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**SHELTER**

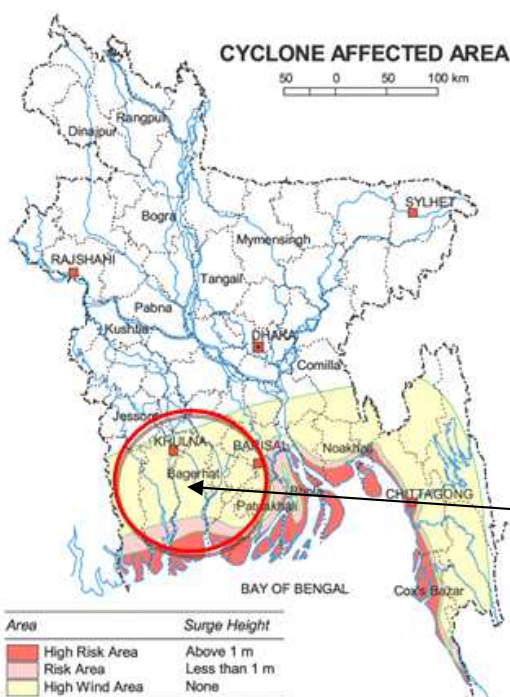
Project **Community Based Disaster Risk Reduction Program**  
Project name **Adorshogram Multipurpose Cyclone Shelter**

Country	<b>Bangladesh</b>
Region/town	<b>Bagerhat Sarankola</b>
GIS data (WGS 84)	<b>22°17'25.40"N 89°47'17.19"E</b>
Project type	<b>New construction / DDR</b>
Typology	<b>Community based multi purpose shelter</b>
Approach	<b>Private sector contracted construction</b>
Beneficiaries	<b>Local communities affected by the Cyclone Sidr 2007 and Alia 2009</b>
Climate	<b>Hot, humid</b>
Special constraint	<b>Storm / Flood / Earthquake</b>
start / end of project	<b>2010 / 2012</b>
Country GNP	<b>784 USD/cap (2010)</b>



**Partners**

- Organization (donor) SDC Regional Cooperation + Humanitarian Aid
- IO/NGO partners Bangladesh Disaster Preparedness Centre (BDPC)  
Ashroy Foundation (AF)
- GO partners Ministry of Food and Disaster Management (MoFDM) and the Disaster Management and Relief Division (DMRD) and Disaster Management Buro





## Context to project

### Initial Situation

The Cyclone Sidr hit the south and south-western parts of Bangladesh in November 15, 2007 and killed nearly 5'000 people and caused severe damages to livelihoods, housing and crops. Some 8.7 million people (2 million families) of 103 Upazillas (sub-districts) in 710 Unions (communities) had been affected. Shelters – many are at the same time accommodating schools – provide a vital first line of defence against cyclones, alongside early warning and increased awareness and preparedness. People often hesitated to leave their animals behind, delayed their departure to the shelters and got trapped in the storm. Moreover, many of the existing cyclone shelters which are combined with schools proved to be non-functional or remained closed in emergency situations. According to the Government, beside the need for replacement or renovation of hundreds of old shelters, the country still needs over 2'000 additional units.

Cyclone Aila 2009 On the 25<sup>th</sup> May 2009 the cyclonic storm "Aila" hit the south western part of Bangladesh (Khulna Division), affecting more than 3 million people and killing approximately 190. Several hundred thousands of homes were washed away when wind-driven tidal surges up to 3 meters destroyed the coastal belt. Many areas of the affected districts were inundated and houses, roads and embankments were damaged

### Goals, Beneficiaries

After the withdrawal of the Swiss Red Cross, the only candidate able to guarantee a professional implementation of the construction for such buildings in the desired quality and at the same time for organising the complex community work, was the Swiss Humanitarian Aid Unit SHA, which had already a tested implementation experience in Bangladesh and India for the construction of multi-purpose cyclone shelters with *kilas* (previous SDC programmes implemented in the 1980's and in 2004). In spring 2009 the SDC Humanitarian Aid agreed to join the undertaking for cyclone shelters and engaged to finance all project management costs. This led to the credit: SDC HA 7F-06209.01 CHF 980'000.- from 20.04.09 – 30.11.12 for the overall project management for 12 Multipurpose Cyclone Shelters (planning, construction, community work). Encouraged by Government and the wider community, SDC HA later became aware that there would in fact be enough capacity in the Khulna Office to build 5 more shelters in particularly vulnerable locations. This led to the signature on the 23.09.10 of the credit: SDC HA 7F-06902.03 CHF 1'150'000.- from 01.09.10 – 31.08.12 (construction phase III for 5 units). As it was not possible to cover all cyclone shelter needs only with a school-cum-shelter approach, SDC took the challenge to set an example – in most remote and greatly exposed areas – with buildings that would be entirely community-managed and multi-purpose. This should at the same time also serve as example for multifaceted knowledge building and as a contribution to the setting of standards.

Overall goal:

- Casualties are reduced in a long term
- Activities generate sustainable income for maintenance

### Implementations / Results

With the handing over of the 12 Multipurpose Cyclone Shelters the communities in the catchment areas became sustainably protected against cyclones with a capacity coverage of almost 18'000 person. With a 2 years follow-up project for Community Work it is envisaged to consolidate the achieved results and to use the concept as replicable example and standard setting for the many other existing or future shelter locations of other institutions. Preparedness and reduction of risks for lives and livelihoods of the coastal vulnerable communities is increased through improved ownership and capacities of communities to manage and exploit the multipurpose cyclone shelters and improved skills and capacities on DRR



### Reference data (comparative)

Occupants max.	1300 persons		
Ground floor	328m <sup>2</sup>		
First floor	328m <sup>2</sup>		
Roof floor	25m <sup>2</sup>		
Total house area	681m <sup>2</sup>	Surface / occupant	0.52 m <sup>2</sup> /cap
House volume (outside dimension)	3567m <sup>3</sup>	Volume / occupant	2.74 m <sup>3</sup> /cap
Number of rooms	6 + technical and sanitation rooms		
Ranking in strenght	<b>1</b>	Result according to the Bangladesh Codes of construction	<b>143%</b>
cost /unit *	183'332 USD	cost/occupant	141 USD/cap
cost/m <sup>2</sup>	269 USD/m <sup>2</sup>	cost/m <sup>3</sup>	52 USD/m <sup>3</sup>
	*15'267'891 BDT Exchange rate 30.6.12		

### Approach to results



Adorshogram entrance



## Initial Situation

1) Contribution to the reconstruction and/or the improvement of cyclone shelter; the specific objective is to save lives in the case of cyclones and floods by improving the infrastructure as multifunctional installations and by setting up community based management schemes for the shelters.

2) Strengthening of disaster awareness and preparedness; the specific objective is to improve the ability of coastal communities to react against natural calamities in preventive ways and therefore, to reduce their respective vulnerability.

3) Strengthening the recovery of rural production under a DRR perspective; the specific objective is to restore productive infrastructure in a "refinement rehabilitation" way, thus, to re-establish food security and to re-animate the local economy in the affected areas.

## Approach

Specific elaborations to SDC's Multipurpose Cyclone Shelters

Community ownership

Experience shows that the prerequisite for a successful implementation of any project in remote areas of Bangladesh is the active involvement and genuine interest of the targeted local communities. SDC in close consultation with relevant communities in exposed remote areas and with government authorities opted for an innovative approach in the framework of a Community Based Multipurpose Cyclone Shelter Programme whereby both, the government on local level and the communities would be part and would be consulted during all stages of the project:

- Decision to construct "Multipurpose Cyclone Shelters" (and not school-cum-shelters)
- Shelter locations in remote areas where no other shelters are available
- Land to be donated by the community
- Focus on protection for the poorest and the most vulnerable
- Due inclusion of gender aspects
- Combination of human- and livestock-protection
- Combination of construction- and community-work (mobilization, awareness, preparedness)
- Inclusion of maintenance- and business-planning (use of the shelters during normal times)
- Advocacy for shelter issues on local-, district- and national level

During the planning and construction of the shelters the communities were actively involved in:

- Definition of the shelter locations, shelter designs and shelter use during regular time
- Land registration (plot donated by community members)
- Definition and planning for long-term shelter management and maintenance

The SDC Cyclone Shelters – compared to others - contain improvements / new components:

- The first floor of the shelters is reserved for the livestock, frequently representing the communities most valuable assets and livelihood
- Solar panels, a generator and a rainwater collecting system for drinking water in the shelters allow an independent functioning during times of disasters
- Besides the challenging civil engineering task, community involvement and mobilisation through capacity building is a fundamental project element
- After construction the cyclone shelters are handed over to the communities, who are thereafter the legal owner and responsible for its management and maintenance
- The shelters are multipurpose, meaning that during normal times they can be used as a community asset for social events or to generate further income to cover maintenance costs

The shelter construction was implemented by SDC-HA (SDC-HA Khulna Office with an SHA Project Manager) in cooperation with local contractors.

The community mobilization and the capacity building for awareness / preparedness was done by SDC partners: Ashroy Foundation and Bangladesh Disaster Preparedness Centre (BDPC).

*Depending on the shelter size (4 big and 8 slightly smaller shelters) each shelter has space for 1'000 - 1'300 people and for 330 - 460 cows or 830 - 1160 sheep / goats.*



Thorough consultation and particular attention on quality and needs

- Close consultation / coordination / cooperation with Communities, Relevant Government Departments, Other Donors, partner- and other NGOs
- Solid foundations (cast in situ pile foundations); basement pillars, beams and slabs are made of reinforced concrete; external walls with 15 or 20 cm bricks plus plaster and paint; windows are metallic with fixed louvers or openable shutters. Doors are made with wood for rooms, PVC for toilets and metal for access doors and technical rooms
- Separate space for female/children/aged and male; separate toilets for each of these groups; 1<sup>st</sup> aid facilities and separate rooms for sick and injured; room for equipment, food and seed storage;

The project was developed and managed according the following steps:

### **1. Preparation and selection**

- Selection of the most communities in need through SDC-HA according to authorities/assessment list
- Definition of the needs through SDC-HA together with the communities.
- Meetings with local authorities (existing, planned shelters) through SDC-HA.
- Getting plots from the communities through SDC-HA.

### **2. Planning and control**

- Architectural studies. (from preliminary project to construction plans done from a local architect after pre-selection).
- Technical studies. (from foundations to roof, incl. soil, water and electricity)
- Technical documents. (Drawings, bill of quantities, details)
- Tender procedure, definition of method of construction, selection of contractors.
- Contract with contractor, construction works through SDC-HA.
- Site supervision, regular reports, payments to contractors through SDC-HA.
- Technical reception.
- Handing over to the local communities through SDC-HA.
- Guarantee period and release of guarantee retention after three months through SDC-HA.

### **3. Construction and Equipment**

- All foundations (piles and pipes caps) and grade beams are made of reinforced concrete with stone chips and not brick chips.
- Building have reinforced concrete share walls for better stability and resistance against earthquake.
- The cross ventilation is considered for each room.
- All access roads, ramps and when necessary bridge are included.
- Generator; in closed space.
- Solar panels and batteries
- Water well and pump for washing & bathing purposes.
- Rain water harvesting system, with tanks for drinking and cooking purposes.
- Toilets facilities at first floor, separate men and women including also children toilets.

### **Problems/Constraints**

The construction constraints are related to the necessary strength of the building to resist cyclones, but also to the particularly difficult locations where it has to be built. Specific constraints were:

- Access; inavailability of roads or in bad condition;
- Nature of the soil; often need for special foundations
- Durability; saline aggressive water, humidity.
- Maintenance; resistant materials.



## Humanitarian Aid construction group

- Quality of construction materials; brick chips concrete.
- Difficulty of supply: transshipment of materials (Bricks, cement, rods)
- Insufficient or little knowledge of good workmanship of most of the construction workers due to the insufficient wages and salaries for local labourers thus little motivation for good work

### Lessons learned

At this stage we want to demonstrate that our investment is sound. For this we have to compare the total of effective and expected cost against the total of effective and expected benefits. We want to describe that the benefits outweigh the costs, and by how much. We want to calculate the benefit for an individual person and we also want to elaborate the benefit in broader terms. It is therefore important to focus not only on financial terms but to include appropriate socio-economic elements in order to correctly visualize the overall potential and the investment benefits (direct and indirect) in the field of prevention and preparedness (investment, result and impact).

Current situation (end of June 2012):

- All 12 communities are duly trained (DRR preparedness, Comprehensive Shelter Management)
- All 12 shelters are handed over and legally registered as community asset

Continued support for community work with local NGO Ashroy Foundation until 31.12. 2013:

- Further consolidation of disaster preparedness and risk reduction
- Further optimization of comprehensive and sustainable long-term shelter management
- Monitor progress and compile experience for benchmarking with other shelter projects
- Participate in advocacy undertakings for better protection of most vulnerable groups

The main difficulties which we faced during the phases I, II and III was the lack on knowledge and lack of motivation often recognized due to the insufficient small salary which resulted in selection of good skilled laborer by the contractor. If SDC would give restriction and regulation in the BoQ in advance more benefit could directly transfer to the laborer thus selection of better skilled workers will be possible cause better paid and better efforts made to overcome them. This may include PCM-related challenges.

Where is the project with regard to replicability and scaling up?

General: After completion of any construction phase and before going into the next phase, it is highly recommended to check and discuss the whole construction period. Together with all the involved engineers and architects inclusive SDC engineers should be evaluated and sorted out negative details and bad running construction processes.

This project can be replicable with adjustments in the design (i.e. improvement in the roof design resulting in more rainwater harvesting). In the table below we describe the results of SDC quality test which we have forwarded to all construction firms. This result show of our last 8 of 12 Shelter building have passed Bangladesh Codes of Construction clearly.

OVERALL RANKING	Overall strength	Khulna Engineering University LABORATORY	Overall SDC testing	Shelter name	Contractors name	SDC Khulna test COLUMNS				SDC Khulna test BEAMS				SDC Khulna test SLAB			
						Basement columns required strength 3600 PSI	Ground floor columns required strength 3600 PSI	First floor columns required strength 3600 PSI	ranking over 100%	Basement floor beam required strength 2600 PSI	ground floor beam required strength 2600 PSI	first floor beam required strength 2600 PSI	ranking over 100%	Basement slab required strength 2600 PSI	Ground floor slab required strength 2600 PSI	first floor slab required strength 2600 PSI	ranking over 100%
1	143%	158%	139%	SDC- A Adorshogrom	Azmal Hossen Mukta	4253	4240	4191	121%	3304	3485	2973	130%	4106	4039	4230	165%
6	137%	135%	138%	SDC- S1 Sonatola**	Roy Enterprise	4172	4273	4253	121%	3351	3038	2851	123%	4137	4118	4379	168%
5	138%	146%	136%	SDC- S2 Sonatola	Roy Enterprise	4306	4229	4185	121%	3171	3052	3078	124%	4105	3992	4031	162%
3	140%	141%	140%	SDC- D Dhansagar	Roy Enterprise	3996	4402	4523	123%	3335	3302	3118	130%	4166	4080	4297	167%
7	132%	139%	130%	SDC- E E.Khontakata	Mizan Construction	3988	3812	3778	110%	3489	3045	2679	123%	3502	3953	4281	156%
2	142%	162%	135%	SDC- J Jilbungia	Azmal Hossen Mukta	3665	3891	3649	107%	3038	3222	3311	128%	4147	4357	4281	170%
8	126%	136%	123%	SDC- R Rajoir	M/S Sikder Traders	3790	3746	3637	106%	3177	3360	3067	128%	3014	3701	3398	135%
4	139%	138%	139%	SDC- V Varampirpar	Faisal Traders	4215	4271	4153	120%	3498	3563	2958	134%	4068	4246	4025	165%

### Evaluation

Proposed by end of continued support for community work with local NGO Ashroy Foundation by 31.12. 2013:



## Legal framework

<b>Politically attached to</b>	Memorandum of Understanding with the Ministry of Social Welfare
<b>Type of ownership</b>	Community owned multi purpose shelter

## Construction information

### Construction

<b>Structure</b>	Foundations	All foundations (piles and pipes caps) and grade beams are made of reinforced concrete with stone chips and not brick chips.
	Walls or columns	Building have reinforced concrete share walls for better stability and resistance against earthquake.
	Facade	Combinde construction type pillar, beam structerd with brickwalls in between bothside plastered and painted
	Roof	Flat roof with inclined topping without any additional roof or heat protection
	Earthquake protection	According to the Codes of Bangladesh no backstopping through Swiss engineers
<b>materials</b>	Floor surface	Cement coating
	Walls	Brick plasterd and painted
	Doors	Wooden, varnished painted doors
	Windows	Irond window shutters painted light grey
	Ceiling	False ceiling with painted timber boards
	Thermo insulation	None
	Roofing	
<b>watsan</b>	Water	Water well and pump for washing & bathing purposes.
	Toilets	Toilets facilities at first floor, separate men and women including also children toilets.
	Waste water	Setic tank over soak pit
<b>equipment</b>	Rain water	Rain water harvesting system, with tanks for drinking and cooking purposes
	Heating system	Not requirred
	Electricity connection	Standart installation with light tubes and pulps, ventilators and power plugs. Emergency ilumination additional served by solar power. Generator; in closed space. Solar panels and batteries
	Telephone connection	Lautspeaker and flagpost for community warning
	Cooking facilities	None



**Urban planning**

<b>Distance to</b>	Health center	None
	Education facilities	None
	Income activities	Yes by Inclusion of maintenance- and business-planning (use of the shelters during normal times)
	Public transport	None

**For further information**

Involved SHA construction group consultants	Francois Poffet, Markus Sprenger and Marc Zimmermann
Other involved SHA consultants	Next Door Consultant and Living System Consultant Consortium; architects and engineers
Author / Contact:	Markus Sprenger
Recommended Institutions:	N/A
Recommended partners:	BDPC Dhaka Ashroy Foundation Khulna
Recommended books/reports:	End of phase report by Matthias Anderegg
Relevant other projects (links):	<a href="http://www.jica.go.jp/bangladesh/english/activities/activity01.html">http://www.jica.go.jp/bangladesh/english/activities/activity01.html</a>
Annex	

Relevant illustration





