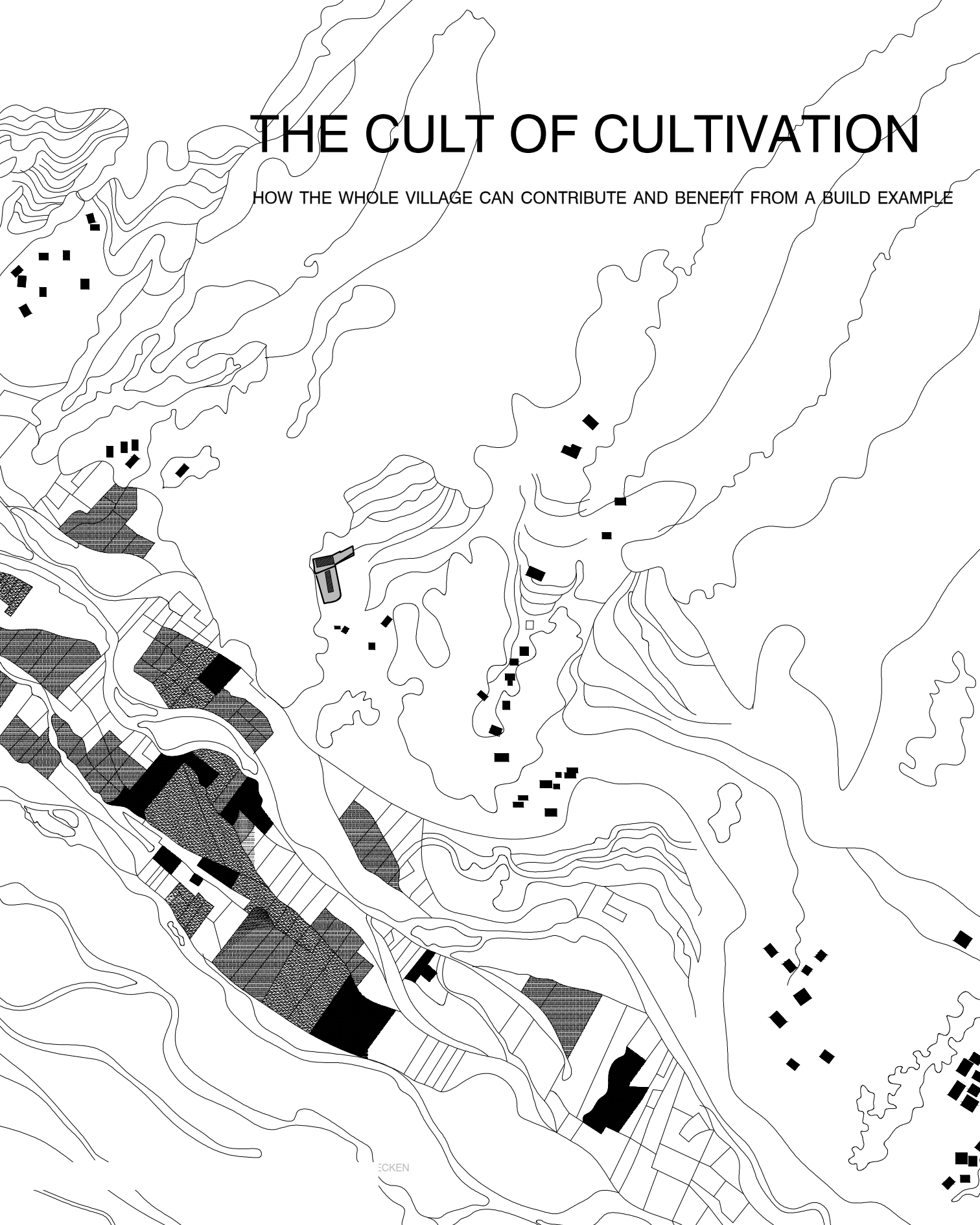
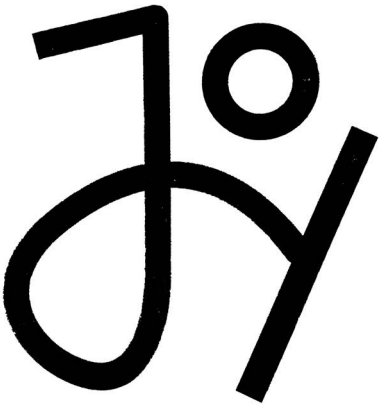
THE CULT OF CULTIVATION

HOW THE WHOLE VILLAGE CAN CONTRIBUTE AND BENEFIT FROM A BUILD EXAMPLE



The joy of making, learning and teaching “ Two weeks Nepal with masterstudents of KUL ,faculty of Architecture

The ambition of the workshop is about the (re)construction of school buildings and the revitalizing of the schooling process. Therefore an elaborate research on traditional and local Nepali building methods and ways of living is an important part of this project. It aims not only at designing structurally strong, aesthetically pleasing, functionally efficient and economical/ecological attractive schools, but also to build them in such a way that the local population can relate to them.



THE JOY OF MAKING LEARNING AND TEACHING

a sustainable school and community

THE IDEAL SCHOOL FOR NEPAL
A NEPALI BELGIAN COLLABORATION

The cult of cultivation

Master dissertation project

This reflection paper presents a combination of research and analysis to build up my project. It is an attempt on showing where the challenges and opportunities of the site are and how the proposed architecture utilizes these elements. Brought as a coherent book, this reflection paper offers an insight into the progress, and outcome of my master dissertation project.

Cover image: http://www.takeonnepal.com.au/blog/

The following people contributed and guided the development of this project and publication:
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This project was developed for the master dissertation, within the project of the Ideal school for Nepal. Proposed by Ignaas Back.

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Preface

First of all I want to thank the school and teachers for the great opportunity to have a master dissertation project in Nepal. The experience that I had would never have happened without the introduction of the research for an ideal for Nepal, but also thanks to the collaboration with the local ngo CEPP.The fieldwork, study trip to Nepal was a lifetime experience that changed the way of looking and approaching architecture. It's a gifted memory that will last. Living close with the local people was a big opportunity and let me and the other students realise what living in Nepal means. I'm a hunderd percent convinced that the close approach of living with the Nepali people gave us an inside in their daily routines and showed what the essentials are to live. Our stay in the village would never have been the same thanks to our lovely guide and translator Shail Shrestha who did a marvelous job. I also want to thank friends and family for the support during the whole master dissertation.

My experiences of the Nepali lifestyle are essential to analyse the site and the specific needs of those people. My discoveries and thoughts about how to design for them are shown in this reflection paper. Most of the time they rely on agriculture. Their close relation with nature strikes me. It's an agricultural based society where from time to time the husband tries to find in different cities or countries some extra income. Income is spended on living costs and education for the kids. Education for the children is not cheap for them. The drop out or abscence of children is an issue, especially when the children get older, more and more children stop going to school.

Building a school for the Nepali people needs a shift in the building approach. A school is a status building in the community. The school building is something they look up to and it can set an example for the whole community. The status symbol is important so that they believe in the value of the institute so they send their children to school. That the school building sets an example for the whole village is an opportunity to change the perception in the available building materials. Today the holy grail is concrete which is not easily available in Nepal and is quite expensive.

My goal for my master dissertation is to find easily available buiding materials so the local people can build, maintain and repare their properties without making big expenses.

Therefore I digged in local cultivated material as part of the agriculture background. This means that even before the building process starts the involvement starts with growing and harvesting the building materials. So it becomes a school grown and build by the community for the community.

The involvement is a crucial part to enlarge the role of the school in the community, and to make the school part of their community. In that way the function of the school can be enlarged and get an extent as a parents meeting area, center point where meetings, school performances and social dialogue can happen.

Field research

The field research is the first part of research based on our stay in Nuwakot. The field research has two chapters, one chapter explaining the fieldwork and the second chapter as an introduction to the site.

After this first research you will find my translations of how to deal with the complexity of the program and the site. These translation come directly from the field research and are a search how to respond on the necessities of the school and the meaning-full relation of the school for the community.

Fieldwork

by Jolien Van der Eecken, february 2017

School observations

Our arrival in the village went really well. We could easily make contact to the children allthough we had to cross the language barrier. By trial and error we found out how we could communicate. We spended at lot of time in and around the school, which was a temporary learning center (TLC) because the existing school collapsed.

In the school we observed some classes and the daily routine an ordinary school day. In order to get to know what the school needs, it was necesarry to see what a school day means in Nepal. When does it start, how lessons are teached, when do the children have a break, etc.

We also discussed our models from our casestudies all over the world with the children to see what they liked. Therefore an honorable mention goes to Shail Shrestra to be our personal guide and translator. This type of class discussions was very new for the children. A class organised outside the classroom was sometime that was not done. Teachers and children were both enthousiastic about this more informal way of teaching. The boundary of being in a classroom gives a certain pressure to a child to well behave and to sit down and listen and repeat. Outside the children act more spontaneous. Students gain confidence in speaking without the pressure of a classroom environment. The teachers also told us that children who barely communicate in class were more open and willing to speak outside. The existing classrooms are too small to let group activities happen, especially multi-grade teaching or school activities were never organised.

by Jolien Van der Eecken, february 2017

former school building

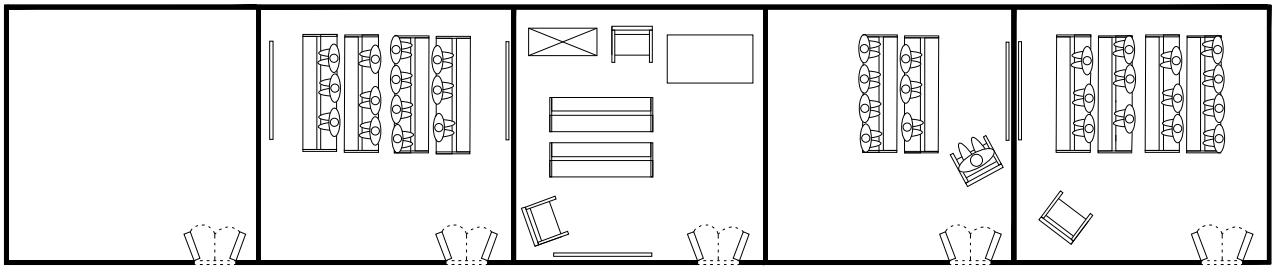
TLC

School observations
- different classroom set-up

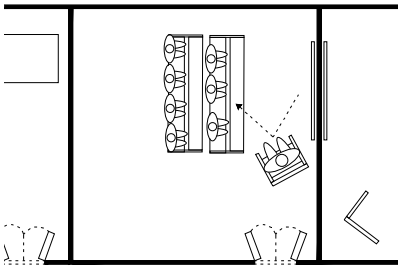
We joined different classes from grade 1 till grade 5. We looked how a classroom is set up and how the teaching is done. The children repeat a lot, copying the the teacher. That is the way they learn by copying excercises and repeating the teacher words. It's a very formal way of learning. We tried to change the set-up of the banks in the classroom to see if that would chance anything. Our intention is to change the formal way of teaching to a more open and interactive way. Changing the way the children sit together can improve their interaction with eachother and it may stimulate peer learning. On the otherhand it also changes the relation between the teacher and children because our set-up changes at the same the space in front of the classroom. This set-up gives the teacher more space in front to interact instead of the very static way of the normal way of teaching they are used to. The set-up gives the teacher also the possibility to access each child better, so individual help can happen more easily.

by Thomas Vandesande, february 2017

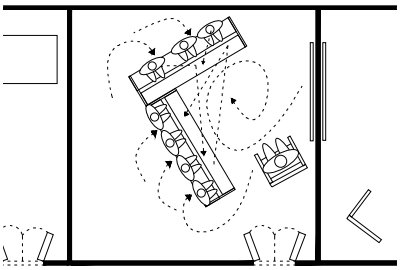
by Thomas Vandesande, february 2017



configuration existing TLC building



This is an existing set-up of the classroom. Pictures from the existing situation show the static way of teaching where the interaction level is very low. The classrooms are quite small but one classroom was not full with benches, so reconfiguration could easily happen.

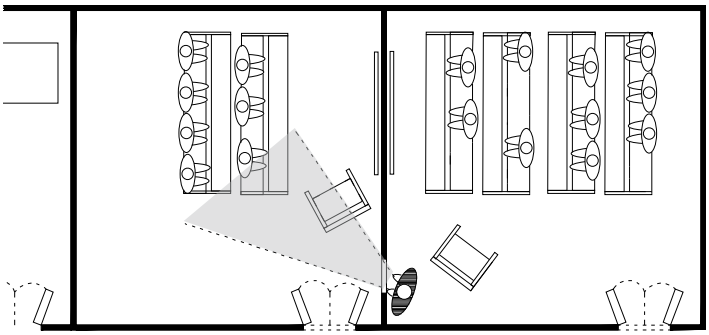


This is the same classroom but the benches are placed in a triangle configuration so the children have a different interaction and the teacher has more space to move in front. Each child can be accessed from the front as from the back so the teacher can come close to help and assist the child when necessary.

School observations
- remarks inside the classrooms

For the observation I was sitting in the back, being as much as invisible as possible to not disturb the teaching and the natural behavior of the teacher and children. Allthough my presence in the classrooms was distracting the children in the beginning, they got more and more used to it. When time passed by, the children stopped noticing and their natural behavior became visible. From shy and silent, the children became more interactive. While spending my time in the classroom I noticed some things which were revealing some issues the classrooms of the school deals with.

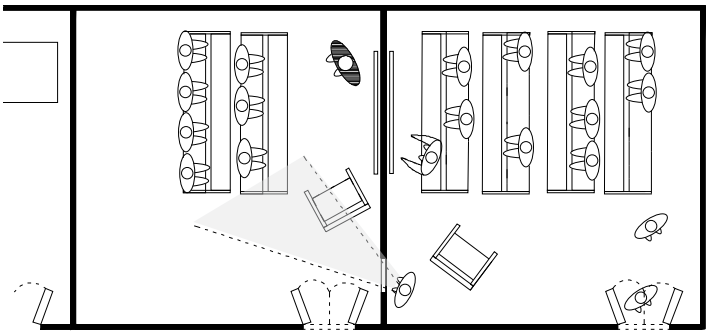
The classrooms are not acoustically seperated, and sounds from the other classes can be easily heard. This is ofcourse distracting the children but also the teacher. Three teachers and five grades translates itself in the abscent of a teacher is every classroom. It are still very young children so without the presence of a teacher, the situation in the classroom goes immediately wrong. Allthough I found the children were very well-behaved you could hear the difference if a teacher was present or not. Next to my observation classroom there was a class without teacher, but the teacher in my classroom had a sneak peek to look to the attached classroom. I don't know if the sneak peek was created or not, but I found it a remarkable fact.



teacher supervising a second classroom

by Jolien Van der Eecken, february 2017

by Jolien Van der Eecken, february 2017

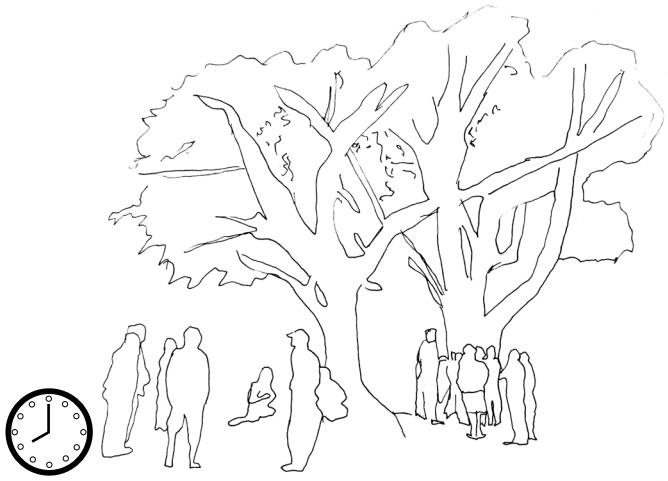


teacher supervising a second classroom

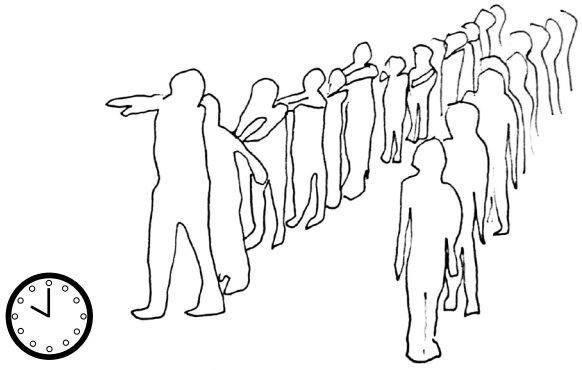
From time to time the teacher left the blackboard and looked into the other classroom to check the situation, especially when too much sounds were reaching us. Every time the teachers checks the other classroom, his teaching is interrupted which is far from an ideal class situation. The teacher has to divide his time and try to control two different class groups at the same time. When the teacher goes to the other classgroup, I saw how the children were behaving differently. They immediatly ran to the other classroom to see what was happening and other children were teaking over the blackboard.

Without the presence of the teacher, the children became more active. The interaction among them was much higher and they showed some initiative by drawing on the blackboard etc...
In a regular class I never saw children drawing on the board or doing something else that could enlarge the participation of the children which could make the classes more alive instead of the static sitting during the whole day.

by Jolien Van der Eecken, february 2017

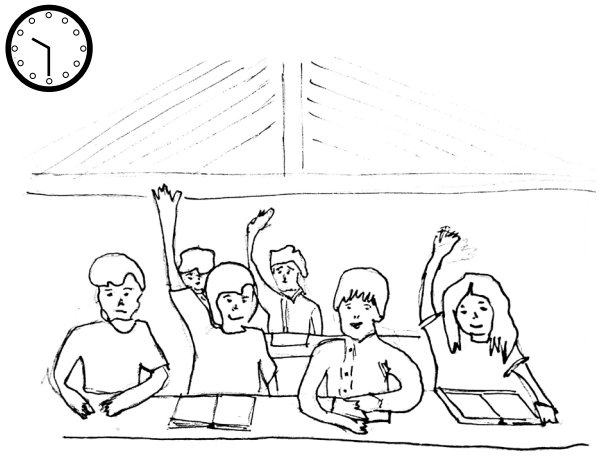


Parents' meeting
When a community meeting is organized it is allways early in the morning. You could call it a parents' meeting because most of the people who meet have children is the school. Sometimes they meet for road construction, deforestation, etc...



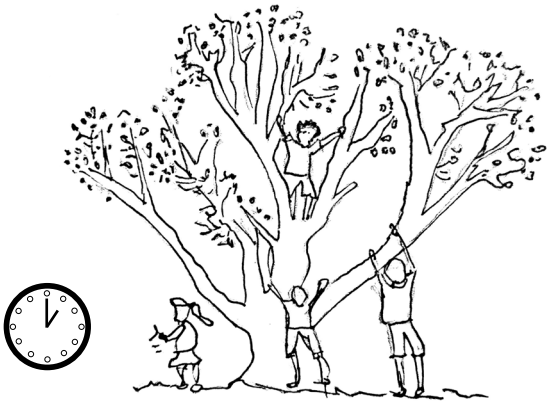
Morning ritual
Before the children start with their lesson, a morning ritual is giving. It's a small physic or stretch introduction that is learned by heart just before the classes start and were they sing a small song.

Journey to school
The children from our school came from two villages which are at a raisonable distance to walk. The children have to walk 15 to 20 minutes, which is a very raisonable distance in Nepal. A lot of children join eachother to come to school.

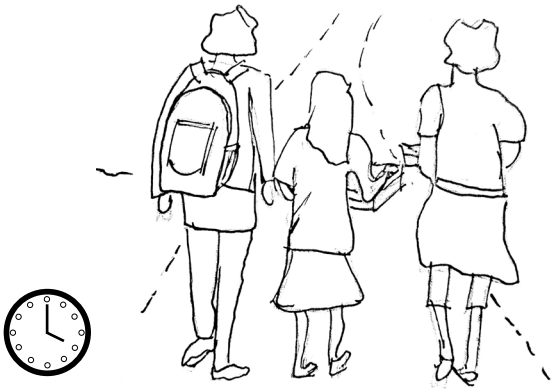


The main lesson
There is no teacher for each grade so some classes share a teacher which means the teacher is not always present. The classes are given in one-way method: the teacher tells what to do and children copy excercises and words, without self-thinking.

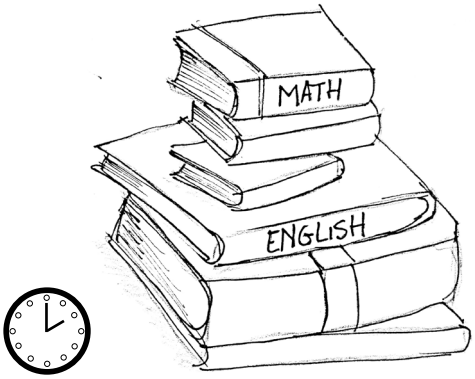
School observations
- a typical school day



Break time
Their break time is what we call lunch time, but they don't eat but play. The natural surroundings like trees and hills together with the very simple play area is enough to enjoy and have a joyfull breaktime.



Walking home
After the class has ended children walk home. Most of them stay until the end of the day, without a bell ring or closing children walk home when the teacher finishes.



Second block of lessons
The lessons are based on the standards the government gave them. A lot of attention goes to the English lesson, which is for them very important because it gives opportunities, chances for a better life. Most of the lessons are taught verbally due to a lack of educational materials.

Home time/ activities
When the children are at home, they help their parents on the field or do something in the household. Our school gives no or nearly no homework which allows the children to help the parents, which a positive aspect so their don't forget traditions but get education as well.

Participation activities
- model presentation day

In Belgium we made models of existing case studies. Each of us had to bring a model to site so that we could discuss with the children and people from the village. The discussion with the models was interesting in two directions. We learned what they liked and disliked and the people could see different interpretations of a school. Showing different models widens up the discussion and makes it possible to see a school in different ways, which makes it easier to rethink a school in general. For the local people it is necessary to see variations on school buildings because mostly they don't rethink the joy of making, learning and teaching, and they often propose a building they are allready familar with.

During the presentation of our model we discussed the models and we tried to get as much feedback on what they find inportant and what they see as a good or bad example for a future school. Our presentation was very succesfull and a lot of people came to look what we did and came to listen and expressed their opinion.

by Jolien Van der Eecken, february 2017

Floating school in Nigeria
+ triangle seen as safe structure
- floating not realistic for the site

Mulan primary school in China
+ staircase, sitting area
around a central space
flags

Floating in the sky in Thailand
- very traditional
abscence of windows

Maria Grazia Cultuli in Afghanistan
+ playfull
- all lot of material
not compact, a large site is needed

Handmade school in Bangladesh
+ colors
open sitting area
light structure on top with a solid base

Louisiana Hamlet pavilion in Kenya
+ roof and wall in one shell
staircase as meeting place
- not much escape routes, long distance

pictures by Thomas Vandesande,
february 2017

Participation activities
- participation in the daily life

Me and the other students spended a lot of time in and around the school, but we also participated in the daily activities of the village. We joined group meetings to see where and when people meet. It was important to do this to know which places were important and why. For instance there was only one formal meeting place around the two old trees. The trees are always close to a shrine and part of a religious place. The position of these trees is important. They are postitioned on the passage way that connects the two villages where the children come from. Offcourse a lot of different participation activities were organised in the school giving classes, drawing activities on their ideal school which were at the same time observation moments to bring the children outside the classroom and to do group activities. Besides the school, we spended a lot of time in our host families. One family offered us a sleeping place and another family made us diner. We also participated in cooking with the family and learn the make the traditional dish dal bhat.

by Jolien Van der Eecken, february 2017

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Participation activities
- cooking experience

The cooking experience was really nice and created a real bouding with the family. In our village and host families we were free to enter the kitchen, which is not allways the case all around in Nepal. It's a more open kitchen concept were eating, cooking, sitting, even sleeping is done in one space. The cooking process is definitly consuming at lot time. The whole family especially the women and their children contribute to it to prepare the diner. If there is a man in the house he is more responsible to cultivate and harvest the ingredients or to buy the extra ingredients. Twice a day, in the morning and in the evening they have a very sober diner experience, called dal bhat. We were got allways there when the diner was made, but when we where we most of the time stayed outside the house. They cook inisde with wood which creates a lot of smoke. The small and bad ventilated room was very uncomfortable and was in no time full with smoke. We wouldn't stay inside, we had to cough or pull our t-shirts before our mounth being able to breathe. They were more used to it, so they always stay in this smoke which is completely unhealthy.

Back in belgium I was thinking to make the school as a reference building. Dreaming how the building could contribute to a shift in their mindset. Showing a new approach of how to construct with local materials. In an idealistic way how they could improve their own house our for some families to rebuild their home. In that way it would be an opportunity to show how a better performing cooking stove works. How smoke can be easily evacuate by a shimney. In that way the school does not only educate their children but also the parents who can implement techniques and material uses in their own houses.

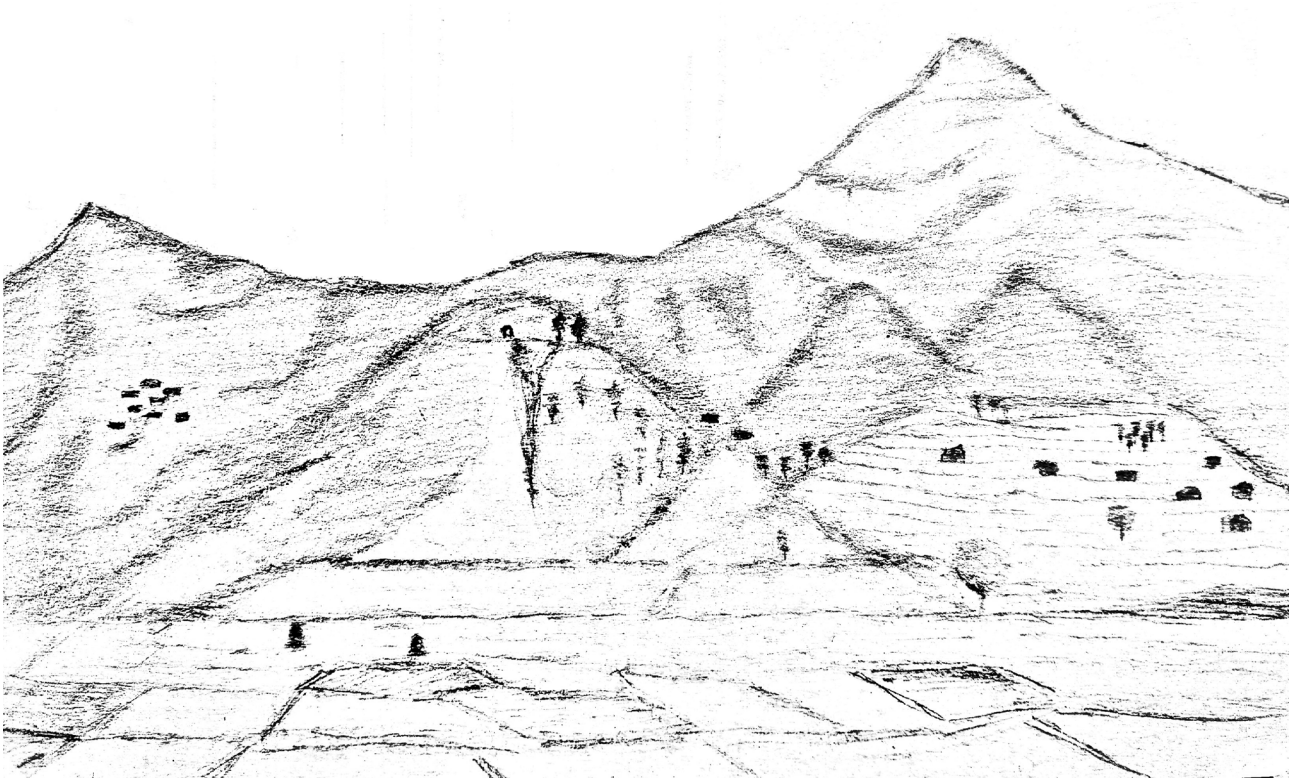
The introducing of a better performing cooking stove is also a goverment goal. Keeping up with global initiatives, the government plans to install improved cooking stoves throughout Nepal by 2017. On January 20, 2013, the Government of Nepal announced an ambitious mission of 'Clean Cooking Solutions for All by 2017' (CCS4ALL). (1)

Introduction to the site

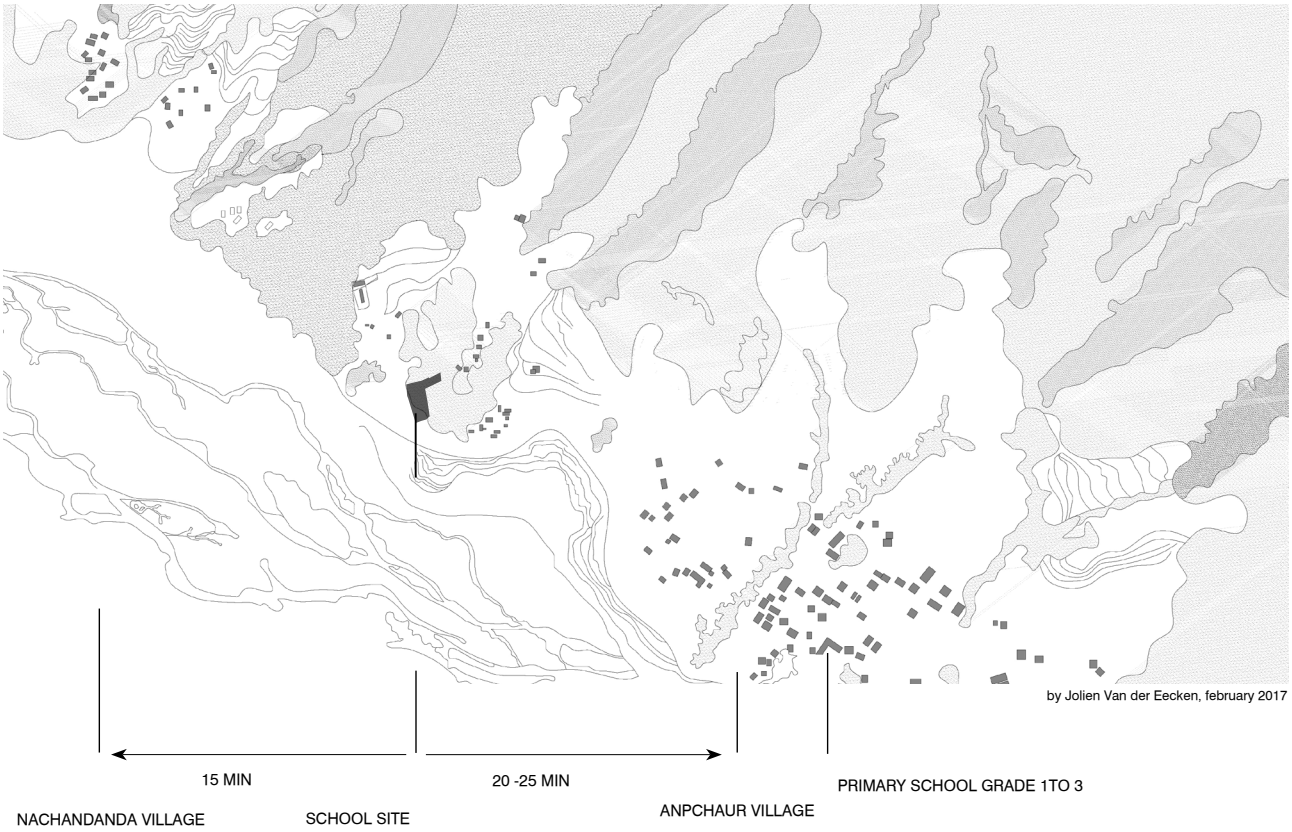
by Gaëlle Mys, february 2017

Arrival at our site

To get to our site in Nuwakot we drove four and a half hours with a jeep. Our site was situated on the other side of a big river which we needed to cross. The river seperates our village from a more economical active part, because it is connected with a reasonable constructed road. Our small village is disconnected especially during moonsoon season when it's unpossible to drive across the river. In Februari when we arrived we could drive across river, but it's was a dry season. But also the last part of our travel we needed to go by foot because of the lack of a decent road. This is essential to understand why the site stayed very rural and how we should think about construction there. Rethinking possibilities with available materials. To get building materials on site it involves a lot of human labour.



by Jolien Van der Eecken, february 2017


by Jolien Van der Eecken, february 2017
15 MIN
20 -25 MIN
PRIMARY SCHOOL GRADE 1TO 3
NACHANDANDA VILLAGE
SCHOOL SITE
ANPCHAUR VILLAGE

Key elements of the site

The existing school was totally damaged by the earthquake, but was not broken down to show to us, as an example to see what the former school looked like.

The start of a brick foundation, with the intention to rebuild a part of the school overthere, but there is a total lack of money.

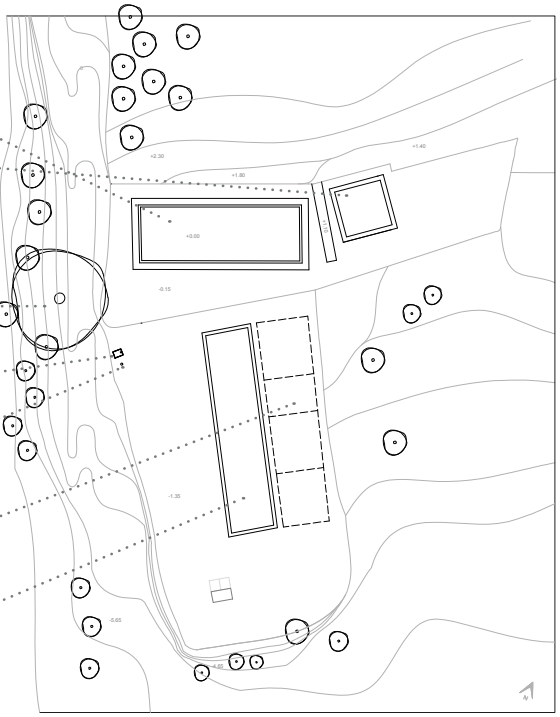
The biggest tree around the school. Important for them as a more religious artefact and indicates the entrance of the school. The tree creates one of only shadow places for the school which is fundamental with their climate.

Drinking place is poorly exucted and offers the only water tab available in the school. The tab is a tube with water come from the mountain.

Electricity pilar although the school doesn't have electricity.

This is a reminder of the formal building that was standing there. The foundation was executed in concrete.

TLC or temporary learning center built after the earthquake. The two former school buildings are now reduced to one TLC building.



by Jolien Van der Eecken, february 2017

by Jolien Van der Eecken, february 2017

The first thing that you notice when you enter the site is the old building which will be broken down by the community. It's totally damaged by the earthquake. The second building standing on the site is the TLC building built by the community as a temporary school. It's important to mention that the community built the TLC themselves as a new school for their kids. The community has the capability to organise and construct themselve.

The next thing that catches your attention when entering the site is the water/ drinking place. The water comes with a tube from higher up the mountain. Next to the drinking spot a kind of electricity pilar is standing, allthough there is no electricity in the school. At first sight we as western people do not recognize the importance of the big tree. The tree indicates the entrance to the school site and is important for the people and gives a lot of shading. One of the only shadow places of the whole school area.

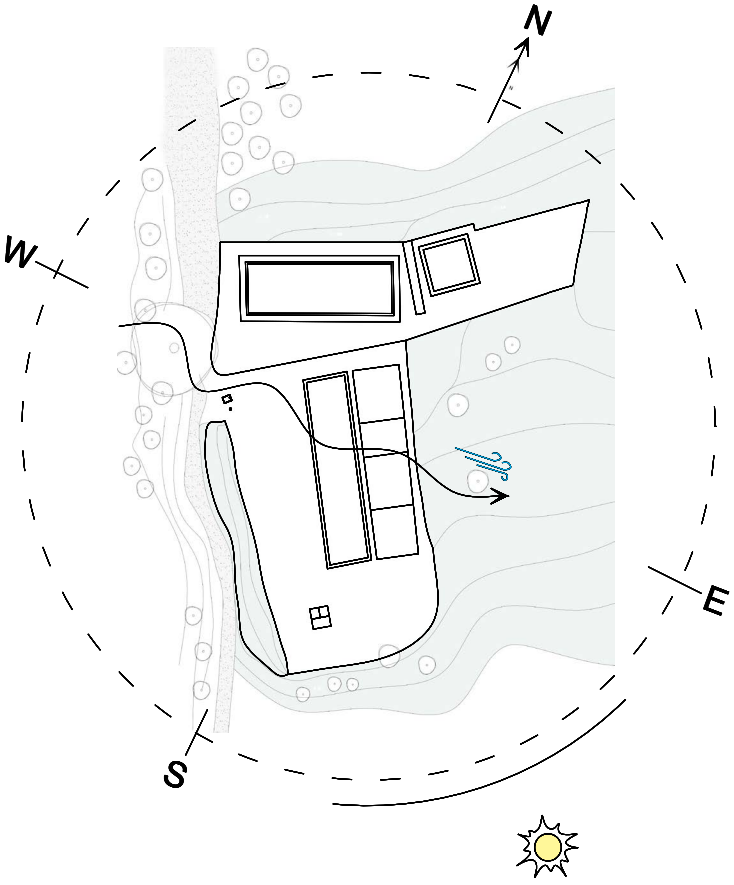
On the site the foundation of the former school building lays next to the TLC. The original school had two buildings. The second building was too badly damaged it already felt apart. The next thing that shows of is the start of a brick foundation, but there is no money anymore to finish the building.

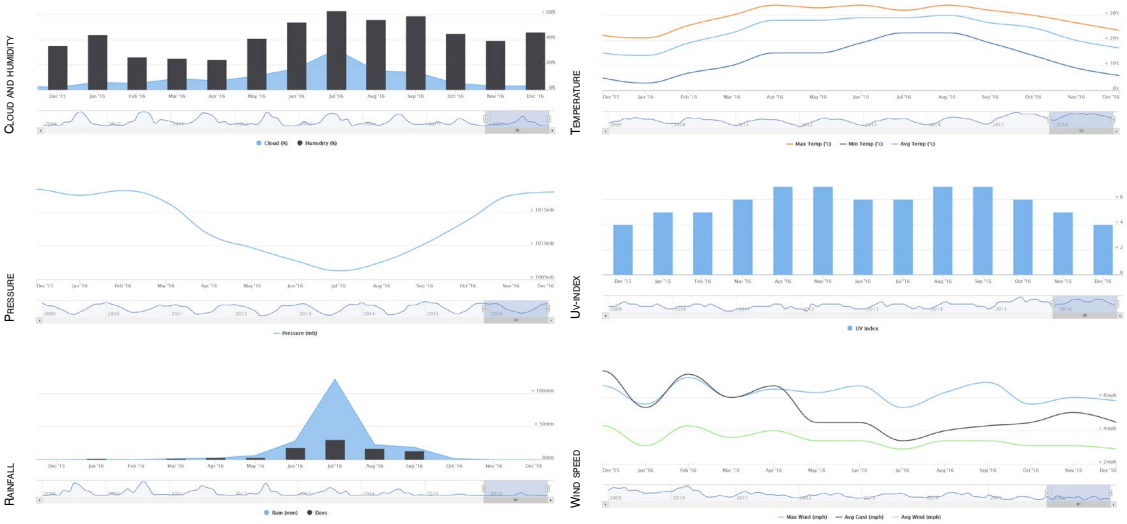
Orientation and climate conditions

Nuwakot can be classified as warm temperate climate. The temperature in Nepal's warm temperate climate does not drop down drastically during the winter. Therefore, solar radiation combined with thermal mass of the building can keep the indoor temperature at a comfortable level. Buildings should be oriented with the longer façade towards the south and have medium sized openings; by this way solar penetration of the south façade could provide solar heat gains in winter (when the sun angle is low)and reduce overheating in summer. Shading devices for windows are needed for the summer period. From December to January active solar or conventional heating might be partly needed. The Mahoney Table recommends heavy external and internal walls and light but well insulated roofs. However, according to Givoni's chart thermal mass is only favourable during April and May to balance the internal temperature swing. In humid summer months air movement is the essential bioclimatic design strategy for Nepal's warm temperate climate. Therefore, single-banked room arrangement or other means of natural ventilation are recommended. Heavy rains during the monsoon season claim for protection and adequate rainwater drainage.

Climate-responsive design strategy recommended by the Mahoney table (2) for warm temperate climate

- Solar passive heating
- protection from cold +/-
- high thermal mass of walls and floors
- building orientation north-south +/-
- light well insulated roof +/-
- reduction of direct solar heat gain in summer
- enhancement of air movement in summer
- protection from heavy rain
- medium sized openings
- shading of openings in summer

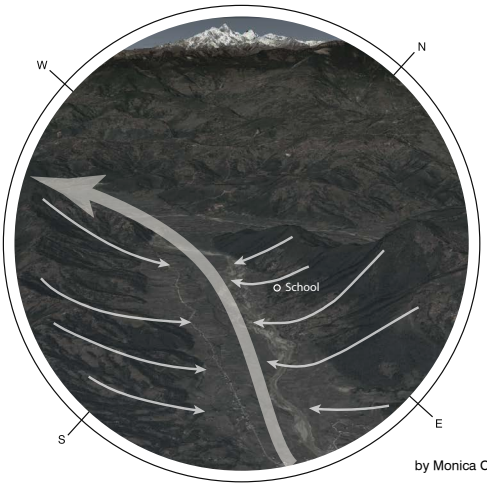




weather condition Nuwakot (3)

Daytime uphill wind just after sunrise

The wind occuring on the school site has the typical bevahiour of a valley wind: due to the tempera-ture fluctuations, the air pressure directs the wind towards the top of the mountain in the moning and returns in the direction to the valley during the night.



by Monica Cardoso

Night time downhill wind just after sunset

This means that the school building has to resist strong winds coming from west-east and returning, especially during the monsoon season, where the winds are described by the local inhabitants as “ worse than the earthquake”.

Grasping field complexity
- a translation of the field research

by Jolien Van der Eecken, february 2017

ASPIRATIONS

KEY WORDS OF THE SCHOOL

Supervision classroom
It's important for me to find a way to deal with the abscence of a teacher in each classroom. it's important every classroom can be ontrolled. It's not only a problem in our school, but in many schools in Nepal. Not every grade has his own teacher. I want to find a spatial solution where a teacher is able to overview more than one classroom at the same time.

Classrooms allowing more informal learning
The teaching in the school is not very pleasant. A static way of teaching with not much interaction, which is very boring for the young ages. Group activities or presentations and performances are never teached. A differentation in typologies of classrooms could create opportunities to teach differently.

Self grown classroom
The availability of building materials is rare. But a bunch of local materials are grown by themselves. I see an opportunity to cultivate and grow buildings materials to create a school grown and build by the community itself. This will enlarge their care and involvement more than a lot. With the benefit that the money spend on the school building will go back to the community.

Community involvement
The chance to succeed is partly determined by the involvement of the community. If the community and parents feel connected to the school, they will send their children more to school or motivate them to go school instead of keeping children at home to help with household or agricultural activities.

School as a build example for the community
The school needs to be structurally strong and functionally problem solving but can set an example for the community. By re-introducing forgotten materials while adding new applications people can rethink there own house.

AIM

The school is a representive building for the community, making use of the status it sets an exemple to rethink the building process/ materials. Many houses needs to be rebuild even 2 years after the earthquake. The school building can contribute to make a shift in the mindset to use local grown and produced materials so rebuilding their own houses gets financially possible, without the import or expensive construction materials. The school as a build example instead of the final result

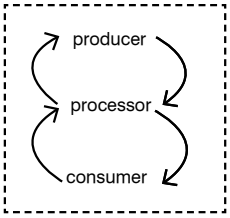
IDEA

The project proposes a school building in the rural area of Nuwakot with divers types of classrooms and an communal space. With as much of the construction build and produced by the villagers. The villagers would build an take care of the building to enlarge the involvement and at the same time set an exemple of how to construct with local grown and produced materials.

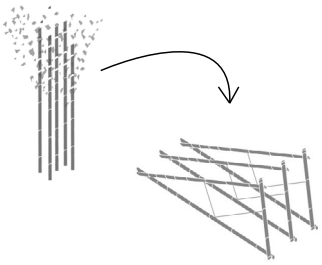
The school as a building example instead of the final result

All material research, design decisions and construction aims to keep a **short supply chain** of expertise, labour, and materials. At the same the decision is made to work with the local constructors, carpenters, ... which will lead to a **knowledge transfer**. The local skilled people will learn other construction techniques and make use of their own knowledge to construct. The school will become a new **build example** where they can learn from, and bring the ideas to their own houses. Building the new school is seen as way to strenghten their local economy and as an opputonity to show new construction methods which are useable to reconstructed or to improve their own houses.

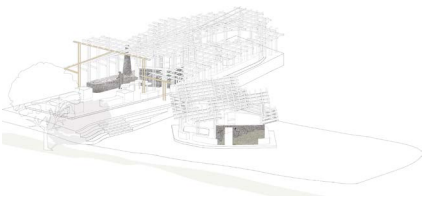
Short chain economy



Knowledge transfer



Build example to learn from



Short chain economy

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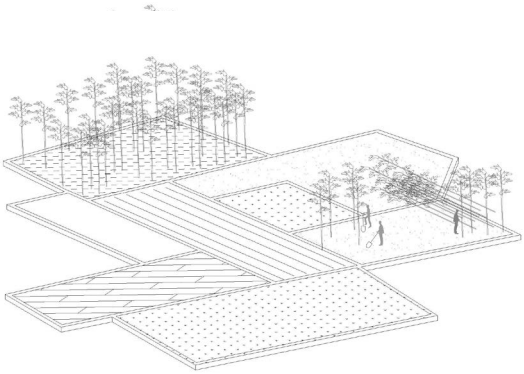
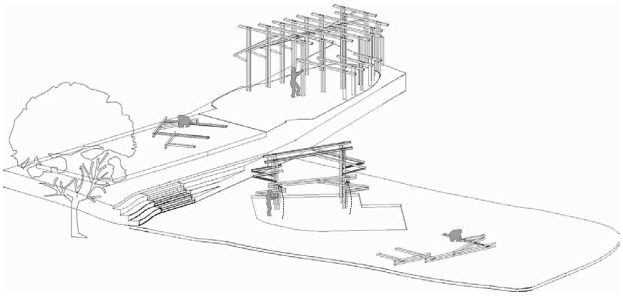
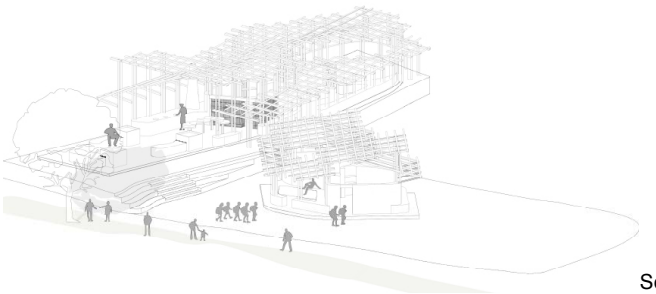


Production field farmers



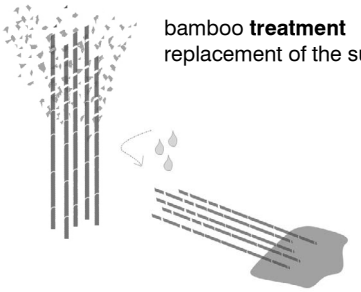
Site constructors



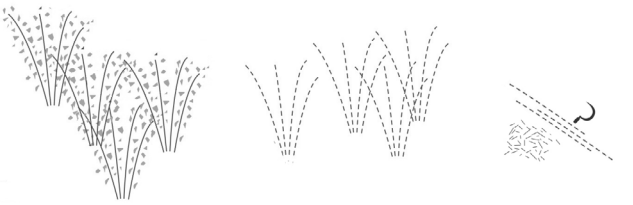
School community

Knowledge transfer

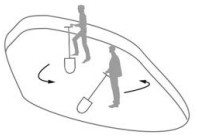
The decision is made to work with the local constructors, carpenters, ... which will lead to a **knowledge transfer**. The local skilled people will learn other construction techniques and make use of their own knowledge to construct.



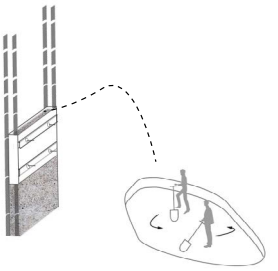
bamboo **treatment**
replacement of the sugar inside by water



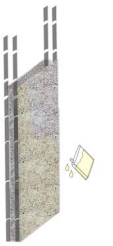
harvest hemp
from plant to stalk fibre



making **hempcrete**
hemp-lime-cement-water



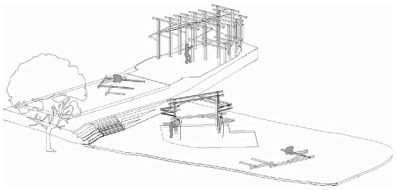
hempcrete mixture
stamped in **mold**



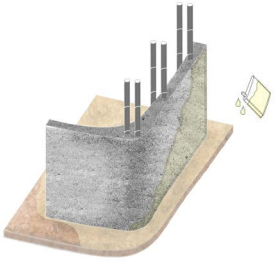
finish with linseed oil and milk
protein keeps maintenance free

Build example to learn from

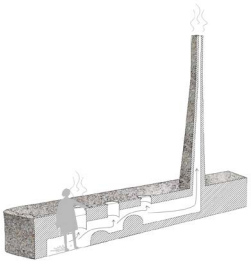
The school will become a new **build example** where they can learn from, and bring the ideas to their own houses. Building the new school is seen as way to strenghten their local economy and as an opputonity to show new construction methods



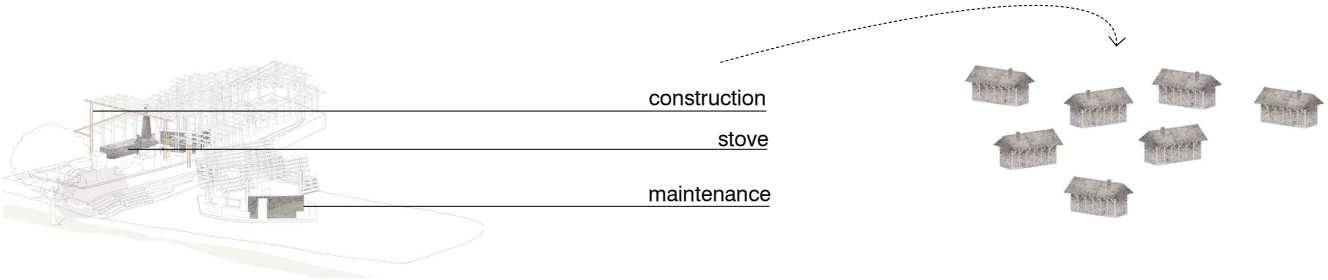
example in **construction**



example in **maintenance** floorfinish linseed ans milk-protein

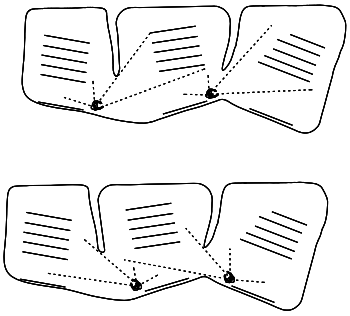


example in clean **cooking stove** for all introduction of a chimney

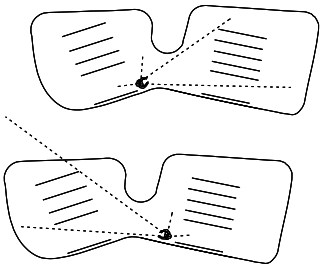


The school as a build example, transition of the building techniques or improvements

Program
- supervision classrooms



1. Cluster of three classrooms



2. Cluster of two classrooms

PROGRAM

- INFORMAL LEARNING

To have a differentiation in teaching different typologies can support more informal learning methods.

The organic shape will give a more intimide and enclosed feeling and to gether with a fixed sitting bench this room will be used in more unconvential way.
But offcourse the useable chairs and tables should be also present is the school. Have different table variations will also allow to work more in group or use them just like they are used to.

Not every class should be inside. Their climate allows them to have classes outside but with the necessary shading. A covered outside classroom can also become a place where children play in the shade or where parents and teachers meet.

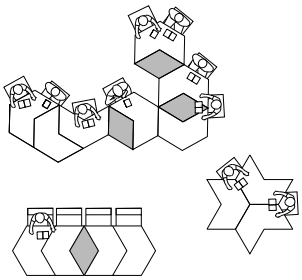
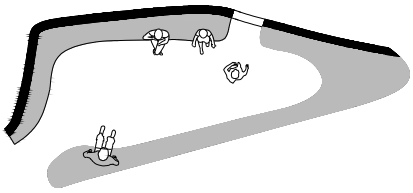
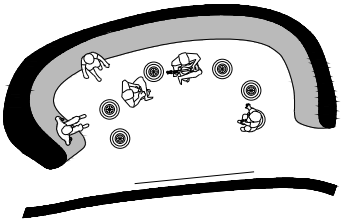


Table variations



outside learning spaces



organic shaped room

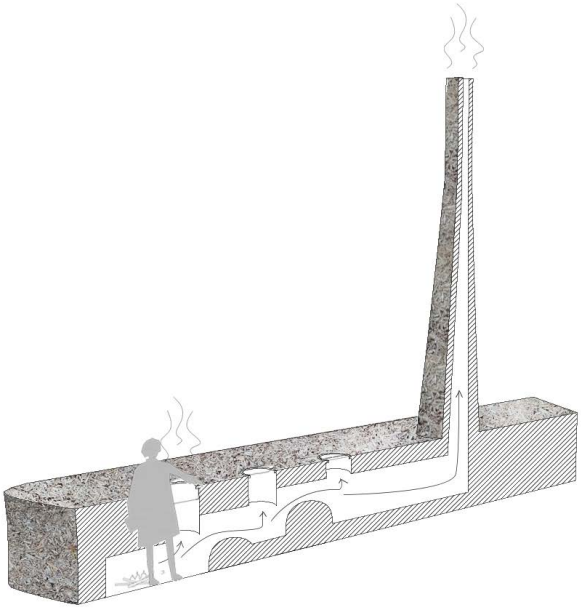
Program
- meeting space

The meeting place is a covered open space with some extra benches to sit in the shade of the trees in the afternoon. The community can always access this place and make use of the stove without interfering in the classes. Offcourse the meeting place will bring more atmosphere to the school and will enlarge the involvement of the people .

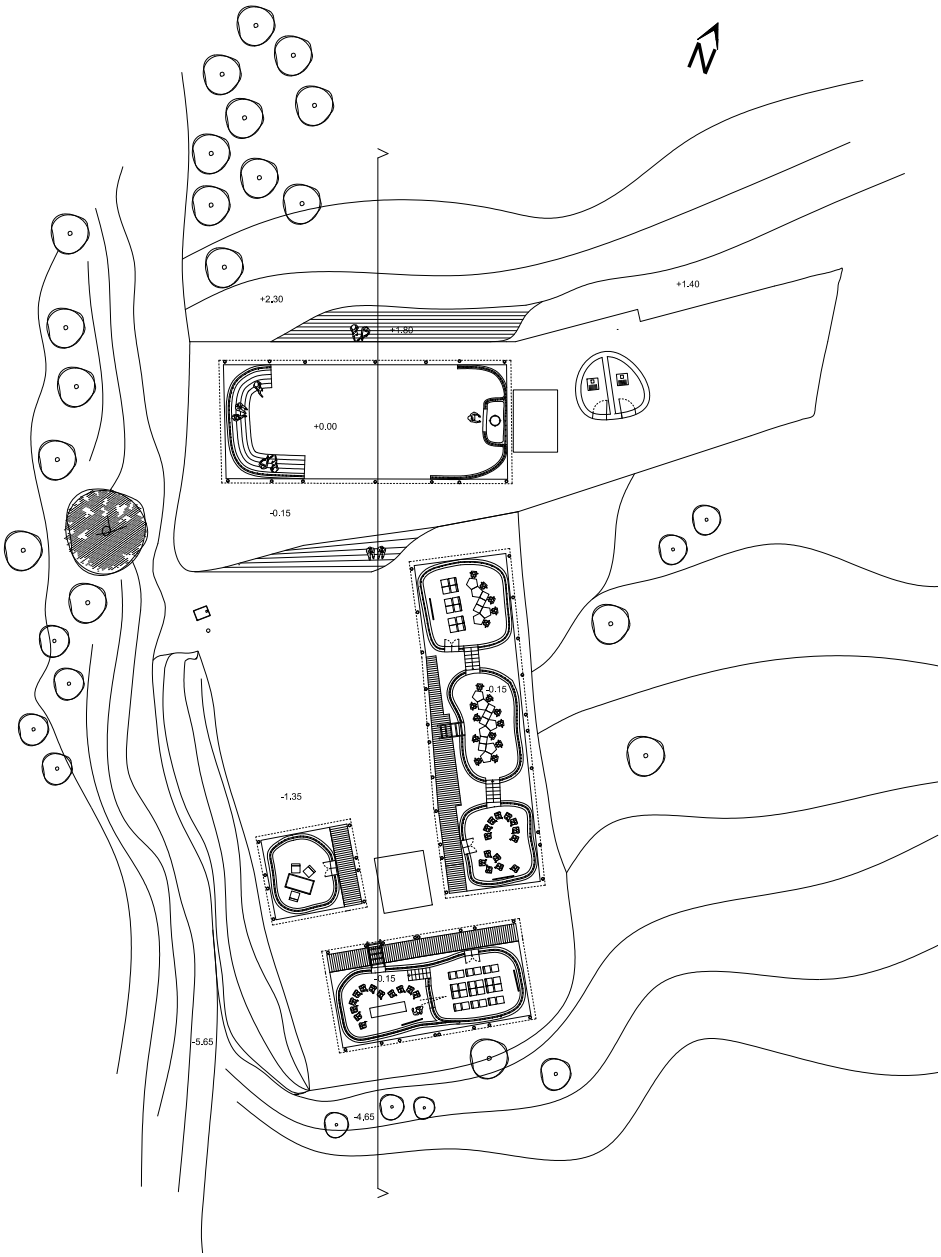
PROGRAM

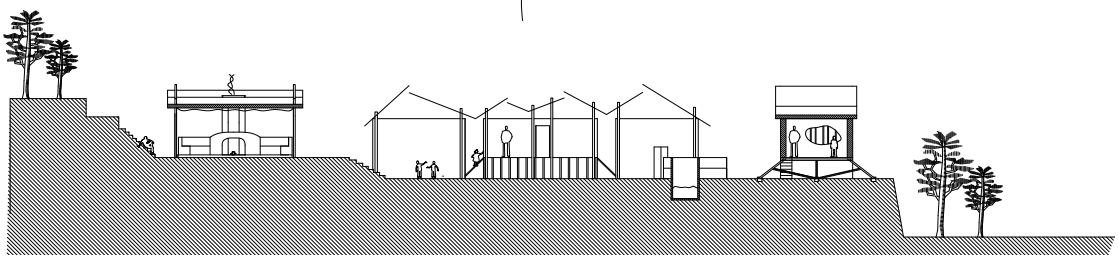
- COMMUNITY STOVE

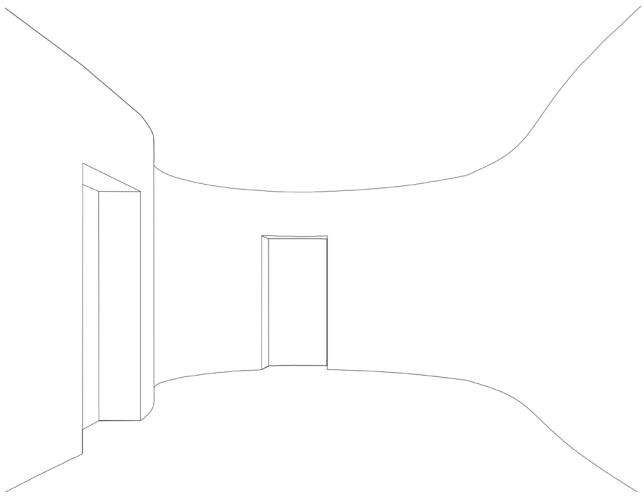
Ccs4all or a clean cooking stove for all is something that will be introduced in the community through the school building. Inside the houses of the villagers a lot of smoke developse because they burn wood with a open fire inside. It's extreme unhealty and the school can be used to tackle the problem and can introduce a better cooking way with a chimney to evacuate the smoke.



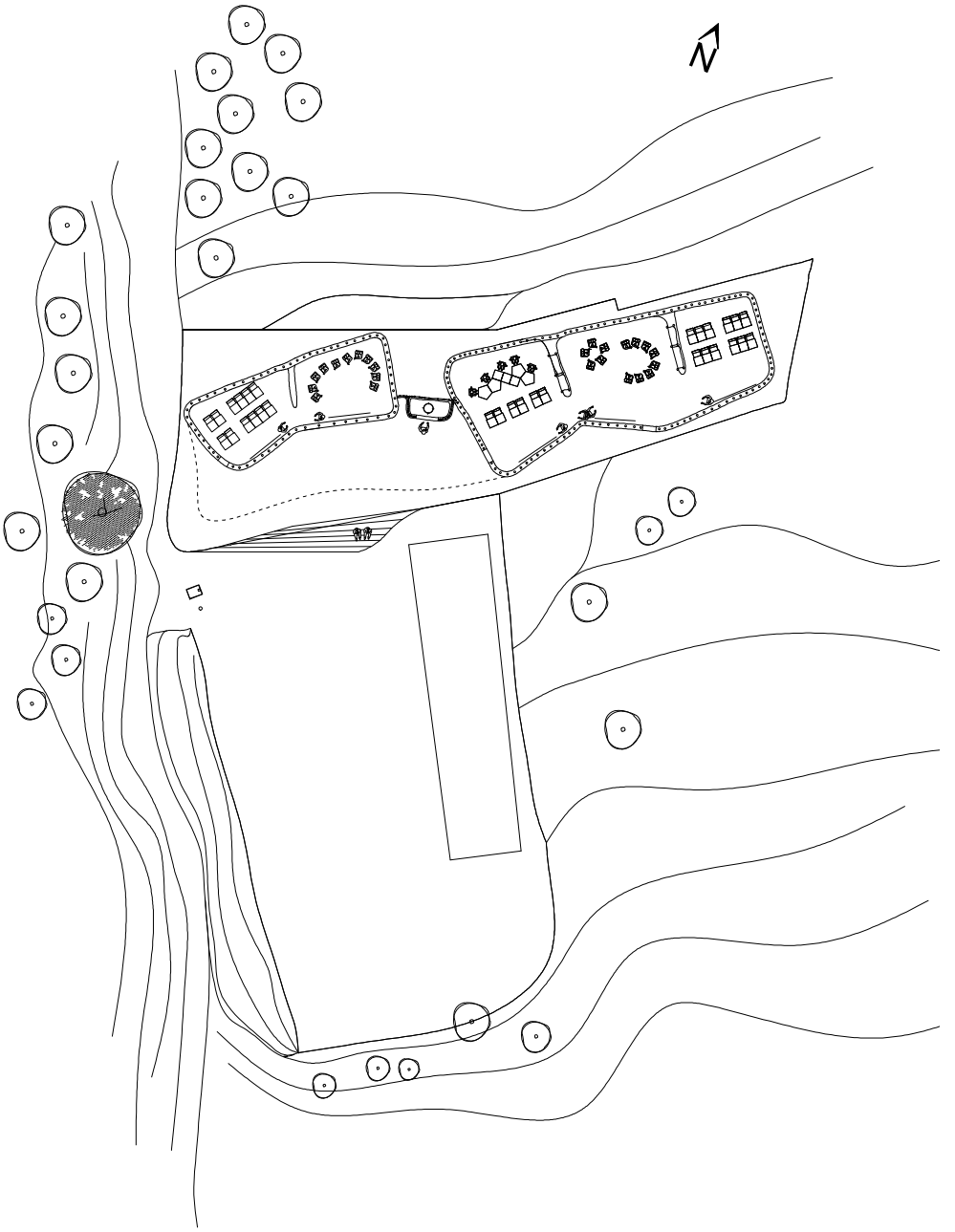
Proposals







The proposal offers uncoventional shapes for a classroom. This to be sure the way of teaching will be different. Even in a more circular shaped classroom you can arrange the room with tables and chairs. Will this change the teaching for sure ? This proposal occupies requires a lot of space, also caused by the more individual building.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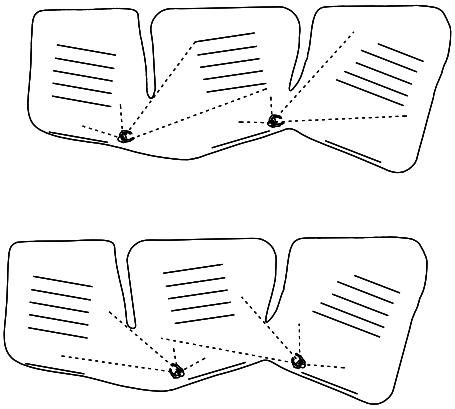
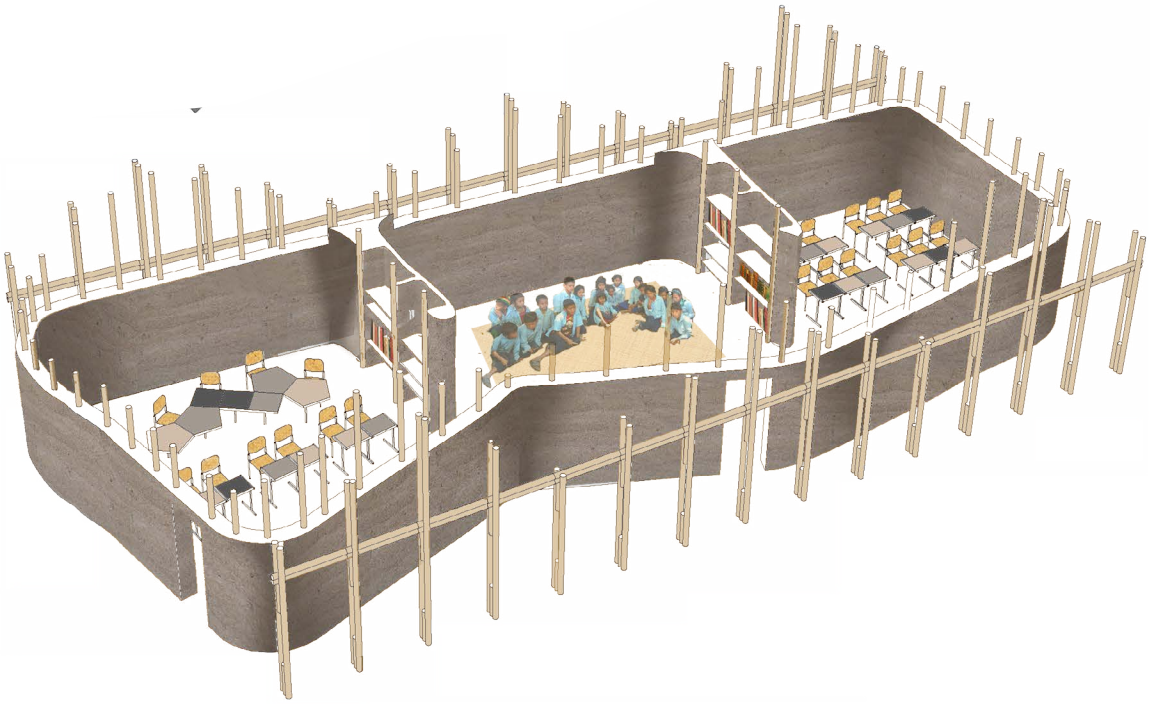
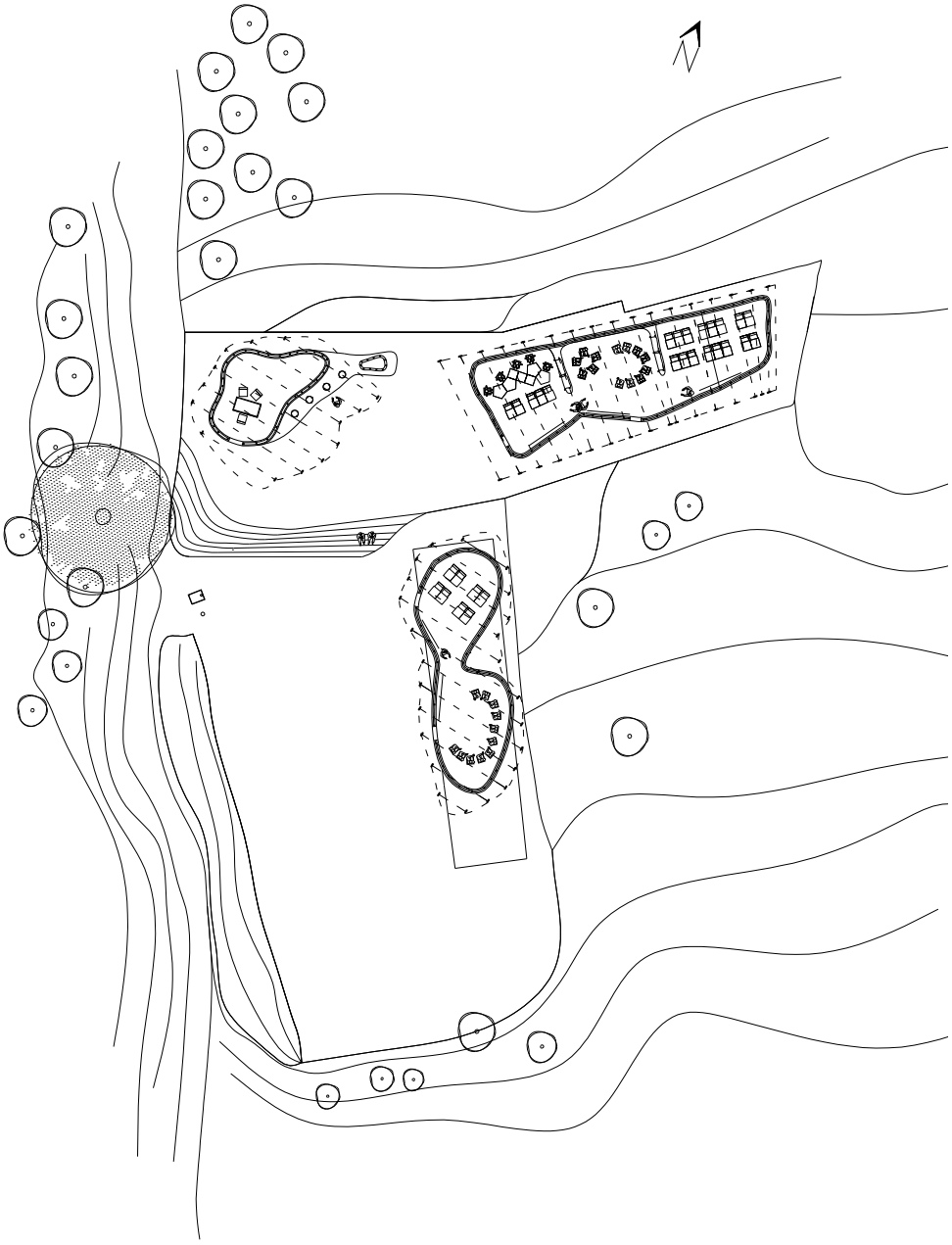
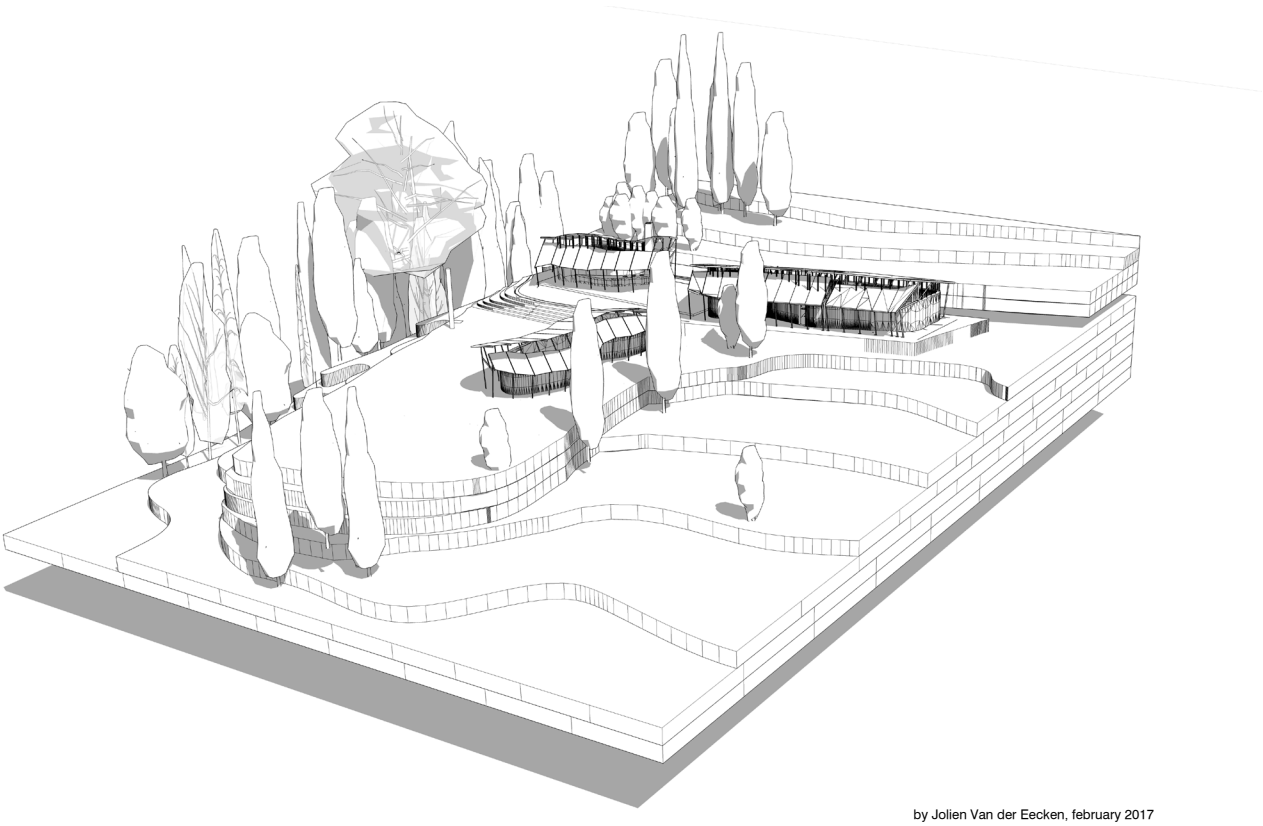


by Jolien Van der Eecken, february 2017

In this proposal the organisation of the classroom was tackle and how they relate to eachother. The classrooms are not individual anymore but are clustered. This set-up offers the advantage that one teacher can control more than one classroom for the same viewpoint or as I called it, the supervision classroom.



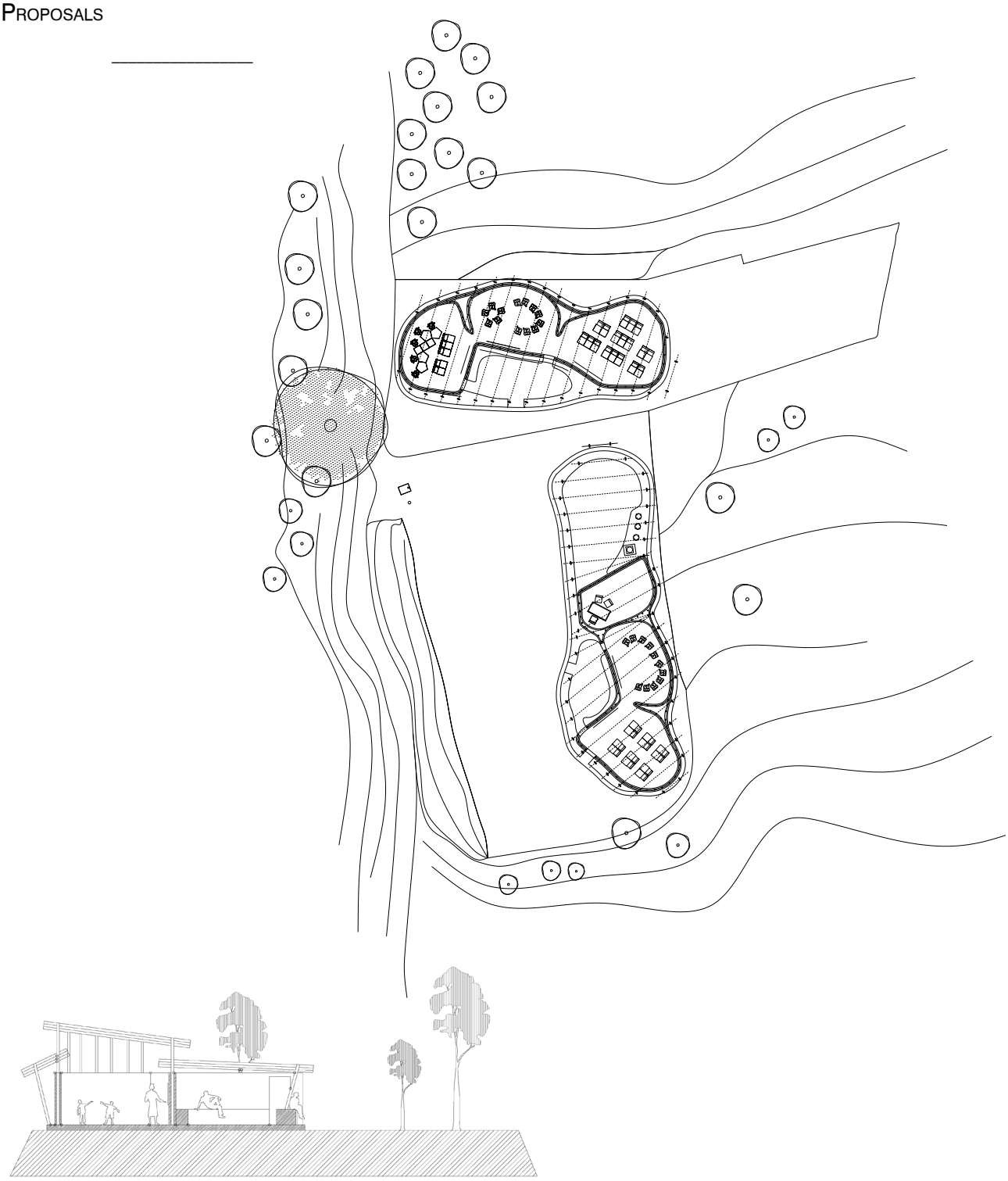




by Jolien Van der Eecken, february 2017

The idea of the supervision classroom is kept but the organisation on site is changed. The school should not only offer classrooms but can also offer something for the community. In the villages they don't have an infrastructure for gatherings or meetings. I doesn't mean a new building needs to be build for something that bring people together. A cooking stove gives them the opportunity to organise something for the school and can be used by the community.

Proposals



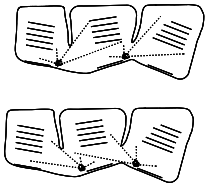
This proposal includes all the key elements of what I think the school should bring to the site. It has the unformal ways of teaching caused by the organic shaped rooms but include at the same time outdoor covered spaces where classes can be given or meetings can happen. The outdoor spaces for always be used even if the school is closed. The cooking stove is connected and inbedded in these covered outdoor space.

by Jolien Van der Eecken, february 2017

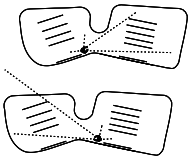
Proposals

by Jolien Van der Eecken, february 2017

The picture above shows the entrance of the site. I would propose a building giving shelter for grade one and two and an other building for grade three till five. The proposed classrooms will form a cluster of three or two grades. The classroom offer an answer for the three teachers taking care of five grades. The classrooms are developed based on the eyeview of the teacher who will always need to be able to control more than one grade at the same time.



1. Cluster of three classrooms



2. Cluster of two classrooms

In the schemes you see the different positions of the teacher(s) from where they have an overview on two classes at the same time. From the point where the teacher is standing next to the blackbord he or she will always be able to look at two classes from the same spot. The classes itselves have some kind of seperation wall, which can function as a bookshelter. To base the design on the view of the teacher, the direct presence of the teacher inside the classroom stays but giving each grade a defined classroom. It's particularly important to improve the quality of teaching with especially the young children who are easily distracted.

The shape of the classrooms is based on the viewpoint of the teacher but also is influenced by a more optimal orientation. The curves are not bold but embrace the classrooms and stand better against the strong wind forces on the site, as it improves the stability.

by Jolien Van der Eecken, february 2017

Cultivation research

Researching agricultural based society

by Jolien Van der Eecken, february 2017

Significance of agriculture in nepal

For the research paper I want to zoom-in on “local cultivated resources” as a dynamic concept for the school. The local building materials are under-rated after the earthquake. I see potential in local resources as tradition and individual talent to gain social involvement and rural empowerment. Their value remains in their own hands and possibilities. For the community it will be important that they will build it, reconstruct if necessary but their independence and respect for the environment must remain.

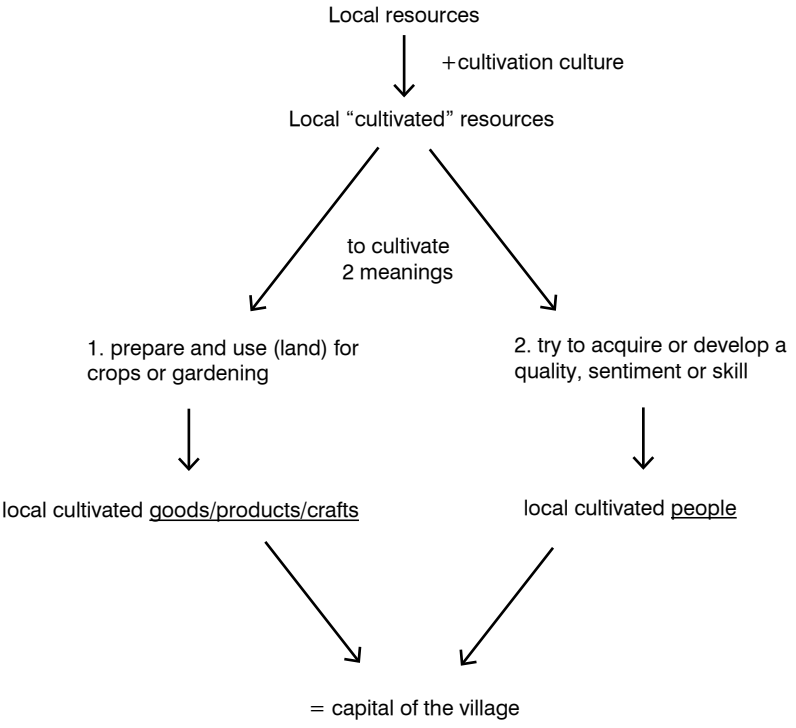
1. prepare and use (land) for crops or gardening

by Jolien Van der Eecken, february 2017

2. try to acquire or develop a quality, sentiment or skill

by Jolien Van der Eecken, february 2017

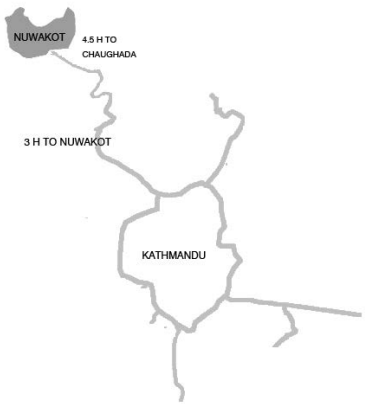
THE CULT OF CULTIVATION



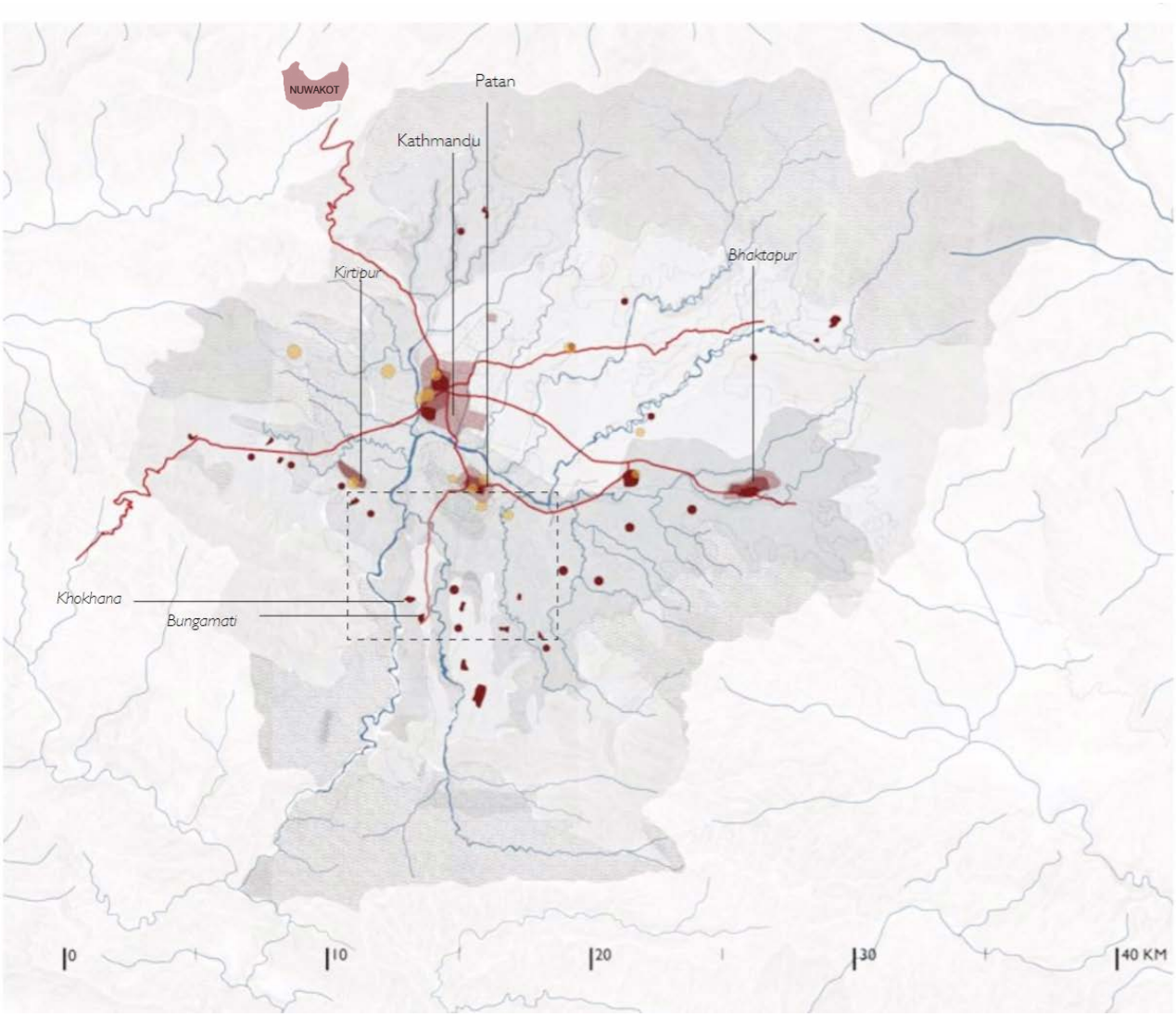
Significance of agriculture in nepal

Kathmandu's orginal settlements polarized around temples. Small agricultural meadows were mushrooming in a very disperse way throughout the valley with a close relation to rading routes and the existing topography. Patan was one of the early settlements of the valley, build on the banks of Bagmati River. However, particulary during the Licchavi period, the setting of the meadow lands will progressively move from the riverbanks to the ridges of the valley in order to maximize the area for the cultivation. In order to supply the urban areas, having low watertables with water, the Licchavis set out an indigenous water system that would develop a network of ponds and wells fed by rainwater and irrigation canals. (4)

From kathmandu different trading routes exist. One of the trading route leads to Nuwakot and it's close surroundings. Nuwakot is a very good example of a agriculture productive landscape along a trading route with a close connection with the river bank.



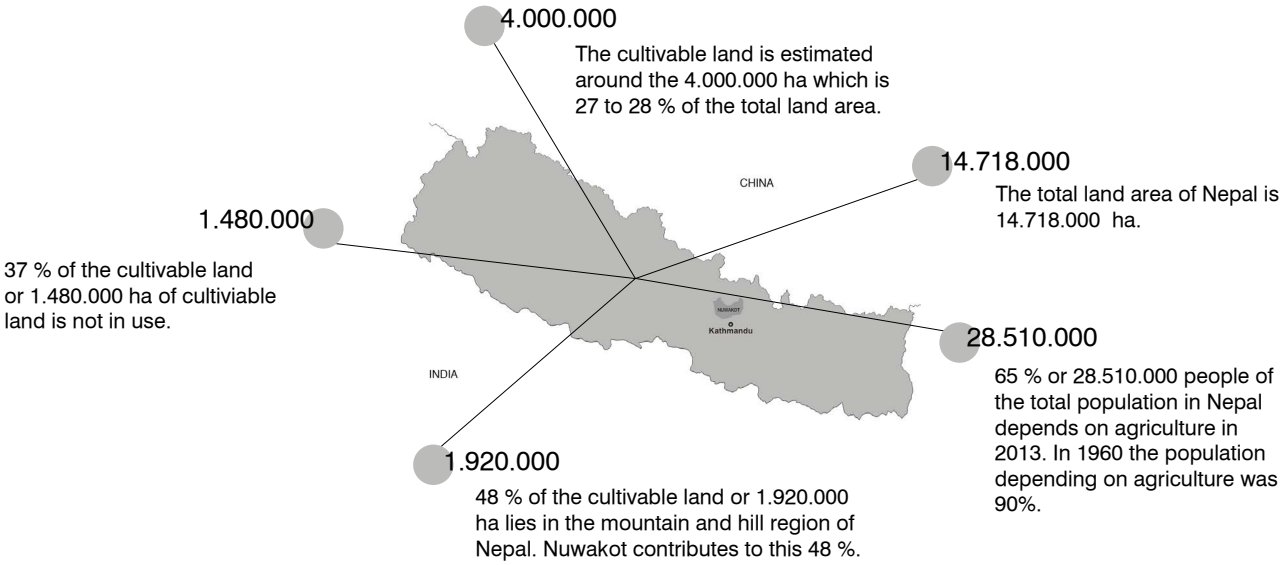
by Jolien Van der Eecken, 2017



by Niels Gutschow 'Architecture of the Newars', 2011

trading routes

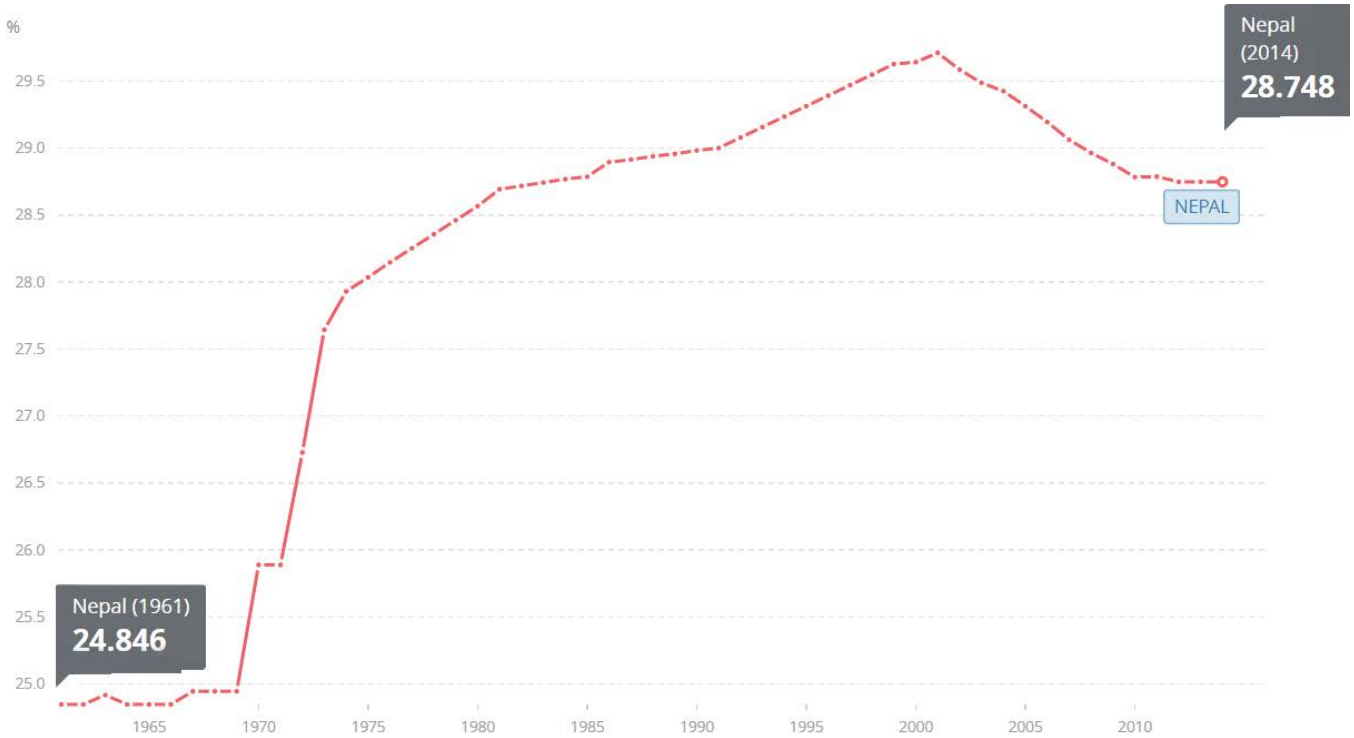
Significance of agriculture in nepal



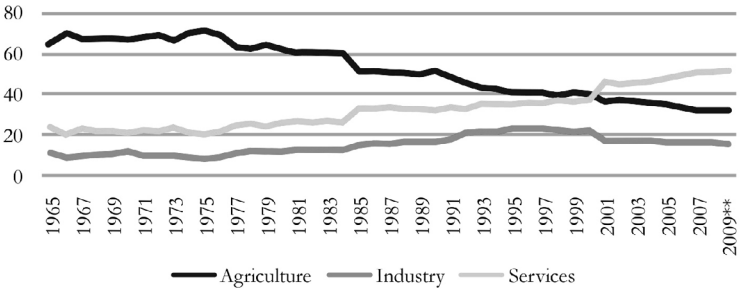
Today this are the numbers about agriculture in Nepal. But is has not always been like this for. The importance of agriculture has changed during decades. The charts on the other page show important shifts are happening. More than a quarter of Nepal is agricultural land. More than half of the Nepalese population, sixty five per cent depends on agriculture. This procent is dropping than because a lot of people leave the agricultural industry to find a financial better job. This translates itself to women staying in the rural without the presents of a husband. The men most of the time of abroad to other countries or cities.

The most agriculture productive regions are in the mountain and hill region of Nepal. Nuwakot belongs to this region. The agricultural productive landscape in this region very high. But still there are some opportunities for the argricultural landscape. Not all the cultivable land in Nepal is in use. The amount of hectares that are used are decreasing so as the importance of argriculture. Thirty seven per cent of the cultivable land is not in use but could contributes to a better income for the people living from agriculture and stabilize the situation of more and more people leaving the agriculture economy which a vital part of their social identity.

by Jolien Van der Eecken, 2017



by http://data.worldbank.org/indicator/AG.LND.AGRI.ZS



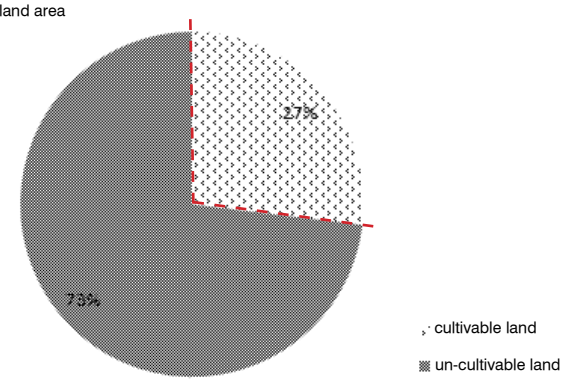
by B. D. Pant and A. Palikhe, 20011

From 1961 till 2001 the agriculture land in Nepal has increased with almost 4%. The agriculture land reached in 2001 almost 30% of the total land area, the highest percentage in a long time. From 2001 we see a decline of the agriculture land in despite of the increase of the population in Nepal. Nepal went from a food exporting country to a food importing country. From 2010 till 2014 the amount of agriculture land stabilised. (1)

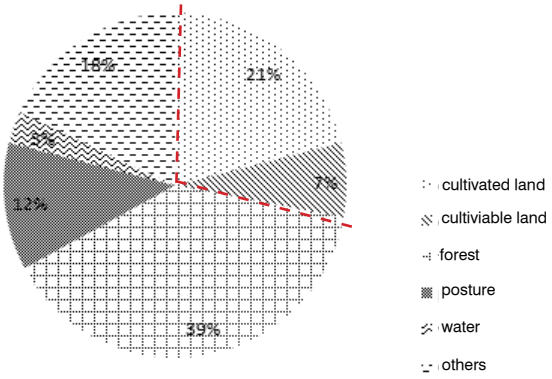
The decline brings the Nepalese agriculture land percentage back to 1982. Agriculture is under pressure, and what does this mean for the future? Especially for the future of an agricultural based society like Nuwakot. If we look to the economy in general you see a clear shift where agriculture contributes less and less to gross domestic product (GDP). The chart on the left shows the sectorial to the GDP, the economic performance of the whole country and indicates the increased importance of the industry and service economy. The industry contributes almost 20-25% more to GDP than the agriculture.(2)

Significance of agriculture in nepal

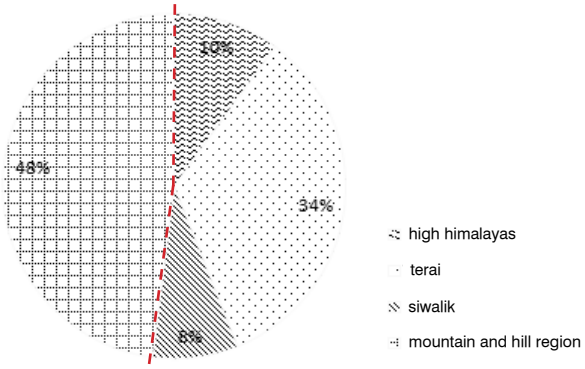
Agriculture land in comparison to the total land area



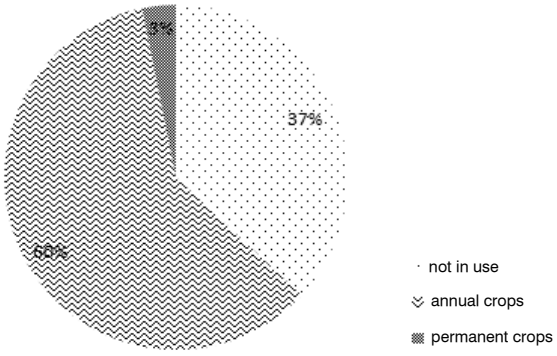
Division of the total land area by use



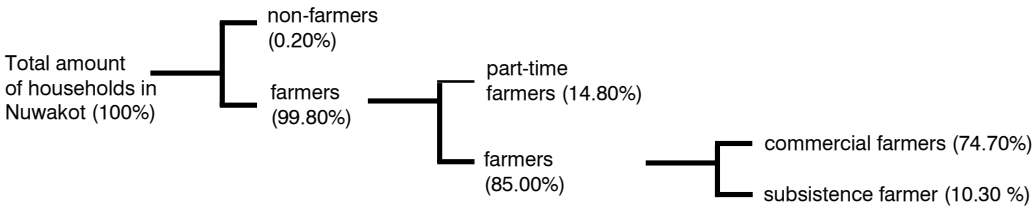
The cultivable land available in the physiographic regions of Nepal



The cultivable land by occupation



by Jolien Van der Eecken, 2017



District	Total population	number of households	HHs whose main soure of income in argriculture
Dhading	336.250	64.517	75 %
Sindhulpalchock	289.455	58.998	77 %
Nuwakot	278.761	53.984	85 %
Gorkha	269.388	57.671	78%
Dolakha	188.186	40.718	75 %
Rasuwa	43.798	8.504	78 %

The agricultural land in Nuwakot

In 1960 the population depending on agriculture was 90%. Agriculture still remains the backbone of the society but is losing. Is Nuwakot responding in the same way and losing their band with agriculture ?

Nuwakot is based in the mountain and hill region which has the most cultivable area compared to the other physiographic regions. Mountain and hill regions depend the most on agriculture with almost half of cultivable land in their region.

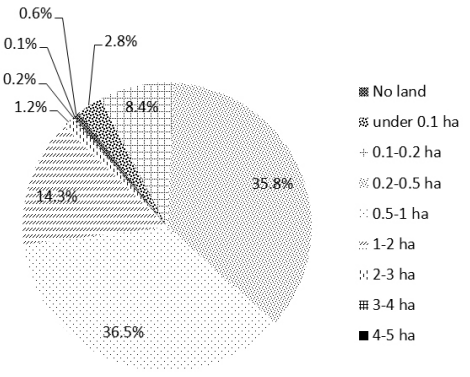
60 percent of the cultivable land is cultivated with annual crops which include most labour. 37% of the cultivable land is not in use which shows the relation with declinated rate of agriculture in Nepal and shows that fewer people are depending on agriculture. People are shifting away from agriculture and looking for better job opportunities in the indusrty and service sector. Less land is cultivated to furfill the needs in food consumption which has increased by the population growth.

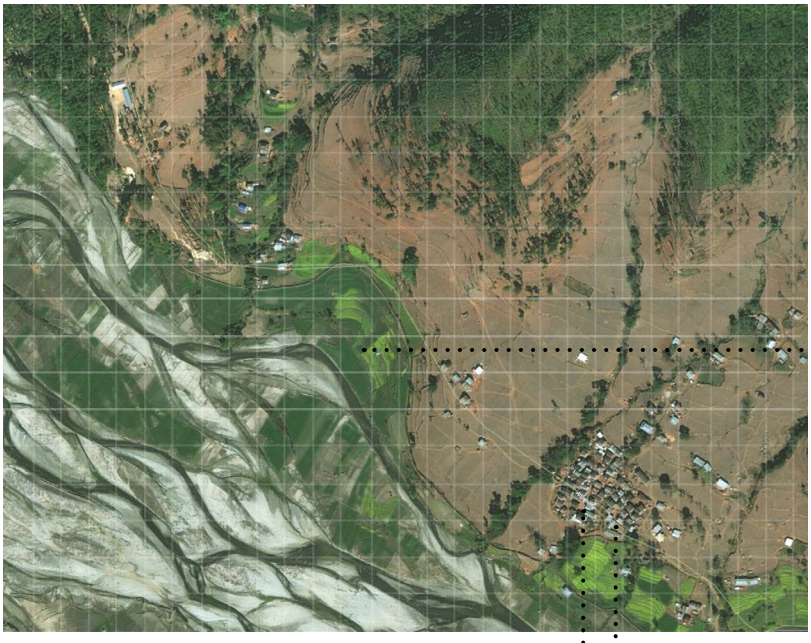
What does the argicultural land mean for Nuwakot? We know that the argriculture is losing and making place for more industry and services. Does Nuwakot response in the same way ?

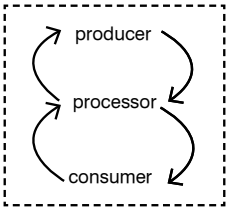
In the table you see the comparison of argriculture based villages. It are all villages where the agriculture production remained high even after the decline of agriculture all over the country. What is remarkable is that Nuwakot stands out with 85% of households whose main income source comes from argriculture.

A subsistence agriculture family needs at least 0.2 ha of land to furfill the needs. Therefore a look at the division of the agricultural land by each household would tell us if we deal with a liveable situation. In Nuwakot two big groups are noticed: households with 0.2-0.5 ha and households with 0.5-1 ha. Together they represented the majority of their community with 72.3 %.

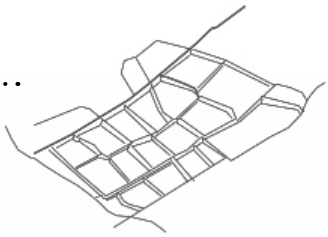
After this facts it became clear that 85% has a liveable income from agriculture but the ohter 14.8 % also is involved in farming but do this as a part-time job but choose for a job abroad the village or even abroad the country and from time to time come back to their village.



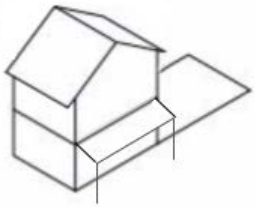




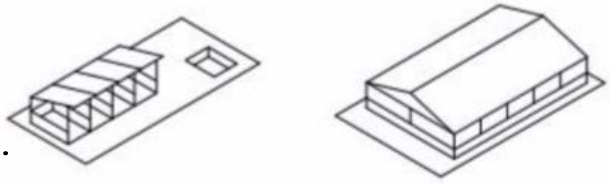
on site



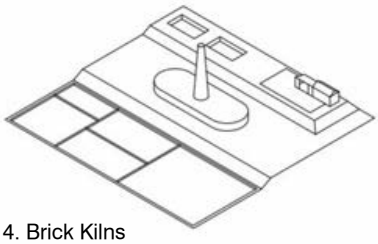
1. Farming plots



2. Household/Settlement



3. Family based animal/ vegetable farming

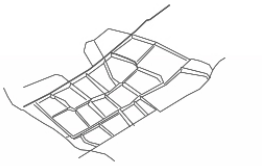


4. Brick Kilns

Identification of agricultural landscapes

The aim of the fieldwork in Nuwakot was to identify the different typologies, families and living patterns to understand the living conditions where the new school will be build. The main describing factor of Chaughada and the neighboring villages in Nuwakot is their self-reliance factor.

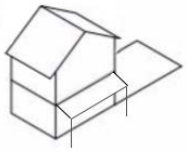
The valley location creates ideal situations for food production. In the valley landscape, the villagers become the producer, processor, and consumer of resources. The economical circle is closed in situ. Local resources are used to furfill the basic needs and create all along the village production plots. The first identified production plot is the farming plot, second one is the household characterized by the settlement and craft production. The third identified production plot is the small scale animal or vegetable farm. The fourth type are the brick kilns spread out in the the valley, not is the very near environment but with a rather close proximity.



Rained farming slopes or river banks around nuwakot

1 subsistence farming
0.26 ha/family managed
0.9625 tonnes cereals/family
0.576 tonnes vegetable/farming

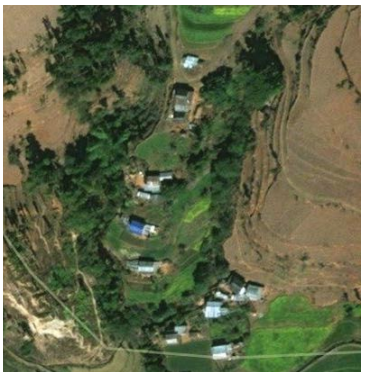
0.2 ha/family

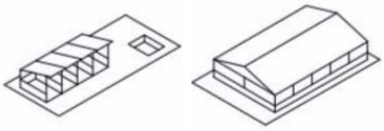


Traditional settlements

1 household/ 5 inhabitants
6-8 ha / settlements
1.560 tonnes cereals, 0.525 tonnes vegetables, 0.400 tonnes fruits, 120kg meat, 290ltr milk, 40kg fish, 40 kg fish

6-8 ha/family

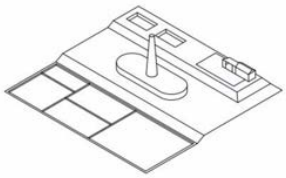




Family based animal/vegetable farming

small family business
2 tot 3 person/ farm
200 chicken a year
200-250 eggs/year/chicken

0.6 ha/family



Brick factories within agriculture fields

cooperative farming
10 ha, commercial enterprise
50-300 seasonal labourers
15-50 thousand bricks/day/ 6months

10 ha/unit

by Jolien Van der Eecken, february 2017

Social rythm and agriculture

The realtionship between water availabilty and cropping and harvesting is celebrated through festivals along festivals along specific public spaces and varying in order of participation ranging from family to community. People create meanings associated around collective action related to availability of resources and productivity. The concentrated rainy season, impacts the availability of water, which creates other patterns related to agricultural production, festivals and community collaborations. Various community level activities are organized to clean the channel conduits and ponds before the arrival of the rainy season.(3)

Bhumya is the god of agriculture crops and provides food to the people with good harvest. It is worshipped twice a year: once before starting cultivation “ubhauli” (february - march) for good cropping season ; and ones more after the crop is harvested “udhauli (december) for thanks giving and offering newly harvested crops.

Holi or festival or colours is celebrating the victory of good over evil, the arrival of spring, end of winter, and for many a festive day to meet others, play and laugh, forget and forgive, and repair broken relationships.

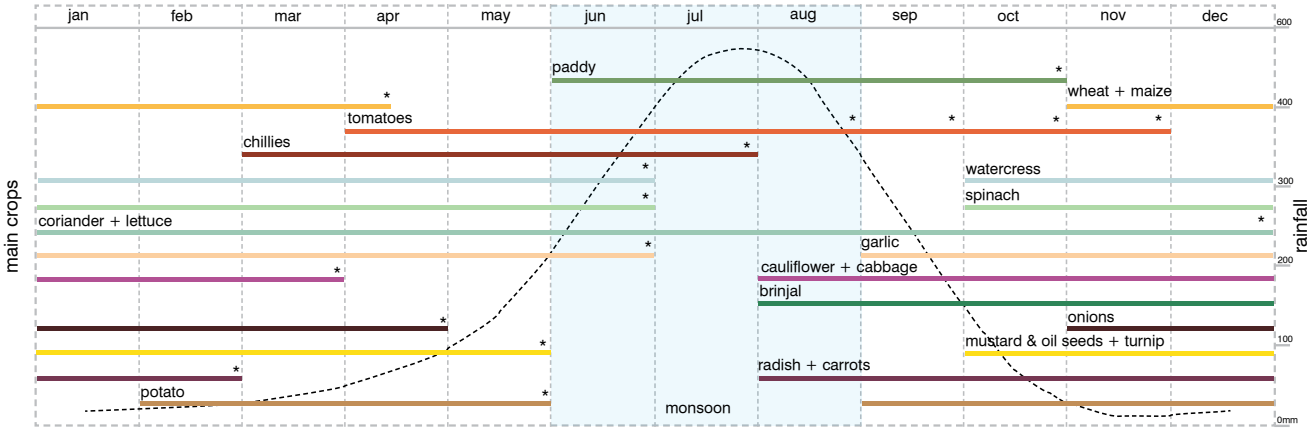
Bunga Dyah Jatra or Chariot of the Rain God Festival is celebrated by the Nepalese folk to Rato Machhendranath (the God of Rain). Celebrating the hope of bringing on the monsoon rains.

Udhauli - december

by N.B. Gurung, december 2016

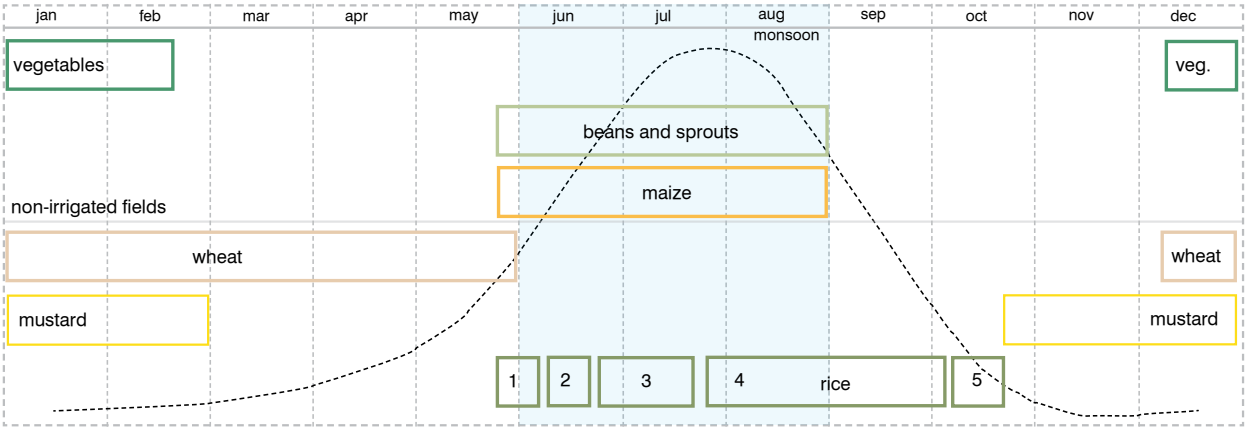
Ubhauli - februari/march

by N.B. Gurung, december 2016

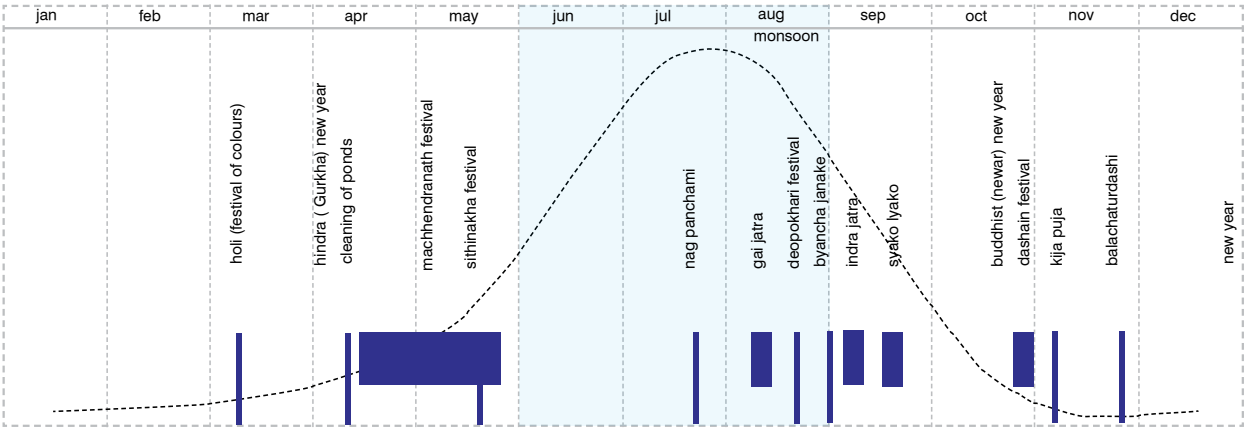


* harvesting time

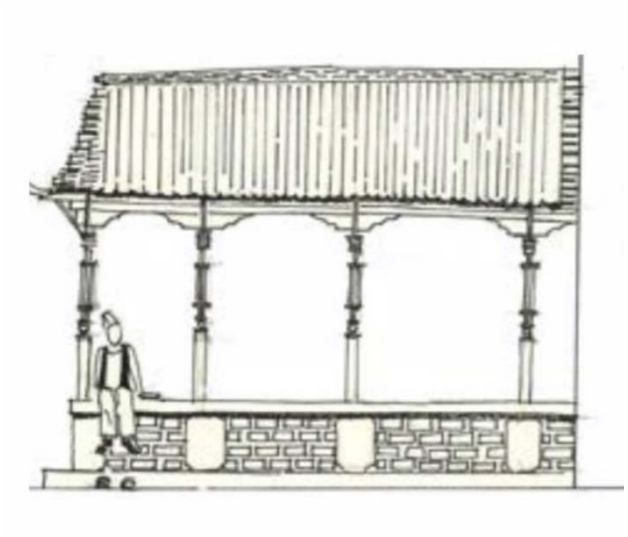
multicrop timelines, accentuated by the availablity of rainwater during the monsoon period



* 1 preparation, 2 sowing, 3 planting, 4 growing & 5 harvesting



Religious festival timeline

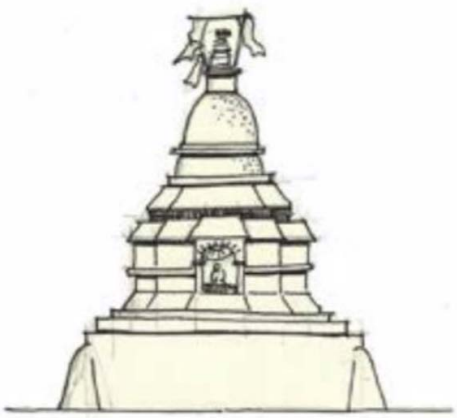


PATI

The traditional resting place and space of encounter. Also offering shelter for occasional travellers. A playground for all generations (cards, ...) but also a place for rituals where music is played at certain occasions during the year. Covered social space for gathering, storing, drying crops, ...

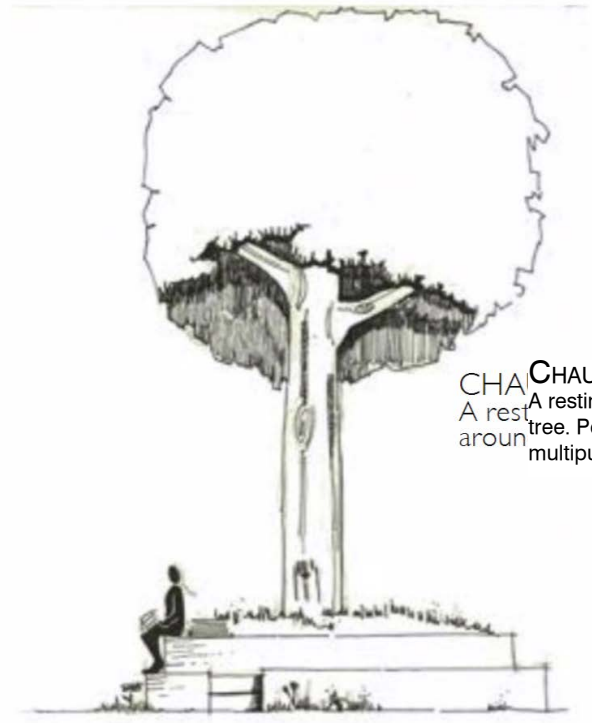
SOCIAL KEY TYPOLOGIES RELATED TO THE PRODUCTIVE ACTIVITIES

Small agriculture villages are spread out around kathmundu valley and the river banks to supply the urban areas. Traders roads are set up from those villages to the more urban areas to supply them with fresh grown agriculture goods. Along the traders road and selling agricultural products al kind of typologies occured providing an infrastructure to make trading possible.
A “Pati” is know as a resting place for traders but often occurs in the more urban settelements as social covered space. Religious artefacts like shrines are embedded in the daily life to pray for all sort of things like luck, wealth. In rural areas shrines are combined with the presence of two old trees. The two trees are part of the religious set-up. The space around the trees is known gathering space for the community as religious space but also for community decisions, ect.
Also the houses show some interaction with the public field. The ground level of the Nepali houses are often used to sell goods, therefore some steps are made before entering the house to show the goods and attract people attention to sell.



CHIAYA

A shrine typically build and worhiped by the local communities within the settements or along the roads.



CHA
A rest
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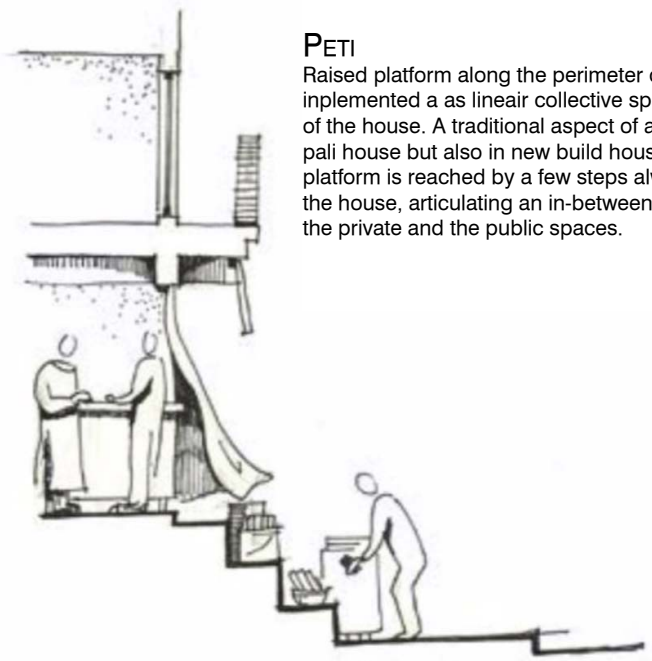
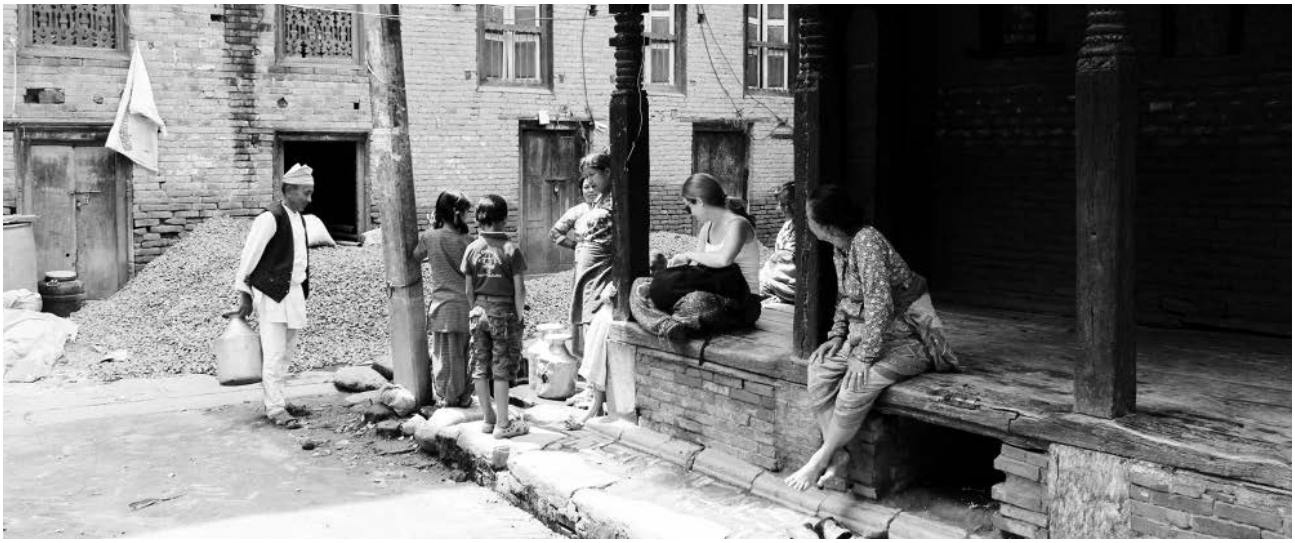
Chauttara

A resting place often build around a people tree. People trees are age-old trees offering multipurpose community spaces.



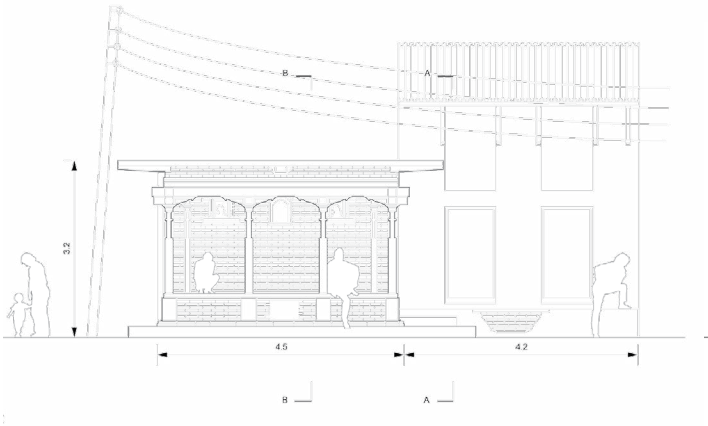
Peti

Raised platform along the perimeter of a house inplemented a as lineair collective space in front of the house. A traditional aspect of a traditional Nepali house but also in new build houses. The raised platform is reached by a few steps always in front of the house, articulating an in-between area between the private and the public spaces.



Social key typologies related to productive activities
- pati

Pati's are all around present in the daily life of Nepal just like small agriculture villages are spread out around Kathmundu Valley and the river banks to supply the urban areas. Along the traders roads different kind of typologies related to agriculture based economy occured. A "Pati" is know as resting place for traders but occurs also in the urban settlements as a social covered space.
The amount of pati's in the streets of urban settlements is big. Each pati relates to his own public space. This means that every square or courtyard formed by houses has his own pati. Each community or building block has his own pati where they can meet and sit together. A Pati can be compared with an outside community room giving shelter for 24 hours a day. The wide spread presence of pati's all over the streets show their vital role in society. These public spaces are enhanced and implemented to strengthen community resilience.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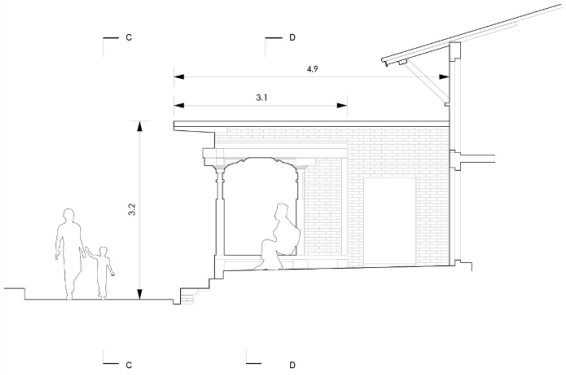
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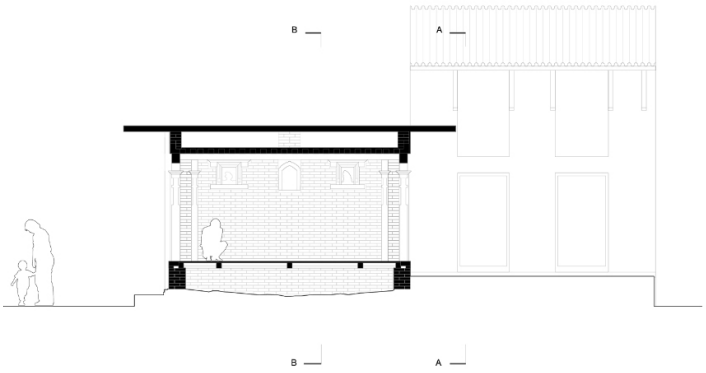
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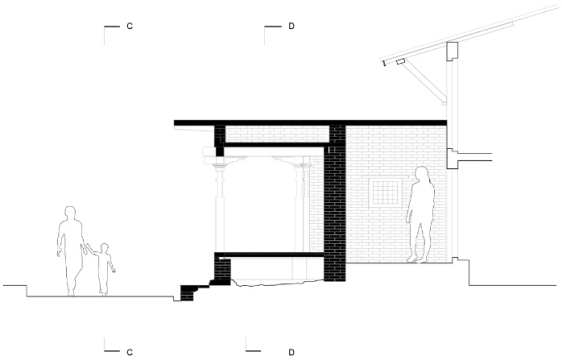
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Social key typologies related to productive activities
- PETI

Raised platform along the perimeter of a house of inplemented a as lineair collective space in front of the house. A traditional aspect of a traditional Nepali house but also in new build houses. The raised platform is reached by a few steps allways in

Hempcrete - raw hemp shiv

Hempcrete & the environment

Hempcrete can benefit the environment and create a healthy structure in many ways including:

Environmental benefits
- Non-toxic
- sustainable
- renewable
- carbon sequestration
- reduction of carbon dioxide emissions
- low energy building product
- reusable
- returns nutrients to the soil
- ideal as rotation crop

Healthy structure
- Good vapor permeability (capillarity and hygroscopicity)
- Naturally provides a healthy internal environment
- thermal comfort

Material benefits
- good thermal performance (insulation and mass)
- inherently air-tight material
- energy efficiency
- reduced heating and cooling require ments
- low maintenance
- multiple finish options

Hempcrete - cast around frame

Hempcrete - roof insulation

Hempcrete structural/ construction

The hemp plant has been used for thousands of years for various trades, including rope making, ship sails, oils, textiles, paper, and construction materials. though it doesn't have structural properties alone, it can enhance the structural components of a structure in several ways.

Structural

- can be used in load bearing applications with an integrated timber, steel or concrete frame
- Provides racking/ shear strength
- can stiffen structural frames
- can allow for increased spacing of structural members

General information

- easy to handle and install
- Monolithic product

Material benefits

- wall construction including racking strength and insulation
- protects timber from deterioration
- durability and longevity
- lightweight
- site mixed
- reusable

Hempcrete

Hempcrete is a lightweight bio-composite building material made from hemp and lime that provides insulating and moisture regulating properties. Various finishes can be incorporated with hempcrete

Material information

- Lightweight sustainable bio-composite
- Together with a lime based binder

Uses

- pre-cast blocks
- cast-in place walls
- retrofit existing conditions
- non-load bearing with integrated structural frame
- above ground/ daylight walls

Benefits

- energy and thermally efficient
- breathable insulating layers
- vapor permeability
- fire and pest resistant
- acoustic insulating properties
- easy to handle and install

Hemp
- casestudies

Casestudy Nepal hempcrete

Anybody who has been to Nepal knows why hemp makes sense as local resource. Hemp grows in the wild all over Nepal. International conventions and laws have not been able to remove the plant from the DNA of the country due to its religious, social and economic relevance. For generations and decades, seeds and fiber of the plant have been major sources of livelihood for people living in remote western areas of Nepal.
Building homes with hemp definitely makes it not only innovative but economically, socially and environmentally sustainable as well. Hemp building do three things differently:

1. Constructions built with hemp are not a financial burden. It works on the model of local sustainability. Families contribute in building their own house by being part of construction. This ensures that they earn ownership of their new homes and gain skills along the way.

2. Constructions built with hemp are extremely healthy.

3. Constructions are built with local materials, local people and with technology easy to learn and easy to maintain.

The pictures on the right give the order from cutting the hemp into the hempcrete to construct a wall with with the hempcrete. These pictures come from the Shah Hemp Inno-Ventures which I also visted in Nepal how is building with hemp as well.

Casestudy belgium hempcrete

A material made by mixing hemp with lime and water forms a new layer of insulation around this house in Belgium, as part of a renovation by Ghent studio Martens Van Caimere Architecten. Known as hempcrete, the hemp-based render was applied in thick layers to all four walls of the small house to help it retain heat and make the structure more weather-resistant. The result is a textured surface with a similar appearance to rammed earth.
the material offers a similar but more sustainable and economical solution than concrete.

“Hempcrete combines the insulation and finishing in one layer, reducing building costs,” he continued. “Plus it is durable and sustainable, because it is made from a waste product.”

The material is processed in similar way to concrete. Wooden boards are used to create formwork around the perimeter of the building, and the hempcrete composite mixture is poured in layer by layer. The wood is removed once the mixture has dried. Steel wiring can also be added to give additional strength to load-bearing walls.

Bamboo

Physical properties:
Before bamboo clum can be used in a building industry as a structure is has to go through certain demands, starting from harvesting and grading selected steams to treatment and application.

- Bamboo clums cannot be harvested when they are younger than 3 years.
- Cannot be cut before the second node or higher then 30mmm above the ground.
- All bamboo clums should be as straight as possible.
- Change in diameter over length should be kept minimum. Maximum taper of 10mm per meter is acceptable for length up to 3 m.
- Columns and roof members should be a minimum of 70-100mm in diameter at thin ends
- Wall thickness not less than 10-12 mm
- Distance between nodes should not exceed 300-600mm (they are the strongest points in the column)
- While processing it should be set out to dry for around 2-3 months to evaporate 90% of it's natural moisture content
- There should be non- toxic treatment applied
- It is better no to use nails and screws due to the danger of splintering between longitudinal fibers.

Treatment:
Untreated bamboo have life expectancy no more than five years and can be attacked by insects. Moreover it can cause high risk of fire spread when internodes in the clum can burst and collapse the building. This plant consists of carbohydrates (soluble sugars) that attracts the insects. The solution for this issue is to inject water soluble salts into bamboo cells. When water evaporates it removes starch and leave salt inside the fibers.This process is not toxic and a sheap solution to the treatment with borax, and makes bamboo beams fire retardant.

by Katarzyna Krawczuk, october 2013

Walls

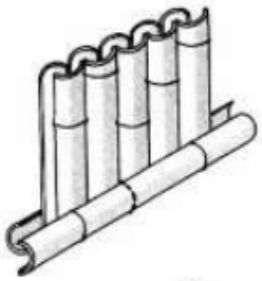
- Whole or halved bamboo
  Preferred orientation is vertical as it increases shear resistance and is better for the rain falls. Vertical beams can be driven directly into the ground with or without battens.

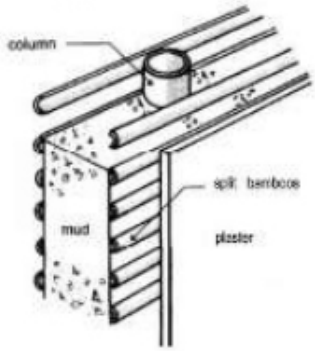
- Split or flattened bamboo
  Boards can be stretched or covered by wire mesh to provide good surface for plastering.

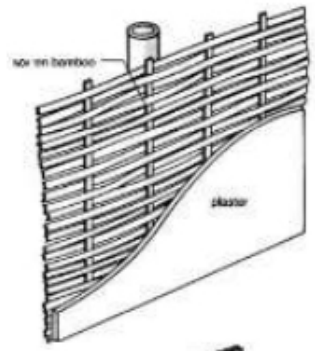
- Bajareque
  Type of construction commonly used in Latin America that is based on horizontal bamboo strips tied or nailed to both sides of the posts. The space between is filled with mud or stones. This construction is strong and massive and earth-quake resistant.

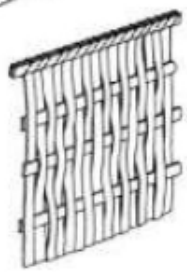
- Wattle bamboo
  Commonly used in India, Peru and Chile. Thick woven panels of bamboo strips are attached to bamboo supporting beam and covered with plaster.

- Woven bamboo
  The same type a wattle bamboo wall but the the bamboo strips are arranged closer and thicker which don't require external plastering.





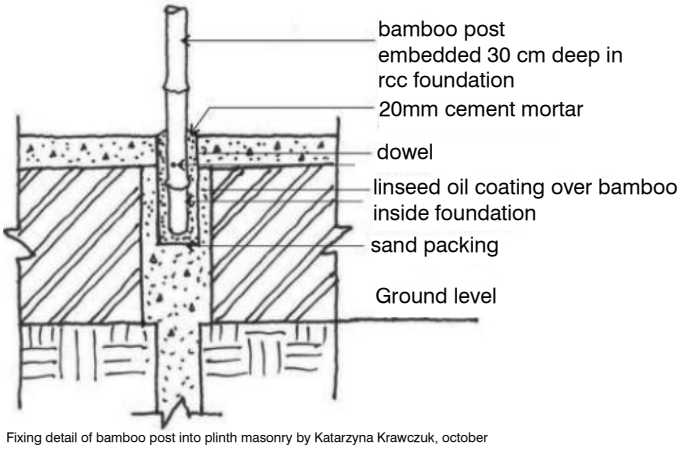




Bamboo

Foundations:
Bamboo is basically an above-ground material. Unless undergoing proper treatment it can last about 2-3 years underground. It is impossible to put bamboo post directly to the ground, however the bamboo column can be embedded into the foundation or plinth.

- Bamboo canes should not touch soil, since they should not be exposed to the moisture
- the moisture control can be created by a coating. My research led me to linseed oil which is easy available and makes the connection layer between bamboo and concrete for a better adhesion and waterproof sealing. (5)
- Height of the plinth in which bamboo is set in should be above the flood water line or min 350 mm above ground level
- Minimum diameter of bamboo posts at thinner shall not be less than 70 mm
- The highest post can be up to 3m, if the height is greater, the post should be supported by

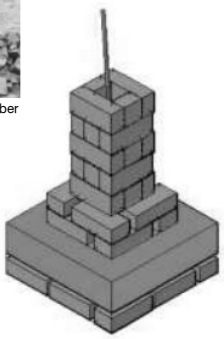


Fixing detail of bamboo post into plinth masonry by Katarzyna Krawczuk, october

Foundation with brick pedestal:
This kind of foundations are earthquake resistant and can be used even for brick wall houses. After soling bricks on the ground level, we pour and spread the concrete and mark center for vertical bamboo post. Then going up to the ground level, bricks should be put in such a way to make 120x120mm gap inside to fill with the concrete. After creating foundation plinth, the reinforcement and pipes can be put on the top as the final foundation layer.

This is the type of foundation that I will implement in my design. First reason is that it is earthquake resistant and the second is the use of stones or bricks to make a precast for the bamboo column. The stones used for the foundation will be re-used from the collapsed school buildings.


Fixing detail of bamboo post into plinth masonry by Katarzyna Krawczuk, october



Joinery:
Joining bamboo members to transfer load are the basic and
the most important part in the building process as their function it to transfer load equally down to the foundations. We can divide bamboo connections into two types:
- Low-technology connection
- High-technology connection

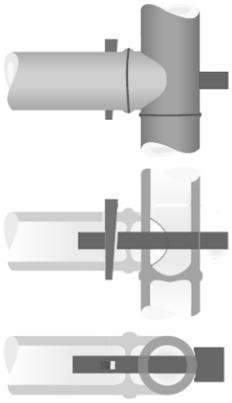
I will only show the low-technology connections, because that were I'm looking for. A ow tech construction way , affordable and easy application.

- Friction-tight rope connection,
Is the basic connection, usually used with natural materials such as: cocos/asgo palm fiber, bast, strips of bamboo or rattan or more industrial materials: iron wire and plastic ropes. Lashing can also have variations of complexity. Bamboo pieces can be cut and attached to each other or can be lashed with pre-drilled holes in each of the piece and the rope tied through them.

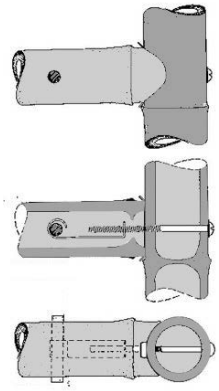
Friction-tight rope connection by Katarzyna Krawczuk, october 2013

- Plug-in connections
Those connections are very similar to those in wood with mortise and tenon and are quite seldom used in bamboo connections. However bolds and consoles you can find very often. The bamboo pieces are appropriately cut and in between them the plug is inserted (preferably wood block). An additional fastening with rope is required to prevent from unplugging and slipping the beam.

- Connection with steel tension clamp
Still considered as a low technology connection although a steel element is used. With this attachment more connections are possible, but we should avoid those places where forces are going vertically to the cane axis-they may destroy bamboo clum.



plug-in connections



Connection with steel tension clamp
by Katarzyna Krawczuk, october 2013

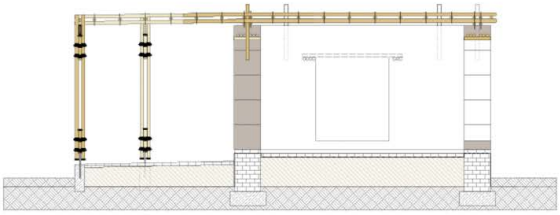
Bamboo
- casestudy

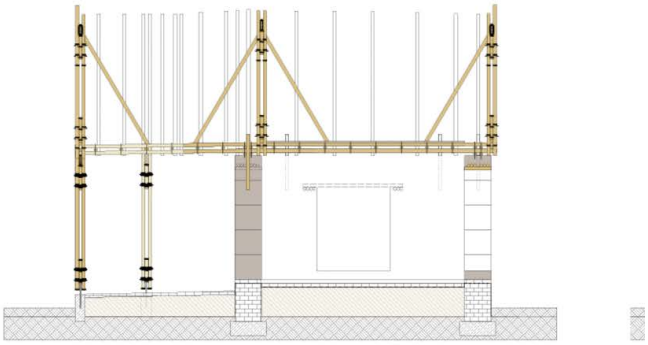
The new school building consists of the required eight classrooms and the required service areas. The classrooms are located in two separate earthen structures. A bamboo bearing structure is located between them and in front of them, which supports the staircase, service areas, and the free study room. The classes in the ground floor feature large window niches with a seating bench directed towards the south. The balcony in
the first floor features benches made of bamboo to provide additional seating surfaces. The veranda on the north side is relatively open and orients itself visually towards the arcade featured by the existing structures.

by ziegert roswag architekten, march 2013

In order to execute the two-storey building complex in a manner able to withstand earthquakes, separate axis-symmetrical structures are produced in two building phases. In the ground floor, this features a heavy earthen body, and in the top floor a light bamboo structure. The baked brick foundation projecting 60 centimeters from the ground forms the base of the school. This protects the school against splashing water and possible flooding and supports the solid earthen walls. These are constructed in cob, a building technique using an earth and straw mix, which is similar to the traditional local technique. The inserted horizontal barrier between the wall and base protects the earth against rising moisture. Classrooms on the first floor are built using the wattle and daub technique; the light bamboo structure is filled with brickearth and covered with a surrounding bamboo weave, which also offers protection against the sun and rain.

by ziegert roswag architekten, march 2013





The classrooms are connected via a two-storey bamboo veranda, which also serves as an extended classroom. This also forms a buffer zone to protect the earth walls behind against the monsoon rains that mainly approach from the north-west. The ceiling and the classic flat-roof structure consist of a triple-layer bamboo structure that is covered with a layer of earth. The moisture-regulating property of the earth in combination with night time cooling (ventilation through the window opening) mainly allows additional air conditioning to be omitted during the hot summer months. In the winter, the building is warmed via passive solar energy due to its north-south orientation. Sufficient large windows may be opened to provide good natural lighting. The roofed veranda area provides a well-ventilated outdoor room, and the surrounding bamboo curtain also acts as a good sunshade.

by ziegert roswag architekten, march 2013

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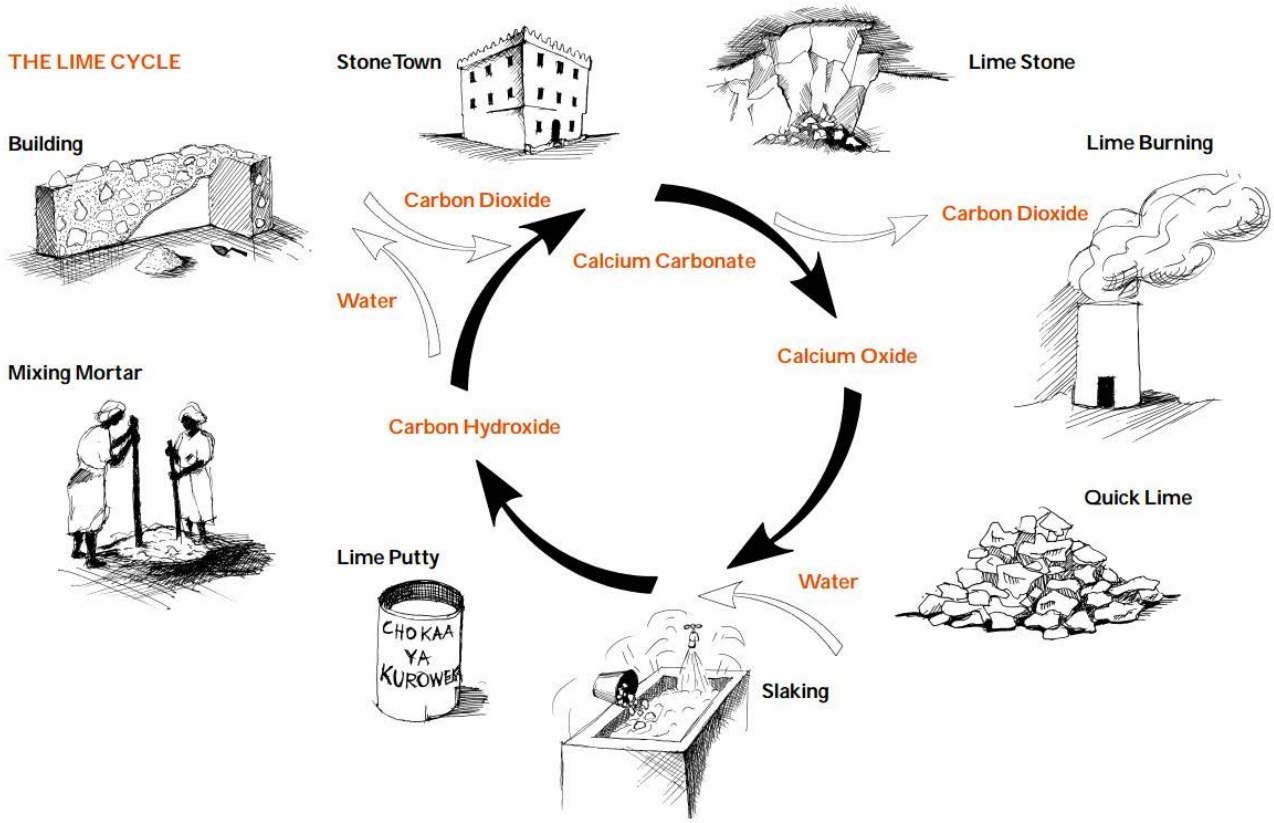
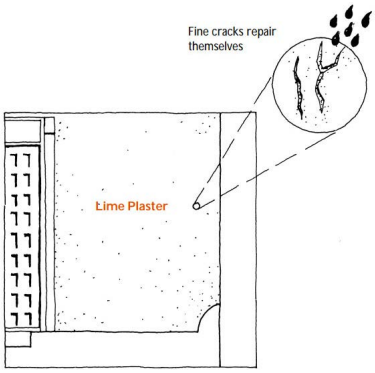
LIME



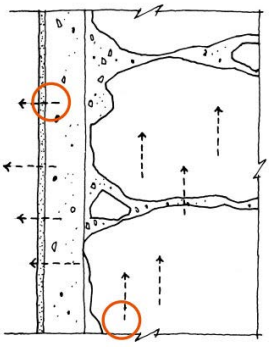
To build the higher quality coral stone Swahili house, and many years ago to build the Stone Town, a third kind of binder was used, lime. Lime is today supplied as a fine white powder called hydrated lime or as a thick white paste called putty. Hydrated lime is generally only used as a component of cement/sand/lime mortars and is not of sufficiently high quality to specify for use as a traditional lime mortar. Lime putty is the binder originally used in the construction of the Stone Town. Lime in this form has been used to make mortar for thousands of years in many parts of the world.

Mortar made with a lime binder remains slightly flexible even when set and will let walls move without cracking too much. Furthermore, lime mortars repair fine cracks themselves as rainwater slowly deposits fresh calcium carbonate taken into solution from the surrounding mortar.

Old buildings were built without damp proof courses which stop rising damp inside the walls and it is very important that mortars are porous so moisture can pass through them and evaporate. This helps to keep houses dry and makes a healthy atmosphere inside.



Cement mortars are very useful to modern builders but potentially disasterous when used for traditional construction and restoration work. When cement sets it is strong, hard, waterproof and can be used in almost any circumstances. Cement is also very easy to use and of known quality and reliability. All of this makes them ideal for many modern building processes but not recommended for use in old buildings. When preparing a mortar for use with historic masonry, it is important to think of the building not as a rigid structure, with all of its parts set fast as though cast in steel, but as a living animal that MUST move and breathe. Cement-based mortars do not have the ELASTICITY to allow the building to move without cracking.



Moisture rises in the wall

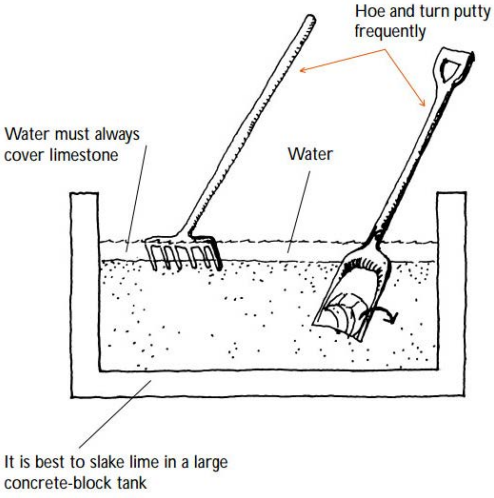
Adding other materials to lime mortar that react chemically, can speed up the setting processs. Set additives are essential if the mortar is to be used in a situation that is constantly wet, as carbonation will not take place if the mortar remains saturated. Lime mortar alone will NOT set under water, to do so, it must have an effective set additive mixed with it. The materials that will work in this way are called pozzolanas (vulcanic ashes) and contain silicates or aluminates or both.

A very common building material that makes an excellent pozzolana is brick. To be used in this way, the bricks must first be broken into small pieces and then reduced to dust by sieving through a fine flour screen. The brick dust is added to the mix of lime and aggregate just before use. To one part of lime and three parts of aggregate should be added 1/4 of a part of brick dust. Although it is not best practice, if no other pozzolana is available, a small amount of cement can be added to the mix. This should not exceed 1/2 of a part.

The use of brick powder is also an old fashioned method uses to make ancient cement. Ancient cement from India is made out of Briquettes of Surki (brick powder) and lime and allowing ti dry for 2 to 3 months. These briquettes are fired and then finely powdered to get cementing material called Shyay.

Making Lime Putty

Make sure that the lime putty stays in the pit for a **minimum of 4 days**, or as long as possible



PROJECT DESIGN

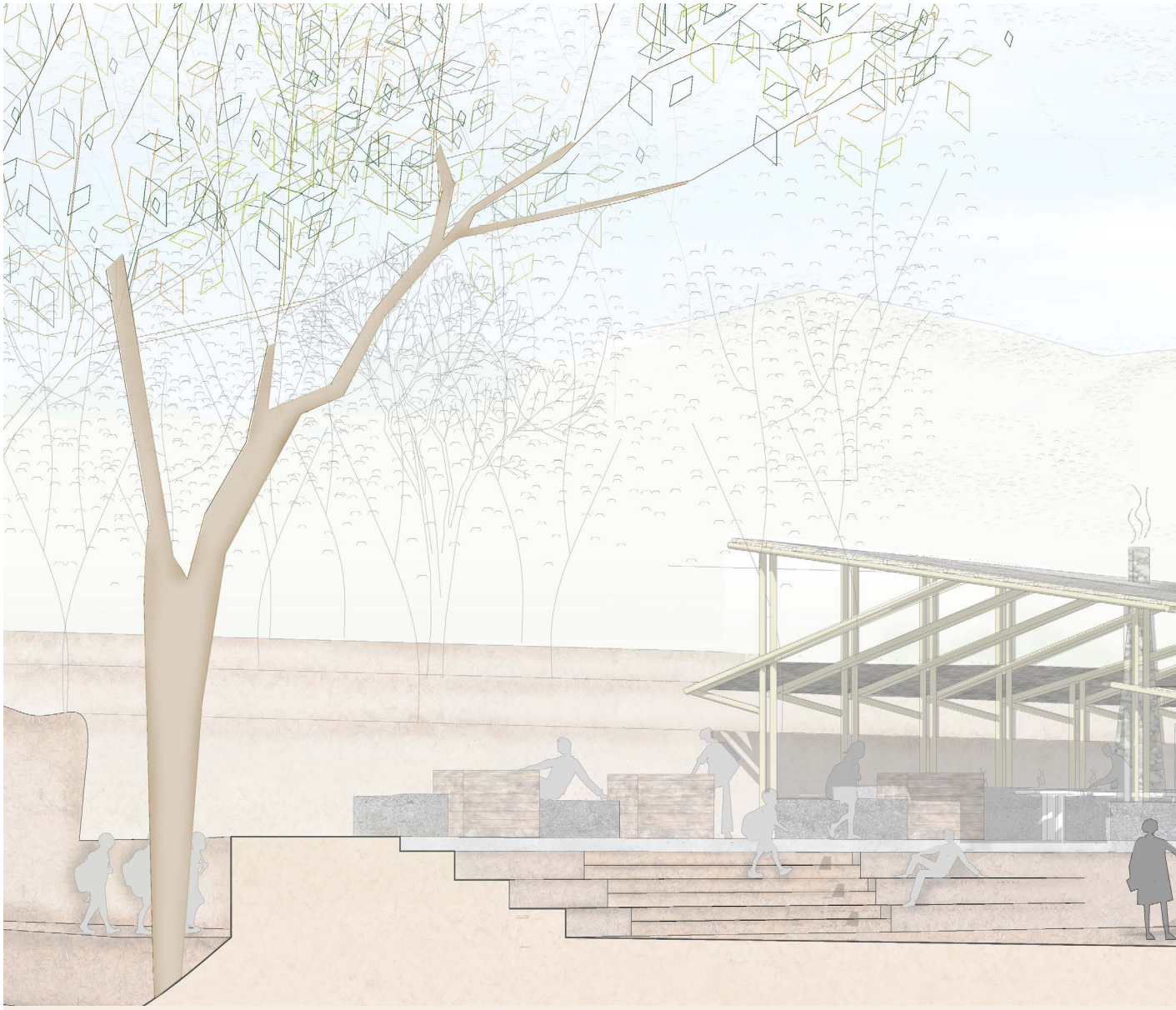
The aim to build a new school is extended with a idea of place where children can be teached and where parents see an example with new constructions techniques which they can help them to (re) build their own houses. The school building itself it a representation in their community and has a good position to bring the two villages closer to eachother. Therefore the school is equipped with a covered community space with a cooking stove. This cooking stove will allow the school to organise meetings with parents, invite new children to the school, organise a school celebration etc. The possibility to cook or to boil tea which will bring people together and makes the school more than only a school and can be used for community meetings in general.

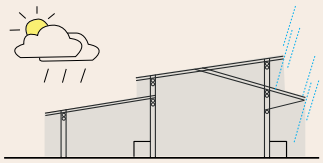
The representaion of the building is something else than what they are used to. Nevertheless the material use makes it a local cultivated building where they can relate to, and at the same time respond on their will to have a solid concrete building which they appreciate a lot. The hempcrete walls offer a similar look to concrete.

The classes don't have a convential shape which will activate more informal ways of teaching and will change the way classes of giving and enlarge the interaction between teachers and children. Classes can be organised inside but also outside with the the covered outdoor spaces where teaching, playing or group activities can take place. In that way different types of classrooms are offered to broaden the perspective of teaching.

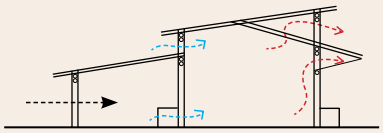
The classrooms are forming a tree-classroom cluster and a two-classroom cluster so each grade can have which own classroom. The cluster of classroom has the advantage than one teacher can control more than one classroom from the same viewpoint, the supervision classroom.

Project design

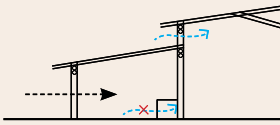




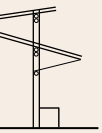
Overhanging climate protection

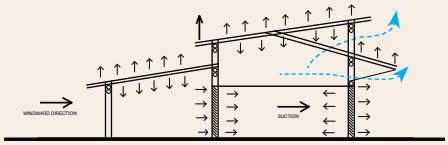


Hot season heat escape

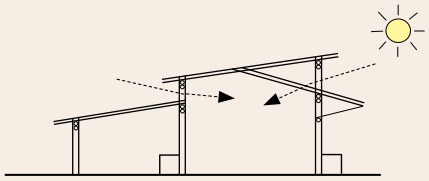


Winter season heat escape



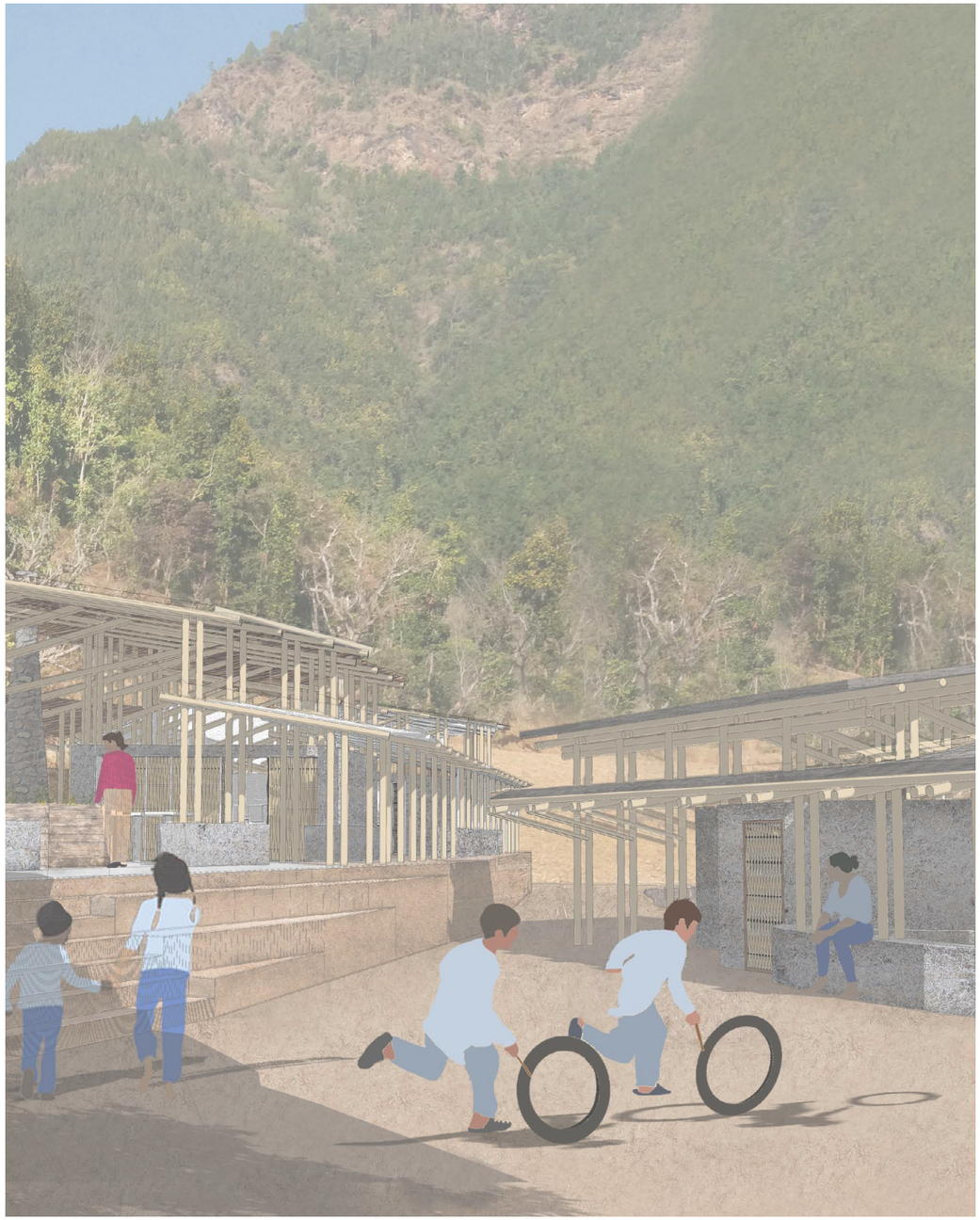


WINDWARD DIRECTION (WEST) DAYTIME

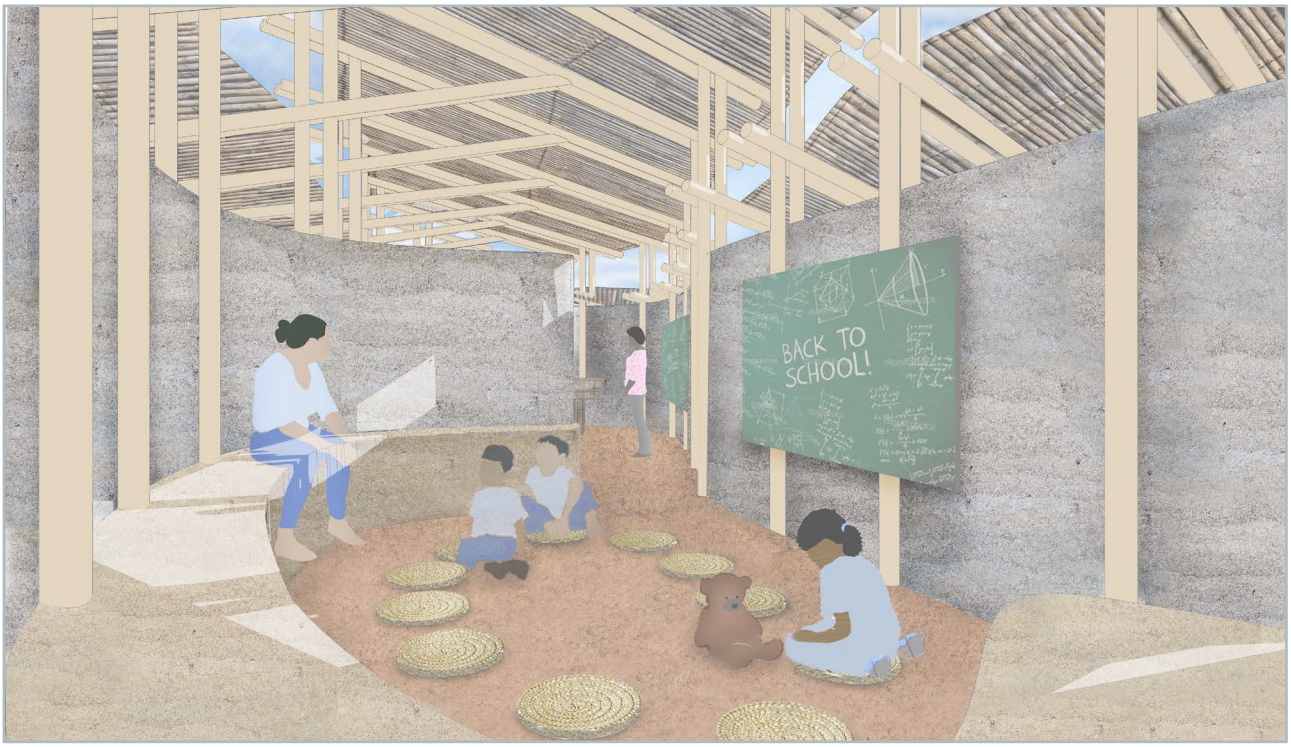


LIGHT ENTRANCE

Design investigations
- informal learning space

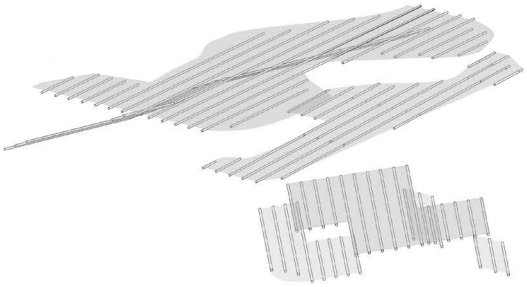


Design investigations
- informal learning space


BACK TO
SCHOOL!

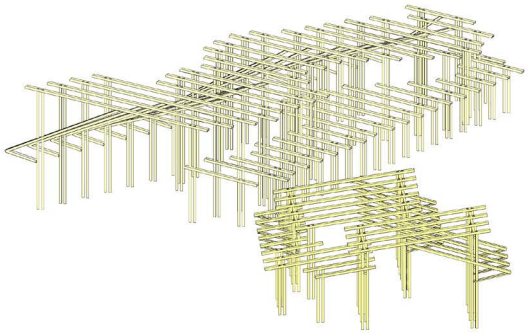
Design investigations
- outside informal learning space

Design investigations
- exploded view



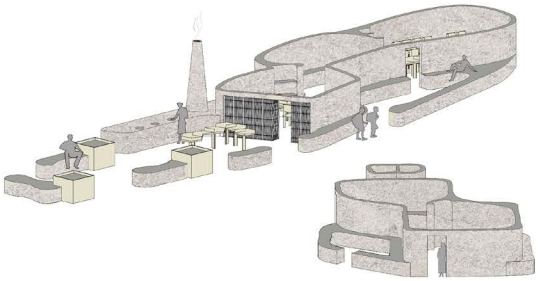
Roof

THE ROOF IS MADE FROM BAMBOO WITH A LAYER OF HEMP ON TOP FOR INSULATION. TO PROTECT FROM THE HAVY RAINFALL CEMENT ROOF TILES ARE MADE ON SITE.



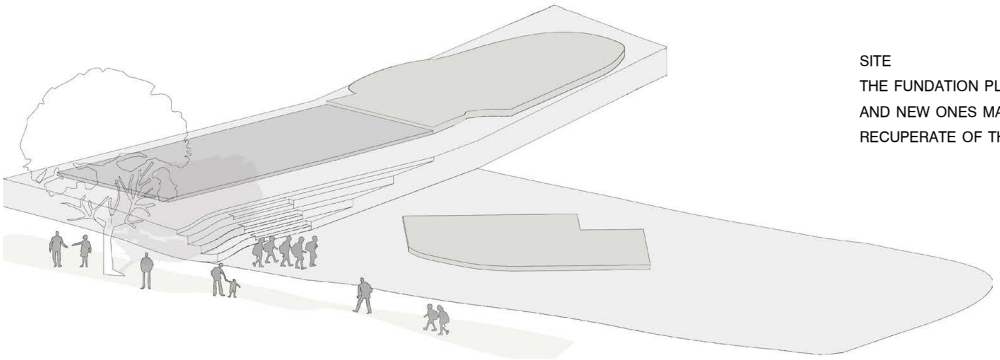
Structure

THE COMPLETE STRUCTURE IS MADE FROM BAMBOO.



Walls

THE WALLS ARE MADE FROM HEMPCRETE, AS AN INFILL BETWEEN THE BAMBOO STRUCTURE.

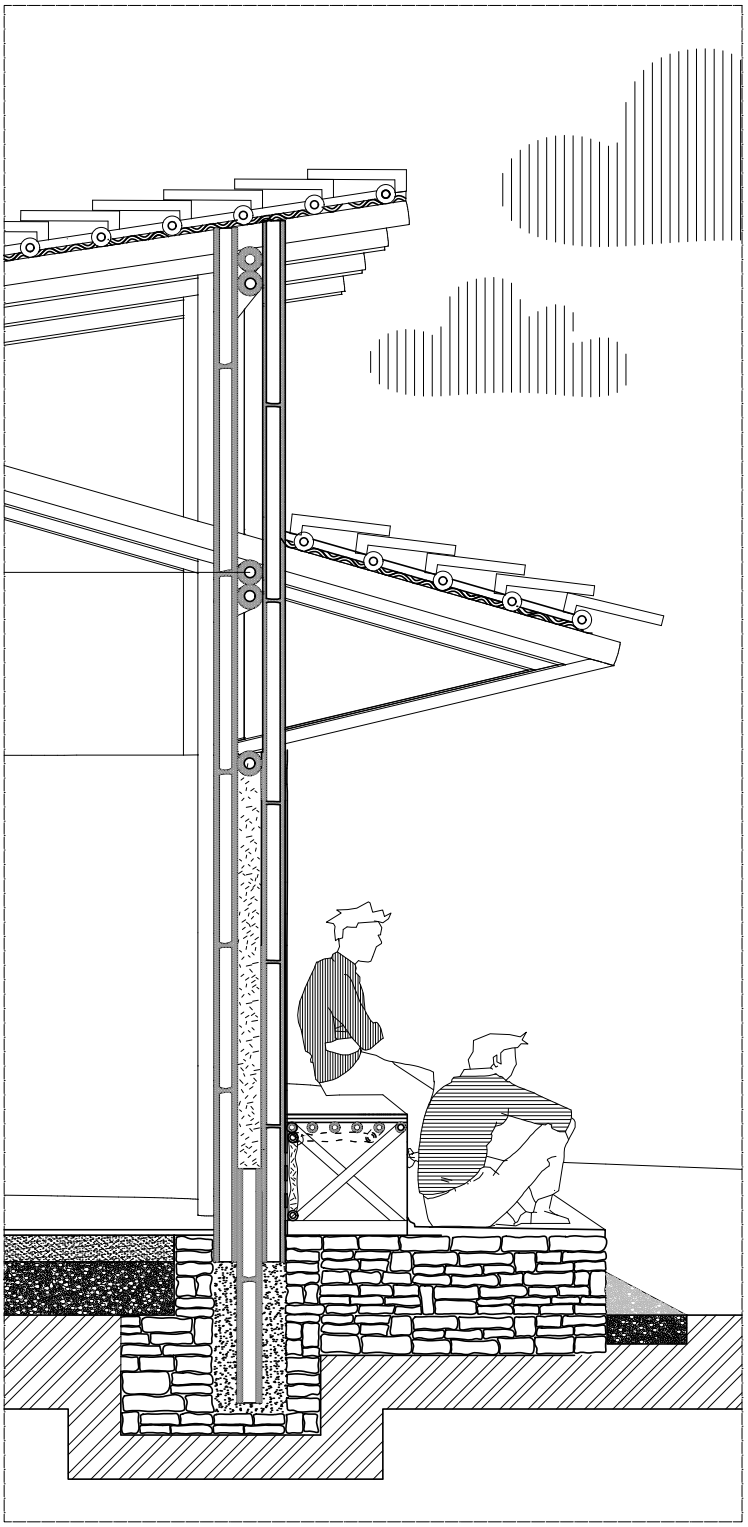


SITE

THE FUNDATION PLATES, EXISTING (DARK GREY) AND NEW ONES MADE FROM THE LOCAL STONES RECUPERATE OF THE COLLAPSED SCHOOL BUILDING.

Design investigations
- detail

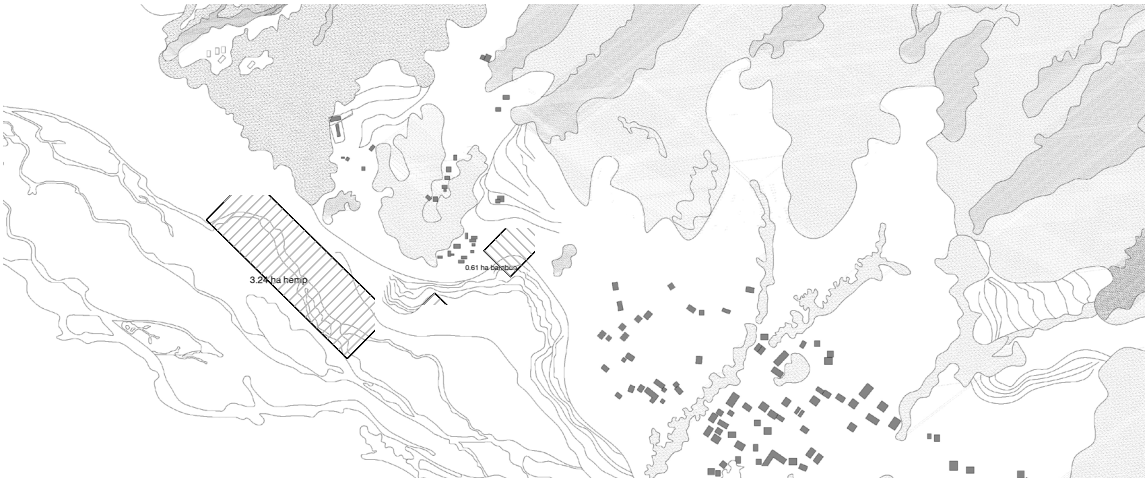
The foundation for the bamboo frames is made with recuperation stones for the collapsed school building on site. Cement or concrete is a rare material and is expensive, therefore is looking for ancient techniques to construct with cement. In previous times old cement was made with lime putty brcik dust and rice husks. The use of rice huss is cement looks in the beginning quite strange but it makes a hudge difference in de strenghts of the cement. In Nepal the tradition exist also to work with ash.

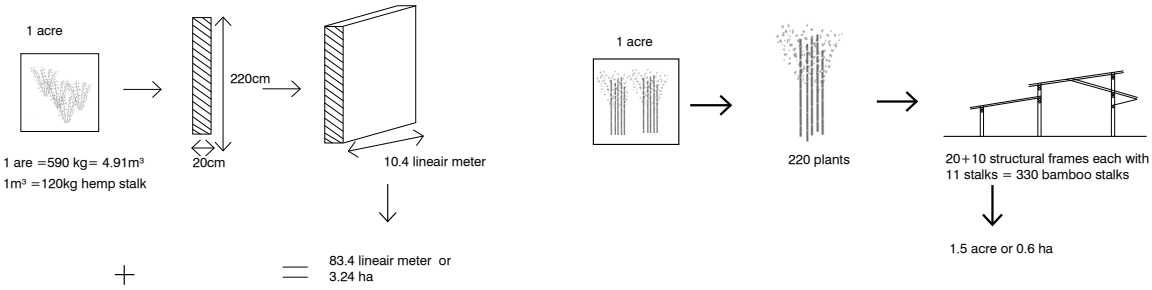


Design investigations

- area need to cultivatie a school

To build this school with local cultivated materials, what does that mean in terms of land use ? A simple calculation is made to have an idea of how much land will be needed to grow the materials to build the school.

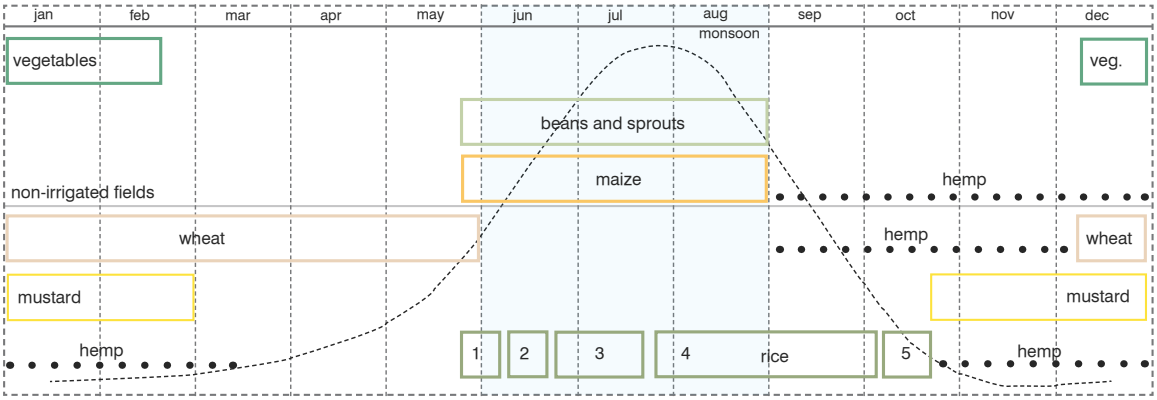




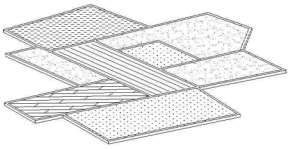
Cultivating a school

Growing hemp has a lot of added qualities as a material to build with and enriches the ground or soil. It leaves an enriched soil type. Hemp can be grown between the season of other types of vegetables or wheat.

The plant grows fast and in four months it's ready to harvest and make use of the stalk of the hemp. The fast grown makes it possible to use hemp as an rotation crop. They can grown in between the rice production. To use hemp as a rotation crop the food production is not in danger.

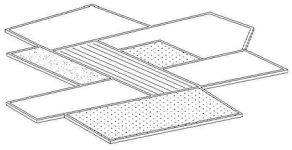


* 1 preparation, 2 sowing, 3 planting, 4 growing & 5 harvesting



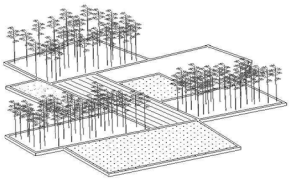
agricultural land

J F M A M J J A S O N D



agricultural land not entirely in use

J F M A M J J A S O N D



using hemp as rotation crop after monsoon

J F M A M J J A S O N D

Conclusion

The general aim to start with this project is to build a new school for a village in Nuwakot, because their school collapsed after the earthquake in 2015. The availability of building materials on site is low and bringing new building materials to the site would take a lot of manpower. This triggered my interest in their agricultural fields where they grown everything they need in their daily life.

They are self-sufficient for their food production, so why not becoming self-sufficient in building materials? Instead of spending a lot of money to materials from abroad, they can invest in their community economy. Using local cultivated materials means that a lot of the money spent on the building would go back to the community, and enforces their income and creates a short chain economy.

The required amount of building materials is high means which means the two villages around the school, nachandanda and anpchaur will need to work together and that the involvement of farmers, constructors and families will be high. The high involvement is important almost necessary so the people of the villages can relate themselves to the building and know the school is build by their own power, instead of a school that is brought in by an unkown foreign organisation with the best intention.

The contribution of the villagers to build will lead eventually to a knowledge transfer. The school building can become a build example showing new techniques to construct, improve the finishing of floors and walls, or set an example of a better cooking stove. My aim for this school project is that inside the school the children can be teached in a pleasant way but that the building itself can set an

The contribution of the villagers to build will lead eventually to a knowledge transfer. The school building can become a build example showing new techniques to construct, improve the finishing of floors and walls, or set an example of a better cooking stove. My aim for this school project is that inside the school the children can be teached in a pleasant way but that the building itself can set an example where the community can learn from and incorpated the new techniques to their own houses. The education starts already during the buiding process.

The physical appearance of the building is something else than what they are used to. Nevertheless the material use makes it a local cultivated building where they can relate to, and at the same time respond on their will to have a solid concrete building which they appreciate a lot. The hempcrete walls offer a similar look to concrete. The school building itself it a representation in their community and has a good position to bring the two villages closer to eachother. Therefore the school is equipped with a covered community space with a cooking stove. This cooking stove will allow the school to organise meetings with parents, invite new children to the school, organise a school celebration etc.

The classrooms don't have a convential shape which will activate more informal ways of teaching and will change the way classes or giving and enlarge the interaction between teachers and children. The layered ideas of the school make this school a complete project with a bigger influence than a standard school, there fore I would a call it an ideal school for Nepal.

Bibliography

Books:

M. Karus, I. Bosca (1998). The cultivation of hemp: Botany, varieties, cultivation and harvesting. USA. Hemptech
J.R. Subba (2008). History, culture and customs of Sikkim. India. Gyan Publishing House
B.H. Adhikary (2014). Green-Manuring for Increased Crop Production. Nepal. Communication, Publication and Documentation Division

Thesis:

J. Lee, “Steiner Academy Five Valleys” unpublished thesis, University of Bath BSc Architecture, 14 july 2014 [Online]. Available: https://issuu.com/jennifercwlee/docs/jennifer_lee_-_stroud_brochure [consultated on 3 may 2017].

Articles:

(1) The Kathmandu Post, “ A burning issue”, kathmandupost.ekantipur.com, 15 july 2014 [Online]. Available:http://kathmandupost.ekantipur.com/printedition/news/2014-07-14/a-burning-issue.html [Consultated on 14 march 2017].
(2) Bodach, S., Lang, W., Hamhaber, J., “Climate responsive building design strategies of vernacular architecture in Nepal.”, researchgate.net, 2014 [Online] Available: www.researchgate.net/publication/263812612_Climate_responsive_building_design_strategies_of_vernacular_architecture_in_Nepal [Consultated on 21 march 2017].
Climate responsive building design strategies of vernacular architecture in Nepal (PDF Download Available). Available from: https://www.researchgate.net/publication/263812612_Climate_responsive_building_design_strategies_of_vernacular_architecture_in_Nepal [consultated June 16, 2017].
(?)L. Crossly, “ Praying for a good harvest: Nepalese worshippers light up town with traditional torches as they celebrate chariot festival”, dailymail.co.uk, 8 june 2013 [Online]. Available: http://www.dailymail.co.uk/news/article-2338042/Praying-good-harvest-Nepalese-worshippers-light-town-traditional-torches-celebrate-chariot-festival.html [Consultated on 18 april 2017].

Internet sources:

(3)(?) “Nuwakot Monthly Climate Average, Nepal”, worldweatheronline.com [Online]. Available: https://www.worldweatheronline.com/nuwakot-weather-averages/np.aspx
Worldbank “Agricultural land (% of land area)”, worldbank.org, 2016 [Online]. Available: http://data.worldbank.org/indicator/AG.LND.AGRI.ZS [Consultated on 18 april 2017].
(?) B. D. Pant and A. Palikhe, “Agricultural Performance and Food Security in Nepal: Constraints and Challenges”, slideshare.net, 14 november 2011 [Online]. Available: https://www.slideshare.net/resakssasia/1-a-bishnu-pant [Consultated on 18 april 2017].
M.A.J. Sathak, “Bamboo”, slideshare.net, 19 december 2016. [Online]. Available: https://www.slideshare.net/ganapathymohan/bamboo-70267889 [Consultated on 2 april 2017].
L. Geiswiller and G. Monge, “Des architectes itinérants pour une architecture identitaire”, drive.google.com, january 2016. [Online]. Available:https://drive.google.com/file/d/0B5bSXPTxF2u4cnJ0ZHR1UWVBYnc/view [consultated on18 april 2017]
R.S. Gabitan, “Millenium school deisgn competition winner”, rsgabitan.blogspot.be, 29 may 2008 Available: http://rsgabitan.blogspot.be/2008/05/millennium-school-design-competition.html [consultated on 23 march 2017].
Dr. A.S. Nene, “Building materials and construction, techniques of ancient India”, slideshare.net, 7 august 2014. [Online]. Available: https://www.slideshare.net/ashoknene/building-materials-of-ancient-india [consultated on 3 may 2017].
?, “Lime and lime mortars”, archnet.org,? [Online]. Available: https://archnet.org/system/publications/contents/4790/original/DPC1502.pdf?1384786794 [consultated on 7 may 2017].

Internet sources:

Central Bureau of Statistics Kathmandu, “National Sample Census of Agriculture,Nepal 2011/2012 Nuwakot”, cbs.gov.np, december 2013. [Online]. Available:http://cbs.gov.np/image/data/Agriculture/District%20Summary/28%20Nuwakot.pdf [Consultated on 8 april 2017].
L.Geiswiller, “Architecture Confined Stone Wall technology”, cswpulchowk.blogspot.be, february 2017[Online]. Available:http://cswpulchowk.blogspot.be/ [consultated on 18 april 2017]
?, “A burning issue”, kathmandupost.ekantipur.com, 15 july 2014. [Online]. Available: http://kathmandupost.ekantipur.com/printedition/news/2014-07-14/a-burning-issue.html [Consultated on 24 march 2017].
?, ziegert, roswag, seiler architekten ingenieure earthen school tipu sultan merkez, Pakistan,divisare.com, [Online]. Available: https://divisare.com/projects/309226-ziegert-roswag-seiler-architekten-ingenieure-earthen-school-tipu-sultan-merkez-pakistan [Consultated on 16 may 2017].
Internet sources:

Multimedia source:

https://www.youtube.com/watch?v=IgcYJKaCxj4&t=3s hemp
https://www.youtube.com/watch?v=oDxYWspiN-8 schooling the world