

Low Carbon Construction Training Report

Building Professionals – Madhya Pradesh

3rd – 4th November 2012



Contents

1. Background	2
2. Training Approach	3
3. Training Process.....	3
Introductory Session.....	3
Session 1: Current Scenario	4
Session 2: Strategy for Change.....	6
Session 3 : Application	8
4. Observations and Lessons Learnt	8
Participation:.....	8
Sessions:.....	8
Evaluation:	9
5. Annexure 1 : Agenda.....	10
6. Annexure 2 : List of Participants.....	11
7. Annexure 3 : Group Work Output	13
8. Annexure 4 : Press Coverage.....	23

1. Background

A workshop on Low Carbon Construction was held on 3-4th November 2012 at the School of Planning and Architecture, Bhopal. The workshop was organized in collaboration with the Development Alternatives Group, New Delhi and supported by the Climate and Development Knowledge Network (CDKN), UK. The two day workshop aimed to orient building professionals towards using low carbon construction concepts while designing buildings in semi arid spaces like Madhya Pradesh. The workshop was attended by over 35 architects, planners, engineers and building professionals from Bhopal, Raipur and Delhi.

Climate change is a reality today. The impacts of climate change have been felt in varying degrees in different geo-climatic regions across the globe. The construction sector particularly shares an intertwined relationship with climate change. The construction sector meets one of our basic needs i.e. habitat and shelter. Buildings are constructed to shelter people from the worst of weather and climate. Building construction and operation activities have extensive direct and indirect impacts on the environment as the sector is very resource intensive. The sector also contributes substantially to national Green House Gas (GHG) emissions at about 22 %.

On the other hand, the impacts of changing climate are keenly felt by the sector. Design and construction of buildings need to ensure climate resilience to resist climatic extremes of uncomfortably hot or cold temperatures, high velocity winds and intense precipitation. An increased tendency of extreme climatic events places additional demands of durability and performance on buildings.

The practices in the construction sector of Madhya Pradesh that aggravate climate change need to curb their impact on the local environment by,

- Reducing ecologically detrimental methods of sourcing building materials.
- Using more energy efficient construction technologies.
- Ensuring minimum amounts of energy used in the operation of buildings constructed.



Figure 1: Climate change and Construction Links

The Government of India has recognised the need for action in the Low Carbon, Climate Resilient (LC-CR) sector. However, there is a lack of attention towards the 70 million strong rural spaces and small towns which are emerging as areas of high growth. This training workshop aimed to bridge this gap by generating knowledge support for LC-CR solutions for small towns and rural spaces to build capacity for Building Professionals.

The workshop is part of a larger initiative that seeks to generate knowledge support for LC-CR solutions for small towns and rural spaces by building capacity at three levels, viz. Policy Makers, Building Professionals and Artisans. It also attempts to influence policies and building practices in response to imminent climate change trends and need for low carbon construction.

The objective of the workshop were to :

- Understand concepts and dynamics of climate change and the construction sector
- Learn concepts of carbon and energy intensity
- Learn about passive design strategies and alternate building material
- Know about different policies influencing low carbon construction
- Apply strategies to a real like context



Figure 2 : The Participants

2. Training Approach

The approach adopted for the training workshop was participant centred, with an emphasis on applying strategies discussed in practice. In order to bring conceptual clarity on subject matter, expert lectures supported with power point presentations were followed by discussions with the participants. Case studies and a site visit were used to enable the participants to see the application of principles and designs discussed during the workshop. A group exercise further encouraged them to apply these principles to their design.

“The “eco-centric” school of thought feels that ecological principles should be honoured where as the “techno-centric” school of thought thinks that technology has all solutions to every problem i.e. whatever problem comes technology will solve. I see alternative technologies as an initiative that brings in a balance - alternative technologies have certain inputs of technologies *based* on the ecological principles.”
– Sanjeev Singh

3. Training Process

Introductory Session

The Welcome Address was delivered by Architect. Sanjeev Singh, Associate Dean of SPA Bhopal. He traced the history and evolution of the ideology of sustainable development, summarizing events beginning with the release of the Silent Spring, Rachael Carson in the 1960’s. His address touched upon the Development Alternatives Group’s (DA) pioneering work in the field of sustainable habitat and development. DA’s school of thought of combining ecological principles with technological solutions was spoken about with reference to the number of alternate technologies available for the semi-arid region of Madhya Pradesh. He

emphasized SPA Bhopal's encouragement of design practices of minimum intervention, learning from time-tested vernacular construction techniques and principles and using building materials that do not need secondary and tertiary levels of processing to be made usable for construction. He also announced SPA Bhopal's plan to construct an Alternate Technologies Demo Centre on its new campus in Bhauri.

After the inspiring welcome, Kriti Nagrath, DA, gave the participants an overview of the planned agenda and workshop expectations. Shreya Kalra, DA, introduced the workshop with a background of the overall project for knowledge development and dissemination. Housing is a priority for the government, however there is now a need to address the challenges faced by the sector due to globalisation and climate change.

Session I: Current Scenario

This session focused on orienting the participants on the basics of climate change and construction. Prof. Manmohan Kapshe, SPA, kickstarted the session with an in-depth presentation on the challenging link between climate change and construction practice. Conventional technologies ignore environmental impacts they cause. Climate Change has become a buzz word since the 1990's, though prior to that only "climate responsive" architecture was discussed. He explained the phenomenon of climate change with reference to definitions of weather, season and climate.



Figure 3 : Prof Kapshe explaining the concepts of climate change

Climate responsive design has always been a mandatory principle but how climate change has added a new dimension to this design basis in the next 50 years. In the context of Madhya Pradesh, recent examples of erratic rainfall patterns were quoted to highlight how drought led to a suspension of all construction activity for an entire season.

Losses due to climate change in the light of who it affects were discussed i.e. primarily property losses in the developed countries and human losses in developing countries. Also the urban-rural disparity was summed up. Cities consume 60% of resources; give out 70% of emissions while occupying only 1% of land area. The dual responsibility of the construction sector to both adapt to climate change as well as mitigate it was explained. Talking about the lifecycle energy consumption of a building, Prof. Kapshe pointed out that environmental solutions and economic solutions must

go hand in hand. The main areas to be focused on include retrofitting the existing building stock, ensuring low energy consumption levels in new construction, efficient use and re-use of water reuse and how can industrial waste be reused in construction.

The discussion following the presentation highlighted the role of negative externalities nullifying the positive impacts of adaptation and mitigation. The need for collective responsibility was discussed while drawing parallel from the climate change negotiations at a global level where developed countries have adversely affecting climate while developing countries face the brunt of the problem. Prof. Kapshe very aptly summed it up saying that *'When I Adapt, Only I Benefit; When I Mitigate, The Whole Planet Benefits'*. The discussion also touched upon the trade-offs between necessary construction activities (eg. Extracting soil for brick making) and the impact they are bound to have on the environment. Every human activity has far reaching consequences that are often not predicted. Even activities carried out for the sake of restoring environmental balance can go astray. For example installing a rain water harvesting system to replenish the water table in an area might result in over recharging of the ground water and lead to water logging elsewhere. Hence, the need for developing 'win-win strategies' where the impacts of every action are thoroughly assessed and with the aim that *'At Least None Is Worse Off And At Least One Is Better Off'*.

"The whole basis of our design discussion for responding to the climate requirement, that basis itself is likely to change in the next 50 years how we will design our buildings then. And then, secondly, we identify that buildings are playing an important role in defining those surroundings as well" "Buildings contribute to change in climate and buildings respond to change in climate. This dual responsibility is very important for us building professionals who are involved in any building industry." – Manmohan Kapshe



Figure 4 : Mr P N Mishra explaining policy processes

The second presentation of the session focused on energy and carbon intensities of buildings. Pankaj Khanna, DA, introduced concepts of energy assessment and the tools needed to quantify the energy implication of construction and associated emissions. Performance standards of buildings differ with the technologies used, and it is important to understand the benefits and boundaries of each. Rating systems today have brought energy issues to the forefront. There is a need to find solutions that deliver performance while cutting down on the consumption of energy and energy intensive materials.

Both embodied and operational energy need to be considered while designing and planning. Assessment tools help in making material choices that can have a huge impact on the footprint of the structure. This dealt primarily with the embodied energy of the structure.

This highly technical session raised many queries among

the participants. The main issues raised were the need for accuracy in calculating the embodied energy of certain building materials and construction technologies as compared to getting an overall idea of the level of savings. Emissions at various stages of construction were discussed and realistic solutions to reducing these were mentioned. The discussion was summarized by recognizing the need for innovation in design and material use in tandem with the aesthetics of the building.

Session 2: Strategy for Change

The second session focused on Low Carbon – Climate Resilient Strategies. Associate Prof. Sandeep Arora, SPA Bhopal presented a detailed overview of passive design strategies for semi-arid climatic zones. Climate analysis of the region was carried out with reference to occupant comfort, clothing levels, in response to seasons. Examples of adaptive designs in nature were used to highlight these aspects. A climate analysis software was introduced to the participants and they were walked through a trial run on the individual workstations. design were then examples for similar semi-world.

After highlighting, presentation focused on technologies used to strategies. Rita John, DA presented an inventory of options to the participants semi-arid zones. These and sanitation technologies like rat trap roofs as well as new fabrication were raised about specific technologies as there was among participants to

“When we talk about operational energy in the energy efficiency of buildings in the contemporary context there are already regulations which are being put into place which aim to control that operational energy. But as far as embodied energy was concerned there is no such regulation or any guidelines that have to be followed. They are not in place. So that’s an important thing that for operational energy there are still incentives to bring it down but for embodied energy the onus lies still largely on the community to recognize the problem and then offer solutions for it”

- Pankaj Khanna

software at their Thumb rules for passive discussed quoting various arid zones around the strategies, the next the materials and implement these and Pankaj Khanna, DA alternate technology that could be applied in included walling, roofing technologies. Traditional bonds and stone *patti* technologies including pre discussed. Queries were technical details of these a fair bit of interest adopt them. Some

participants, with prior experience of using these technologies, spoke about their projects. For example, it was pointed out how the Rat-trap bond masonry is not a feasible walling technique in Bhopal as the standard brick size prevalent there cannot be used to construct it. Also there was much interest in quality control achieved in these technologies as well as standardization in the conventional building practice.

Following a rich discussion, the participants proceeded to the Water and Land Management Institute (WALMI) to see the design principles being applied. Associate Prof. V Bhatt discussed the evolution and the ideas behind the design. He focused on the implementation of the design and how the structure was being used currently. The pros and cons of the passive and active design strategies planned and implemented were discussed. Gaps in management and actual execution of climate responsive design features on the ground were evident. The importance of carrying through a project from the proposal stage right to its operation was one of the key lessons of the visit.

The next day started with a recap of the previous day by two participant volunteers; Prashanti Rao, a research scholar at SPA, and Basant Rajak, an urban planner with BMC Bhopal. The proceedings began with the screening of a movie on Development Alternatives Headquarters Green Building that showcases how various low carbon alternative technologies are implemented. Many of these technologies were discussed with the participants on Day 1 and the building helped participants see that they were practical solutions that could be executed. The floor was then open to participants to share examples of their work that incorporated these principles. Prof. K. K. Chakravarti, gave a photo presentation of a series of his projects pointing out various ingenious design strategies. He spoke at length about the need for the architect to be an integral part of the construction team and not rely on standardized methods of construction but instead improvise and arrive at individual solutions. Ar. Jai Singh Kothari, also through photographs and drawings of some of his projects, demonstrated a number of examples within Madhya Pradesh where he had implemented passive cooling measures. Discussions highlighted the need for passive strategies in the face of growing energy shortages and rising costs.

The next presentation touched upon policy interventions at the national and a state level for promoting LCCR growth. Kriti Nagrath, DA, oriented participants to existing policies which have implications on the construction sector. National policies and plans related to climate change and habitat, synergies and gaps in existing policies as well as programs that contribute to LCCR construction were discussed. The discussion began with a broad idea of defining inclusive growth and incorporating economic, social and environmental parameters.

Professor K. K. Chakravarti pointed out that many of the alternate technologies and construction techniques recommended were already in place in institutions like Taragram and the Nimit Kendras (Government Resource Centres for Buildings). The main area of concern is to include these in the Public Works Department (PWD)



Figure 5 : Group Work

Schedule of Rates to regularise the process of material choice. Specifications need to be set to ensure quality control of these technologies. There is an urgent need to change the mind-set of people by influencing change at the highest level. If implementation of these technologies increases in urban areas, user acceptance would be a lesser concern. P.N. Mishra, an architect planner and a

retired government employee, spoke at length about his planning experience. He suggested inclusion of experts – architects and planners - at state level clearance committees to ensure adequate due diligence and regular monitoring. Other gaps discussed by the participants included the lack of transparency and accountability within the systems to ensure implementation. As a culmination of this discussion it was agreed that more holistic solutions need to be arrived at, there is a need for stringent implementation and that none of this can be achieved without proper capacity building at all levels.

Session 3 : Application

The final session for the workshop aimed at encouraging participants to apply and implement the strategies and tools discussed during the workshop in their practice. Rita John, DA, introduced the group work design exercise to them. The exercise was to design an alternate technology demo centre for the new SPA Bhopal campus. Participants were divided into three groups of 8-10 members each. There was much discussion and collaboration between participants of varying amounts of experience and different areas of specialization.

At the end of the afternoon, there was a pin-up presentation done by each group, of their work. Each group had arrived at a completely unique and innovative solution to the design problem and each of these were discussed with the larger group. The design solutions proposed are described in detail in Annexure 3.

Prof Binayak Choudhury, HOD Planning, SPA, concluded the workshop with a warm address thanking for participants and organizers for their enthusiasm and contribution to the 2 day event. He particularly appreciated the passion with which the participants tackled the group work. He then handed out certificates to all the participants.

4. Observations and Lessons Learnt

Participation:

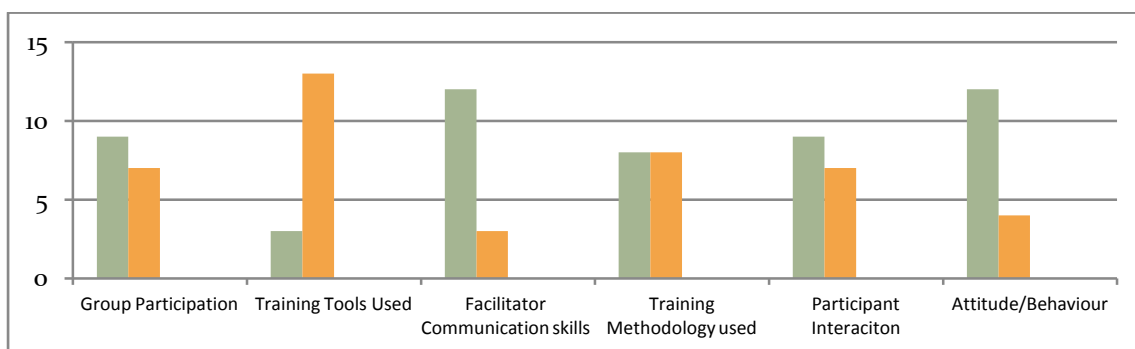
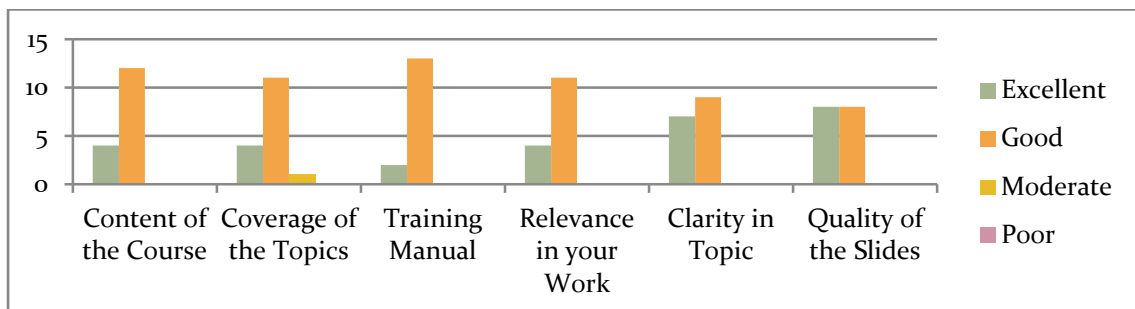
The workshop exceeded our expectations in terms of participation with over 40 practising architects, planners and professors attending the two day workshop. The presence of faculty members and their interest in taking the subject forward will enable these concepts in reaching students. This will help in building awareness and capacities of the new generation of professionals who will enter the field. In fact the participants expressed a need for developing a programme designed and targeted at students. The workshop received quite a bit of press coverage in the local dailies – both English and vernacular.

Sessions:

The sessions were conducted as planned. There was a request from participants to focus on application of principles being discussed. In order to accommodate this the session on case studies was expanded. Some participants volunteered to showcase some of their work that incorporated some of these principles.

Evaluation:

Pre and post evaluation were planned to assess the impact of the trainings on the participants. The pre forms were distributed at the beginning of the workshop. However, they were collected at the end of session one. Hence it is not a true reflection of the pre status, as participants filled in the forms during the introductory lectures. The feedback showed that the group work session was very well appreciated. The feedback on the other aspects of the training is given below.



5. Annexure 1 : Agenda

Workshop on Low Carbon Climate Resilient Construction for Building Professionals 3rd - 4th November 2012

School of Planning and Architecture, Bhopal

Agenda

Saturday, 3rd November 2012

Time	Session Details	
09:30 - 10:00	Registration	
10:00 - 10:30	Welcome Address Workshop Introduction	SPA DA
	SESSION 1: CURRENT SCENARIO	
10:30 - 11:00	Climate Change and Construction Practice	SPA
11:00 - 12:00	Energy and Carbon Intensity of Buildings	DA
12:00 - 12:20	Tea Break	
	SESSION 2: STRATEGY FOR CHANGE	
12:20 - 01:20	Passive Design Principles for Construction	SPA
01:20 - 02:20	Lunch Break	
02:20 - 02:40	Alternative Building Technologies	DA
02:40 onwards	Site Visit	

Sunday, 4th November 2012

Time	Session Details	
09:30 - 09:45	LC-CR Case Studies	Movie
09:45 - 10:00	Recap & Agenda	Participants
10:00 - 11:00	Case Studies and Experience Sharing	Participants
11:00 - 11:20	Policy Linkages / Support	DA
11:20 - 02:00	Group Work Exercise	
01:00 - 02:00	Working Lunch	
02:00 - 03:00	Group Work Presentation	Participants
03:00 - 03:30	Valedictory	DA & SPA

6. Annexure 2 : List of Participants

S. No.	Name	Organization	E-mail ID
1.	Ms. Sheetal Sharma	MANIT, Bhopal	ar.sheelalassociates@gmail.com
2.	Dr. Krishna Kumar Dhote	MANIT, Bhopal	kkdote@hotmail.com
3.	Mr. Vineet Shrivastava	MANIT, Bhopal	vviinneeeett@gmail.com
4.	Mr. Prashant Shrivastava	M/s. Prashant Shrivastava Associates	prashantvidhu@yahoo.com
5.	Ms. Ragini Sinha	Institute of Geoinformatics (Pvt.) Ltd., Bhopal	gisforall@rediffmail.com
6.	Mr. S.C.P. Sinha	Institute of Geoinformatics (Pvt.) Ltd., Bhopal	gisforall@rediffmail.com
7.	Mr. Anand Kumar Sharma	Esthics	anand.neeva29@gmail.com
8.	Ms. Vandana Agarwal	National Institute of Technology, Raipur	vandanaagrawal28@gmail.com
9.	Mr. Gaurav Singh	SPA, Bhopal	ar.gauravs@gmail.com
10.	Mr. Sandeep Arora	SPA, Bhopal	
11.	Ms. Shweta Saxena	SPA, Bhopal	shweta@spabhopal.ac.in
12.	Mr. Arvind Kumar Meel	SPA, Bhopal	arvind@spabhopal.ac.in
13.	Ms. Gayatri Nanda	SPA, Bhopal	gayatri.nanda@spabhopal.ac.in
14.	Ms. Nayana R Singh	SPA, Bhopal	nayana@spabhopal.ac.in
15.	Mr. Apurv Shrivastava	SPA, Bhopal	apurvmam@gmail.com
16.	Shweta Vardia	SPA, Bhopal	shwetavardia@spabhopal.ac.in
17.	Mr. Ramesh P Bhole	SPA, Bhopal	rameshbhole@rediffmail.com
18.	Ms. Supriya Kukreja	SPA, Bhopal	

19.	Mr. Govind M.P.	SPA, Bhopal	govind.warier@gmail.com
20.	Ms. Garima Shrivastava	SPA, Bhopal	shrivastava.garima@gmail.com
21.	Ms. Vinita Verma , Paikra	SPA, Bhopal	
22.	Ms. Purna Sheoliker	SPA, Bhopal	purna.sholiker@gmail.com
23.	Ms. Prashanti Rao	SPA, Bhopal	prashanti_seve@yahoo.co.in
24.	Mr. Shulronshu Upadhyay		shuyay@gmail.com
25.	Panlose. NK	<i>SPA Bhopal</i>	paulose@gmail.com
26.	<i>Jai Singh Kothari</i>	Bhopal	jaesengh@gmail.com
27.	P. M. Mishra	Bhopal	
28.	<i>Basant</i>	<i>BMC Bhopal</i>	
29.	V Omkar Parishwad	PRUDA AILSG	pariswad.omkar@gmail.com
30.	K. K. Chakravarti	Bhopal	
31.	Prof. Binayak Chodhry	SPA Bhopal	binayak1961@gmail.com
32.	Vaibhav Pandit	TIT Bhopal	vaibhav_padit@gmail.com
33.	Sunil pradhan	<i>MYHIDB</i>	sunil-sunilpradhan@rediffmail.com
34.	Sanjay Jain	Vardhman Associate	vardhman_bpl@rediffmail.com
35.	Vimilesh Jain		-
36.	Nishchay Dube	MBCA	nishchoydube@gmail.com
37.	Apoorv Garz	MANIT, Bhopal	apoo.archi@gmail.com

7. Annexure 3 : Group Work Output

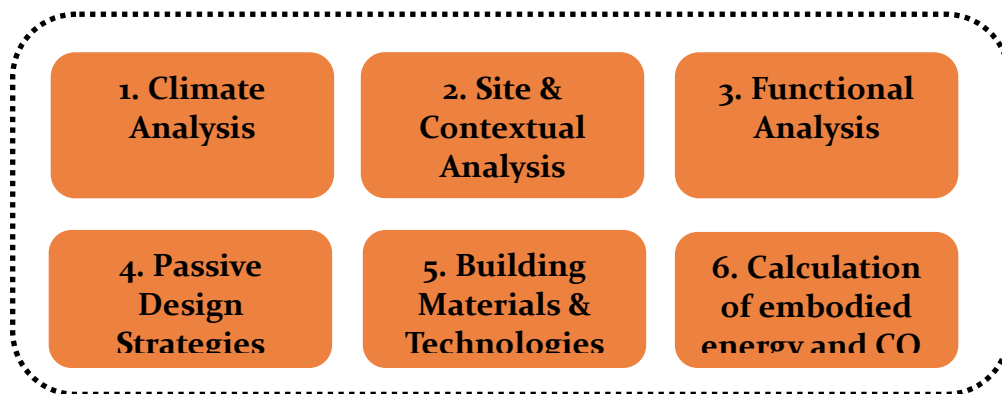
Introduction:

The objective of the group work was to orient participants on using LCCR principles in design. The approach followed was to divide the participants into smaller groups of 5-8 people each. The exercise was then explained in detail to the participants with respect to the process to be followed and the expected outcomes. The group work exercise entailed a design proposal for a multipurpose alternate technology demo centre at the newly built campus of School of Planning & Architecture, Bhopal.

This was followed by discussion among groups with each group at separate locations for independent working. Constant support was provided to the groups to clarify any doubts or conflicts and to ensure that discussion remains on the right track. At the end of the group work, each group presented the outputs as a pin up. Feedback on each presentation in plenary and discussion with larger group ended the session.

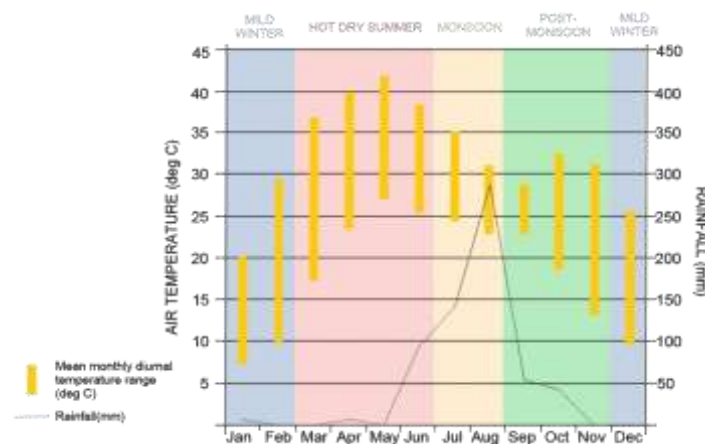
Design Process:

The design process explained to the participants of the exercise was:



Climate analysis

The climate data of Bhopal was provided. The participants were required to understand and analyse varying comfort requirements of each season. It is assumed that the structure built is to be non-air conditioned and hence seasonal passive methods of heating and cooling needed to be looked into.



Site Analysis

A site plan of the new proposed campus was provided. Participants were required to consider surrounding proposed building blocks and their possible effects on the site of construction. Also analysis of the site topography and landscape was recommended.

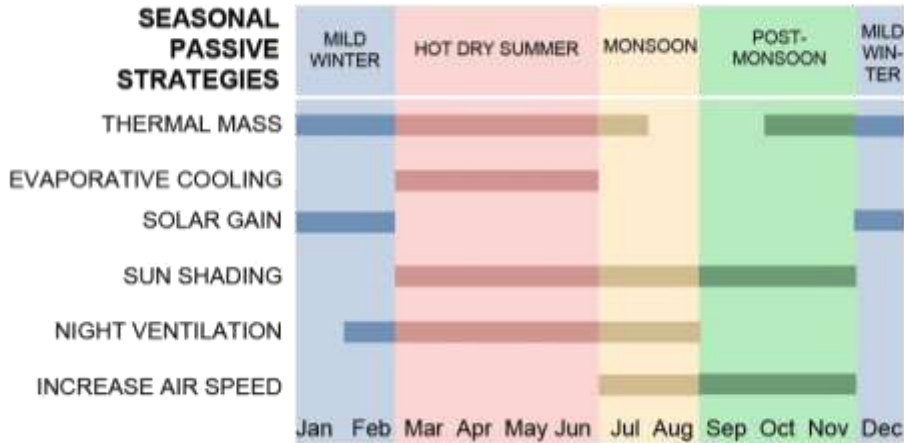


Functional analysis

The 2000 sq.ft structure to be built is intended to be a multipurpose space. Participants were required to define these multiple activities to be carried out within the Alternate Technology Demo Centre depending on the comfort requirements of various seasons: exhibition space, classroom, canteen, performance area, etc.

Passive Design Strategies

Based on climate analysis, the participants were asked to plan physical manifestations of the various passive design strategies over the year and provide opportunities for the users of the space to adapt to changing comfort requirements. For this, they were provided a list of appropriate design strategies for the semi-arid area of Bhopal and told to prioritise which strategy they felt would be the most useful in this specific context.



Objective		Physical manifestation
Resist summer heat gain + Resist winter heat loss	Decrease exposed surface area	Orientation and shape of the building
	Increase thermal resistance	Optimum roof insulation, wall insulation
	Increase shading	Walls, glass surfaces protected by overhangs, fins and trees
	Increase buffer spaces	Balconies and verandahs
	Increase surface reflectivity	Light coloured and reflective finishes Reflective surface on roof
Promote summer/monsoon heat loss	Increase air exchange rate	Cross-ventilation through windows/ exhausts, courtyards, wind towers, etc. Ventilated roof construction
	Decrease humidity levels in monsoon	Dehumidifiers/ dessicant coolers
	Increase humidity levels in summer	Trees/water bodies for evaporative cooling

Alternate Building Materials & Technologies

The participants were provided with an inventory of alternate technologies appropriate for semi-arid regions and asked to propose appropriate walling & roofing technologies for the demo centre.



Calculation of embodied energy and CO2 emissions

Embodied energy data for building materials was provided and the method of calculating emissions was explained to the participants as the exercise progressed.

Outputs :

The participants were required by the end of the 3 hour exercise produce and present the following outputs:

- Explanatory list of passive design strategies followed
- Drawings - building plan, elevations, sections, views (if needed). the drawings (digital or hand-drawn) must demonstrate and illustrate the following:
- Design strategies (solar passive, water management, disaster resistance)
- Occupation pattern
- Materials and technologies - schematic construction system, technical specifications, building envelope.
- Calculation - embodied energy & co2 emissions from the structure and envelope – wall and roof - normalized w.r.t to the built-up area of the building
- List of enabling factors - issues related to technology, manpower, policy, etc in order to replicate the proposed solutions on a larger scale

The participants were also provided with 6 case studies of LC-CR design in semi-arid regions for reference:

The image displays six case study posters for LC-CR design in semi-arid regions. The posters are arranged in a grid-like fashion. The top row contains two posters: 'HOUSING FOR INDUSTRIAL WORKERS, VYSANKERE, KARNATAKA' and 'RUDRAMATA - ARTISAN'S VILLAGE, KUTCH DISTRICT, GUJARAT'. The middle row contains one large poster on the left and one on the right: 'AZADPURA RURAL HOUSING, MADHYA PRADESH, INDIA'. The bottom row contains three smaller posters, each featuring a site plan or floor plan and a section titled 'LC-CR FEATURES'. Each poster includes descriptive text, photographs of the buildings, and technical diagrams.

Design Proposals:

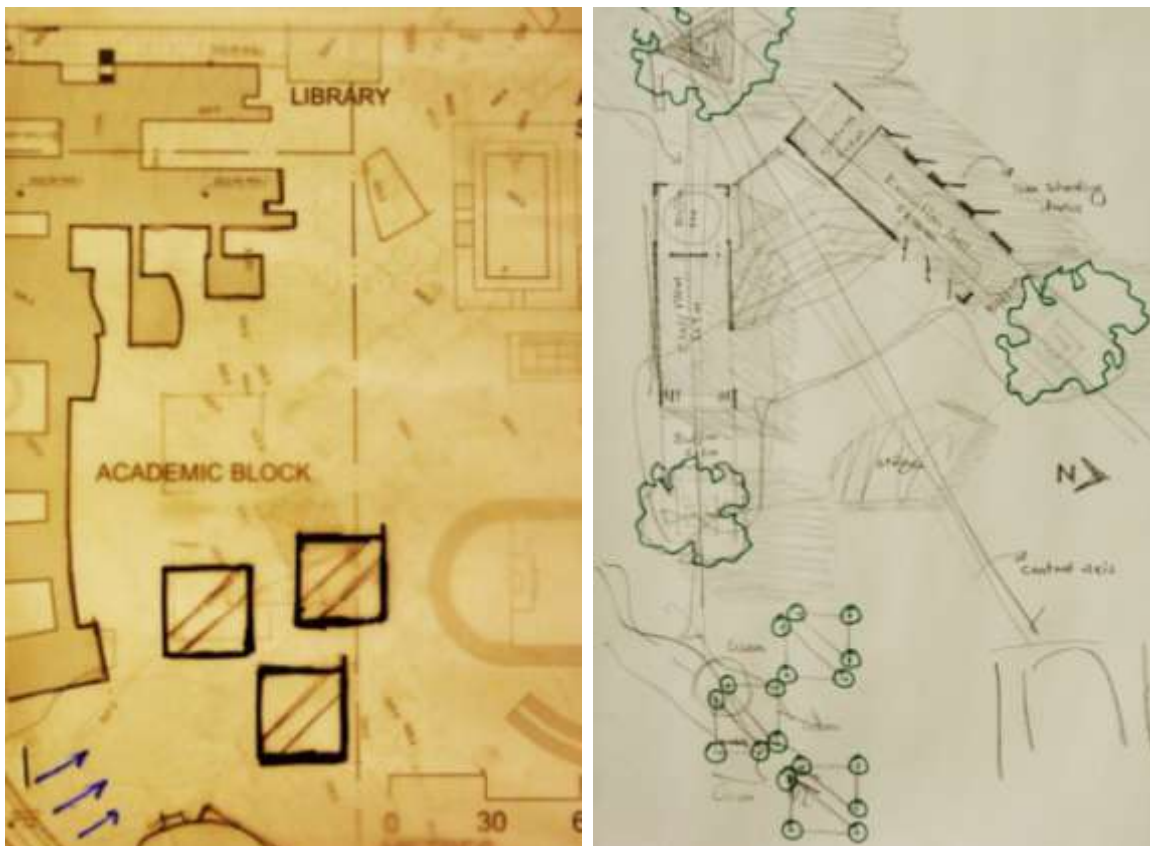
The participants were divided into 3 groups. The design proposals received from each group are elaborated below.

Group 1

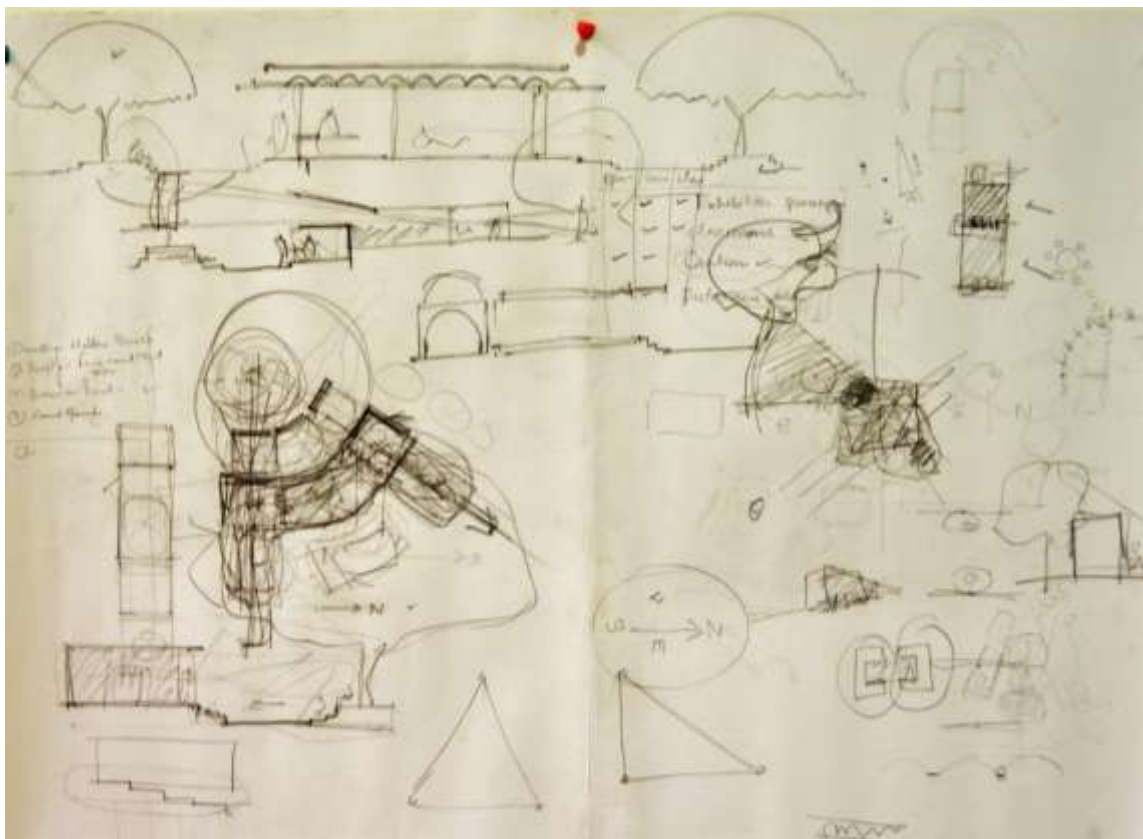
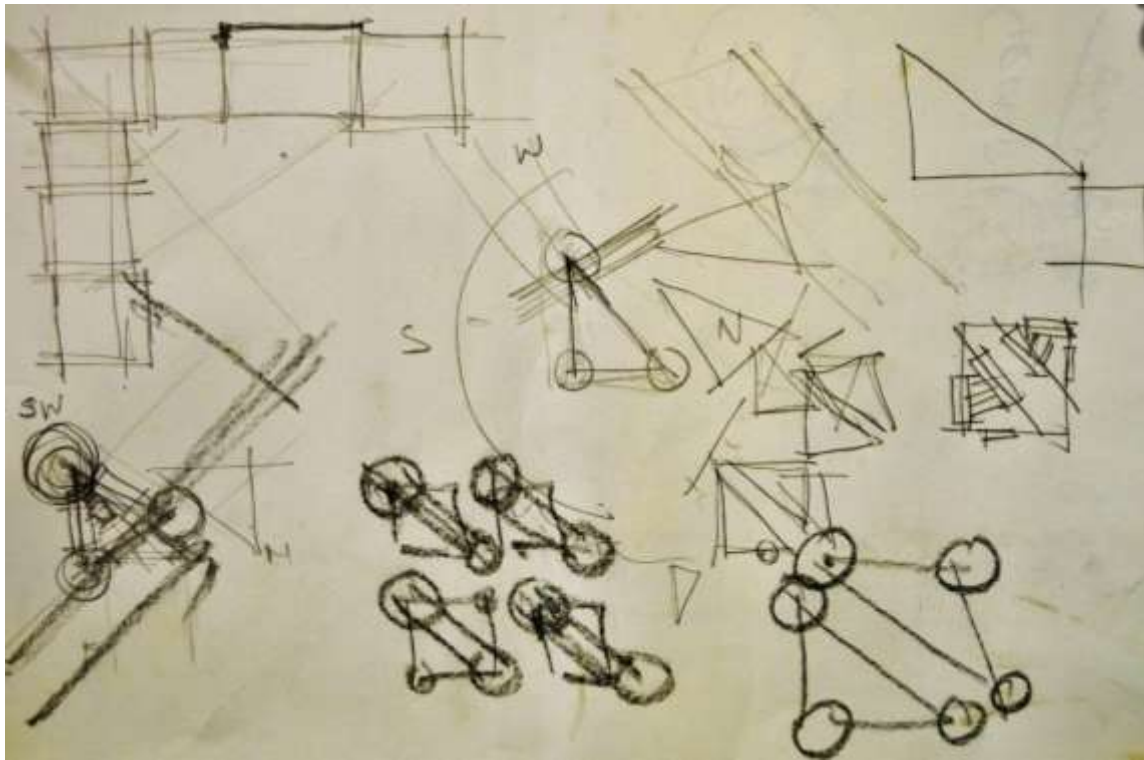
The group designed a triangular modular structure that can be replicated. This highly flexible space was meant to house many different functions like classrooms, a canteen, exhibition spaces, etc.

The driving forces in the determination of the form were the orientation of the faces towards the sun and the prevalent windward direction. An interesting use of sun-shading devices incorporated into the fenestration system with centrally pivoted revolving doors was proposed. These were intended to be operated by the users of the space according to varying shading/ventilation/day-lighting needs over the year. The use of available gradient to increase air speed as well as a funnel shaped space on the interior of the module allows air to spread out as it enters the structure and cool down the space.

The open and semi-open spaces in the structure are self-shading and the acute angle of the triangular block ensures that no wall is fully perpendicular to the sun's rays during the hottest parts of the day. Trees were used to provide buffer spaces along with water ponds. Semi-open spaces were incorporated with a punctured roof overhangs that acts like pergolas.



The roofing system composed of ferro-cement channel roofing while hollow concrete block masonry was proposed for the walls. No steel is required anywhere in the structure except in the beams on which the ferro-cement roofing channels rest.



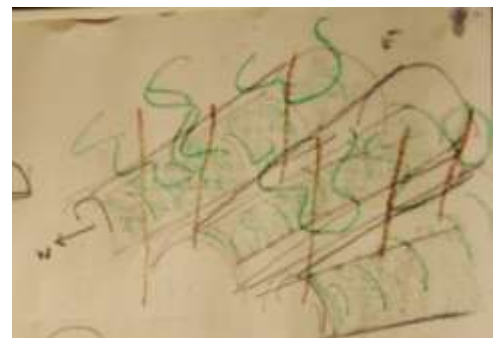
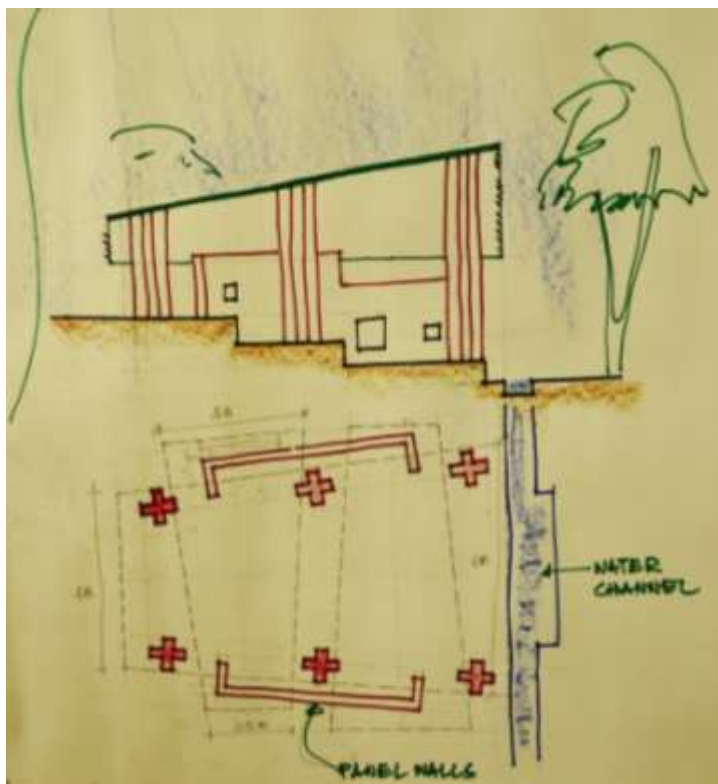
Group 2:

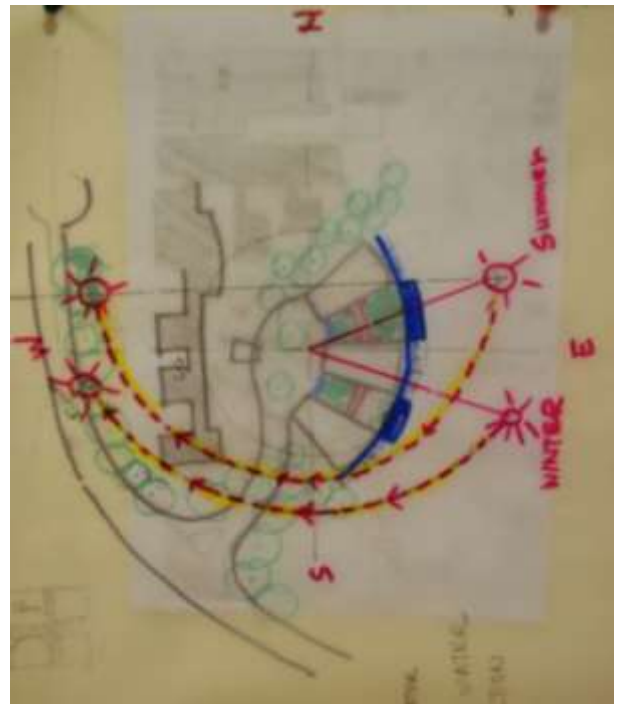
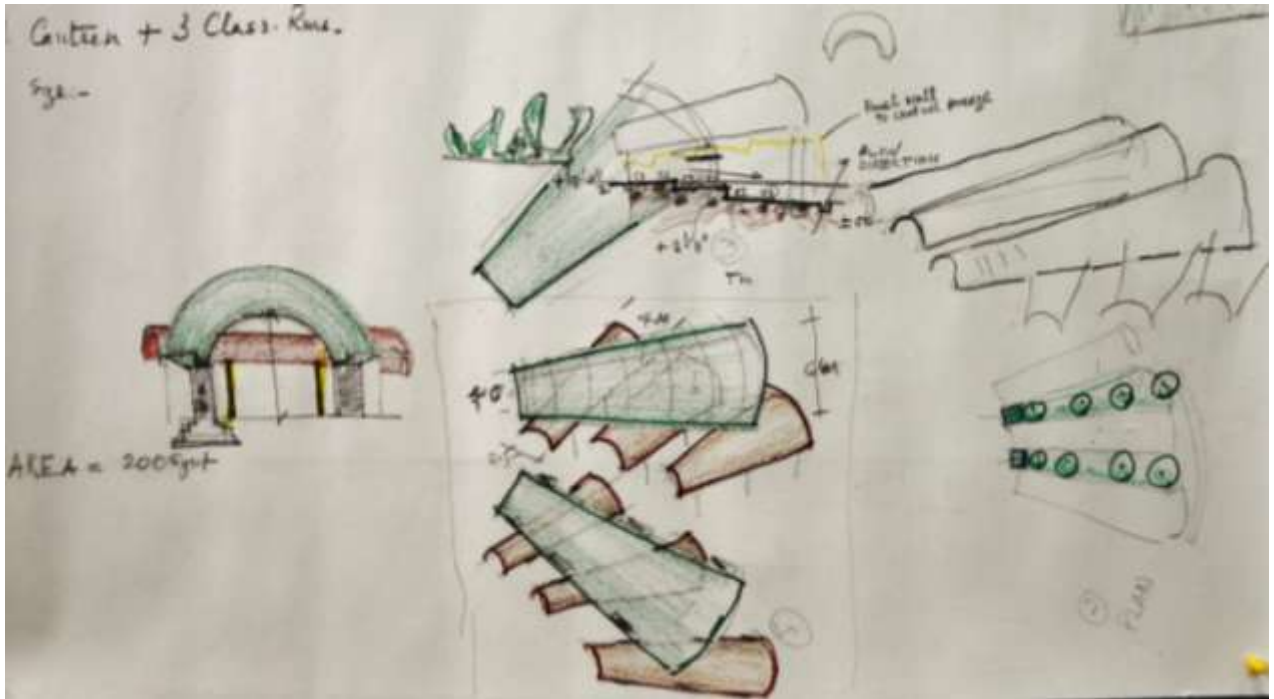
This group's design process took a roof-to-plinth approach. In tune with the way the load transfers through the structural system, self-shading shells were proposed. These funnel shaped shells, orientated towards the wind ward direction and with a slope of 11 degrees, create an open but well shaded structure. The double roof of these shells provides much cooling to the interior by cutting down transfer of absorbed heat through the roof. Further cooling occurs through the use of deciduous trees around the structure.

The group studied the sun path diagram at the site and designed a layout that minimises on solar gain. An ingenious use of water pools and the shell roofs to provide cool diffused light into the classrooms was proposed. For these pools the natural contours of the land were proposed to drain water without pumping it mechanically to fill the pools. These water channels would be connected across the campus and have evaporative cooling effects. Intermediate green spaces and trees in the plaza with seating were proposed.

Many functions were proposed for this space with a plaza for social activities, a canteen and performances. A small closed structure for services was proposed.

The roofing system proposed was to be made using ferro-cement channels. Use of material available on site was key in deciding the flooring of dry masonry. Pebbles mixed with mud and clay in outer areas along with greenery was proposed.

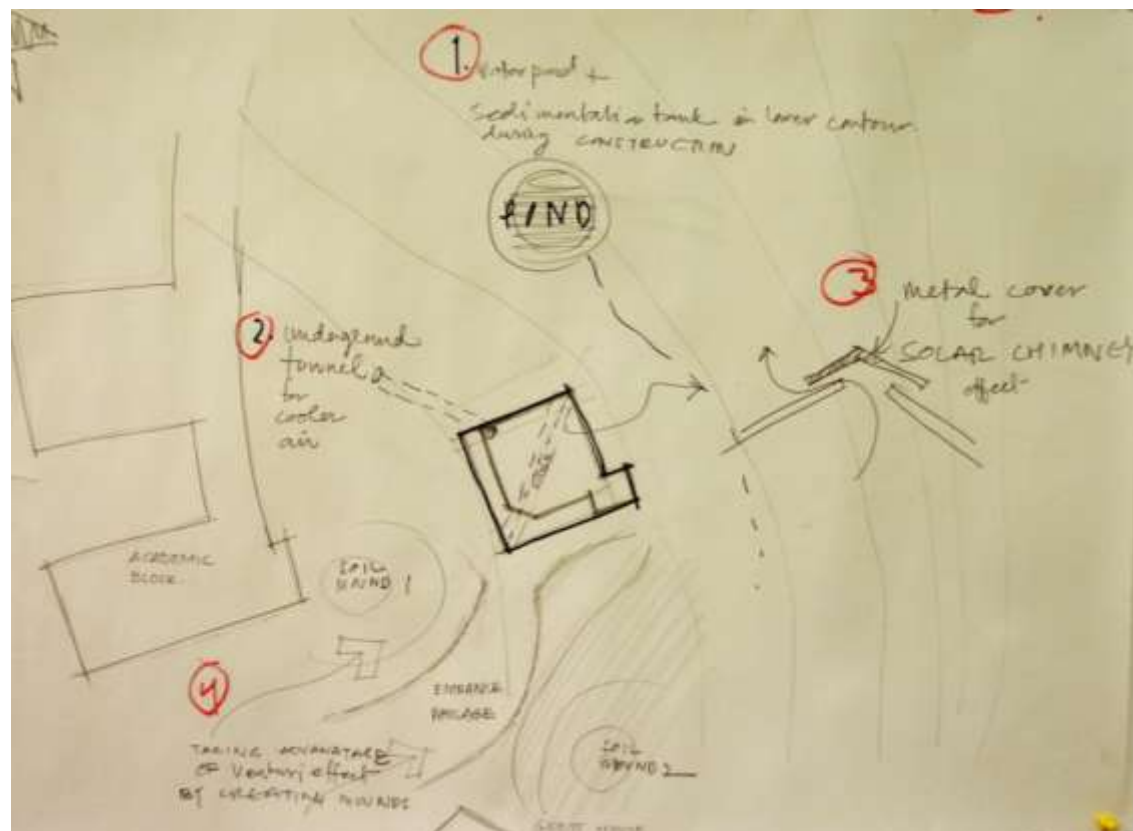
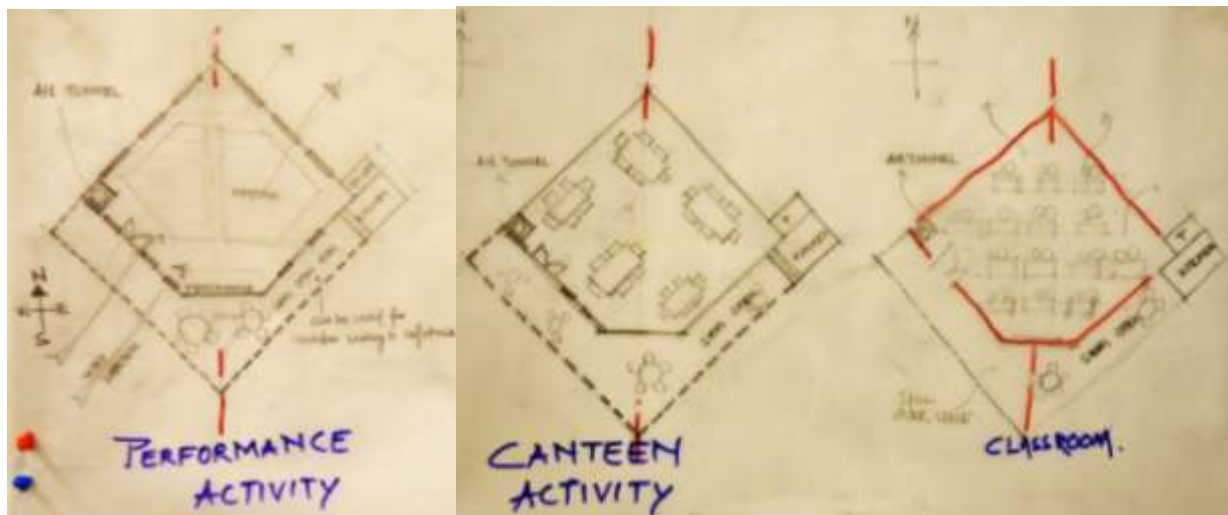


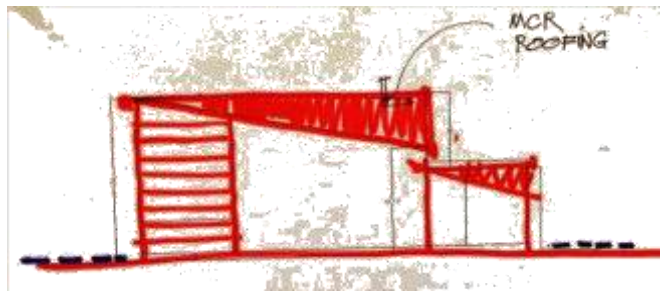
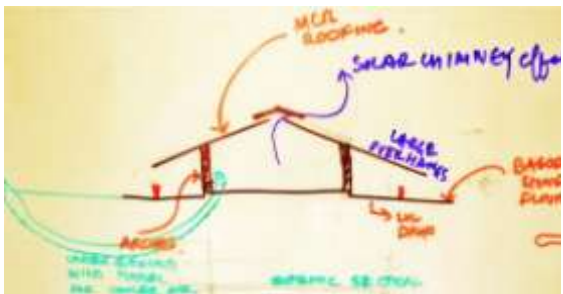
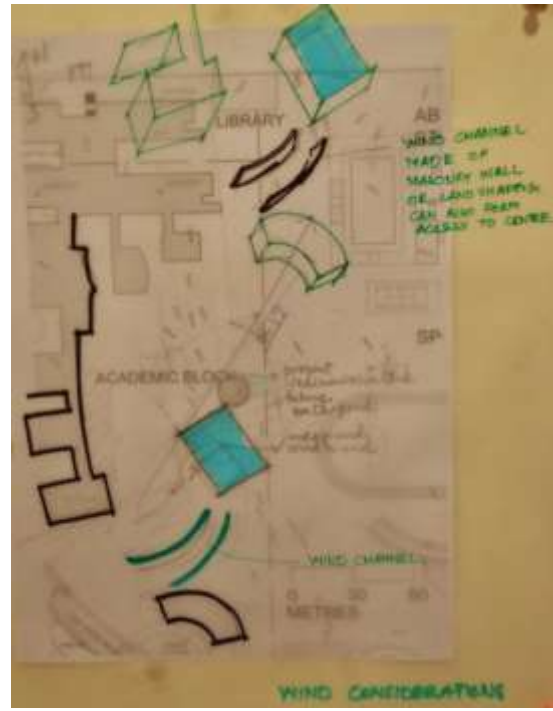


Group 3:

This group's approach was very functional and user oriented. They developed a modular structure that was compact and hence maximised on efficiency of building material used.

Various activities were planned for the same space like a classroom, a student activity room, a performance area and a canteen. A south facing semi-covered buffer space was provided for a permanent exhibition area. Free standing walls acting as wind funnels were designed around the structure. The module is square in plan and has a diagonal axis. An MCR tile sloping roof spans the structure and has a solar chimney at the ridge that cools the interior by inducing a stack effect. A fly-ash brick cavity wall was proposed for the walling.





8. Annexure 4 : Press Coverage

'लो कार्बन कंस्ट्रक्शन' पर वर्कशॉप आज

सिटी रिपोर्टर | भोपाल

[DB\(City Bhaskar\)-03 Nov 2012\(Pg. 02\)](#)

मैनिट कैंपस स्थित स्कूल ऑफ प्लानिंग एंड आर्किटेक्चर (एसपीए) में 3 नवंबर से 'लो कार्बन कंस्ट्रक्शन' विषय पर दो दिनी वर्कशॉप का आयोजन किया गया है। मैनिट स्पोर्ट्स कॉम्प्लेक्स में होने वाली यह वर्कशॉप डेवलपमेंट आल्टरनेटिव्स, दिल्ली और क्लाइमेट एंड डेवलपमेंट नॉलेज नेटवर्क, यूके के साथ मिलकर आयोजित की जा रही है। इसमें पार्टिसिपेंट्स प्रदेश में एन्वायरनमेंट चेंज पर चर्चा भी करेंगे।

WORKSHOP TO EXPLORE LOW CARBON CONCEPT

HT Correspondent

[* editor@hscs.com](#)

[HT-03 Nov 2012 \(Pg. 02\)](#)

BHOPAL: A two-day workshop on low carbon construction would begin at the School of Planning and Architecture, Bhopal on Saturday.

The workshop (on November 3 and 4) aims to orient building professionals towards use of low carbon construction concepts while designing buildings in semi arid spaces like Madhya Pradesh.

It is being organised in collaboration with the Development Alternatives Group, New Delhi and supported by the Climate and Development Knowledge Network (CDKN), UK.

Being exposed to the elements and freak weather events courtesy climate change, the construction sector is also drastically affected by the impacts of the changing climate. Design and construction of buildings need to ensure climate resilience to resist climatic extremes of uncomfortably hot or cold temperatures, high velocity winds and intense precipitation, a press release from SPA stated.

The practices in the construction sector of MP that aggravate climate change need to adopt measures that curb their impact on the local environment.

प्रदेश में लो कार्बन कंस्ट्रक्शन पर हुई चर्चा

[DB-04 Nov 2012\(Pg. 19\)](#)

SPA

EVENT

सिटी रिपोर्टर | भोपाल

मैनिट कैंपस स्थित स्कूल ऑफ प्लानिंग एंड आर्किटेक्चर (एसपीए) में शनिवार को 'लो कार्बन कंस्ट्रक्शन' विषय पर दो दिनी वर्कशॉप शुरू हुई। मैनिट स्पोर्ट्स

कॉम्प्लेक्स में इस वर्कशॉप में डेवलपमेंट आल्टरनेटिव्स (दिल्ली) और क्लाइमेट एंड डेवलपमेंट नॉलेज नेटवर्क (यूके) वर्कशॉप के बैकड्रॉप में मध्य प्रदेश में लो कार्बन कंस्ट्रक्शन कॉन्सेप्ट पर चर्चा हुई। इसमें दर्जनों प्लानर्स, इंजीनियर्स और बिल्डिंग प्रोफेशनल्स ने हिस्सा लिया। एसपीए के एसोसिएट डीन प्रो. संजीव सिंह

ने कहा कि आज के दौर में लोगों के दिमाग में इस कॉन्सेप्ट के प्रति अवेयरनेस बढ़ी है। क्लाइमेट चेंज में लो कार्बन कंस्ट्रक्शन की खासी भूमिका है। इससे प्रकृति को कम से कम नुकसान पहुंचता है।

यहां पार्टिसिपेंट्स ने वाटर एंड लैंड मैनेजमेंट इंस्टीट्यूट की विजिट की और स्ट्रेटजी डिजाइन की।

Workshop on low carbon starts

HT-04 Nov 2012(Pg. 02)



■ A two-day workshop on low carbon construction underway in Bhopal on Saturday.

HT PHOTO

HT Correspondent

■ editorbhupal@hindustantimes.com

BHOPAL: A two-day workshop on low carbon construction commenced at the School of Planning and Architecture (SPA), Bhopal on Saturday. Planners, architects and government officials, associated with construction works from across Madhya Pradesh, par-

ticipated in the workshop.

Experts from the SPA and Development Alternatives Group, New Delhi - the co-organiser of the workshop - delivered lectures on the first day aimed at orienting building professionals toward the use of low carbon construction concepts while designing buildings in semi-arid spaces like Madhya Pradesh.

Associate dean Sanjeev Singh inaugurated the workshop. The experts included Manmohan Kapse and Sanjeev Arora from the SPA and Pankaj Khanna, Kriti Nagrath and Rita John from Development Alternatives Group. The workshop supported by the Climate and Development Knowledge Network (CDKN), UK will conclude on Sunday.

पर्यावरण फ्रेंडली

Patrika-05 Nov 2012(Pg. 14)

बिल्डिंग बनाएं

लो कार्बन कंस्ट्रक्शन विषय पर कार्यशाला

भोपाल. स्कूल ऑफ प्लानिंग एंड आर्किटेक्चर में लो कार्बन कंस्ट्रक्शन विषय पर आयोजित कार्यशाला का समापन रविवार को किया गया। इसमें दिल्ली, भोपाल और रायपुर के पैंतीस से अधिक प्लानर्स, इंजीनियर्स और बिल्डिंग प्रोफेशनल्स ने हिस्सा लिया। वर्कशॉप के दूसरे दिन भी क्लाइमेंट चेंज और बिल्डिंग कंस्ट्रक्शन विषय पर वक्ताओं ने जानकारी दी। उन्होंने कहा कि प्रत्यक्ष और अप्रत्यक्ष रूप से बिल्डिंग कंस्ट्रक्शन और अन्य एक्टिविटी का एन्वायरमेंट पर इम्पैक्ट पड़ता है। कंस्ट्रक्शन सेक्टर्स का भी क्लाइमेंट चेंज के लिए काफी योगदान है। पार्टिसिपेंट्स ने जियो क्लाइमेट चेंज जोन से जुड़ी विभिन्न केस स्टडीज से परिचित कराया। इसके लिए कुछ इनोवेटिव डिजाइन और अल्टर्नेटिव बिल्डिंग्स निर्माण के लिए टेक्नोलॉजी की जानकारी दी गई। इस मौके पर एसपीए प्लानिंग के एचओडी प्रो. बिनायक चौधरी ने वेलेडिक्टरी सेशन को संबोधित किया।



Funded by :

This document is an output from a project funded by the UK Department for International Development (DFID) and the Netherlands Directorate-General for International Cooperation (DGIS) for the benefit of developing countries. However, the views expressed and information contained in it are not necessarily those of or endorsed by DFID or DGIS, who can accept no responsibility for such views or information or for any reliance placed on them. This publication has been prepared for general guidance on matters of interest only, and does not constitute professional advice. You should not act upon the information contained in this publication without obtaining specific professional advice. No representation or warranty (express or implied) is given as to the accuracy or completeness of the information contained in this publication, and, to the extent permitted by law, the entities managing the delivery of the Climate and Development Knowledge Network do not accept or assume any liability, responsibility or duty of care for any consequences of you or anyone else acting, or refraining to act, in reliance on the information contained in this publication or for any decision based on it.

© Copyright Climate and Development Knowledge Network 2013.

© Development Alternatives 2013