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The new Silk Road

Visions of caravans filled with spices, perfumes and fine fabrics are conjured up by any mention of the Silk Road, a term coined in 1877 by Ferdinand von Richthofen, a German geographer. For centuries, this overland corridor seemed to have been swallowed up by the desert sand. Now, a vast EU project aims to revive the route, encourage trade between East and West, and promote the development of regional infrastructure. PTV's experts are helping by developing a freight transport model on a truly grand scale.

EU project revives old trade route

The old Silk Road tied together Asia and Europe. It led from Chang'an, China's former capital and now known as Xi'an, skirted the edge of the Taklamakan Desert, threaded through the Pamir Mountains to reach Samarkand and Bukhara, passed Teheran and Bagdad, and stopped at the Mediterranean. Besides goods such as silk, jewels, spices or art, it also channelled ideas from East to West. It acted as a conduit for world religions such as Buddhism, but also brought important inventions such as paper, the compass or the spinning wheel to the West, where they revolutionised how people lived.

During the Cold War, however, the overland corridor lost some of its significance. Borders were closed, becoming impassable. Trade and economic ties realigned themselves along the North-South axis, or withered away altogether. As a result, the transport infrastructure on the old route was neglected or left underdeveloped until it became inadequate for modern trade and transportation. Bureaucratic, infrastructural and political barriers rose, and when trade resumed between China and Europe and other East-West trading partners, the barriers remained largely intact. Today, crossing borders on this ancient trail takes mountains of red tape, unpredictable costs and interminable amounts of time. Goods are transported faster, more cost-effectively, safer and more reliably by ocean vessel, plane or overland through Russia.

The new Silk Road

Now, life is being breathed back into the Silk Road. The effort began in 1993, with the creation of the TRACECA programme (Transport Corridor Europe – Caucasus Asia) with the support of the EU and countless countries along the former route. The participating nations include Armenia, Azerbaijan,

Bulgaria, Georgia, Kazakhstan, Kyrgyzstan, Moldova, Romania, Tajikistan, Turkey, Turkmenistan, Ukraine and Uzbekistan. The programme represents a continuation of the EU's efforts to strengthen its neighbourly relations to countries in the Caucasus and Central Asia. Early on, it became clear that strong transportation links were essential to enabling free trade. An important part of this approach involves reviving the Eurasian land bridge to allow greater utilisation of economic and trade opportunities between Europe and Asia.

"By helping to integrate the transport systems, PTV is encouraging stabilisation and sustainable growth along the Europe-Caucasus-Asia transport corridor," says Uwe Reiter, Director International Consulting at PTV.

Now, the EU has launched a new project, entitled "TRACECA-IDEA" (Interoperability and Transport Dialogue between the EU, its neighbouring countries and Central Asian Countries), to improve commerce between the continents. It focuses on harmonising transport policies and legislation and developing multimodal supply chains. Barriers to crossing borders will be reduced; free trade will be encouraged. The project will also strengthen relationships between TRACECA countries, contribute to political stability in the region and encourage economic development.

The European Commission has engaged a consortium to implement TRACECA-IDEA, which will run until May 2012. The consortium is led by the Italian firm TRT (Trasporti e Territori Milan), with support from PTV AG, Dornier Consulting and Alfen Consult in Germany.

PTV is providing transport planning expertise for TRACECA-IDEA. This involves quantifying the current transport flows, forecasting future trends and identifying bottlenecks and obstacles. Necessary projects and activities will be drawn up and their impacts assessed. This final step will provide a basis for investors and partners to analyse the projects in the public-private partnership process.

Challenge for transport experts

Since the existing transport models were inadequate for the task at hand, PTV set about creating a new freight transport model of the region. The model will provide the transport planning foundation needed to identify and remove bottlenecks and obstacles to transnational transport. PTV has to consider not only the region's international corridors, but also the countries' specific interests. It will focus mainly on developing a cross-national transport system. This involves activities such as expanding ports and cargo handling facilities, improving clearance processes and capacities at border crossings and developing road and rail infrastructure along international corridors.

It is not easy to quickly develop a freight transport model for the entire region. First, the data is hard to come by. Second, the primary geographical scope of the model encompasses not only the 13 participating countries, but also southern Russia. The surrounding area includes the rest of Russia, Iran, China, Europe and, as trip origins and destinations, the other continents as well. This is thus the largest

freight transport model ever developed by PTV in terms of its geographical scope and route network.

Largest-ever freight transport model

The TRACECA-IDEA freight transport model was developed as a strategic planning tool for decision-making that would help with assessing the impact of future infrastructural improvements. The model calculates multimodal freight flows (domestic, import, export, and transit flows) and provides insights into shortcomings in the route network, such as missing network links, capacity bottlenecks at ports and cargo handling points, capacity problems at border crossings, and so on.

There is no finished, standardised software application for modelling multimodal freight transport – in contrast to, say, passenger travel demand. Instead, the transport experts developed their own solution to address the special needs of freight transport modelling based on PTV's transport planning software VISUM and VISEVA.

Their basic approach is to sort the complex, heterogeneous freight transport flows into different classes of goods, and then calculate trip generation, trip distribution and assignment (simultaneous route and mode choice) for each class. The TRACECA model covers around 50 different commodities of goods: from agricultural and food products to raw and building materials to chemical products, crude oil, natural gas, petroleum products and consumer goods.

The freight transport model consists of two components. The first is the demand model for calculating cargo volumes [t/d] per commodity of goods and freight flow matrices [t/d] per commodity of goods; the calculations are based on structural parameters for each traffic analysis zone. The demand model was implemented in Excel and controls every computational step in the model with VBA. The second component is the VISUM network model containing the multimodal route network (road, rail, waterways, pipelines) and its parameters.

The VISUM network model assigns the freight flow matrices from the demand model to the route network in order to determine link volumes. The two components exchange data iteratively during the modelling process.

PTV pioneered this new approach to generate the Swiss freight transport model, and then revisited it to model freight traffic for the United Arab Emirates' traffic development plan. For the TRACECA-IDEA model, the company used a simplified version to compensate for the project's vast geographical scope and scarcity of high-quality data.

The team generated not only a base year model for 2008, but also forecast models for 2020 and 2030. The base year model is calibrated and validated with empirical data and can be used to identify current capacity problems, while the forecast models serve to predict future freight flows and the impacts of planned improvements.

A pathway of ideas

"The project offers countless benefits," explains Dr. Uwe Reiter, Director International Consulting at PTV and the project manager. "They range from analyses of the current transport situation to forecasts of future traffic flows. Training TRACECA employees in the fields of transport planning and modelling will deliver long-term benefits. Other important aspects include project financing and idea-sharing between participating countries."

The TRACECA-IDEA project will create the following synergies:

National and regional planning

The transport model is a strategic model for the entire region. It can initially be used to analyse and assess international flows. It also provides a basis for national refinement and enhancement. As such, it can be used not only by the EU and the overall TRACECA region, but also by individual countries for their own national planning.

Training programmes

The TRACECA secretariat and the 13 TRACECA countries will receive training in transport planning and modelling. This will enable more professional planning of national transport systems and international infrastructure in the future.

Tapping sources of financing

The objective presentation of costs and benefits promotes public-private partnerships and helps attract private financing, which would not have been possible without a quantitative estimate of costs and revenues from user fees.

Communication and information dissemination

TRACECA countries communicate extensively with one another through regional conferences, workshops, meetings, presentations and training courses. They work more closely together to develop transnational transport systems, select projects and measures, weigh costs and benefits and attract investors.

Looking ahead

The future will hopefully bring closer ties between the TRACECA countries and between TRACECA and the EU. With secure overland routes, reduced or predictable costs and transit times, the corridor will become a viable alternative to transport by air, ocean or via Russia. Shortening the routes also lowers energy consumption. And that is a major plus for the environment and the region's inhabitants. Local populations will benefit handsomely from the development of transnational infrastructure. In short, the Silk Road is not a relic of a bygone era, but the motor for future economic progress.

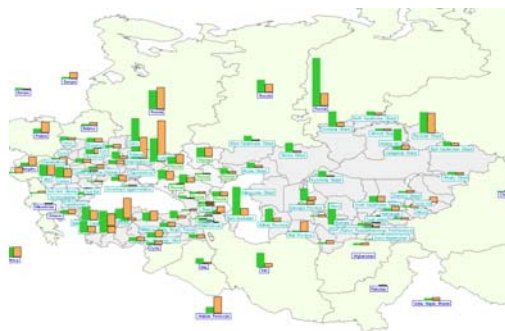
The freight transport model: facts and figures

The model area extends slightly more than 5,000 km East-to-West, and 2,300 km North-to-South. Over 250 million people live within this area of nearly 5,500,000 km². The area is divided into 172 traffic zones: 123 in TRACECA countries and 13 in the Russian territory between Ukraine and Kazakhstan to the north of the Caucasus. The area is particularly challenging to model since it exhibits considerable variation in population density, income distribution, economic development and, most importantly, transport infrastructure.

The route network was completely remapped using the VISUM module from the PTV Vision transport planning suite. It includes the main interregional links for each mode of transport and is extremely extensive: 470,000 km of roads, 300,000 of railroads, 190,000 km of sea routes and pipelines in total. Besides the TRACECA countries, the route network also extends to all adjoining regions and countries at an adequate level of granularity in order to model alternative routes for freight flows.

The focus is on modelling a northern route that circumvents the TRACECA area (entirely or partially via Russian territory) and modelling southern alternatives to crossing the Caspian Sea through the Islamic Republic of Iran.

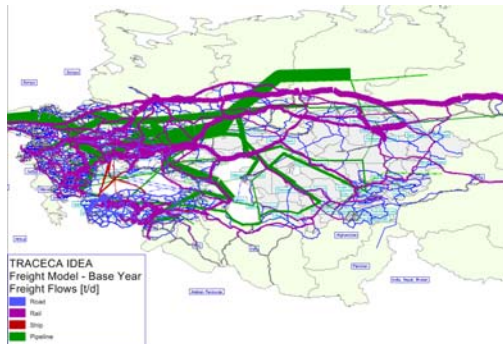
Fig 1:



This chart shows the freight transport volume in tonnes per day as the total amount of all classes of goods: the green bar visualises the goods in tonnes leaving the traffic zone (origin) and the orange bar shows the goods in tonnes entering the traffic zone (destination).

Background Report

Fig 2:



Calculated flow of commodities in tonnes per day for the total amount of all classes of goods covering road, rail, waterways and pipeline transport.

Fig. 3:



The main route of the ancient Silk Road ran some 8,450 km from Xi'an to Antakya. A difference in altitude of 4,900 metres between Turfan and the Taldyk Pass had to be mastered. In addition to the main routes there was a comprehensive network of trade routes linking Asia and Europe. It even reached Japan.

Fig.4:



"By helping to integrate the transport systems, PTV is encouraging stabilisation and sustainable growth along the Europe-Caucasus-Asia transport corridor," says Dr. Uwe Reiter, Director International Consulting at PTV

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