Finding rail potential: methodology to predict rail ridership based on socio economic developments

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Summary of Abstract
Socio economic data are used to determine the theoretical number of passengers per station. The resulting demand is compared to actual data to find out where there's potential. This new methodology proved to be valuable for the development of long term timetables.

Introduction
About 6 six years in advance, a new countrywide timetable has to be developed for the Netherlands, aiming at profitable growth of passengers. For the development of this timetable a methodology was used this year that is new for the Dutch rail sector. An approach was chosen where several market driven methodologies are used. One of them is the potential-analysis: a demand focussed approach with a thorough analysis of the developments in the transport market to subsequently develop a product adjusted for this demand. This method is contrary to the usual supply focused methodology where the constraints/opportunities of the infrastructure and existing trip patterns are often leading.

Potential analysis

The base for the potential-analysis are socio-economic data. The most important source of socio-economic data is from the Dutch National Model "NRM" (Rijkswaterstaat 2014). For all areas in the Netherlands data of number of inhabitants, surface, employment and number of scholars/students are known. Additionally, for every region a distinction can be made on age groups, job type and education type.

We filtered the most relevant socio-economic data from the NRM. Specifically, the number of inhabitants (separated by age group), the amount of jobs and the amount of scholars/students.

From the nationwide mobility survey "OViN" (CBS 2014), the age groups, the purposes jobs and education, and the amount of trips by train as main mode per person per day are deduced. This trip production confirms the view that an average elderly takes the train less often than an average employee. It also shows that the level of urbanization in a region plays a large role in the amount of trips per day made.

Inhabitants in a strongly urbanized region tend to take the train (or bus and tram) sooner than inhabitants in the countryside and a job outside the city will generate less trips by train than a job inside the city. This also requires a correction of the socio-economic data. In order to do this a OViN-classification of urbanization serves as base. This classification consists of five degrees of urbanization: For example, regions with 2,500 or more addresses per km^2 are strongly urbanized (1) and regions with less than 500 addresses per km^2 are not very urbanized (5) according to the classification.

Using the previous variables, the theoretical demand for public transport is determined for the three aforementioned purposes. By summing the data of the different motives, an indication of total demand is obtained, as is shown in figure 1.

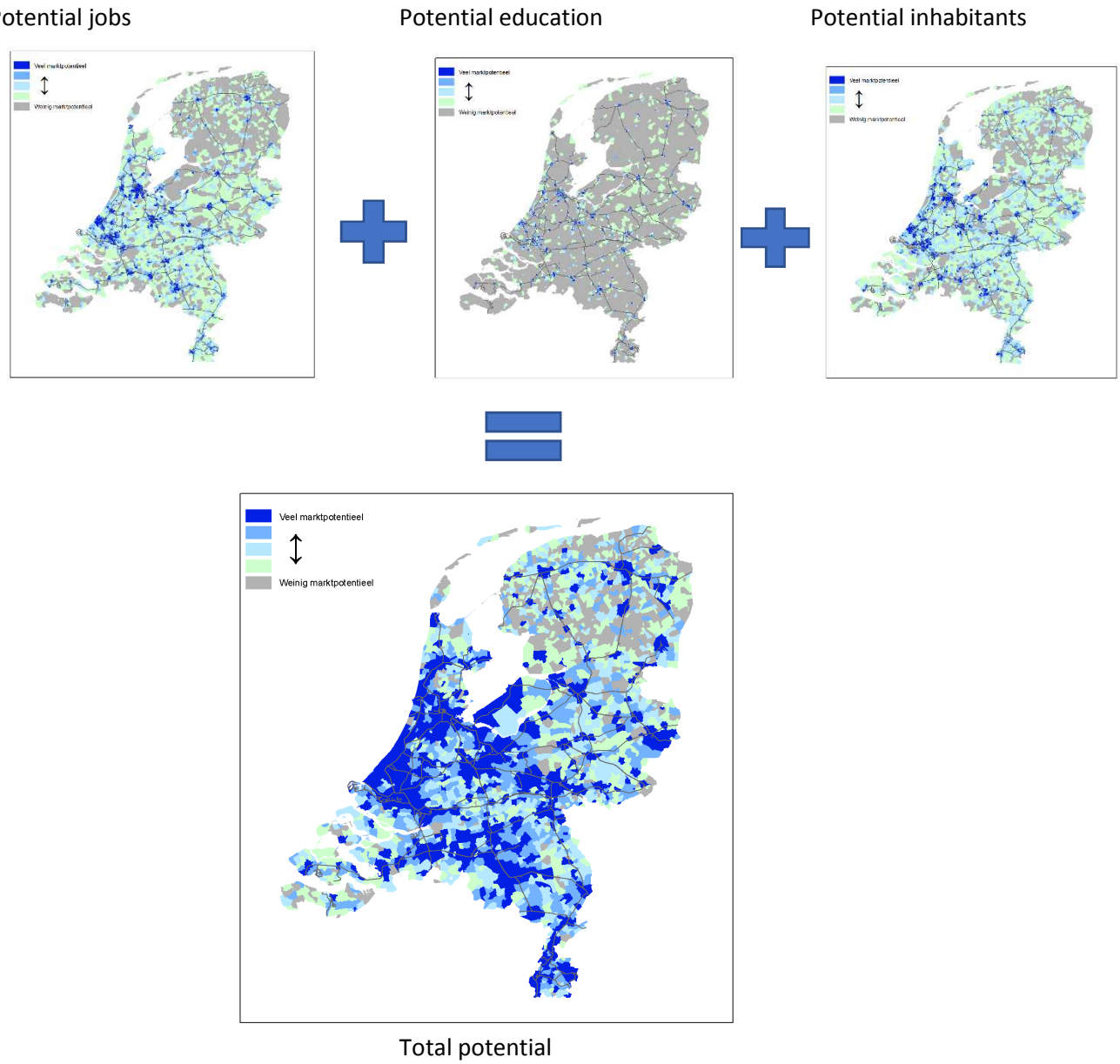

Figure 1: Composition and result of the potential-analyses

Now that the theoretical potential is known, the next step is to include the actual supply in the analysis. In order to do this, the distances to the nearest station are calculated for all regions and for all travel purposes a distance decay curve is used to determine the demand as a function of distance.

After the new potential is determined in this way, the final step is to combine the current demand with the theoretical demand in order to estimate the public transport market potential. If current demand is higher or equal to the modelled demand the market is saturated. In the regions where the model calculates higher demand than currently is observed there is unused travel potential. This unused travel potential is illustrated in figure 2.

Figure 2: Rail potential in 2025

The analysis indicates that mainly in the Randstad there is a large potential. However, several cities outside the Randstad, like Breda, Eindhoven, Arnhem, and Zwolle, also show extra potential. Compared to similar type of regions, the train use in these regions is low and therefore there's an opportunity to grow. This could be facilitated by extra and/or different timetables.

Conclusion

An important advantage of the demand-driven methodology is that market demand is deduced from characteristics of potential passengers and regions, and it doesn't solely use existing passenger flows, as is the case for common models. This means the passengers potential, that would be invisible in these models, is revealed. Furthermore, the approach leads to a logical and repeatable result. The choices that are made are transparent and the risk of missing opportunities is therefore small. The application of the new methodology has led to identifying new opportunities. The analysis of market potential shows that inside and bordering the Randstad there remain regions where a focused product improvement could lead to gaining many new passengers for the train.

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