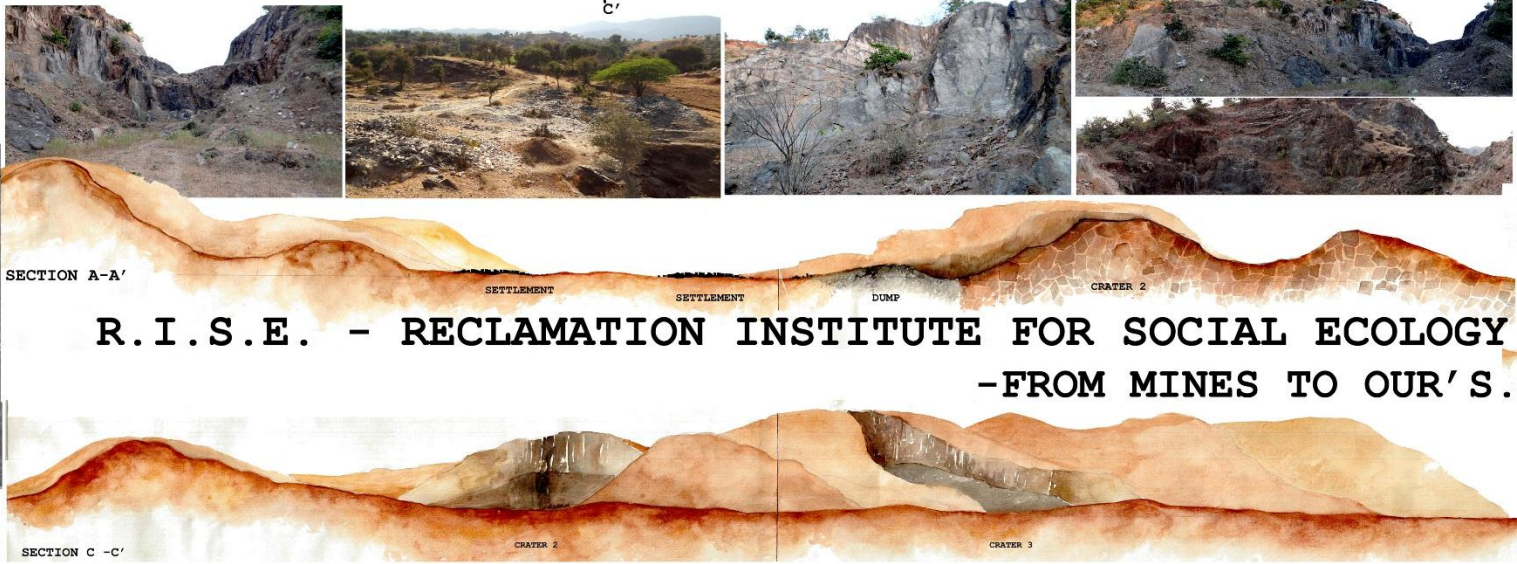
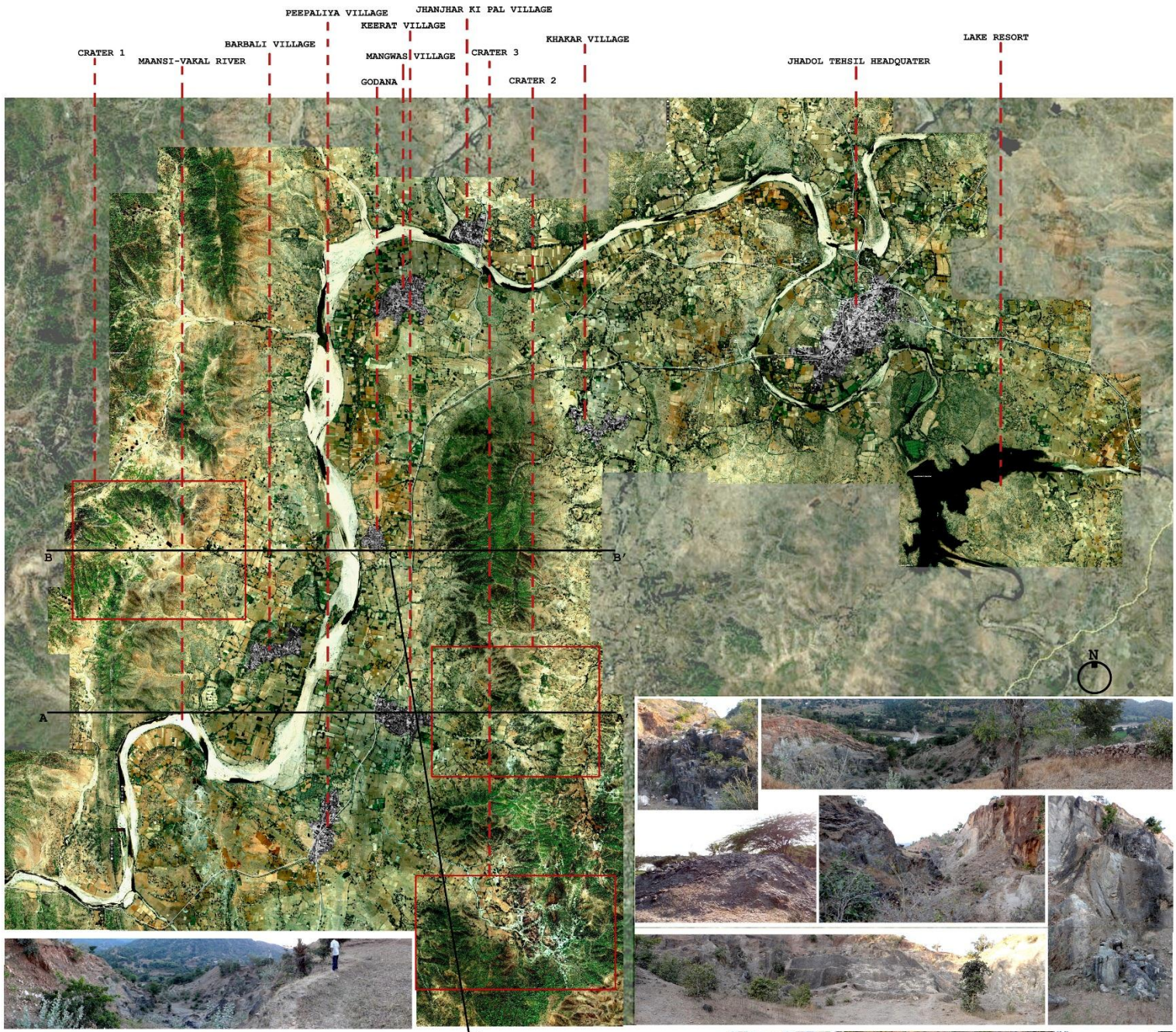
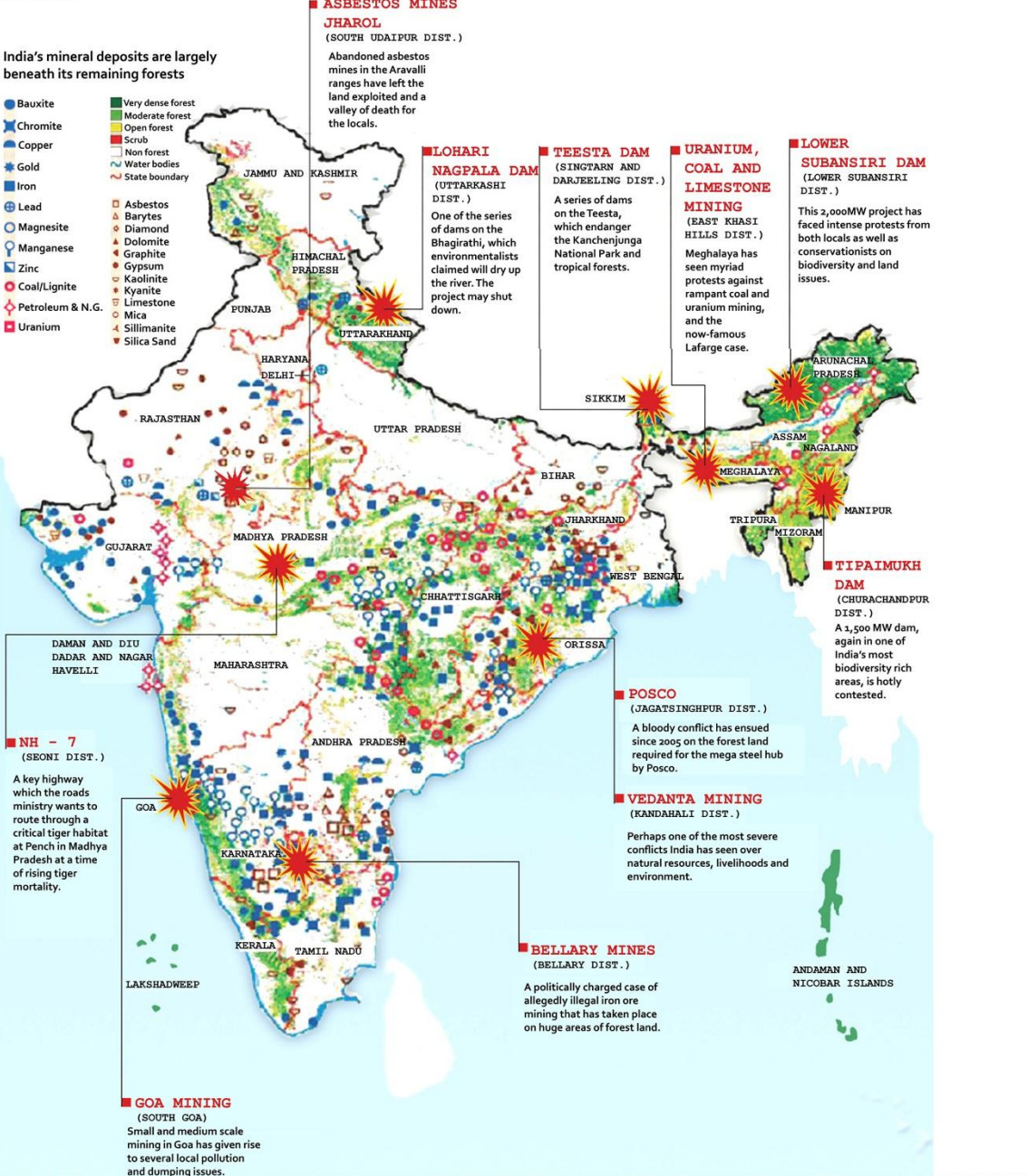
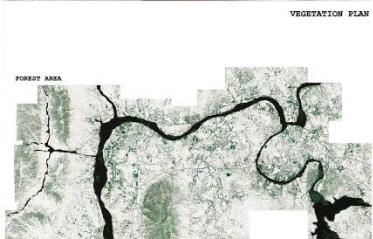
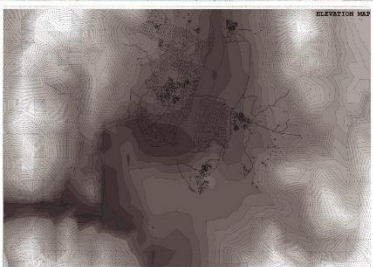
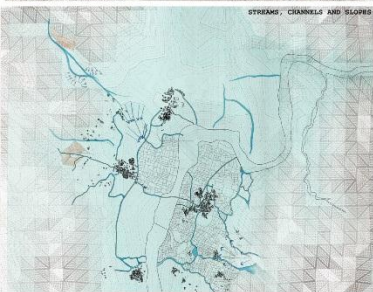
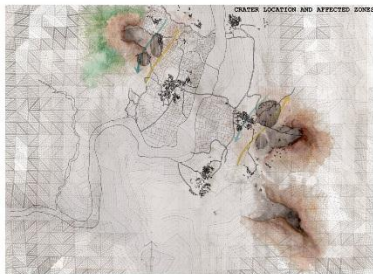


# ZONES OF CONFLICT

The map of India's green conflict zones clearly shows development pitted against the environment. These hotspots induce hydroelectric projects, mining projects, factories and infrastructure development as the intensifying search for resources consistently squares of against supporters of the environmental cause. Critically, most of India's recoverable mineral reserves are in heavily forested land, which is located in the poorest, most backward districts. The battle then takes on political overtones as in the swathe of land encompassing the Maoist insurgency-affected states of Jharkhand and Chhattisgarh, manifesting itself as a constant struggle involving land for resources, subsistence, livelihoods and environmental conservation.







## CASE STUDY

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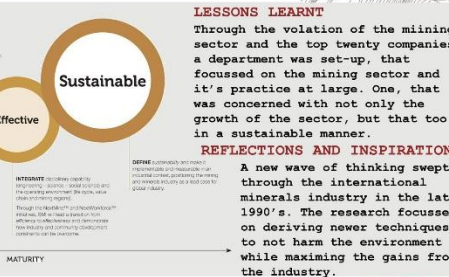
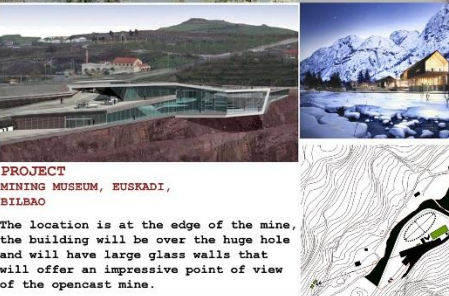
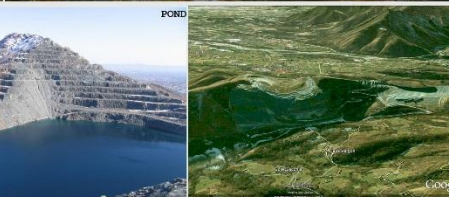


**PROJECT SMI, QUEENSLAND**  
The Sustainable Minerals Institute at the University of Queensland (UQ) is a world leading research institute dedicated to finding knowledge-based solutions to the sustainability challenges of the global minerals industry. The purpose is to develop practical solutions to the challenges of operating sustainably in the resources sector.

**THE PROJECT** is a break away from the Indian social-work tradition, which had an urban, middle-class and academic orientation, to create a programme that respected local skills, providing training and upgrading to help people help themselves. Over the years, the centre has worked with local teachers, health-care providers, solar engineers and hand-pump mechanics in a comprehensive development plan, implemented with the rural poor for the rural poor.

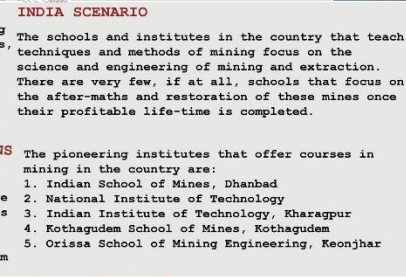
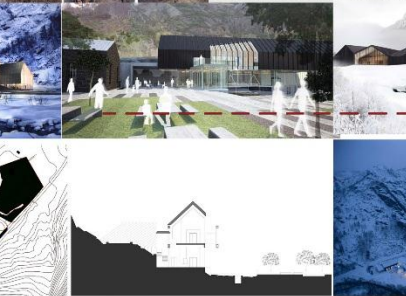
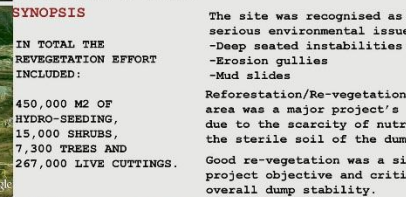
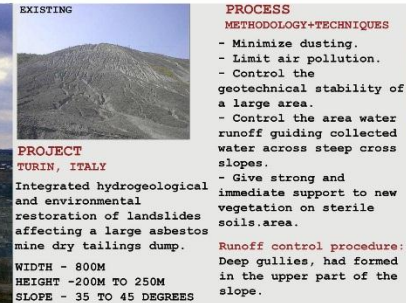


The Barefoot College began in 1972 with the conviction that solutions to rural problems lie within the community. The College addresses problems of drinking water, girl education, health & sanitation, rural unemployment, income generation, electricity and power, as well as social awareness and the conservation of ecological systems in rural communities.



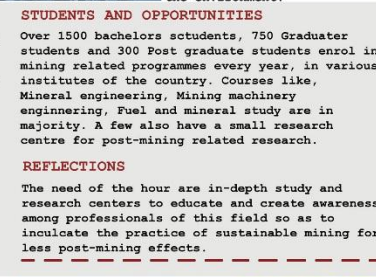
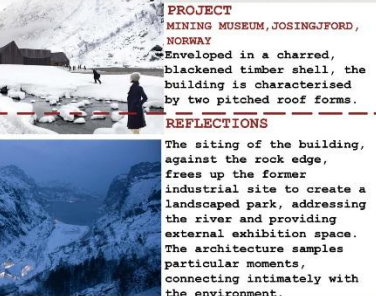
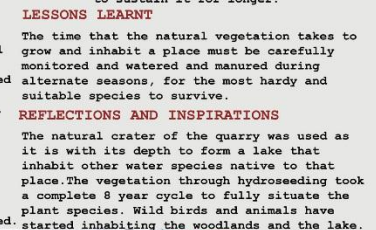
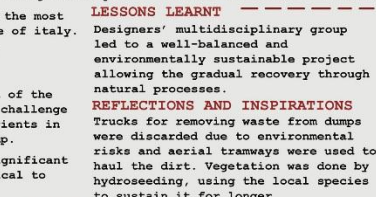
**LESSONS LEARNT**  
Through the violation of the mining sector and the top twenty companies, a department was set-up, that focussed on the mining sector and it's practice at large. One, that was concerned with not only the growth of the sector, but that too in a sustainable manner.

**REFLECTIONS AND INSPIRATIONS**  
A new wave of thinking swept through the international minerals industry in the late 1990's. The research focusses on deriving newer techniques to not harm the environment while maximizing the gains from the industry.



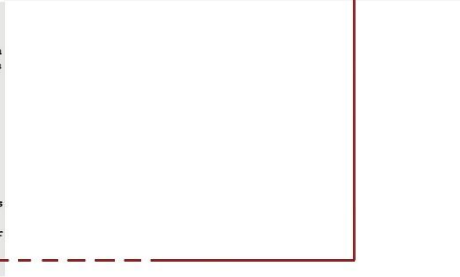
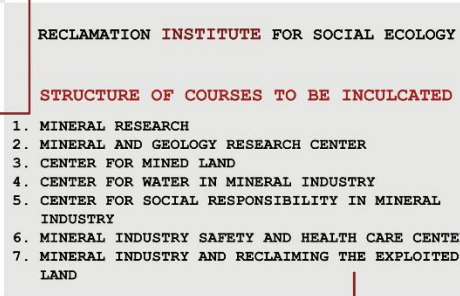
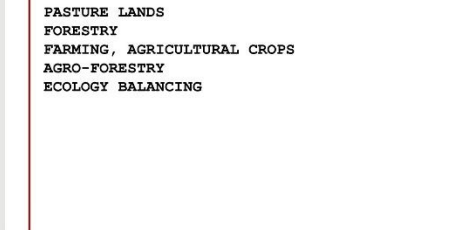
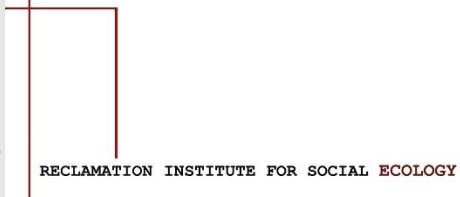
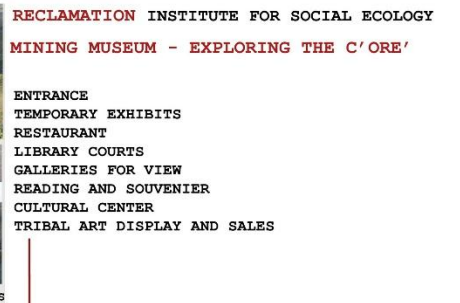
**LESSONS LEARNT**  
The schools and institutes in the country that teach techniques and methods of mining focus on the science and engineering of mining and extraction. There are very few, if at all, schools that focus on the after-maths and restoration of these mines once their profitable life-time is completed.

**INDIA SCENARIO**  
The pioneering institutes that offer courses in mining in the country are:  
1. Indian School of Mines, Dhanbad  
2. National Institute of Technology  
3. Indian Institute of Technology, Kharagpur  
4. Kothagudem School of Mines, Kothagudem  
5. Orissa School of Mining Engineering, Keonjhar



**LESSONS LEARNT**  
The time that the natural vegetation takes to grow and inhabit a place must be carefully monitored and watered and manured during alternate seasons, for the most hardy and suitable species to survive.

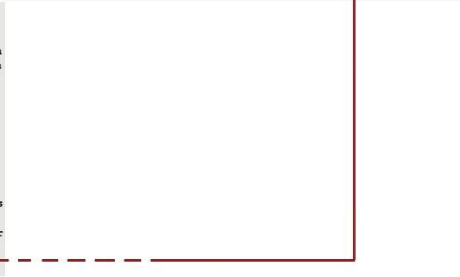
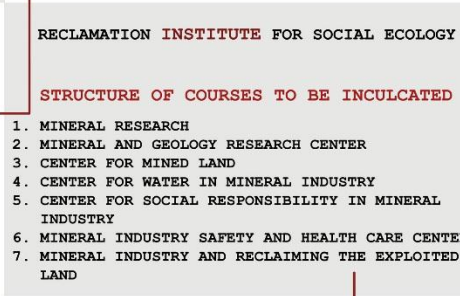
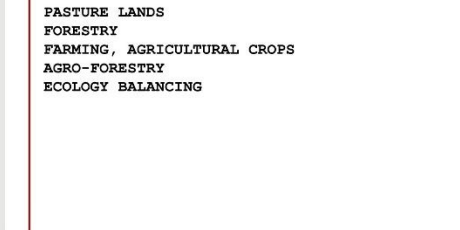
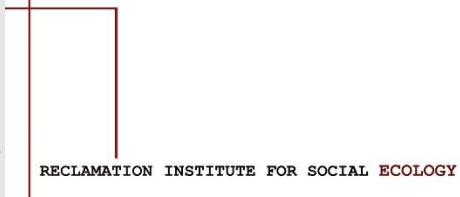
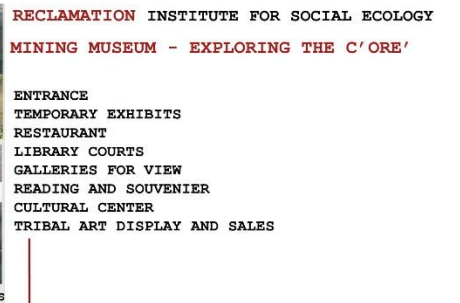
**REFLECTIONS AND INSPIRATIONS**  
The natural crater of the quarry was used as it is with its depth to form a lake that inhabit other water species native to that place. The vegetation through hydroseeding took a complete 8 year cycle to fully situate the plant species. Wild birds and animals have started inhabiting the woodlands and the lake.



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## PROGRAMME



**LESSONS LEARNT**  
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**REFLECTIONS AND INSPIRATIONS**  
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SECTION B-B'

DUMP

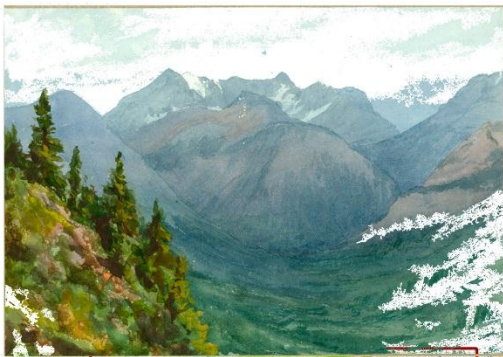
SETTLEMENT

SETTLEMENT

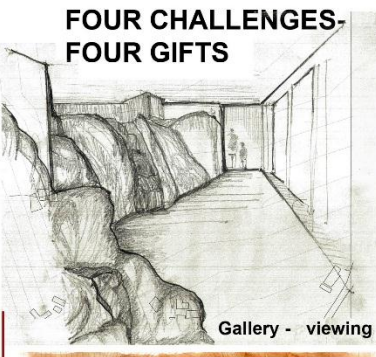




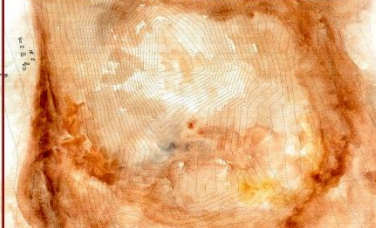
**Ecological Renewal** - The crater in the forest of the Aravalli ranges has disrupted the ecology at all levels. Revival of the forest and reclamation of the exploited land in appropriated phases is the most suitable. This, hence becomes a prototype for the various other abandoned mined sites around the site and the other in the country.



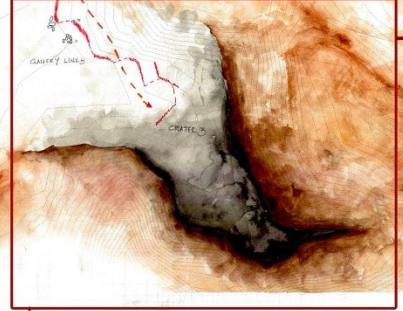
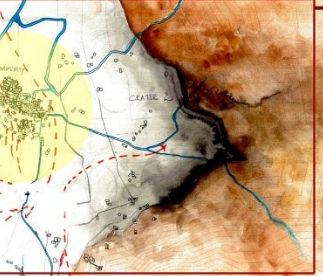
**Social Equity** - The crater closest to the community and in close proximity to their everyday living, is a hazard due to the loose dumps lying around as well as a symbol of death and scarcity in the neighbourhood. Reviving the community, equipping them with skills and providing with the technological think tank, to introduce better systems and methods to alleviate their condition and make them self-sufficient.



**Masterplan showing the VISION for the site**



**Authentic Cultural Identity** - The communities in the neighbourhood, were once a thriving, self-sufficient, tribal lot, with inherent means to earn and sustain their living. The mining activity, though did employ them in the interim, but took away their culture and the only means of earning. Reviving their art and culture in the form of outreach by the think tank, is another goal that we wish to address.

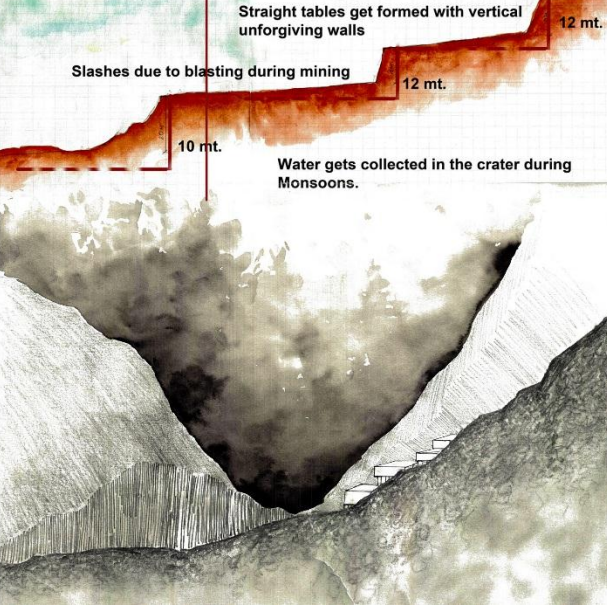


**North-east winds dominant in Winter season**

**Waste Dumps - around craters** Towards community

**Existing Section of the Crater 2**

**Vibrant Economy** - Little things have as much effect and impact on people than first hand and personal experience. For the condition to become a prototype of its kind and help propagate an approach which is more considerate and holistic in its being, it is important for people to experience it. The third, most interesting crater for its current existence, is stabilised and the vicinity developed as a museum.



**Conceptual sketch of the Crater 3**



*“When you build a thing, you can’t merely build that thing in isolation, but must also repair the world around it, and within it, so that the larger world at that one place becomes more coherent and more whole.”*  
- Christopher Alexander

**Architecture as a derivative of Pedagogy**

**Center for ‘Mined’ land regeneration**

‘The department and its curriculum focuses on the rehabilitation of the mined land and exploited soil. Soil building, cleaning of soil and rendering it useful, back to its ecological state are some of the areas of focus. The disturbed ecological state of mined land becomes a huge concern for the locality around and in the larger context also.

**Mineral and Geology Research - Sustainable methods**

The techniques and methods of mining of all types of materials, is the major area of focus. Post mining rehabilitation techniques and the pre-mining preparation is of prime importance to make the mining activity least harmful.

**Innovation and redesign department**

The area of focus here is to innovate and support research for newer materials so that mining is not required for harmful materials like asbestos. Also, newer machinery and tools and safety methods for workers and to gain maximum efficiency is the area of study.

**Health care, safety and security**

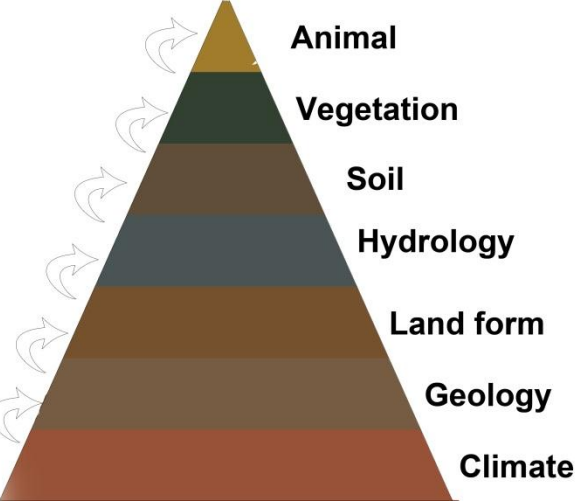
Mining can have severe ill effects on the workers and the communities dependent on the land around it. As an example, and dealing with the local community, asbestosis as a disease and its cure is a major area of concern. Also health care of the communities around and their upgradation shall be focussed.

**Social activism and justice**

The people once employed, in the mines, are left abandoned, with no or minimal employment opportunity and no means of livelihood. The hygiene, education, health and living standards in general are very poor and require policy decisions to be incorporated. Through this education, they become aware, self-reliant and literate.

**Climate and micro-climate**

Mining and exploitation of ecology leads to major changes in the micro-climate and eventually to the climate. The study and in-depth analysis of the local level and for general cases should help fight the major issues it creates and counterbalance the ill-effects.



Center for ‘Mined’ land regeneration



Before



After

Food and agriculture department



Before



After

Water management during and post mining process



Before

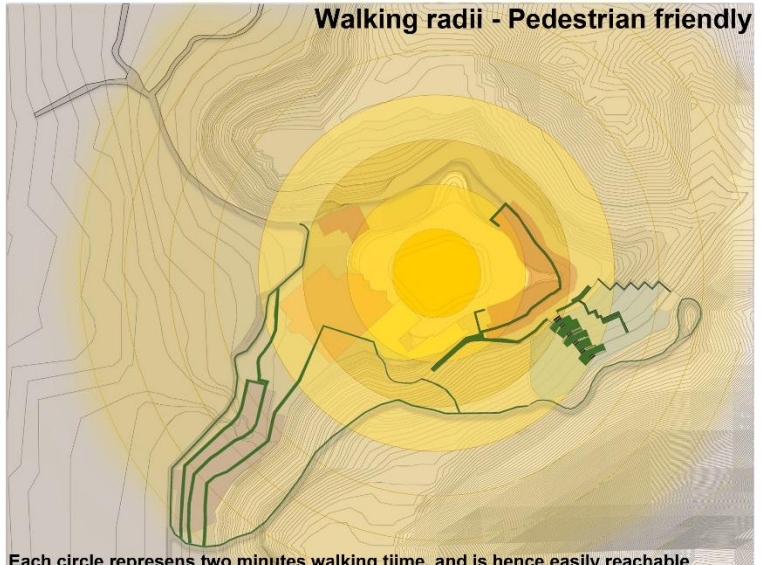
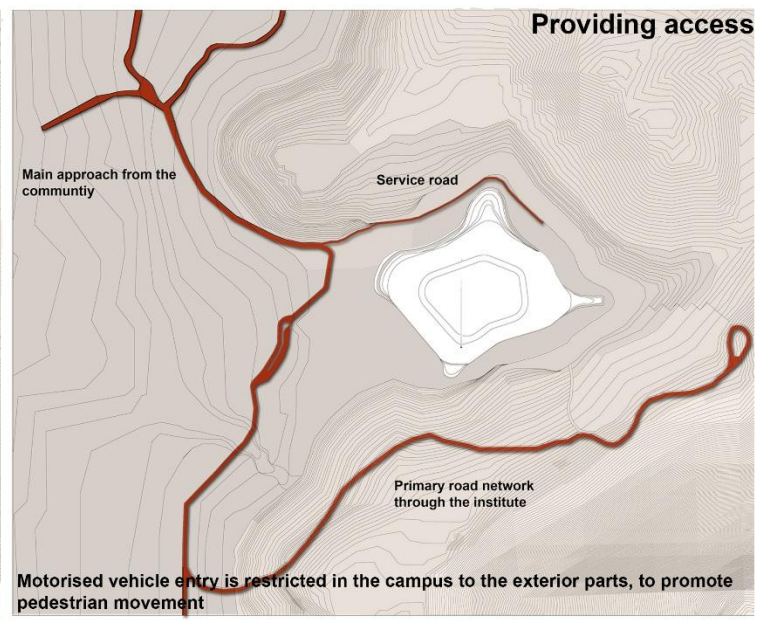
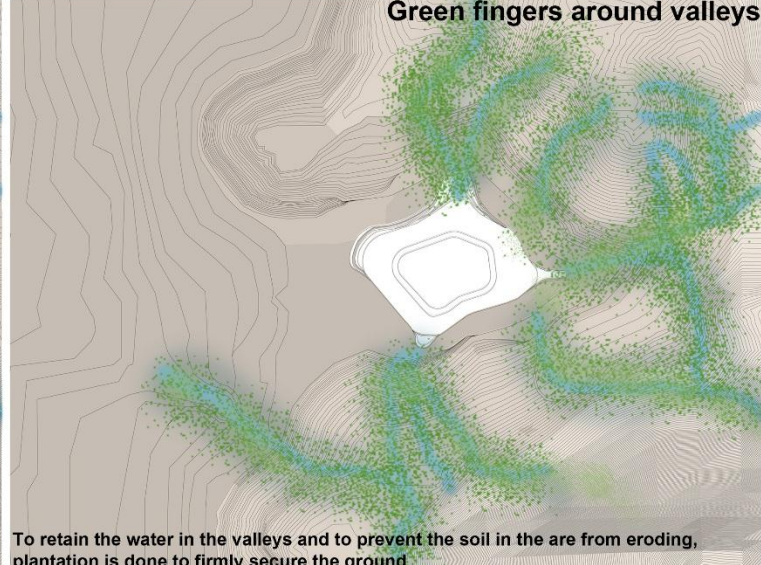
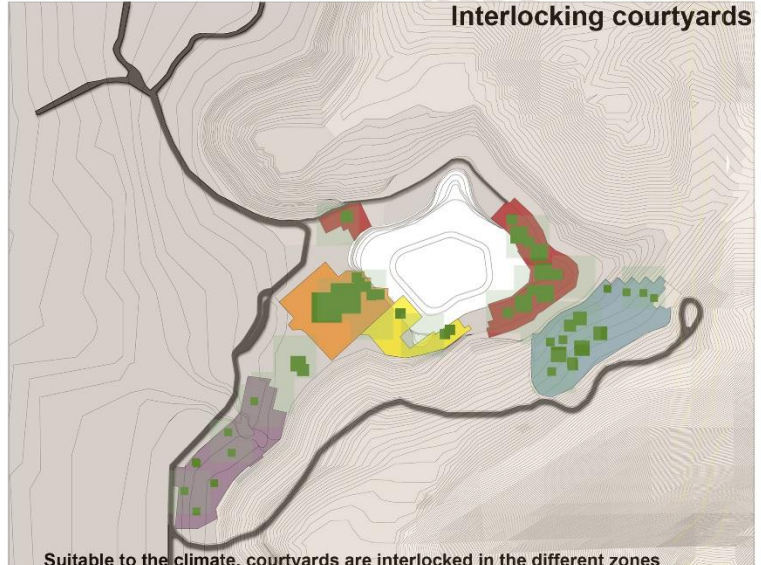
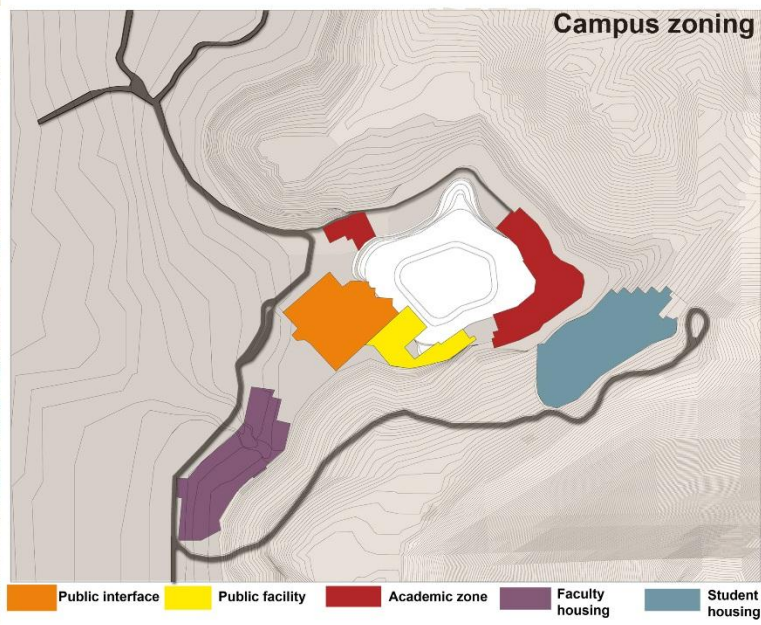
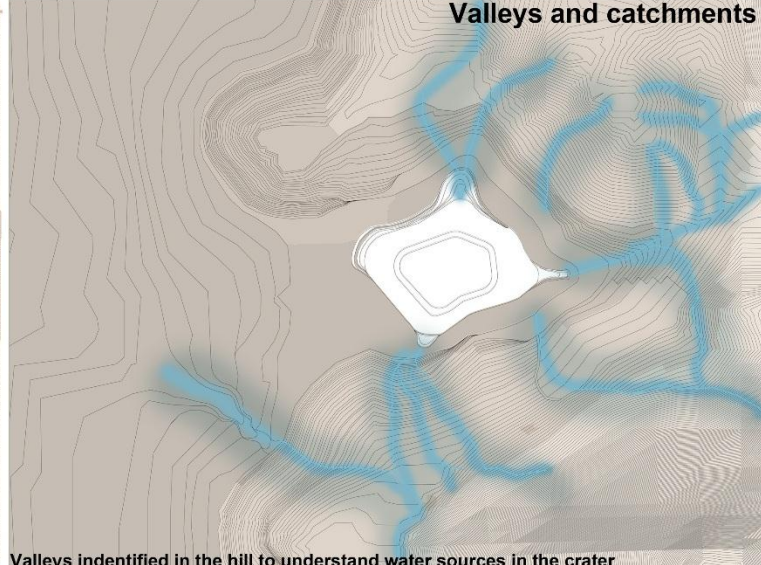
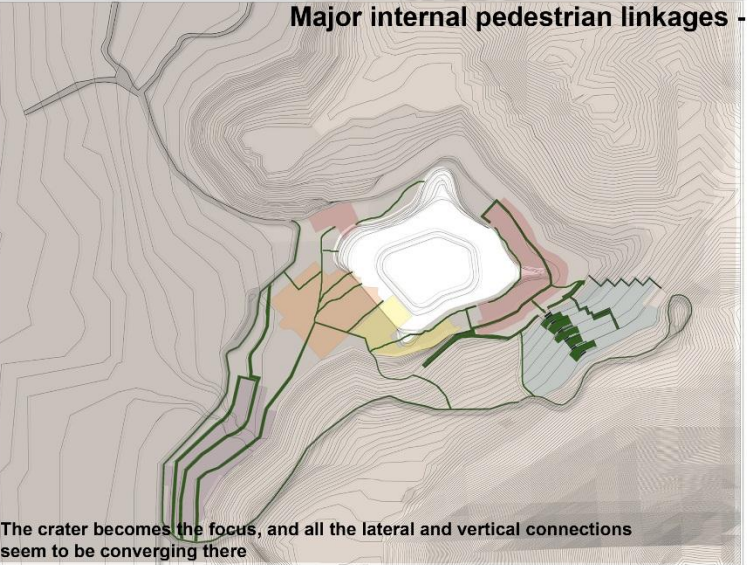
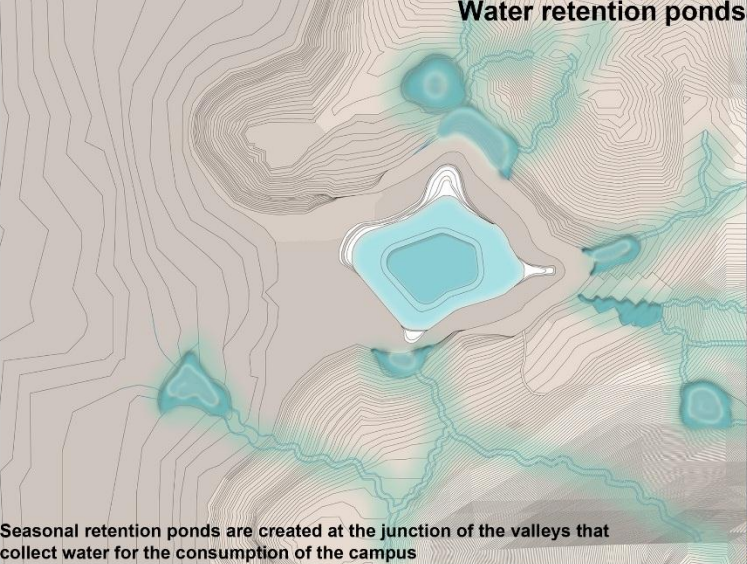


After

**Water and Soil are a major concern in Udaipur and the main focus of the architecture. Water through the water gathering slopes in the site are gathered in a catchment pond and utilised in the institution and the agriculture around. Vantages across the hilly terrain are spectacular and have been tried to be incorporated in the experience. The climate of Udaipur with the unforgiving heat and cold is best accommodated with the clustered form for self-shading.**



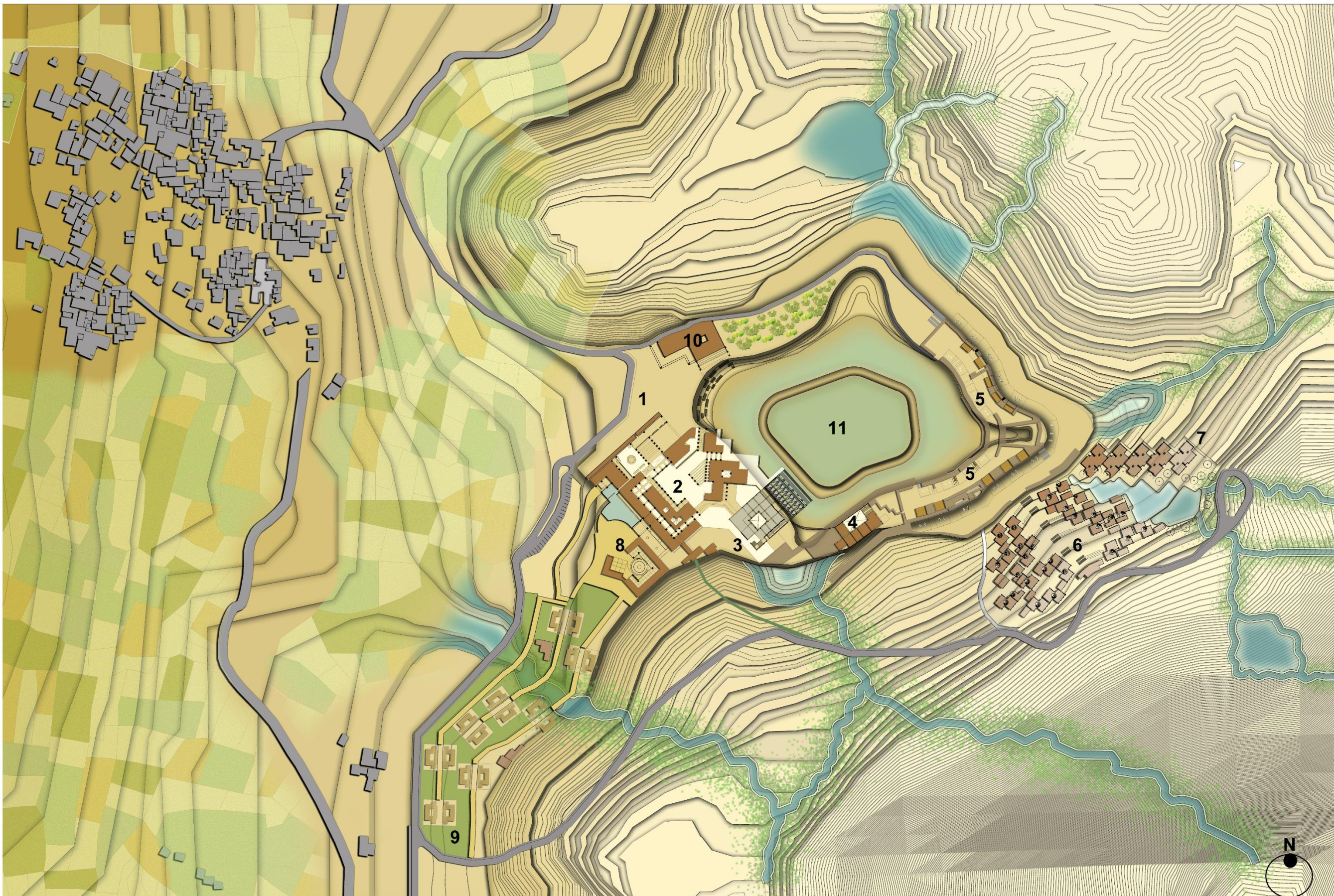
DECODING THE CRATER



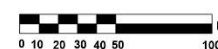
ARCHITECTURE AS PEDAGOGY







1. First view   2. Administrative block   3. Library   4. Dining Facility   5. Academic block   6. Student housing  
7. Married students's housing   8. Amenity center   9. Faculty housing   10. Outreach of academic section   11. Lake



LAYOUT

RISE





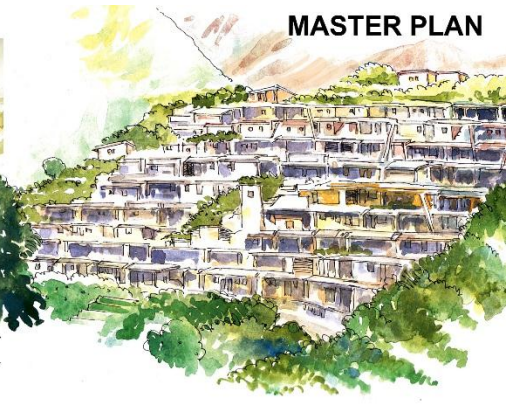
Conceptualising faculty housing with step farming integration



First View from the approach road



View of subsequent craters from housing area



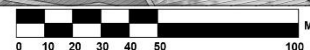
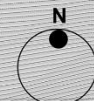
Academic section

Conceptualising student housing by 'cut and fill'



# LAYOUT

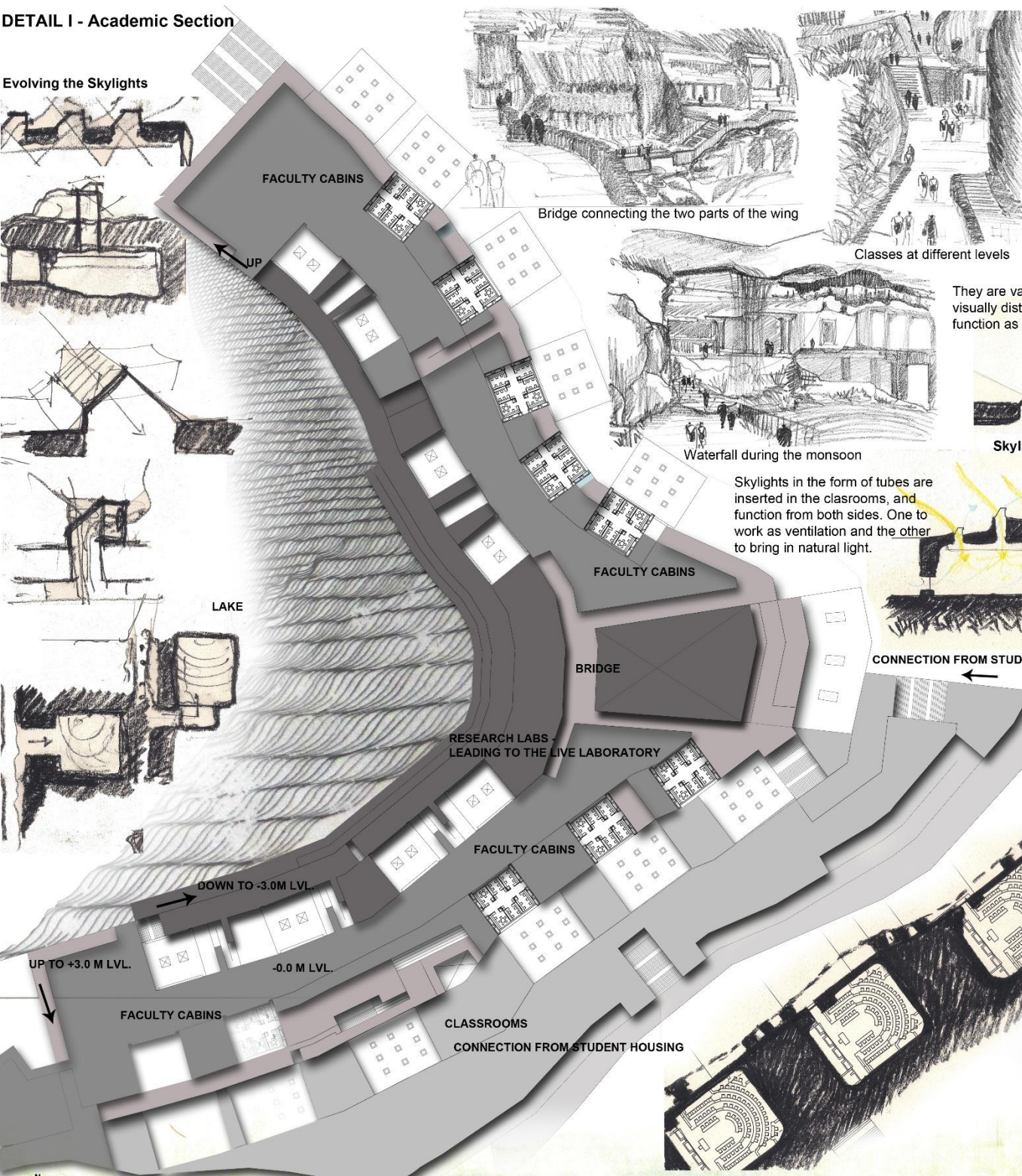
1. Administrative Block
2. Library
3. Student Dining Facility
4. Academic Block
5. Student Housing - 400 students
6. Married Student's Housing
7. Faculty Housing
8. Amenity Center
9. Toilet blocks





DETAIL I - Academic Section

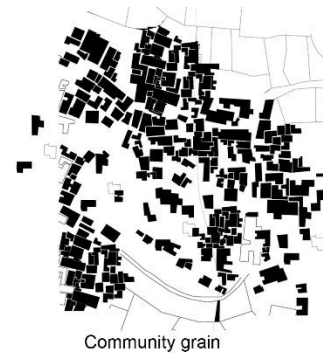
Evolving the Skylights



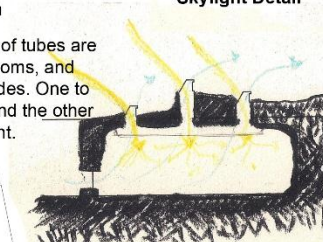
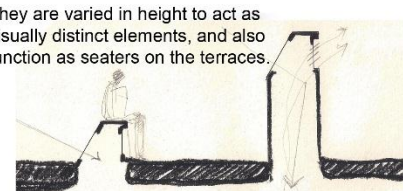
ACADEMIC WING PLAN - Not to scale

DETAIL II - Student Housing

The student housing is derived from clustered form of housing derived from the community dwelling grain. Interlocking courtyards, provide varied sizes of spaces for public funtions as well as relief from the heat, by self-shading.



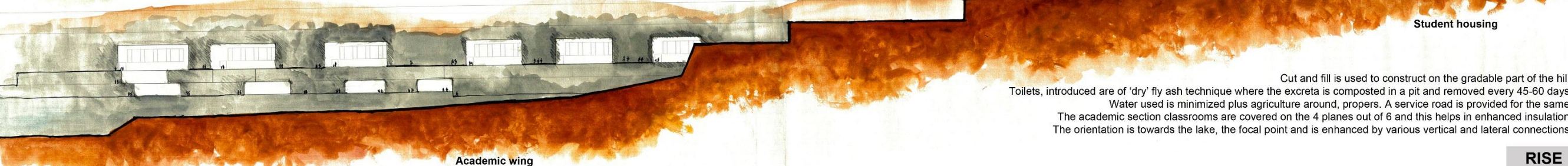
They are varied in height to act as visually distinct elements, and also function as seaters on the terraces.



STUDENT HOUSING LAYOUT - Not to scale



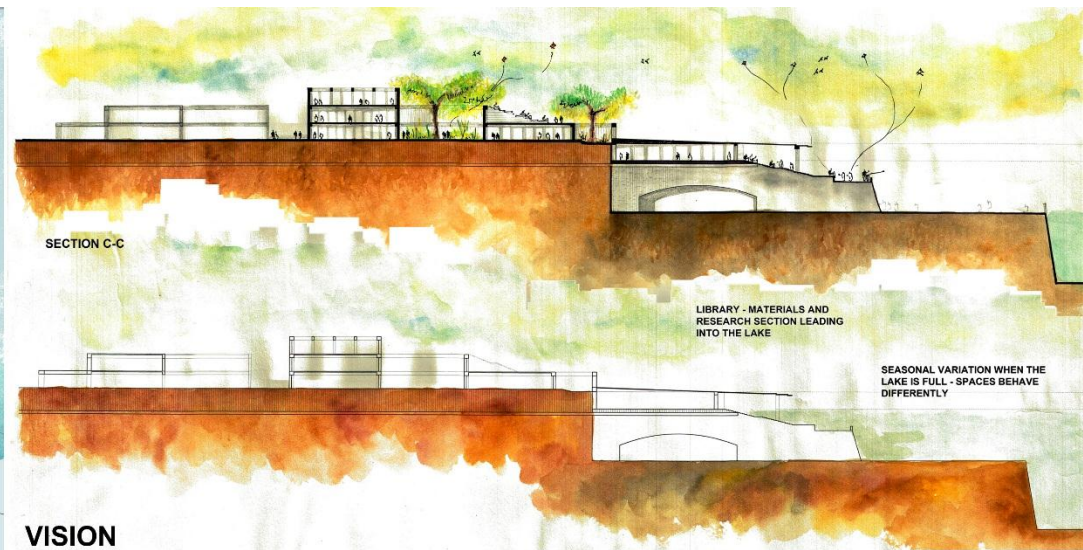
CLASSROOMS - PART PLAN Not to scale



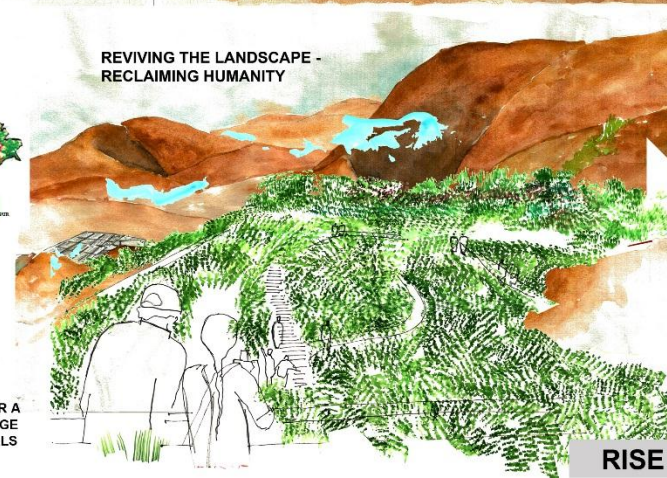
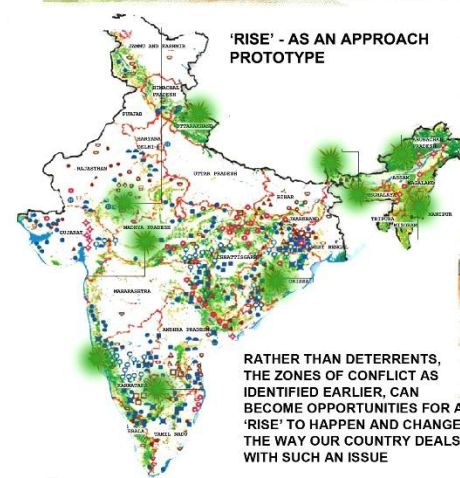
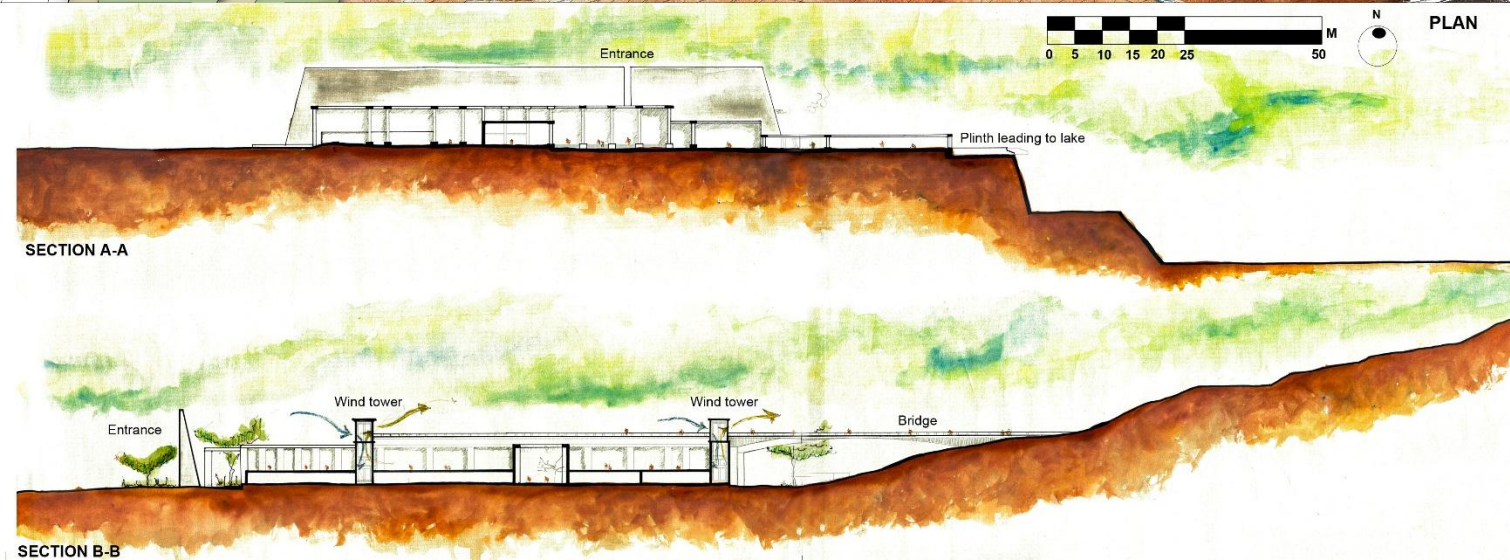
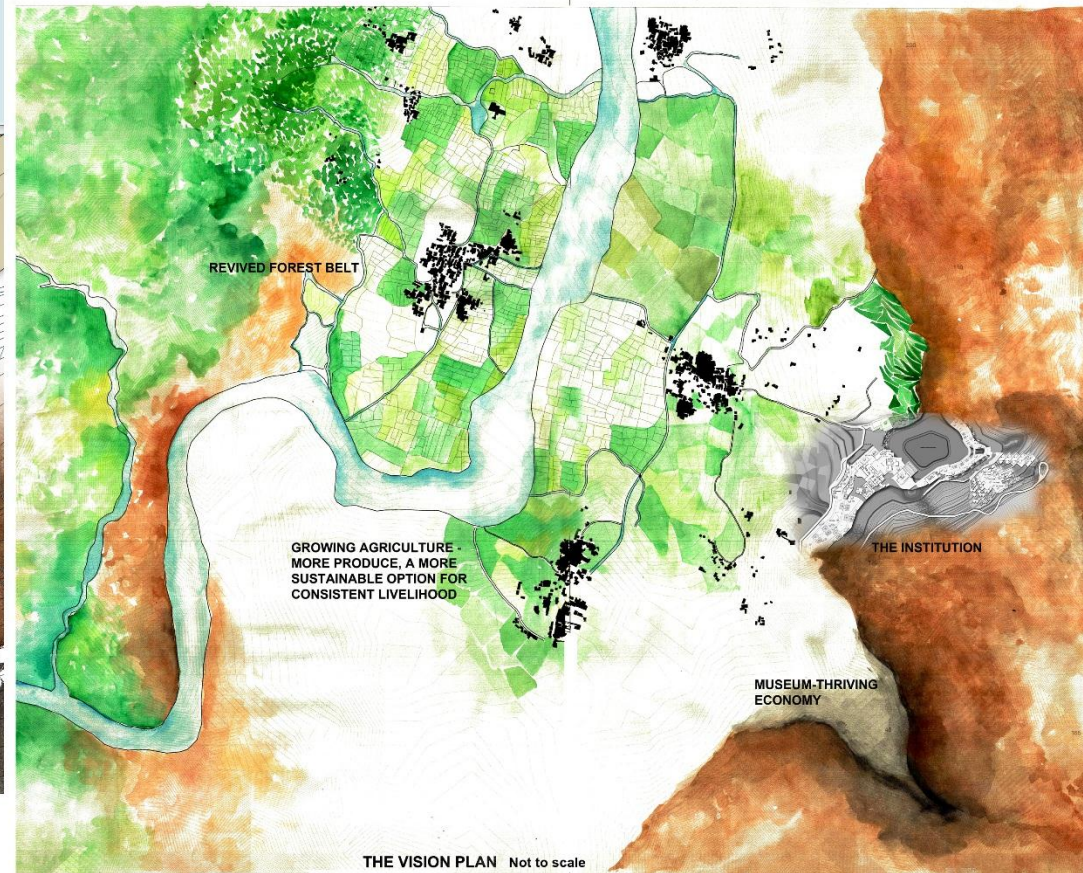
Cut and fill is used to construct on the gradable part of the hill. Toilets, introduced are of 'dry' fly ash technique where the excreta is composted in a pit and removed every 45-60 days. Water used is minimized plus agriculture around, proper. A service road is provided for the same. The academic section classrooms are covered on the 4 planes out of 6 and this helps in enhanced insulation. The orientation is towards the lake, the focal point and is enhanced by various vertical and lateral connections.



# DETAIL III - Administration Block



## VISION





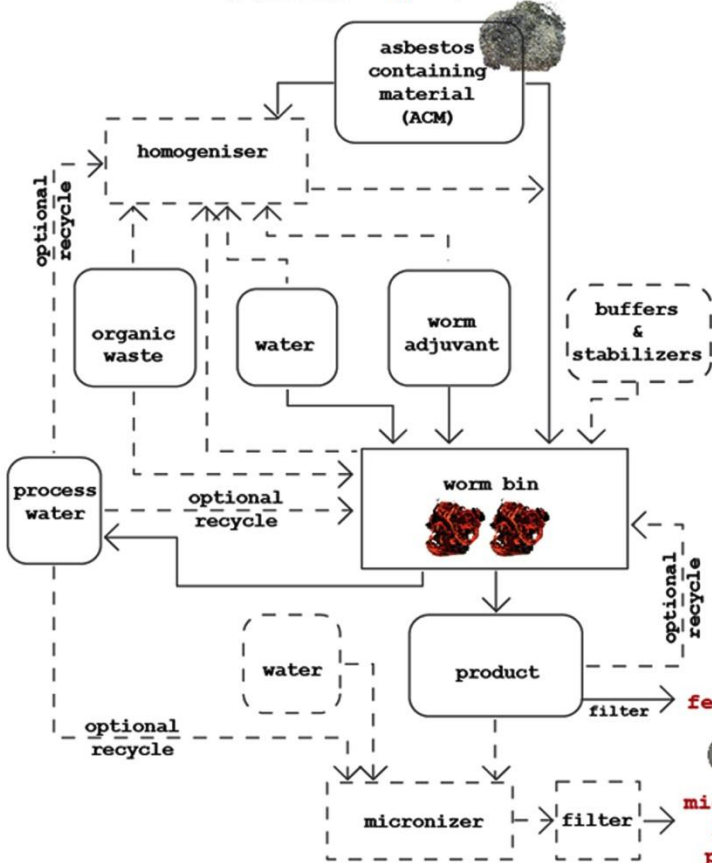
## Asbestos Dump Processing and Productive Reuse



### Asbestos collection

bare hands  
low-tech equipment  
no protection

collected in a controlled facility  
specific breathing equipment  
protective gear



Filtration of asbestos into powder for reuse



Thermo-chemical treatment



Vermi processing

### Asbestos processing

*Fusarium oxysporum* - a fungi, scavenge iron from the environment. Hence, they can be effectively used for decontamination of soil and water containing heavy toxic waste. Moreover, the fungi bind asbestos fibres in a kind of web of thin strands called hyphae, making them less liable to escape into the air if the soil is disturbed. The far-reaching hyphae networks that fungi spin throughout large areas of soil could immobilize asbestos fibres. To use such microorganisms in field operations generally involves 'seeding' the soil with a few spores and adding the nutrients that they need to grow.

*esenia fetida*



Patent - US 6,716,618 B1

Vermi processing for asbestos remediation

### Asbestos recycling Unit

Thermo-chemical treatment

SPLAINEX technologies



liquid product as non-ACM

+ cement

manufacture

light weight blocks for roofing/paving

+ fertilizer

inert non-ACM powder

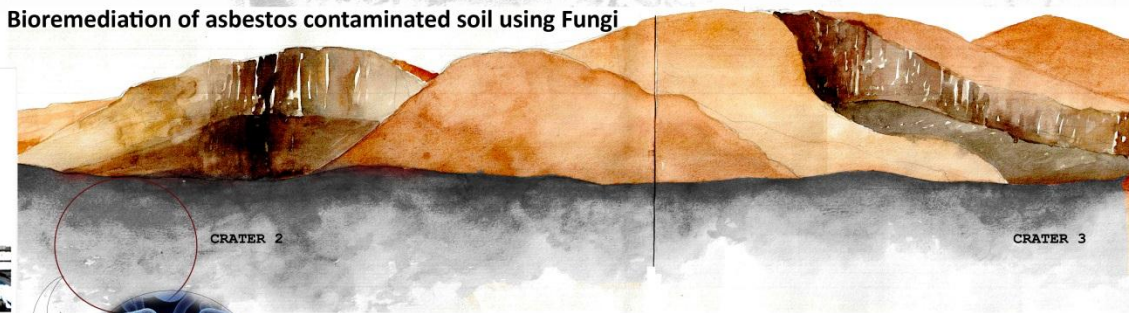
+ hardening agent

manufacture

inert non-ACM composite

Vitrification result in the maximum amount of volume reduction, destroys the asbestos fibre, treays problematic debris after treatment and immobilises radiological contaminants within the resulting glass matrix.

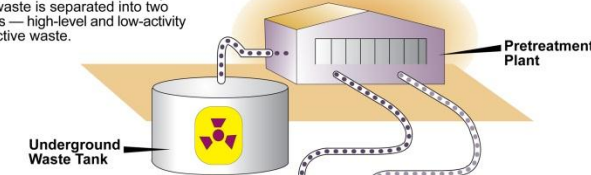
## Bioremediation of asbestos contaminated soil using Fungi



## Vitrification Process

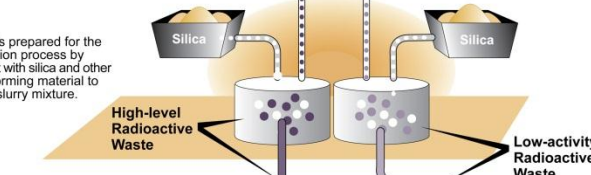
1

At the WTP Pretreatment Facility, liquid waste is separated into two streams — high-level and low-activity radioactive waste.



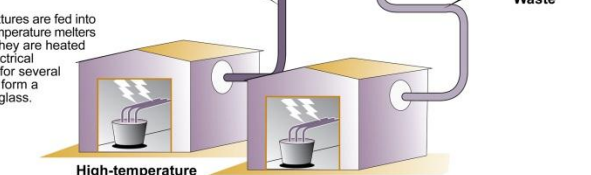
2

Waste is prepared for the vitrification process by mixing it with silica and other glass-forming material to form a slurry mixture.



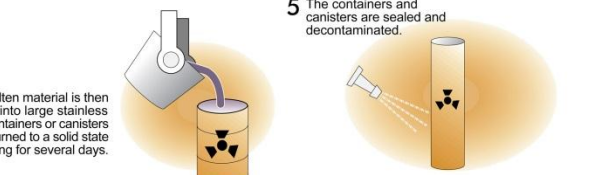
3

The mixtures are fed into high-temperature melters where they are heated with electrical current for several days to form a molten glass.



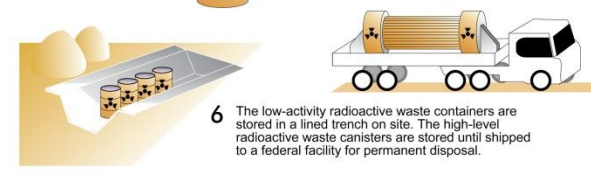
4

The molten material is then poured into large stainless steel containers or canisters and returned to a solid state by cooling for several days.



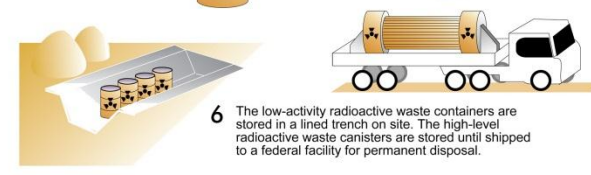
5

The containers and canisters are sealed and decontaminated.



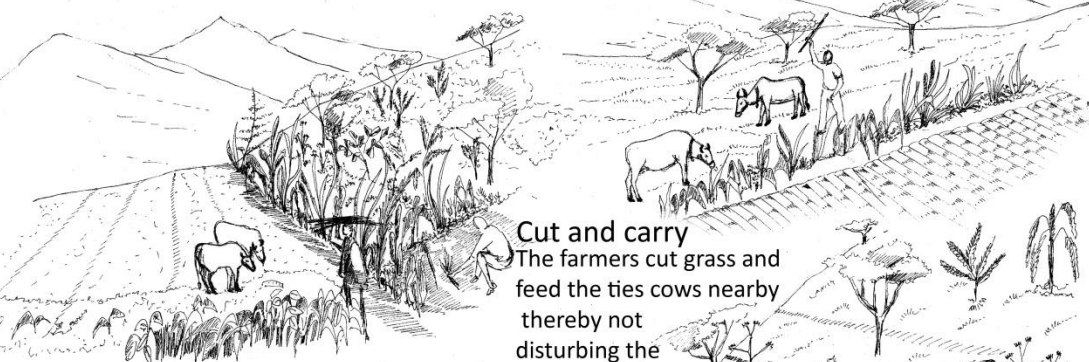
6

The low-activity radioactive waste containers are stored in a lined trench on site. The high-level radioactive waste canisters are stored until shipped to a federal facility for permanent disposal.



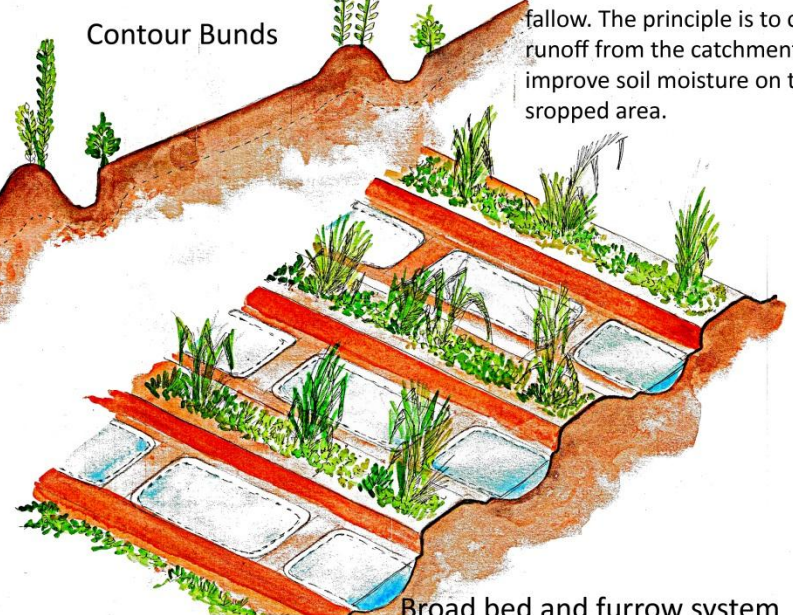
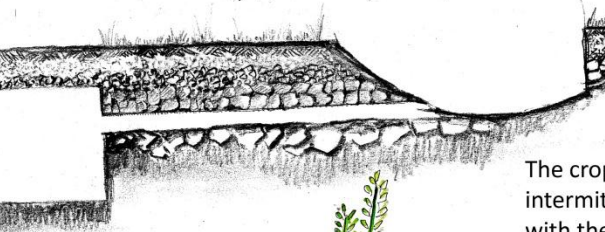
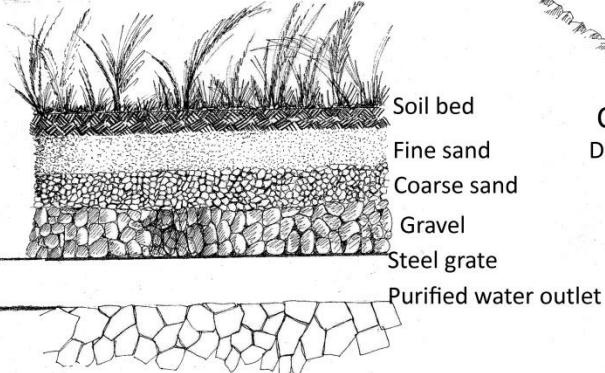


Soil Building and Effective Cropping Techniques



**Rotation of grazing - Controlled**  
When the left part is eaten up, the herd shifts to the right part till the left can regenerate

**Root zone water filtration method**



To encourage moisture storage in the soil profile

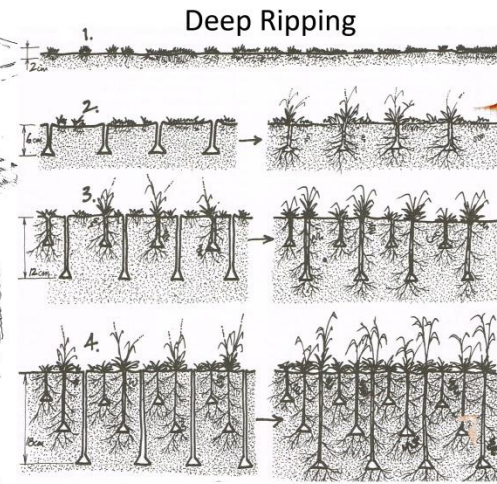
**Cut and carry**  
The farmers cut grass and feed the ties cows nearby thereby not disturbing the grassland

**Clear area closure**  
Develop the closed area into forest

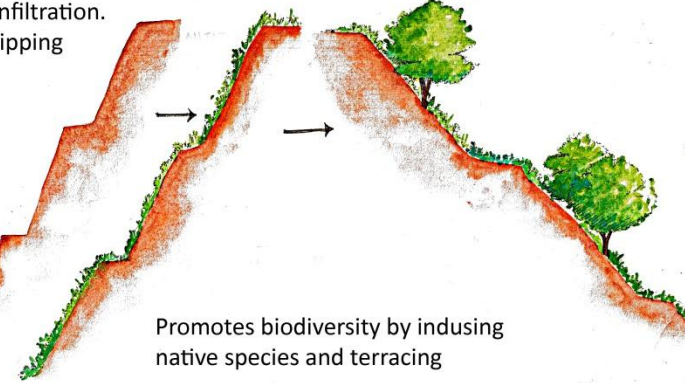
**Water conservation and utilisation techniques for effecient cropping in arid and semi arid areas**

The cropping is usually intermittent on stripd or in rows, with the catchment area left fallow. The principle is to collect runoff from the catchment to improve soil moisture on the sropped area.

A khadin, also called a dhora, is an ingenious construction designed to harvest surface runoff water for agriculture. Its main feature is a very long (100-300 m) earthen embankment built across the lower hill slopes lying below gravelly uplands. Sluices and spillways allow excess water to drain off. The khadin system is based on the principle of harvesting rainwater on farmland and subsequent use of this water-saturated land for crop production.



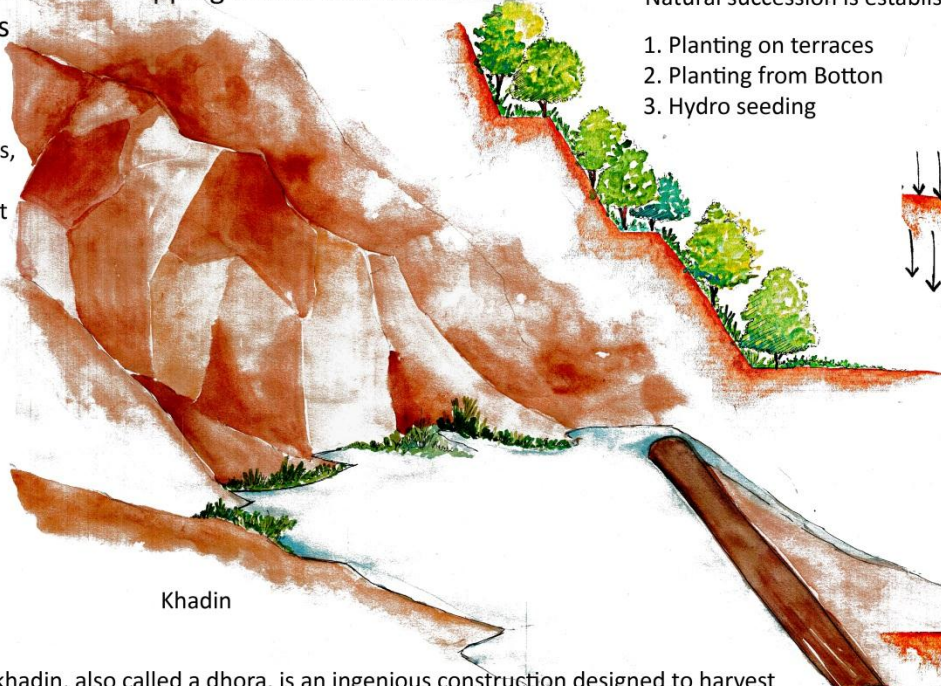
Deep Ripping and Decompaction are key factors which help in restoring soil pore space and permeability for water infiltration. The objective of Deep Ripping and Decompaction is to effectively fracture through the thickness of the physically compressed subsoil material restoring soil porosity and permeability and aiding infiltration reduce runoff



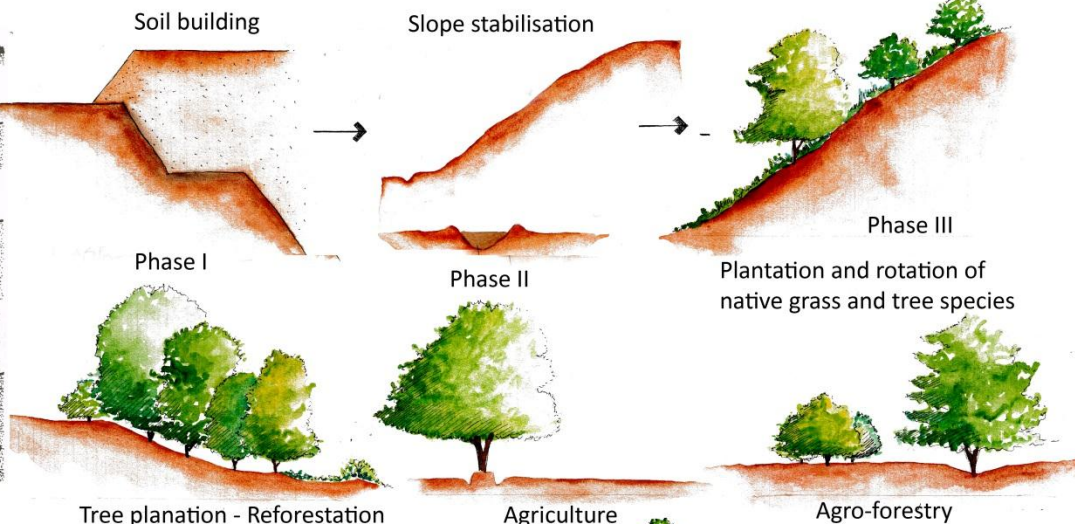
Promotes biodiversity by indusing native species and terracing

Natural succession is established

- 1. Planting on terraces
- 2. Planting from Botton
- 3. Hydro seeding



Khadin



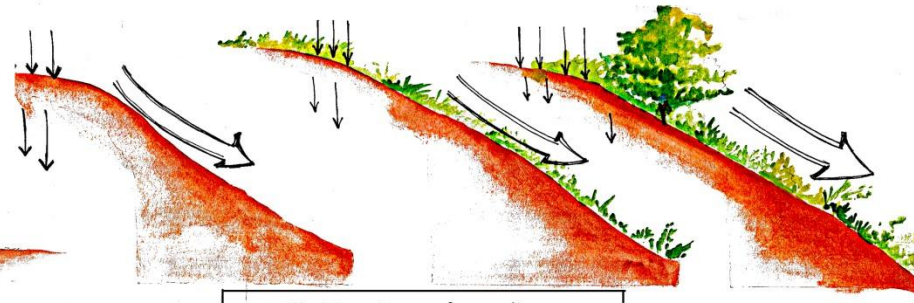
Tree planation - Reforestation

Agriculture

Agro-forestry

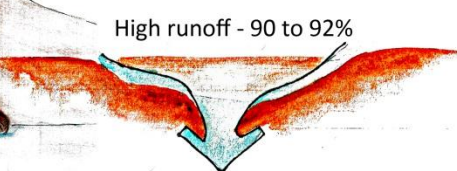
Mixture of native plants, trees, shrubs, ground cover at all levels.

Biomass Reserves, managed by locals - Participation



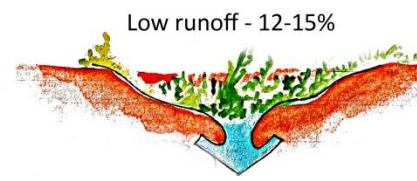
First two stages of regrading

Controlling soil erosion



High runoff - 90 to 92%

Road paths - initial stage



Low runoff - 12-15%

Grass swards - after rehabilitation

Drainage channels

Reference - Watershed Management by E.M. Tideman



Dump treated as depicted in methods

Soil contaminated with asbestos waste

**PRESENT CONDITION**

**PHASE I**

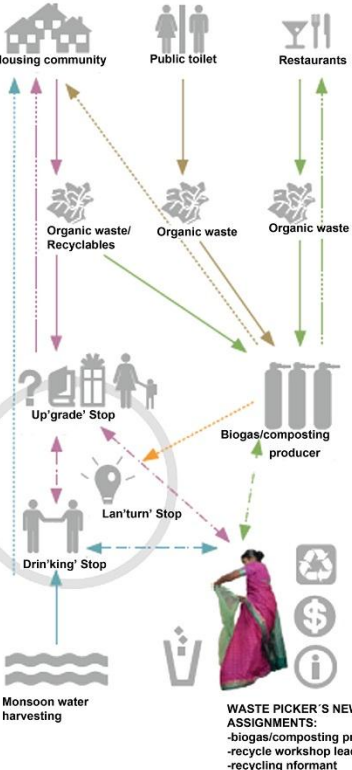
Scraping off top soil, Fungi treatment to make asbestos inert, Growing native legumes to repair soil. Organic nutrient supplements to rejuvenate

**AGRO-FORESTRY WITH NATIVE GRASS AND TREE SPECIES**  
(KHEJRI, BABUL, NEEM, TAMARIND, MAHUA CROPS - BHINDI, CORIANDER, BARLEY  
GRASS - CENCHRUS CILIARIS, DICHANTHIUM ANNULATUM)



# The Outreach of the Institute

## Flows of Production and Services - A Holistic Approach

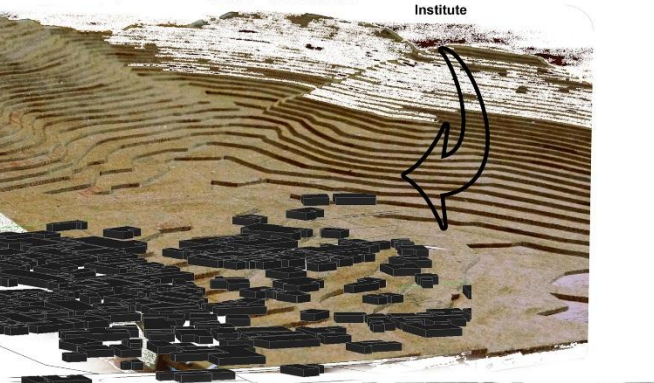


The institute is not only limited in its functioning to the formal education and training in the campus. Rather, the idea is to integrate the communities around and make them self-sufficient in their functioning and energy consumption. Outreach functions, are thus planted in the forms of interactive activities in already existing institutions like schools, temples, households, clinics and market places. The centers are of varied kinds, each performing a unique role in making the community sustainable.

Connections among these nodes are brought through a series of decentralised recycling units that integrate the current waste system management with additional functions to promote local participation. Together, they form a network of waste-and-recycle related production, as well as information nodes.

Each Unit contains an additional function that supports the local community, for example a meeting place or workshop space. By placing the units where existing functions and needs in these communities already exist, it makes the waste process more accessible and integrated in daily life.

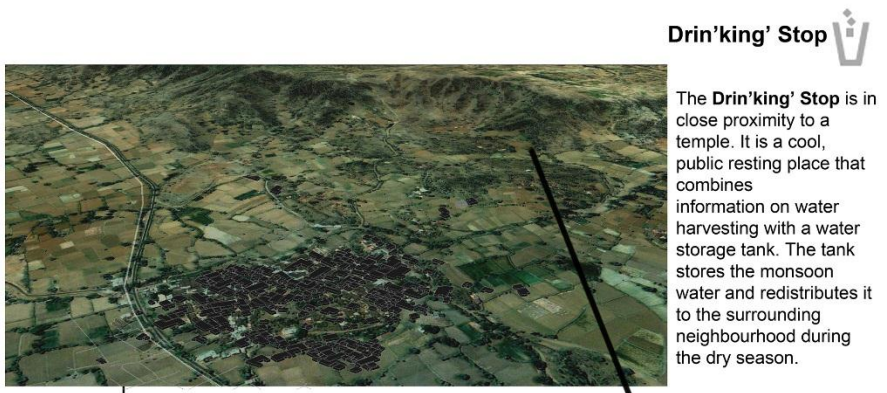
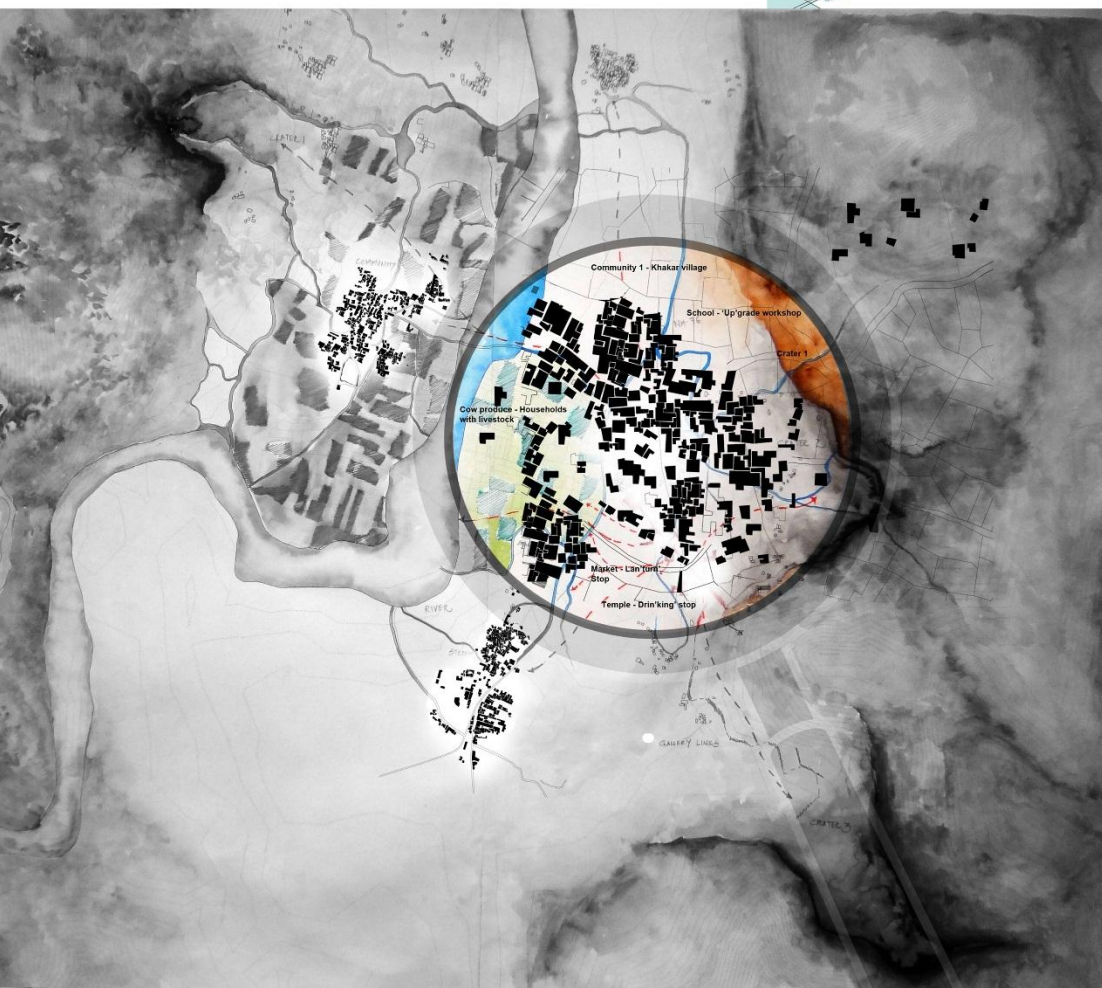
Monsoon water harvesting  
WASTE PICKER'S NEW ASSIGNMENTS:  
-biogas/composting producer  
-recycle workshop leader  
-recycling informant



### Up'grade' Stop



The **Up'grade' stop** combines a recycling unit with the schools in the locality. It functions as a shed for sorting, recycling and re-selling waste. Through workshops, the cityemployed waste picker teaches the children how to sort and construct new things made from scrap materials.



### Drin'king' Stop

The **Drin'king' Stop** is in close proximity to a temple. It is a cool, public resting place that combines information on water harvesting with a water storage tank. The tank stores the monsoon water and redistributes it to the surrounding neighbourhood during the dry season.



The **Hap'pee' Stop** connects a biogas station and fuel shop to the public toilets. Get paid for using it- or buy biogas here. Biogas is produced from the compost material and then sold. These units also provide information on recycling and composting.

At the **Lan'turn' Stops**, organic waste from nearby restaurants is collected and turned into biogas, which in turn is used as fuel in the restaurants' stoves. The biogas can also be used to generate light at nearby bus stops. This system is maintained by a biogas expert - a former waste-picker.

