European Commission

TRIMIS
TRANSPORT RESEARCH AND INNOVATION MONITORING AND INFORMATION SYSTEM

D I G E S T

Issue 6
November 2018

Reducing Transport Emissions

Subscribe to Free Bi-monthly Research Alerts

Source:Prussi, M. and Lonza, L. (2018) Passenger aviation and high speed rail: a comparison of emission profiles on selected European routes, Journal Advanced Transportation. Available Here

Read more about TRIMIS at:
https://trimis.ec.europa.eu

The emission benefits of switching from aviation to high speed rail

The continuous growth in passenger air transport has consequences for greenhouse gas (GHG) emissions. This study assessed the environmental impact of travelling by high speed rail (HSR) rather than flying. Comparing six intra-European Union (EU) routes and a domestic route, it found that high speed trains (HST) offer GHG savings, but the duration of a trip limits real substitution. However, due to an expected rise in extreme weather events, rail travel will have a greater role in the European transport system as it will be considered as a resilient and reliable mode of transport, which is less affected by severe weather conditions compared to air travel.

The number of EU air passengers has been increasing. In 2016, there were 973 million air passengers of which nearly half flew to and from airports within the EU28. The development of new rail lines within the EU and the availability of HST services have opened the possibility of partial substitution with short-haul and medium-haul intra-EU flights, which will reduce GHG emissions.

The environmental impact of aircraft operations on local air pollution and climate change is dependent on flying time, aircraft seat capacity, engine efficiency and fuel consumption. In contrast, HST emissions are dependent on the energy mix used for electricity production, route distance, seat occupancy, and overall train efficiency, with a strong impact on cruise speed.

The study investigated the potential GHG reduction that could be achieved by substituting a proportion of intra EU flights with HST services in the period 2017 to 2025. The analysis was undertaken for a specific set of city pairs, considering that a total of 730 million passengers passed through the top 20 passenger EU airports in 2015.

Continued/...

TRIMIS
TRANSPORT RESEARCH AND INNOVATION MONITORING AND INFORMATION SYSTEM
DIGEST

TRIMIS

The Transport and Research and Innovation Monitoring and Information System (TRIMIS) supports the implementation and monitoring of the Strategic Transport Research and Innovation Agenda (STRIA) and its seven roadmaps.

TRIMIS is an open-access information system to map and analyse technology trends, research and innovation capacities, as well as monitor progress in all transport sectors.

TRIMIS is developed and managed by the Joint Research Centre on behalf of the European Commission.

Contact:
European Commission
Joint Research Centre, Ispra, Italy
Email: *EU-TRIMIS@ec.europa.eu*

The emission benefits of switching from aviation to high speed rail

Duration: HST/Flights [h:mm]	London Heathrow (LHR)	Paris-Charles de Gaulle (CDG)	Frankfurt/Main (FRA)	Amsterdam/Schiphol (AMS)	Rome Fiumicino (FCO)	Milano Linate (LIN)
London Heathrow (LHR)		3:05*	6:30*	5:30*	-*	-*
Paris-Charles de Gaulle (CDG)	1:15**		5:00*	3:15*	-*	-*
Frankfurt/Main (FRA)	1:30**	1:15**		4:30*	-*	-*
Amsterdam/Schiphol (AMS)	1:20**	1:20**	1:15**		-*	-*
Rome Fiumicino (FCO)	-**	-**	-**	-**		1:10*
Milano Linate (LIN)	-**	-**	-**	-**	3:00**	

Relative distances for railways (*) and air flights (**) for routes considered in the study

The energy consumption and the resulting aircraft emissions were estimated using available data for the mixed fleet that services the routes. The results highlight the significant advantage of HST compared with aircraft regarding direct carbon dioxide (CO_2) equivalent emissions per passenger kilometre.

Three scenarios were considered. The business-as-usual scenario, where the allocation of the 3.5 % annual pace of passenger growth remains constant until 2025. Also considered were a low-rail scenario and a high-rail scenario where 5 % and 25 % respectively of the same annual growth rate is shifted from air to HSR. The study found that shifting to HST allows GHG savings of 4 % in the low-rail scenario and 22 % in the high-rail scenario.

As well as reduced GHG emissions, HSR in the medium-term is more resilient to adverse weather conditions compared with air travel. Therefore, rail transport is expected to play a significant role in strengthening the EU transport system and its reliability, which is likely to be increasingly affected by severe weather conditions.

The study concludes by calling for additional research to consider other environmental impacts of air and rail travel. For example, non-CO_2 related emissions (e.g. contrails and soot) and the impact of HSR on biodiversity and landscape, etc.