Unit 1: TheCityAndTheCity 2023

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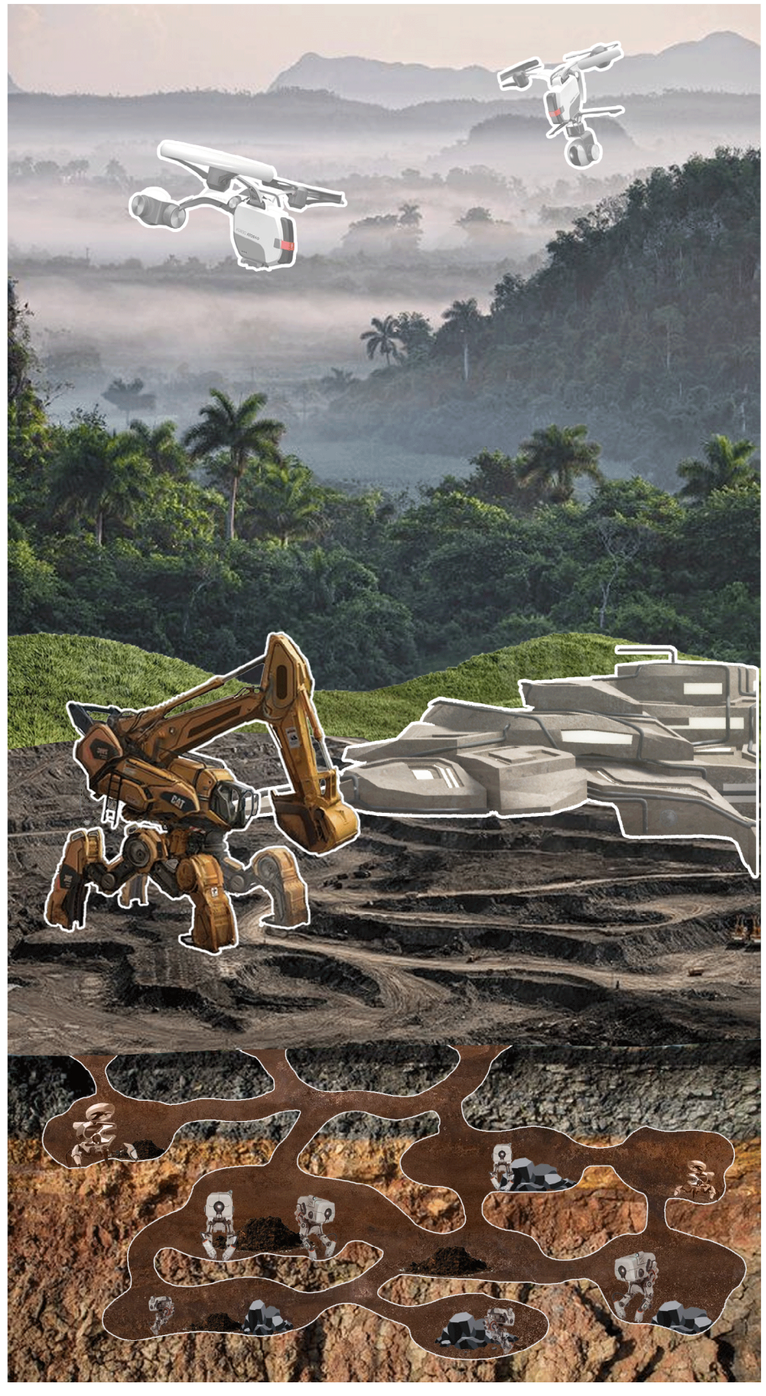
Rebirthing the Mine

Keywords:
Treatment of mine pollution & ecological restoration



Background Analysis

“Mining in Borneo”

The mining industry in Borneo is becoming increasingly hot, most of the mines are dug for coal mining, Indonesia as a developing country, the demand for coal is also increasing, and the export of coal also benefits the country a lot, but the mines left in the rainforest are difficult to restore, which has caused irreversible damage to the ecology of Borneo.

Abandoned Mine

Mining machines send plumes of smoke into the sky over Borneo, dust falls on farmers’ crops and degrades the quality of the crops, while locals suffer from respiratory diseases in the harsh conditions, and people are aware of the environmental damage caused by industry, but it is still a long way from getting their homes back from mining companies.

Air Pollution

Deforestation

In Borneo, many mining companies cut down large areas of primary forest in order to expand mining, resulting in the loss of habitat for plants and animals in the tropical rain forest, which triggered changes in the entire food chain in the rain forest.

Land Deterioration

The heavy metals left behind in the mines continue to spread out from the soil, making it difficult for the land to grow plants again after mining, and the pollutants that spread to the fields of local residents have greatly reduced the yield of crops.

Water Pollution

Mining machines discharge sewage continuously into the river, causing serious damage to the life in the water, and at the same time, this polluted water not only endangers the main source of food for people, but also brings various diseases, especially for children and the elderly.

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Mining industry

COAL MINES NEGATIVELY IMPACT VILLAGERS, ECOSYSTEMS IN BORNEO

Pollutants produced by mining companies quickly spread across Borneo through the soil, rivers and air.

Government action

A HUNGER FOR COAL THREATENS THE HEART OF BORNEO

The government has taken various measures to reduce the impact of industry on people and nature.

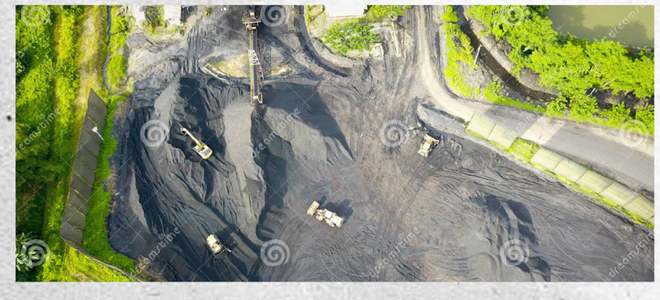
Mining has made an important contribution to the economic development of Borneo, providing export revenue, jobs, and resources for power generation. However, the environmental impacts of mining have also been severe and there is a growing recognition that continued economic development in Borneo will be contingent on significant improvements in the environmental and social practices of companies and individuals operating there. Furthermore, much of the mining in Borneo is for coal; burning coal is a significant contributor to climate change which is adding to environmental and social pressures in Borneo and around the world.

Mining in Borneo has been carried out by traditional miners since the eighteenth century. Large scale commercial mining took off following geological surveys by the Dutch in the first half of the twentieth century and has since grown rapidly. In recent years, both the Malaysian and Indonesian governments have expressed interest in further expanding large-scale commercial coal production in Borneo. The challenge for the governments' vision for conservation and sustainable use enshrined in the HoB Declaration is therefore to ensure that as producers turn their attention to deposits within the HoB, careful spatial planning is conducted, and good regulations are developed and / or are rigorously and consistently enforced.

In many ways however, small scale miners pose a greater challenge for regulators than larger operators because their activities are more numerous and they are often dispersed throughout inaccessible areas. Steps need to be taken to ensure that the access and activities of small

The Government Has Made Policy Interference In The Mining Industry

The Tenth Malaysian Plan sets out plans for increased exploitation of coal resources in Sabah and Sarawak. These developments intend to reduce the cost of coal imports and increase regional energy security. The plans include the construction of two new coal power plants, one in Lahad Datu, Sabah, and one in Peninsula Malaysia, together with the associated mining infrastructure to meet their capacity. However, the Sabah plant has received significant media and NGO attention calling for the project to be abandoned. Challenge has also come from the Ministry of the Environment, who rejected the initial Environmental Impact Assessment based on its failure to address a number of environmental sensitivities in the area. In addition, the Sabah State Government has committed to conserving the Maliau Basin assigning it Class 1 Protection as Heritage Conservation under the Cultural Heritage Conservation Enactment 1977, such that future coal extraction of reserve in this area would require legislative approval.



Mining Companies Need Legislative Approval

Regulations in Borneo, and in particular in the HoB, need to guide companies to implement more environmentally and socially sustainable practices to avoid these potential adverse consequences.

To maximise compliance, regulations need to be clear and enforced. One of the challenges indicated by companies through consultations were issues related to unclear or conflicting regional regulations. Decentralisation in Indonesia has given regional government the responsibility to set and maintain regulations, but these efforts must still be coordinated.

POTENTIAL ENVIRONMENTAL ISSUES DUE TO POOR MANAGEMENT OF MINING ACTIVITIES

●Habitat loss

Open cast mining is land intensive necessitating the removal of large areas of terrestrial habitat and the loss of associated ecosystem value. There are also often secondary impacts which lead to habitat loss associated with both open cast and underground mining activities.

●Land removal and degradation

Large volumes of soil and overburden are extracted and processed in mining operations, and these can generate contaminated tailings as by-products. This can result in soil degradation, erosion and contamination, and also generate geohazards such as subsidence and landslides. This reduces land productivity and value, and can also lead to safety risks for local communities.

●Degradation of watercourses

Mine effluent can adversely affect water quality by increasing sedimentation in local watercourses and introducing contaminants. Even low levels of mercury and cyanide (used in gold processing) are toxic to most forms of wildlife and humans.

Regulating And Enforcing Mining In Borneo

Effective regulation and enforcement is a critical part of mining operations. Regulations help ensure operations are carried out in a manner which reduces the risk of undue negative impacts to third parties. In doing so, regulations help maximise the economic benefits of an operation without compromising or sacrificing the economic, environmental, and social needs of others.

Of particular concern are illegal mines. Illegal mines are those which operate without a licence, and often use inefficient and polluting techniques with little regard for health, safety, and the environment. Most illegal miners operate at a small scale, however there are some much larger scale operations which avoid enforcement. One illegal coal mining operation is reported to have 16 excavators and 200 trucks at their disposal. Accurate figures are difficult to gauge but illegal miners were thought to account for more than 5% of coal production in South Kalimantan107 in the year 2000, and across Kalimantan and Sumatra illegal coal production is thought to be in the region of 20 million tonnes per year108 today. These miners degrade concessions before commercial operations begin, resulting in lost private returns and considerable lost government revenue. National and regional governments can do more to control informal decision making and ensure that regulatory enforcement applies to all mining operations.

Tracking the origin of mining products is challenging, and stemming the illegal mining trade is hindered by high and diffuse domestic and international demand. The ease with which illegal miners can find a market for their goods despite the poor environmental and social practices under which they were produced means there is currently little incentive to improve operations. This makes it all the more important that governments work to reduce illegal mining and enforce regulations.

Forcing Mining Companies To Carry Out Land Restoration

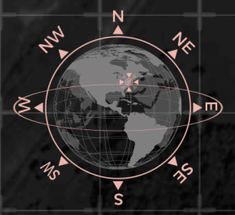
Mining companies, particularly those funded by large multi-national commercial banks, are required by their financiers to demonstrate appropriate management of environmental and social impacts. For project finance funded mining developments, these environmental and social commitments are often established under the Equator Principles.

In the HoB specifically and there are several challenges with the current approach:

● Mine development and expansion may be funded using corporate loan facilities as opposed to project finance which means the use of proceeds are not always known by a bank. Banks face difficulties applying the Equator Principles to these types of facilities and thus face challenges ensuring responsible mine development.

● Mine development or expansion may be supported by local or national Indonesian or Malaysian banks which are either not Equator Principles signatories, or have limited environmental and social risk management functions.

● Even where mine expansion or development is supported by banks with leading environmental and social management functions and risk screening procedures, banks are challenged by how to practically, and pragmatically, implement these commitments, and in particular identify areas of high biodiversity value (e.g. High Conservation Value Forests) in their client's projects or portfolios.



2007

Vast areas of forest have been cleared for mining. Women and children suffered from respiratory problems in the harsh conditions of open-pit coal mines, where dust fell on crops

Open-cast mining

2015

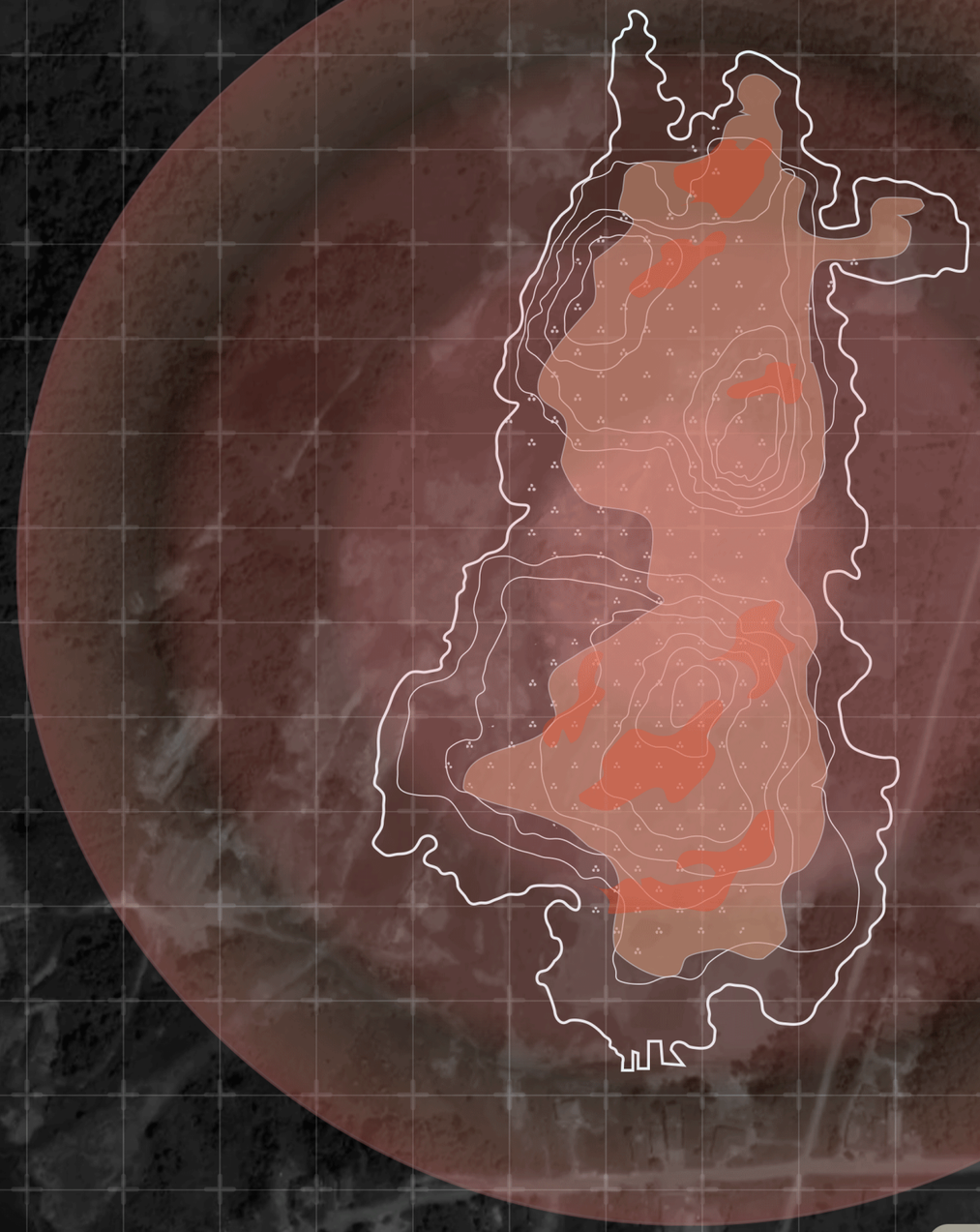
The machinery in the mine rumbles, pollutants spread through the soil to local farms, the land is degraded, crops are dwindling, lakes left in the mine contain all kinds of heavy metals, and the sky is covered in thick black smoke

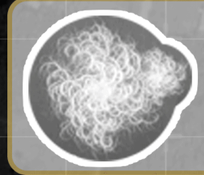
Ecological collapse

2023

Due to the continuous removal of the overburden, the ground is permanently disturbed. Sulfur minerals in the mine oxidized to pyrite and pyrite,
resulting in a pH below 3 that prevented continuous vegetation development

Quarries

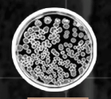




Coal Environments as Natural Habitats for Microbial Communit, they have many resident biomes

Bacillus mycoides CSB25

Bacterial flora distribution



Bacillus paramycoides SP3

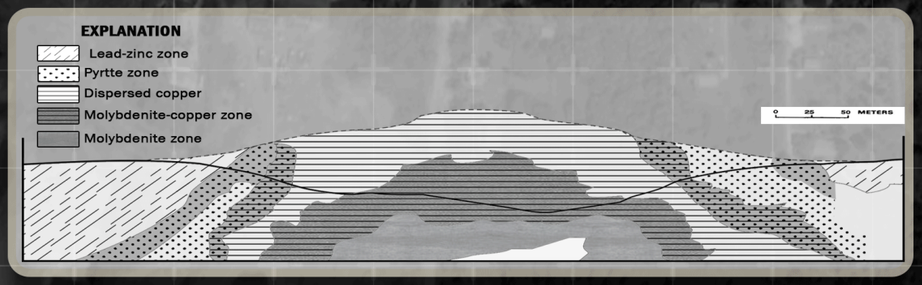
Bacterial flora distribution

Plant-growth-promoting

Bacterial flora distribution

Sulfate-reducing bacteria

Bacterial flora distribution

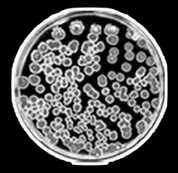


Oil palm and coal mines overlap anaencircle and traverse the countryside

Microbiological Analysis

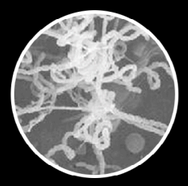
Bacillus mycoides CSB25

Location: Coal residues, coal sediment, and rhizosphere coal degradation.



Sulfate-reducing bacteria

Location: Mining sites. Attenuate toxic metal/metalloid concentrations.

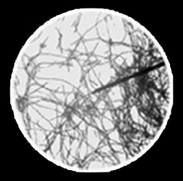


Nocardiaceae

Location: Survival at petroleum dewaxing, sewage.
Function: It can slowly purify sewage.

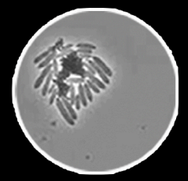
Nocardia in tin tailings (Nocardiopsis sp.)

Location: The lead-zinc mining area.
Function: It can effectively degrade methyl parathion.



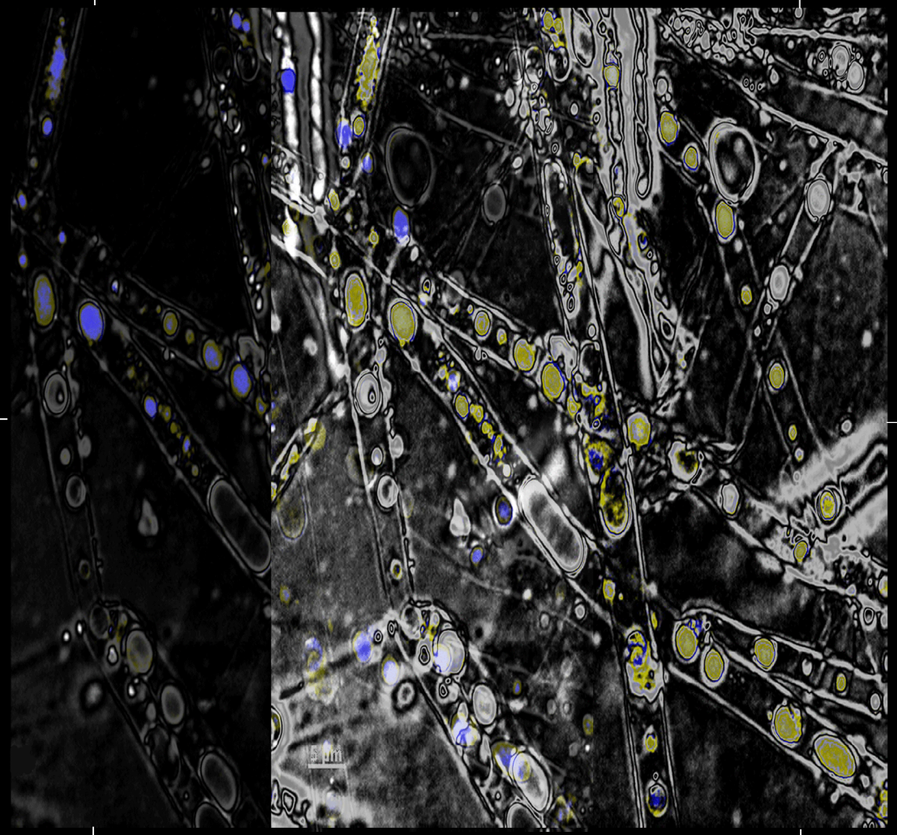
Bacillus paramycoides SP3

Location: The leachate of coal-mine-overburden rocks.
Function: Eco-friendly removal of selenite with the concomitant bio-synthesis of Se nanoprticles.



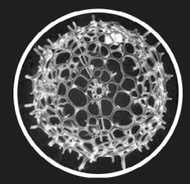
Plant-growth-promoting (PGP) bacteria

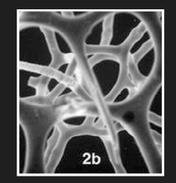
Location: Coal slurryfrom discard-dumps.
Function: Positively influence plant-growth, hormone balance.



There are six main types of bacteria in the site. Their presence is of great benefit to biomaterials, site building materials and microbial robots.

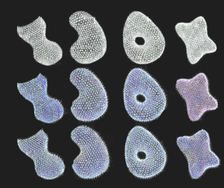
Microorganisms in Biomaterials





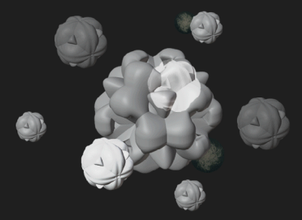
Use: For sale to the outside world, the biomaterial degrades into fertiliser after use.

Microbiological applications in building materials



Use: Bacteria in the building induce biomineralisation and repair the building structure on their own.

Microbes in Nanorobotics



Definition: Microbial nanorobots are the product of mixing and culturing nanorobots and microbes together.
Use: Treatment of site contamination.


Why are microbes are the soul of the site?

Work Procedure

Existing problem

Detection of site conditions

The legacy of pollution from the mine has been very damaging to the surrounding flora, fauna and inhabi-tants.

Pollutant spread

Pollution spreads to water

BANDONED MINE

Land without vegetation

Soil degradation

Pollution seriously harms soil

Recycling pollutants

Operated by small machines on the field

We use robots to collect the contamination, which is analysed by the mastermind and then processed.

Excavate More Resources

Robot further probes the soil

DETECTING POLLUTANTS

Type of pollutant tested

Organic substance

Massive cyanobacterial emergence

COLLECTING POLLUTANTS

Robots recycled into buildings

Metallic substance

Significant mineral contaminants

LABORATORY

Significant mineral contaminants

Reusing pollutants

Operate in the mothermachine

Organic fertilizer

Reactivation of the soil

Pigment

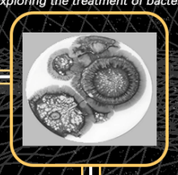
Selling like an outsider

Fuel

Selling like an outsider

BACTERIAL REACTION TANK

Exploring the treatment of bacteria



NEW PRODUCTS

Heavy metals obtained from pollution

Extract

ALGAL REACTION TANK

Analysing the habits of cyanobacteria

BIOLOGICAL MATERIALS

Biomaterials from contaminants

Transport

Transport

PRODUCT WAREHOUSE

Preservation of substances

Export

Reprocessing of recovered contaminants to obtain biomaterials and other products. This can be used for building construction and marketing to the outside world, among other things.

Restoring ecology

Sustainable development

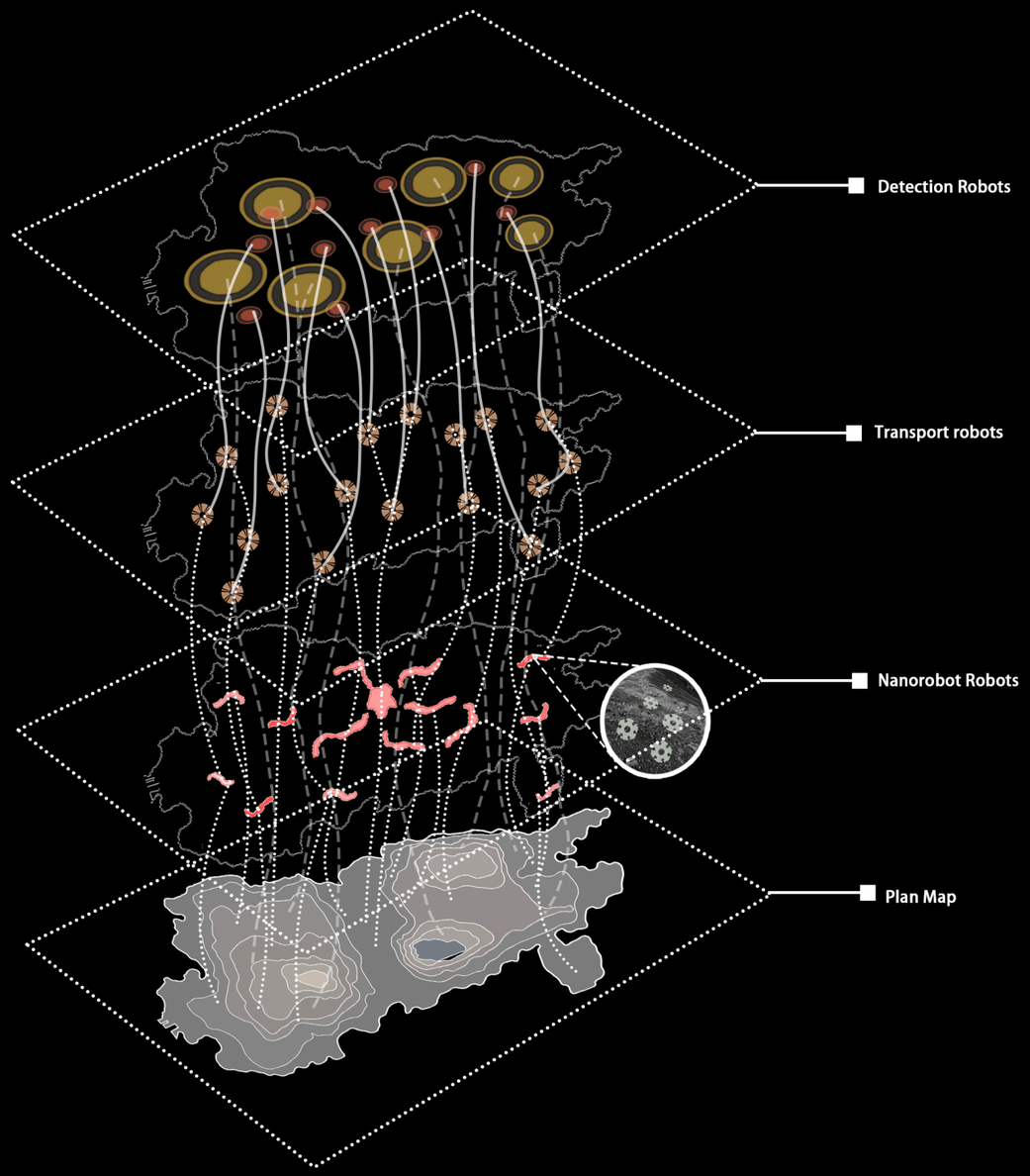
Obtain working capital

Reactivation of buildings and soils

Restoring ecology

Sell it for profit to outsiders

Robot and Bacteria Distribution Map



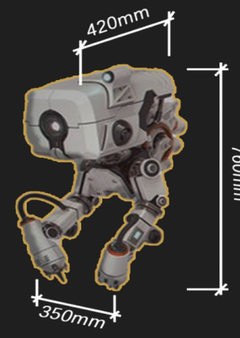
Airborne Detection Robots

Land Detection Robots

Recycling Release Robot

Nanorobot

Land Detection Robots

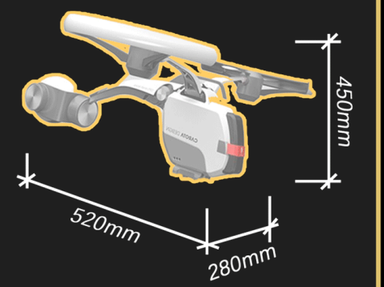


Function: Collect soil and bring it back to the mastermind.
Mode of action: Walking on land.

STEP 01
Move to site

STEP 02
Soil collection

Airborne Detection Robots



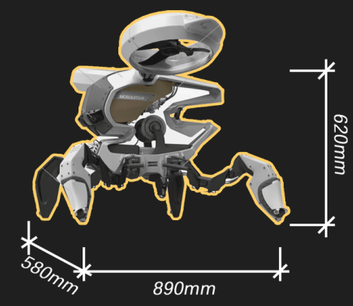
Function: Monitoring of pollution

Mode of action: Flying in the air.

STEP 01
Move to site

STEP 02
Infrared detection

Recycling Release Robot



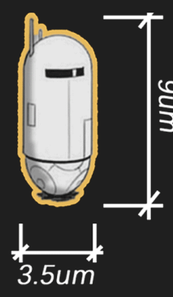
Function: Transport nanorobots and contaminants.
Mode of action: Walking on land.

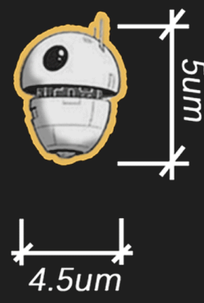
STEP 01
Move to site

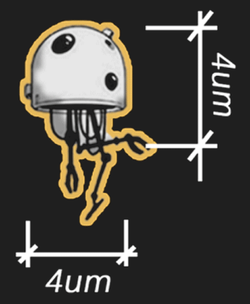
STEP 02
Take out conveyor belt.

STEP 03
Transport Nanobots

Nanorobot Robots



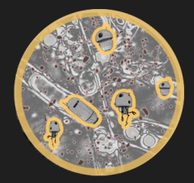




Function: Converts contaminants to sediment and brings it back.
Mode of action: Working in the soil.

STEP 01
Transport nanobots

STEP 02
Unleashing Nanobots

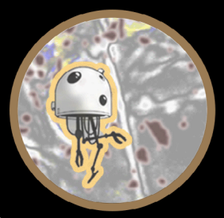


STEP 03
Converting subsur-face contaminants to precipitationrecovery.

STEP 04
Recovery of nanoro-bots and sediments.

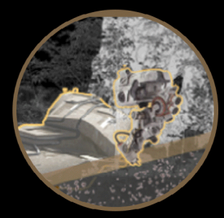
PROBE

Two probe robots were sent out to survey the site for contamination and then bring the soil back to the mastermind for material analysis.



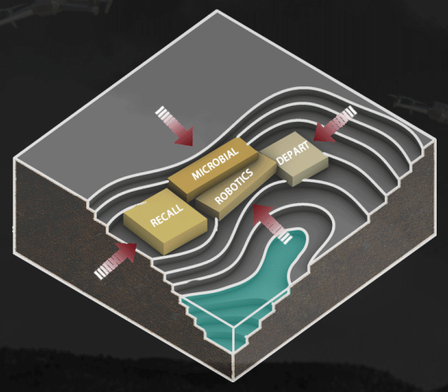
NANOPROCESSING

Nanobots were sent out based on the composition of the detected contaminants.
The nanobots are transported to the site with the appropriate substances and chemically react with the underground pollutants to form a precipitate.



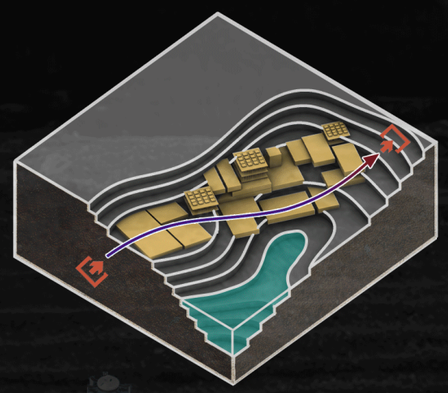
RECYCLE

The nanobots carrying the precipitates are recovered by the head-back robots and brought back to the mastermind for further production and utilisation.



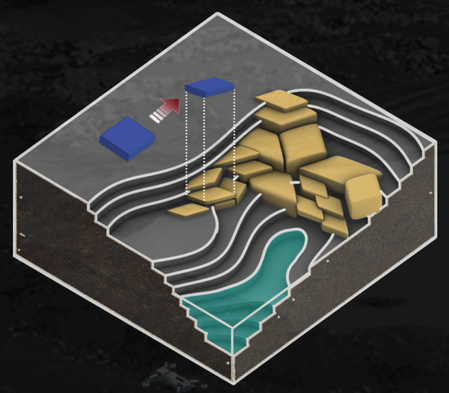
Step 01
Four main zoning districts are situated on the site.

Step 04
Determine the three final flows and further deepen the shape.



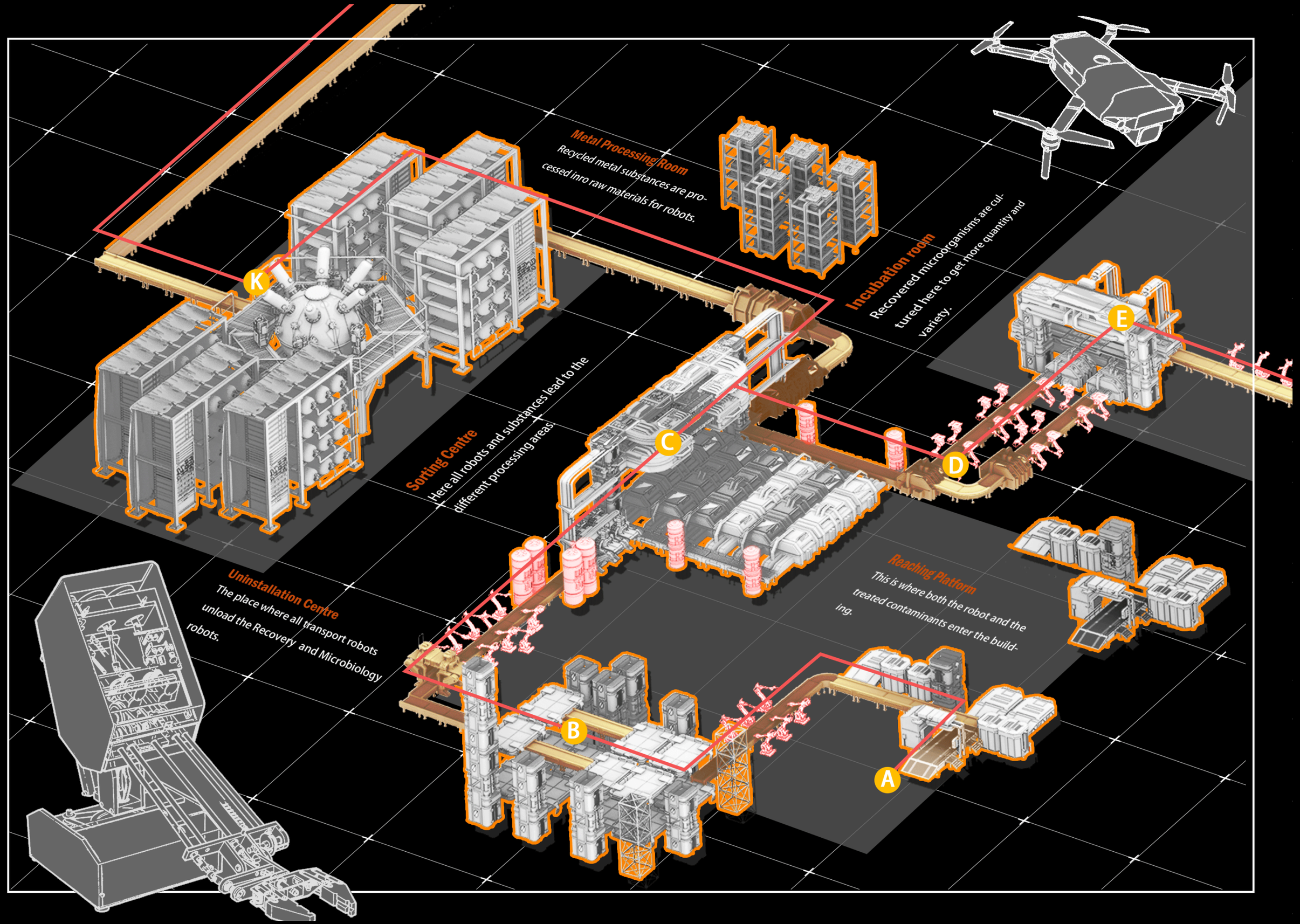
Step 02
The initial arrangement of the body blocks is based on the flow needs of the robot.

Step 05
Deepening of window and door openings in buildings.



Step 03
The building becomes more rounded and adapts to the shape of the site.

Step 06
The building was treated for robotic transport and exhaust ducting.


Metal Processing Room
Recycled metal substances are processed inro raw materials for robots.
Incubation room
Recovered microorganisms are cultured here to get more quantity and variety.
Sorting Centre
Here all robots and substances lead to the different processing areas
Uninstallation Centre
The place where all transport robots unload the Recovery and Microbiology robots.
Reaching Platform
This is where both the robot and the treated contaminants enter the building.
K
C
E
D
B
A

Warehouse
Parking of undeparted and ready-to-depart robots.

Departure Platform
This is where all the robots load the required items and depart.

Sorting Warehouse
Sorting and storing the produced robots in the warehouse.

Combined Laboratory
Load the produced microbial robot onto the transport robot.

Metal Processing Room
Recycled metal substances are processed into raw materials for robots.

Robotics Factory
The processed metal is used to produce various type of robots.

Robotic Arms
Places and moves items on conveyor belts for faster flow.

H

I

J

G

E

F

Product Factory
Biomaterials and microbial robots are stored here in zones and transported outwards.

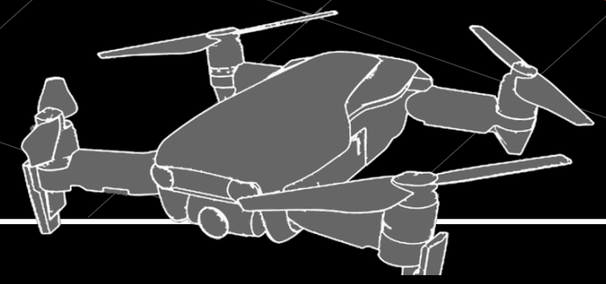
Finished goods warehouse
Storage of products destined for outward shipment, ready for transport.

Transport platform
Ship and sell some of the biological material to the outside world at a profit.

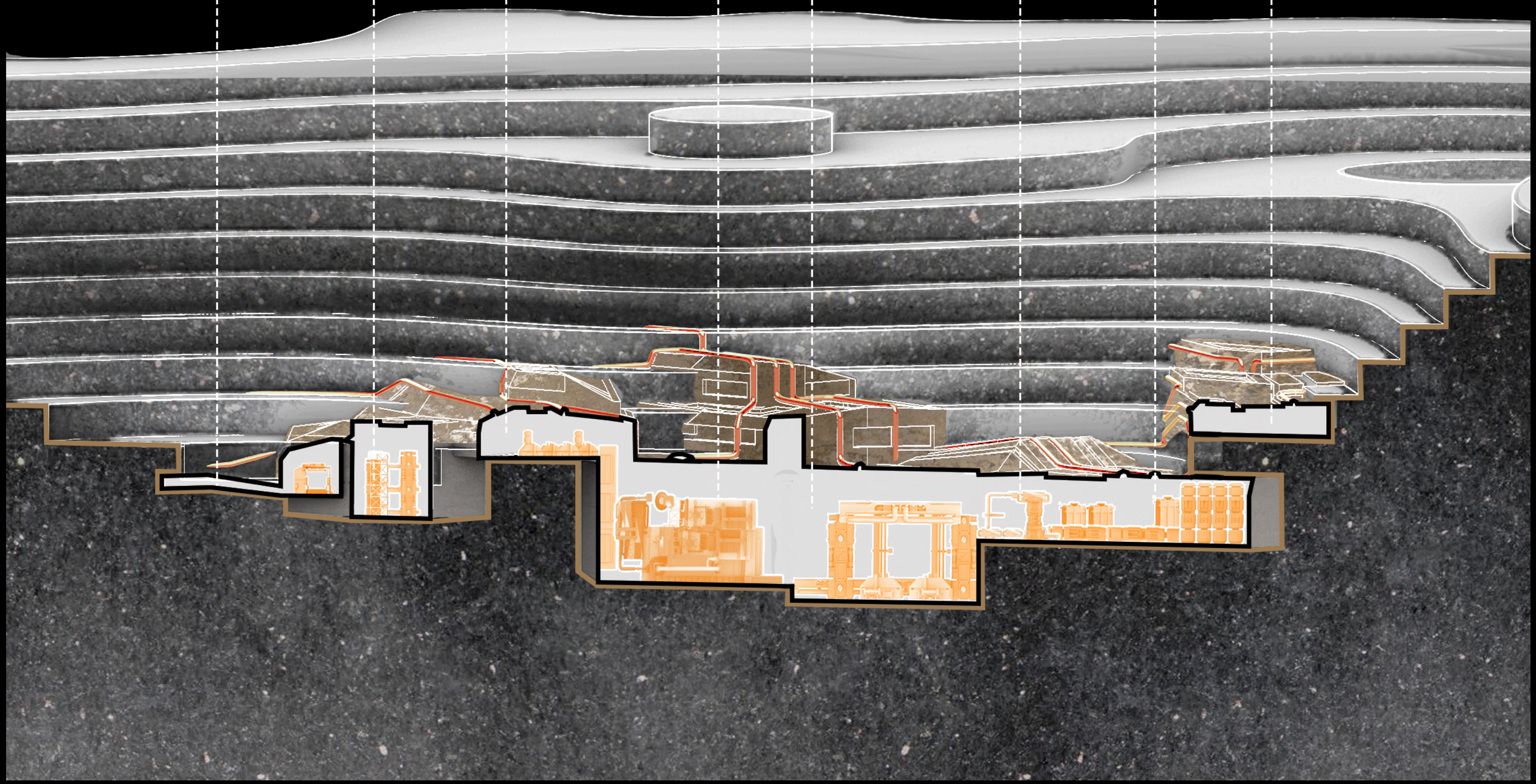
Incubation Room
Recovered microorganisms are cultured here to get more quantity and variety.

Microbiological Repository
Preservation of microorganisms in warehouses and production of microbial robots and biomaterials.

Building Material Factories
Converting microorganisms into biomaterials to act on the building itself.

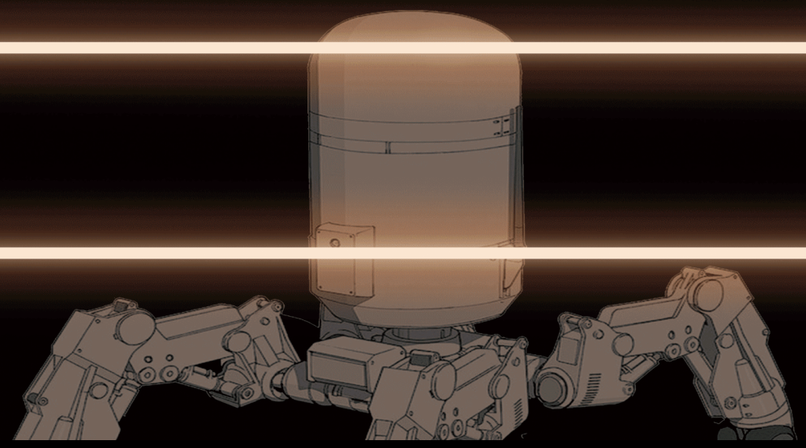


Arrival platforms
Unloading Centres
Sorting Centre
Incubation Room
Microbiology Warehouse
Product Plants
Warehouse



Sorting Center

Recyclables and robots are diverted here to go to different areas for processing and utilisation.




Microbiological Laboratory
The cultured microbes are sent to a nanorobot lab to be loaded onto nanorobots, which are then sent back to work in the mines using machines such as drones.
There are six main types of bacteria in the site. Their presence is of great benefit to biomaterials, site building materials and microbial robots.

[Mining site]

2023

No living organisms can survive cause legacy pollution in the mine

[Mastermind Architecture]

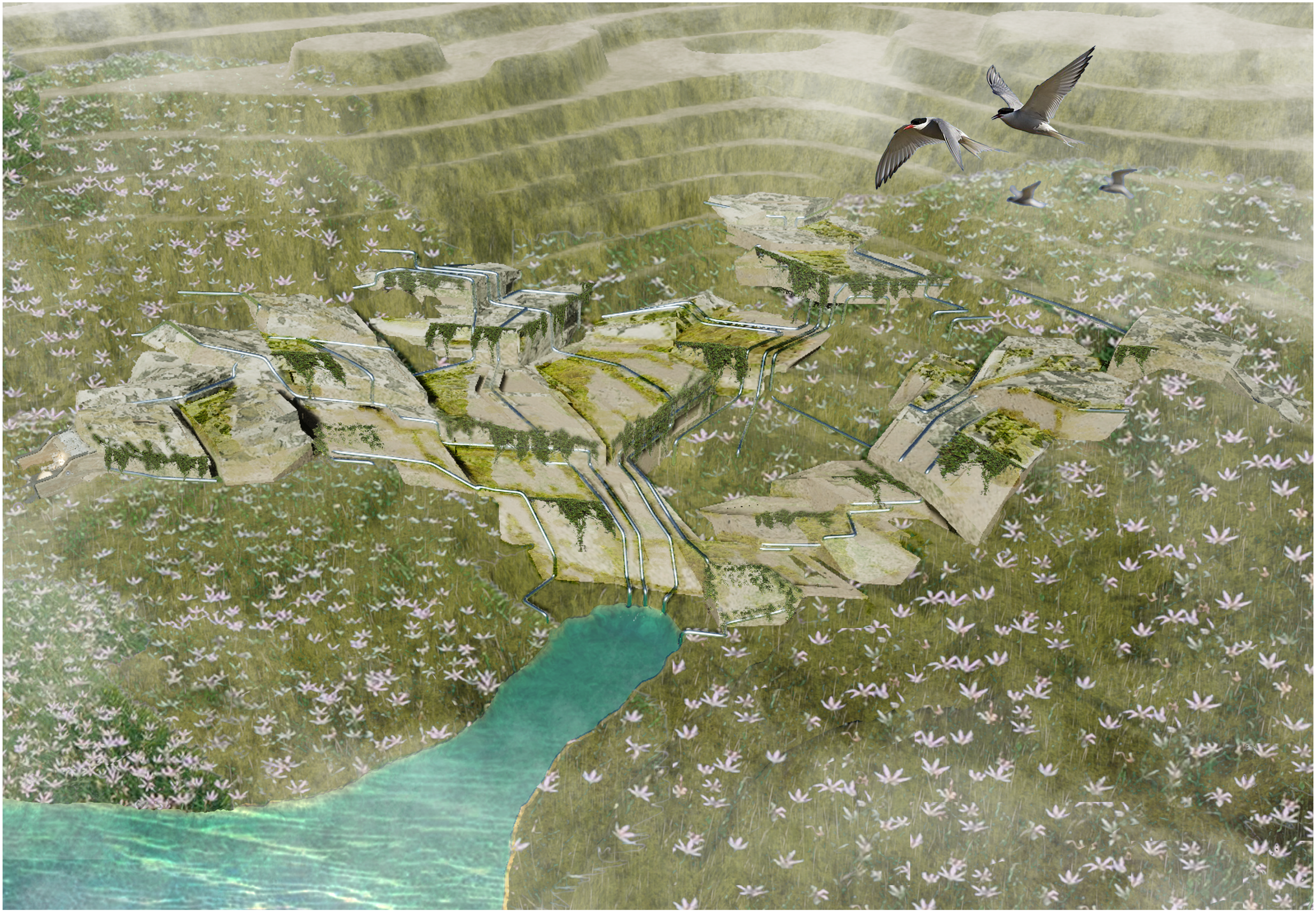
2045

Companies invest in improving the environment

[Architecture site]

2070

The environment is alive and well after restoration



ROTM 2.0

100%

Thank You For Watching！