a reasonable cost.

But above all it is imperative to ensure that the process of the project becomes an opportunity to generate capacities among the local population and to adapt to the geographical and cultural particularities.

Field of sacred baobabs in Senegal (Source: photo taken by the author, 2014)

BIBLIOGRAPHY

AECID. (2013). *Marco de asociación España–Senegal.*

Amics Escola Pia Senegal. (2004). *Centre social i comunitari a Kabrousse*.

Base A. (2012a). Construcción de escuelas en Senegal. http://www.crowdthinking.org/project/construcci%C3%B3n-de-una-escuela-en-senegal_4012

Base A. (2012b). Enfortiment de l'educació pública a Casamance.

Base A arquitectura i cooperació. (2012). Projecte de rehabilitació i ampliació de l'escola primària d'Ourong. Base A blog oficial.

Benjamin Blankenbehler. (2011). Engaging The Image Of Culture: Post-Modernism of Venturi and Philip Johnson. © Benjamin Blankenbehler Written for University of Idaho 2006.

Berg, E., Wan, R., & Lau, R. (2009). *Cultures of the world: Senegal.* (D. Graham & S. Pee, Eds.) (2nd Editio). New York: Michelle Bisson.

Campamentos solidarios. (2008). Proyecto de construcción y dotación de la escuela de Tambanoumouya, Senegal oriental. Asociación española de Ecoturismo Activo.

Colegi d'Arquitectes de Catalunya. (2014). Presentación de la Aula abierta para la Escuela Diatock. Retrieved April 16, 2015, from https://www.arquitectes.cat/es/presentacion-aula-abierta-escuela-diatock

Craven, J. (1999). Architect Mies van der Rohe. Retrieved April 19, 2015, from http://architecture.about.com/od/20thcenturytrends/a/Mies-Van-Der-Rohe-Quotes.htm

Demanesse, M. (2006). *Educación , formación y codesarrollo desde España.*

Denton, J. A. (1990). *Society and the Official World: a Reintroduction to Sociology.* (General Hall, Ed.). Boston: Rowman & Littlefield.

Dia, M. (2014). *3052.* (M. Dia, Ed.) (3ª edición).

European Commission. (2014). *International Cooperation and Development: fighting poverty in a changing world. State Government*. Retrieved from http://europa.eu/pol/index_en.htm

Fathy, H. (1973). *Architecture for the Poor: An Experiment in Rural Egypt.*

Fathy, H. (1978). *The art of living in the cultural revolution.pdf.*

Fathy, H. (1994). Architecture and environment. *The Arid Lands Newsletter*, Issue No. 36 p.20–25. ISSN: 1092-5481

Federation of the Free States of Africa. (2007). Casamance: Geographie - Economie - Culture. Retrieved April 23, 2015, from http://www.africafederation.net/Casamance_Geo.htm

Goldberger, P. (2009). *Why Architecture Matters.* (N. Ovedovitz, Ed.) (Yale Unive). Pennsylvania: Louis Stern Memorial Fund.

Harries, K. (2000). *The ethical function of Architecture*. (MIT press, Ed.) (3rd editio). New Directions Publishing Corp.

Kane, K. (2010). *Gambia y Senegal*. (Editorial Planeta S.A, Ed.) (2ª edición). Lonely Planet Publications.

Kane, L., Diop, B., & Sy, A. A. (2010). *Senegal, effective delivery of education services*. (AfriMAP, Ed.). Open Society Initiative for West Africa.

Mairie de Tendouck. (2011). Le village de Tendouck. Retrieved April 17, 2015, from http://www.tendouck.net/component/content/article/52-presentation.html

Master International Cooperation Sustainable Emergency Architecture. (2015). Teddy Cruz on mediating from bottom-up to top-down. Retrieved May 4, 2015, from http://masteremergencyarchitecture.com/2015/teddy-cruz-on-mediating-from-bottom-up-to-top-down

Ministère de l'éducation nationale. (2013). *Normes et standards de qualité en education et formation*.

Ministerio de Asuntos Exteriores y Cooperación. (2005). *Plan Director de la Cooperación Española 2005-2008*. NIPO 502-05-007-6

Naïr, S. (1997). *Rapport de bilan et d'orientation sur la politique de codeveloppement liee aux flux migratoires*.

Nogué, J., & de San Eugenio, J. (2011). La dimensión comunicativa del paisaje. Una propuesta teórica y aplicada. *Revista de Geografía Norte Grande*, *49*, 25–43.

Oficina de información diplomática de España. (2012). *República de Senegal*.

Olivié, I. (2007). *¿Es coherente España con el desarrollo de Senegal?* Real Instituto El Cano.

Programme Solidarité Eau. (n.d.). Agir dans le secteur de l'eau et de l'assainissement. http://www.pseau.org/fr/senegal/contexte

Projecte Xevi. (n.d.). L'escola de Tendouck.

The World Bank Group. (2015). Climate Change Knowledge Portal. http://sdwebx.worldbank.org/climateportalb/home.cfm?page=country_profile&CCode=SEN

Tomàs, J. (2005). *La identitat ètnica entre les joola d'Oussouye*. Universitat Autónoma de Barcelona.

UNESCO. (2000). Education for All Movement. http://www.unesco.org/new/en/education/themes/leading-the-international-agenda/education-for-all/

UNICEF Canada. (2008). *Helping to make your classroom a global schoolhouse*. Toronto.

United Nations. (1992). *United Nations Conference on Environment & Development in Rio de Janerio, Brazil. Reproduction*.

United Nations. (2010). Millennium Development Goals. Retrieved April 19, 2015, from http://www.un.org/millenniumgoals/bkgd.shtml

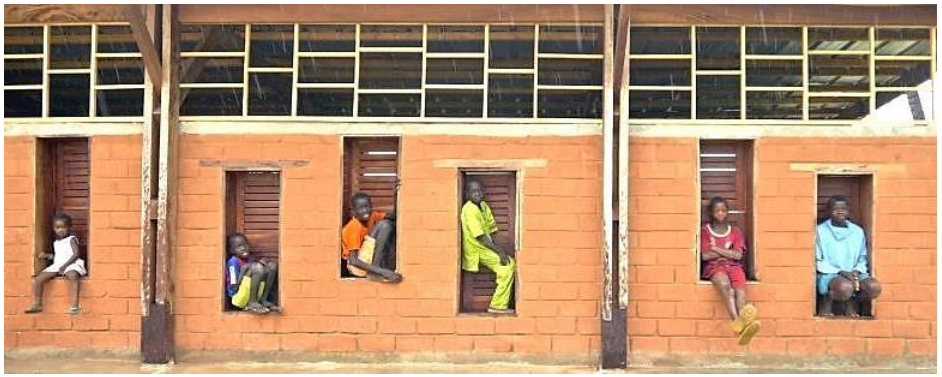
United Nations. (2014). *The Millennium Development Goals Report 2014*.

Vidal, P., Albaig, J., & Mart, S. (2009). *Codesarrollo: conceptos básicos y gestión de proyectos*.

World Health Organisation. (n.d.). Development Cooperation. http://www.who.int/trade/glossary/story016/en/

Wright, C., Mannathoko, C., & Pasic, M. (2006). *The Child-Friendly School manual*. New York.

LIST OF FIGURES



Children of Ourong's school (Source: Base A)

Children are the catalyst for change and the hope of Africa. Guaranteeing their favourable education is the only way of ensuring an engaged youth that will struggle for the economic and social development of their continent.