Implementing Eco-District and Green Building In Ulaanbaatar

Japan Fund for Poverty Reduction

Vauban Freiburg

Promoting Bilateral Mechanisms in Asia and the Pacific
Workshop on the Joint Crediting Mechanism
25 August 2016

Arnaud Heckmann
Senior Urban Development Specialist, ADB

Statement and Intentions

Japan Fund for Poverty Reduction

There is a problem…

- Pollution
- Coal based heating and electricity supply
- Sub standard living conditions in ger areas
- Available housing stock not affordable while demand is important

… we know the solutions

- Extend access to urban services and integrated redevelopment
- Affordable housing using innovative building methods
- Green Building using renewable energy

How to implement them…

Urban Block / Eco-District

Japan Fund for Poverty Reduction

Integrated planning and development process, and **complete solution** at the neighborhood level to build up **citywide sustainability** and **green development**

- **Combination** of public policy, catalytic investments from local government and utilities, private sector and communities participation
- **Bridge the gap** between green policy objectives and practical investments
- **Appropriate scale** for step by step implementation and to enhance neighborhood urban and environmental solutions

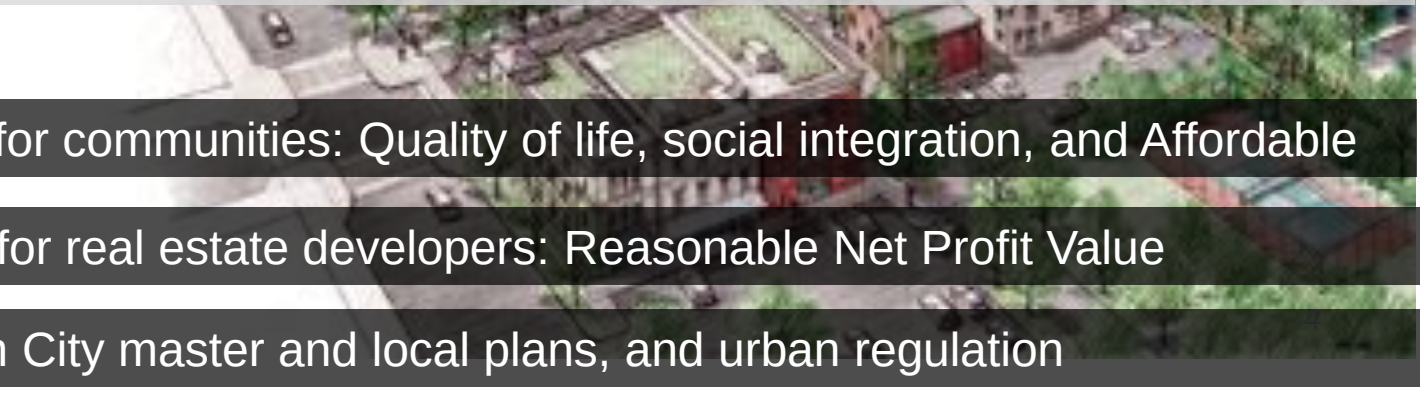
Eco District Key Principles

Japan Fund for Poverty Reduction

- **Mix land uses and functions** (residential, commercial and recreation functions; ample public and green space; education, cultural and health facilities)

- **Social mix** (urban areas that mixed different category of population having different income level) and vibrant/engaged communities

- **Green building and planning** using implementable renewable energy and energy efficient



- Attractive for communities: Quality of life, social integration, and Affordable
- Attractive for real estate developers: Reasonable Net Profit Value
- In line with City master and local plans, and urban regulation

Eco Districts outstanding Examples

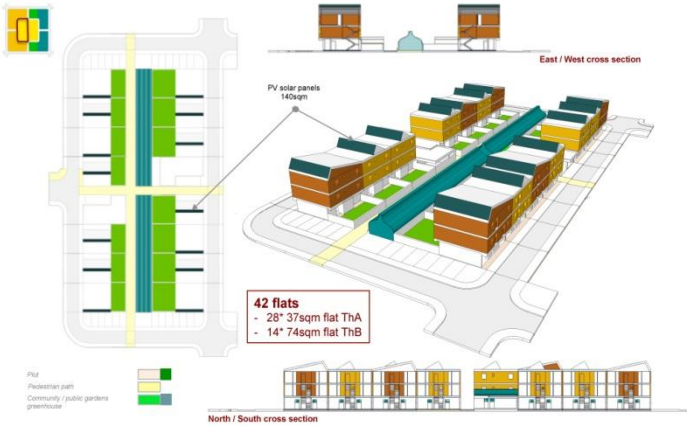
Japan Fund for Poverty Reduction

Country	District	Program	Context
Germany	Berlin - Kreuzberg	13 buildings	Urban renewal
Netherlands	Amsterdam GWL Terrein	6ha - 591 housing units	New urban area and urban renewal
	Culemborg: Eva Lanxmeer	24 ha - 244 housing units	New urban area
Sweden	Malmö: Bo01	30ha - 1,100 housing units	New urban area
	Malmö: Augustenborg	1,800 housing units	Urban renewal
France	Dunkerque: Courghain	104 housing units	Urban renewal
	Nantes: Ile de Nantes Malakoff	350 ha - 8,200 housing units	Urban renewal and new urban area
	Grenoble: ZAC de Bonne	8.5 ha - 850 housing units	New urban area

Urban Redevelopment Unit Modules

Japan Fund for Poverty Reduction

Townhouses

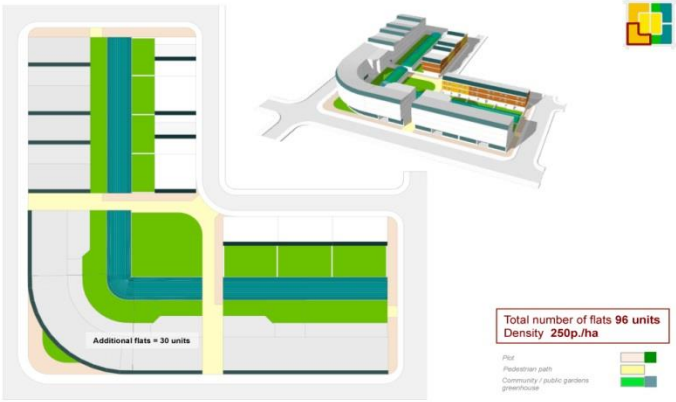


Land footprint: around 7 plots/Khaasha
28 and 56 Housing units

70% affordable and social housing
Green space and public amenities

IRR: 12% - 16%
Construction Cost $325 - $350
Selling Price: AH: $550
MP: $850

Mix Townhouses and low-rized buildings



Land footprint: around 9 plots/Khaasha
66 to 84 Housing units
Higher room for shops and offices

Construction methods

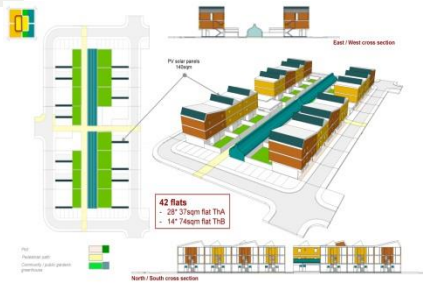
Type of Construction	Construction Timeline
Metal Framing	45 days
Modular Homes	60 days
Community Built	Dependent on Scale
Pre Cast Concrete	2 months
Multipoint foundation	2 months

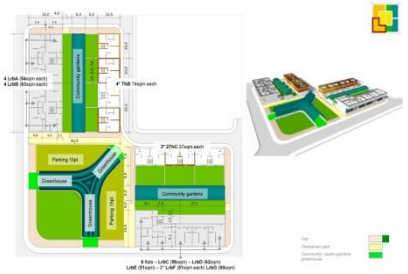
Construction Cost between $300/m2 and $400/m2

Some construction methods allow construction during the 4 seasons

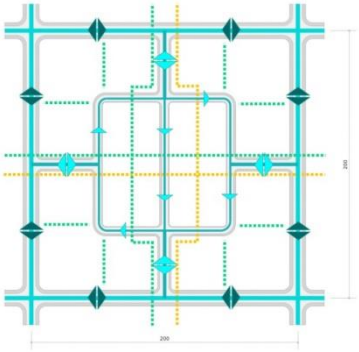
Step by Step Implementation

Japan Fund for Poverty Reduction

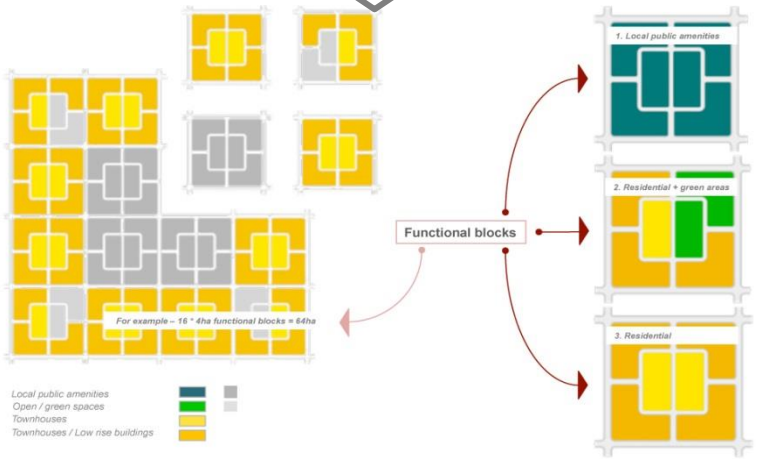




Block



DISTRICT



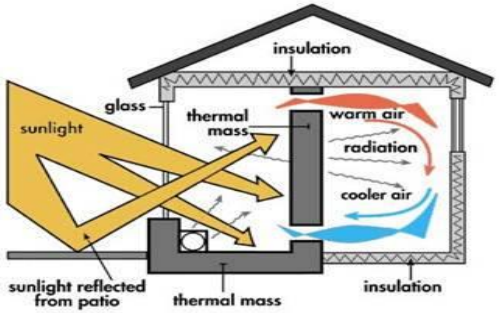
City

Green Components

Japan Fund for Poverty Reduction

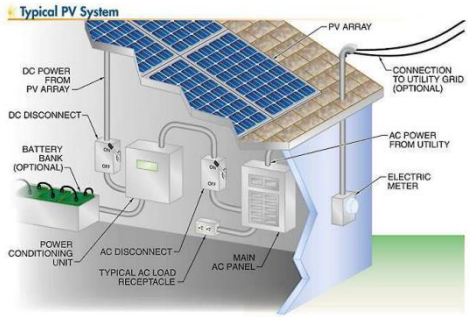
Renewable Energy

- **Passive Solar Design**
- **PV (Photo Voltaic) Panels**
- **Ground-Source Heat Pumps**
- **Solar Hot Water System**



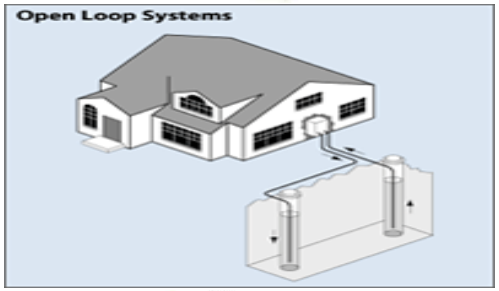
Energy Efficiency

Modern energy efficiency technology based on Mongolian Norm and Regulation BnDB 23-02-09 “Thermal Performance of Buildings”

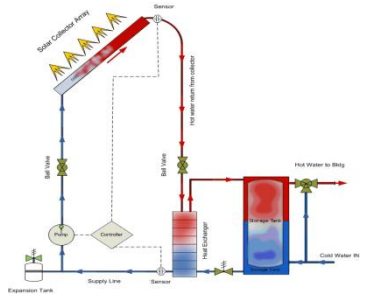


Efficient land use planning

Compact design
Shape and building orientation



Energy Performance Monitoring (green and smart)



Green Components Details

Japan Fund for Poverty Reduction

Solar PV

Planned 6kW array per townhouse, generates average 1kW over 24 hours.
Covers all electricity needs and contributes to heat and hot water.
Selling excess power increase benefits and eliminates the need for storage

But

Regulations and administrative procedures for household systems are not in place.
Mongolia has good conditions for PV, but pollution and dust will reduce performance.

Solar Hot Water

Indirect active systems are required for Mongolia.
Solar Hot Water is more efficient than PV in converting solar energy to heat (60%)

But

Technically more complex; Some electricity is needed.

Ground Source Heat Pumps

Heat Pumps have lower efficiency in cold climates like Mongolia.
Heat pumps require electricity to work (20-40% of output) in UB.
Vertical open loop is most suitable, about 0.45 l/s for 7.5 kW output
Feasibility depends on suitable ground conditions, studies underway to determine feasibility.

Green Components Details

Japan Fund for Poverty Reduction

Passive Solar Design

A set of design principles that can be used to reduce heating and cooling requirements in conjunction with energy efficient construction (5-25% for modest systems / 40% for "highly optimized" systems / Up to 75% for "very intense" systems).

But

Requires careful design, computer calculations;
More challenging for multifamily housing;
Increased materials cost must be balanced with affordability.

Energy-Efficient Building Technology

Already part of Mongolian regulations (BnDB 23-02-09);
Target reduce heating load to less than 50% of present 30-40 W / (m^2 • °C • day);
Not just increased insulation, but consideration for ventilation and moisture, with attention to materials and design details;

But

Requires improved design and regulatory technical capacity;
Requires realistic energy tariffs based on metering to provide incentives.

Energy Performance Monitoring

Data collection is no longer costly;
Operations can be optimized to reduce cost;
Verifies designs and detects maintenance requirements.

How Each Technology Saves Energy

Japan Fund for Poverty Reduction

Demand Side

Passive Solar Design /Energy-Efficient Building Technology /Energy Performance Monitoring

- All reduce energy inputs and increase occupant comfort.

Supply Side

Solar PV /Solar HW /Ground Source Heat Pumps

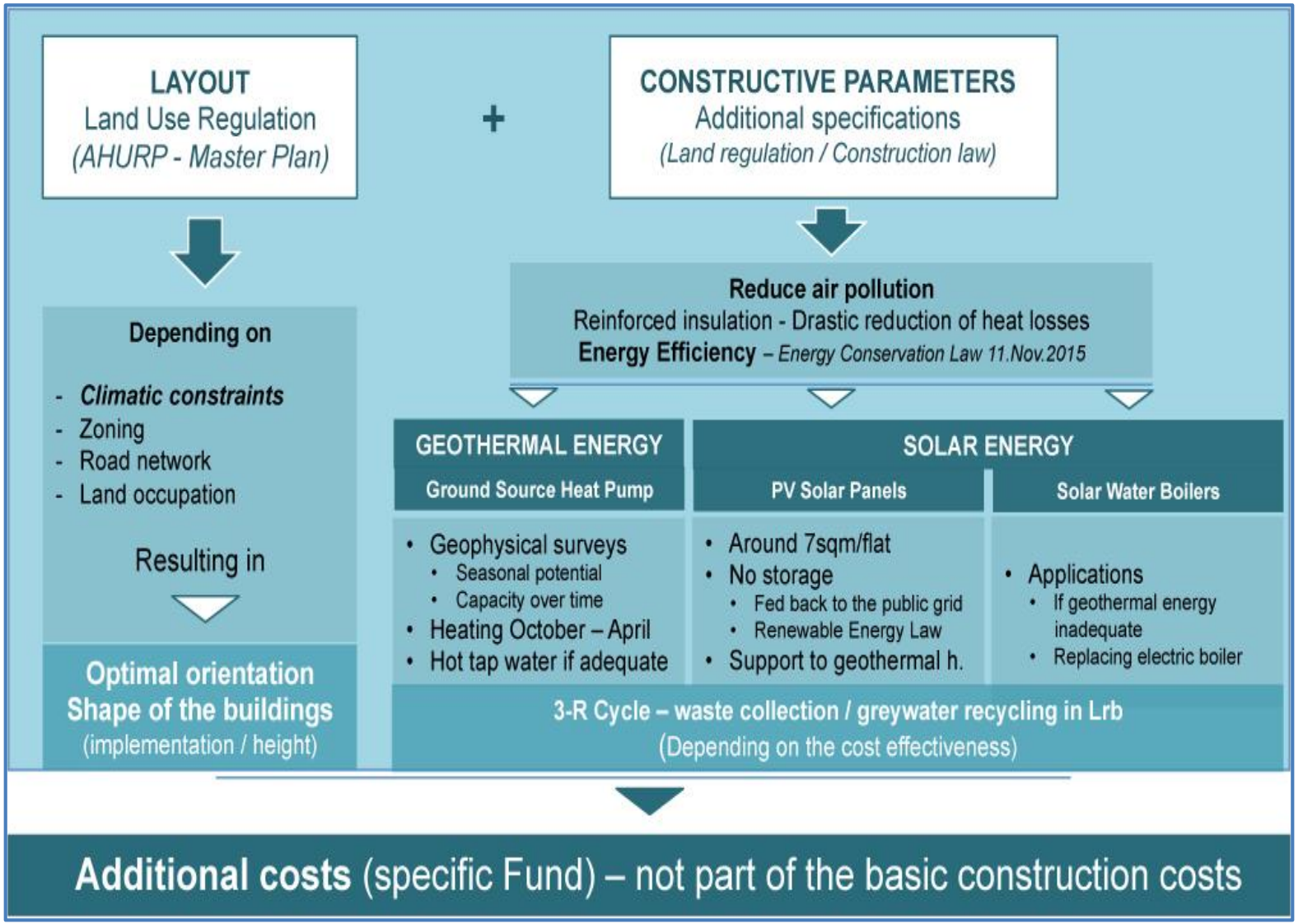
- All reduce dependence on coal combustion. Individually or in combination, will be able to fully supply all energy needs for the housing density planned.

Supply and Demand investments must be balanced, with realistic tariffs and subsidies to incentivize policy objectives.

Energy Efficiency and renewable energy

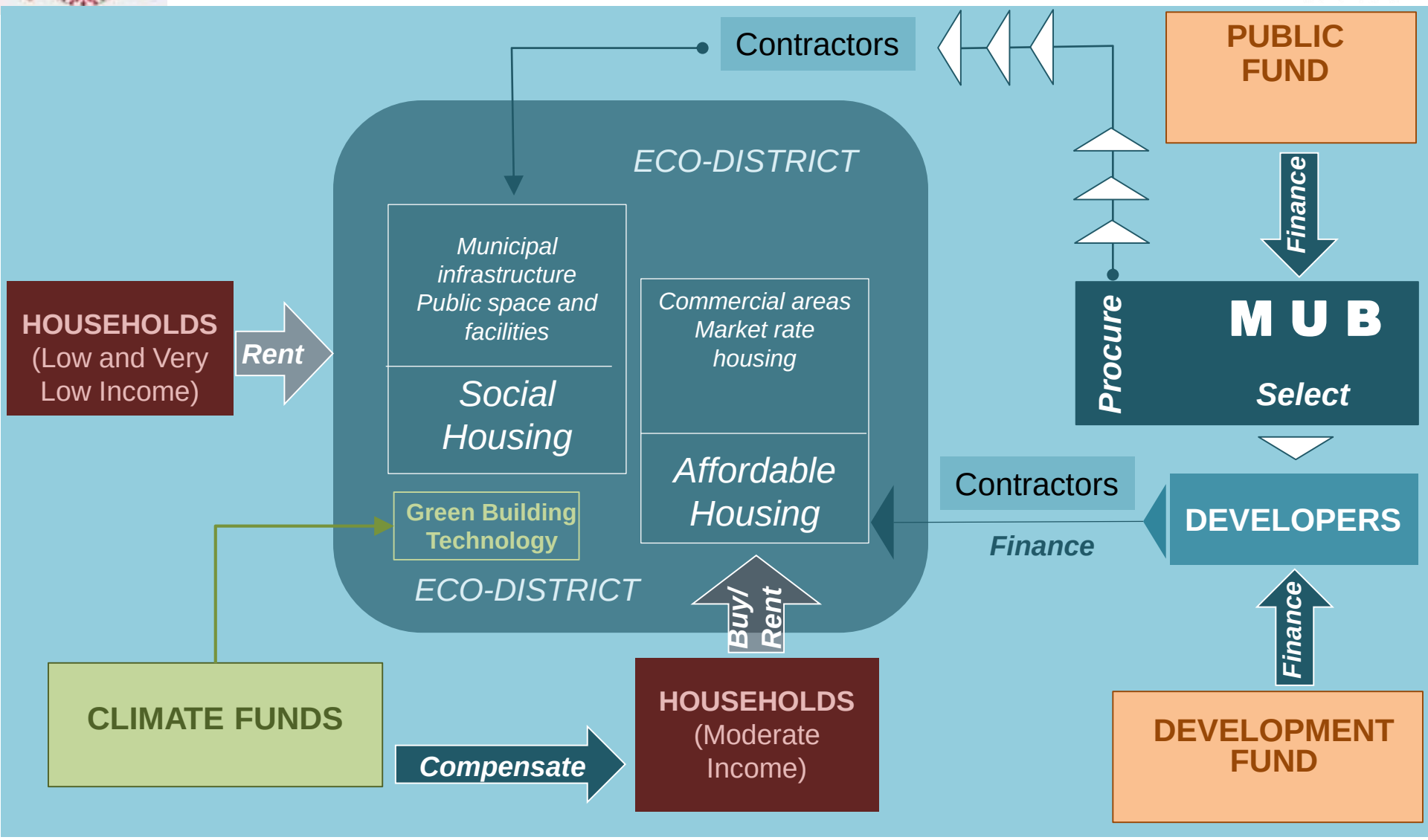
Japan Fund for Poverty Reduction

Performance Monitoring And Smart Cities



Funds arrangements – Subsidies

Japan Fund for Poverty Reduction



Project Preparation / Implementation Arrangements

ADB

Japan Fund for Poverty Reduction

1. Identification

Cluster of households willing to swap → Choice of the size and type of the URU → Agreement between Communities and MUB

2. Design/Approval

Agreement on land swap/sell and resettlement plan & Preliminary design of the URU → Contract between communities and MUB/project management unit

3. Financing commitment/Detailed design

Public fund commitment & Private sector selection → Detailed plan and design

4. Construction

Procurement → Construction and supervision → Completion of infrastructure / housing units

5. Development

Affordable/Social housing

Market rate housing commercial areas

Development coordination

6. Operation

Sustainable O&M

Operation and maintenance for urban services

Maintenance of public space, building and public facilities

Financing Solutions

Japan Fund for Poverty Reduction

- Climate Change Mitigation and Resilience Funds
Green Climate Fund…

- Grant Funds to support energy efficiency and renewable energy solutions
Japanese Fund for Joint Crediting Mechanism…

- Local Commercial Bank
(Xac Bank, TDB, Arig Bank, Ni Bank, Golomt Bank, Khan Bank…)

- Guaranties

- Private sector department of Development Banks
(ADB-PSOD, EIB, EBRD, PROPARCO, IFC)

- **Private Sector**
PPP, Energy Efficiency Performance Contract, International Infrastructure Support System (IISS)

AHURP Objective

Japan Fund for Poverty Reduction

Demonstration project and leverage private sector investment to deliver affordable and green housing stock, and establish policies, mechanisms, and standards for sustainable affordable housing (AH) and green urban development.

- Physical component will deliver 10,000 to 15,000 housing units (55% affordable, 15% social, and 30% market rate units) and redevelop 100-130 hectares of *ger* areas into ecodistricts that will be:

  (i) mixed-use with ample public space and public facilities,
  (ii) mixed-income with at least 60% of combined affordable and social housing units,
  And
  (iii) resource efficient and maximizing the use of renewable energy.

- Institutional and capacity component will:

  (i) Establish mechanisms for delivery of affordable housing units stock;
  (ii) Improved urban redevelopment process and standards; and
  (iii) Strengthened project management, and institutions for urban redevelopment and AH.

Synergies

Japan Fund for Poverty Reduction

MUB
Support the implementation of the City Master Plan Implementation,
Support NOSK activities
Ger Areas Housing Project
GADA…

ADB
Ulaanbaatar Urban Services and Ger Areas Development Investment program

Urban Transport Development Investment Program

Improving Access to Health Services to Disadvantaged Group Project

International organizations
JICA, UNHabitat, UNDP, Asia foundation, GIZ, World Bank, IFC, EBRD…

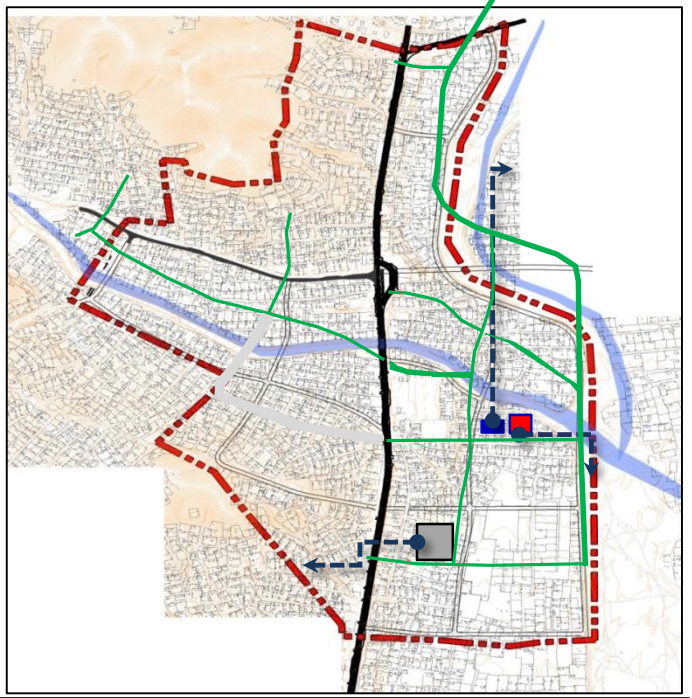
Private sector investments

Ulaanbaatar Urban Services and Ger Areas Developpent Investment Program

ADB

Japan Fund for Poverty Reduction

- **Infrastructure** - Road, Water Supply, Sewerage, Heating(Plant, Pipe)
- **Socio-economic Facilities** - Kindergarten, Business Incubator & Vocational Training Center
- **Technical Support** – Implementation, Detailed Design, Sub-Center Development, Community Engagement



Kindergarten

Heating Plant

Business Incubator & Vocational Training Center