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Item 12 of the provisional agenda
Productivity in Rail Transport

Rail productivity indicators*

Note by the secretariat

I. Mandate

1. The proposal on the development and calculation of rail productivity indicators presented below has been prepared by the secretariat in line with the mandate of the Working Party on Rail Transport (SC.2) to analyze the various elements of railway productivity growth, in particular in freight transport in accordance with its programme of work for the period 2014–2018 (ECE/TRANS/2014/26, activity 02.5.2, output (f)).

II. Rail Productivity Indicators

2. The rail productivity indicators adopted by the Working Party in 2000 (TRANS/SC.2/194, para. 23) are as follows:

* The present document is being issued without formal editing.

Quantitative Rail Productivity Indicators

	Rail productivity indicator	*Measurement*	
A	Labour productivity (high-speed – conventional rail)		
	(1)	employees/ km of network in use	
	(2)	(a) net tonne-km/ employee	(b) passenger-km/ employee
B	Productivity of freight transport		
	(1) per km	(a) gross tonne-km/ km of network	(b) net tonne-km/ km of network
	(2) per employee	(a) gross tonne-km/employee	(b) net tonne-km/ employee
C	Productivity of passenger transport (high-speed – conventional rail)		
	(1) per km	passenger-km/ km of network	
	(2) per employee	passenger-km/employee	
D	Productivity of traffic (high-speed – conventional rail)	(1) net tonne-km/ km of network	(2) passenger-km/ km of network
E	Productivity of locomotives (high-speed – conventional rail)	(1) gross tonne-km/ locomotive	
F	Productivity of wagons	(1) net tonne-km/wagon	
G	Productivity of lines (where necessary only on railway lines to be determined)	(1) passenger train-km/ km of network	(2) freight train-km/ km of network
H	Energy consumption (for traction power)	(1) MJ/ 1000 gross tonne-km	

3. At its fifty-fourth session in 2000 (TRANS/SC.2/194), the Working Party again examined the productivity figures provided by OSJD, UIC and Trans-European Railway (TER) Project, and agreed that the indicators available should be completed by qualitative indicators. It also asked the secretariat to prepare a proposal in this sense, together with the TER project Central Office and in cooperation with the OSJD and UIC and to present it at its session in 2002 together with productivity figures from all UNECE member countries.

4. During its 2002 session, the Working Party (TRANS/SC.2/198, para. 13) asked member Governments to reply to a questionnaire containing a range of quality indicators of railway productivity for passenger and freight transport separately (on efficient service delivery, service quality, safety, accessibility, environmental quality, financial sustainability, capital and management together with the best practices) based on the following table.

Qualitative Rail Productivity Indicators

Indicator	*Measure*	*Best practice*
Efficient service delivery	Price (US$ per freight tonne-km)	< 2 ¢
	Price (US$ per passenger km)	
Service quality	Average train speed (km/h) (urban, local, intercity, etc.)	
	% of arrivals less than 15 minutes late	95 %
Safety	Train accidents (per million train-km)	
Accessibility	Network density (route km/km^2)	
	Freight ton km/US$ GDP (Purchasing Power Parity)	
	Rail share of rail + truck ton km	
	Rail passenger km as % of passenger km + tonne-km (%)	
Environment quality	KJ of energy per converted tonne-km	
Financial sustainability	% of costs covered from internal cash generation (Real return on total gross assets) (%)	> 100 (USA)
Capital	Track operated under slow orders on track and structures	
	• route km	
	• % total km	
	km travelled per available locomotive/day	
Management	Ratio of average passenger tariff to average freight tariff (based on US$ per km) (%)	> 2.0 (Europe)
	Locomotive availability (%)	90 (USA)
	Freight and passenger wagon availability (%)	> 90 (USA/Europe)

5. At its last session the Working Party was informed by the secretariat that many comments on the calculation of productivity indicators were received by Governments. These comments were mainly focused on the need to further review these indicators, re-evaluate their consistency, establish clear definitions and establish commonly agreed objectives regarding their interpretation.

6. The Working Party requested the secretariat to prepare an official document for its sixty-eighth session with the reviewed and fine-tuned rail productivity indicators based on Government's comments for consideration and approval by the Working Party.

7. Following are the revised rail productivity indicators based on comments received by the Governments.

8. Quantitative Indicators:

Title:

1. Labour productivity indicator (high-speed and conventional rail)

Definition:

Labour productivity is defined as output per unit of labour, and is calculated by dividing output produced by a measure of the labour input used to produce the output (number of employees or labour hours). The first labour productivity indicator divides the kilometres of network in use for both high-speed and conventional rail by the total number of employees working in both railways undertakings and infrastructure manager(s).

Indicator:

km of network in use /employees

Good Practice:

Remarks:

Employees: The year of data used should be provided. Data for employees should include data of all Railways Undertakings (RU) if there are many and of the Infrastructure Manager (IM) if any.

km of network in use: The year of data used should be provided. For the calculation of kilometres of network used both double and multiple track lines should be counted once.

Title:

2. Labour productivity indicator (freight trains)

Definition:

Labour productivity is defined as output per unit of labour, and is calculated by dividing output produced by a measure of the labour input used to produce the output (number of employees or labour hours). The second labour productivity indicator divides the net tonnes -kilometres of freight trains by the total number of employees working in freight railways undertakings only.

Indicator:

Net tonne-km/employee

Good Practice:

Remarks:

Net Tonne –km: the tonne – km should be declared in million tkm, for instance 115,000,000,000 tonnes per kilometres should be calculated in the indicator as 115,000 million tkm. The year of data used should be provided.

Employees: The year of data used should be provided. Data for employees should include data of freight Railways Undertakings (RU) only.

Title:

3. Labour productivity indicator (passengers trains, high speed and conventional)

Definition:

Labour productivity is defined as output per unit of labour, and is calculated by dividing output produced by a measure of the labour input used to produce the output (number of employees or labour hours). The third labour productivity indicator divides the passengers -kilometres of passengers' trains by the total number of employees working in passengers railways undertakings only.

Indicator:

passenger-km/ employee

Good Practice:

Remarks:

passenger –km: the passenger – km should be declared in million pkm, for instance 80,000,000,000 passengers per kilometre should be calculated in the indicator as 80,000 million pkm. The year of data used should be provided.

Employees: The year of data used should be provided. Data for employees should include data of passengers Railways Undertakings (RU) only for both conventional and high speed rail.

Title:

4. Productivity indicator of freight transport

Definition:

Freight rail productivity is defined as output per unit of network and is calculated by dividing output produced by a measure of network used to travel (kilometres). The fourth productivity indicator divides the net tonne kilometres transported by freight trains by the total number of the kilometres of network in use.

Indicator:

net tonne-km/ km of network

Good Practice:

Remarks:

Net tonne-km: the tonne – km should be declared in million tkm, for instance 115,000,000,000 tonnes per kilometres should be calculated in the indicator as 115,000 million tkm. The year of data used should be provided.

km of network in use: The year of data used should be provided. For the calculation of kilometres of network used both the double and multiple track lines should be counted once.

Title:

5. Productivity of passenger transport (high-speed – conventional rail)

Definition:

Passengers rail productivity is defined as output per unit of network and is calculated by dividing output produced (number of passengers' kilometres) by a measure of network used to travel (kilometres). The fifth productivity indicator divides the passenger kilometres moved by conventional and high speed trains by the total number of the kilometres of network in use.

Indicator:

passenger-km/km of network

Good Practice:

Remarks:

Passenger –km: the passenger – km should be declared in million pkm, for instance 80,000,000,000 passengers per kilometre should be calculated in the indicator as 80,000 million pkm. The year of data used should be provided.

km of network in use: The year of data used should be provided. For the calculation of kilometres of network used both the double and multiple track lines should be counted once.

Title:

6. Productivity of locomotives (Freight transport)

Definition:

Productivity of locomotives for freight transport is defined as output per locomotive and is calculated by dividing output produced (net tonne kilometres) by the number of locomotives used for freight transport. The sixth productivity indicator divides the net tonne kilometres transported by freight trains by the total number of locomotives used in freight transport.

Indicator:

net tonne-km/locomotive

Good Practice:

Remarks:

Net tonne-km: the tonne – km should be declared in million tkm, for instance 115,000,000,000 tonnes per kilometres should be calculated in the indicator as 115,000 million tkm. The year of data used should be provided.

Locomotives: number of locomotives used for the transportation of freight.

Title:

7. Productivity of locomotives (Passengers transport: high-speed – conventional rail)

Definition:

Productivity of locomotives for passengers transport is defined as output per locomotive and is calculated by dividing output produced (passengers kilometres) by the number of locomotives used for passengers transport. The seventh productivity indicator divides the passengers' kilometres moved by conventional and high speed trains by the total number of locomotives used in passengers transport.

Indicator:

passengers-km/locomotive

Good Practice:

Remarks:

Passenger –km: the passenger – km should be declared in million pkm, for instance 80,000,000,000 passengers per kilometre should be calculated in the indicator as 80,000 million pkm. The year of data used should be provided.

Locomotives: number of locomotives used for the transportation of passengers.

Title:

8. Productivity of wagons (freight transport)

Definition:

Productivity of wagons for freight transport is defined as output per wagons and is calculated by dividing output produced (net tonne kilometres) by the number of wagons used for freight transport. The eight productivity indicator divides the net tonne kilometres transported by freight trains by the total number of wagons used in freight transport.

Indicator:

net tonne-km/wagon

Good Practice:

Remarks:

Net tonne-km: the tonne – km should be declared in million tkm, for instance 115,000,000,000 tonnes per kilometres should be calculated in the indicator as 115,000 million tkm. The year of data used should be provided.

Wagons: number of wagons used for the transportation of freight.

Title:

9. Productivity of wagons (Passengers transport: high-speed – conventional rail)

Definition:

Productivity of wagons for passengers transport is defined as output per wagons and is calculated by dividing output produced (passengers kilometres) by the number of wagons used for passengers transport. The ninth productivity indicator divides the passengers' kilometres moved by conventional and high speed trains by the total number of wagons used in passengers transport.

Indicator:

passenger-km/wagon

Good Practice:

Remarks:

passenger –km: the passenger – km should be declared in million pkm, for instance 80,000,000,000 passengers per kilometre should be calculated in the indicator as 80,000 million pkm. The year of data used should be provided.

Wagons: number of wagons used for the transportation of passengers.

Title:

10. Productivity of lines (freight transport)

Definition:

Productivity of lines for freight transport is defined as output per kilometres of network and is calculated by dividing output produced (number of freight trains kilometres) by the kilometres of network used. The tenth productivity indicator divides the total travelling kilometres of freight trains by the total kilometres of network used.

Indicator:

freight train-km/km of network

Good Practice:

Remarks:

Freight train –km: the freight train – km should be declared in million ftkm, for instance 115,000,000 freight train kilometres should be calculated in the indicator as 115 million ftkm. The year of data used should be provided.

km of network in use: The year of data used should be provided. For the calculation of kilometres of network used both the double and multiple track lines should be counted once.

Title:

11. Productivity of lines (Passengers transport: high-speed – conventional rail)

Definition:

Productivity of lines for passengers transport is defined as output per kilometres of network and is calculated by dividing output produced (number of passengers' trains kilometres) by the kilometres of network used. The eleventh productivity indicator divides the total travelling kilometres of passengers trains (conventional and high speed) by the total kilometres of network used.

Indicator:

passenger train-km/km of network

Good Practice:

Remarks:

passenger train –km: the passenger train – km should be declared in million ptkm, for instance 600,000,000 passenger train kilometres should be calculated in the indicator as 600 million ftkm. The year of data used should be provided.

km of network in use: The year of data used should be provided. For the calculation of kilometres of network used both the double and multiple track lines should be counted once.

Title:

12. Energy consumption (for traction power)

Definition:

The energy consumption indicator is defined as output per 1000 gross tonne-km is calculated by dividing output produced (mega joules) by 1000 gross tonne – kilometres. The twelfth productivity indicator divides the energy consumed for traction in mega joules by 1000 gross tonne – kilometres.

Indicator:

MegaJoule/1000 gross tonne-km

Good Practice:

Remarks:

9. Qualitative Indicators

Title:

13. Efficient service delivery (freight transport)

Definition:

The efficient service delivery indicator for freight transport is defined as output per net tonne kilometres and is calculated by dividing output produced (annual turnover of freight rail undertaking) by net tonne kilometres moved. The thirteenth productivity indicator divides the annual turnover of freight rail undertaking by net tonne kilometres moved.

Indicator:

Price (US$ per net tonne-km)

Good Practice: < 2 ¢

Remarks:

US$: Indicates the annual turnover of Railways Undertakings for freight in Million US$.

Net tonne-km: the tonne – km should be declared in million tkm, for instance 115,000,000,000 tonnes per kilometres should be calculated in the indicator as 115,000 million tkm. The year of data used should be provided.

Title:

14. Efficient service delivery (passengers transport: conventional and high speed)

Definition:

The efficient service delivery indicator for passenger transport is defined as output per passenger kilometres and is calculated by dividing output produced (annual turnover of rail undertaking for passengers) by passengers kilometres transported. The fourteenth productivity indicator divides the annual turnover of rail undertaking for passengers by passengers kilometres transported.

Indicator:

Price (US$ per passenger km)

Good Practice:

Remarks:

US$: Indicates the annual turnover of Railways Undertakings for passengers in Million US$.

passenger –km: the passenger – km should be declared in million pkm, for instance 80,000,000,000 passengers per kilometre should be calculated in the indicator as 80,000 million pkm. The year of data used should be provided.

Title:

15. Service quality (freight transport speed)

Definition:

The indicator calculates the average speed, kilometres per hour, of freight trains operated during one year.

Indicator:

Average freight train speed (km/h)

Good Practice:

Remarks:

Average speed: The average speed of freight trains is being calculated by adding the speeds of all freight trains operated during one year and dividing by the total number of freight trains operated during the same year.

Title:

16. Service quality (passengers transport speed)

Definition:

The indicator calculates the average speed, kilometres per hour, of passenger trains operated during one year.

Indicator:

Average passengers train speed (km/h)

Good Practice:

Remarks:

Average speed: The average speed of passenger trains is being calculated by adding the speeds of all passenger trains operated during one year and dividing by the total number of passengers trains operated during the same year.

Title:

17. Service quality (freight transport delays)

Definition:

Significant lateness captures the percentage of freight trains that have caused significant disruption to at least some clients of cargo (i.e. lateness at final destination greater than 15 minutes). The seventeenth indicator calculates the percentage of freight trains with arrivals less than 15 minutes late.

Indicator:

% of freight trains arrivals less than 15 minutes late

Good Practice: 95 %

Remarks:

Title:

18. Service quality (passengers transport delays)

Definition:

Significant lateness captures the percentage of passenger trains that have caused significant disruption to at least some passengers (i.e. lateness at final destination greater than 15 minutes). The eighteenth indicator calculates the percentage of passenger trains with arrivals less than 15 minutes late.

Indicator:

% of passenger trains arrivals less than 15 minutes late

Good Practice:

Remarks:

Title:

19. Safety (freight transport)

Definition:

Safety of freight transport is defined as output per freight train kilometres and is calculated by dividing output produced (freight train accidents) by the total freight train kilometres of the year. The nineteenth productivity indicator divides the Freight Train accidents occurred in freight trains by the total freight train kilometres.

Indicator:

Freight Train accidents per freight train-km

Good Practice:

Remarks:

Freight train –km: the freight train – km should be declared in million ftkm, for instance 115,000,000 freight train kilometres should be calculated in the indicator as 115 million ftkm. The year of data used should be provided.

Freight Train Accidents: as freight train accidents are considered the “significant accidents” which means any accident involving at least one rail vehicle in motion, resulting in at least one killed or seriously injured person, or in significant damage to stock, track, other installations or environment, or extensive disruptions to traffic. Accidents in workshops, warehouses and depots are excluded.

Title:

20. Safety (passengers transport)

Definition:

Safety in passengers transport is defined as output per passenger train kilometres and is calculated by dividing output produced (passenger train accidents) by the total passenger train kilometres of the year. The twentieth productivity indicator divides the passenger train accidents occurred in passenger trains by the total passenger train kilometres.

Indicator:

Passengers Train accidents per Passengers train-km

Good Practice:

Remarks:

passenger train –km: the passenger train – km should be declared in million ptkm, for instance 600,000,000 passenger train kilometres should be calculated in the indicator as 600 million ftkm. The year of data used should be provided.

Passenger Train Accidents: as passenger train accidents are considered the "significant accidents" which means any accident involving at least one rail vehicle in motion, resulting in at least one killed or seriously injured person, or in significant damage to stock, track, other installations or environment, or extensive disruptions to traffic. Accidents in workshops, warehouses and depots are excluded.

Title:

21. Accessibility and network density

Definition:

Accessibility and network density is defined as output per country's total area (km^2) and is calculated by dividing output produced (kilometres of network) by the total area of a country in km^2.

Indicator:

Km of network / km^2 of country

Good Practice:

Remarks:

km of network in use: The year of data used should be provided. For the calculation of kilometres of network used both the double and multiple track lines should be counted once.

Title:

22. Accessibility and GDP

Definition:

The indicator calculates the accessibility of freight rail transport in the economy – or the contribution to the economy – by dividing the net tonne kilometres by country's GDP in US$.

Indicator:

Net tonne km/US$ GDP

Good Practice:

Remarks:

Net Tonne –km: the tonne – km should be declared in million tkm, for instance 115,000,000,000 tonnes per kilometres should be calculated in the indicator as 115,000 million tkm. The year of data used should be provided.

US$ GDP: The GDP of the country in US$. The GDP should be declared in the indicator in Billion US$

Title:

23. Accessibility of rail (freight)

Definition:

The indicator calculates the degree of rail freight accessibility to the total freight transported by rail and trucks and is calculated by finding the percentage of rail net tonne kilometres to the total net tonne kilometres of the year transported by rail and trucks.

Indicator:

Rail freight share (%) of rail + truck net tonne km

Good Practice:

Remarks:

Net Tonne –km: the tonne – km should be declared in million tkm, for instance 115,000,000,000 tonnes per kilometres should be calculated in the indicator as 115,000 million tkm. The year of data used should be provided.

Title:

24. Environment quality (freight transport))

Definition:

The environmental quality is defined as output per net tonne kilometres and is calculated by dividing output produced (kilo joule of energy) by the net tonne kilometres of the year. The twenty fifth productivity indicator divides the kilo joule of energy consumed by the freight trains by the total net toone kilometres of the year.

Indicator:

KJ of energy per net tonne-km

Good Practice:

Remarks:

Net Tonne –km: the tonne – km should be declared in million tkm, for instance 115,000,000,000 tonnes per kilometres should be calculated in the indicator as 115,000 million tkm. The year of data used should be provided.

Title:

25. Financial sustainability

Definition:

The indicator calculates the profitability of railways by providing the percentage of costs that was covered by the revenues of the company(ies).

Indicator:

% of costs covered from internal cash generation
(Real return on total gross assets) (%)

Good Practice:

Remarks:

Title:	
26. Management (turnover passenger and freight)	
Definition:	
The indicator calculates the ratio of turnover between passengers' transportation and freight one.	
Indicator:	
Ratio of turnover in rail passenger traffic to turnover in rail freight traffic (%)	
Good Practice:	> 2.0 (Europe)
Remarks:	

Title:	
27. Management (locomotives)	
Definition:	
The indicator calculates locomotives availability by dividing the output (locomotives used in one year) by the total number of locomotives.	
Indicator:	
Locomotive availability (%)	
Good Practice:	90 (USA)
Remarks:	

Title:	
28. Management (wagons)	
Definition:	
The indicator calculates wagons availability by dividing the output (wagons for freight and passengers used in one year) by the total number of wagons for both freight and passengers.	
Indicator:	
Freight and passenger wagon availability (%)	
Good Practice:	> 90 (USA/Europe)
Remarks:	