Switzerland:

- Public Transport Investments and Pay-Backs in General
- Gotthard Base Tunnel in particular
Inhabitants

- 309 millions (est. 2010)
- 281,421,906 (Census 2000)

- 7,76 millions

GDP (per capita)

- 46,381 USD (2009)

- 67,559 USD (2009)
General Aspects of Swiss Public Transport
<table>
<thead>
<tr>
<th>Year</th>
<th>ROAD</th>
<th>RAIL</th>
</tr>
</thead>
<tbody>
<tr>
<td>1950</td>
<td>134.00</td>
<td>97.50</td>
</tr>
<tr>
<td>1960</td>
<td>490.40</td>
<td>139.40</td>
</tr>
<tr>
<td>1970</td>
<td>2054.00</td>
<td>368.40</td>
</tr>
<tr>
<td>1980</td>
<td>2575.80</td>
<td>519.20</td>
</tr>
<tr>
<td>1990</td>
<td>3674.40</td>
<td>1968.00</td>
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<tr>
<td>1999</td>
<td>4166.40</td>
<td>2566.40</td>
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<tr>
<td>2000</td>
<td>4230.90</td>
<td>2920.70</td>
</tr>
<tr>
<td>2001</td>
<td>4176.80</td>
<td>3206.60</td>
</tr>
<tr>
<td>2002</td>
<td>4178.80</td>
<td>3737.10</td>
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<td>2003</td>
<td>4159.00</td>
<td>3876.20</td>
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<tr>
<td>2004</td>
<td>4214.00</td>
<td>4191.90</td>
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<tr>
<td>2005</td>
<td>4283.00</td>
<td>4471.80</td>
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<tr>
<td>2006</td>
<td>4265.00</td>
<td>3713.00</td>
</tr>
<tr>
<td>2007</td>
<td>4174.00</td>
<td>3741.60</td>
</tr>
</tbody>
</table>

in million CHF

Public vote „Bahn 2000“ (November 98)
Rail Investments 1992 - 2030

Public vote AlpTransit (Sept. 1992)
Financing of the Rail Investments

a.) • Performance related: Distance / weight (Vehicle and Trailer) / Emissions
  • ~ 1 USD / km for a 40 ton truck
  • 2/3 of tax used for rail investment

- Heavy vehicle fee of 25% (LSVA) a.)
- Value Added Tax 1‰
- Special Tax on Petrol

Base: 2009
Public Transport System in Switzerland Today: I
Public Transport System in Switzerland Today: II

More transport infrastructure needed

- ZEB
- AlpTransit
- HGV

Ordinary budget 2007-2010

Infrastructure fund

Munich

Paris

D, NL

Paris

Lyon / Spain
Daily breakdown of distance (km)

Total distance: 38.2 km / day
International comparison; Trips per Year in 2008

European Champion: Switzerland!
International Comparison; km / year in 2008

European Champion: Switzerland!
International Comparison; Miles by train per citizen 2007

- Switzerland: 1307 miles
- Japan: 1228 miles
- France: 839 miles
- Germany: 564 miles
- UK: 321 miles
- USA: 87 miles
Particular Aspects of Swiss Public Transport

The Gotthard Base Tunnel – The world‘s largest Railway Tunnel
Swiss Alpine Tunnels: Connecting Europe

- The „blue“ Banana
- 150 Mio. people
The Gotthard Project: General Project I
The Gotthard Project; General Project II

- Flat trajectory
- Freight Train up to 4000 tons
- Passenger Train up to 250 km/h
- Zurich – Milan < 3 hours

- 57 km Railway tunnel
- 2 Tunnel sections
- 2 Multi-functional points
- Highest safety requirements

Quelle Bilder: ATG
The Gotthard Project: Comparison of Energy Consumption

Freight transportation: example with UKV 1300 tons with travel time gain

100% Traction power via Mountain track

Travel time gain: 43 minutes

52% Traction power via Base line

43%
### The Gotthard Project: Comparison of Energy Consumption

<table>
<thead>
<tr>
<th>Type of train</th>
<th>without time gain</th>
<th>with time gain</th>
<th>gain in time</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>North – South</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>UKV (unaccompanied combined traffic)</td>
<td>- 57 %</td>
<td>- 48 %</td>
<td>47 min</td>
</tr>
<tr>
<td>RoLa (Rolling Road)</td>
<td>- 52 %</td>
<td>- 34 %</td>
<td>47 min</td>
</tr>
<tr>
<td>Intercity (Intercity with Locomotive)</td>
<td>- 28 %</td>
<td>- 6 %</td>
<td>57 min</td>
</tr>
<tr>
<td>HGV (High Speed)</td>
<td>- 20 %</td>
<td>- 17 %</td>
<td>61 min</td>
</tr>
<tr>
<td><strong>South-North</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>UKV (unaccompanied combined traffic)</td>
<td>- 45 %</td>
<td>- 37 %</td>
<td>47 min</td>
</tr>
<tr>
<td>RoLa (Rolling Road)</td>
<td>- 42 %</td>
<td>- 27 %</td>
<td>47 min</td>
</tr>
<tr>
<td>Intercity (Intercity with Locomotive)</td>
<td>- 23 %</td>
<td>- 2 %</td>
<td>57 min</td>
</tr>
<tr>
<td>HGV (High Speed)</td>
<td>- 17 %</td>
<td>- 12 %</td>
<td>61 min</td>
</tr>
</tbody>
</table>
Planned Traffic Volumes:
300 Trains per day
40 Mio Net tons per year
15 – 20 % Passenger Trains
Accumulated gain in travel time per day 240 h/day
Simpler traction modes

Energy consumption of all trains per day:
• 2000 MWh via mountain track
• 1250 MWh via Base tunnel (-37%)
The Gotthard Project; Rail Installations

Track

Power Supply / Earthing / OCS

Lighting / Cabling / Communication

Tunnel Supervision
Automation

Ventilation,
Mechanical Installations
Signalling
The Gotthard Project: Tunnel Profile

- Antennas
- OCS
- European Train Control System
- Max. Profile Envelope
- Hand-Rail, Lighting
- Escape path
- Cables
- Rail
- Drainage Line
The Gotthard Project; OCS

Type of OCS: Re 250 ADT opt. 2009

C.W: 120 mm² Silver-Copper RIS/17 kN
M.W: 70 mm² Bronze/ 15 kN
Feeder: 4 x 95 mm² CU
Earth: 3 x 150 mm² CU
The Gotthard Project: Logistics

Installation site Biasca

Object: OCS-Yard
Place: IP South
Date: 21. January 2010
Installation processes

Suspension post, Console, Electrical connection (Insulator, Copper profile)

- Working direction

Earth wire / return conductor

- Working direction
Installation processes

Installation / Pulling of radiation cable

- Working direction
- Fixing of the radiation cable to the Messenger cable
- Fixing of the radiation cable to the Messenger cable
- Uplift pole
- 67.00m (for Overrun)

Pulling of Feeder Wires

- Working direction
- Fixing of the radiation cable to the Messenger cable
- Two Guide arms with each one Capstan
- Install of wires
- Clamping of wires
- 67.00m (for Overrun)