flexible moduling in an environmental framework
reprogramming of existing structures

Large existing buildings with adaptable interior space are reserved to first house soil remediation and related industries.

As soil remediation moves out of the major spaces, other industrial uses as well as migrant housing will move in provisionally as the rest of the site is developed into industrial and light commercial enterprises.

Industrial spaces become commercial and housing.

As the remediation activities move elsewhere on the Shougang site, the remaining industrial volume can be broken up into smaller commercial and residential spaces while larger spaces will become civic and entertainment venues.

As migrants move to other parts of the site, their housing becomes middle class apartments.
programmatic transitioning

- Phase 1: Industrial
- Phase 2: Industrial, Migrants
- Phase 3: Commercial, Migrants, Greenies
- Phase 4: Villagers, Commercial, Migrants

Establish critical circulation and extents of build out

long narrow strip
Programmatic transitioning

Building Height

Density

Phase 1
Industrial

Phase 2
Industrial

Phase 3
Commercial
Migrants
Greenies

Phase 4
Villagers
Commercial
Migrants

Adapt migrant housing to middle and upper class residences, expand residential higher, convert industrial spaces to academic, commercial or garden apartments and lofts.

Establish critical circulation and extents of build out.
Programmatic transitioning

Adapt migrant housing to middle and upper class residences, expand residential higher, convert industrial spaces to academic, commercial or garden apartments and lofts

Establish critical circulation and extents of build out

---

density

building height

---

Phase 4
Villagers
Commercial
Migrants

Phase 3
Academic
Commercial
Migrants
Greenies

Phase 2
Commercial
Migrants
Industrial

Phase 1
Industrial

long narrow strip
Housing is now a mix of middle class dwellings ranging from row houses to apartment blocks within city blocks containing institutional, civic, commercial and light industrial.

Adapt migrant housing to middle and upper class residences, expand residential higher, convert industrial spaces to academic, commercial or garden apartments and lofts.

Establish critical circulation and extents of build out.
prototypical development north of the little hot lake
prototypical development north of the little hot lake

long narrow strip
Possible Contaminants

- Heavy Metals
  - Arsenic
  - Cadmium
  - Chromium
  - Mercury

- Petroleum based
  - Gasoline
  - Diesel
  - Motor Oil

- Solvents
  - Paint thinners
  - Metal degreasers

Methods of cleaning

- Excavation and landfill
- Capping
- Soil flushing
- Soil washing
- Vitrification
- Soil incineration
- Thermal desorption
- Bioremediation
- Phytoremediation
<table>
<thead>
<tr>
<th>Mechanics</th>
<th>Phytoremediation</th>
<th>Pros</th>
<th>Cons</th>
<th>Affected Contaminants</th>
<th>Plants</th>
<th>Alternative</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Hydroponically raised plants placed in contaminated water concentrate the metals in their roots and shoots</td>
<td>Cost effective for large volumes; applicability to many metals; less need for chemicals; reduced volume of secondary waste; possibility of recycling; appealing to regulators and public</td>
<td>Small, slow growing root systems; the need to specialized facilities and expertise</td>
<td>Chromium, lead, zinc, petroleum hydrocarbons, chlorinated solvents, benzene, ethylbenzene, xylenes</td>
<td>Water hyacinth, duckweed, pennywort</td>
<td>Rhizodegradation</td>
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<td></td>
<td>Contaminant migration via wind, rain, and groundwater prevented through planting</td>
<td>Less expensive; less invasive; easy to implement; aesthetic value; allows for the postponement of action</td>
<td>Not appropriate for highly contaminated sites; does not remove pollution; requires soil additives</td>
<td>Lead, zinc, copper, selenium, trichloroethylene, mercury, arsenic</td>
<td>Grasses</td>
<td>Phytodegradation</td>
</tr>
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<td></td>
<td>Plants absorb elemental metals from the soil and biologically convert them to gaseous metals and release them into the atmosphere</td>
<td>Minimal site disturbance; less erosion; no need to dispose of contaminated plants; require little maintenance</td>
<td>Less control over path of contaminants; may contaminate air</td>
<td>Arsenic, Mercury, Selenium</td>
<td>Cattails, tobacco</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Roots absorb contaminants and store them in above ground shoots</td>
<td>Cost effective for large areas; reduce in contaminant mass; metals may be extracted from plant material; metal enriched plants may be sold</td>
<td>Slow process; cannot reach deep contamination; must dispose of plants</td>
<td>Variety of solvents, Zinc, nickel, cadmium, lead, titanium, chromium</td>
<td>Sunflower, indian mustard, Chinese brake fern</td>
<td></td>
</tr>
</tbody>
</table>
Migrant Demographics

- **40,000,000**
- Downtown: 372,000 (91%)
- Suburban: 2,208,000
- Surrounding Villages: 1,431,000 (55.9%, 35%)
Implications:
Facility needs change as individuals form families.

Space Requirements:
- Single: 20 sq m
- Couple: 40 sq m
- Family: 60 sq m

Housing

long narrow strip

migrant demographics

keith case - zhang ruoxi - ma xiaoying - kristina katic - marissa grace desmond
**migrant demographics**

**Family unit**

- **Shougang family**
  - Age ranges:
    - Under 15
    - 50-80

- **Migrant**
  - Age range: 15-39

- **New “family” group provides mutual support**
  - Shougang family provides migrants with low rent
  - Migrant provides family with labor
  - Both provide emotional support

**Distribution**

- **Shougang family**
- **Migrant**
- **New family group**
long narrow strip

remediation via sunflowers

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reuse of existing infrastructure as remediation site
In 2005 the Chinese government proposed building 5 ecocities.

- Dongtan
  Self sustaining community near Shanghai
  500,000 people by 2030
  Criticized as an elite community focused towards ecological commuters

- Guangming
  Self sustaining community near Shenzhen
  7.92 sq km area
  Farmland incorporated in landscape and buildings

- Communities with wind or solar initiatives
- Chinese government sponsored ecocities
- Proposed socially conscious ecocity
everyone can remediate their share
environmentally conscious living on any scale
one soil, one dream
SELECTION OF BASES FOR [ PHASE O ]

1. ENERGY STATION | 能量基地
   EFFICIENT & TOTALLY COVERAGING NET
   能量站形成的网络可以有效覆盖整个区域
2. HUGE WORKSHOP | IN GOOD CONDITION | 质量好规模大现有厂房
3. EXISTING HOUSING AREA | 现存的可居住区域
4. CLOSENESS TO RAILWAY | 铁路交通的可达性
<table>
<thead>
<tr>
<th>Phase 0</th>
<th>Phase 1</th>
<th>Phase 2</th>
<th>Phase 3</th>
<th>Phase 4</th>
<th>Phase 5</th>
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</thead>
<tbody>
<tr>
<td><strong>HOUSING</strong></td>
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<td><strong>INDUSTRY</strong></td>
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<td><strong>COMMERCIAL</strong></td>
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<td><strong>EDUCATION</strong></td>
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*four reactive functions*

*Long narrow strip*
long narrow strip
long narrow strip
land use of 20 km squared

long narrow strip

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land use

long narrow strip

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Mixed Use

The success of a mixed use block depends on the logical integration of varied programs at the architectural scale. While not every combination may result in a new architectural prototype, understanding the way that two distinct programs will interact is crucial to plan a system of growth based on flexible modules whose function is constantly changing.
**Beijing**  Currently in Beijing, and around the Hougang site, the city has developed according to the tower-in-the-park pattern, where there is little hierarchy in terms of road width or treatment between circulation within and between developments. Generally and programmatic uses are not mixed and the space between the towers are reserved for parking and limited recreation.

**New York**  The hierarchy between roads and alleys is extreme in New York City. There is little public access through or into the block, rather major and minor circulation are organized by the surrounding streets. Commercial fronts the surrounding streets exclusively or develop upward within the building. Programs are straited and stacked through the building, but not mixed.

**Hutongs**  In the hutongs there is a clear hierarchy between public and semi-public circulation. Commercial fronts the surrounding streets, which are more direct. Individual houses are accessed from serpentine lanes that create spaces for semi-private functions.
The intention of this project was to develop a new typology of block that combines elements from contemporary urban models as well as more traditional, human-scaled precedents. In order to create flexible modules that could adapt to any combination of mixed uses within the block, the main circulation is directed through the center of the block, serving as access, green space and buffer between the program elements. The surrounding streets are linear and direct to facilitate bicycle and small vehicle traffic, but are narrower and more closely resemble alleys. An architectural device that steps down towards the center of the block immediately provides more urban area for commercial frontage as well as the opportunity for semi-private spaces in front of residences.
furnace # 4 as a living machine - plan

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long narrow strip
long narrow strip
long narrow strip
long narrow strip