New Solutions - Underground Logistics Systems
Use of Underground Space
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Underground freight
Why important?

- Underground freight can help to reduce congestion and distribution bottle necks on the surface.
- It can help be part of a sustainable transportation and infrastructure development system.
- It can help cities move their cargo, shipments and deliveries without congesting our city streets with trucks, thereby avoiding polluting emissions.
- It can help save costs for industries and companies using an efficient and dedicated distribution system.

www.fhwa.dot.gov depiction of SUBTRANS, the proposed underground freight transport system.
One of the main aspects why infrastructure projects fail is the missing integration of relevant stakeholders in the planning phase.

The integration of relevant stakeholders is key to a successful planning phase.

In Germany 68% of the population are sympathetic towards protests against big infrastructure projects after having passed the approval procedures.

New ways of Participation and new ways of Communication are needed – Important Aspects of Our Solution Finding.

Worldwide Cargo Transportation is estimated to increase by 56% until 2030 - compared to the figures from 2002

Just adding more roadway lanes does not help anymore – sustainable solutions are needed.

In 9 of 10 infrastructure projects costs are underestimated.

Our Planning Approach increases security and accuracy significantly.

Failure of many infrastructure projects is due to insufficient system design.

Infrastructure projects must be scaled to profitable operations and must be planned based on market needs.

Infrastructure projects naturally have a huge complexity but it can get even more complex with underground projects.

Why is this the case and how can we manage the complexity?
The question is how to get over these hurdles and how to manage the complexity?
The complexity of infrastructure projects is mainly driven by two elements:

- The project itself
- The stakeholder environment (Investor – Public – Supply Chain)

✓ With underground projects there is a third driver: the integration into the existing infrastructure network above ground.
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**Value Designed Solution**

**How to manage the complexity.**

_Underground solutions_ need a **dedicated process to integrate the new infrastructure into the existing infrastructure.** Because of common reservations (for example: underground is more expensive than above ground) the infrastructure design **PROCESS** is a key element:

**Benefits of Value Designed Solution (VDS):**

- The system design **bases on market needs** and secures a seamless connection of the supply chain into existing infrastructure.
- **The interdisciplinary approach results in maximum acceptance** within the involved people and profitability.
- The **business modeling element is key to overcome the higher initial invest** of the underground solution.
## Value Designed Solution
Market based analysis.

### Challenges of underground solutions
- Aboveground there is already **existing infrastructure** and it is easier to increase its efficiency
- All infrastructure is part of a network and therefore the main challenges are the connections

### Main Risks
- The economic operator always compares the opportunity costs of the underground infrastructure
- All underground infrastructure needs to be designed along the supply chain and network

### What we provide
- Setting a proper base for the infrastructure design by **analyzing the goods transportation flow**
- We rely on **real market data** (transport volumes for different industries) as much as possible
- We have **collected industry transportation data from all over the world**. Combined with real data we are able to project the movements and the supply chains
- The **relevant stakeholders** of the project can be identified and the information on their **requirements can be captured**

### Benefits for the project
- The **analysis pictures** the relevant stakeholders and geographical dimensions of the relevant flows
- Out of the market map we are able to **identify area points with highest volumes**
- This makes us aware of **interactions in-between spots and areas**
- The **existing infrastructure is laid out** and we no the important connections need to be
- The relevant stakeholder groups are identified and can start analyzing the supply chain more in detail
Value Designed Solution
Market based analysis.

Different layers of the market analysis will deliver a clear understanding of the threats and opportunities of today’s solution.
## Challenges of underground solutions

| Underground infrastructure is often **not connected to the infrastructure above ground** | Underground infrastructures not fully integrated are never profitable and it will remain “unique experiments” |
| Underground infrastructure is very often considered for the first time and there are no standard solutions for connecting the above ground network | No out of the shell solutions for connection concepts are a high risk |

## What we provide

- All performance aspects (availability, operation times, buffering) will be part of the service and operations level requirements
- All relevant stakeholder groups and their requirements will be integrated for further design solutions, steps and interactions

## Benefits for the project

- Clear understanding of performance criteria within the supply chain and the environment **compared to above infrastructure**
- Identification of additional transport volume to make infrastructure more efficient and therefore more attractive (because of the higher underground costs)
- First ideas for further business potential and therefore relevant aspects in solution design
Supply Chain Analysis
Transparency by Layering.

Visualization and Simulation

Trends and Technologies

Strategic Level
Supply Chain Design
Network Analysis

Tactical Level

Operational Level

Working in Scenarios

Structured Check, Visualization and Simulation of the Supply Chain(s)

Analysis of influencing Trends, Technologies and Scenarios

Identification of Technologies and Automatisation Improvement Potential

Elaboration and Realisation of innovative Business Solutions
## Challenges of underground solutions

- Underground space **has not become attractive enough due to lack of integration** in existing infrastructure networks
- **Project setup needs to be different** from traditional ones and this is key from the beginning (idea creation)

## Main Risks

- Individual underground projects can be realized but not nationwide
- **Underground will not be fully accepted** and not be seen as equal to above ground infrastructure solutions

## What we provide

- Derived from the results of phase 1 and 2 the **solution requirements will be translated into technical solutions**
- The **system will be configured along the construction kit** as far as possible. Wherever new solutions are required the **interdisciplinary approach leaves flexibility** for new innovative designs
- The overall solution design will be optimized for **profitability and acceptance** (implementation) within the existing environment

## Benefits for the project

- A project design **which is strictly oriented on profitability and sustainability** and involves all relevant players at the right stage
- Innovative Design with **connection to existing infrastructure and networks**
Value Designed Solution
Solution design.

- Tailor-made technical solutions, fully integrated into existing infrastructure
Value Designed Solution
Business modeling.

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<tr>
<td>Underground solutions are often more expensive than above ground</td>
<td>Underground projects are not considered attractive enough</td>
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<tr>
<td>Customer links underground solutions with inflexibility and eternity</td>
<td>Not enough projects are realized that underground space is considered the norm?</td>
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What we provide

- Based on all analysis business opportunities will be identified in a structured way
- Along the future supply chain, business opportunities are transformed into technical requirements for the system design
- Business opportunities and the detailed specifications will be evaluated on expense-income ratios

Benefits for the project

- Through the process new business can be identified – Underground infrastructure needs different business models because of higher initial costs in comparison with above ground solutions
- The result will be a profitable and sustainable business case
- Investment concepts for the dedicated case for further fundraising
The possibility to simulate different business ideas in one case allows you to find new business models. With this approach you will be able to find the most attractive case with sustainable profitability and operation.
Value Designed Solution  
Life cycle cost - sustainability.

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<td>Growing regions are often focusing on the transportation of people but not of goods—therefore important synergies are not being considered</td>
<td>In case no life cycle observation is done, projects will most likely not be economical</td>
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<td>For underground projects very often only the investment is in focus – can be a shop-stopper</td>
<td>Underground projects normally have a negative ecological balance because of negative impacts during the construction phase</td>
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**What we provide**

- Based on the previous phases a **proper outline of the ecological balance** is possible – all trigger points can be identified  
- The **system design will be** consequently **optimized on life cycle aspects**  
- Through to the supply chain analysis also ecological aspects can be optimized for example through smart city solutions

**Benefits for the project**

- Clear understanding of **ecological drivers** and triggers for further business models  
- **Optimized solution also from operational standpoints**, which increases attractiveness for all different kind of investors
Sensitivity analysis will help you to find the most sustainable solution without compromising on profitability.
Value Designed Solution
Benefits at a glance.

Value Design Approach

• Clear understanding of the market situation and processes (Supply Chain)

• Knowledge of all relevant drivers and relevant interfaces in between underground and above ground infrastructure

• Business levers are identified and enable a profitable business modeling process

• The approach is an enabler for integrated and sustainable underground projects

Traditional Approaches

• Lack of clear understanding of processes

• Isolated project view – no integration into the infrastructure network or relevant processes

• Underground projects are often more expensive and therefor not attractive enough – No clear business model

• No real breakthrough nationwide for underground space
## Use of Underground Space

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Smart use of Underground Space
Cargo sous terrain – Switzerland.

Hubs:
- Underground Connection of logistics and shopping centers in Switzerland.
- No additional consumption of land: existing infrastructure will be used.

Terminals:
- Inside the tunneling system fully automated, autonomous transport vehicles are operating on three lanes.

Vehicles:
- Goods are mainly transported in fixed units: pallets or skeleton containers are transported with continuous speed around 30km/h.
Smart use of Underground Space
Cargo sous terrain – Switzerland.