INCREMENTAL URBANISM: Ulaanbaatar's Ger Settlements
Rural Urban Framework

EXECUTIVE SUMMARY

January 2019

Executive Summary

For thousands of years, Mongolians have been living in *gers* – portable structures made of timber, felt and canvas. They are highly evolved designed objects, easy to disassemble, move and reassemble in a matter of hours without any tools or fixings. It is a perfect dwelling for the nomads. Yet, when this specific type of dwelling forms the basic unit of inhabitation for Mongolia's capital city, Ulaanbaatar, it has led to unsustainable urban development. [2] The increase of inward migration to the city since 1990 has been exacerbated by the ease and speed of replication of the ger, resulting in the creation of sprawling districts that lack basic urban infrastructure of water and sewage and contribute to toxic levels of air pollution in the city.

Households in the ger districts burning coal during winter.

The Ger districts of Ulaanbaatar in Winter.

A khashaa plot where gers are bounded by a fence.

This report documents the process of transformation and spatial characteristics of selected ger districts describing how settlements densify by subdivision without improvements to infrastructure. It highlights the difficulties in implementing ger district development projects and positions the ger districts as a unique case study of an informal settlement because the majority of ger district inhabitants are land owners.

In response to these findings, the report proposes an alternative mechanism for ger district development in the form of an incremental urban strategy. The target is to demonstrate how these districts can be incrementally developed by the residents themselves to include infrastructure, better housing, and community facilities, each with improved environmental performance to improve air quality and reduce reliance on coal. This strategic framework for development includes:

- a design for an affordable housing prototype – the Ger Plug-In – as an adaptation of a traditional ger with embedded infrastructure and improved energy efficiency;
- a design for a waste collection and recycling building to improve solid waste collection within the districts
- a design for a community hub in response to resident and stakeholder feedback establishing the need for a community space to support after-school facilities and events
- scenario plans to increase density for three different ger district typologies: the central; mid and fringe areas
- an action plan for incremental development that conceptualises how Green Climate Funds can be accessed to support low interest rate mortgages to initiate development

In conclusion, it is clear that the only mechanism to improve the overall sustainability of the city is to provide an alternative to sprawl and the outward expansion of the city. However, although it has been reported that 60% of ger residents are willing to move to apartments if appropriate compensation can be delivered, that still leaves 40% of residents wishing to remain (2016, Capital City Housing Survey quoted in "Mongolia: Ulaanbaatar Green Affordable Housing and Resilient Urban Renewal Sector Project", Project Data Sheet, ADB, 2018). These plots have to able to densify without inhabitants giving up land tenure. In order to densify, this land has to become more valuable in order to stimulate development. Development can be made feasible for residents by providing access to low income mortgage products made possible through the Green Climate Fund (GCF), a fund set up by the United Nations Framework Convention on Climate Change (UNFCCC) or an 8% mortgage program sponsored directly by the Mongolian Government.

Ger Plug-in

Ger Innovation Hub

Smart Collection Point

The next steps are to develop the incremental urban strategy established in this report into a Development Toolkit. This Toolkit would comprise of several marketable products, each proven to reduce carbon emissions by 20%, and therefore qualify for low interest mortgages offered by local banks and underwritten by the GCF. We propose that the Toolkit would be managed by a new entity - The Ger District Development Corporation comprised of an architect, contractor, financial and legal advisor and community coordinator in order to deliver development that complies with the terms of the loan and GCF criteria. If established successfully, it would allow thousands of households' access to housing with improved infrastructure with lower carbon emissions and less air pollution.

The long term objective is to build capacity for a healthier population offering Mongolia's young, upwardly mobile citizens a more sustainable urban future. This report sets out a strategy and recommended next steps for how this can be achieved.

Research Findings

The research comprises three phases: ger district analysis; prototype development and an incremental strategic plan. The findings are summarized as follows:

Phase 1: Ger District Analysis

Background context

The 1990 democratic revolution propelled the country into a free market economy and restructuring that followed a neo-liberal model advocated by international financial organisations such as the International Monetary Fund and the World Bank. Herders, having operated under a state supported collective model, were now forced to operate under private ownership. Devastating winters or dzuds, killed many

livestock, forcing many nomads to move to the city. The 2002 land law that allowed every Mongolian citizen the right to claim 0.07 hectares of land in urban areas, together with a lack of employment and educational opportunities in provincial cities, intensified the situation, leading to a massive influx of rural nomads to Ulaanbaatar. [1_Section 1A] As a result, the population of the city has increased from 629,000 in 1997 to about 1.2 million in 2012 with over 768,000 people living in about 200,000 households in the Ger districts. This is over 60% of Ulaanbaatar's population of 333,379 households and 1,267,024 inhabitants. Over 750,000 people in the ger districts depend on basic pit latrines and buy water at kiosks and transport it to their homes. Nearly 85 percent of ger dwellers use wood or coal-burning stoves for heating, spending between 25-40% of their income on fuel. [3] This produces some of the highest levels of air pollution worldwide, with ger districts experiencing winter PM2.5 concentrations more than 100 times the World Health Organization (WHO) 24-hour guideline (National Center for Public Health, and UNICEF 2018).

Ulaanbaatar's power stations in Winter.

Ger district residents collecting water at a water kiosk.

Khashaa plots side by side in the ger districts.

In order to document the unique characteristics of the ger districts we undertook fieldwork and community consultation in two districts: Chingeltei-16 and Sukhbaatar-16 and created maps documenting formal infrastructure including roads, bus stops and water kiosks, and informal infrastructure such as private water wells, illegal dump sites and roadside coal sellers. [1_Section 1F and 1G] Archival information of the historical transformation of Ulaanbaatar was collected showing how the city's administrative territory has expanded to over 30 times its original size and the urban population has doubled since the 1990 democratic revolution and Soviet withdrawal (Solongo, 2007). In terms of infrastructure in both districts, we understand that there is an average for each water kiosk to serve approximately 185 families with some families reporting that they collect 500 litres per week, visiting the kiosk twice a day, every other day. These districts also lack civic infrastructure; about 1000 children do not attend kindergarten in Chingeltei-16 due to insufficient supply and in Sukhbaatar-16 there is only 1 health clinic to serve a population of approximately 11,945. This is also the case in other districts: in Songino Khairkhan-31, there are no schools, only two kindergartens and no community spaces for the 3,000 households or approx. 12,000 inhabitants of the district. [1_Section 1F]

By comparing google earth imagery from 2009-2017 with our own drone footage, we created maps for our two selected districts showing the process of densification through sub-division and the transformation of urban morphology over time. [1_Section 1C] Although it has been argued that the categorisation of the Central, Mid and Fringe districts, which equate to different densities and housing types, are directly related to distance from the city centre, (The World Bank, 2010), we have found that these typologies exist within single khoroos. For example: Chingeltei-16 contains all three forms of urban fabric. Some plots are densifying and subdividing to an average of 480m2, residual sites are infilled, houses predominate, and the

urban fabric is organised into back to back plots with a clearly defined street grid. [1_Section 1C] Chingeltei-16 is also expanding, with more haphazard fence lines forming plots of irregular shape, and an unresolved street pattern containing dead ends and awkward constrictions. Chingeltei-16 is therefore evolving constantly, with different patches transforming at different speeds. The Mid typology changes to the denser Central typology and the Fringe becomes more 'mid' in character, whilst new settlers encroach further into more mountainous and steep terrain seeding the beginnings of a new Fringe. [1_Section 1C]

Fringe sample

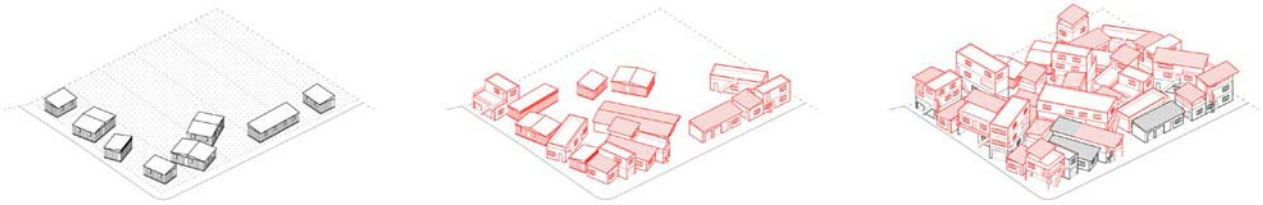
Mid sample

Urban sample

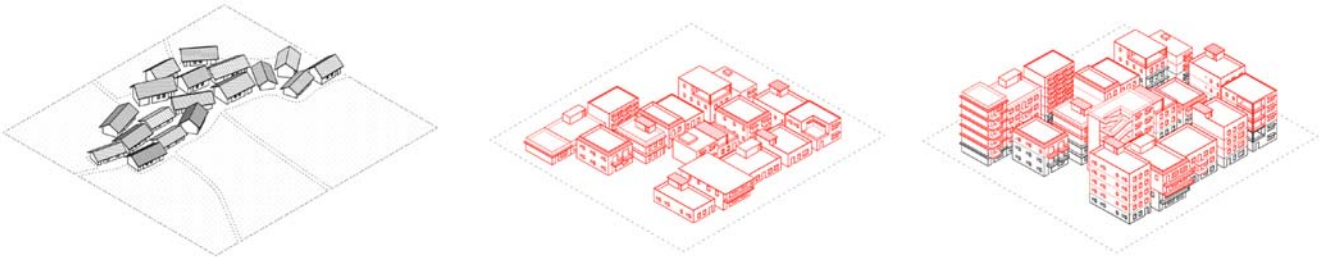
Sample district transformations - Chingeltei-16 (2009-2017)

Based on household surveys and drawing people's plots, we note that some residents have modified their ger adding simple wooden thresholds to prevent heat loss or building permanent concrete foundations to limit the cold from the ground. [1_Section 1B] Over 65% (Asia Pacific Investment Partners, 2017) of families build a simple house or baishin next to their ger, yet based on our fieldwork, many retain the organization of the ger, tending towards shared spaces rather than separate room divisions. [1_Section 1B] Most still lack internal toilets and showers, are ineffectively thermally insulated and are still reliant on coal, with over 85% of ger district residents using wood or coal-burning stoves for heating (The World Bank, 2010). Density is low, ranging between 2.1 structures/plot (plot size averaging 453m2) in the older districts to 1.6 structures/ plot (plot size averaging 734m2) in the outer, newest districts. [1_Section 1C]

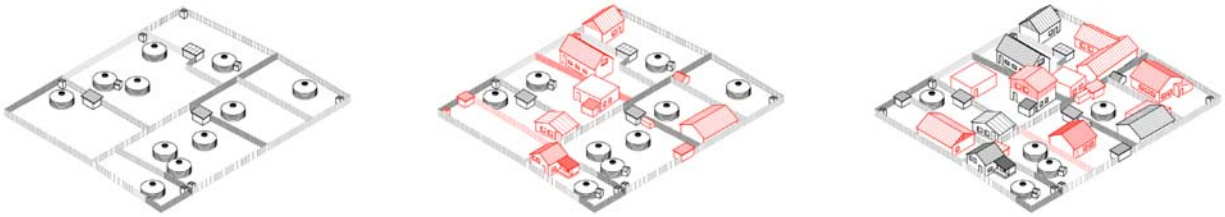
This pattern was compared to examples of informal urban growth in sample sites of Paraisopolis, Brazil and Baishizhou, Shenzhen to position ger districts as a unique example of an informal settlement. These sites were chosen as they exhibit different forms of land tenure: Paraisopolis is an example of an illegal settlement with no security of tenure; Baishizhou, a form of illegal development but with legal land tenure, and the Ger districts an informal settlement but with legal land tenure undertaking legal development. In each case the process of transformation was documented and densities of built fabric and total population compared. [1_Section 1D]



Favelas - Paraisopolis, Brazil



Urban Villages - Baishizhou, China



Ger Districts - Ulaanbaatar, Mongolia

Transformation process of different typologies of informal settlements

Given the complexity of land tenure and the issues facing the ger districts, implementing masterplans has proven difficult; the 2020 master plan was amended in 2013. Although infrastructure was to be provided through the 2012 Chinggis Bond – a sovereign bond of US$1.5 billion, the intention was to encourage capital investment through private developers (Economic Research Institute, 2013).

The collapse of the commodities markets amid global economic slowdown meant that developers were put-off from potentially slow projects involving multiple negotiations with stakeholders for low returns. In response, the current Development Directions 2030 emphasizes the need to integrate the ger areas into the city through the creation of four strategic subcentres. The Asia Development Bank (ADB) financed Urban Transport Development Investment Program involves the creation of a Bus Rapid Transport system (BRT) that will create new bus lanes that will transect the city connecting the subcentres to the city centre. The subcentre will be developed through another ADB project, the Ger Areas Development Investment Program (GADIP) that will provide $USD 320 million to provide infrastructure including heating, water and sewerage; improve roads and public services; and develop capacity for businesses and economic opportunities. In turn, the Ulaanbaatar Green Affordable Housing and Resilient Urban Renewal Sector Project (AHURP) will create eco-districts at these subcentres containing 10,000 housing units creating a model for a mixed-use community comprising 15% social, 55% affordable and 30% market rate housing together with public amenities and open spaces. The eco-district increases the current household density by 3.6 times and sets environmental criteria for their thermal performance and energy consumption with a minimum apartment size of 35m2. In preparation, multiple stakeholder workshops have taken place, conducted by consultants M.A.D. Investment Solutions as part of the ADB team to ascertain the market value of the land based on whether owners have improved their plots, built houses or operate businesses or rent their land. The mechanism for implementation will be through voluntary land swapping and at the two initial sub-projects the team has confirmed agreements in principal from 72.5% of residents at Selbe East and 83.8%of residents at Bayankhoshuu West. (Mongolia: Ulaanbaatar Green Affordable Housing and Resilient Urban Renewal Sector Project, ADB, June 2018). It attempts to adjust the development model to appeal more to ger district residents by allowing residents access to land, providing greenhouses and incorporating business spaces at the ground floor of buildings. Financial tools have been reworked to encourage private developers to participate in the project delivery and attractive mortgage rates will be offered by channeling Green Climate Fund loans through the commercial banks. The strategy is to limit the risk for investors as much as possible, however ultimately, the success of the project is contingent on private developers and contractors to implement the project. These plans are reliant on loans from the Asian Development Bank that will ultimately have to be paid back, stretching the stabilization of Mongolia's economy which is reported to have $2bn in external sovereign debt, (Koyanagi, Nikkei Asian Review, February 2017). Additionally, the uncertainty of the

currency conversion from the GCF loans (in USD) to the local banks (in Tugriks, MNT), means that the promised low interest rates might not be as low as originally anticipated (meeting with XAC Bank, Eco-banking team, October 2018).

If successfully delivered the inter-connected ADB projects will bring much needed improvement to the designated subcentres with the aim to benefit 400,000 residents. The extent of the problems affecting the ger districts means that this still leaves approximately 440,000 ger district residents that live outside of these zones, lacking basic urban services and contributing to toxic levels of air pollution. As these areas are growing by an estimated 35,000-40,000 people each year, the analysis supports that a different form of ger district development must be sought in order to address the increasingly threatening urban risks associated with this form of settlement [4].

Smart Collection Point , Chingeltei-16

Smart Collection Point , Khan-Uul

Phase 2: Prototype Development

Initially, a range of concept designs were developed that focused on urgent issues such as housing, unemployment and the lack of infrastructure. Each was conceived to allow for adaptation in anticipation of future changes to the context. These initial prototype designs were shared and tested with potential stakeholders and experts including university professors, various NGOs, policy think-tanks, the planning department and the mayor's office. Over a period of 3 years we developed and implemented three prototypes: a waste collection point; an affordable housing unit and a community centre. Each required several stages of development and feedback between the client body, residents, contractors and specialist consultants. Each was constrained by the demands of a limited budget, construction expertise, and the harsh climate and seasonal construction period. Each prototype involved galvanizing funding from different sources to pay for the construction costs.

Waste Collection Point [1_Section 2C]

The first prototype was the design and construction of a waste collection point. The project was commissioned by The Asia Foundation and the Mayor's Office, Ulaanbaatar. For rural nomads, waste, in the form of plastic bottles, glass and cans is an unfamiliar urban phenomenon and without clear systems of collection, garbage accumulates in gulleys, roadside verges and streams. The Asia Foundation produced an interactive community map of ger districts from data gathered through numerous meetings with local residents. The map showed areas of illegal dumpsites alongside official sites for waste collection. From this data, the Foundation identified the worst areas for rubbish build up within certain neighbourhoods that they had forged good relationships with local leaders. The aim was to create a demonstration project that could facilitate the hygienic collection of solid waste. Entitled, Smart Collection Points, the project engaged neighbourhood participation and outreach; improved the scheduling of trucks; and aimed to influence policy from the Mayor's office to alter how they administered city-wide waste collection. Based on their site research two locations were selected to implement and test the viability of the prototypes: one in the fringe district of Khan-Uhl and the other in the mid-ger area of Chingeltei.

At Chingeltei, the site was located by the side of a recently constructed road on an uneven dirt slope. The scheme took advantage of the height difference of the topography to form a ramp leading from the high ground to the road and bus stop with several places for rubbish drop off along the way. A recycling station was contained under the ramp adjacent to an open public space. At Khan-Uhl, the primary issue on this flat terrain was how to negotiate the ease for the public dropping off their trash with the ease for the collectors. The design created an artificial topography excavating 1.5m below ground for the collection and + 1.5m for the drop off with a retaining wall holding this new mound in place.

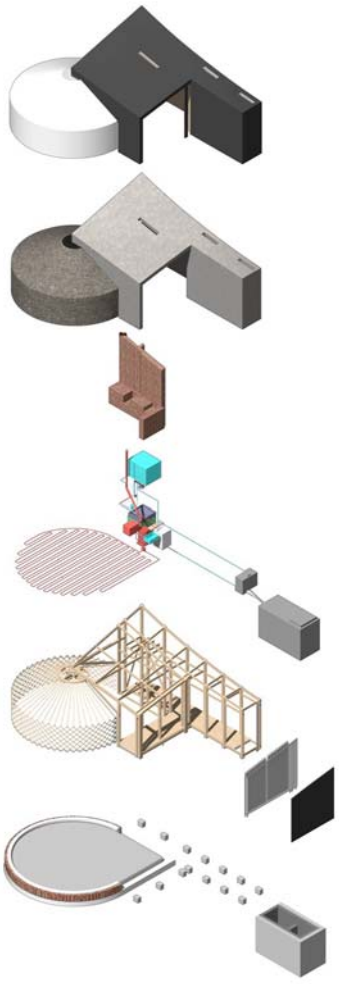
Both prototypes tackled the issue of solid waste collection by linking the daily routines of residents to waste and recycling facilities. Both projects address the immediate need to have somewhere to drop off rubbish, however each was designed so that spaces within the structure can adapt into community facilities if and when metropolitan door-to-door waste collection is introduced.

Ger Plug-In [1_Section 2C]

The affordable housing prototype was designed and implemented in 2017. It was funded by an international NGO, the Lorinet Foundation, and involved partnering with a local NGO, GerHub to assist in community engagement and in sourcing the family who would live and test the pilot project. Named, The Ger Plug-In, the project fuses the traditional structure of a ger with typical timber house construction. [5] A new truss suspends the ger from above, allowing the centrally placed columns to be removed and the stove to relocate within the thermal mass of a brick wall. This liberates the ger as a free-space providing the family with more options for how they wish to live. The project improves the environmental performance of the household testing low-tech, off-grid systems providing a septic treatment system and WC; water tank and shower; underfloor heating; an electric boiler and a passive solar trombe wall. Taking the principals of a trombe wall construction, the project tests how a screen wall placed behind a window can be designed that can collect radiant heat yet maintain transparency to the interior. The design was low cost and easy to construct, comprised of black PVC pipes filled with sand to increase the thermal mass, yet spaced to allow for visual and light penetration to the interior.

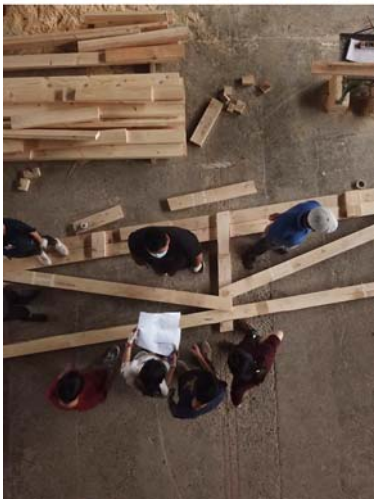
A couple, Urangua (age 33 in 2017) and Zulaa (age 26 in 2017), was selected to be the owner-occupiers of the Plug-In in exchange for allowing us to build on their land and having access to the building to monitor its performance. We had interviewed them for the Venice Biennale Installation in 2016 and learned they had moved from the countryside in 2001 in search of better job opportunities. Zulaa works at a printing company making wholesale cardboard boxes and Urangua at the Gobi Cashmere factory and their combined income is around 1,200,000 Tugriks or 490 USD per month after tax.

The Ger Plug-in, Bayankhoshuu Area



The Ger Plug-in environmental components.

Construction was completed by September 2017 and we fitted the prototype with data loggers (UX100-003) to record the internal temperature in different parts of the structure. We also fitted a standard ger with the same loggers to construct a baseline to compare performance. As well as temperature we recorded water usage, coal consumption and electricity use in both locations. The Plug-In was also documented with a thermal imaging camera to locate any areas of heat loss.



Ger Innovation Hub, Songino Khairkhan-31

After a one year testing period, we can note that: from October to December 2017, when the external temperature was between -9.9°C and -19.8°C, the Plug-In was 2.48°C warmer than a traditional ger. The average daily temperature fluctuation in the Plug-In was 4.1°C compared to 10.2°C in a traditional ger. The thermal stability of the Plug-In, due to its additional thermal mass, meant that during a period of inoccupation when the temperatures ranged from -12.5°C to -23.4°C, it took five days for all parts of the interior to reach negative temperatures. During the winter, the residents used an estimated 93% less coal than their previous year living in a ger, an estimated 0.266 tonnes compared to an average of 3.8 tonnes, a coal reduction of 3.534 tonnes. If we extrapolate these numbers, if each of the 104,000 ger households (Mongolia Real Estate Report 2017, Asia Pacific Investment Partners) was replaced by a Plug-In this would result in an estimated saving of 27,664 tonnes of coal per year, a profound impact that would improve air quality to the entire city.

As well as coal use, the short term impact has been that the household has access to an internal toilet, has access to sanitation, and does not need to collect water on a daily basis. Instead of having to walk 30 minutes to collect water every day the couple have access to a 1 tonne water tank which is filled by a truck once every 10-14 days. This amounts to saving 2.5hrs per week of their available time, which can now be used to do something more productive. The access to water means that they do not have to go to the communal bathhouse and are able to take showers whenever they like. The couple also shares the shower with other families in the district. The next steps are to consider how this prototype can be scaled up, could be made more affordable and be constructed more easily.

Ger Innovation Hub [1_Section 2C]

The research findings show that ger districts desperately lack civic and social infrastructure. The Ger Innovation Hub is a pilot community centre that will provide a space for all sections of the community, supporting a crèche, youth facilities, vocational training and a place for screenings and performances. Over time, it can include small cooperative enterprises and demonstrate how an entire plot can be used to engage community needs and serve as a model to reduce carbon emissions.

Construction was partially funded by the Hong Kong Jockey Club and will be completed by June 2019. It will be managed and run by local NGO, Ger Hub. It is designed as a layered structure, comprised of an inner room that is wrapped in an outer layer of polycarbonate that creates a buffer space that traps radiant heat in

the winter. The energy models indicate that during a winter's day, with an outside temperature of -20°C this buffer zone would be at -1.4°C, therefore the inner zone would only have to heated to +15°C rather than make up the differential of 33.6°C, significantly lowering energy consumption. After construction is complete we will document how the building is used by the community as well as monitor its thermal performance.

PHASE 3: Incremental Strategic Masterplan

The three prototypes are components within the incremental strategic plan. [1_ Section 3A] This plan incorporates scenarios that are developed based on the three different types of urban fabric as observed in our initial analysis. Key concepts of the scenarios are:

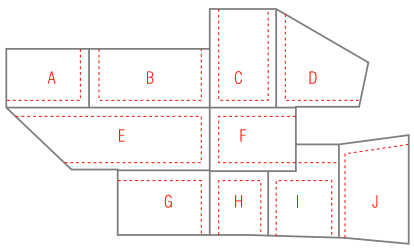
- to find ways to densify and provide affordable housing
- to create off grid infrastructural networks
- to create mechanisms for future growth and incremental upgrades
- to engage residents in forms of shared infrastructure
- to create feedback loops of investment encouraging future stages of development
- to create neighborhood funds for community investment
- to seek financial mechanisms to provide residents with access to lower income loans based on improved environmental performance.

The first scenario is to develop an *Infrastructural Spine* in areas which have already developed back to back plots and have an established street grid. This spine is made from a series of prefabricated concrete sections with built in piping that connect to a septic tank and water tank with additional capacity for new residents. The initial investment is shared by four families who operate as a management company and seek new tenants to rent land within the plots. The access to infrastructure means that the land is more attractive than other plots. The rental income is used to pay back the loan and maintain the infrastructure. Over time the original owners decide to raise capital to invest in an apartment building. They can do this in two ways. Either through re-mortgaging their land or by selling off a piece of their land to another stakeholder. If another stakeholder joins they will become part of the shareholder group based on the % of land they have bought. For example: if the plots are subdivided into 12 sections and 2 are sold, the original owners become 21% stakeholders while new owners become 8% stakeholders each. In this way the original stakeholders maintain majority ownership. When new houses are built each plugs into the original infrastructural spine. Each property has to meet regulative controls on environmental provision including insulation, and reduction of coal usage. The income generated through rent or from selling apartments will be pooled back to the collective which will siphon off a proportion for maintenance, a proportion to a community improvement fund and a proportion of profit distributed proportionately to each stakeholder. The

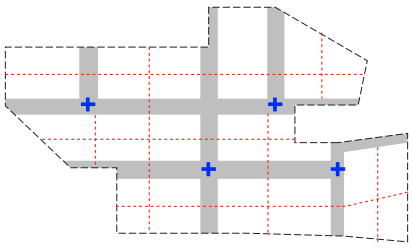
improvement fund could be used for renewable energy, greenhouses, community centres, kindergartens, playgrounds or whatever the stakeholders decide is necessary. These improvements will further increase the value of land and thereby rental returns, which further can feed into increased profits and the community fund.

The second scenario is to develop *Infrastructural Nodes* in the mid-ger typology and promotes increased density through multiple occupancy. The idea is for each resident of a defined patch of plots to join a collective as stakeholders. On joining, each agrees to provide an easement of 2m, off-set from the boundary of their plot. This land will be used to support infrastructure, a community byway and other activities related to the common good. Stakeholders agree the locations of infrastructural nodes which leads to a pattern of subdivision. Each core is designed to supply a septic tank and water supply for a projected increase of population. These nodes will be constructed from taking bank loans. Original residents become equity stakeholders based on proportion of ownership based on original area calculation of their original plots. Each node has wall extensions that act as the interface for new housing. The node and its increased provision of basic urban services increases the value of the land. At an initial stage they can simply rent spaces for new families in gers who will pay above average rent due to the increased provision of access to infrastructure. This money helps repay the loan. Each stakeholder can take further steps to develop the land through bank loans or re-mortgaging. They can choose whether they build a house for themselves or build a house with an additional rental unit. Properties are constructed with the capacity for future extensions. The income generated from properties that are sold or rented go back to original stakeholders. However, a percentage from the profit is fed back into the collective improvements to community infrastructure. This supports increases to rental process, the value of property and the value of the land. In the process of increasing the population capacity of the land, land banks need to be reserved in order to prevent over-densification. These land banks can be used for community gardens, waste treatment facilities, playgrounds and kindergartens.

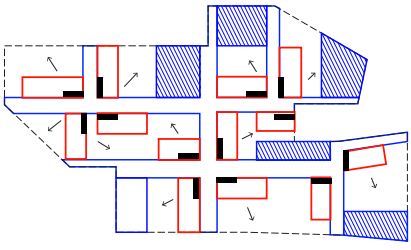
Creating easements



Locating infrastructural nodes



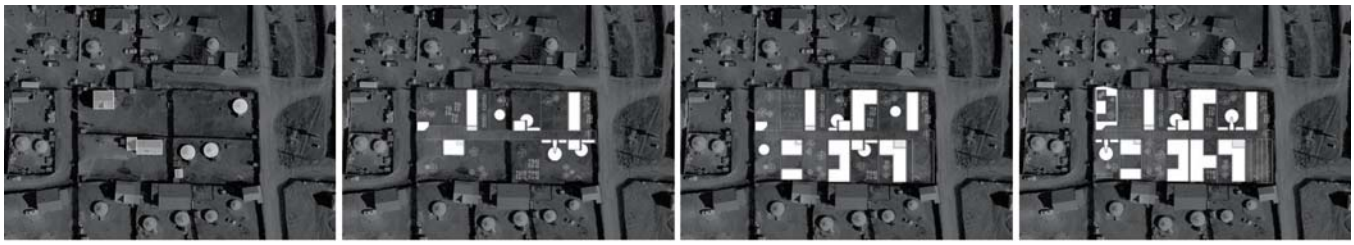
Extensions and adding community facilities



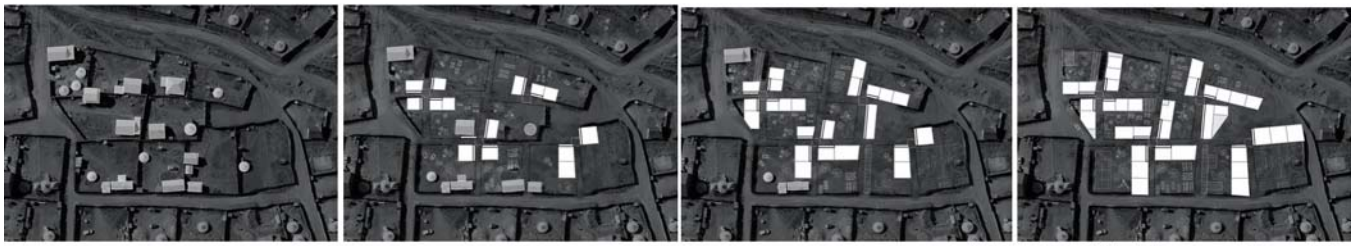
Strategy for Incremental Node

The third scenario is designated for fringe sites with larger plot areas and is based around the *Ger Plug-In* prototype. One family invests in a Ger Plug-In structure. The plug in structure would have its own heating, water tank, shower and WC. A septic tank would be built with additional capacity to serve 5 additional families. The family sets up an additional ger that can plug into the septic system. They rent this out and use the money to pay back their loan. With the additional income the family decides to build a house. When they vacate their original property they rent out the Plug-In to a new family. When each new family signs a tenancy agreement they agree to comply with environmental policy of zero coal use. They also will pay a service charge that will form a collective fund for maintenance and future community improvements such as spaces for a small shop, a greenhouse, planting trees, parking, or a small crèche or playground.

The scenarios were presented to numerous potential stakeholders who visited the Ger Plug-In pilot project in September 2017. Alison Nankivell (October, 2017), Vice President, Global Expansion Business Development Bank of Canada, BDC Capital, and part of a group of international investors who donate their time and expertise to mentoring fund managers in developing markets such as Mongolia, suggested that the innovative aspect of the project is to create a network effect within the non-profit sector. In meeting with Bold Magvan, the CEO of XacBank, (7th September 2017) he stated how his bank could help provide low interest mortgages to ger district residents via the Global Climate Change Fund (Green Climate Fund, 2017). This feedback led us to further develop the scenario into an implementation plan.



Infrastructural Spine incremental scenario.



Infrastructural Node incremental scenario.

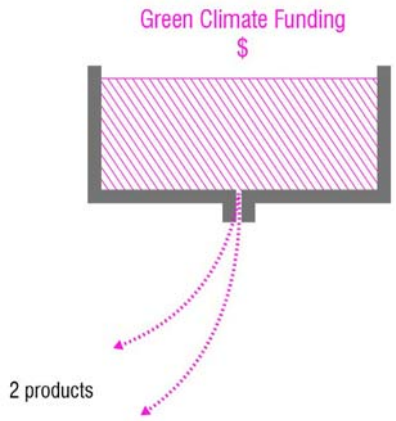
Plug-in incremental scenario.

Implementation Plan and Next Steps

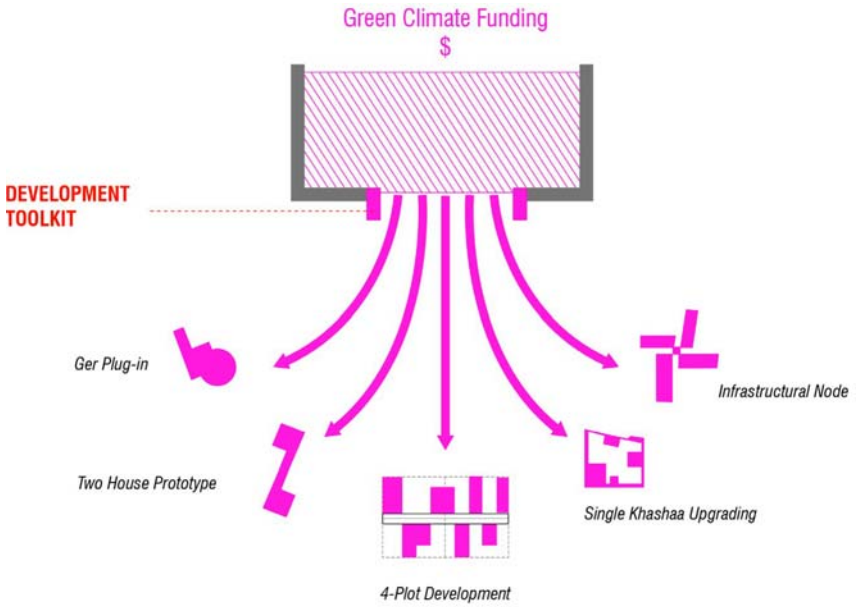
The Green Climate Fund approved programmes proposed by different local financial institutions in the form of bank loans in October 2018, (meeting with The Mongolian Sustainable Finance Association on 22nd Oct 2018). This allows local banks to create mortgage products to access these better loan rates, 10-12% compared to 18%, (meeting with Xac Bank 23rd Oct 2018), based on delivering housing that meets the criteria of a 20% reduction in CO2 emissions. The onus is on construction companies to create housing products that demonstrate that these criteria can be achieved. The mortgage is with individual residents who will agree on a product, then the money will go to the contractor to build the house. However, there are currently only two products available on the market eligible for these low interest loans. The proposal is to unlock this funding by creating a Development Toolkit – a series of different products serving a range of incomes and housing types that meet the criteria–thereby enabling residents to incrementally develop their own plots. [1_Section 3B]

The Ger-Plug-In demonstrates how the ger can be adapted and transformed into a viable low energy and low cost housing typology. Using the mechanism of the Green Climate Funds, the aim is to get the Plug-In accepted as a viable product eligible for low interest rate mortgages, in order to allow thousands of households' access to improved infrastructure with lower carbon emissions.

Current Model



Proposed Model



Ger District Development Corporation Unlocking GCF Funding

However, as the scenarios demonstrated, the intention is not to rubber-stamp this product as a singular solution but to provide mechanisms to diversify housing typologies and increase density on each plot. The only mechanism to improve the overall sustainability of the city is to provide an alternative to sprawl and the outward expansion of the city. If the land-law remains, and people are reluctant to give up their land, the city has to be able to densify. However, to densify, the land has to become more valuable in order to stimulate development. Land value can be increased by providing shared access to infrastructure, incentivizing residents to leverage development for themselves. In this way, by opening up access to low interest loans, we can incrementally transform the ger districts into a viable low carbon community while still maintain land ownership with the residents themselves.

The updated scenario for a one plot densification scheme is as follows. The land owner selects a product from the Development Toolkit linked to a mortgage with the local bank to build an energy efficient house and a septic tank and water tank with added capacity for two more households. The access to infrastructure on his plot means he can attract new residents to lease the land. These residents take a loan to pay for the rights of land use and to build a house, again selected from the Toolkit meeting the 20% reduction criteria. Income generated from the rent is used to pay back the initial loan, however a percentage is retained to contribute to a neighborhood improvement fund. This fund is managed by the residents and used to invest in communal benefits such as landscaping, greenhouses, car parking or any necessary repairs to collective infrastructure. Additional income created through rentals can allow existing residents to further invest or co-invest in more housing or in profit-making ventures such as shops, car parking or workspaces. Critically, unlike other development models, land ownership resides with the residents themselves. In a city whereby 97.8% land is owner occupied by a population with an average monthly income of around $80USD (The World Bank, 2017), the mechanism initializes a process to increase the value of their land.

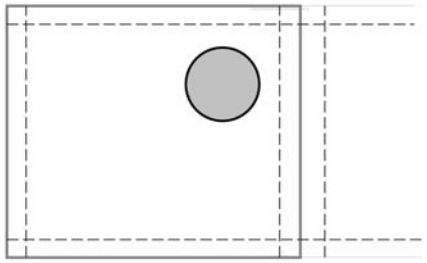
In order to implement this plan, the first step is to set up a Ger District Development Corporation comprised of an architect (Rural Urban Framework at the University of Hong Kong), a community advisor, a financial real estate expert, a lawyer and a contractor. It will act as a delivery agent, making sure the buildings that are constructed comply with improved environmental performance.

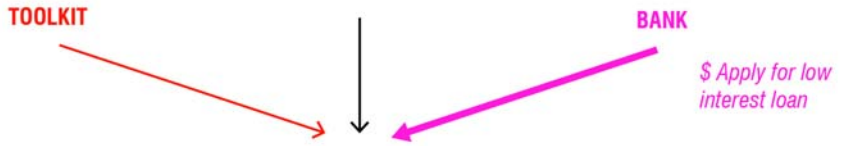
The second step is to obtain environmental verification on the Ger Plug-in by ARUP to qualify it as a viable product that meets the 20% emissions reduction criteria of the GCF. Once audited, we will partner with local financial institutions to have the Ger Plug-in accepted as a product, and released to market. Income to the Ger District Development Corporation will feed into the development and construction of new products from the Development Toolkit. The third step is to develop a new product to add to the Toolkit. Starting with fieldwork within the local communities, the scope and specifications of the next prototype will be determined. The design will undergo detailed technical evaluation with environmental engineers to improve its thermal efficiency and

STAGE 0

Existing condition
Single family on a plot without infrastructure

Carbon Emissions: *100%*
No of Families: *1*
Infrastructure: *No*

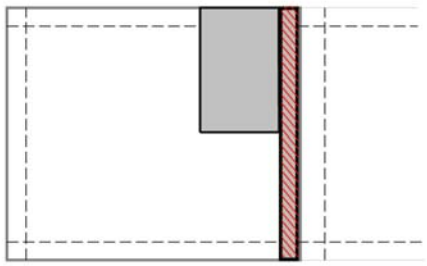




STAGE 1

Owner takes loan to build infrastructure with added capacity and an energy efficient house.

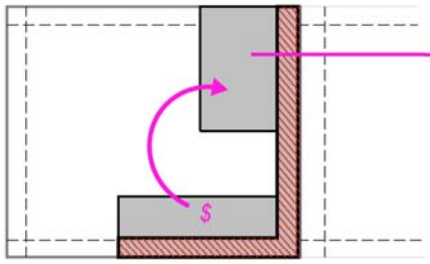
Carbon Emissions: *>20% reduction*
No of Families: *1*
Infrastructure: *Yes*



STAGE 2

New residents move to plot and take loan to pay for right to land use and to build a house

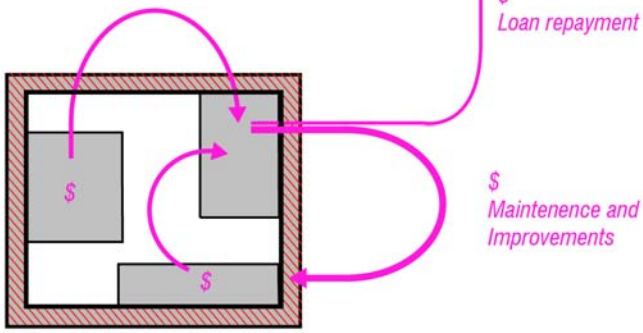
Carbon Emissions: *>20% reduction*
No of Families: *2+*
Infrastructure: *Yes*



STAGE 3

Income from rent used to invest in new programmes and infrastructure such as shops and greenhouses to generate different income streams

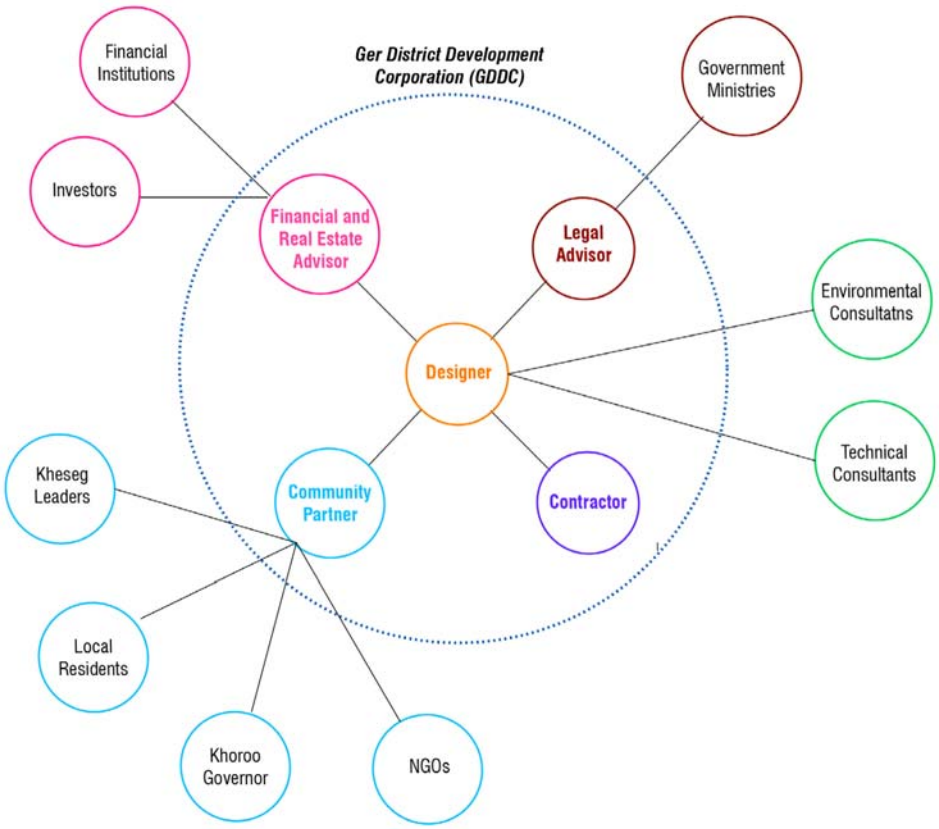
Carbon Emissions: *>20% reduction*
No of Families: *4+*
Infrastructure: *Yes*



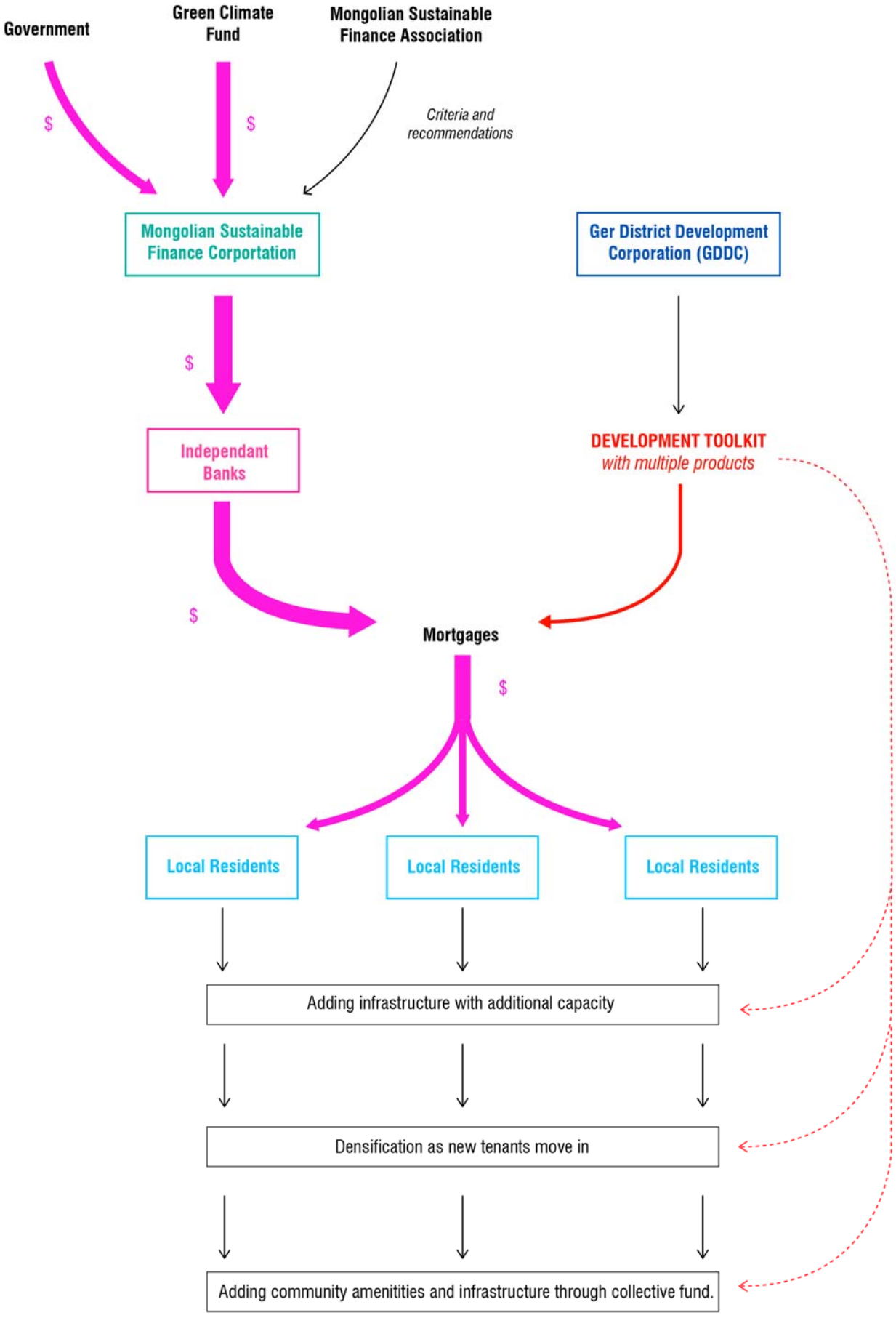
Ger District Development Corporation 1-Plot Upgrading Strategy

reduce carbon emissions. The design will also be verified with local contractors to ensure that the all materials and components specified are readily available and that methods of construction are within the capabilities of local workers. The design will then be built, environmentally verified, and presented to the financial institutions and linked to a mortgage product. The method of implementation will cycle through to the next product, and then the next.

Each of the tested products will feature in the Development Toolkit. This will act as a guide for ger district upgrading by the residents themselves made affordable by unlocking multiple ways to access the Green Climate Funds. This would radically shift the policy for ger district redevelopment both within the government and by funding agencies such as the Asian Development Bank. The Development Toolkit presents a paradigm shift in the planning approach to a holistic and agile bottom-up solution that targets densification, improving infrastructure access, and releasing the value of residents' land to support community improvements and create new economic drivers for the districts. If taken up as a model for upgrading it has the potential to impact thousands of people in the ger districts. As the ger district phenomenon is not just specific to Ulaanbaatar, but exists in every urban area of Mongolia, it could have widespread ramifications for the entire country.



Ger District Development Corporation Stakeholders



Ger District Development Corporation Mechanism

References to the research

[1] “Incremental Urbanism: Ulaanbaatar’s Ger Settlements: Final Report”, GRF funded research by the RGC, HKSAR, completion date January 2019.

[2] “Settling the Nomads”, Joshua Bolchover in Designing the Rural: A Global Countryside in Flux, Architectural Design Series, guest edited by Joshua Bolchover, John Lin and Christiane Lange, Wiley London, 2016. ISBN 978-1-118-95105-7.

[3] “City of Nomads” in Fear and Love: Reactions to a Complex World curated by Justin Mcguirk at The Design Museum, London, November 24, 2016 – April 27, 2017.

[4] “Incremental Urbanism: Designing a Resilient Urban Strategy for the Ger Districts of Ulaanbaatar”, Rethinking Urban Resilience Implementation: Aligning sustainability and resilience, 11th International Forum on Urbanism, Barcelona. 2018

[5] “Seeding the City in Ulaanbaatar’s Ger Districts: Urbanisation from the Inside-out”, Monu No. 27 Small Urbanism, Bruil, Netherlands, 2017

[6] “Settling the Nomads” in Reporting from the Front curated by Alejandro Aravena at la Biennale di Venezia, Venice, May 28, 2016 – November 27, 2016

[7] “Ger District Hub” in Common Good, Museum for Applied Arts and Sciences (MAAS), Sydney, March 2-Dec 2, 2018.

Bibliography

Asian Development Bank, Project Data Sheet, Mongolia: Ulaanbaatar Green Affordable Housing and Resilient Urban Renewal Sector Project, Ulaanbaatar, 2018

Asian Development Bank, Voluntary Land Swapping Plan, Mongolia: Ulaanbaatar Green Affordable Housing and Resilient Urban Renewal Sector Project, Ulaanbaatar, 2018

Asian Development Bank, Project Data Sheet, Mongolia: Ulaanbaatar Urban Services and Ger Areas Development Investment Program, Ulaanbaatar, 2017

National Center for Public Health and UNICEF "Mongolia's Air Pollution Crisis". Mongolia's Air Pollution Crisis A call to action to protect children's health. Feb 2018. National Center for Public Health and UNICEF

Solongo, Algaa "Growth of Internal and International Migration in Mongolia" in Migration, Development and Poverty Reduction, 8th International Conference of Asia Pacific Migration Network, May 2007

Kamata, Takuya, et al. "Managing Urban Expansion in Mongolia". 2010 Managing Urban Expansion in Mongolia. World Bank. Washington DC. License: Creative Commons Attribution CC BY 3.0 IGO

Gerelsaikhan, Gerelmaa. Mongolia Real Estate Report 2017, Asia Pacific Investment Partners LLC

Economics Research Institute, "An Economic Impact Assessment Of The Committed Chinggis Bond Allocation". Economics and Research Institute. 01 Dec 2013. http://www.eri.mn/research/finished/345-ewohxidw

Koyanagi, Ken. "Battered Mongolia Faces Make-or-Break Moment." Nikkei Asian Review, 2 Feb. 2017, https://asia.nikkei.com/Economy/Battered-Mongolia-faces-make-or-break-moment

Asian Development Bank. "Mongolia: Ulaanbaatar Affordable Housing and Urban Renewal Project". Asia Development Bank, 2015. https://www.adb.org/projects/49169-001/main

Green Climate Fund. "GCF Begins Funds Transfer to Mongolia's XacBank." 11 May 2017, www.greenclimate.fund/-/gcf-begins-funds-transfer-to-mongolia-s-xacbank.

Singh, Gayatri. 2017. Urban Poverty In Ulaanbaatar: Understanding the Dimensions and Addressing the Challenges. World Bank. Washington DC. License: Creative Commons Attribution CC BY 3.0 IGO

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INCREMENTAL URBANISM: Ulaanbaatar's Ger Settlements

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(Project No. 17613415)

Principal Investigator: Joshua Bolchover, Associate Professor, The University of Hong Kong
Research Assistants: Matthew Hung, Jersey Poon
Main Collaborators: Badruun Gardi, Enkhjin Batjargal

Total number of research trips:
33 (Principal Investigator and Research Assistants)

Total number of students taught:
123 (110 students visited Ulaanbaatar)

Total number of community presentations and workshops:
12

Total number of local residents engaged:
177 (263 incl. student surveys)

Total number of stakeholders engaged:
37

Total number of local organizations collaborated with:
7 (GerHub, The Asia Foundation, Tontoo Grand, ZAG LLC, Ecotown, Shinest LLC, Institute of Engineering and Technology)

Filmmaker: Dulguun Bayasgalan

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Amarbayasgalan Enkhsaikhan, CEO, Golomt Capital,
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Judith Bruno, Deputy Country Representative, UNICEF
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Jon Lyons, VP of Regulatory Affairs & Strategy, Erdene Resource Development Corp
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Bolor Enkhbat, Construction Director, Shinest LLC
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Urangua Shagdar

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The University of Hong Kong, Hong Kong
HKU School of Professional and Continuing Education, Hong Kong
The University of Columbia, New York, USA
The Berlage, Delft, Netherlands

Interview Participants (Existing Initiatives):
Khan-Uul -13 Governor
Khan-Uul - 13 Organiser
Chingeltei - 16 Governor

Chingeltei - 16 Kheseg Leaders
Mr. Delgerbayar, The Asia Foundation
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Batdorj Gongor, Ger Community Mapping Center

Interview Participants (Films):
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Munguntuya Odontungalag
Munkhbold Naran
Bold-Erdene Adiya
Anir-Ernene Mukhbat
Purevsaikhan Mukhbat
Ariunzaya Puntsag-Osor
Akhntur Batzaya
Enkhtur Batzaya
Adiya Bileg-Ulzil
Baasansuren Alexander
Oyungerel Tserenjav
Oyun-Eerdene Baasansuren
Tsetsenjargal Baasansuren
Togtokhbayar Dambadarjaa
Lkhagvasuren Bazarsuren

Interview Participants (Personal Geographies - Chingeltei-16):
Otgonchimeg
Uranchimeg
Batsukh
Tungalag
Zultsetseg
Mungunchime
Ariunaa
Surenkhorloo
Segelen
Bayarmagnai

Interview Participants (Personal Geographies - Sukhbaatar-16):
Dulamyumlaa
Ichinkhorloo
Enkhbaatar
Chintulga
Oyunbat
Narantsetseg
Bayasgalan
Altangerel
Buyankhishig

GER PLUG-IN

Design: Joshua Bolchover (Rural Urban Framework)
Project Team: Ben Hayes, Jersey Poon, Matthew Hung
Commissioning Donor: Lorinet Foundation
Contractor: ZAG Engineering Group LLC

GER INNOVATION HUB

Design: Joshua Bolchover and John Lin (Rural Urban Framework)
Project Team: Jersey Poon, Chiara Oggioni
Funding: Construction as partially funded by the Hong Kong Jockey Club Charities Trust as part of the Jockey Club HKU Rural Urban Design Project
Partner: GerHub
Collaborators: EcoTown,The University of Hong Kong, HKU SPACE, Shinest Co Ltd.

WASTE COLLECTION POINTS

Design: Joshua Bolchover (Rural Urban Framework)
Project Team: Matthew Hung, Yan Qian, Shivina Harjani, Johnny Cullinan
Client: The Asia Foundation, Mongolia and The Mayor's Office, Ulaanbaatar, Mongolia
Design Institute: Toonto Grand

Image Credits: Rural Urban Framework (RUF)
Rural Urban Framework is a not-for-profit design agency based at the Faculty of Architecture, The University of Hong Kong.

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