Make German Railways Fit for the Silk Road

by Dean Andromidas

Sept. 13—Is German transport infrastructure fit for integration into the New Silk Road transport corridors now emerging throughout Eurasia? The New Silk Road is already there—it is a work in progress, and it is already integrating the entire Eurasian land mass from Spain and Portugal to Vladivostok and Shanghai. New Silk Road express cargo trains are now coming to German cities such Duisburg and Hamburg—and through Germany to France and Spain. But much work is yet to be done. While there are rail connections throughout the growing network, not all are optimized for efficient and high-speed transport of goods. Speeds average a sedate 60 kilometers an hour (37 miles per hour), and there are bottlenecks throughout the transcontinental network: An "express" train from China takes more than two weeks to arrive in many West European cities. Nonetheless, the technology exists to cut that time in half.

This report addresses one of those bottlenecks that lies in Germany and advances a solution to the problem that has been put forward by German engineers and citizens who possess the vision required for the 21st Century.

German engineers and regional citizens' initiatives have proposed a mega-project to facilitate the passage of high-speed cargo trains through the rail corridor along the Rhine valley between Bonn and Wiesbaden. Dubbed the Westerwald-Taunus Tunnel (WTT), it entails building an 118-kilometer tunnel from Saint Augustine (Sankt Augustin), near Bonn on the east bank of the Rhine, to Hochheim near Wiesbaden, at the

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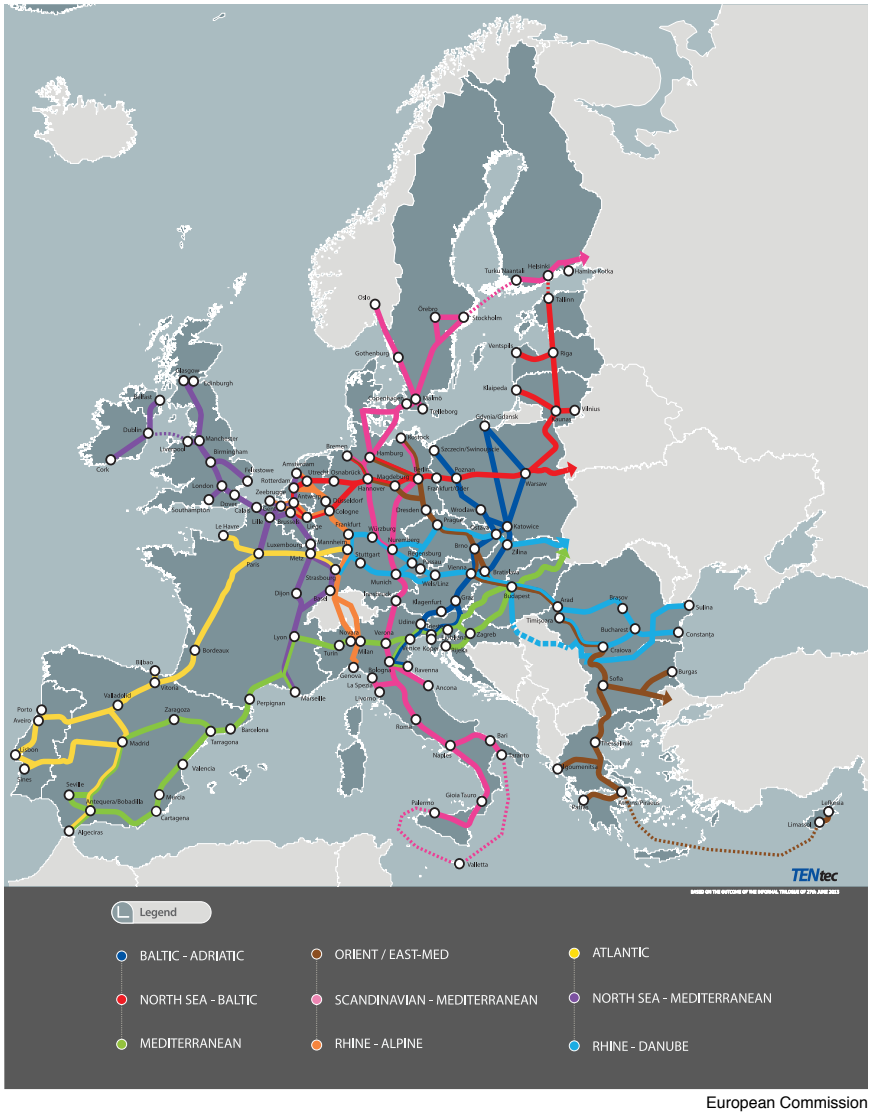
The head of an S-210 Tunnel Boring Machine used to excavate the Gotthard Base Tunnel under the Swiss Alps, shown after "breakthrough." Four such machines were used. The chisels have already been removed. The diameter is 8.8 meters (29 feet); the length of the machine is 400 meters (1,312 feet).

junction of the Main and Rhine rivers. It will be 50 kilometers shorter than the existing 170-kilometer route through the Rhine valley. Modeled after the newly completed Gotthard Base Tunnel under the Swiss Alps, it will have double tracks passing through each of twin tunnels, allowing cargo trains to travel at speeds up to 160 kilometers an hour (100 miles per hour), possibly unmanned.

The WTT will bypass one of the narrowest and deepest stretches of the Rhine Valley, especially between Bingen and Bonn. While this region is the most picturesque part of the Rhine Valley and has UNESCO World Heritage status, it has perhaps the most antiquated rail infrastructure in Germany. This stretch of railway is more than 150 years old and was designed for trains with an axle weight of 3 tons, not the current 23 tons, which has caused sections of the line to sink. Yet this is the primary route for cargo trains. No less than 400 freight trains pass through the valley every 24 hours. While Deutsche Bahn, the German national rail company, has built a high-speed passenger line through this region, it does not carry cargo trains.

The proposed WTT is a crucial link in the emerging New Silk Road that integrates Eurasia. Moreover, the project could serve as a paradigmatic solution for the dramatic expansion of rail freight throughout Europe.

Trans-European Transport Network



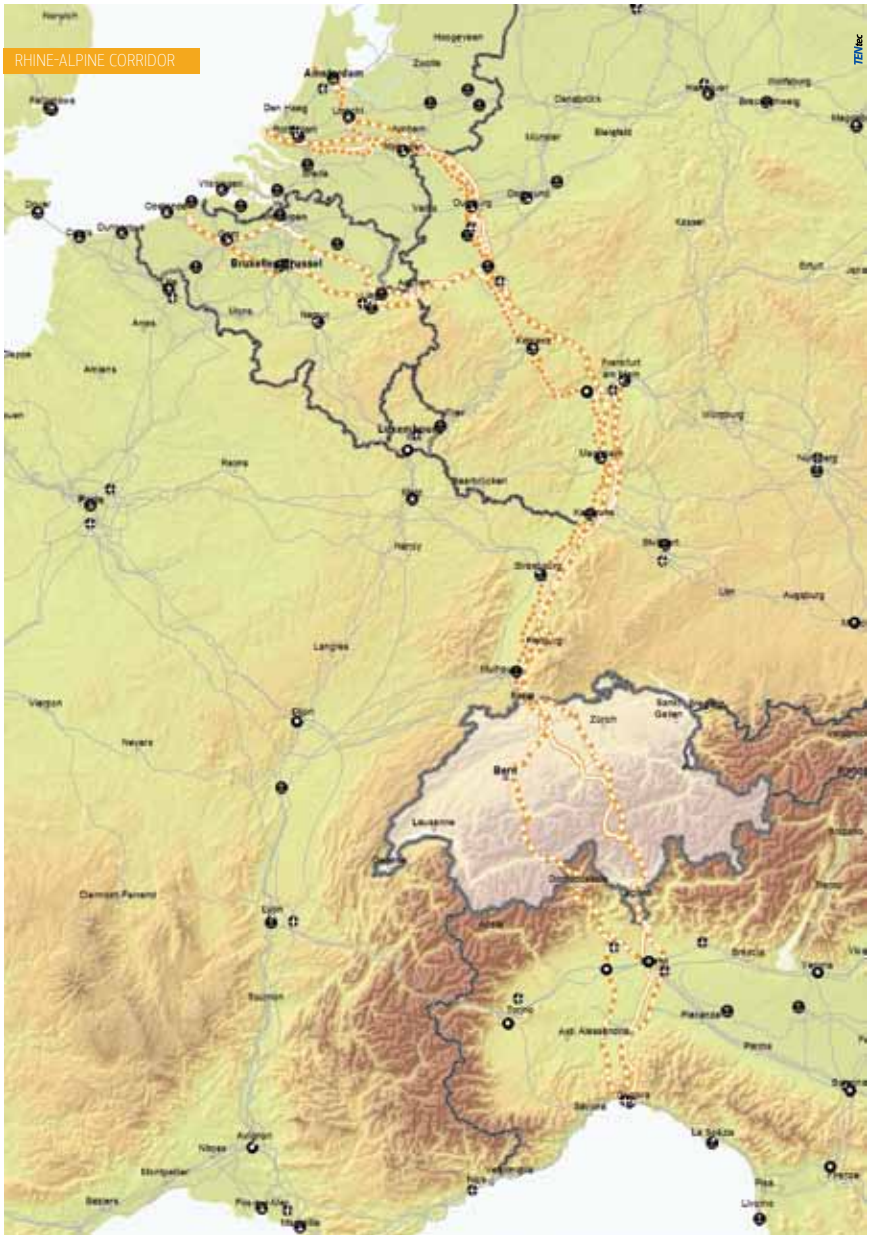
European Commission

The Bottleneck of All Bottlenecks

Cargo trains are already traveling from Central China to West European cities, including Lodz, Poland; Duisburg and Hamburg in Germany; Lyon in France; and cities in Spain, Switzerland, and other countries. Most of these trains take one of two routes. One route begins in Chengdu, the capital of Sichuan province in Central China, where it interconnects with the Chinese network. Traveling west from Chengdu, it goes through Kazakstan and across Russia, through Moscow to Brest in Belarus, and on to Lodz, Poland, and then continues west into Germany. A second route begins at Dalian on the Yellow Sea in northern China, where cargoes from South Korea and Japan can be loaded, enters Russia at Zabaikalsk, goes across Siberia to Moscow and then on to Lodz.

At Lodz, in the center of Poland, the trains enter the Trans-European Transport Network of corridors. These corridors were defined more than two decades ago with the aim of developing an efficient intermodal transport network linking Europe's major ports with the interior of the continent. Now they must also serve to link Europe with the New Silk Road. For example, from Lodz, the Chinese trains can travel south to the Adriatic

Rhine-Alpine Corridor



Existing primary rail routes from the North Sea to the Mediterranean.

Sea and the Mediterranean along the Baltic-Adriatic corridor, which runs from the Polish port of Gdansk on the Baltic through Eastern Europe and Vienna to Venice on the Adriatic.

Trains headed into Western Europe travel along the North Sea-Baltic Sea corridor, which connects Tallinn, Estonia on the Baltic with the North Sea ports of Bremen, Amsterdam, Rotterdam, and Antwerp. This corridor intersects the Rhine-Alpine Corridor. In this way, an express cargo train from Chengdu via Poland, terminates at Duisburg, which lies on the latter corridor.

The Rhine-Alpine corridor links the North Sea ports of Amsterdam, Rotterdam, Antwerp, and Zeebrugge with the Italian port of Genoa on the Mediterranean. Entering Germany near Oberhausen, the route heads south up the Rhine Valley all the way to Basel, where it divides. One branch goes through the new Gotthard Base Tunnel and the other through the Lötschberg Base Tunnel. These two tunnels under the Alps are new. Both lines continue south into Italy and terminate at Genoa.

Passing through one of the most densely populated regions in Europe and its industrial heartland, the Rhine-Alpine Corridor is the most traveled in Western Europe. This same corridor links into all the major East-West corridors of Europe and the North Sea-Mediterranean Corridor, which links Glasgow, Scotland and the French port of Marseille, and passes through the Channel Tunnel. The Rhine-Alpine Corridor also links into the Atlantic Corridor at Mannheim, Germany where it travels west to Paris and southwest through France and into Spain, where it branches off to the Portuguese ports of Porto, Aveiro, Lisbon and Sines and links to Spain's largest port, Algeciras, on the Bay of Gibraltar.

To go east, as mentioned, the Rhine-Alpine Corridor links into the North Sea-Baltic Corridor, through which trains pass to and from China and Russia. At Frankfurt and Mannheim, the Rhine-Alpine Corridor links into the Rhine-Danube Rail Freight Corridor, which reaches the Romanian port of Constantza on the Black Sea.

In Italy, it links into the Mediterranean Corridor that begins at Seville in the southwest of Spain and runs along the Mediterranean coast of Spain, France, and northern Italy; it continues eastward, passing through Budapest to reach the Ukrainian border.

Thus all rail cargo coming from China and heading to points in western Germany, France, Spain, Portugal, Switzerland, and northwestern Italy must pass through this corridor. But the corridor is already tremendously overburdened by the huge volumes of cargo from the big North Sea ports of Rotterdam and Antwerp, respectively Europe's largest and second largest ports.

The Rhine-Alpine Corridor is the very backbone of the European rail freight network, yet its German segment is a serious bottleneck which the German government and Deutsche Bahn have so far refused to adequately address.

The New *Steel* Silk Road

The New Silk Road has to become a new, high-tech steel road employing the most advanced railway technology and operating on a separate, cargo-dedicated rail network capable of carrying cargo trains at speeds above 160 kilometers per hour.

Transcontinental railways are often seen as the alternative to shipment by sea, but a closer look reveals that they can become a serious competitor to air freight. While cargo trains carry 120 containers on average, the latest container ships carry up to 18,000. There could never be enough capacity to carry this trade on rails. Nonetheless, railways do compete with ships when shipping to points in the interior of Eurasia—for example, between Germany and points in Central Asia, western China, and western Siberia.

In densely populated regions such as Western and Central Europe, railways must provide an attractive alternative to truck transport to improve efficiency. The railways must also work hand in hand with overseas shipping as part of the intermodal transportation system that will efficiently move cargos from Eurasia's peripheral ports to points in the interior.

Reducing current travel times of two weeks or more from Chengdu or Dalian to one week or less at lower costs, would make railways competitive with air freight. But the issue is not just transporting laptops from China to the European market, but developing the huge underdeveloped regions along these transcontinental corridors. Such development requires machinery and technical equipment. To enable Western European manufacturers to respond to this need, a separate cargo network is required, which will enable the full development of freight-specific technologies, without having to make the compromises involved in using a single network for freight and passenger traffic. For example, on a separate network, freight trains could be run automatically without drivers. And a separate network would increase freight capacity. Eventually, magnetically levitated train systems will be used for cargo.

To consider the requirements of such a freight-specific network across Eurasia is a task for several reports. Nonetheless, the example of the Rhine-Alpine Corridor, and the WTT within it, illuminates several key issues.

The creation of cargo-dedicated rail lines has begun in Europe. Both France and Spain have built cargo-dedicated lines along the Atlantic Corridor, and other countries such as Belgium and Hungary are considering doing the same. On the Rhine-Alpine Corridor, the Netherlands is the most advanced with its cargo-dedicated Betuweroute, which runs from the Port of Rotterdam to the German border at Zevenaar-Emmerich. It was begun in 1997 and opened in 2007. Built at a cost of 4.7 billion euros, the 160-kilometer line includes 18 kilometers of tunnels and has 130 bridges and viaducts totaling 12 kilometers. It is designed to carry trains with an axle weight of 23 tons at a speed of 120 kilometers an hour. Experiments will begin soon to test automatic trains without drivers.

While it carries more than ten percent of the cargo volume arriving in Rotterdam, its throughput is being hindered because Germany, despite agreements, has yet to expand transport capacity from the German border at Emmerich, and throughout the rest of the Rhine-Alpine Corridor in Germany.

Belgium would also like to build a freight-dedicated line from Antwerp, Europe's second largest port, to Mönchengladbach on the German border along the route of the old Iron Rhine Railway, which was closed down in the 1990s.

From the other end of the corridor, Switzerland has become a heavy lifter in rail projects. With the aim of getting trucks off of the nation's highways, it has constructed two railway tunnels that are among the longest in the world. While these are dual use—freight and passenger trains—they have increased the efficiency of the system dramatically. The first is the Lötschberg Base Tunnel through the Bernese Alps, built below the old mountain tunnel. The 35-kilometer tunnel has two single-track tubes. While one tube is finished and has

been in operation since 2007, the second tube has not been fully completed because funds had to be transferred to the second huge tunnel project, the Gotthard Base Tunnel under the St. Gotthard Pass.

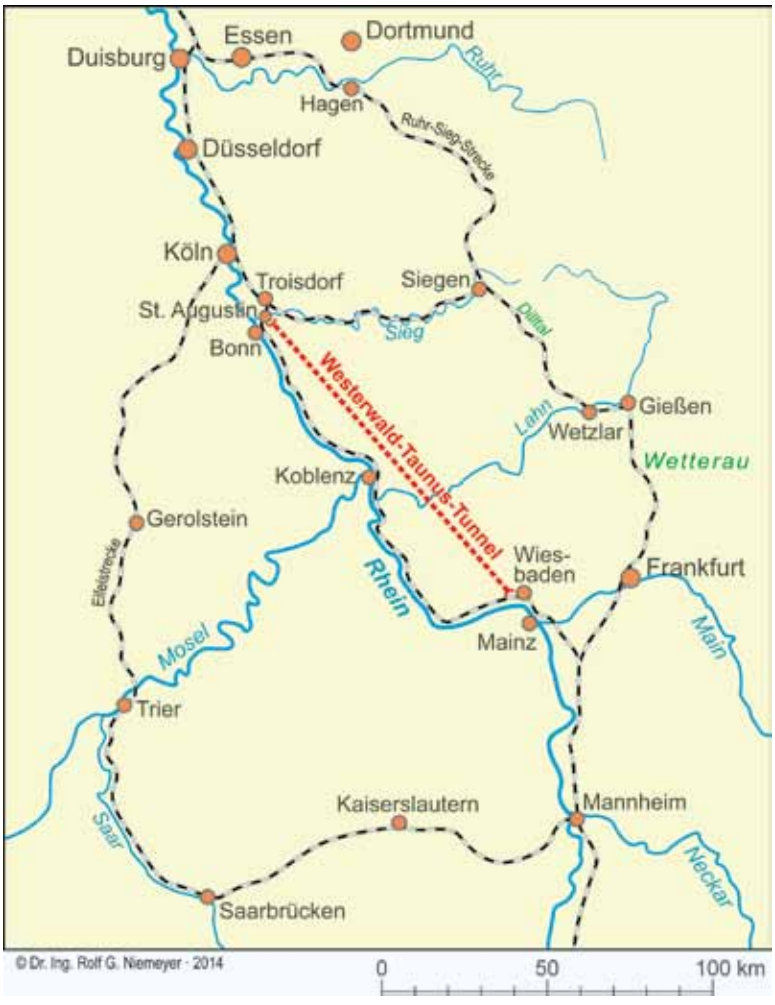
The Gotthard Base Tunnel, after 20 years of construction and the excavation of 28 *million* tons of rock, was officially opened in June of this year; regularly scheduled service will commence in December. At 57 kilometers (35.4 miles), it is the longest and deepest rail tunnel in the world and an inspiration for infrastructure planners throughout the world.

Where the Vision Ends

This visionary approach ends at the German border. Under the "schwarze Null" (black zero) budget policy of German Finance Minister Wolfgang Schäuble, "vision" has been banned from policy making. After almost a decade of pressure from Dutch interests in the Rhine-Alpine Corridor, Germany has finally relented, but has taken the cheapest and least desirable option. Rather than building a dedicated, double-track freight line along the entire length of the corridor, it has only committed itself to building a third track along the existing passenger line that will go from Emmerich to Oberhausen, a distance of 73 kilometers. While the third track will be dedicated to freight, it will not permit high speed and will hardly solve the problem along the Rhine Valley. Work is to begin this year and is scheduled to be finished in 2025, at the cost of 1.5 billion euros. But don't hold your breath.

Germany took a similar approach in the Upper Rhine Valley for the Mannheim-Karlsruhe-Basel line, where the plan has been to simply upgrade the line and lay two more parallel tracks along certain sections to support high-speed trains. Begun in the 1980s, it was expected to be finished by 2008, but still remains unfinished with no date set for completion, although the German government "hopes" it could be completed by 2030. And this stretch of the Rhine Valley does not present great topographical challenges, since the valley is broad and relatively flat. One of its primary functions is to serve as the approach from Germany to the new Gotthard Base Tunnel. Although this is one of the most important sections of the Rhine-Alpine Corridor, the upgrade is primarily for passenger trains.

Westerwald-Taunus Tunnel



Build the WTT, Establish a New Paradigm

By implementing the principle that the future of rail cargo operations must entail the establishment of an entirely new, independent rail freight network, the WTT could be the game changer that launches a new paradigm for rail transportation in Germany and the new Steel Silk Road.

The registration for the WTT project, inspired by the Gotthard Base Tunnel and drafted by Dr.-Ing. Rolf G. Niemeyer, is available on the website www.westerwald-taunus-tunnel.de/ It indicates that all of the technology and engineering know-how required for the project has been proven and is readily available. The

The Westerwald-Taunus Tunnel is proposed as an alternative to the present route on the bank of the Rhine River, shown here as it passes Burg Katz. The present rail infrastructure is more than 150 years old and has a limited load-bearing capacity for the 400 freight trains which pass through this section daily.

tunnel will traverse a straight line beginning at the town of St. Augustine, east of Bonn and not far from the two railway marshalling yards at Cologne. It will terminate at Hochheim near Wiesbaden, where it can connect with the rail line leading to the nearby Mainz-Bischofsheim marshalling yard. From there, various rail lines go south along the Rhine-Alpine Corridor, and there are also connections to lines going east and west. The route will be 50 kilometers shorter than the old 150-kilometer Rhine Valley route.

An alternative is to have the line terminate near Wiesbaden-Schierstein on the other side of Wiesbaden, where it could link with the line to Mainz-Bischofsheim from further down the Rhine. The former configuration would be 118 kilometers long and the latter, 107 kilometers.

The tunnel must cut through the Rhenish Massif (*Rheinisches Schiefergebirge*), the geological formation that includes the Westerwald and Taunus ranges, and will use the Gotthard Base Tunnel configuration—two tracks passing through each of two parallel tunnels, with connecting tunnels between the two for emergencies and maintenance operations. The tunnel will be in two segments, one under the Westerwald and the other under the Taunus range. Eight boring machines similar to the ones used on the Gotthard Base Tunnel could operate simultaneously, working from both directions on each parallel pair of tunnels in each segment. Assuming a construction cost of 45 million euros per kilometer (2012 estimate), the tunnel alone will cost an estimated 5.3 billion. Adding the rail lines, technical equipment, and signaling system, the estimated total cost is 10 billion euros.

The current traffic through the Rhine Valley is 400 freight trains per day, and the tunnel will enable a large increase. Modern signaling technology is so good that it will permit more trains per day (720 per track, 1440 per day) than is practically feasible given other constraints.

The projected cost of the WTT compares with the 177-kilometer Cologne-Frankfurt high-speed rail line, begun in 1995 and finished in 2002, which parallels Germany's A3 Autobahn and cost 6 billion euros.

Too expensive? The promoters compare the cost to the "rescue" of German banks, pointing out that the rescue of WestLB, the German Landesbank, cost taxpayers 18 billion euros, while the rescue of IKB Deutsche Industriebank, HRE-Hypo-Real East, and others cost a total of 74 billion euros. They might have added the European bank bailout that was camouflaged as the Greek bailout, which cost more than 250 billion euros.

Using tunnels for a rail freight network would be very attractive along other sections of the corridor that pass through high-density population centers, both for safety and to permit high speed. It is about time that a few railway tunnels were built to improve a rail network that is, in part, more than 150 years old.