

LIVE TUNA TRANSPORT SKILLS

Establishment of skills for transportation of live tuna over extended periods of time and long distances to facilitate their stable cultivation and exhibition



Challenges in live tuna transport

Tokyo Sea Life Park, which opened in 1989, maintains a 2,200-ton exhibition tank housing about 200 fish, including tuna. The bluefin tuna are mainly obtained from a remote location about 1,000km from Tokyo. Since the fish's morphology and features are suited to life in vast open waters, the surface of their bodies is delicate, making it extremely difficult to contain them in a limited amount of space and transport them for prolonged periods and over great distances, while maintaining a high survival rate.



| Aquatheater exhibit at Tokyo Sea Life Park ※ 1 | Bluefin tuna ※ 2

Japanese Translation

マグロの安定的な飼育展示を可能にする長時間・長距離輸送ノウハウを確立

マグロの輸送における課題

葛西臨海水族園（1989年開園）では、水量約2,200トンの水槽でクロマグロなど約200尾を飼育展示している。クロマグロは主に東京から約1,000キロ離れた遠隔地から入手しているが、マグロは広大な外洋の暮らしに適した形態や特性があるため、体表が傷つきやすく、限られたスペースに収容し、高い生存率で長時間・長距離輸送を行う事は非常に難しい。

Figure※

- 1 展示水槽（アクアシアター） 3 輸送のワンシーン 4 専用の担架で活魚船から活魚車の水槽へ搬入する
2 クロマグロ（Bluefin tuna）



Expertise that facilitates transport of tuna over prolonged periods and great distances, while maintaining a high survival rate

(Key Points)

To reduce various damage to the tuna during transport

1. One fish at a time is removed from the farming (cultivation) pen or cage, and a dedicated stretcher is used when handling the fish.
2. Ample water as required by body weight and space are secured to enable the fish to steadily swim in the live fish transport ship or vehicle.
3. When the fish is moved by net or stretcher, it is done very swiftly.

(Results)

An 83-100% survival rate of fish transported by live fish transport ships to the aquarium over the past five years (on average 92%)

Transporting tuna ※ 3



Transferring tuna from a live fish transport ship to the water tank of a live fish transport truck using a dedicated stretcher ※ 4

高い生存率を維持したまま長時間・長距離を輸送するノウハウ

(要点)

～輸送中に受ける様々なダメージを軽減するために～

- ① 養殖（蓄養）生簀から1尾ずつ釣上げ，取り扱う際は専用の担架を用いる
- ② 活魚船や活魚車では安定して遊泳できるスペースと魚体重あたりの必要な水量を確保する
- ③ 網や担架で運ぶ際は，極力短時間で行う

(実績)

直近5年間の生残率（活魚船積込数に対する水族園搬入数）は83～100%（平均92%）

PRESERVATION OF CULTURALLY SIGNIFICANT GARDENS

To preserve and enhance the value of culturally significant gardens through restoration and repair works



Overview of preservation of culturally significant gardens

At nine metropolitan gardens, efforts are underway to enhance the value of the gardens and preserve these cultural properties by conducting restoration and repair works on buildings and other structures based on historical records and carrying out management and maintenance in a way to ensure that gardening skills are sufficiently passed down to younger workers.



Tsubame-no-Ocha teahouse at the Hama-rikyu Gardens ※ 1



Tokyo Grand Tea Ceremony at the Hama-rikyu Gardens ※ 2

Japanese Translation

文化財庭園の復元・修復等による保存及び価値の向上

文化財庭園保存の概要

都立庭園（9庭園）については、史実に基づく建造物等の復元・修復や、庭園技術を継承した維持管理の実施により、庭園の価値を高め、文化財の保存を図っている。

Figure※

- | | |
|------------------|---------------|
| 1 浜離宮恩賜庭園「燕の御茶屋」 | 3 小石川後楽園「円月橋」 |
| 2 浜離宮恩賜庭園「東京大茶会」 | 4 庭園技術の継承 |



Initiatives for preservation of culturally significant gardens

- Efforts are being made to pass down garden maintenance techniques to younger generations.
- Teahouses and other historical structures are being restored and repaired.
- Events are held to introduce traditional Japanese culture, such as demonstration of falconry and tea ceremonies.



Engetsukyo Bridge at the Koishikawa Korakuen Gardens ※ 3



Garden maintenance techniques passed down to younger generations ※ 4

文化財庭園（都立庭園）保存の取組

- ・維持管理を通じて培われた庭園技術の継承
- ・御茶屋などの、建造物等の復元・修復
- ・放鷹術や茶会など日本の文化を伝える催しの実施

“UMI-NO-MORI (SEA FOREST)” PROJECT AT THE PORT OF TOKYO LANDFILL SITE

Transforming a “mountain of waste” into a beautiful forest to create a “green island”



Turning a “mountain of waste” into a “green island” by planting trees and cultivating a forest



Site being used as a landfill (Around 1975–1990) ※ 1

<Source>

A 100-Year History of Tokyo Metropolitan Government Sanitation Services
(Tokyo Metropolitan Government Bureau of Sanitation)

Japanese Translation

「ごみの山」を美しい森に生まれ変わらせ「緑の島」に

「ごみの山」で植樹活動、森の育成などを行い「緑の島」へ

Figure※

1 ごみの埋立状況（1975～1990年頃）

出典：東京都清掃事業百年史
（東京都清掃局）

2 堆肥と建設発生土の混合土

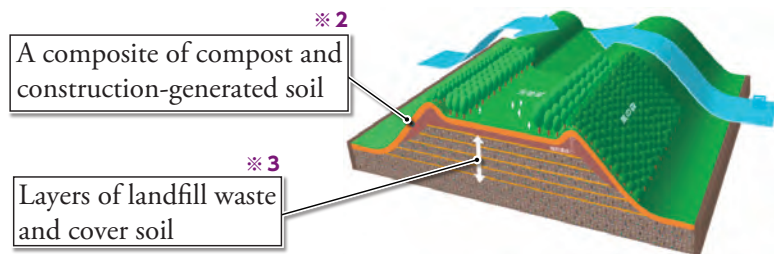
3 埋立てられたごみと建設発生土の層

4 植樹5年後

💡 Creating a forest using recycled materials, with citizen participation

Creating a forest using recycled materials

Importance is placed on maintaining a recycling perspective. For example, pruned branches and leaves from Tokyo parks and roadside trees are used to make compost, which is then mixed with construction-generated soil to create the soil.



Creating a forest through citizen participation

Activities ranging from the cultivation of saplings from acorns, etc., to the planting of trees and cultivation of forest are carried out with the cooperation of Tokyo citizens and companies.



※4
5 years
after
planting



資源循環型、市民参加による森づくり

資源循環型の森づくり

都内の公園、街路樹の剪定枝葉から堆肥をつくり、建設発生土と混合して土づくりを行うなどリサイクルの視点を大切にした資源循環型の森づくり

市民参加による協働の森づくり

ドングリから育てる等の苗木づくりから植樹、森の育成までを都民や企業との協働で実施

COLLECTING AND ACCUMULATING DATA ON GROUNDWATER AND LAND CHANGES

To protect the lives and assets of Tokyo citizens from land subsidence



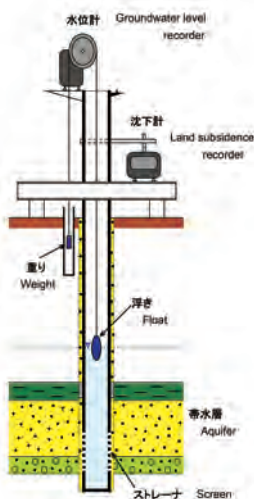
Problems due to heavy of groundwater withdrawal with the progression of industrialization

Land subsidence due to heavy extraction of groundwater has caused serious damage. More than 4.5 meters of subsidence has been observed.

To grasp the long-term situation of subsidence, the Bureau of Construction monitors groundwater levels and land heights, and collect these data.



| Ground sinking lower than the river surface (around 1963)※ 1



Japanese Translation

地盤沈下から都民の生命と財産を守る

産業の進展に伴う地下水の大量汲み上げによる課題

地下水の大量汲み上げによる地盤沈下による深刻な公害が発生。

最大4.5m以上の地盤沈下が観測。

地盤沈下は、長期にわたり進行するため、地下水位と地盤の変動を計測・蓄積し、地盤沈下の状況を把握。

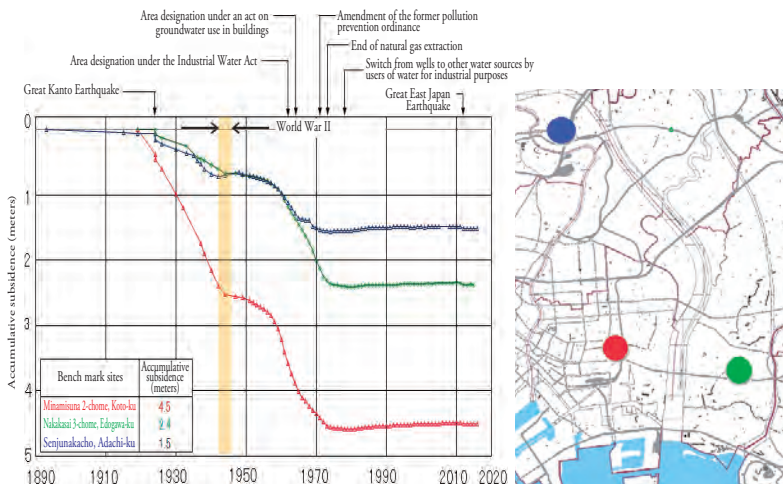
Figure※

1 川より低くなった土地 (1963年頃)



Monitoring land subsidence for taking countermeasures and preventive actions

- Collected data showed that the rate of subsidence had reduced when smaller amounts were taken during World War II, identifying that groundwater withdrawal was the cause of land subsidence.
- Strict restrictions on groundwater pumping have suppressed land subsidence.



The accumulated data are made public over the internet

<http://www.kensetsu.metro.tokyo.jp/jigyo/tech/start/03-jyouhou/chinka/chinka.html> (in Japanese)

地盤沈下の状況を監視し、対策や防止につなげる

- 得られた観測データから、第二次世界大戦中に地下水の汲み上げが減少した際、地盤沈下も減少が見られたことなどにより、地盤沈下の原因が地下水のくみ上げだと判明。
- 厳しい揚水規制を実施し、地盤沈下の発生を抑制。

■蓄積した情報はインターネット等により一般に公開しています

<http://www.kensetsu.metro.tokyo.jp/jigyo/tech/start/03-jyouhou/chinka/chinka.html>

ACCELERATING CONSOLIDATION SETTLEMENT AT THE PORT OF TOKYO LANDFILL SITE

Accelerating consolidation to increase landfill capacity



To use landfill sites for as long as possible

It is necessary to reduce impact on the environment by using landfill sites, which are created by filling up precious sea space, for as long as possible.



Japanese Translation

圧密沈下促進による廃棄物処分場の容量増大

廃棄物処分場をできるだけ長く使用する

貴重な海面を埋め立てる海面処分場をできるだけ長く使うことで、環境負荷の軽減を図る必要がある。

Figure※

1 新海面処分場

2 ドレーン打設船

3 概要図

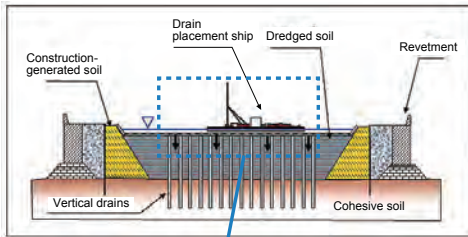
4 排水の仕組み



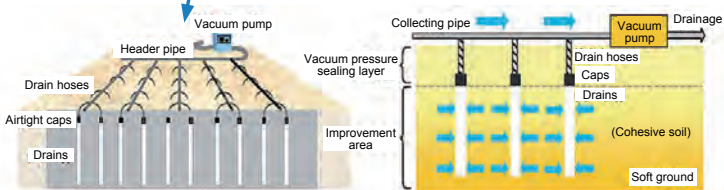
Increasing the capacity and extending the life of landfill sites by accelerating consolidation settlement

Consolidation settlement acceleration method

- A vacuum pump drains water from the cohesive soil under the seabed to accelerate settlement.
- By accelerating the subsidence of the seabed and soil within the reclaimed site, this method increases the capacity of landfills.
- Type of soil: cohesive
N-value of ground: 15 or less
Depth: up to about 40 meters



Drain placement ship ※ 2



Schematic drawing ※ 3

Drain mechanism ※ 4

圧密沈下促進により廃棄物処分場の容量を拡大し、延命化

圧密沈下促進工法

- ・海底面下の粘性土の水分を真空ポンプを使って強制的に排水し、沈下を促進
- ・海底地盤や埋め立てた土砂で沈下促進を行うことで、処分場の容量を拡大
- ・対象土質：粘性土 対象地盤のN値：15以下 適用深度：最大40m程度

LEACHATE SEEPAGE CONTROL AT THE PORT OF TOKYO LANDFILL SITE

Seepage control and leakage prevention



There is the risk of water contaminated by landfill waste leaking into groundwater or the sea.



When rainwater permeates a landfill site, the water becomes contaminated by the waste.

This could result in contamination of groundwater and the surrounding seawater.

Japanese Translation

遮水機能の確保と汚水流出の阻止

廃棄物による汚水の地下水や海への流出が懸念される

廃棄物処分場に雨水が浸透すると廃棄物による汚水が発生する

地下水、海域を汚染させる原因になりかねない

二重遮水と三重管基礎杭工法により汚水拡散を防止

二重遮水の実施

鋼矢板背面の遮水シートに加え、護岸本体に遮水対策を行い、二重の遮水対策を行う。護岸背後に事前混合処理工法を採用することで、副次的な遮水効果が期待できる。

三重管基礎杭工法

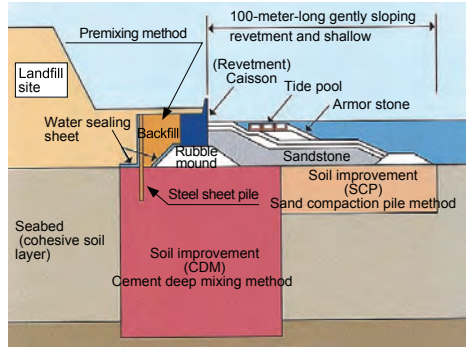
オールケーシング工法により廃棄物層を掘削、除去⇒その中に外周管及び本杭を打設し一体化杭打設時の廃棄物の巻き込み、遮水層を貫いても浸出水の拡散防止が可能
廃棄物処分場、汚染土壌などでの杭基礎に適用可能



Preventing the spread of leachate using a double layer of seepage control measures and a triple tubular steel pile method

Double layer seepage control

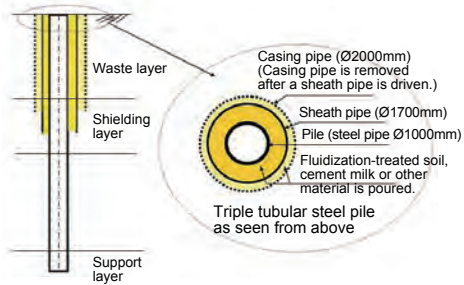
- In addition to seepage control sheets placed behind steel sheet piling, measures are taken on the revetment for a double layer of seepage control measures.
- Use of the premixing method behind the revetment is also expected to be effective in blocking seepage of leachate.



Double layer seepage control

Triple tubular steel pile method

- Using an all casing method, a casing pipe is inserted into the waste layer and the waste inside the pipe is removed. A sheath pipe is inserted within the casing, which is then inserted with a pile.
- A pile can be driven without dragging in the surrounding waste. Also, it can prevent the spread of leachate even when the shielding layer is penetrated.
- This method can be applied at landfills, as well as at covered sites where the polluted soil has been contained.



Triple tubular steel pile method