

## Building with Stone | Methods and Tools

### Context

Building with stone is not new to the Sahel. Here and there, one can see buildings, often made of dry stone, which withstand the passage of time. People in Chad often use palisade fencing made from woven plant material, sun-dried brick or fired clay bricks for building. These materials are locally available and the construction methods are well-known. Structures made of woven plant material or sun-dried brick do call for regular maintenance, though, whereas fired clay brick is weather-resistant and needs less upkeep. People also build with breeze blocks, but these are more expensive, as are fired clay bricks, and the breeze blocks are often of inferior quality.

Ideally, buildings should be better equipped to withstand the ravages of time. Frequently, techniques for public buildings use fired clay brick and breeze blocks as the main construction materials. This type of construction has a high environmental impact. Stone, a material that is often available locally, enables the construction of solid buildings that are highly weather-resistant, less expensive, more durable and cost less to maintain.

The *Programme for Decentralised Rural Development* (PDRD) has tried to promote this type of construction via its *Decentralised Development Fund* (DDF) component in places where material was available. Contractors and masons needed to be trained, and the agreement of local organisations and authorities had to be obtained.

The sub-programme PRODABO built model buildings in its compounds to demonstrate the material's attributes. The use of stone makes it possible to develop a new market for local products, to increase local technical expertise and at the same time to reduce the effects of desertification. A lot of wood is used for firing clay bricks, particularly since the traditional firing techniques are not energy-efficient. A governmental decree has banned the use of green wood and charcoal since 2004, thereby reducing supply sources and increasing costs, since charcoal is now imported from Cameroon.



### Stakeholders

#### a. The population

The people have defined their development plan, identified their priorities, sat on the DDF's grants awards committee, and taken part in designing and building the structures they own. As the contractors, they also manage the buildings via a management committee.

As in all its activities, the programme applies a labour-intensive approach, which creates jobs and instructs labourers in simple work techniques. Above all, the local people, as contractors for the buildings, protect the community's interests and comply with the democratic principles promoted by the programme.

#### b. The management committee

Before applications for technical and financial support are approved by the grant awards committee, a management committee is set up by the people. This committee has the task of monitoring the project. Once the project has been approved, it ensures that the committee receives management and maintenance training. During the construction phase, the committee manages the workforce and takes part in construction site meetings. After the building has been completed, the committee signs the final acceptance for the building and assumes complete responsibility for it.



### c. Executing agencies

According to the rules of the DDF component, after the project has been accepted by the grant awards committee and the contractor has been selected (following an invitation to tender to local contractors recognised by the DDF), the contractor signs an agreement with the management committee to apply the labour-intensive approach and makes sure that labourers are selected from the community that will benefit from the building.

A supervisory office monitors how work is progressing. Once this has been completed and approved, the management committee and the project sign the acceptance of work done.

### Activities

PRODABO has built 144 stone buildings and 6 fired clay brick buildings, due to the distance of quarries for obtaining stone. The following table shows the comparative costs. (see Table 1)

The following table taken from the Moguena study shows all the buildings that have been completed and their individual costs.

### Products and their use

- Training for beneficiary communities: training in building and maintaining the structures
- New construction techniques that apply to all the buildings: homes, commercial buildings, schools, health centres etc.
- Capacity building for the local people with regard to drawing up and implementing the local development plan.

### Direct results

- 47 community buildings
- 64 commercial buildings
- 36 water-spreading weirs
- 3 hydraulic structures
- Possibility of creating jobs: buildings, stone cutting, transport.

### Monitoring and evaluation

As with all PDRD activities, the construction of stone buildings was monitored. Contractors had to attend training courses on DDF rules, as well as on certain construction methods. The management committees were prepared for assuming their role in the construction and maintenance process, and also for assuming their responsibilities towards the people.

A technical, economic and social assessment of the implemented project is jointly drawn up by all stakeholders. The aim is to analyse each of the phases in the implementation process, evaluating the technical, economic and psychosocial aspects.

### Scaling up

Building with stone makes it possible to show the people that using local materials, if they are available close by, is cost-effective during construction and also simplifies maintenance. The techniques for making fired clay bricks are costly in environmental terms. Charcoal making is now forbidden by the government, so producers are faced with dwindling supply sources and customers are obliged to import charcoal from neighbouring Cameroon.

The programme has already trained contractors and masons in the region where it operates, but this method is promoted via the construction of public buildings and the training of contractors and local masons. The government might therefore help to promote the approach in other regions.

The new construction methods also constitute a major gain for the local people, who are now familiar with other types of buildings and construction methods.

### Environmental impact

Building with stone is good for the environment as far as the use of materials is concerned. The environmental costs of transporting stone are minimal compared with the carbon footprint

**Table 1: Comparative costs of stone buildings. Moguena, 2010**

Item	Type of building	Cost of stone building in FCFA	Cost of breeze block building in FCFA	Cost of fired clay brick building in FCFA
1	Type 1 health centre	40,408,670	40,120,405	43,664,225
2	Type 2 school	37,000,000	35,336,905	39,207,437
3	Type 1 shop	13,725,109	14,382,040	16,775,500





**Table 8: Average costs per type of building (source: PRODABO-DDF)**

Item	Type of building	Number	Construction	Works control	Total cost
1	Type 1 school	6	26,000,000	2,232,500	28,232,500
2	Type 2 school	26	37,000,000	3,220,258	40,220,258
3	Type 1 shop	45	13,725,109	1,372,509	15,097,618
4	Type 2 shop	8	16,375,453	1,481,212	17,856,665
5	Health centre	12	40,408,670	3,410,672	43,819,342
6	Teacher's accommodation	2	14,200,000	1,294,470	15,494,470
7	Literacy centre	1	13,900,000	1,251,000	15,151,000
8	Vaccination yard	4	8,365,780	643,950	9,009,730
9	Type 1 slaughterhouse	5	10,064,269	814,646	10,878,915
10	Type 2 slaughterhouse	2	16,203,230	1,620,323	17,823,553
11	Water-spreading weirs	36	8,000,000 to 20,000,000	1,400,000 to 4,200,000	21,400,000 to 72,200,000

for importing concrete from Cameroon or Nigeria. These costs are even higher if buildings are made from breeze blocks.

Secondly, the use of stone rather than fired clay brick spares tens of thousands of trees each year in a region where desertification is widespread.

The life expectancy of a stone building is certainly more than 80 years for the foundations and walls, with minimal maintenance. The life expectancy of the roof and openings depends on the chosen quality. This durability, added to the fact that there will be no need to rebuild the same structure in years to come, adds to its environmental value.

## Constraints

The first constraint is one of habit: few people are familiar with this method, and even if such buildings can be seen in town, that does not mean other people are willing to build in the same way.

The building costs are favourable as long as stone is available locally, but transport costs may put a strain on the construction budget. These costs can, however, be quickly recouped in view of the life expectancy and low maintenance costs of such structures. Calculations need to be made to determine the break-even point. This data can then be used in promotion campaigns targeted at ministries, donors and contractors.

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I [www.pdrd-tchad.org](http://www.pdrd-tchad.org)  
E [ctp.prodabo@yahoo.fr](mailto:ctp.prodabo@yahoo.fr)

Post Box 99, Abéché, Chad

**Contact :**  
E : [giz-ts Chad@giz.de](mailto:giz-ts Chad@giz.de)

Linh Feldkötter  
E : [linh.feldkoetter@giz.de](mailto:linh.feldkoetter@giz.de)

**Author:**  
Jacques Picard  
E : [jpica rd@gmx.de](mailto:jpica rd@gmx.de)

**Design:**  
creative republic  
Thomas Maxeiner Visual Communications,  
Frankfurt a. M./Germany  
T: +49 69.91 50 85 - 60  
E: [t.maxeiner@creativerepublic.net](mailto:t.maxeiner@creativerepublic.net)  
I: [www.creativerepublic.net](http://www.creativerepublic.net)

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