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**MONITORING OF THE DEVELOPMENTS RELEVANT  
TO PAN-EUROPEAN TRANSPORT CORRIDORS AND AREAS**

Transport Infrastructure Bottlenecks

Publication of the Report on Bottlenecks and Related Activities

Note by the secretariat

**I. INTRODUCTION**

1. At its twenty-first session (9-10 September 2008), the Working Party on Transport Trends and Economics asked the secretariat to ensure the publication of the report on bottlenecks and missing links drafted by Professor Alan Pearman and welcomed follow-up activities related to further development and applications of the methodology elaborated in the report (ECE/TRANS/WP.5/44, para. 17). This note describes the progress made in the publication of the report and related activities.

2. The secretariat completed the editing of the report on bottlenecks in December 2008 and submitted the document to the Inland Transport Committee and its Bureau for their approval (ECE/TRANS/205). Following the approval by both bodies in their respective sessions in February 2009, the final version of the report was published in English in May 2009. The French and Russian versions are to be published in the second half of 2009. A link to the electronic version of the report has been set up on the WP.5 website.

## II. A DISCUSSION OF THE REPORT BY OUTSIDE EXPERTS

3. The UNECE report on bottlenecks generated an interesting discussion among participants in the Roundtable on Integration and Competition Between Transport and Logistics Businesses that took place in Paris on 5-6 February 2009. The Roundtable was organized by the ITF-OECD Joint Transport Research Centre. This section summarizes the main points made during the electronic discussion of the UNECE report mentioned above that took place after the Roundtable and was held under the Chatham House Rule.<sup>1/</sup>

4. The experts participating in the discussion agreed that inland transport infrastructure in Europe was provided mainly by governments at prices that are usually set well below the long-run marginal cost. Therefore, an administrative process is needed to identify bottlenecks and potential investment. The UNECE 2009 report<sup>2/</sup> aims to provide a methodology for the identification of bottlenecks for further analysis that would consider a range of options to remove such bottlenecks, including investment, infrastructure pricing, regulation of access, and so on.

5. In contrast to the UNECE report that does not distinguish between national and international infrastructure bottlenecks, participants in the discussion agreed that international bottlenecks are likely to have causes and solutions that are different from national ones. If the bottleneck is between countries or if an internal bottleneck is mostly a problem because it reduces international traffic flows, the root cause may well be related to rivalry between states that pursue narrow national interests or the lack of an adequate international funding mechanism.

6. All experts participating in the discussion agreed that bottlenecks depended on prices. In other words, there will always be a price high enough for the bottleneck to disappear. For instance, fixed rail rates in Canada that do not allow for seasonal variations result in seasonal traffic congestion. In contrast, flexible rail rates in the United States remove seasonal traffic congestion.

7. Market definition exercises are being used by regulators to set the limits of a bottleneck. For example, whenever an economic regulator (setting prices for monopoly/bottleneck elements of markets such as energy, rail, post) and a company are in discussion about which products should be within the scope of a price cap, the analysis required is about market definition. If a product can be demonstrated to exist in a market with sufficient competition (such that Simon's hypothetical monopolist test suggests that entity could not raise prices profitably) then that product is removed from the price cap and ex ante price setting, with control passing to ex post competition law. In this case, the bottleneck is the remaining set of products that are still subject to the price cap. Thus, the implicit definition of a bottleneck is a product or products in a certain geography where a hypothetical monopolist could raise prices profitably.

8. In principle, a shadow price approach can be applied to assess whether a bottleneck merits regulation. This shadow price is the amount that "society" would pay to have the constraint

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<sup>1/</sup> The Chatham House Rule states that participants in a discussion are free to use the information received but neither the identity nor the affiliation of any participant may be revealed.

<sup>2/</sup> UNECE (2009), *A Methodological Basis for the Definition of Common Criteria regarding the Identification of Bottlenecks, Missing Links and Quality of Service in Infrastructure Networks*, United Nations, New York and Geneva.

relaxed or removed, which in turn reflects the degree to which there are substitutes, more or less adequate, for the bottleneck capacity. This is similar to the market definition exercise commonly applied in competition law. The shadow price cannot be defined precisely enough to substitute for a market price, however, and only prices formed in a reasonably competitive market provide a meaningful indication of the opportunity cost of scarce bottleneck capacity. Instead, answering some questions regarding choices available to customers can provide an indication of how much market power is associated with a bottleneck, although this process will not provide much guidance on appropriate investment levels.

9. Designating a facility as a "bottleneck" would require a study of what shippers are doing in response to the constrained road or rail capacity and what they would do in response to increased capacity. For example, what are the commodities being shipped on the corridor? Can these commodities travel by alternative modes (bottleneck has lower shadow price) or by one mode only (bottleneck has higher shadow price)? Can the potential customers get very good substitutes from other sources (bottleneck has lower shadow price) or do they suffer without or pay much higher prices for much inferior substitutes (bottleneck has higher shadow price)? And so on. These are not easy questions to answer, and data will not be easily available, but an identification of bottlenecks based on estimated shadow prices could be, if feasible, more valuable than that based on studies of where quality is below design standard, or what percentage of the time a routing is capacity-constrained.

10. The discussion revealed that a straightforward application of standard economic concepts to the identification of bottlenecks may not be feasible for all inland transport modes. The well developed analysis of road bottlenecks is reflected in the concept of congestion pricing of individual highway links. The efficient price for a highway link is the monetized value of delay that one vehicle imposes on others using the link. A link should be expanded when the present discounted value of expected congestion can pay for the capacity expansion. This body of analysis is consistent with the discussion of road bottlenecks in the UNECE report.

11. In principle, all concepts of capacity are a matter of service degradation as throughput levels rise. In transportation, it is natural to assume that service degradation can be measured by delay. The capacities of highways are measured by speed-volume curves that show the drop in speed as traffic volumes rise for different kinds of highways. The value that users place on service degradation on one link depends on the availability of alternative routes. This is where market definitions come into play. If a link is one of several parallel routes, demand on the route will be highly elastic and thus volumes will quickly balance themselves among different routes when demand between two endpoints rises.

12. Would it be possible to measure speed-volume curves and place a value on service loss for railways, borrowing the highway concepts of bottlenecks? There are numerous issues that would need to be taken into account if standard economic concepts were to be used to measure shadow prices of rail bottlenecks. First, standard traffic theory assumes that there is no scheduler and that the speed falls due to the decision making of atomistic independent actors on the highway. This assumption obviously fails in the case of railways. Second, congestion pricing assumes that the goal of transportation policy is solely to provide service to those users who will pay the maximum amount for the service (net of the costs of providing the service). In reality, there is a much richer set of motivations than is assumed by standard congestion theory. In particular, policymakers may not be indifferent between providing service to their own nationals as opposed

to those simply transiting to get to a different country. Third, for many commodities, reliability is as important as average service speed, but this is not taken into account in the standard theory of congestion pricing. Fourth, there may be strategic motivations for a railroad or infrastructure manager in decisions of where to invest and how to route trains. In this case, technical definitions of bottlenecks may not be possible based on traffic on particular links.

13. In conclusion, the discussion of the UNECE report on bottlenecks by outside experts shows that it would be desirable to identify and rank bottlenecks by means of shadow prices, if they could be estimated with a reasonable degree of accuracy. This approach may well be feasible for highways but its viability is less obvious in the case of railways or inland waterways. This is consistent with findings of the UNECE report (pp. 16-17). However, the discussion added value to the report by specifying preconditions for the use of a theoretically founded identification of bottlenecks at the link level in rail networks. Further, the discussion revealed that the causes and remedies pertaining to international capacity bottlenecks are likely to differ from those relevant to internal bottlenecks. Last but not least, economic regulators of network industries developed pragmatic approaches to the definition of bottlenecks that might be of interest to transport planners.

### **III. PLANNED FOLLOW-UP ACTIVITIES**

14. Following a suggestion of the Working Party mentioned above, the secretariat has offered to co-organize a joint UNECE-DG TREN Workshop that would consider inter alia the ITC methodology developed in UNECE (2009) and the feasibility of its use in transport infrastructure planning at the pan-European level. The Workshop is expected to take place during the second half of 2009.

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