

Report

**Field Study
in Pono Village, Pakistan**

2nd - 7th Dec. 2022



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LAHORE



Report

Field Study in Pono Village, Sindh, Pakistan

2nd – 7th Dec. 2022

University of Lahore

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This field study was held upon the invitation of the Heritage Foundation of Pakistan and its representative, Yasmeen Lari. Yasmeen Lari has launched an amazing initiative for the reconstruction process of Pono village and 13 other villages in the surrounding after the flood disaster in summer 2022, based on a housing initiative that had already been going on for years. It is absolutely amazing how many houses have been built in a very short amount of time. This gives the project the potential to have an impact on a large scale and change the quality of housing for a great number of people.

Since the delegations of Vienna University of Technology and University of Lahore have been the first to visit some villages based on an initiative by Yasmeen Lari called “Climate Volunteers”, the aim of this report is to give subsequent delegations from other universities an insight into the field situation, our field results, and above all, a state of the art report on which further research could be based on. Since we visited Pono village for 5 days only, many questions have been answered but even more have been raised which could not be answered due to the shortage of time. We are aware that our stay in Pono village was short and that we only were able to get a first insight. Therefore, most of our thoughts are assumptions which need to be verified, discussed or be subject to further research.

Above all, Yasmeen Lari and the Heritage Foundation have started an amazing project which is refined and efficient. However, for further implementation on a large scale, now might be a good time to evaluate the system and explore ways to enhance and optimize it further. To do this, Yasmeen Lari has introduced the idea of “climate volunteers”, a network of universities with faculty and students to support and accompany the process with further research and critical questions raised. It is therefore of great interest to form a platform of exchange and communication among the stakeholders involved.

Since the University of Lahore and the Vienna University of Technology have been the first institutions in the field, this report contains a general overview of the outcome of our field research. To pass on our experiences the report includes a) practical recommendations for staying in the field and b) many research questions to be explored by future climate volunteers:

- **Blue: Recommendations: Practical tips for staying in the field**
- **Green: Research questions - further research to be conducted in the field**

1. THE RESEARCH ENVIRONMENT

Pono Village: Base and main field of research

GPS: 25.306, 68.925

Further villages in the vicinity visited:

Taj Mohammad Nondani (cooperation with Heritage Foundation)

Noor Mohammad Nondani (cooperation with Heritage Foundation)

Three more villages were visited that have not, only partly, or fully cooperated with Heritage Foundation



12

Pono village site plan: (to be completed by the students within the next days)

Students involved: Elena Thöni, Birgit Rieder, Ali Osaf, Irtaza Malik, Uzair Imtaiz

More than half of the buildings are new LOG (Lari OctaGreen) buildings

a) Field situation

We have been greeted and received by the villagers in a very welcoming and warm way. They were interested in our undertaking and willing to support us and give us all the information we wanted to collect. We felt safe and welcome during our entire stay and the hospitality of the people was overwhelming. This was real joy!

When we arrived, two women from South African NGOs were present in the village:

Safeeyah Moosa – Spiritual Cords (NGO)

Mooneera Asmal - Gate of Hope Foundation (NGO)

Both have been active in the village for several years. They wanted to support the village and got in touch with Yasmeen Lari. Since then, a close cooperation has evolved. Safeeyah and Mooneera returned to South Africa on the third day. They are only in Pono from time to time.

Safety: When we visited the village, two policemen of the local police department were protecting us day and night. However, we felt perfectly safe in the village and there were no threats of any kind.

Temperature: In December it gets very hot in the sun during the day (up to 30 degrees C) and quite cold in the evening/night (10 degrees C).

Recommendations (depending on time of visit):

- Bring warm cloths and a sleeping bag. During the day light cotton cloths with long sleeves are recommended.

Infrastructure:

- Guest houses: When we arrived, construction of the guest houses had just been finished the day before and the walls were still damp. However, the guest accommodations are beautifully arranged with double beds made out of bamboo and an attached bathroom with a compost toilet system. There is no shower, but a bucket of hot water is provided upon request.
- Electric light is provided by a solar panel, electronic devices can be charged in the evening when the generator is on for one or two hours.
- Internet: If you buy a local sim-card, internet (slow and unstable) is available
- Food: A local cook provided food on a *chulah* (cooking stove). The food was very good – rice, potatoes, vegetables, chicken etc. There was always something for vegetarians. We took our meals outside on shaded platforms. Also, dinner was provided outside around a campfire.
- There are two small local shops in the village where you can buy biscuits, crackers, sweets etc.
- There is a market about 2 km away where you can buy drinking water, soft drinks, fruits, vegetables, bread etc.
- Drinking water for locals: The locals drink water from wells. There is one water post for about 5 households. According to the villagers there is one deep well (about 30 feet deep?) that was provided by Yasmeeen Laris organization, and from this well the water is transported via pipes to the household wells (2-3 feet deep).
- Running water: there is no running water in the houses except in the guest house
- Toilets: Outside the guest house there are no toilets in use (people go to the fields)
- There are no showers or bathrooms
- There is no wastewater system: There is very little waste in the village which is collected and burned
- Electricity: There is no electricity system in the village, but some households have been equipped with solar panels by the Heritage Foundation for having light in the evening.
- Other devices: There is no TV, radio or internet in the village. Some families share one mobile phone

Recommendations:

- Do not drink local water but only bottled water!
- Take enough drinking water, soft drinks, toilet paper, fruits. Collect your waste.

Health: Health was the major concern, when staying in Pakistan. Although the food is wonderful and we took good care by only drinking bottled water and well-cooked food, 10 out of 12 students got sick with rather severe diarrhea. Most of them got sick already before going to the village either in Lahore or Karachi. Three had to be hospitalized already in Karachi to get infusions (medical treatment was excellent), one got an infusion from a physician, other students managed to do with medication. Additionally, students got sore throats or fever maybe due to big temperature differences between day and night.

An ambulance was constantly in the village prepared to drive sick people to the next hospital (about 45 minutes). All of the students have recovered after two or three days, some sooner, some later but some felt quite weak throughout the whole stay.

Against all warnings, mosquitos were no problem when we were there, and we rarely saw any or had problems with mosquito bites.

Recommendations:

- Tell the students that they have to be prepared to get sick (even if they have vaccinations against colera and typhus) – there seems to be no way to avoid this. Take medication and electrolytes to regain strength. Make sure to have a good travel insurance.
- Take only students who have travel experience outside Europe.



Guest houses and rooms
Dining and cooking area

b) Facts about Pono village

The village itself is kept very clean and is wonderfully situated within fields of sugar cane, cotton and banana plantations. There are water canals all around and especially at sunset it is a beautiful scenery.

- Inhabitants: There is no clear number, but we estimated that there are about 15 – 20 households in one part of the village, and on the other side of the street there are some

more households. The household size is about 10 – 12 people (about 5-6 children), so there might be about 200 – 400 people in the village.

- Religion: Mainly Hindus and some Moslems. In most compounds you will find a small shrine or place for worship, we have also seen small mosques.
- Language: The villagers speak the local language Sindhi, many of them speak Urdu, only a few speak a little English
- Farming: sugarcane, wheat, bananas, rice, cotton, raps, mangoes, various vegetables, there are sophisticated irrigation systems to water the fields.
- Animals: goats, cattle, fowl
- Income: We were told that most of the people work for a local landlord who is the owner of the land. He tolerates people living on his land if they work for him in the fields. Some people told us that the land is distributed by the head of village and that they get a land certificate. Ownership of land seems to be a precarious situation and more research should be put into this (to be further explored)
- Some villagers gain income from farming and keeping cattle, women from sewing work or pottery, some are construction workers (to be further explored)
- Village organization: We were told that the villagers determine a “mayor” with no distinct mandate period (to be further explored)

Recommendations:

- It is strongly recommended to cooperate with a local university because – apart from having great inter-cultural experience - you will need translators throughout the time (unless you speak Urdu) for speaking with the cook, the villagers, the artisans, for organizing things, etc. Having only one or two Urdu-speaking persons will not be enough. Make sure that there will be several people there who are willing to help out with organizing things and translating. In our case Naheem, the foreman responsible for construction, was there and able to translate. However, without the colleagues and students from Lahore it would have been very difficult.

Further Field Research:

- More surveys should be conducted with different households to gain a better understanding of the lives of the villagers.



Environment around Pono village

2. FIELD RESEARCH

The village is a beautiful place to stay and a nice and relaxed environment also for longer field studies, if one can cope with a simple life. The villagers are friendly, despite the hardship of everyday life that poses many challenges especially after the flooding.

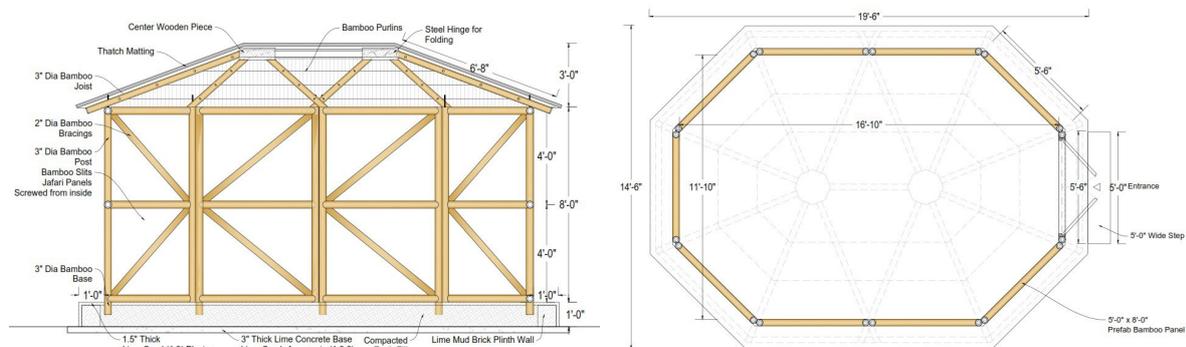
For short field trips like ours (5 days) the question arises, what to do in the village. The stay is too short to conduct a profound field research, but it can give an insight in the way of life of the villagers and the valuable work that the Heritage Foundation has done to support them. It is also a good opportunity for students to experience the traditional way of building with zero-carbon-footprint using only local materials which come entirely from nature and are given back to nature without waste – something most students cannot experience in their own cultures anymore.

Other than this, there are many questions that arise in which direction the development of the villages should go in order to stay as zero-carbon as possible, but at the same time increase the quality of life of the villagers and make them more resilient against future floods.

I see the main benefit of future delegations and students coming to the village in finding out more about the villager's lives, their way of living and dwelling, to collect this knowledge, to introduce new ideas and in this way to contribute to the constant development of Yasmeen Lari's outstanding engagement in the region.

a) School building experience

Our main task when coming to the village was to build a school within 4 days. However, for European students it is important to make clear, that building a school there does not mean that you physically build it. Falsely, this was the expectation of the Austrian students, since there had been earth building workshops in Austria and in African countries, where the students actually built structures with their own hands to learn the technical skills. In the village there were about 10 artisans to do the construction work. They knew well what to do and it was hardly possible to contribute anything besides maybe trying to cut a piece of bamboo or fasten a roof panel. This is probably also the right way, since the artisans are trained and job opportunities are created. In addition, the artisans have been working from about 6:00 to 9:00 am (9:00 was our breakfast time) and again in the evening, when the sun was down and it was not that hot anymore (which was our dinner time). Thus, we missed a lot of the construction process. All in all, watching and documenting the construction process of a LOG (Lari OctaGreen) house is interesting but does not fill the days. This was one of the reasons why we decided to do field research instead.





Construction plans provided by the Heritage Foundation
 Stock of bamboo; assemblage of the bamboo frame
 School building under construction

b) Furniture Design

The students from Lahore designed furniture made out of bamboo, since the guest houses were just completed and were still lacking furniture. They made plans for a shelf, a basket, a bench, and devices for the bathroom. The furniture was then built by the artisans according to the student's instructions and plans. Thus, one guest room was beautifully equipped, and it is planned that the artisans will also do furniture for the other guest houses.



Fully equipped room with shelf, bench and basket

c) Methodology of field research

Our field research concentrated on participant observation, surveying and conducting interviews in Pono village and some other villages in the area:

Further villages in the vicinity visited:

Taj Mohammad Nondani (cooperation with Heritage Foundation)

Noor Mohammad Nondani (cooperation with Heritage Foundation)

Three more villages that have either not, partly, or fully cooperated with Heritage Foundation

Interviews:

Prior to our field stay, we had already developed a semi-formal questionnaire. We interviewed three families in Pono village using the questionnaire, several other households were visited in Pono and other villages and the main questions were asked there as well. The surveys were conducted in Urdu and translated by students from the University of Lahore. The interviews were recorded, and the homesteads documented photographically.

The questions mainly concentrated on the traditional architecture compared to the new LOG (Lari OctaGreen) system:

What does the traditional architecture look like? What are the pros and cons of traditional construction? How resilient is traditional architecture to climate change events such as flood disasters? What are the advantages of the newly introduced LOG system compared to traditional construction? Which further developments can represent sensible synergies from traditional and newly implemented construction methods?

Surveying:

A rudimentary survey of Pono village was made (via GPS and Laser measurements).

Five traditional buildings in Pono and Noor Mohammad Nondani were typologically measured and surveyed.

d) Effects of flooding

When approaching Pono village, we could still see a few flooded fields and emergency shelters and tents along the road. However, in the villages we have visited there was no water anymore, only in the canals and partly in the adjacent fields. The effects of flooding in Pono village and the other villages were described very diverse, depending on the placement of the compound. Some villagers told us that their compound was completely flooded up to more than one meter, some said, that their compound was not flooded. It probably depends on how high the compounds are situated. In Pono village we could not find traces of destroyed houses but in the village of Noor Mohammed it could clearly be seen that from many houses only the mud foundations were left, and occasionally new houses had been erected above them.

Further Field Research:

- Measuring the elevations within the villages
- Pointing out areas which have a high risk to be flooded

e) Research on traditional houses

As far as we found out, little or no research had been done on the villager's traditional way of building houses. However, from studying the traditional way of building interesting findings might be drawn that could eventually be integrated into the LOG system.

In the following text, we use the term "traditional houses" to refer to those structures that are based on traditional construction methods. This does not imply that these houses are particularly old. On the contrary, most of the houses we visited that were built in a traditional manner were only a few years old, according to the owners. This suggests that the villagers are still building in the traditional way. Brick or concrete houses are not affordable for the villagers and thus very rare.

Based on observation and surveying of the village, a household compound currently consists of the following: A low perimeter wall with multiple openings, fenced stalls (partially covered) for the animals, two to four "traditional houses" with attached porches or separate covered outdoor spaces, one or two LOG houses, one big *chulah* (cooking stove), and one or two small *chulahs*.

The traditional building style, which can still be found in the villages today, basically consists of two floor plan typologies:

- Rectangular houses with porches
- Round houses with separate shaded places



Traditional rectangular house with porch and foundation (extended platform made out of mud)
Traditional round house with roof structure made out of twigs and mud shelf

In principle, we observed two types of traditional wall constructions:

- Solid mud houses: cob (straw and mud mixture)
- Wooden frameworks, filled with wattle and daub (wickerwork with mud plaster)



Traditional massive mud building (cob = straw/mud mixture); section of a collapsed cob house
Wattle-and-daub house in the process of plastering

Traditional rectangular and round houses have been surveyed and measured and drawings will be added soon.

The roof construction is always similar: relatively gently sloping pent or conical roofs with wooden rafters, with twigs and/or reed above, and a layer of mud on top. According to the residents, the mud layer must be renewed regularly after heavy rains.

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Traditional roofing with wooden beams and a decorated ventilation opening between roof and wall
 Left: new roofing with plastic foil between reed mats, right: traditional roofing with layer of mud on top

Both, traditional wall and roof construction, have a problem: Today, wood is a rare resource. Deforestation and population growth ensure that good lumber is hardly available anymore. This means that there is not enough timber for the roofs or for a wooden frame construction.

Solid mud houses have the advantage that they do not need wood, at least for the wall construction, but only need mud and straw. However, the wall construction dissolves if it stands in water for a long time during flood disasters and massive static problems occur which can result in collapse.

What both traditional types of construction have in common is that they do not have stable foundations, an important prerequisite for being prepared for flood disasters.

Further Field Research:

- More traditional houses, compounds and villages should be surveyed to gain a better understanding of the functionality of the houses
- More households should be questioned regarding their traditional way of building since this might give a valuable insight to further develop the built environment.

f) The LOG houses introduced by Yasmeen Lari

The LOG houses (Lari OctaGreen) newly introduced by Yasmeen Lari and the Heritage Foundation rely on bamboo as a constructive element, which takes over the static performance. The bamboo is anchored in a waterproof foundation made of prefabricated clay-limestone and thus it forms a stable framework which is largely collapse-proof even in the event of flooding. The roof consists of a two-part thatch covering with a plastic layer in between. This makes it largely waterproof. The roof also has a steeper slope than the traditional roofs, which is why the water runs off faster and no additional layer of earth is needed to seal it. Also, the structure of the roof is more stable since the rafters are securely fixed to a wooden disc at the top of the roof construction. As a result, the roof construction is lighter overall, less at risk of collapsing and there is lower risk of injury if it actually collapses. The many advantages of the LOG system can be learned from Yasmeen Lari's impactful and easy-to-follow tutorials: <https://www.youtube.com/c/YasmeenLarisZeroCarbonChannel>

When studying the indigenous architecture and the way villagers build their own houses, we had the impression, that the porch in front of the rectangular structures is very important. This is where the *chulah* and the beds are situated, where people are doing their every day's work and it is the main

gathering place during the day (but they also sleep there during the hot season). It is a cool and well-ventilated space and thus it should be considered to integrate a porch element into the existing LOG system.



Roofed porches: places, where people spend most of their time for resting, working, cooking etc.

When we asked a few villagers which houses they prefer, the traditional ones or the LOG houses, they answered that they would prefer the LOG houses. Reasons: It is more secure, it has a lighter roof which does not collapse, and the round form is more stable.

It could be observed that almost all LOG houses are nicely painted and highly decorated. This is something that can only very rarely be observed on traditional homes. Obviously decorating the home is something that was introduced with the LOG houses.

In Pono village we could observe different typologies of LOG houses, especially the octagon and the smaller square emergency shelters. The floor plan shows that meanwhile almost two thirds of the houses in Pono village are LOG houses. According to information from the villagers, most of these houses were built after the flood in the summer of 2022, proving that this system can be used very effectively and very quickly as emergency measure after the disaster.

Cost of LOG houses: about Rs 25.000 to 30.000 (= € 120 to € 150; Rs 1000 = € 4,3)

With Plastering and Washroom: about Rs 55.000

Further field research:

- Why are the LOG houses decorated whereas the traditional houses are not? Motivation?
- Which houses are preferred by the villagers and why?
- In which way could porches be integrated into the LOG system? Would it make sense?



Roof structure of new square emergency shelter; Square house mixed with traditional wattle-and-daub wall
 Decorated LOG octagon houses; new octagon house next to collapsed traditional house
 Interiors and roof constructions of octagon houses

g) Considerations regarding mud-lime-plaster

The LOG-System uses a clay-lime plaster for the walls (mixing ratio: 1 part lime, 3 parts clay). This is due to the assumption that lime plaster is more resistant to flooding.

However, during our stay we had many discussions if it is necessary to put quite an amount of lime into the mud plastering. Lime is essential for the foundation, as this needs to be waterproof and it

stabilizes the bamboo structure anchored to the foundation. However, for the plastering it could be considered to just use the traditional system with mud and cow dung. It is clear that the mud plastering might be washed away during flooding, but since the bamboo structure is stable enough (given that it is done in a proper way) and will keep standing, the plaster can easily be replaced within one or two days. We have seen village people using a mix of mud and cow dung (they use more than 50 % cow dung for the mixture) which makes a very strong and crack-free plaster material.

In every compound we could see that the villagers have a prepared mixture of mud and cow dung ready to be applied in various ways to the walls, the roofs or as an additional layer on the ground of the compound (we could observe many villagers plastering the compound ground with either a layer of straw and mud on top of it or just mud).



Woman putting a new layer of mud on the compound floor
Mud and cow dung pit, as we could see it in almost every compound

In contrary to mud plaster, the lime-mud plastering tends to crack and cannot be repaired but has to be replaced as a whole. Furthermore, the lime uses quite some energy when produced, it has to be transported, and once it is added to the mud, the plaster is no longer recyclable and becomes a waste product. Therefore, building with lime cannot be considered as zero carbon. In addition, the mud in the area is very rich with a high clay content. The richer the mud, the more lime needs to be added to gain a certain strength. The great advantage of mud as a building material is that it can be used again and again, and if not needed anymore it can be brought to the fields. This effect and the cradle-to-cradle principle is gone with adding lime. Lime is costly and most people won't be able to afford it if it is not provided by an NGO. Another problem is that the artisans and also the villagers do not take any safety precautions when working with this highly etching material, but mix and apply it with their bare hands, since this is what they are used to when working with mud (although they are instructed to use gloves and safety glasses in the tutorials, in reality they will hardly do so). A reflection is recommended to find out, if lime is really needed for the plastering.



Mud with a high clay content for construction is taken out of the water channels
The mud is mixed with lime

Regarding the wall infills, reed mats are nailed to the bamboo structure which are then plastered. There is quite some risk, that the reed-mats will not be stable enough to hold the plastering on the long run. There is only air in between the two reed mats forming the wall but no structure they can steadily be attached to. Thus, the lime-plastering might fall off after some months/years and it will be difficult for the villagers to repair the wall. A wattle-and-daub system, which is already traditionally in use by the people and is based on their own knowledge, should be considered as an alternative infill for the bamboo structure, as it could be a more stable and long-lasting alternative. This would also provide for a thicker wall (without the need of lime) and better protection from heat.

An overhang of the roof of at least 50 to 70 cm could be an additional protection for the (mud) walls. Also, an additional water protection of the plinth from splash water by adding a lime-wash up to 40 cm from the floor level (eg. mixed with ash to make it more waterproof) might be considered.

Based on this discussion and based on the LOG system we have therefore developed two further infill systems for the LOG structure based on the traditional ways of building. They can be applied to the existing LOG frame, the knowledge of the technique is known by the villagers, it is zero-carbon and can be applied at no cost. The mud might be washed away during flooding, but the LOG frame will be stable. The mud plaster will cause no waste and can easily be reapplied after flooding. The University of Lahore and the Vienna University of Technology attempt to build 1:1 models of different wall-infills and make comparative testings. Drawings of wall infills will be added soon.

Further field research:

- Further zero-carbon wall systems should be explored and tested in the field
- Carbon-footprint of different wall panels should be calculated
- Where does the lime come from? How is it produced? Is cement in there?
- How much does lime cost? Is it affordable for the villagers?
- Is the lime treated and mixed in a proper way?

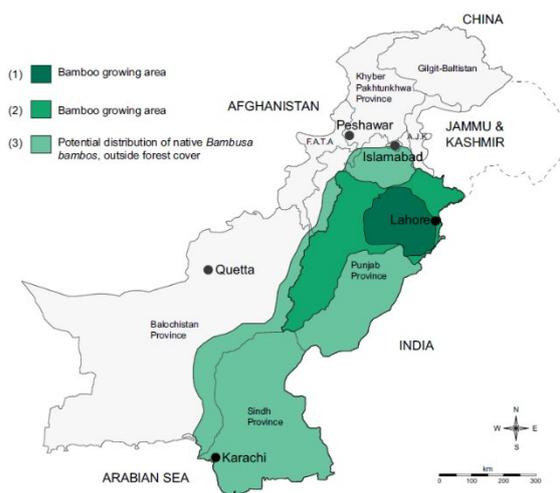
h) Bamboo as a construction material

The bamboo used for the LOG system is 3 to 5 years old and several meters long. The lower, thicker part (12-15 cm) is used for the walls, the middle part for the horizontal bracing and the upper and thinner part for the diagonal bracing. The bamboo is treated (we could not find out exactly in which way: smoked and rubbed with iron powder? Drill salt?).

In Pakistan bamboo is cultivated mainly in Punjab and in the eastern parts of the country. Bamboo is a great construction material and the LOG system is ideal for the conditions in the villages we have visited. However, since bamboo does not grow in the direct vicinity of the villages and has to be bought on the market, the people either must be able to afford it or depend on NGOs who provide it to them. Bamboo, which is widely considered as “the poor men’s wood” in many regions does not seem to have an acceptance problem in the villages we explored. Since it is brought from outside and costs something, it is considered as a rather valuable material.

However, in order to empower the villagers to build their own houses on the long run, it should be considered to start growing bamboo in the area. The climate seems to be very suitable, and studies should be carried out, what kind of bamboo would grow, and people should be supported to plant and grow their own bamboo for construction or eventually even for selling it on the market. In their paper “Bamboo for construction in Pakistan – a scoping review”, Elizabeth Wageman and Michael Ramage from the University of Cambridge, UK, show a map suggesting that also Sindh Province could be a potential bamboo growing area.

Taking up this discussion immediately, Yasmeen Lari started planting bamboo to explore its potential. The bamboo was planted in a trench to secure that it has enough water. It is a first experiment, but it will be interesting to observe if the bamboo will grow under these conditions.



Map of existing and potential bamboo growing areas in Pakistan. Sources: Based on information from (1) Suleman (2005), (2) Karim Alm-Ns (2016) (3) Bystriakova et al. (2003). Elizabeth Wageman and Michael Ramage, 2019, Bamboo for construction in Pakistan – a scoping review, https://www.researchgate.net/publication/319414536_Briefing_Bamboo_for_construction_in_Pakistan_-_A_scoping_review, 17.12.2022

Experimental bamboo plantation by Yasmeen Lari

Further field research:

- How much does bamboo cost?
- Where does it come from?
- How is it treated against insects etc.?
- Could bamboo be grown in the area?
- Which type of bamboo would be suitable?
- Installation of a test plantation

i) Consistency of mud

The mud taken out of the canals is very rich and has a great proportion of clay in it (estimated 30 to 40 %). This means that there is a high risk of cracks when it dries. The ideal clay portion for crack-free mud plastering is 10 to 15 %. It might be worth looking for a leaner mud, since the consistency of mud can vary considerably even within a small area. We have taken several mud samples from around the village. All of them were comparatively rich in clay. If no leaner mud can be found in the vicinity it would be an option to mix it with a substantial portion of dung (the villagers told us that they use more than 50 % of dung for the mixture), straw, husks, etc. as the people already are doing it in their traditional way of building.

Further field research:

- Taking mud samples from different areas to check out, if more lean mud would be available

j) Chulahs – cooking stoves

In our field research we had the impression that people, especially women, are very proud of their *chulahs* (cooking stoves), they decorate them nicely and they have become something like an object of prestige. *Chulahs* are not built by the Heritage Foundation. The Foundation only provides the lime, so that women can build their own *chulahs* (building *chulahs* is women's work). This could encourage people to keep the *chulah* and also the houses in good shape, since they are proud of it and identify themselves with it. On the contrary we had the impression that the villagers do not use the large, newly built *chulahs* and that there is a danger that they become a pure object of prestige. We have observed that women much rather use the small *chulahs* for cooking that are usually in the porch, close to the house or even inside the house.

Therefore, women are still exposed to a considerable health risk by inhaling a lot of smoke when cooking on their small *chulahs* without a chimney. It should be considered to start an initiative to equip the small *chulahs* used on a daily basis with chimneys. The advantage of the newly introduced big *chulahs* is that they are constructed on raised platforms, thus they can also be used during flooding whereas the small *chulahs* are based on the ground and used for everyday cooking.

Further field research:

- In which way are the small and the big *chulahs* used?
- What is the motivation of the women to decorate the newly introduced *chulahs*?
- What is the effect of encouraging people to decorate their houses/*chulahs* nicely from a development viewpoint?



Every-day cooking stove in porch for regular use; small cooking stove next to a large elevated *chulah*
 Large and extensively decorated *chulahs* seen as prestigious objects but not in use
 Small *chulahs* in porch and close to the house, equipped with chimneys and in regular use

k) Toilet systems

Although we could find many small square structures using the LOG system and termed as “toilets” or “bathroom” in the villages, we have not experienced that any of these newly installed toilet systems were in use. People go to the fields therefore. Convincing people to use a toilet instead of going to the fields will need some supporting measures of schooling or accompanying information. In any case the system must be well thought through, so that the villagers consider it as a benefit.

Further field research:

- Which kind of toilet system would be suitable for the villagers?
- Which accompanying measures would be necessary to introduce toilet systems to the villages?



Toilets/bathrooms not in use

3. RECOMMENDATIONS and FUTURE PERSPECTIVES

The LOG project of Yasmeen Lari and the Heritage Foundation has been going on in a great way and is well-established. The construction of houses is only one part of an initiative with much wider goals such as to support the microeconomic potentials by providing job opportunities in construction, but also to build up many more measures for improving the villagers lives through education, vocational trainings, financial support etc. Since the Heritage Foundation and Yasmeen Lari are planning to extend the project to a much larger scale, it is now the time to evaluate and develop strategies which could bring the project forward in an even more effective and efficient way.

Due to the short amount of time, our field study only gave us quick impressions and assumptions which must be verified or falsified through more in-depth research. The climate volunteer program is a chance to involve universities and students, to build on each other’s insights and experiences and advance further research. It is also very important to introduce more long-term field studies (3-6 months) throughout various disciplines which could be conducted by Master- and/or PhD students. Further, joint research projects with stakeholders from different universities and disciplines based on third party funding (e.g. EU project) could be of great impact.

Suggestions:

- a) Master- and PhD-thesis should be carried out covering the following disciplines and topics:
- Environmental Engineering/Natural Resources: Is growing of bamboo in Sindh possible? Which kind of Bamboo is suitable for the climate? Experimental bamboo plantings in the area etc.
 - Architecture or civil engineering: Experimental analysis of different wall-building elements: Elements with reed mats, with traditional wattle and daub, with earth-lime plaster, with earth-dung plaster, cob or earth loaf fillings etc. Making life-cycle analysis and calculating the zero-carbon-footprint
 - Anthropology: Analyzing the life of the villagers, use of houses, use of traditional structures and newly implemented structures, wants and needs regarding housing
 - International Development: Which development strategies could be most effective to enhance the quality of the villagers lives and make them more resilient against future floodings
- a) Research Project: An interdisciplinary research project (e.g. EU-project) should be filed.

Working title: Building up resilience against future flood disasters in Pakistan
Proposed Partners: Heritage Foundation, University of Lahore, Vienna University of Technology, Vienna University for Environmental Engineering and Life Sciences, Department of Social and Cultural Anthropology, University of Cambridge etc.

Being part of Yasmeen Lari's commitment to enhance the lives of a great many people in Pakistan was an extremely inspiring and valuable experience for both faculty and students. We are looking forward to future cooperations with different universities. Such joint initiatives could have a major impact on the long-term progress of the project.