

How can innovative low tech design impact an urban village?

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Introduction

This project aimed to understand, how human centered design and other forms of experimental design thinking can contribute in a dense low-income urban space. More specifically, we strive to build useful solutions with and for the target community using locally recyclable materials. This approach is a combination of low-tech design, DIY, empathic design¹, human centered design², humanitarian design³ and upcycling. The idea behind the deployed experimental approach and the project itself is that, people with essential needs (security, shelter, food etc.) are able to satisfy their needs living in a dense urban environment using free resources and existing design solutions from the global civil society⁴.

Having deployed this approach in different target areas (refugee camp, urban slum in India, refugee shelter in Germany), it is from utmost interest to discover how for this approach can be pushed and if it holds stand to very complex urban scenarios. This project was established by InnovationAid.co with the support and cooperation of the Aformal Accademy, the Shenzehn Centre for Design, SuperUse Studios, Guangdong Xin'An Polytechnic College, Handshake 302, and MongJin Workshop.

Conducting this project in Baishizhou over the time period of two month was a tremendous challenge, given the complexity and history of this community, as will be described. Needless to say, this project did not finish with an all out success, rather a pragmatic approach lead the project to adapt to the changing environments and resources. An analysis of this conducted project will allow the reader to better understand the limitation of the theoretical approach as well as highlights the very real obstacles to such a design project in Shenzhen, China. To elaborate on this point, notions of public space are different in Baishizhou and current approaches in human design and experimental design are unable to guide a project like the one described above.

To finalize, this paper will examine the methodology, research and implementation of low tech

¹ Dorothy Leonard, Jeffrey F. Rayport (1997) Harvard Business Review, Spark innovation through empathic design.

² Donald A. Norman (2005) Interactions, Human-centered design considered harmful

³ Kate Stohr, 100 years of humanitarian design

⁴ Scholte, Jan Aart (1999) *Global civil society: changing the world?*

solutions in an urban village in Shenzhen. In doing so we will give the reader an overview over the failures and successes of this approach. This will conclude in an analysis of the applicability of low tech innovative approaches in dense urban communities and their ability to empower as well as support those communities.

Methodology

Innovation Aid (IA) is officially registered as part of the Trial and Error Culture Laboratory in Berlin, a registered charity organisation in Germany. IA started 2014 to bring low tech design to people in need all over the world. Since then IA as worked with over 10 partners (government, NGOs, designers etc.) and more than 200 volunteers in India, Germany, Jordan, Shenzhen and Hong Kong. In doing so we focus or work on empowering people in need buy building the solutions for their problems with them out of free recyclable materials found in the immediate vicinity of the target area.

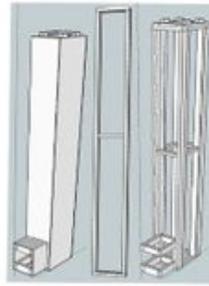
The working method of IA is the following, a area and community is defined in which all recycling materials, problems and needs of the target community is defined. This research deploys several quantitative and qualitative tools which will be described in detail in the research part of the paper. Following the identification of the problems, needs and resources of the target area similar problems and areas are used comparatively to identify already existing products that are satisfying the needs. Ideally, the target community is so engaged in the brainstorming the that the identified products and their design, that they perceive themselves as inventors of the solutions to their problems. This assures a form of empowerment during the prototype building phase in which several design of the products are build to find a perfect local adaptation of the product using the materials available in the immediate vicinity. In doing so, the product becomes part of the local knowledge and identity assuring a sustainable and long lasting impact of the project in the community. This however is just the case if, the product addresses the problem in such a way that it is easy to reproduce and does not have big adverse effects. Ideally, this project builds several products creating a holistic approach to several problems building several products, as illustrated below.



Plastic bottle light



Solar water disinfection box



Solar Chimney



Metal waste playground

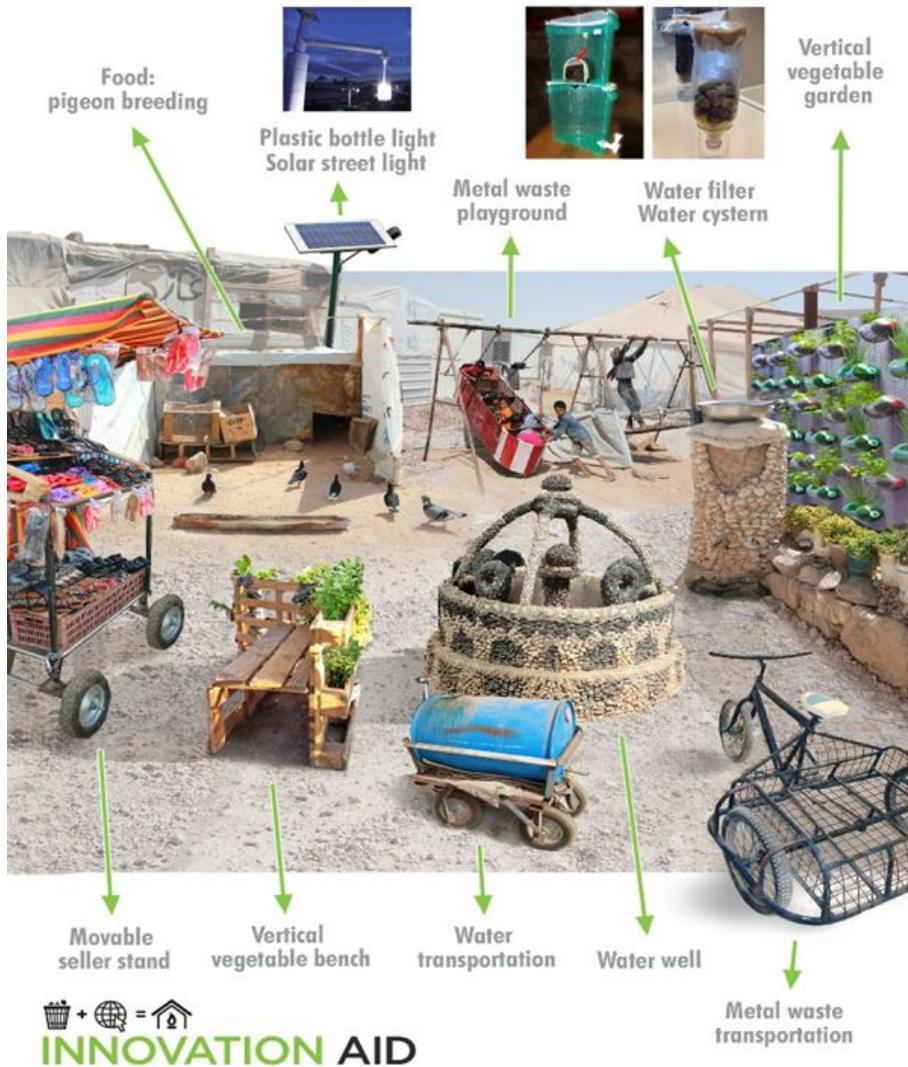
Tin Can + Lid Solar cooker

Vertical vegetable garden

Metal waste playground



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This differs to current approaches to human centered design and experimental design to some respect. To be precise, human centered design very much focuses on the involvement of the target community in the research phase. For example, pictures are taken by the target community about their daily lives to aid the assessment of problems for the researchers. This however is a very flawed and time costly approach that does not really take advantage of the whole scope of analytical and research tools that are available. When it comes to the analysis of the research and the resulting building phase, traditional understandings of empathic design and human centered design fail to guide the project about how to involve the end user.

Research

Baishizhou Description

Shenzhen is the first city opened the gate to the western country and the first Special Economic Zone from China in 1980. Originally, there are more than one thousand local village insider of Bao'an county during early 20th century. However, the number has been dropped dramatically after the open gate policy. Currently, the city still maintain around 300 villages, and around 100 of them are located inside of the Special Economic Zone. During the later 1970s, the farmland from each village has been collected by the government for the urban development, and the speed of urbanization has been started since then. And soon, the village area is surrounded by the high density urban development and isolated from each other, the name of urban village is represent the village in the city. The village itself becoming migration settlement zone because of the lower rent and good location.

Baishizhou is the biggest urban village inside Shenzhen special economic zone, which has more than 140,000 residences by 2012, and surrounded by high end gated community from OCT development. In the history, the local villager is relying on fishing, farming and oyster farming to grow organically. The area formed under the government farming industry by Shahe farmland collaboration since 1950. The cover area of the site is 44.1 hectares, which includes Baishizhou Village, Upper Baishi Village and Xintang Village. Industrial land, previously belonging to the Shahe Branch of the Guangming Overseas Chinese Farm (沙河农场) between 1950 and 1980.

Baishizhou is densified through the development of the city within the past 30 years. Shenzhen has reached its limits of urbanization as there is no land left for the new development in the center district. The limited stock of urban land is one of the reasons for releasing the urban renewal proposal from the national and regional regulation. Urban village as one of the renewable land is facing the redevelopment, and the projects have been recognized as successful cases for governments, developers, and village collective ownership enterprise. The measurement of success refers to the economic benefit for the investor and the compensation for the local owners. However, during the process of redevelopment, more than 99% of the resident would be forced relocation without any compensation, they are migrant who work in construction, office, factory, street business, who has no ability to afford the rent in the gated community inside the CBD.



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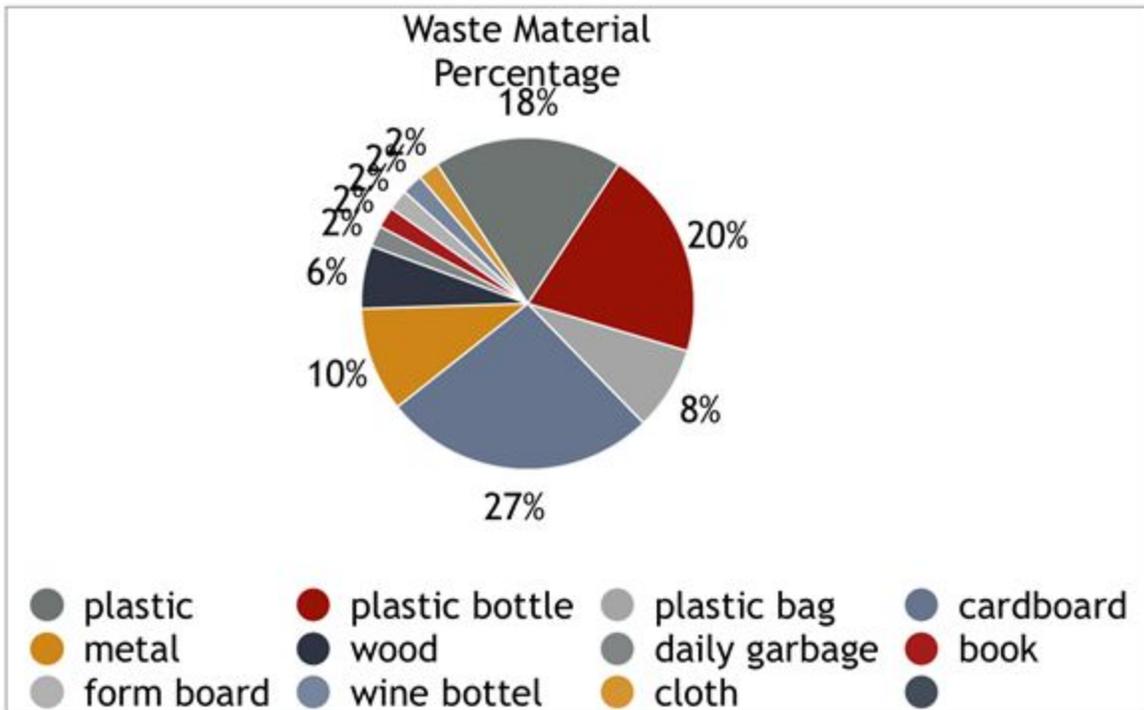
Baishizhou community is representative of the majority of low-middle income population's living conditions. The lack of social support and limited interactive public space lead this project to pose the question: How can experimental design help low income urbanisation in Shenzhen and China? And the goal of this project is to understand how product design, recycling and DIY can have a significant contribution to satisfy the needs of a low-income dense urban community, such as Baishizhou.

Research Method

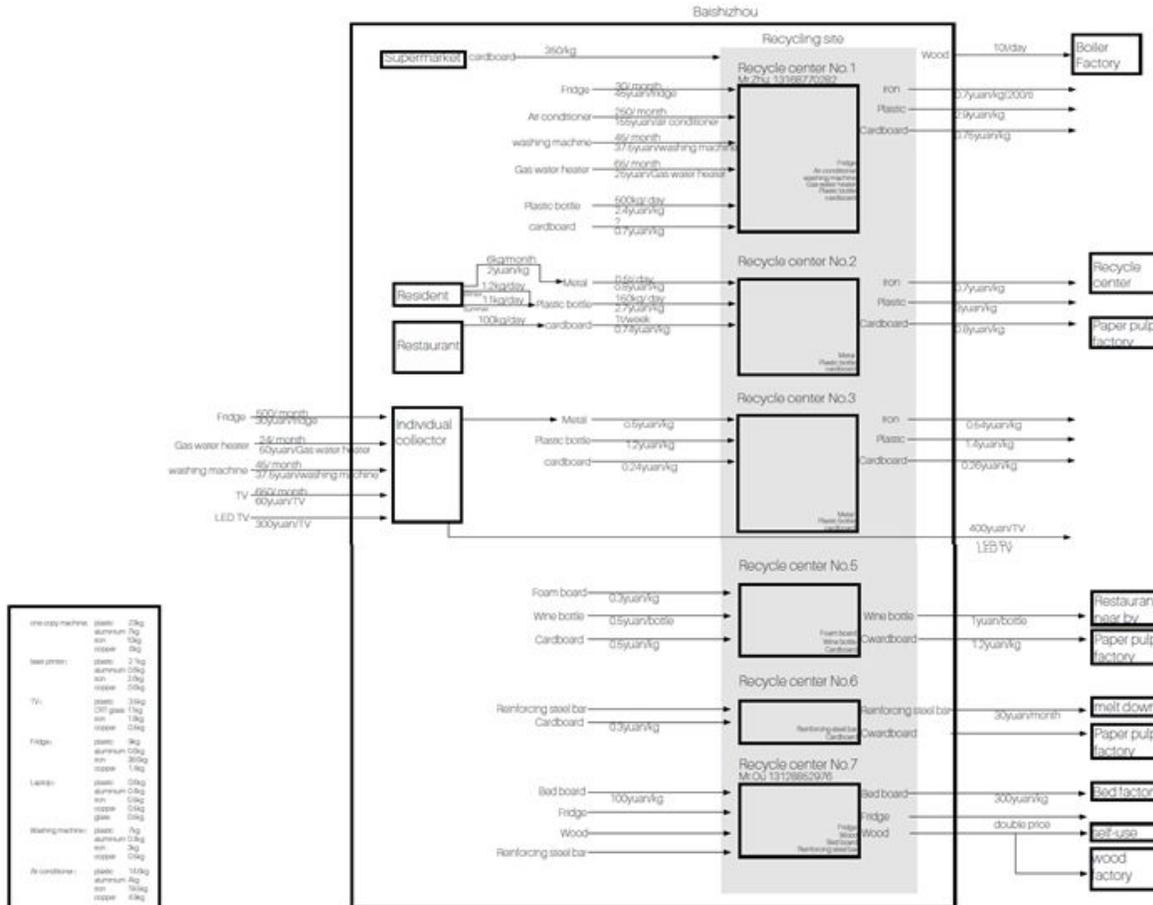
The research conducted focuses on the material flows (garbage and recyclable materials) in the identified target areas. With the knowledge of Shenzhen, the waste landfill and waste incineration is the main strategy for the city level waste structure. The city has 5 landfill sites which are landfilling 80% of the waste produced by the city daily. The waste system has not consider the possibility of recycling by the city level government. One of the city official told

⁵ Catherine Verbeelen, University of Amsterdam, The collaboration of actors in urban village redevelopment projects in Shenzhen, China.

researchers: “they know there is the traditional informal valuable waste recycle networks in all the communities, including residential and commercial, public space and private space. So for them the question is: where is all the un- recyclable material going to.”, during the the waste recycling study during early 2015. However, the recycle material considered as recyclable or not by the informal system is depended on the economic value not the environmental impact. That is clear during the site survey of Baishizhou and Gangxia Village, the valuable waste has been collected by the individual collector network, such as plastic bottle, cardboard, metal, and so on. However, the no value waste should be consider for a better use recycle strategy than dumping this type of rubbish on landfills, such as wooden chopstick, any kind of plastic bag, plastic cup, paper and more.



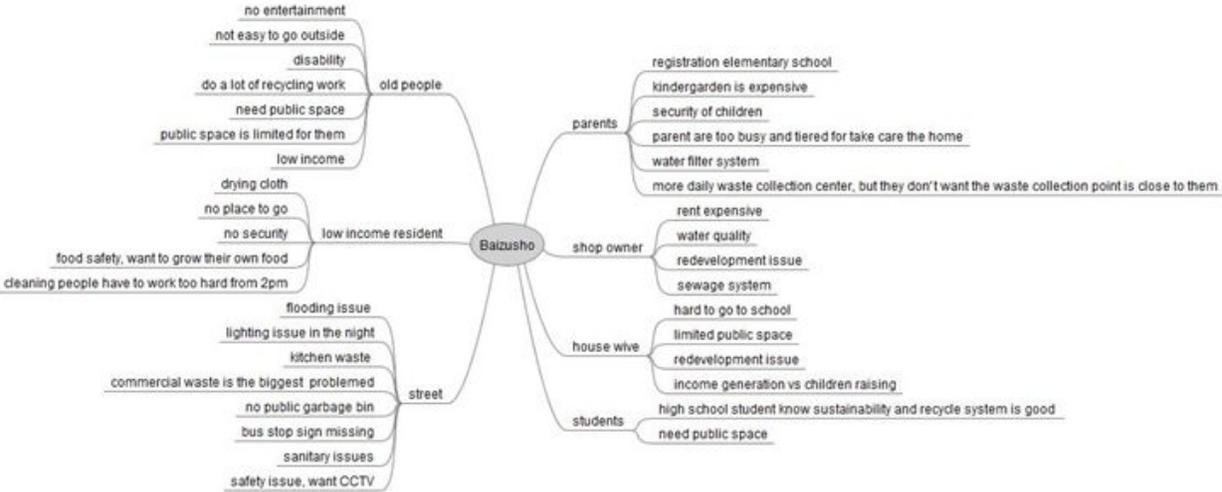
The research was conducted over the time period of several weeks where we conducted over 200 interviews and collected data to better understand the problems and recycle systems of the community. For example, working with the SuperUse Studios we were about the analyse the material flow in depth, as can be seen in the following graph. In addition, the research was analysed using cloud word charts, we overlaid pictures of the problems or dump sites on google maps and we analyzed the research through the thurow analysis and reflection working with the on site researchers.



There are seven waste collection points in Baishizhou, not only serving the site, but also the surrounding neighborhood. The recycle station is served for the inside urban village usage, and because the cheaper rent which attracted the informal collector and recycle station to be located inside of urban village, the capacity of the amount of valuable waste flow in urban village is much higher than other urban communities. It is also make urban village become the first collection point for urban valuable waste which is increased the pressure of waste treatment on site.



Within the limited social and facility support for urban village area, the lack of help that the local community is receiving both from local or external effort is presented by the difficulty to engage with the locals. There is no local NGO or institutes to work with for the research and implementation phases. However, the service station been set up by neighborhood district government is located in the heart of Baishizhou. During the research phase, we had opportunity to interview the students from one of the class, then we realize the people come to the class are coming from all surrounding neighborhood, hardly any of them is from Baishizhou villages. By collaborating with the service station, like all the governmental requirements in China, there are application and approval process to go through in order to have the facilitational help. In the two months implemental project, we decided not to work with the service station, rather working with internal and external individuals and institutes.



During the first phase of the site analysis, the several groups were interviewed and their response was collected as one. This together with the stigma related to waste and garbage presented some obstacles in conducting the research for this project. The detail list of what type of problems exist in the target community and if there are any existing DIY (do it yourself) solutions to these problems that are already spread in the area. This will allow the resulting project to build low tech solutions to these problems using the locally available waste material. In doing so, the project strives to include the local community and to avoid any interference with existing economic mechanisms that benefit garbage collectors or recycling centres. In addition, throughout the research we noted stakeholders and organisations that we might be able to involve into the follow building process.

The research resulted in a list of products. The analysis gathered from the community suggests that this project might mainly concentrated on the public safety, environmental, sustainability and public facility issues. The product that are needed include but are not limited to trash cans, vertical gardens, modular furniture, a climbing wall for children, seating for the elderly, washing lines and reflective surfaces to direct sunlight. This is an attempt to introduce low tech solutions to the problems identified through the research in the target community. Also noted that most of the material is produced from Baishizhou community, and been recycled by the team.

Implementation

The goal of the implementation phase was it to use the research outcome, namely a list of products that are needed and a list of recyclable materials out of which these products could be build. As mentioned before, this was successful. This allowed us to determine how and where we would strive to build the products with the community.

First and foremost, we strived to construct products within the community satisfying public needs. However, each part of the implementation phase started with the training of the volunteers that attended the “building day”. All steps and materials were explained which then started the building part of the implementation phase.

The main contributor to the project are the volunteers engaging with the construction process as well as members of the partner organisations that were working with Innovation Aid. In total we have worked with around 160 individuals during the implementation phase. There were several simultaneous implementation process on the way during the implementation phase which we would like to highlight here.

Climbing wall and Toys for Children

As highlighted in the research, children are among the most vulnerable inhabitants of the target area. There is no real chance for children to play safely in this polluted and chaotic environment.

Given our access to the wood workshop we decided to build a climbing wall over the duration of 1.5 month. Starting with a simple skeleton design this construction grew more and more durable over time. We started out with a simple frame of several cubes stacked and added to the base cube.



Adding more and more layers of recycled wood we were able to construct a very durable and fun climbing wall. The durability of the wall was tested by adults to assure a very large load bearing ability of the structure. All the screws that stuck out of the structure were flattened and the very top of the structure was wrapped in recycled textiles. Following the construction, we transported the structure to a larger common area and further increased the robustness and stability of the entire structure by adding four heavy fire extinguishers seats to the 4 inner corners of the structure.



Following the implementation of the climbing wall a volunteers stayed behind and filmed the interaction with the community which was very positive. In building the climbing wall we did not manage to involve the target community but we were able to contribute to the psychosocial well being of the community. In addition, this implementation phase was made part of the school curriculum of Guangdong Xin'An Polytechnic College as a segment of the experimental class of the students.

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Public Seating

The need for public seating was mostly addressed through the construction of 80 chairs. The fashion collective Carpe Diem that design and produces in the urban village consists of a group of fashion designers that organised an international fashion show. The group was in need of seating arrangements for the fashion show.



Together with our partner SuperUse Studios, we decided to use the textile waste that are the leftovers of the our fashion partners to create a cushion on the top of of 4 welded extinguishers that were wrapped in old advertisement poster. This construction was stable, durable, water resistant and comfortable. However, it was also bulky, heavy and prone to corrosion.



The feedback following the fashion show encouraged us to distribute the products through public spaces in the village. In some cases the seats remained until today (4 month after implementation). Others were destroyed or picked up by the local recyclers to sell. Thankfully, a local shop owner who lived in the community for over 15 years helped us to pick locations in the target area that frequented by the part of the community that requested this solution. Namely parents at playgrounds and elderly who wanted to talk and play cards.



This product received the most immediate positive feedback of the community where products were used instantly. Especially the design of the chairs created a lot of attention and curiosity of the target community.



These products were later complemented by a variety of small chairs produced in the wood workshop. During the construction of these chairs, we paid special attention to the durability of them. A follow up with these chairs however, did not happen as they are easy to be moved and are most probably taken by some household in the community.



Noticeable is the black bench shown above. It consists of two pallets (the seat and the backrest). This is then bolstered with advertisement posters and wrapped in a mesh wire plastic wrap which allows the surface to be very soft and durable at the same time.

Even though the public seating was provided, the inability of the builders to engage the target community sufficiently into the building process, one can argue that this part of the implementation phase was a failure. Nonetheless, it is also successful in providing a solution to a problem for the target community.

Vertical Garden

The research highlighted that people are in need of gardening as a vocational activity as well as as a source of free unpolluted food. Given the abundance of plastic bottles and the difficulty where sunlight might just hit a small part of the local apartment, we decided to build vertical gardens made from plastic bottles in the community. Given that we did not have access to community members who have this need, we decided to build the vertical gardens in the middle of the street in order to attract volunteers and public attention. Following the building we distributed the vertical gardens throughout the community as well as gave them to volunteers who helped us throughout the day.



Some of the volunteers were children that helped to paint the vertical gardens. This design manages to grow a small amount of food vertically. A reverse installed bottle on top of it assures a form of drip irrigation where a small hole in the bottom of the top bottle allows the water to drip through it and to hydrate the soil underneath. However, there are no nutrients that go into the system and it is prone to catch too much sun and heat, which lets the vegetation suffer. After checking on some of the gardens several weeks after construction many of them were still with the original owners and in use. However, some did not like the unusual design and decided to destroy the construction in order to replant the vegetation in traditional pots.



We managed to build around 22 vertical gardens where half was donated through the community and the other half given away to the volunteers that helped us. The best feedback was from a volunteer who got approach from his neighbour who now also wants a vertical garden like this and asked for guidance in how to acquire it.

However, the project failed to properly include the neighbourhood. Time restraint and mistrust made the identification and collaboration with local stakeholders impossible. Meaning that the most immediate effect of the implementation phase was limited to the people that walked by and decided to engage with the construction.

Hanging Furniture

One of the major needs that came alight when questioned about the home and space was the lack of storage. The high rent as well as the general lack of space in the handshake community creates a need for smart furniture that does provide space instead of take space. We decided to build three vertical cupboards that served the Afromal Academy and the artspace that supported us. The furniture for the Accademy was build over a Saturday afternoon with 2 students and a family of 5. The resource used was some not used wooden tea table gutters common in China. These gutters allow hot tea to be poured into a container that is part of a Chinese tea table. We attached on each corner plastic strings to another gutter above. Repeating the process until we balanced 2 very strong hanging cupboards made from old wood and plastic.



Another type of material was used for the 3rd piece of furniture where old wooden boards were cut and painted replacing the tea cup gutter. While looting for free construction materials we found the plastic lining that is used to wrap artificial grass floors. We used old wire and the strings to replace the thin plastic used in the products above. Replacing these materials added weight but also robustness. However, the wood became wet and mould might have taken hold while we painted over them. Avoiding this minor mistake the final design is very user friendly and easy to replicated in future projects.



Unfortunately, this solution was not carried into the community. We clearly see an income generating potential for this solution given the ease of assembly and relevance in very dense urban spaces. Interestingly, the same storage solution might be universal from a refugee camp to a high class apartment in Shenzhen, storage should be above ground allowing the space underneath to be effectively utilized.

Experimental Design and Product Implementation

There were some additional products that were mostly produced to illustrate the DIY approach for the Biennale in Architecture and Design in Shenzhen. Below you can see some of the products. Following the exhibition some products were given to the community.





However one storage shelf was too big, so they were of no interest to the community. The space in between the storage shelf is too small. The wind charm made from recycled industrial waste, is now hanging in front of a shop. The hammock made from old plastic bags, is now hanging in the same park as many of the public seating was donated to. Mostly, these products were of very experimental nature illustrating the vast amount of products that can be build. For example, a working boat made from plastic bottles or a safety helmet that does not just protect but gives shade.

Conclusion and Lessons Learned

The ownership of public space in Baishizhou is a special case because it is a rural collective owned land, but it also represent the fundamental understanding for “public” from the individual’s understand. “All land is owned by the nation.” this is first of law written in the China law book. what that means is no one have the legal right to own land, but legally, there is Urban ownership and Rural collective ownership. how would that work in reality? First, the government can legally lease the land to the public, which usually come with 70 years, 40 years property ownership for individuals under urban ownership. Rural collective ownership is under the village

collective enterprise and the village owners collectively make decisions, they have unlimited time right for owning the property developed on the land. Both the urban and rural don't own the land, but the government. The public space is been provided and managed by the power, during the urbanization process, individual have limited to no right for giving opinion. This undermined the project because if one does not feel responsible or part of the common space, it is difficult to convince inhabitants of this space to create common goods through innovative design.

Through the development process, the team been working intensively with the needs from the locals, which concentrated in the public spaces. However, because of the feeling of not owning the right to practise in public space, is given difficulties for people to willing to work with us and refuse to given opinions. Most of the product produced by the workshop has been installed in three public spaces inside of Baishizhou. After two months, the product is gone from two out of three plazas, some of them is been stolen because the economic value, and some is caused by the safety concern.

In addition, the project faced major obstacles among which were issues of timing, outreach, inclusion and implementation issues. Partially the project failed to reach the goal to improve the life of a dense low-income urban village community using recycled materials. Especially, involving the target community to contribute was rarely achieved. Some issues like more public garbage cans were not built because of the timing and complexity of the relationship between garbage can design in an urban village and the need for the recycler to access the garbage. To a large extend students and volunteers were constructing and installing the products in the community. However, it is not fair to say that we have not learned and succeeded in some respects.

Regarding the methodology of the project, the concepts used are experimental design approaches and not really understood or implemented correctly by practitioners. One could argue that the pure understanding of these methods proves that true sustainable empathic design is something so altruistically natural in the field of design; that social sciences and approaches out of the international development aid sector are unable to grasp their complexity. To engage a community to engage with low tech design is strongly dependent on the social status as well as income. Meaning that even though there are people in need within this complex urban village, the social pressures do forbid certain interactions with waste, period. In some ways, this is also the case in Indian slums where just the lowest cast work with recycled materials.

One of the most interesting findings while reflecting onto this project is the importance of the garbage cart that is used by recyclers to roam the narrow streets of the urban village. Their design and usability is simple, robust and can be easily repaired. This design is highly adapted to its task and is simply brilliant. A small design improvement on one of them is very easily copied by the individual collectors because everybody is looking for a more effective way to make more money, visa vi collecting more garbage that could be sold.

In contrast, the project in succeeded in supplying various innovative products to the community which might have transferred into the common conscience of the community. The climbing wall, vertical gardens and the public seating among other parts of the project had a positive effect onto the community. The research report that was compiled before the implementation phase managed to inform the participants about the needs and available resources of this and possible future projects. To conclude, it is clear that low tech design and DIY can have a significant positive contribution to low to mid income communities in very dense urban communities. Issues of ownership, power and participation are among the biggest hurdles to a successful project implementation.