Hinterland Connections
Keynote Address: W. Winkelmans

Sustainable port development and technological innovation
Case study Port of Antwerp

“Greed, anger and ignorance poison life.”
(Legends of Dune, The Butlerian Jiad, Cogitor Eklo, Beyond the Humand Mind? 2002)
Sustainable Mobility: WHAT DOES IT MEAN?

IT IS ALL ABOUT TAKING CARE OF

... A triple P-bottom line in balance!

Sustainable Logistics

Source: www.greenlogistics.org

Source: Sven Verstrepen - VIL
STRUCTURAL CONGESTION DUE TO IMBALANCE BETWEEN SUPPLY AND DEMAND ... all over the world!
AND ... ESPECIALLY IN AND AROUND SEAPORTS
THE COST OF CONGESTION in terms of pollution and time is enormous.
In Antwerp the number of km highways confronted with structural congestion increased by 8 times since the last 20 years!

Evolution in km highways saturated min. for 75% (i.e. 1500 vehicles/hr) during week days (except July and August)

“This situation will worsen because traffic jams are becoming wider and longer, whence travel time will become uneasily volatile”!

Source: FOD Mobiliteit en Vervoer (2008)
The intensity of the use of the (Belgian) road network increased by more than 300% over the last 30 years.

Source: PWC (2009)
WORSE on top of the transport imbalance a vicious circle is emerging!

Limited Infrastructure

SUPPLY (Costs)

Unlimited number of vehicles

MORE & MORE

traffic jam, queues

Accidents

Congestion & Pollution

Unlimited demand for mobility

Demand (prices)?

COST AND/OR PRICE?

LOSS of TIME & MONEY

inefficient transport organisation

solving the problem of congestion is mainly a question of restoring equilibrium between supply (of infrastructure) and demand (of mobility in terms of vehicles and displacement)

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New ways of transport
WHAT DOES THE EU TRANSPORT POLICY SAY IN THIS CONTEXT?

• An interesting brochure full of good ideas ...
• BUT where is the LONG TERM VISION ON NEW WAYS OF TRANSPORT?
• ALTHOUGH ...

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... AND NOTWITHSTANDING ULS and UTT ARE FULLY IN LINE WITH THE WHITE PAPER OBJECTIVES FOR 2020!

| 1. | decarbonisation of transport |
| 2. | internalisation of the external cost of transport |
| 3. | higher energy efficiency |
| 4. | development of transport corridors or so-called “priority freight lines” |
| 5. | promotion of PPP for financing transport infrastructure |

| 1. | No difference HENCE NO ISSUE |
| 2. | internalisation of all external effects is evident |
| 3. | excellent performance regarding capacity, rotation time, transport costs (cf. absence of bad weather, of congestion, of route problems) |
| 4. | UTP/UTT is corridor transportation by definition |
| 5. | ULS is Ideal for PPP’s given its perfect confinement |
| 6. | Additional advantages are smaller space intensity + preservation of the above ground alternative use of space |
FINALLY LET’S KEEP IN MIND THAT EVEN WITH A very POSITIVE MODAL SHIFT TOWARD RAIL AND IWT ROAD TRANSPORT STILL WILL INCREASE!

<table>
<thead>
<tr>
<th>(x tonne-km)</th>
<th>2005</th>
<th>2020</th>
<th>2020/2005</th>
<th>rail capacity: +100%</th>
<th>inland navigation: +100%</th>
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<tr>
<td><strong>total</strong></td>
<td>100</td>
<td>150</td>
<td>+50%</td>
<td>150</td>
<td>+50%</td>
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<tr>
<td><strong>road</strong></td>
<td>75</td>
<td>125</td>
<td>+70%</td>
<td>100</td>
<td>+25%</td>
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<td>15</td>
<td>15</td>
<td>0%</td>
<td>30</td>
<td>+100%</td>
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<tr>
<td><strong>inland nav.</strong></td>
<td>10</td>
<td>10</td>
<td>0%</td>
<td>20</td>
<td>+100%</td>
</tr>
</tbody>
</table>

➢ In the meantime: no other option than getting the best out of existing road network capacity and use? ... UNLESS ...

... SSS AND NEW WAYS OF TRANSPORTATION ARE BROUGHT INTO OPERATION!
HENCE additional transport capacity and new transport modes to de-congest ports and hinterlands are required ... BUT HOW ...?

TEUSTACK - AIRSHIPS
DUAL MODE
ULS – PCP – UTP – UTT - UCM
A. BY IMPROVING EXISTING CAPACITIES

LAND BRIDGES for double stack corridors

PUSHING CONVOYS UP TO 24-35 BARGES

35 BARGES = 35,000 tons!!
ECO COMBIS

- 12.9% vkm
- 12.45% energy/km
- 20% COST/KM
- + millions of tons CO₂

BY BIG - BIGGER – BIGGEST (VANS)?
EUROPE IS NOT AUSTRALIA!

AUSTRALIAN ECOCOMBI IN EUROPE?
“Two measures and weights”!
II. BY INNOVATIVE THINKING!

Cf. BUSINESS CYCLES AND INNOVATION WAVES

The major waves of innovation

A. Coal
   - Steel
   - Railways
   - Textiles
   - Inorganic chemicals...

B. Electricity
   - Oil
   - Cars
   - Steel (sheet metal)
   - Aircraft
   - Mechanical engineering
   - Organic chemicals...

C. Telematics/telecommunications
   - Computing
   - Automation
   - Oceanics
   - Biotechnology
   - Genetic engineering
   - New energy sources
   - Superconductivity

MIND THE RELATION BETWEEN INNOVATION AND INFRASTRUCTURE WAVES!!!
III. BY BUILDING UNDERGROUND!

MIND THE DIFFERENCE BETWEEN TUNNELS & TUBELAR TRANSPORT

Tunnels are the PAST...

... Tubes and channels are the FUTURE
The more because SPACE is in SHORT both for ports and trans-порт!
If space is definitively in short...
let’s build underground...

ULS and pipe jacking
IN CONCLUSION
RE-POSITIONING OF PIPELINES/TUBES

- Transport modal comparisons turn out in favour of tubular transport, because:
  - their much smaller space intensity and the possibility of “double” space usage
  - their performance regarding damage, frequency, speed, reliability and punctuality (in a way tubular transport represents ultimately a kind of JIT)
  - their performance in terms of capacity, rotation time, transport cost, etc. given that bad weather conditions, congestion, etc. do not exist, whence rerouting problems and/or repositioning of empty haulages are exceptional
  - last but not least because of much lower social transport cost implications compensating the higher construction costs
NEW WAYS TO INTERCONNECT REGIONS AND TRANSPORT MODES

UTT FOR PORTS?

DEURGANCK DOK

LEFT BANK

RIGHT BANK
Overview of CONTAINER TERMINALS in the port of Antwerp and origin/destination of traffic

- Noordzee terminal
- Europa terminal
- MSC home terminal
- Spoor hub
- PSA Deurganckdok
- Antwerp gateway (DP)

<table>
<thead>
<tr>
<th></th>
<th>Capaciteit finale fase (TEU)</th>
<th>Volumes 2007 (TEU)</th>
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<tr>
<td></td>
<td>2.000.000</td>
<td>1.400.000</td>
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<td></td>
<td>1.700.000</td>
<td>800.000</td>
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<tr>
<td></td>
<td>4.000.000</td>
<td>3.500.000</td>
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<tr>
<td></td>
<td>5.700.000</td>
<td>1.200.000</td>
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<tr>
<td></td>
<td>3.500.000</td>
<td>750.000</td>
</tr>
<tr>
<td><strong>TOTAAL</strong></td>
<td><strong>16.900.000</strong></td>
<td><strong>7.650.000</strong></td>
</tr>
</tbody>
</table>

- Germany 33%
- South France 33%
- North France 20%
- N-Belgium 9%
- Holland & N-Germany 22%

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New ways of transport

Universiteit Antwerpen
THE "PORT OF ANTWERP" AND ITS LOCATION
vis a vis the City and the E-Highways

1. 70% of all containers loaded/unloaded at the Deurganckdock are coming from or going to the northern and eastern hinterland of the port of Antwerp!
2. today 60% of it is done by truck, i.e. ca. 2.5 mio vans/y
3. in 2012 ca. 9 million boxes are to be expected, which might boil down into 4 million boxes moving over roads!
4. “Roads” in and around Antwerp therefore need to be expanded seriously (see note) i.e. toward the creation of a greater ring


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THE LIEFKENSHOEK RAILWAY TUNNEL
A CLASSIC uni-modal SOLUTION

Haven van Antwerpen
Nieuwe verbinding LO-RO

Costprice: 750 mio EURO
Construction time: min. 5 year

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New ways of transport
LINKING THE RIGHT AND LEFT BANK OF THE PORT: NOT AN EASY TASK
UCM® (Denys NV) = Underground Container Mover

A closed loop of 20km transport chains moving at a speed of 15 km/hr in pre-fabricated tubes:

=> more than 5000 ctrs/day
=> cost price 550 mio EURO
=> construction time 3 to 4 years
UCM LOOP CONNECTING 3 TERMINALS TOGETHER WITH A BARGE SECTION AND THE SHUNTING YARD
UCM FOR THE WHOLE PORT OF ANTWERP BY MEANS OF MULTIPLE INTERCONNECTED TRANSHIPMENT LOOPS?

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New ways of transport
AN EXTENDED UCM TRAJECT AS A FUNCTION OF AN EXTENDED GATEWAY?

Lus 1:
- Lengte: 12.1 km
- Kost: 389.000.000 €

Lus 2:
- Lengte: 29.0 km
- Kost: 780.000.000 €

Lus 3:
- Lengte: 35.2 km
- Kost: 1.000.000.000 €

Capacity UCM:
- 2.000.000 ctrs/jyr

Max. speed UCM:
- 20 km/hr
ESTIMATION OF potential UCM VOLUMES in 2020
in accordance with forecasted modal split

13,707,309 TEU

Hinterland (90%)

Transhipment (10%)

Truck (42%)

Spoor (15%)

Binnenvaart (43%)

Duitsland (20%)

Zuid-Frankrijk (16%)

Nederland & Noord-Duitsland (33%)

Noord-België (9%)

Noord-Frankrijk & Westhoek (22%)

Marktpotentieel business case

1,055,055 TEU

Bron= Interview GHA 2008

Bron= EOS studie 2005

Bron= EOS studie 2005

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New ways of transport
UCM FOR THE MAASVLAKTE 2?

E:\DVD-VIDEO\UTT-UCM\ucm
maasvlakte2.mpg
HOW CAN UCM BE PUT INTO PRACTICE?
AND HOW TRANSHIPMENT WILL TAKE PLACE
TRANSPORT CHAINS IN A LOOP WITH multi-functional LOW BED TRAILERS and ELECTRIC MOTORS

UCM ® (Denys NV) = Underground Container Mover
UCM Horizontal transhipment
Artist impression

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New ways of transport

UCM ® (Denys NV) = Underground Container Mover

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UCM VERTICAL TRANSHIPMENT

© DENYS NV
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New ways of transport

UCM ® (Denys NV)
= Underground Container Mover
UCM IN DETAIL

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New ways of transport
UCM AT THE REAR QUAY
INDIRECT TRANSSHIPMENT REQUIRED!
UCM AT APRON ABOVEGROUND:
aerial view
UCM AT APRON + IF UNDERGROUND: INDIRECT TRANSHIPMENT NECESSARY
UCM AT APRON ABOVEGROUND: DIRECT TRANSHIPMENT!
UCM at front quay (apron)

ABOVEGROUND:
detail
Plenty of potential advantages of UCM ...
BUT IS IT PAYABLE?

1. optimal distribution of containers
2. JIT delivery given optimal transit times
3. Sustainability given almost no negative externalities
4. Very high degree of reliability of operations given total absence of external impacts
5. Very low energy consumption and maintenance cost.
Yes, because the impact of the congestion cost in evolution on truck tariffs is becoming substantial & ...
... and because UCM might improve the seaport’s competitiveness
FEASIBILITY OF UCM IN THE FRAMEWORK OF SCM?

TOTAL TRANSPORT CHAIN COST

Truck

UCM

Deep seaschip

Port of Antwerpen

Terminal operator

UCM

Land transport modes

Singapore

New York

Haven van Antwerpen

Operator

TOTAL TRANSPORT CHAIN COST

New ways of transport
The cost per container is composed as follows:

- **Charter cost** of the vessel based upon a loaded voyage price to Antwerp or Rotterdam
- **Fuel costs**
- **Suez transit** cost (for trips from/to Far East)

The vessel type differs between North Atlantic and Far East:

- **North Atlantic**: 4.234 TEU – ship (Sealand Achiever)
- **Far East**: 9.580 TEU – ship (Xin Los Angeles)

<table>
<thead>
<tr>
<th>Scheepsnaam</th>
<th>New York Sealand Achiever</th>
<th>Singapore Xin Los Angeles</th>
</tr>
</thead>
<tbody>
<tr>
<td>TEU capaciteit</td>
<td>TEU</td>
<td></td>
</tr>
<tr>
<td># containers geladen</td>
<td>ctrs</td>
<td></td>
</tr>
<tr>
<td># TEU geladen</td>
<td>TEU</td>
<td></td>
</tr>
<tr>
<td>Call size</td>
<td>ctrs</td>
<td></td>
</tr>
<tr>
<td>Gemiddelde snelheid</td>
<td>miles/h</td>
<td></td>
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<tr>
<td>HFO consumptie</td>
<td>ton/dag</td>
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<td>MDO consumptie</td>
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<tr>
<td>Charterkost</td>
<td>€/dag</td>
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<tr>
<td>Suez Transit kost</td>
<td>€/ctr</td>
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<td>Aantal kranen</td>
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The table shows the comparison between New York Sealand Achiever and Singapore Xin Los Angeles.
Benchmark 2018 – Munchen

UCM heeft kostpositie Antwerpen t.o.v. Rotterdam verbeterd

Antwerpen heeft kostenvoordeel t.o.v. Rotterdam op deze bestemming

<table>
<thead>
<tr>
<th></th>
<th>Antwerpen met truck</th>
<th>Antwerpen met UCM</th>
<th>Rotterdam met truck</th>
<th>Δ(A’pen UCM - R’dam)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Totale ketenkost New York-Munchen</td>
<td>€/ctr</td>
<td>2.044</td>
<td>2.033</td>
<td>2.167</td>
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<td>Extra voordeel in Antwerpen door UCM</td>
<td>€/ctr</td>
<td>10</td>
<td></td>
<td></td>
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<tr>
<td>Totale ketenkost Singapore-Munchen</td>
<td>€/ctr</td>
<td>2.216</td>
<td>2.205</td>
<td>2.342</td>
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<tr>
<td>Extra voordeel in Antwerpen door UCM</td>
<td>€/ctr</td>
<td>10</td>
<td></td>
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<tr>
<td>Gemiddelde tijd gate - Munchen</td>
<td>u</td>
<td>12,1</td>
<td>15,8</td>
<td>12,9</td>
</tr>
<tr>
<td>Minimum tijd gate - Munchen</td>
<td>u</td>
<td>11,5</td>
<td>15,8</td>
<td>12,3</td>
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<tr>
<td>Maximum tijd gate - Munchen</td>
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<td>14,2</td>
<td>15,8</td>
<td>14,4</td>
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<tr>
<td>Variantie</td>
<td>%</td>
<td>23%</td>
<td>0%</td>
<td>16%</td>
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</table>
Benchmark 2018 – Duisburg

UCM heeft kostpositie Antwerpen t.o.v. Rotterdam verbeterd

Antwerpen heeft kostenvoordeel t.o.v. Rotterdam op deze bestemming

### Benchmark met Rotterdam

<table>
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<th>€/ctr</th>
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<td>Rotterdam truck</td>
<td>910</td>
<td>854</td>
<td>844</td>
<td>1.084</td>
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<tr>
<td>Antwerpen UCM</td>
<td>910</td>
<td>854</td>
<td>844</td>
<td>1.084</td>
</tr>
<tr>
<td>Rotterdam truck</td>
<td>1.026</td>
<td>1.016</td>
<td>1.084</td>
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<tr>
<td>Antwerpen truck</td>
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<td>Antwerpen UCM</td>
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### Totale ketenkost New York-Duisburg

<table>
<thead>
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<th></th>
<th>Antwerpen met truck</th>
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<th>Δ(A’pen UCM-R’dam)</th>
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</thead>
<tbody>
<tr>
<td>€/ctr</td>
<td>854</td>
<td>844</td>
<td>910</td>
<td>-7,9%</td>
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<tr>
<td>€/ctr</td>
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### Totale ketenkost Singapore-Duisburg

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<th>Antwerpen met truck</th>
<th>Antwerpen met UCM</th>
<th>Rotterdam met truck</th>
<th>Δ(A’pen UCM-R’dam)</th>
</tr>
</thead>
<tbody>
<tr>
<td>€/ctr</td>
<td>1.026</td>
<td>1.016</td>
<td>1.084</td>
<td>-6,8%</td>
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<tr>
<td>€/ctr</td>
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<td>10</td>
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### Gemiddelde tijd gate - Duisburg

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<thead>
<tr>
<th></th>
<th>u</th>
<th>%</th>
<th>u</th>
<th>%</th>
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<tbody>
<tr>
<td>Minimum tijd gate - Duisburg</td>
<td>2,6</td>
<td>129,2%</td>
<td>6,9</td>
<td>37,3%</td>
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<td>Maximum tijd gate - Duisburg</td>
<td>5,2</td>
<td>0%</td>
<td>6,9</td>
<td>67%</td>
</tr>
<tr>
<td>Variante</td>
<td>102%</td>
<td>0%</td>
<td>67%</td>
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</tbody>
</table>
IN CONCLUSION: overall BENEFITS OF UFT/UCM

Source: International Society for Underground Freight Transportation (ISUFT) Bylaws (Drafted on September 1, 2008)

Underground freight transport such as UCM will benefit society:

1. It will reduce the number of trucks used for freight transport and as such it will reduce traffic jams, accidents, noise and air pollution.
2. It will reduce the amount of energy and fuel.
3. It will reduce the damage to highway infrastructures caused by trucks, thereby enhancing the life of road infrastructure and reducing their maintenance costs.
4. It allows to transport all kinds of freight faster, safer and at less cost than using trucks for the same purpose.
5. UFT infrastructures are less vulnerable than aboveground infrastructures to damages caused by natural disasters including earthquakes, hurricanes, and tornadoes.
6. UFT infrastructures are also less vulnerable than aboveground infrastructures to damages that can be caused by manmade hazards such as terrorist attacks or wars.