

TRENDS

Globalisation

Demographic
Change

Digitalisation
& Automation

Climate
Change

ANTICIPATING THE IMPACT OF CHANGE IN TRANSPORT

on employment | working conditions | professions and skills



EUROPEAN TRANSPORT **WORKERS'** FEDERATION



With the Support of the European Union

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A. INTRODUCTION

The world of work is always changing, posing new challenges for workers and their representatives. To assess the future of employment in the European transport sector, trade unions need to deal with global mega-trends. "Mega-trends are middle or long-term changes whose effects will reach deep into social, ecological, and economic systems and have a major influence on future developments." Trends in economics, technology, climate, and demographics are especially relevant to the development of the transport sector in Europe. Employee representatives must take part in shaping these changing social realities. To do so, they need knowledge, influence, and a strategy.

The ETF TRENDS project² analysed and discussed with the ETF affiliates in 4 sub-regional Conferences in Gdansk, Madrid, Zagreb and Vienna four mega trends, which have and will have an impact on the future of the transport sector and thus on transport workers:

- Economic developments & globalisation
- Technological developments: automation & digitalisation
- Demographic change
- Climate change

Some key messages from the 4 sub-regional Conferences summarise well some of the findings:

Deregulation is felt by the trade unions as the biggest threat for transport workers since it undermines working conditions and destroys acquired labour and trade union rights. Globalisation and the EU Internal Market in their current form are deregulation projects with more threats than opportunities for transport workers. Job opportunities through increased trade and thus transport flows are undermined by social –dumping practices. Fair globalisation, a fair internal market and thus fair transport are needed.


Technological developments cannot be stopped, fighting technology is not an option. Important is to understand positive and negative elements, negotiate transition conditions and regulate the new challenges for the workers-employers relationship and collective representation coming with the so-called "fourth technological revolution". Technological choices are human made and can be influenced and shaped by trade unions.

Digitalisation and the platform economy are societal issues: trade unions should have a word in shaping the taxation and social security systems of the future as well as overall working time reduction and the distribution of work.

Climate change is already happening and it is a threat for the people and the planet. Stopping global warming is a responsibility of all. It's the future of young workers. The transformation towards a sustainable transport system provides good opportunities for example for public passenger transport and freight transport by rail and shipping. Developing a real just transition in transport is a challenge for social partners and political decision makers.

1 Dispan, Jürgen und Pfäfflin, Heinz (2014): Nachhaltige Wertschöpfungsstrategien. Unternehmensstrategien im Kontext von Industriepolitik und Megatrends. Edition Hans Böckler Stiftung .. p. 11

2 With the financial support of the European Union.



Demographic change in Europe is a big threat for the transport sector considering the high average age of transport workers and the lack of attractiveness of many jobs in the sector. It can be an opportunity for trade unions to bargain better conditions to increase the attractiveness provided that it is not undermined by social dumping practices using migrant workers and refugees against quality employment and by technological developments. Investment in training on the one hand and fair integration of migrant workers and refugees on the other hand are an integral part of an attractive transport sector.

This publication is intended to provide a foundation for the development of a trade union strategy. It provides an overview of the most important aspects of these four mega-trends in a global context, and illuminates their effects on the European transport sector. Using examples, the paper will analyse specific aspects and their effects on ports, maritime transport, road transport, inland waterways, civil aviation, railways, and public transport. Working conditions are expected to experience the greatest effects from these trends. These results are based on research into literature and sources and on background interviews.

An additional discussion paper “TRENDS in transport – anticipate and act” summarises the trends, the major impacts on employment and working conditions (threats and opportunities) and makes suggestions for trade union action at European and national level.

An aerial photograph of a large cargo ship sailing on the ocean. The ship's deck is visible on the left, covered with a dense grid of multi-colored shipping containers in shades of blue, red, white, and brown. The ship's wake, a series of white, frothy waves, stretches from the bottom left towards the top right of the frame. The entire image is overlaid with a semi-transparent teal color.

ECONOMIC GLOBALISATION

B. MEGA TREND

“ECONOMIC GLOBALISATION”

1. What do we understand under the term globalisation?

“Globalisation describes the increasing interdependence and global interlinking of economics, politics, and other areas of life.”³ The process of globalisation isn’t new, but it has taken on a new quality and a more comprehensive meaning for us and for the world of employment in recent years. Globally, people and structures are becoming more and more tightly bound together. Drivers of this development include political decisions to eliminate national barriers, and the opportunities created by new information and communication technologies. “Key characteristics of globalisation have been the liberalisation of international trade, the expansion of foreign direct investments (FDI), and the emergence of massive cross-border financial flows.”⁴ These lead to increasing competition for resources and profits. The following factors drive the process of globalisation or are driven by it:

- **Political factors:** The cessation of the East-West conflict in the 1990s, liberalization in international trade achieved through multi-lateral negotiations;
- **Technological factors:** The technological development of information and communication technologies and mass media;
- **Social factors:** Cultural exchange, migration, and international tourism;
- **Economic factors:** International flows of finances and trade, generally lower transport costs, and the expansion of the activities of transnational companies⁵.

2. The effects of the globalised economy on the transport sector and working conditions

Globalisation and economic development influence all areas of the transport sector, although they do so in different ways. This section will include a brief outline of key data on the global economy for the future of the transport sector. It will identify four focal points the transport sector should consider more closely in its further development:

- Geographic changes in trade and transport caused by globalised economies;
- Regulatory and political frameworks and the effects of competition on companies;
- The meaning of financing and the influence of capital;
- Company strategies and new power relationships.

The section will end with an assessment of how these points affect employment and working conditions.

2.1 Geographic shifts

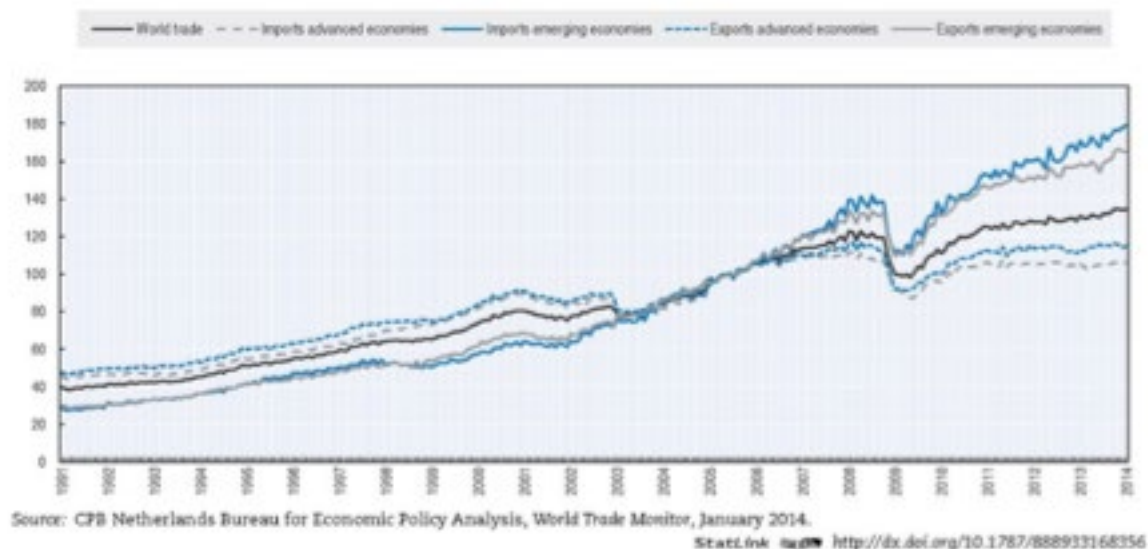
The volumes of both global trade and transport services have increased continually over time. This development was interrupted by two crises, in 2002/2003 and 2008/2009, which had significant effects on trade volume. Prognoses assume ongoing growth in trade volume between the continents. Future growth will depend on the compositions of product ranges, types of products, and the average lengths of transport routes. The high volume within Europe is estimated to remain high in the coming years and decades as well. Growth markets, however, are generally located outside of Europe. There is a shift of production taking place to lower-wage countries, facilitated by low transport costs. If goods manufacturing through 3D printing becomes commonplace, it will completely reshape this scenario. This would change the range of products and types of products available, as well as transport volumes.

3 Dispan, Jürgen und Pfäfflin, Heinz (2014): Nachhaltige Wertschöpfungsstrategien. Unternehmensstrategien im Kontext von Industriepolitik und Megatrends. Edition Hans Böckler Stiftung. p.12.

4 The World Commission on the Social Dimension of Globalisation (2004). p. 24

5 Cf. http://www.unesco.org/education/tlsf/mods/theme_c/mod18.html, accessed on 1/4/2016.
Cf. Wolf in APuZ 1-3/2014 1-3, p. 15.

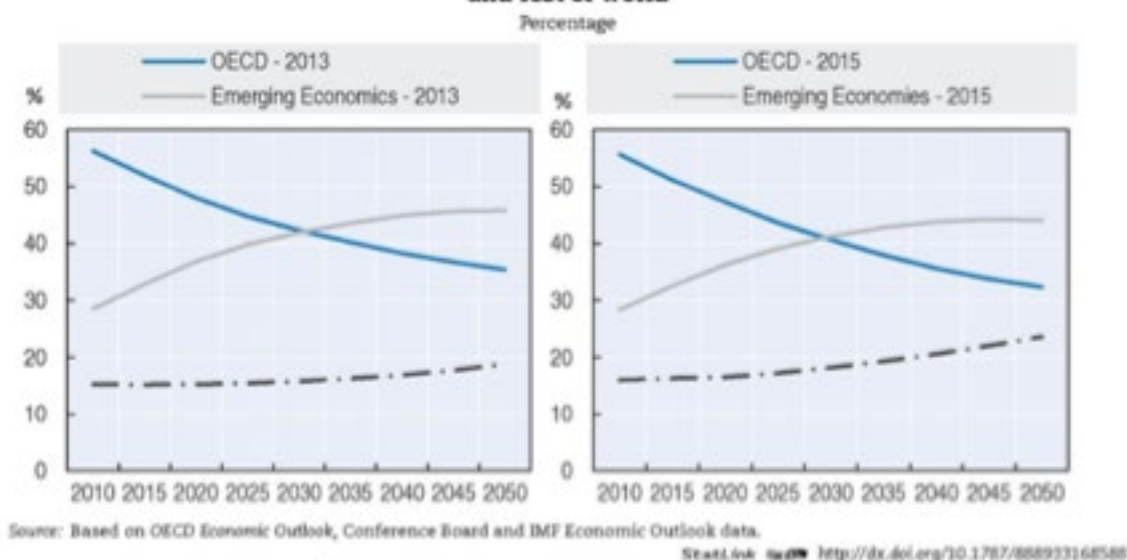
Figure 1.1. Monthly index of world trade
Advanced and emerging economies, 2005 = 100



International Transport Forum: ITF Transport Outlook 20015. p.22.

The prognosis of worldwide GDP volume is relevant for a scenario of global goods transport. The OECD countries' share in the global GDP will decrease. This development will affect the meaning of the economy and transport volumes.

Figure 2.6. Share of world GDP volumes generated in OECD, emerging economies and rest of world



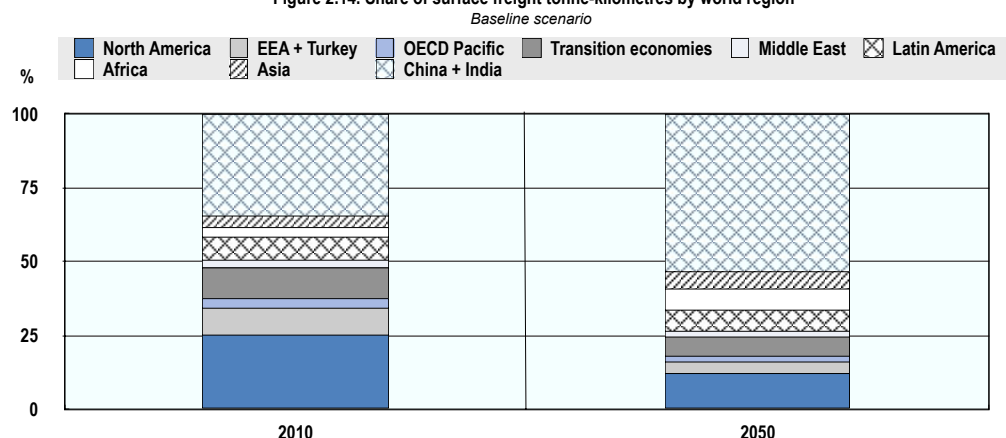
International Transport Forum: ITF Transport Outlook 20015. p. 48

The demand for imported goods is increasing in emerging markets. Industrialised countries are predicted to experience only low growth. Trade between emerging markets will increase (intra-Asian and South-South trade)⁶. The OECD estimates that, by 2050, a third of global trade will take place between non-OECD countries, in comparison to 15% today. This development will have major effects on international goods transport and supply chains.⁷

⁶ International Transport Forum ITF: Transport Outlook 2015. p. 23

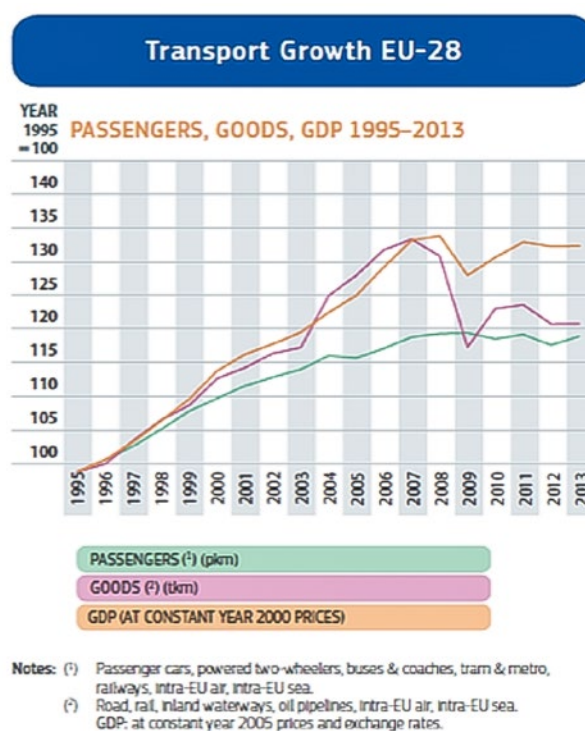
⁷ International Transport Forum ITF: Transport Outlook 2015. p. 23

Figure 2.14. Share of surface freight tonne-kilometres by world region



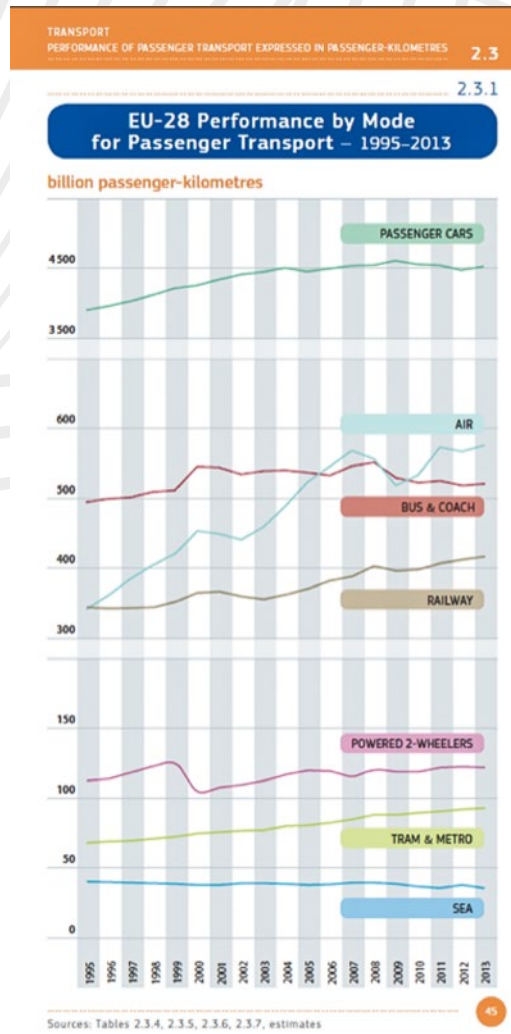
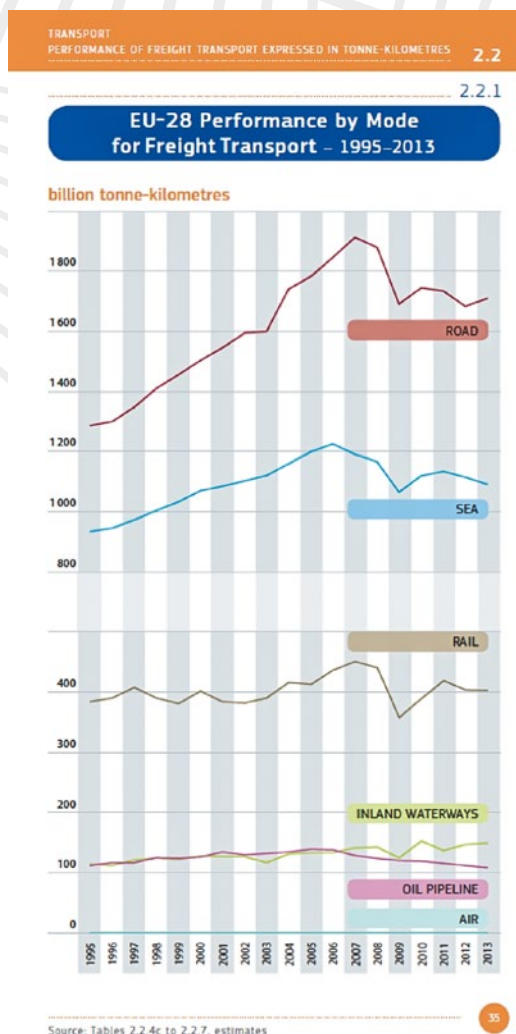
International Transport Forum : ITF Transport Outlook 20015. p.58.

From statistics on transport volumes in Europe in the last twenty years, it is clear that another slight increase in goods transport occurred after the 2008/2009 crisis and the decline in goods transport volumes. Since that time, the volume has fluctuated, but remained below pre-crisis levels. In passenger transport, the crisis primarily affected civil aviation. In the next 20 years, no essential changes are expected in Europe in association with global developments⁸



Source: European Commission (2015): EU Transport in figures. Statistical pocketbook 2015. P. 21. Data based on Eurostat.

8 Source: European Commission (2015): EU Transport in figures. Statistical pocketbook 2015. p. 21, 35 and 45.



Source: European Commission (2015): *EU Transport in figures*.
Statistical pocketbook 2015. P. 35 and 45. Data based on Eurostat and estimates.

Industry will shift to airports and harbors as hubs, making these more important alongside growing logistics clusters. The organization of goods transport around such hubs and into main corridors will have a key function. Companies serving these areas will become more influential. Infrastructure capacities will need to be expanded. “With logistics clusters, the more freight that flows into them, the more efficient the transport moving in and out becomes, because it is possible to use larger conveyances with higher utilization.”⁹

MARITIME TRANSPORT

Globalisation and maritime goods transport are each spurring the other on. 85% of international trade goods are transported via sea. The tempo and volume of ocean transport has increased significantly in the last few years. Container transport facilitates integrated goods transport paths using a variety of different methods. This both increases speed and lowers transport costs.¹⁰

- 9 Professor Yossi Sheffi, director of the MIT Center for Transport and Logistics, <http://www.supplychainbrain.com/content/nc/logistictransport/facility-location-planning/single-article-page/article/logistics-clusters-drive-value-and-growth/>. Accessed 2/13/2016
- 10 Global Forum on Transport and Environment in a Globalising World (2008): *The Impacts of Globalisation on International Maritime Transport Activity*. p. 7

In Europe, the volume of maritime freight transport is still stagnating below pre-crisis levels. Exports to BRIC countries, and especially to China and India, have increased.¹¹ European sea transport is subject to global competition, especially along routes from the Far East to Europe. Competitors from third countries offer these transport routes with their own means of transport.

The development of long-distance sea transport has had a significant influence on European freight shipping. Integrated multimodal transport chains, including sea transport, are the mobility approach of the future. (cf. Monios, 2015).

DOCKERS

The growth in international trade means transport systems are facing major challenges, especially in and around harbors. Handling volumes are likely to quadruple by 2050.¹² The ten largest container harbors are all located in Asia. Harbors and intermodal terminals will play a key role in shifting transport traffic.

CIVIL AVIATION

The growth in civil aviation over the last few years will continue, although likely not at the same high level as before. There will be a shift towards developing countries. There will not be notable growth within the EU, although growth will take place outside of the EU. The greatest level of growth is predicted in Asia.

2.2 Political and regulatory focuses of the transport sector during globalisation

Deregulation and liberalization of trade and the markets are driving economic globalisation. This trend is not expected to shift in the future. Crucial factors in competition within the transport sector include time, cost, and reliability. The European legal frameworks surrounding domestic markets and trade agreements with third party countries have aided in this development. Trade agreements are primarily focused on the free exchange of goods. The Transatlantic Trade and Investment Agreement (TTIP) between the EU and the USA, the Comprehensive Economic Trade Agreement (CETA) between the EU and Canada, and the Trade in Service Agreement (TISA) must also be seen in this light. The purposes of the agreements are the creation of a free trade zone for (major) companies and the dismantling of regulation. This also includes the dismantling of social and environmental standards. Business activities under these agreements are controlled by corporate interests, and not by democratically elected institutions. The TISA is intended to remove barriers to the free exchange of services, which also includes public services. Economically powerful countries and multinational companies will benefit most strongly from these changes. Labor laws will not be observed or will be circumvented in global supply and transport chains in order to achieve a competitive advantage, and employees will be forced into unacceptable and unsafe working conditions.¹³ The Transport white book was the European Commission's attempt to react to global developments. In 1992, this included primarily the creation of a domestic market and the establishment of the trans-European transport network. The white book Transport 2011 focuses on a mobility system that is no longer viewed as made up of multiple individual sectors. This mobility system assumes the integration of various types of transport and the removal of restrictions for transport service providers to improve competitiveness.¹⁴

In the future, as well, competition will continue to play out on the level of wages and occupational standards. Maximizing profits will be more important than maintaining social conditions. The consequences of this will affect the transport industry as well, through the

11 Cf. International Transport Forum ITF: Transport Outlook 2015. p. 23

12 Cf. International Transport Forum ITF: summit 2014. p. 23

13 European Parliament, Committee on International Trade (18.3.2016): Draft report on a new forward-looking and innovative future strategy for trade and investment. (2015/2105(INI)). P.7.

14 Thomas, Marc (2016): Research for TRAN Committee – The World is Changing. Transport, too. Policy Department B: Structural and Cohesion Policies. P. 33.

use of personnel agencies, “indirect employment” (part-time work, temporary employees, outsourcing) and shifting services to low-wage countries (shared service centers) to circumvent standards and save costs. The suggested guidelines of the European Commission are moving in the same direction by trying to allow single person companies in Europe. According to these guidelines, companies can register in one member state and carry out their business activities in another, without needing to be tied into its social benefits system. In the future, this will allow companies to legally leverage out social systems such as those including worker co-determination.¹⁵ New business models like the sharing economy pose additional challenges to social systems and their regulation. The European Commission considers regulatory approaches from the standpoint of the customer and of market access.

Protective mechanisms tied to particular countries are disposable in international competition. Even more, protective regulations can trigger infringement actions by free trade. Trade is shaped by competition, not by cooperation. Monitoring mechanisms function poorly, especially in international trade, where they are either wholly non-existent, voluntarily enforced, or non-binding.

Within some sectors, legal provisions are regulated through individual “packages” (e.g. road package, railway package, ports package). Liberalization is the guiding force behind all such regulations.

RAILWAYS: Single European Railway Area (SERA): The goal of the European Commission is the separation of operations and infrastructure, and a stronger role for the European Railway Agency (ERA). The fourth railway package was in the final phases of negotiations about political bases in 2016, under which social conditions and worker protections could be regulated.

Civil aviation: on the European level, the Single European Sky II package (and the subsequent package SES II+) aimed to dissolve the links between air navigation services providers – ANSPs and national supervisory authorities – NSAs, and to establish functional airspace blocks – FABs to be able to process more flights with fewer personnel. The intention was to establish a unified European infrastructure politically managed by the European Commission and operated by the flight safety industry.¹⁶ The regulation of new technologies like remotely piloted aircraft systems – RPAs or drones is key from security and technical standpoints, although experiences in this area are still lacking. The Air Transport Regulation Panel (ATRP) by the International Civil Aviation Organization (ICAO) is working towards the unrestricted liberalization of aviation, and towards market access, ownership, and control for aviation companies.¹⁷

ROAD TRANSPORT: the regulation (EG) 1071/2009 to determine common rules for licensing for professional trucking companies regulates aspects of working hours, vehicle specifications, driver training, and other quality and safety issues. The problem is that these regulations are not uniformly applied or implemented in Europe. Global logistics companies work with a large network of subcontractors, whose observance of these regulations is not monitored. The responsibility is transferred to drivers as (bogus) self-employed persons.

MARITIME TRANSPORT: The Maritime Labour Convention MLC 2006 regulates minimum requirements for employment conditions on board ships. The problem here, as well, is that the requirements are not implemented. Companies use labor conditions as an element of competition.

15 <http://www.dgb.de/presse/++co++6fbd8684-f204-11e3-ae9a-52540023ef1a>. Accessed 2/13/2016.

16 Thomas, Marc (2016): Research for TRAN Committee - The World is Changing. Transport, too. Policy Department B: Structural and Cohesion Policies. P. 96.

17 International Civil Aviation Organization (2014): Air Transport Regulation Panel (ATRP). Twelfth Meeting, Montreal, Canada, 26 to 30 May 2014. P. ii-

2.3 Financing and capital

The European transport sector is dependent not only on trade and order volumes, but also on investments and capital equity. Direct investments are a preferred method for achieving market access to other countries. BRIC states, especially, are investing in European companies and infrastructure.

Foreign direct investments in transport companies shift control and responsibilities. The state loses its ability to control this capital. "Modern globalisation has the effect to drastically reduce public control of capital and greatly increases competition, both between countries (to attract investments) and within the global labour market."¹⁸

The growth in private financing in comparison to state financing results in a reduction in state revenues from transport services. "The role of the state in the economy has been weakened, the relative contribution of capital to fiscal revenues has diminished"¹⁹. On the other hand, public households are subject to increasing tax burdens to make up for poor speculation by private companies. The question of liability in these systems is decided all too often at the expense of the public.

State debt forms the backdrop for the decrease in public funding for the transport sector. Public investments in infrastructure and operations will continue to be insufficient in the future as well. Corporate taxes will drop, leading to tax competition, including within Europe. Public companies will be privatized to generate short-term income.

The focus of European spending in the transport industry are the financing of the TEN-T corridors. Multimodal connections, harbors, airports, and railway networks will be funded. More capital is required to finance the entire core network. A large portion of this will need to come from the private sector.

Transport methods and infrastructure are of interest for private capital investments or investments by foreign countries. Often, countries pay for such infrastructure projects through pension funds. The influence of trust companies is increasing. On the other hand, legal regulations regarding the liability of such investors is relatively weak. Intermodal competition can only be achieved through cost equity, which includes internalizing external costs.²⁰

PUBLIC TRANSPORT

The effects of the financial and economic crisis have subjected this sector to austerity measures in most countries. Authorities accept the lowest bids when handing out contracts for public transport services. This development has been so far reaching that commercial service providers of public transport services receive preferential treatment if they require no contributions from these authorities. It is likely that non-lucrative routes in this system will be shut down or significantly reduced in the short or long term.

2.4 Corporate strategies and multi-national enterprises

In the transport sector, multi-national corporations and corporations able to offer full transport and supply chains have the biggest competitive advantage. MNEs, which can choose any location in the world from which to operate, are able to save costs, avoid standards, and dictate conditions. Companies used to come from Europe and North America. Quite some time ago, however, Asian corporations caught up to these regions in technological development, carving out a market share for themselves. In the future, multi-national enterprises will be concentrated more and more on the Asian market, where the

18 Stiglitz 2006, according to Fraunhofer-ISI (2012): ASSIST Assessing the social and economic impacts of past and future sustainable transport policy in Europe. ASSIST Deliverable D3.1: Future challenges for European transport policy. p. 19

19 Palma 2009, according to Fraunhofer-ISI (2012). p. 19

20 Thomas, Marc (2016): Research for TRAN Committee – The World is Changing. Transport, too. P. 95.

largest growth is expected. The share of small and mid-sized European companies active internationally is only 13%.²¹

Another development will be the use of ever larger transport methods, such as mega-ships and ginaliners. These new dimensions will require changes to infrastructure and to employee training. Adding to the volume of transport methods are just-in-time and zero warehouse production methods, that require exact planning of transport processes and tolerate no disruptions to trade.

New actors with new business models will enter the mobility industry. Three relevant business models are becoming more widespread: 1) integrated mobility platforms, 2) the traditional sharing economy model (such as car sharing, bike sharing), and 3) business models based on sharing among customers (Uber).²² The peer-to-peer model has the greatest power to disrupt traditional transport systems.

DOCKERS

Global network terminals (GNT) are a massive presence around the globe, active in more than 50% of ports worldwide. These companies are primarily focused on increasing their share of the global market. The big four GNTs APM Terminals/ A.P. Møller - Mærsk A/S, DP World, (The primary owner is Dubai World, the state investment group of the United Arab Emirates), HPH (Hutchison Port Holdings Ltd.), and PSA International (formerly Port of Singapore Authority) – today control more than half of all ports and terminals on earth. Not all of these recognize trade unions.²³ Rotterdam World Gateway (RWG) was started in 2015 by DP World as a fully-automated container harbor. Ships are loaded and unloaded via remote control; container movements in the harbor and loading trailers is fully automated.²⁴

CIVIL AVIATION

In civil aviation, mergers between companies to create major corporations have become commonplace. In the future, strategic investments in airports and airlines from non-EU countries will increase. This will weaken the control and monitoring capabilities of EU institutions.²⁵

The homebase concept allows airlines, ground handling and air traffic management to select any location from which to operate based solely on cost. Transnational companies can use lower labor costs in other countries to their advantage. Offshore (letter-box) companies have increased their influence in civil aviation. This creates low standards for employment conditions across the transport chain, which do have an effect on societies and conditions in countries with higher standards.

RAILWAYS

Traditional railway companies used to typically be owned by states and was run as a holding company. In the current competitive market, these companies, as well as private ones, are frequently being bought up by investors (either by third party countries or private companies). This allows foreign countries such as China access to the European market.

PUBLIC TRANSPORT

New business models are being created through the sharing economy to offer new services to citizens and customers. These are shifting services to the private realm. Technological developments have allowed companies like Uber, GetTaxi, GrabTax, and Hailo to discover

21 European Parliament, Committee on International Trade (18.3.2016): Draft report on a new forward-looking and innovative future strategy for trade and investment. (2015/2105(INI)). P.10.

22 Thomas, Marc (2016): Research for TRAN Committee – The World is Changing. Transport, too. Policy Department B: Structural and Cohesion Policies. P. 89.

23 <http://www.itfglobal.org/de/transport-sectors/dockers/in-focus/gnt-campaign/>. Accessed 2/10/2016.

24 DP World (Corporate Brochure 2016): Creating the Future. Now. P. 42.

25 European Economic and Social Committee (2015): Opinion of the EESC on Integrated EU Aviation Policy. p. 7

these platforms as avenues for competition with taxis and public transport. It will be difficult to regulate such quasi-private services. It will not be possible to institute criteria ensuring good labor standards.²⁶

3. Effects of trends on employment in the transport sector

On the one hand, some countries will profit from global economic integration and high growth rates. These are making it possible to reduce extreme poverty in some countries and are facilitating development in some national economies. On the other hand, economic globalisation has meant major challenges to many countries in the form of income inequality, high unemployment rates and poverty, the susceptibility of national economies to external crisis, the growth of positions unprotected by pensions and benefits, and informal work, which encroach on traditional employment relationships and social protections.²⁷ Shifts in production to low-wage countries will continue to threaten workers in developed states. This will affect not only low-qualified jobs, but increasingly also highly qualified areas such as software development and transport services. The winners in globalisation are multi-national and internationally active companies, as well as their shareholders, managers, and contractors.²⁸

The European Foundation for the Improvement of Living and Working Conditions (Eurofound) has identified employment trends which also apply to the transport sector. The competitive situation, corporate structures, technological options, and financial and regulatory frameworks provide companies additional flexibility, along with generating an increased pressure to compete. This also affects employees, requiring them to be more flexible and efficient. New forms of work are being created, such as "employee sharing," "job sharing," "interim management," "voucher-based work," "portfolio work," "crowd employment," and "collaborative employment," as well as short-term work and IT based mobile employment (Eurofound, 2015, p. 4). Trade unions need to adjust to these new realities as well, and develop concepts to deal with them.

Personnel planning in multi-national companies is based on the "median line" - of an average capacity. Sales fluctuations up or down are absorbed by flexible employees. "A variety of precarious forms of employment coalesce around the core workforce, similar to concentric circles, with wages and quality and occupational standards that sink the farther one gets from the core workforce."²⁹ Good jobs are replaced by informal, part-time, and contract work. The new kinds of working relationships we have mentioned here make this clear. Corporate social responsibility is more an instrument of PR departments than a concept in the current labor environment.

Subcontracting and outsourcing are more frequently used in business operations, with clear challenges for workforces. The heterogeneity of companies, wage structures, employment, and working conditions is increasing, while the density of regulations decreases. Often, workplaces have neither trade unions nor workforce representation.³⁰ In general, employment and working relationships prove more unstable and insecure, the further the companies in question are from the final manufacturer and their core workforce.

High levels of unemployment, and the mobility of capital, weaken the employee's negotiating position with regard to companies, which are able to determine their own conditions depending on their market position. Unequal working conditions are both utilised and created in the global economic system. This has been especially relevant in the past for sub-contractors of MNE countries and in labor-intensive industries.³¹

26 Cf. Thomas, Marc (2016): Research for TRAN Committee – The World is Changing. Transport, too. Policy Department B: Structural and Cohesion Policies. P. 33.

27 Cf. ILO Declaration on Social Justice for a Fair Globalisation, adopted 10 June 2008. p. 5

28 World Commission on the Social Dimension of Globalisation (2004). p. 45 f.

29 Van Treeck in APuZ 1-3, 2014. p.31.

30 Cf. Dörre, Klaus: Landnahme: Unternehmen in transnationalen Wertschöpfungsketten. In: APuZ 1-3/2014. p.32.

31 Cf. World Commission on the Social Dimension of Globalisation (2004). p. 45 f.

4. What trade unions can do

Globalisation and its European counterpart 'internal market' as such are not rejected by trade unions. Transport workers can benefit from growing trade. But globalisation internationally and at EU level must be fair and controlled by society, not by multinational or European corporations. They must not be based on deregulation but on assuring fair and decent working conditions for everybody and the chance to develop.

To assure fair globalisation and fair working conditions trade unions have to act at all levels:

- At political and regulatory level;
- Through industrial relation and social dialogue;
- By building trade union power and building alliances.

The ETF Fair Transport Campaign for fair pay and quality working conditions and against social dumping in transport is a political and industrial campaign to fight negative effects of the internal market and assure fair working conditions.

This must be complemented by a strong involvement in alliances with the European trade union movement and NGOs for broader political objectives:

- A social compact, a true pillar of social rights; protecting labour and social rights;
- Assuring trade union influence on new forms of work;
- Acting against the new generation of international trade agreements – for fair trade agreements and fair globalisation.


Also the European social dialogue can be an instrument to shape or prevent the negative impact of the internal market and/or globalisation by negotiating social standards to prevent social dumping (existing examples: several working time agreements, agreements on the implementation of international social standards in EU legislation). An additional possibility exists by negotiating social clauses to be integrated in bi-lateral agreements of the EU with third countries like for example in the fisheries or the aviation sectors.

However, without stronger trade union power such agreements at European level remain an exemption. The characteristics of the internal market or of globalisation is that companies organise their business across borders. Targeted global and European campaigns are the right answer to build trade union strength. The ITF 4-levers-strategy is a good instrument to identify the right targets.

The new generation of trade agreements (TTIP, CETA, TiSA) with their objective to deregulate (transport) services and which threaten trade unions and labour rights and limit the regulatory power of governments forms substantial common ground for alliances with NGOs.

At national level European political activities have to be complemented and supported by influence national governments on the same topics. All legislative EU decisions and decisions on international trade agreements are decided by the national governments and members of the European Parliament elected in each Member State.

It is the core business of trade unions to negotiate and use industrial actions to protect and improve working conditions and in particular those who are vulnerable to the impact of deregulation but also automation & digitalisation. Understanding the impact of the trends and European and global cooperation help unions to make strategic decisions.

A woman with short brown hair and glasses is looking to the right. She is holding a yellow and black handheld device. The background is a blurred industrial or laboratory setting. A semi-transparent blue overlay covers the entire image, and the title text is centered in white.

TECHNOLOGICAL CHANGE: AUTOMATION AND DIGITALISATION

C. MEGA TREND

“TECHNOLOGICAL CHANGE : AUTOMATION & DIGITALISATION”

Crowdworking, big data, wearables, and cyber-physical systems. In brief: Everyone's talking about industry 4.0. Even today, electric trains and ships are relying on sensor technologies that transmit data on their status and provide notifications when they need to be repaired. More and more powerful IT systems, worldwide internet availability at home or on the go, continued developments in sensors and robotics leading to dropping production costs, cyber physical systems, linkages between the virtual world and real objects (the internet of things), new production technologies like 3D printing, big data, and changing customer demands. These trends are transforming entire industries and business models – new services are being born. What many people are today calling the “digital revolution” will change the world of work as well – quickly, and in fundamental ways. This is what we speak of when we talk about smart manufacturing and working world 4.0.

Image 1

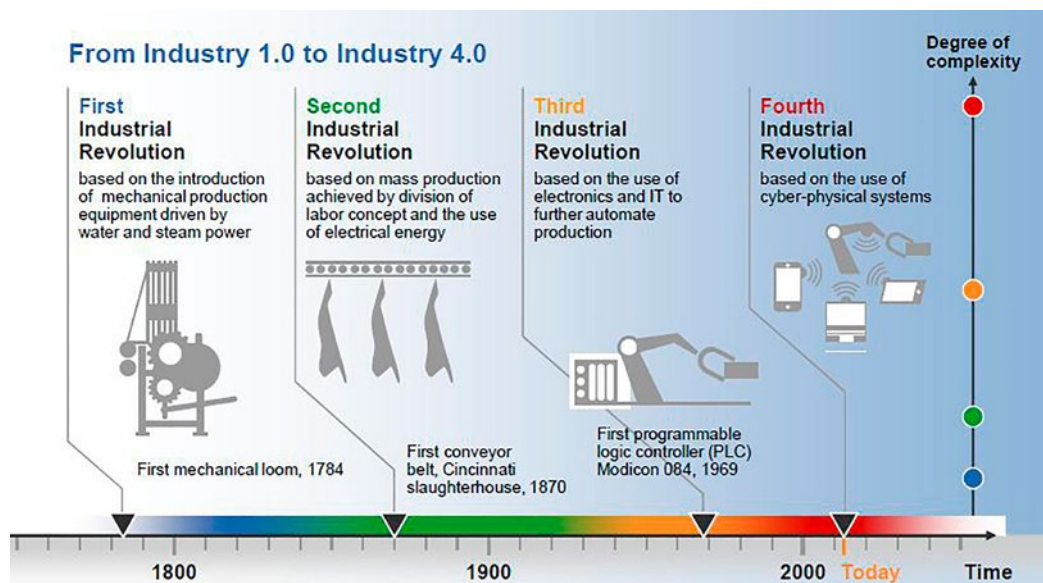


Image 1: From Industry 1.0 to Industry 4.0.

Source: <https://media.licdn.com/mpr/mpr/p/3/005/097/223/3190c81.jpg>

1. The digital agenda in Europe

Digitalization is pushing forward, penetrating into every area of our lives. It represents a central challenge of our time, and creates many opportunities. This is why the European Commission presented its strategy for the European domestic market in 2015. “A common European market, with its more than 500 million citizens, is also advantageous in international competition, allowing digital innovations to be developed and implemented more easily. (...) According to the EU Commission, digitalization could bring economic benefits to the EU to the tune of 415 billion euros annually, creating hundreds of thousands of new jobs.”³²

³² <https://www.bundesregierung.de/Content/DE/Artikel/2015/09/2015-09-14-digitaler-binnenmarkt.html>



Graph 2: Digital Economy and society Index (DESI) 2015 – score per country. Source: European Commission: http://europa.eu/rapid/press-release_IP-15-4475_en.htm

The Index for Digital Economics and Society demonstrated, in contrast, that “the establishment of a truly digital internal market – one of the key priorities of the Juncker commission – is hindered by borders”^{33 34}.

The goal is to develop the digital market, based on the competitiveness of offers within the EU. To do so, competition should be encouraged, and obstacles such as costs of cross-border parcel delivery, VAT systems, and geo-blocking, telecommunications rules should be eliminated. E-transport and intelligent transport networks must be developed. The Digital Transport and Logistics Forum has been established to monitor this, although it includes only one representative from ETF from trade unions among more than 100 participants.

In one chapter, concerns are raised but not answered. Online platforms (as an intermediary) offer opportunities for increased efficiency, growth and jobs, through improved consumer choice, but could also potentially raise new regulatory questions³⁵. There are concerns related to how required information is used, and related to their strong bargaining power in comparison to that of clients, disadvantages

faced by competitors, non-transparent pricing policy, restrictions on sale conditions and a lack of liability for content. No social impacts were analyzed and no measures related to these aspects mentioned, although all other goals are supported with explicit planned measures.

2. Awakening to a new world of work – Working WORLD 4.0

2.1 Automation

Automation is on the march: Testing for automated trucks, cars, and trains is already underway. Other potential areas of application are currently being researched: These include driverless parking when you get to the train station, car sharing, automated transport services, and automated vans and bus travel.³⁶ Automated driving is a technical reality, and not just on streets or rails. In the shipping industry, as well, automated feeder vessels are already being used by container ships on well-known routes and over short distances. Robots automatically load and unload ships, and fully-automated loading zones are available, as are unmanned flying robots³⁷.

33 http://europa.eu/rapid/press-release_IP-15-4475_de.htm

34 The Index researches the connectivity, the utilization of online services (from news to online shopping), and the state of development of digital technology (including cloud services and electronic business transactions).

35 European Commission (2015): p. 11.

36 Cf. <http://www.logistik-heute.de/Logistik-News-Logistik-Nachrichten/Markt-News/13795/Deutsche-Bahn-AG-prueft-in-drei-Pilotprojekten-den-Einsatz-von-autonomen-Fah>

37 Cf. http://www.pwc.de/de/pressemitteilungen/2014/vernetzt-auf-hoher-see_deutsche-reeder-setzen-auf-modernere-flotten2.html

US economists Andres McAfee and Erik Brynjolfsson recently gained attention with a study. The economists' core thesis was that now, for the first time in history, we are experiencing a situation in which the balance between the gains and losses from automation has gone awry. Their assumption is that the gap between low- and highly-qualified employees is expanding noticeably, and that this will lead to greater social inequality.³⁸ They are not alone in this view. An investigation by Oxford economist Carl Benedikt Frey and computer scientist Michael A. Osborne from 2013 predicted an automation potential of 47 percent for the USA in the next 10 to 20 years.³⁹

A current study by ING-DiBa assumes that office and unskilled labor jobs, especially, could sharply decrease in importance over the next few years and will become obsolete in the long term. A potential savings of 85.7 percent is calculated for each of these occupational groups. Other losers in this development are system and machine operators and assembly line operators: 69.2 percent of these jobs could be eliminated. Only academics and managers (11.8 percent) are ranked as comparatively secure.⁴⁰

According to an investigation by the World Economic Forum – which surveyed top managers at the 350 largest group companies in the world – by the year 2020, about five million jobs could become obsolete due to the increased use of robots. Office and administrative jobs are most threatened, according to the results of the as yet unpublished study. On the other hand, only a relatively low number of two million new jobs will be available for specialists in the areas of computing and technology.⁴¹

These numbers make it clear: standardized and routine tasks will be affected especially severely by automation, as will positions with low qualification requirements.

Today, it is already technologically possible to automate all operational processes on board a ship. Because of this, automation can cause the elimination of whole occupational groups – on the tracks, on the water, and on the street.

2.2 Digitalisation

"Digitalisation and, with it, the potential to record mobility data and use it in a targeted way to direct traffic, also makes a significant contribution to better utilizing available infrastructure and existing traffic services. It can help improve mobility services without having to build additional infrastructure."⁴² The internet, and new technologies like mobile data transmission, make it possible to use solutions that support people in creating mobile, flexible, and networked professional lives. The shift has been shaped by a massive wave of technological innovations – so-called "TIMES" technologies⁴³. "Technological development" leads "to a fusion of the 'data world' and the real world of everyday life"⁴⁴.

Work materials such as tablets and smartphones can save travel time and reduce errors in data transmission. This can cause the elimination of jobs – for example in the area of materials handling, since work orders can be distributed via smartphone or tablet. However, these technologies can have positive effects as well. "New information and communication technologies are improving options for collaboration and coordination in the professional world, despite the spatial and temporal distribution of participants."⁴⁵

38 Brynjolfsson/ McAfee (2012)

39 Frey/ Osborne (2013)

40 ING DiBa (2015)

41 Frankfurter Allgemeine Zeitung (2016): Roboter in der Wirtschaft.

42 Clausecker, M. et. al. (2015)

43 TIMES technologies are technologies from the areas of telecommunication, multimedia, security services, and information technologies.

44 <http://www.ibe-ludwigshafen.de/arbeitschwerpunkte/trendsarbeitswelt/153-technologischer-wandel.html>

45 Rump, J./ Biegel, I./ Eilers, S. (2011)

2.2.1 Cyber physical systems (CPS)

"Cyber physical systems are systems in which information and software technology are combined with mechanical or electronic components, facilitating data transfer and data sharing, as well as monitoring and control, through an infrastructure such as the internet in real time. Mobile and movable facilities, devices, and machines are key in such systems (including robots), as are embedded systems and linked objects (the internet of things). Cyber physical systems have a central function in Industry 4.0."⁴⁶ Technologies such as GPS or RFID⁴⁷ Chips, in particular, are being used more and more frequently in the transport sector. "Containers equipped with sensors and RFID technology are registered and tracked for optimized transport and distribution. These allow, for example, perishable goods to be monitored and delivered before they spoil. Telematics systems and databanks in trucks will contribute to shortening wait times and reducing bottlenecks in harbors by providing drivers exact information on times and locations to unload containers."⁴⁸ Locomotives, trucks, and ships are being equipped with sensors more and more often. These notify operators when parts wear out and need to be exchanged. Classic repairs are being replaced by proactive maintenance. This allows defective systems to be repaired while a ship is in harbor, for instance.⁴⁹ "In the shipping industry, sensors also record data on hull stress, machine pressure and temperature, speed, fuel usage per hour per knot, the condition of the freight, and other variables, and transmit this information to land to be compared with target values."⁵⁰ Experts believe that the use of sensor technology will cause a continual decline in workforce sizes. "Theoretically, it would be possible to reduce the number of trained, experienced seamen on board to the single digits. However, the significant technology costs [...] would seem to indicate this won't be happening in the next 10 years."⁵¹ At the same time, experts believe additional personnel will be required on land to monitor data.⁵²

2.2.2 Augmented Reality (AR)

"Augmented reality (AR) describes technology that makes it possible to enrich one's view of the real world through representations of virtual elements, some of which are created using computer graphics."⁵³ This technology is changing the way humans and systems work together significantly. Pick by vision – one AR technology – is already being used in logistics. Using this technology, order pickers receive all the relevant information available in the field of view of their data glasses. The tool can also be used to scan in bar codes. It is also possible to use data glasses in warehouses. Touch and voice operation⁵⁴ can make materials handling as simple as possible. The use of augmented technologies represents a major step in fusing the real and virtual worlds. In the near future, it may be possible to use data glasses to lead others through repairs. This could cause qualifications to wane in importance. On the other hand, the availability of the right information at the right time will also make work easier for employees. Companies hope to use these technologies to shorten process times and minimize error ratios. The primary criticisms of AR have to do with the potential to monitor employee performance or behavior.⁵⁵

46 Springer Gabler Verlag (ed.)/ Gabler Wirtschaftslexikon: Keyword: Cyber physical systems.

47 "Radio Frequency Identification (RFID) is a wireless process to distinguish and identify items, objects, persons, and livestock. It is an electronic process that works without contact, transmitting product data across a certain distance via radio waves or inductive or resonance coupling." (Source: <http://www.itwissen.info/definition/lexikon/radio-frequency-identification-RFID.html>)

48 <http://www.munichre.com/de/reinsurance/magazine/topics-online/2015/09/digitalisation-shipping-logistics/index.html>

49 Cf. ibid.

50 https://www.ihs.com/pdf/Shipping-6200-0814PB-TB-de_218648110915583632.pdf

51 Ibid.

52 Cf. https://www.ihs.com/pdf/Shipping-6200-0814PB-TB-de_218648110915583632.pdf

53 Rump/ Groh (2006): 5.

54 Pick-by-Voice Technologien

55 Ergebnisse des Projekts „Arbeit 4.0“ der Eisenbahn- und Verkehrsgewerkschaft EVG.

2.2.3 3D printing

3D printers allow us to “print out” objects of all kinds. This makes just-in-time production of individual components a reality. This technology is already being used, especially when repairing materials following accidents, for discontinued components, building prototypes, or anytime conventional manufacturing would be highly cost-intensive. Components with long delivery times, available in small numbers, or required in case of a system outage (to a train or locomotive, for instance) are good candidates. 3D printing is primarily used to improve the availability of replacement parts. Today, junction boxes for the traction motors in ICE trains, air grilles, and even coat hooks are being produced with this technology.⁵⁶ On the one hand, 3D printing is used in factories and in repair work, improving the availability of components and reducing workloads. On the other hand, using these new printing technologies could reduce the number of components companies need to manufacture. If 3D printing does establish itself as an alternative to traditional production, it will have an impact on transport volumes in freight transport.

3. New players – Google and Amazon as transport service providers?

New mobile technologies are creating new user potentials, especially for logistics and distribution. Digitalization and other new technologies are opening up the flood gates for companies like Google to get into the logistics industry. The search engine giant has already bought several robotics manufacturers. Experts believe Google will attempt to penetrate new business fields. These new activities could be evidence of a plan to get into the intralogistics sector or parcel delivery. Google isn't the only company with these kinds of plans. Amazon purchased intralogistics specialist Kiva Systems back in 2012. More and more IT companies are buying up intralogistics and logistics service providers.⁵⁷

Services such as Uber and flinc – which have achieved success because of digitalization – offer free transport capacities. There is a danger that, in the future, the borders between public and private transport could begin to blur.⁵⁸

Another technological innovation that can change entire business models are unmanned airplanes. “For logistics, especially in close range transport, speedy delivery and pickup via drones will be an option in the future alongside standard goods transport. Areas of application include both internal and external transport, as well as shipping and goods distribution.”⁵⁹ Google and Amazon are also planning to use drones, although they want to do so with the goal of getting their goods to customers more quickly.^{60 61} Having completed a successful pilot phase, the Polish railway service is planning to begin using drones to thwart thieves and vandals.⁶²

The use of drones can affect multiple business models in the transport sector in a variety of ways. One thing is clear: Major efforts are underway already to research potential areas of application in detail.

4. Where are we headed? Conclusion on working conditions

It's not possible today to gauge exactly how the world of work will change, concretely, in the future. However: A survey conducted as part of the “Working world 4.0” project by the EVG showed that it isn't just a topic for the future. It's already arrived, in one way or another, in everyday operations in German rail companies. From the perspective of worker's representation groups, there are risks primarily in relation to ensuring employee data security,

56 Ibid.

57 Cf. <http://www.logistik-heute.de/print/11115>

58 Cf. Ibid.

59 <http://www.service-drone.com/de/production/logistics-and-transport>

60 Cf. <http://www.verkehrsrundschau.de/auch-google-plant-waretransport-per-drohne-1714248.html?dossier=1612994>

61 http://www.focus.de/finanzen/videos/technik-statt-mitarbeiter-amazon-will-pakete-bald-mit-mini-drohnenausliefern_id_3446719.html

62 Cf. <http://www.verkehrsrundschau.de/polen-drohnensollen-bahnstrecken-schuetzen-1734425.html>

the reduction of positions, an increasing erosion of the boundaries between work and life, the loss of basic professional knowledge, and the increase in precarious forms of employment. Currently, new types of work like crowd working are much discussed. The platform economy is producing these new, atypical types of work. These ways of working strongly influence social security systems, social partnership, worker participation, and worker rights. New, flexible forms of employment must be actively shaped by worker's rights groups in order to avoid a tendency towards job insecurity following a lack of social protections, and to stop personnel reductions in favor of flexible access to crowd workers.

Additionally, the speed of the working world is also on the increase, causing psychic illnesses, above all, to increase as well. The use of electronic work tools leads to a "blurring" of working hours. Individuals must remain protected from themselves and/or from their employers, even in a more flexible working world. The reduced workload that usually accompanies the introduction of new technologies "often leads to corporate restructuring. Many employees are faced with additional duties as a result"⁶³, Dr. Jutta Rumpf and Sibylle Groh from the Institute for Employment and Employability resume in their study on Electronic Mobility.

There is also the question of forward-thinking qualification requirements and employment models. What should trainees learn today to do the work of tomorrow? What vocational perspectives are open to those whose jobs fall victim to automation?

Although digitalization is often seen as a risk factor, it does provide diverse opportunities - if the process takes the interests of employees into account from the start: Physical workload reduction, an increase in competitiveness, and, at the same time, securing jobs, making work locations and times more flexible, and creating new and attractive positions⁶⁴. The way we will all work in the future doesn't depend just on which products and services technological innovations produce. Whether or not we are able to interweave innovative labor policies with technological innovation will be a decisive factor in the design and success of our future working world.

5. What trade unions can do

Automation & digitalisation (A & D) and the platform economy raise questions about the future taxation and social security systems "in a world of algorithm and robots" and about working time, work organisation and a fair distribution of work. The trade union movement has to have a strong voice in this societal debate. For this study, however, such a discussion is beyond scope.

Digitalisation is high priority at the European agenda with strategies (Digital Internal Market Strategy), agendas (EC Agenda on Collaborative Economy, European skills agenda), EU research programs financing research to digitize transport, fora (Digital Logistics Forum) initiating an industry dialogue on the needs and requirements to faster digitize and, finally, legislation to promote and facilitate digitalisation. All initiatives have in common that little attention is given to impact on employment and on working conditions. Here the European trade unions have a role to play and to influence the European institutions to put working conditions, labour rights and collective representation at the agenda. As regards the so-called platform economy, the ETF insists that platforms like Uber are transport companies operating illegally. They have to apply all legal obligations of transport companies. Furthermore, ETF aims to a European legal framework for platform / crowd workers that ensures a workers' status, social security, decent pay and working conditions, professional training and that facilitates collective representation of such workers.

63 Rumpf, J./ Groh, p. (2006a)

64 Ergebnisse des Projekts „Arbeit 4.0“ der Eisenbahn- und Verkehrsgewerkschaft EVG.

The European Social Dialogue Committees are the right place for joint projects with the European employers' organisations in all transport sectors to identify and anticipate more precisely the impact of A&D on the sector and on employment and to negotiate with the employers' organizations agreements or joint recommendations on a "just transition" of A&D and other elements like:

- Principles for trade union involvement and negotiations on technological changes;
- Work organization;
- Health and safety at work;
- Data protection;
- Skills and training.

A & D is a topic for building alliances with NGOs and civil society at national and at European level. A common concern is for example the question of data protection and civil rights or liability in relation to autonomous driving or the use of drones. But is as important to approach youth organisations and consumer organisations in order to raise awareness about working conditions of platform workers.

Fighting illegal forms of the platform economy, like the Uber Pop business model, has to take place at national level even at local level since national legislation applies. Where illegal forms of platforms in transport could not be prevented it would be useful to try to organise those platform workers and negotiate collective agreements where possible. Both, fighting illegal forms of transport platforms and – where not possible – developing strategies to organise platform workers strengthen union power. European and global coordination is essential.

Also at national level trade unions should insist on a social dialogue at company and at sector level on new technologies and digitalisation. Unions should aim to negotiate collective agreements with employers on (for example):

- Consultation, participation and collective representation rights prior to the introduction of new technologies;
- Definition and conditions for alternative task/employment, re-training and qualifications;
- Health & safety at work, right to disconnect, data protection of workers (against permanent performance control);
- Working time reduction and/or (flexible) work organization.

A strong argument in particular in passenger transport is the relevance of human presence for safety, security and quality services that can be used by trade unions.

A challenge for trade unions is to better understand young workers' views and needs as "digital natives". Unions have to adapt trade union work to a changing society. Trade unions have to approach young workers for example by developing strategies to counter the negative public perception of trade unions by professionally using social media to better address young people (and circumvent negative media coverage for trade unions that trade unions in many countries are facing). Or by organising awareness campaigns on the role and achievements of trade unions and the importance of collective representation.

A European coordination to support analysis of sector developments, company strategies and help identifying main players, exchange information and (good) practices and to coordinate solidarity campaigns at European level is important. Training activities should have a focus on understanding the impact of A&D.

A photograph of three construction workers on a site, overlaid with a semi-transparent red filter. Two men and one woman are wearing high-visibility orange safety vests and hard hats. One man is holding a smartphone. The text 'DEMOGRAPHIC SHIFTS' is centered in white, with a short horizontal line above it.

DEMOGRAPHIC SHIFTS

D. MEGA TREND

“DEMOGRAPHIC SHIFTS”

The following trends are apparent in the demographic shift underway in Europe:

1. Reduced population growth in Europe

Over the next few years and decades, there will be strong population growth around the world: in some regions and countries in Africa and Asia, the population will quadruple. According to estimates by the United Nations, the world population will grow from its current level of 7.3 billion people to 9.7 billion in 2050, and could reach 11.2 billion people in the year 2100. The population growth will be greatest in Africa, followed by Asia. Overall, half of the world's population growth by 2050 will occur in just nine countries: India, Nigeria, Pakistan, the Congo, Ethiopia, Tanzania, the USA, Indonesia, and Uganda⁶⁵.

The growth of the world's population has slowed in the last few decades, and researchers assume further slowing will occur. Many demographers believe that the global population will stabilize around the year 2100 and that we can then expect a reduction⁶⁶.

Table 1 shows the population trends in 28 EU countries⁶⁷. It is clear that only low population growth is expected in Europe, with regional differences: in some countries, the population will grow sharply, such as in France, Great Britain, Sweden, Luxemburg, Belgium, Switzerland, and Norway. Population growth in these European states will largely be due to immigration.

Eastern European countries and Germany, above all, will be confronted with sharply shrinking populations.

	2015	2020	2030	2040	2050
European Union (28 countries)	508,223,624	512,474,771	516,499,055	523,545,921	525,527,890

Source: Eurostat, 2014

Immigration into industrialized nations will continue to increase due to the strong population growth in many threshold and developing countries, because of climate change, and because of recurring environmental catastrophes.

2. An aging population

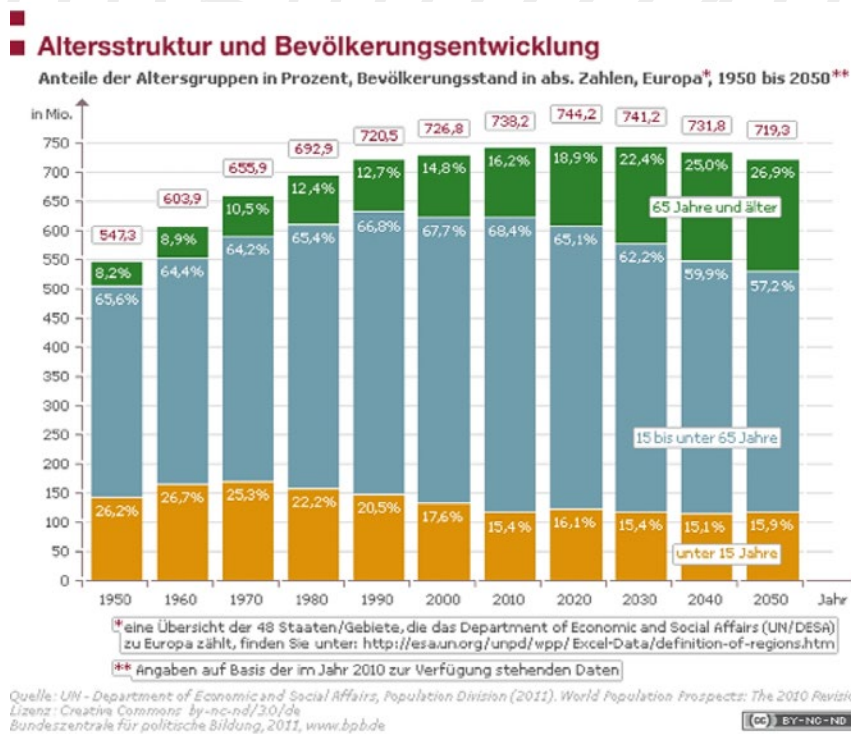
The share of the population over 65 will continue to grow over the next few years in comparison to the rest of the population, and the percentage of very old residents will grow even quicker. This is a global trend. Life expectancy is growing in Europe, as in all other regions in the world. In regions of the world with good health services, including European countries, older individuals in the future will enjoy even more years of healthy life than they do today.

As graphic 1 shows, currently about a sixth of the population in Europe is 65 years of age or older; in 2050 this age group will be almost a third of the population.

65 Quelle: <http://www.zeit.de/gesellschaft/2015-07/bevoelkerungsentwicklung-vereinte-nationen-weltbevoelkerung>

66 Quelle: <http://www.berlin-institut.org/online-handbuchdemografie/bevoelkerungsdynamik/wachstum-der-weltbevoelkerung.html>

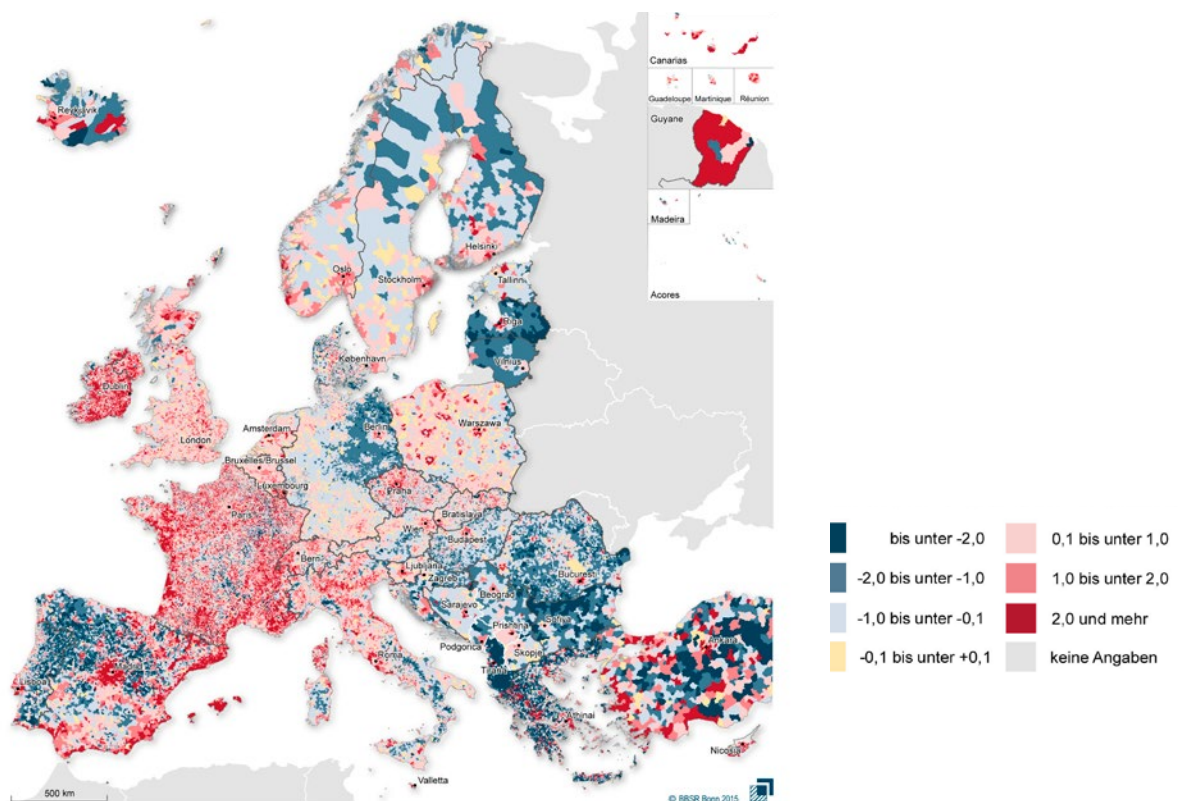
67 Quelle: Eurostat, http://ec.europa.eu/eurostat/data/database?node_code=proj



Graphic 1: Age structure and population trends (age groups below 15, 15-65 years, 65 and older)
 Source: Bundeszentrale für politische Bildung, 2011

URBANIZATION: People are leaving agricultural regions, and metropolises and urban areas will continue to increase their populations. The combination of aging and loss of population will hit some regions of Europe especially hard.

Graphic 2 shows the areas in Europe with shrinking and growing populations. Areas that can expect growth are shown in red, and blue indicates a population reduction.



Graphic 2: Average annual population trend in local European areas
 Source: Bundesinstitut für Bau-, Stadt- und Raumforschung

3. Reduced population growth in Europe and its effects on the transport sector

For companies, a low level of population growth means it will be more difficult to hire workers and adequately qualified personnel. Due to the low level of attractiveness of many jobs in the transport sector, it will become more difficult to fill the jobs required for transport services.

The demand for mobility will not grow if population growth remains low. Personal transport services will not see higher ridership numbers. Company concepts will need to adapt to these realities.

Immigration can counteract population decline and, in the long term, make up for a lack of skilled employees. In 2015, 1 million people fled to Europe through the Mediterranean region. We can only guess how these numbers will change in the future. As long as these regions remain in civil war, the population will continue to flee. The effects of climate change will exponentially grow the streams of migrants from affected regions of the globe. These immigrants can only be integrated into the labor market if nations invest in their education. Increased purchasing power and productivity will also be positive effects of such policies.

4. Aging of the population and effects on the transport sector

The growing share of older citizens among the population is opening up the question of ensuring mobility in old age, encompassing mobility in the home as well as outside of it.

Being able to use transport is a central factor for ensuring older peoples' participation in society and their ability to continue necessary activities (purchasing goods, medical care, etc.).

There are large individual differences in how older people handle mobility after they retire. These are affected by physical condition, income, education level, the availability of a private car, and previous lifestyle on the one hand, and on the other are also strongly affected by external conditions such as the availability, accessibility, and age-appropriate design of transport methods and infrastructures.

In general, older citizens today are more agile and mobile than in previous decades. This trend will continue. In the richer regions of Europe, older individuals will be using transport more often, both locally and for long distance travel^{68 69}.

Most frequently, they will use private cars. Technological development will help them do so, using technical supports to handle physical restrictions that come with aging. Whether the ever-growing group of older transport users will choose public transport will depend partially on the services offered, how transport methods and infrastructures are designed, and the price for utilizing them.

Equipment on vehicles and airplanes, infrastructure, and services must be adapted to the physical and psychological needs of older users.

Legal frameworks have been established on the European level for this purpose:

LOCAL AND LONG-DISTANCE BUS TRAVEL

European directive 2001/85/EC⁷⁰ guarantees the availability of buses to people with limited mobility; it describes in detail the technical features buses must provide to ensure this user group has access to the vehicle safely.

68 Mota Borges, I. (2007) The Added Value of Accessible Public Transport for All in The Context of Demographic Ageing.

69 Sessa, C., Enei, R. (2009): EU Transport GHG: Routes to 2050? EU Transport Demand: Trends and Drivers. <http://www.eutransportghg2050.eu/cms/assets/EU-Transport-GHG-2050-Task-3-Paper-ISIS-EU-Transport-Trends-and-Drivers-September-2009.pdf>

70 <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CONSLEG:2001L0085:20070101:de:PDF>

CIVIL AVIATION

European regulation 1107/2006⁷¹ reinforces the rights of handicapped air travelers with limited mobility. People with limited mobility are ensured access to and use of air travel.

RAILWAYS

European guideline TSI (Technical Specifications for Interoperability) are binding for all interoperable rail lines (trans-European railway system). The TSI PRM⁷² is specifically concerned with the accessibility of these lines for persons with reduced mobility (PRM), and are valid for publicly accessible rail station areas, as well as entrances for which the railway companies, infrastructure manager, or station manager are responsible.

EFFECTS ON EMPLOYEES IN PUBLIC TRANSPORT AND LONG DISTANCE TRANSPORT

Vehicle drivers and service personnel in transport vehicles, in train stations, in harbors, and in airports will need to deal with increasing numbers of older users. They need training to help them understand their specific physical and psychological needs and restrictions and to learn to operate technical support facilities.

Services that accompany and assist older travelers will continue to expand, and new services will come onto the market. This will affect job profiles in traffic-related markets.

5. Older employees and skills shortages

The trend toward an aging population will also affect employees within companies: the share of older employees in the workforce will increase. This will be exaggerated by the increase in the retirement age, recognized as a necessary measure in many European countries to maintain financing for pension and other social systems⁷³.

The growing share of older employees is even more pronounced in the transport sector than in other industries⁷⁴.

A lack of skilled workers is clearly an issue even now in many companies in the transport sector. This is due, in part, to the low level of attractiveness of professions in this sector. (However, one can also speculate as to whether the current lack of skilled workers is not also due to a lack of education in past years).

Ensuring company loyalty, and increasing the attractiveness of transport careers and companies, therefore requires companies and other players in the industry to take action. This is true especially in railway, road, and maritime transport^{75 76}.

Additionally, keeping older workers in the workforce is also important. Many jobs in the transport sector do require working in difficult conditions. Night and shift work, sometimes combined with difficult physical labor, working outdoors, and the effects of weather, can cause health issues after many years on the job, making it difficult for some employees to continue in their positions until retirement age.

71 http://eur-lex.europa.eu/legal-content/DE/TXT/PDF/?uri=uriserv:OJ.L_.2006.204.01.0001.01.DEU

72 <http://www.era.europa.eu/Document-Register/Pages/PRM-TSI.aspx>

73 On this topic, see: European Foundation for the Improvement of Living and Working Conditions (Ed.) (2012): Employment Trends and Policies for older workers in the recession, p. 8ff., <http://www.eurofound.europa.eu/publications/report/2012/labour-market-social-policies/employment-trends-and-policies-for-older-workers-in-the-recession>

74 European Agency for Safety and Health at Work (2011): Occupational safety and health in the transport sector – an overview, Luxembourg, European Economic and Social Committee (2011): Opinion of the European Economic and Social Committee on How EU policies have impacted on the job opportunities, the training needs and the working conditions of transport workers, TEN/445 – CESE 1006/2011, Brussels.

75 Cf. European Commission (2013): Employment in the EU transport sector, S. 3, http://www.transport-research.info/sites/default/files/brochure/20140117_205136_81493_PB05_WEB.pdf

76 See also: Bioly, S., Sandhaus, G., Klumpp, M. (2014): Wertorientierte Maßnahmen für die Gestaltung des demografischen Wandels in Logistik und Verkehr, i, ld Schriftenreihe Logistikforschung, No. 42

6. Urbanization and its effects on the transport sector

Growing urban areas with limited space for traffic and parking will be challenged with guaranteeing the movement of persons and goods while also designing sustainable, environmentally-friendly solutions.

PUBLIC TRANSPORT

Many cities are advocating for diverting growing car traffic - with its pollution and noise emissions, and significant requirements for energy and space - to public transport. Attractive local public transport options are popular with residents; demand is growing in urban centers for employees in associated professions. Even today, there is already a shortage of trained workers in public transport companies.

FREIGHT TRANSPORT

The growth of urban centers results in a growth of freight transport. The simultaneous shortage of resources and the drive for urban logistics designed in the most CO₂ free manner possible⁷⁷ make innovative and sustainable logistics concepts and systems necessary. Political figures on the European, national, and municipal levels, as well as market players in the logistics and freight transport industries, are working on strategies, technologies, and solutions for sustainable freight transport and commercial trade in large cities and urban areas.

LONG-DISTANCE TRANSPORT RAIL / ROAD / AIR

Growing populations in urban areas are leading to increased demand for long-distance travel connections to and from these centers, and between urban areas. An increase in the demand for workers in all of these sectors should be expected as well. If this demand cannot be satisfied, working conditions for employees in long-distance transport companies will worsen due to a lack of personnel.

7. Shrinking regions

In regions experiencing a drop in population, traffic infrastructures are seeing reduced usage. At the same time, the use of cars has greatly increased in importance in the past few decades.

PUBLIC TRANSPORT

Especially in rural regions, the majority of people without driver's licenses, such as students and trainees, use public transport. The number of young people without a driver's license is dropping due to lower birth rates, and older individuals will also be more likely to have driver's licenses in the future. This means that financing for public transport will be more difficult to justify, and will come under fire. Increasing financial problems will lead to cutbacks in public services and to the creation of new private or private-public company models. Instead of a single large public transport provider, the trend will be more and more towards service on request with smaller vehicles, vans, and buses⁷⁸.

This means a reduction in regular employment positions in public transport companies. They may be replaced by innovative traffic on demand concepts, although these are usually offered by private individuals and companies.

FREIGHT TRANSPORT

There has been little research into the connections between population shrinkages and their effects on freight transport. However, we can assume that a reduction in population will be accompanied by dropping demand for goods and services. For service providers, maintaining goods and services on site isn't lucrative in shrinking regions, meaning they will

77 European Commission (2011): Weißbuch - Fahrplan zu einem einheitlichen europäischen Verkehrsraum - Hin zu einem wettbewerbsorientierten und ressourcenschonenden Verkehrssystem.

78 Canzler, W.; Knie, A. (2007): Demographie und Verkehrspolitik. Bundeszentrale für politische Bildung. <http://www.bpb.de/apuz/30348/demographie-und-verkehrspolitik?p=all>

be concentrated in service and purchasing centers. Commercial delivery traffic will decrease, and must be compensated through private shopping services or delivery services. Positions in overland goods transport in these regions will decrease⁷⁹.

There is no information available on the connection between population reduction and freight / railways, inland waterways / civil aviation.

8. What trade unions can do

Meeting the challenges of demographic change requires first of all actions in economic and social policy, development policy, trade policy, asylum policy or a fair treatment and integration of refugees. These are also relevant policies to prevent the brain drain of young skilled workers. In all these areas trade unions have an opinion and a voice. In the scope of this study, however, we concentrate on areas more specific for transport workers and trade unions.

Transport trade unions need to get an understanding of the demographic situation in their sector and their companies, the estimated retirement rates within the next 10 to 15 years. It is important to understand at transport sector level and at company level the future need for workers in the sector (e.g. retirements and replacements, turn over), the skills needs, recruitment plans of companies and whether the sector/ company is able to attract workers or not. We have to keep in mind that the average age of workers in transport is higher than in average of the entire labor market. This combined with the fact that many transport jobs lack attractiveness. This will create of problems in the sector even in countries and sectors that have no problems today and in countries with high unemployment rates.

There are several alternatives for companies to face this situation: sub-contracting and using social dumping practices, investing in technology to reduce the need for skilled labour (e.g. automation) or to increase the attractiveness of the sector and the companies and to invest in training and in knowledge transfer from experienced to new workers.

From a trade union perspective the preferable solution is of course investment in training and enhancing the attractiveness of the transport sectors. These are the levers to get involved and to influence political and company decisions.

A political level trade unions have to get involved in a national debate on investment in training at governmental and sector level to assure a high level of education and qualification for the future. At sector and company level demographic change should be a subject for social dialogue that gives the opportunity to trade unions to negotiate agreements on attraction and retention measures, how to make the jobs attractive in particular also for young workers and women (e.g. training, career opportunities, work-life balance, better health and safety at work, etc.).

Industrial actions are necessary when the companies' strategy to address skills and labour shortage lies in social dumping practices.

Meeting labour shortage by integrating migrant workers and refugees is an alternative. But this has to be a true and fair integration of migrant workers and refugees and not creating second class workers. Trade unions can negotiate at sector and company

79 Arndt, W.-H. (ed.): Der sozioökonomische Wandel in Schrumpfräumen und Folgen für den Wirtschaftsverkehr, Berlin, p. 29ff.

level negotiate diversity agreements for a better integration of migrant workers and refugees.

The high retirement rate in transport in the next 10 years is also a problem for transport trade unions. The average age of trade union members is in most of the European countries high and transport is a male dominated sector. Trade unions have to make every effort to attract young workers and women to become member of a trade unions.

At European level the attractiveness of the different transport sectors, future skills needs and how to attract young workers and women are subjects for the European sectoral social dialogue. A joint analysis on the impact of demographic change on the sector at European, good practice examples, joint recommendations on measures to increase the attractiveness as well as joint recommendations on diversity and integration of migrant workers and refugees in companies are topics for the European social dialogue. Binding agreement on such topics would be preferable.

For the urban public transport sector for both, public passenger transport and city logistics it is important to understand how demographic developments (urbanization vs de-population of rural areas) will influence mobility, estimates of city governments on population developments and their transport concepts. Also this is an area for intervention of trade unions. Transport plans usually include estimates on population developments.

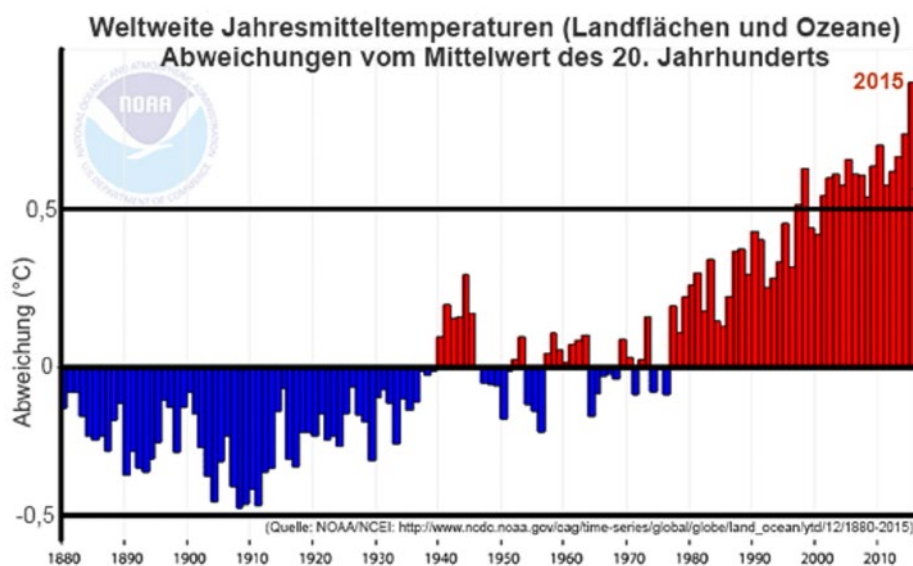
An aerial, high-angle photograph of a city square, likely in Europe, featuring a modern tram. The tram is white with a blue stripe and is positioned diagonally across the frame. The square is paved with cobblestones and is filled with people walking, some carrying shopping bags. There are several market stalls with white canopies set up in the background. The entire image is overlaid with a semi-transparent blue filter. A thick black horizontal line is positioned above the text.

CLIMATE CHANGE

E. MEGA TREND “CLIMATE CHANGE”

The climate is changing due to human emissions of carbon dioxide (CO₂). Put very simply, CO₂ affects our planet's natural ability to regulate radiant heat from space. It is becoming warmer and warmer here in Earth. Measurements of average global temperatures prove this trend. According to the German weather service, these measurements are a reliable indicator for global warming.

At the start of 2016 we know that fifteen of the sixteen total warmest years since the beginning of systematic recording have taken place in the 21st century. To put it another way, there has only been one year since 2000 that didn't set heat records!⁸⁰



Source: German weather service, Global annual temperatures (land and oceans), deviations from the mean value of the 20th century

The average global temperature on Earth is increasing rapidly. In the last 50 years, the temperature even increased twice as quickly as in the 50 years prior. Due to continually increasing CO₂ emissions, each further doubling in temperature will take place at an even more accelerated rate.

1. Climate changes in Europe through 2050⁸¹

HEAT: In Europe, researchers assume median temperature increases from 1990 to the end of the 21st century by 1.0 to 5.5 degrees Celsius. This will lead to more frequent, more intense, and longer-lasting heat waves, that will cause tens of thousands of deaths or more. In general,

⁸⁰ Deutscher Wetterdienst, http://www.dwd.de/DE/klimaumwelt/klimawandel/klimawandel_node.html accessed 01/26/2016

⁸¹ Key points on the description of the changes were taken from the following sources:

- Umweltbundesamt, <http://www.umweltbundesamt.de/themen/klima-energie/klimawandel/zukunft-erwartende-klimaänderungen-bis-2100>, accessed: 01/27/2016
- Europäische Umweltagentur, <http://www.eea.europa.eu/de/pressroom/newsreleases/der-klimawandel-in-europa-ist/#beobachteter-klimawandel-und-zukunftsprognosen>, accessed: 01/27/2016
- Klimawandel: Was er für den Verkehrssektor bedeutet, Kernergebnisse aus dem 5. Sachstandsbericht des IPCC, www.klimafakten.de/ar5, 9/2015

summers will become drier. Drought periods and forest fires will increase in duration and frequency.

Heating will be the most severe in Eastern and Northern Europe *in the winter*, and most severe *in the summer* in Southwestern Europe and the Mediterranean region. In parts of France and the Iberian peninsula, the temperature increase could even top six degrees Celsius; desertification will march onward.

The Iberian peninsula, middle Europe including the Alps region, the eastern coast of the Adriatic, and southern Greece will be most strongly affected by extreme temperatures.

COLD: Days of cold and frost in winter continue to decline. Rivers and lakes will be covered in snow and ice less frequently in the future. Frost and thaw cycles will change in many areas. Damage from snow and winter storms will increase.

As of today, alpine glaciers have lost approx. 2/3 of their total volume, and in the next few years will melt entirely. With the retreat of glaciers, water reservoirs disappear as well, and large rock falls become more likely. Permafrost areas⁸² of the Alps are thawing; following strong rains, landslides and debris flows⁸³ can occur. Soil instability is increasing.

However, counteracting tendencies are apparent in the center of Europe: Due to changing winds, the area experiences more frequent unusually cold days, and especially snowy winters.

WATER: In most areas in Europe, the amount of *precipitation per rainy day* is increasing, even in areas in which overall precipitation is decreasing. Severe precipitation events are continuing to increase all over Europe. The minimum water level for rivers in most parts of Europe will lower significantly, at the same time, we need to expect more frequent “hundred year floods” (similar to the Elbe floods). Groundwater levels drop.

In general, annual precipitation in Northern Europe is increasing, while precipitation decreases in Southern Europe. Especially in winter, increasing precipitation is projected for mid- and Northern Europe. Mediterranean regions will suffer in the future from long-term water shortages. Especially in Northern Europe, populations will need to fight increasing flood waters. In Southern Europe, drought periods caused by low water levels will become more and more frequent.

Rising sea levels threaten the share of the population living less than 100km from a coast. The risk of flood during storms is growing significantly. Due to the melting of ice caps and glaciers, larger quantities of fresh water are flowing into the Northern Atlantic. The salt content in the ocean water is becoming diluted. Warm and cold water masses are becoming more separated, the density of the water is changing, and warmer oceans are losing their buffer capacity because they are not able to recapture as much CO₂ and convert it into organic matter. Coral reefs are dying, and this affects coastal protection. Increased CO₂ concentrations cause the oceans to become more acidic.

WIND: The number of stormy days is increasing, as are wind speeds in general. Increasing wind speeds also cause soils and watery areas to dry out more quickly. Mean winds will, however, not be likely to change much in the future.

With regard to the seasonality of storms, there is currently a tendency for storms to reduce in the summer months of June to August, while climate researchers agree that there will be an increase in winter storms from December to February.

2. Energy

The transport sector is 94% dependent on oil, and according to current white papers, will need to save up to 60% of its CO₂ emissions by 2050. Since crude oil is currently less expensive than it has been in many years, the motivation to invest in alternative forms of energy is dropping.

82 Permafrost is frozen throughout the entire year below a certain depth.

83 A flow of mud and coarse rock material in the mountains flowing quickly down into a valley.

However, the fact remains that our oil reserves will not be able to keep up with increasing demands (peak oil), and prices will once again continuously increase in the future.

Under the effects of a changing climate and the end of the availability of crude oil, the industry has and will continue to search for alternative energies and do research to increase the efficiency of energy used. There are many approaches to doing so.

There is an urgent need to find a substitute⁸⁴ for crude oil to achieve (full) decarbonization of the transport industry. However, the question of whether proposed alternatives truly are alternatives in view of sustainability issues - simply because they use significantly less CO₂ and resources from manufacturing through to disposal - has almost never been considered.

In the near future, we will be able to generate 100% of our electricity needs from renewable energies, above all from sun and wind energy. Both variations are (especially in view of current oil prices) more expensive. Additionally, sufficient infrastructure for widespread distribution of this electricity does not yet exist. Another point is that, although researchers are considering questions such as how to handle recycling for old solar modules in an environmentally friendly manner, according to author's research there seems to be no calculation of how this energy efficiency stacks up when considering the expenses and effects generated in their manufacturing and disposal.

Liquefied petroleum gas (LPG) and natural gas (CNG) are already being successfully used as fuels. At current economic levels, reserves worldwide will be sufficient for about 60 years. LPG can, therefore, only be helpful for a temporary period. The development of alternative fuels must also be considered in a critical light. *Synthetic fuels* continue, in some cases, to use crude oil as a basis, or are still only able to be produced with complex and energy-intensive manufacturing processes. However, there are processes currently being tested that could be alternatives alongside the use of renewable energy sources - with the limitations mentioned above.

So-called "bio" fuels - a definite misnomer in view of sustainability considerations - require the monocultivation of enormous agricultural areas for sugarcane, rapeseed, or wheat, meaning these areas are no longer available for human sustenance. Often, rain forests are cleared for this agriculture.

Drives based on water as fuel would represent a completely CO₂ neutral option. There are functional water-based engines. This energy option has not yet been sufficiently researched or funded. Its use falters due to a lack of infrastructure for "fueling up" vehicles. Battery systems currently available on the market are too ineffective, too expensive, and have too short of service lives and charges. Intensive research is occurring in this area, and completely new energy storage systems are being developed.

Atomic energy is experiencing a renaissance as a "CO₂ neutral alternative" - a state of affairs unthinkable only a short time ago - under the pressure of climate change. Fukushima - like Chernobyl before it - clearly showed us the risks of this technology for the second time in March, 2011. Currently, reactor pressure vessels at two Belgian reactors are experiencing critical errors, having been found to have more than 16,000 fine cracks. These issues could represent a global problem for the entire nuclear sector.⁸⁵

ROAD:

Researchers continue to work to develop more efficient engines and drives to reduce fuel usage. They are also working on lighter materials and more aerodynamic vehicles. Various processes for new road surfaces with smoother running characteristics are in testing. Above all,

84 Goods that satisfy the same or similar needs, and are therefore seen as equivalent substitutes by consumers.

85 <http://www.taz.de/!5019845/> accessed: 02/11/2016

truck drivers are being offered training sessions to help them reduce energy usage. Scientists are researching alternative drives such as fuel cells, more powerful and longer-lasting battery options for electric cars and hybrid vehicles.

Major vehicle manufacturers are testing the possibility of electrifying streets. According to estimates by the German Environmental Agency, investment in e-trucks for shipping companies would pay off within two years, if the electricity from renewable energy were given tax advantages in comparison to diesel.

In the area of freight transport, there are even “green solution” concepts to create more environmentally friendly and efficient logistics processes. Private individuals are taking advantage more frequently of growing car sharing services and the use of urban public transport, especially in urban areas.

RAIL TRANSPORT: In rail transport, too, more efficient drive technologies are being developed, and smooth running rail tracks and lighter, more aerodynamic wheel materials are being researched. Locomotive drivers are receiving training on more efficient driving practices. Diesel emissions have been reduced, electrification pursued and, in some areas, measures have been taken to optimize loads. Energy savings measures are also being taken in passenger transport. There are “green logistics” concepts for freight transport.

MARITIME TRANSPORT: In the transport industry, pure CO₂ emissions per ton transported and per kilometer are lower when compared with overland transport. Since 90% of all large ships today run on heavy crude oil, however, burning this oil releases not only carbon dioxide, but also significant amounts of other toxins, many of which can also affect climate change. This is why it is important to continue to improve fuel quality so that technologies to treat exhaust gas - which have been standard on land for quite some time - can also be used on ships. In the long-term, this means getting away from using heavy crude in sea transport. Liquid natural gas represents one alternative; burning natural gas releases significantly fewer toxins.

CIVIL AVIATION: Air travel has hardly been affected by the effects of climate change, in comparison to the other sectors. And yet, air travel is the mode of transport standing in the way of achieving climate goals. Air travel is a transport industry with a strong international focus. International flights make up the lion's share of air traffic departing from Europe. It is also experiencing strong growth. The European Commission is encouraging the strong growth in the branch. Viewed from a global standpoint, according to the “atmosfair” climate index CO₂ emissions have dropped, but at the same time worldwide air traffic has increased by a hefty 4%. In the industry, this means CO₂ emissions are increasing almost half as quickly as transport performance.

Overall, it is clear that de-carbonizing transport will not be achieved free of charge. Over the next few decades, an enormous amount of research, development, and investment will be required. The longer states and companies put off this duty because of cost, the more they will have to invest in the end. Society must adjust to increasing energy prices – one way or another. Expenses can be reduced through a variety of energy saving measures.

3. Likely consequences - two examples

HEAT:

- Heat regularly causes deformations and material damage to street surfaces, railways, and runways. This causes significant structural damage, which requires immensely time and cost intensive repairs. In some circumstances, streets can be so severely damaged by heat that they become unusable. Electronic infrastructure (traffic lights, overhead wires, signal boxes, signals ...) fail repeatedly. Transport speeds drop because drivers can only drive at reduced speeds, and heat-related traffic jams occur in the streets. Logistics chains are interrupted.
- Air conditioning systems fail or cease to work entirely; this means cold chains cannot be maintained
- In connection with droughts, there is a higher risk of forest fires, which can reach the edges of roadways and railways.
- Thermal expansion in bridge constructions means existing joints and bearings may no longer be sufficient to minimize temperature-related stresses, and therefore unable to guarantee the stability of the structures.
- Heat-related inability to concentrate and heart and circulatory problems will significantly increase accident rates.
- In inland shipping, regular low water levels will need to be expected. Some waterways will be navigable significantly fewer days in the year because of this. In general, the navigability of rivers and canals will be sharply restricted. Some harbors will no longer be suitable for docking. There will be a drive either towards smaller loads (increasing transport costs) or to use smaller inland ships, requiring serious investment.

WATER:

- Due to severe or long-term rains, street substrates will become less stable, for instance due to undercutting. Unpaved roads, in particular, will be extremely susceptible to strong rains. Soil erosion will endanger the stability of railway embankments and track beds. New dangers and increased repair costs will follow.
- More and more frequently, drainage systems will become overloaded, and streets, railways, bridges, and tunnels will be flooded. This will force increased investment in drainage and other protective measures.
- Mudslides and debris flows will destroy traffic routes, making alternative routes necessary in some cases. This will add additional load to existing infrastructure, causing loss of time due to increasing traffic density, thereby driving up transport costs and interrupting logistics chains.
- In general, traffic safety will be restricted by poor street conditions.
- In the long term, traffic routes will need to be moved further inland to address enormous erosion on the coasts.
- **Inland waterways:** Due to high or low water levels, storm floods, and long frost periods, the navigability of rivers and channels will be severely limited. Some ports will no longer be accessible, and traffic will need to switch to others. High water conditions will make it impossible to pass some bridges.
- **Maritime transport:** The rising sea level will cause changes in currents and sedimentation processes. Traditional shipping routes will need to be regularly reviewed for navigability, especially near coasts. The melting of the ice and snow covering much of the earth's surface will open new, shorter shipping paths such as a Northeastern passage in the Arctic.
- **Ports:** High seas ports will be flooded more frequently and more severely. This will lead to operational interruptions, repairs, and greater structural loads on port systems due to higher water levels and bigger waves. In extreme weather events, disasters and accidents will increase. Functioning port hinterland traffic will be more difficult to maintain than today.
- In general, both high and low water levels will lead to longer layover times for ships and delivery delays. Transshipment will reduce and planning security will disappear for port operators and ship owners.

4. Working conditions - trends

An overhaul of the entire transport sector in view of ecological needs will certainly change the labor market. On the other hand, a changing labor market is a precondition that facilitates eco-friendly changes in the transport industry. It is very difficult to estimate what consequences this fundamental change will have for the European labor market.

Based on changes that have already occurred due to new technologies and advancing globalisation, experts agree that the time of transition will be accompanied by a process of "creative destruction" (cf. Joseph Schumpeter; Theorie der schöpferischen Zerstörung). The environmental program of the United Nations names 4 levels of restructuring:⁸⁶

1. New and additional jobs will be created.
2. New, "green" technologies will create about as many jobs as the number lost by eliminating older technologies.
3. Jobs will be lost.
4. The majority of existing jobs will be retained, and adapted to new conditions and needs.

Scenarios developed (e.g. by OECD and EU) which are intended to make predictions on the effects on the labor market all emphasize the major uncertainty factors due to highly complex effective mechanisms. There is a general assumption that:

- There will be only short-term gains in jobs with low qualifications;
- The demand for highly-qualified employees will increase in the long term;
- Employment in the area of renewable energy will increase greatly, although these jobs will only represent a small percentage of total jobs;
- "Green jobs" will include a very heterogeneous selection of positions, with regard to qualifications, potential salaries, and working conditions;
- Above all in domestic transport, employees will have difficulties during the transition. The percentage of employees who are older or who have low qualifications is very high there.

There are some people who believe that the expansive, highly destructive economic model of capitalism can no longer be sustained. So-called "green capitalism" is a contradiction within itself, and cannot succeed. To maintain human living conditions on our earth, and guard ourselves from the worst effects of climate change, a deep re-thinking in all areas of the Western lifestyle is required.

5. What trade unions can do

The ETF developed already early a 'Trade union vision on sustainable transport' with a key message that 'ecological sustainability and social sustainability are the two sides of the same coin'. The deregulated transport system with just in time production and zero stock policies is possible only because transport is too cheap. To a large extent it is too cheap due to downwards pressure on working conditions and pay and social dumping. At European policy and regulatory level there are many action points for the implementation of the ETF strategy on sustainable transport such as the Commission's 2011 Transport White Paper and DG Moves regulatory activities to implement the White Paper for the different transport modes, the EU decarbonizing mobility strategy, EU infrastructure policy through the TEN-T and CEF (connecting Europe facility), EU transport research programs or the Energy Union program.

86 UNEP, Green Jobs: Towards decent work in a sustainable, low-carbon world, September 2008, page 43

Key points within the “avoid – shift – improve - approach” are:

- Stop further liberalization of transport modes and fighting social dumping in transport and for fair rates; too cheap transport due to social dumping promotes unsustainable transport;
- Promote public transport as a solution for healthy and safe urban areas but as well for local quality employment;
- Promote modal shift combined with fair and just transition;
- Fair treatment of all transport modes as regards taxes and charges.

Furthermore, sustainable transport should be a subject in each Sector Social Dialogue Committee (SSDC). Depending on the transport mode the topic of “just transition” should be part of the negotiations between ETF and the employers’ organisations.

A strategic action point is to build alliances with NGOs on sustainable transport at European level. Here an important point is building awareness among NGOs that fair and decent working conditions are part of a sustainable transport system and social dumping a means to make transport cheaper. NGOs can support transport trade unions within a policy for climate justice while the trade unions have to be credible in their commitment for sustainable transport.

At national level trade unions have to be aware that the UN Paris Climate Agreement from 2015 requires from national governments to elaborate national implementation plans to achieve the Paris objectives. The EU level is strongly promoting the establishment of national, regional and local transport plans (e.g. SUMP – Sustainable Urban Mobility Plan). Decisions on investment in infrastructure are taken at national, regional and local level. Political decisions on promoting public transport versus individual car use and on the financing systems for public transport are taken at national and regional level. This includes as well decisions on whether or not to allow faked “ride sharing” business models as for example Uber.

These are all areas of political influence for trade unions. They have to develop a national strategy on sustainable transport, they have to inform and train their members to be capable getting involved at local level. Also at national and local level alliances with NGOs and communities can support trade union objectives to promote public transport, fighting PPPs (private public partnerships) or to promote public transport in public ownership.

In some transport sectors such as urban public transport, railways or inland waterways trade union and employers’ associations/ companies have a joint interest to promote sustainable transport and their transport modes. In other sectors unions should get engaged in a dialogue on sector decarbonizing strategies, their possible impact on employment and how to assure a “just transition” in the sector.

At work place level negotiations of agreements regarding on the introduction of new technologies (drivers assistance systems for eco-driving, clean vehicles, ships, trains; new maintenance skills) or possible bonus schemes to promote eco-driving (if unions agree) are possible.



ANNEXES



ANNEX 1:

For discussion: Theses on the future of the transport sector in Europe

7 Theses on Economic Globalisation

1. Global competition is carried out through the factor of work: Work is being outsourced to low-wage countries.

To achieve a competitive advantage, global transport companies are recruiting employees from low-wage countries, such as from the Philippines, in maritime transport, or are outsourcing their production to countries with lower standards. European institutions are supporting this process with their focus on liberalizing markets. Offshore companies, one-person companies, insufficient cabotage regulations, flags of convenience, and the separation between operational base and home base are becoming the new normal. In this way, standards drop in all countries. The goal of the Air Transport Regulation Panel (ATRP) of the International Civil Aviation Organization (ICAO), for example, is the unrestricted liberalization of aviation, market access, ownership, and control of aviation companies.⁸⁷

2. Regulatory standards are being eliminated in international economic relations

All trade agreements currently under negotiation, such as the TiSA, TTIP, and CETA, have the goal of eliminating trade restrictions, including work, social, and environmental standards. The Trade in Services Agreement TiSA, for example, aims to open up public services to competition, thereby endangering basic public services. These agreements serve corporate interests, and will restrict the opportunities for political action and change in the future. Multilateral agreements are being replaced by bilateral ones, in which the stronger side is disproportionately able to enforce its interests. Competitive tendering in public transport or ground handling services at airports encourage the growth of low-price service providers without social concerns, and a drop in quality for everyone. Labor laws are not observed or are circumvented in global supply and transport chains, and employees are forced into unacceptable and unsafe working conditions.⁸⁸ The disagreement among EU countries makes regulations difficult.

3. Private capital is assuming control of transport companies and infrastructure

Foreign and private direct investment in transport companies is shifting control and responsibilities; the state is losing its ability to control and monitor the economy. The growth in private financing in comparison to state financing results in a reduction in state revenues from transport services. On the other hand, public households are subject to increasing tax burdens to make up for poor speculation by private companies.

Pension funds are being used to finance infrastructure. This has an effect on the way infrastructure is designed, at the same time driving the trend towards privatization. State and private subsidies in civil aviation, as practiced in the Gulf states, and the establishment of low-cost airlines, is forcing established aviation companies into a cost war. In public transport, commercial suppliers are receiving contracts over public passenger transport services by promising to eliminate subsidies from public households.

87 International Civil Aviation Organization (2014): Air Transport Regulation Panel (ATRP). Twelfth Meeting, Montreal, Canada, 26 to 30 May 2014. P. ii-1, p. 4-1.

88 European Parliament, Committee on International Trade (18.3.2016): Draft report on a new forward-looking and innovative future strategy for trade and investment. (2015/2105(INI). P.7.

4. Conditions for transport services are being determined by multinational corporations

The largest logistics groups offer multimodal transport services. Acquisitions expand the worldwide network of companies, as practiced by Deutsche Post DHL - the logistics company with the highest revenues in the world. United Parcel Service (UPS) and the China Railway Group, which builds and operates railways in China and other countries, have followed suit. FedEx transports goods overland, on the water, and in the air, and has its own large fleet of planes. Maersk is the world's largest container ship carrier with over 250 ships, and is also active in overland transport.⁸⁹

Global network terminals (GNT) are a massive presence around the globe, active in more than 50% of harbors worldwide. These companies are primarily focused on increasing their share of the global market. The four biggest GNT – APM Terminals/ A.P. Møller - Mærsk A/S, DP World⁹⁰, HPH (Hutchison Port Holdings Ltd.), and PSA International⁹¹ – today control more than half of all of the harbors and terminals on Earth. Not all of these recognize trade unions.⁹²

5. Unregulated business models are gaining the upper hand over regulated forms

New business models are being created to offer new services to citizens and customers. New versions of the sharing economy are shifting services to the private realm. Through technological developments companies like Uber, GetTaxi, GrabTax, and Hailo have discovered these platforms as avenues for competition with taxis and public transport. It will be difficult to regulate such quasi-private services. It will not be possible to institute criteria ensuring good labor standards.

6. Employees are seen more as a cost factor than an asset in companies

More and more, multinational companies are shifting staffing responsibilities onto subcontractors. Subcontracting and outsourcing are more frequently used in business operations, with clear challenges for workforces. The heterogeneity of companies, wage structures, employment, and working conditions is increasing, while the density of regulations decreases. Often, workplaces have neither trade unions nor workforce representation.⁹³ Good jobs are being replaced by informal, casual, and contract work. The further employees are away from the core workforce, the more severely do wages, safety, and work quality standards suffer; the question of liability is outsourced as well. Corporate social responsibility is more an instrument of PR departments than a real concept in the current labor environment.

7. New forms of work undermine gains by trade unions

Die European Foundation for the Improvement of Living and Working Conditions (Eurofound) has identified employment trends which also apply to the transport sector. The competitive situation, corporate structures, technological options, and financial and regulatory frameworks provide companies additional flexibility, along with generating an increased pressure to compete. This also affects employees, requiring them to be more flexible and efficient. New forms of work are being created, such as "employee sharing," "job sharing," "interim management," "voucher-based work," "portfolio work," "crowd employment," "collaborative employment," "zero hour contracts," and "pay to fly contracts," as well as short-term work and IT based mobile employment (Eurofound, 2015, p. 4). Trade unions need to adjust to these new realities as well, and develop concepts to deal with them.

89 Sales in logistics: DHL: 46.3 billion euros; China Railway Group: 40.0 billion euros; FedEx: 34.3 billion euros; Maersk: 29.7 billion euros. Source: <http://www.manager-magazin.de/fotostrecke/tnt-fedex-und-co-die-groessten-logistikkonzerne-der-welt-fotostrecke-125406-9.html>

90 The primary owner is Dubai World, the state investment group of the United Arab Emirates, formerly Port of Singapore Authority

92 <http://www.itfglobal.org/de/transport-sectors/dockers/in-focus/gnt-campaign/>. Accessed 2/10/2016.

93 Cf. Dörre, Klaus: Landnahme: Unternehmen in transnationalen Wertschöpfungsketten. In: APuZ 1-3/2014. S.32.

1. Customers want a continuous, multi-modal chain of travel, from door to door

Customers expect global, multi-modal solutions from a single company, rather than a patchwork of isolated solutions. Continuous chains of travel that incorporate train, public transport, and all other modes of a single travel chain are easy for customers to plan and purchase through digitized means. Online portals take over the complete transport planning, the transport companies are only the executing bodies.

2. New players – Google and Amazon as transport service providers

Digitization is creating entirely new markets and services, such as "same day delivery." This opens up the flood gates for companies like Google to get into the logistics industry. Google and Amazon, for instance, are planning to use drones to deliver products to customers more quickly. Services such as Uber and flinc – which have achieved success because of digitalization – offer free transport capacities. In the future, the boundaries between public and private transport will become blurred.

3. Digitization will make jobs superfluous – new jobs and professions will be created

Digitization is changing the world of work in all areas of the transport sector. Jobs will be lost on the one hand, for instance in dispatching, made superfluous by modern technology. On the other hand, digitization will create new professions, such as the logistics information technician or information communications specialist. All professions will experience a changed requirement profile.

4. The platform economy is creating a new digital precariat

The platform economy is producing new, atypical types of work. These ways of working strongly influence social security systems, social partnership, worker participation, and worker rights. New, flexible forms of employment must be actively shaped by worker's rights groups in order to avoid a tendency towards job insecurity following a lack of social protections, and to stop personnel reductions in favor of flexible access to crowd workers.

5. The use of cyber-physical systems is accompanied by subtle rationalisation, and will cost a large number of jobs

If it is possible to plan repairs in advance (such as outsourcing crews, freighting, and maintenance abroad), rationalisation and the outsourcing of jobs will occur.

Containers equipped with sensors and RFID technology are registered and tracked for optimized transport and distribution. These allow, for example, perishable goods to be monitored and delivered before they spoil. Trains and vehicles are being equipped more and more often with sensors which notify the user when parts need to be replaced.

6. Automation can cause the elimination of occupational groups – on the tracks, on the water, and on the street

Automated driving has now become firmly fixed in the public imagination as a real possibility. Potential areas of application are currently being researched: These include driverless parking when you get to the train station, car sharing, automated transport services, and automated vans and bus travel. Trials are currently underway with shunting locomotives and in goods transport.

Companies like Google are also investing in research on automated driving.

7. 3D printing as an alternative to traditional production will affect transport volumes and paths

3D printers allow us to "print out" objects of all kinds. This makes just-in-time production of individual components a reality. This technology is already being used, especially when repairing materials following accidents, for discontinued components, building prototypes, or

when conventional manufacturing would be highly cost-intensive.
6 Theses on Demographic Change

1. The low population growth in Europe makes it more difficult to recruit qualified personnel

Due to the somewhat unattractive nature of many positions in the transport sector, it will be increasingly difficult for companies to fill the positions required to provide transport services. The market will experience a fight for talents and the necessity to maintain the employability of senior employees.

This could have positive effects for employees: many companies in the transport sector could attempt to use attractive wages and employment conditions to gain employees and encourage them to stay with the company.

On the other hand, the lack of trained employees could also lead to a weakening of wage, social, and qualification standards: companies recruit employees from low-wage countries, move production to countries with low wage and social standards whenever possible, or outsource transport-related services to companies from these countries. Short training courses and retraining should and can bridge personnel shortages, but will undermine high qualification standards and endanger entire occupational types.

Skills shortages will lead increasingly to unfilled or underfilled positions in companies, and therefore to pressure on working conditions for the remaining employees – many overtime hours will be worked, legally prescribed limits for working hours, breaks, rest, and waiting times will be exploited or even ignored, as will vacation times; shift and vacation plans will not be able to be adjusted to match the personal and family needs of employees.

2. The increasing average age of employees requires measures to maintain their ability to work

The percentage of older employees in the transport sector will continue to grow; the trend will be intensified by raising the retirement age.

Working conditions that can lead to negative effects on health in many positions within the transport sector make it difficult for employees to continue performing their jobs until retirement begins.

For companies and employee representatives the focus will be on the image as an employer to attract older employees, to maintain the ability of older employees to work, and the question of continuing employment or shifting employees with health issues to other positions.

3. More older and very old people are participating in transport, using means of transport and traffic infrastructures

Ensuring the mobility of older and very old people is increasingly a key task for transport policy, in particular on the regional and communal levels. In rich regions of Europe, the percentage of older and very old people using transport will grow. Assuming equivalent financial and structural circumstances, older people today are more mobile than those of the same age in previous generations. In some regions of Europe, people are especially threatened with poverty in old age; a lack of income leads to a reduction in mobility.

Equipment and features in vehicles and traffic infrastructures must be adjusted to meet the physical and psychic needs of older individuals. Employees in passenger transport require additional qualifications so that they can respond to the needs of older travelers and operate technical supportive equipment.

Services offered to assist and accompany older travelers will continue to develop, and new services will be added. This will influence job profiles in traffic-related services.

4. In countries and regions with shrinking populations, the demand for services in passenger and freight transport will decrease

When populations shrink, the demand for transport services will also drop; this endangers the financing of traffic and transport infrastructure. The need for employees will drop; regular employment relationships will increasingly be replaced by freelance employees and micro-

companies that provide traffic and transport services *on demand*.

At the same time, ensuring mobility and supplying the remaining population in shrinking regions is important, and will increasingly be a topic of discussion in transport policy and structural politics on the regional and community levels. Employee representatives must participate in this discussion on innovative concepts and must influence the consequences for working conditions in the transport sector throughout these processes of change.

5. In urban metropolitan areas and congested regions, the demand for passenger and goods transport will increase

Because of population growth, combined with a shortage of space and the high demands of environmental protection in metropolitan areas and congested regions, motorized individual transport will become more and more difficult. Public personal transport could continue to increase in importance, and the demand for employees in this sector could continue to grow. However, new forms of transport based on the digital procurement of free transport capacities from private suppliers – without control of working conditions – could offer competition to public transport.

6. The migration from emerging and developing countries to Europe will increase

The strong population growth in some parts of the Earth, in conjunction with difficult economic circumstances, climate change, environmental catastrophes, and civil wars, has already and will continue to lead to increased migration into industrialized nations.

Immigration can intersect with the declining population in Europe and help counteract a skills shortage in the long term. Companies are above all looking for well-trained employees among the immigrants. However, integrating less well-educated people into society and into the working world, and investing in their training, is the duty of social bodies, workers' representatives among them.

6 Theses on Climate Change

1. To achieve the carbon-cutting measures required of the transport sector, we need new and CO₂-neutral drive types, as well as new mobility and logistics concepts. Significant investments will be required for this.

Alternative technologies that already exist are not a sufficient substitute for oil. Newly developed forms of energy must also be sustainable when manufacturing and recycling processes are factored in. Both states and companies must significantly increase their efforts in the area of research and development, and must be prepared to supply an enormous amount of financing for the purpose.

Individual modes of transport must be integrated into mobility and logistics concepts so that it is possible to always use the most sustainable mode, without exceptions.

1. The shift to environmentally friendly transport services will be accompanied by higher demands for worker qualifications

Wide classes of the population will have to be able to achieve higher levels of education. We must fundamentally rethink existing educational systems to achieve this goal. Low qualified and older employees must receive the objective possibility to gain further qualifications so they can remain competitive in the ever-changing world of work. Lifelong learning and maintaining the ability to work will become vitally important to companies in these times of demographic change. Trade unions must be a part of shaping these trends. According to all predictions, the number of positions offered is not likely to drop significantly.

2. The shift to sustainable mobility can only succeed if it finds broad social acceptance. This includes the readiness to tolerate higher (energy) prices.

The population has to be enlightened with the goal of fostering true insight.

- Always selecting the most sustainable means of transport. The cheapest is not always the best.
- Scrutinizing and eliminating (unnecessary) mobility requirements.
- Purchasing regional (energy) products and services.

Mobility behavior can be supported monetarily, environmentally-damaging mobility can be made much more expensive and external costs have to be internalised.

3. The climate has already changed. The consequences for transport systems must be reduced wherever possible

Adjustment strategies which have already been developed must be funded sufficiently and implemented without delay. Technologies (such as electrifying streets) must be taken into consideration in doing so. When making funding decisions, the most sustainable and climate-resistant mode of transport must always be given preference. Example: Domestic waterways vs. rail. Sustainable transport concepts must also be taken into account.

4. Climate systems and their effects are not understood by most people because they operate in an exponential manner, not in a linear one, and because we are generally unable to predict threshold values

We cannot assume that changes will be constant and will take place within a defined time period; on the contrary, we must assume they will be fast, often unpredictable, and dramatic whenever critical threshold values are exceeded. Due to a lack of experience, we are usually too late in noticing that critical boundaries have been exceeded.

5. Our time is short

The necessary changes must be tackled immediately. Otherwise, advancing climate change will dramatically change the face of our planet and its living conditions. Our transport infrastructures and technologies will, then – just one consequence among many – be set back by centuries.

ANNEX 2:

Seven theses on the influence of trends on trade unions – and what can we do about it

1. According to general understanding of the society, trade unions no longer play any role in defining the working conditions.

- Public relations calling attention to trade union achievements;
- A campaign dedicated to building image on the national and European level about the role of trade unions in defining the working conditions;
- “Mega-trends and trade union strategies” campaign;
- Making trade union work professional.

2. The society is changing. It is impossible to win over young people by using the current concept of workers’ representation.

- Public relations in schools, educational centres and colleges (organized by own young professionals);
- Short posts on social networks directed towards target groups;
- “How can trade unions shape the future of the young” campaign (i.e. working conditions, environmental protection).

3. Social changes go hand in hand with changes of the mentality. Young people prefer individual organization of work rather than collective representation.

- Modern concepts of trade union work take into account individual needs;
- Individualized special offer and measures;
- A public message: trade unions represent individuals in the world of labour undergoing constant change.

4. Trade unions do not organize workers in the new forms of employment.

- To establish and expand demands concerning the need to regulate (i.e. employment contracts, inspections);
- Reaching out to politicians, MPs;
- To constitute trade unions as a monitoring body.

5. The traditional employer/worker relationship is falling apart. The responsibility for work efficiency has been individualized and shifted to workers.

- Trade unions – a contact person for all workers;
- To adopt and introduce regulation on the responsibility;
- To define workers’ minimal rights (minimal wage, social insurance)

6. Reduction of workers’ rights in the process of liberalization deprives trade unions from the possibility to exert influence.

- Introducing international cooperation on the European level;
- Collaboration with trade unions in the third countries;
- Winning over new partners,
- Which concepts have proved to be successful and which have not?

7. Due to the loss of membership and marginalization, trade unions can no longer fulfil their task in defining the working conditions.

- To highlight the trade union role in the context of social peace;
- To introduce new forms of organizing;
- To mobilize everyone by means of simple messages;
- To learn from others.

Questions for working groups

- Are these theses correct?
- Can the measures proposed result in certain improvements?
- Which additional measures should be taken?

ANNEX 3:

Glossary

3D printers

3D printing makes it possible to print a wide variety of objects in diverse materials in three dimensions. "The printers allow one to privately produce objects of all kinds, and secondly – a fact which is above all relevant for companies – facilitate just-in-time production of individual tools and device components, or even mass production, on site."⁹⁴

Augmented Reality

"Augmented Reality (AR)" is understood, for instance, as technology that makes it possible to enrich one's view of the real world by representing virtual elements created by computer graphics."⁹⁵ This technology is fundamentally changing the relationship between humans and systems.

Big Data

Big Data refers to the collection and analysis of data from a variety of sources, facilitated by technical advances in sensor technology and by new analytical methods.⁹⁶ "Big Data" describes large quantities of data, for instance from areas such as internet and mobile communications, the financial industry, the energy industry, healthcare, and transport, and from sources like intelligent agents, social media, credit cards and customer loyalty cards, smart metering systems, assistive devices, surveillance cameras, and planes and vehicles. This data is saved, processed, and analyzed using specialized solutions."⁹⁷

Casual Work

"Casual work is a type of work where the employment is not stable and continuous, and the employer is not obliged to regularly provide the worker with work, but has the flexibility of calling them in on demand. The European Parliament (2000) defines casual work as 'work which is irregular or intermittent with no expectation of continuous employment'. Workers' prospects of getting such work depend on fluctuations in the employers' workload."⁹⁸

Collaborative employment

"Cooperation among self-employed workers and SMEs is a traditional way of doing business to overcome the limitations imposed on those forms of economic activity by their smaller scale compared to larger competitors. In this project, the focus is on specific forms of cooperation that have recently emerged and go beyond traditional supply chain or business partner relationships."⁹⁹

Crowd employment

"Crowd employment is an employment form that uses an online platform to enable organizations or individuals to access an indefinite and unknown group of other organizations or individuals to solve specific problems or to provide specific services or products in exchange for payment (Green and Barnes, 2013; Saxton et al, 2013; Papsdorf, 2009)."¹⁰⁰

Crowdsourcing

Crowdsourcing "is an interactive form of value creation using modern information and communications technologies (Web 2.0). The term is a portmanteau of the words crowd and

94 Springer Gabler Verlag (Herausgeber), Gabler Wirtschaftslexikon, Stichwort: 3D-Drucker.

95 Rump/Groth (2006): 5.

96 cf. Klausnitzer, Rudi (2013)

97 Springer Gabler Verlag (publisher), Gabler Wirtschaftslexikon, keyword: Big Data.

98 Eurofound (2015), p. 46.

99 Eurofound (2015), p. 118.

100 Eurofound (2015), p. 107.

outsourcing. Individual tasks that were previously handled internally are outsourced to a large number of users or interested parties, frequently in the form of a competition. The task could relate either to an innovation or to already existing operational activities or products. The most well-known agent to use crowdsourcing may be the online encyclopedia Wikipedia.”¹⁰¹

Cyber-physical systems

“Cyber-physical systems are systems in which information and software technologies are combined with mechanical or electronic components, with data transfer and exchange, as well as monitoring and control, being carried out through an infrastructure like the internet in real time. Key components of such systems are mobile and movable facilities, devices, and machines (including robots), embedded systems, and networked objects (Internet of Things). Cyber-physical systems play a central role in Industry 4.0.”¹⁰²

RFID Chips

“Radio Frequency Identification (RFID) is a wireless process to distinguish and identify items, objects, persons, and livestock. It is an electronic process that works without contact, transmitting product data across a certain distance via radio waves or inductive or resonance coupling.”¹⁰³

Employee sharing

“Employee sharing is an employment form in which a group of employers hires workers jointly and is jointly responsible for them.”¹⁰⁴

ICT based work

“The increase in all kinds of mobile technologies and communications media, principally smartphones and tablets, the growing availability of such devices, and the ease of internet connectivity they bring (Popma, 2013; Holtgrewe, 2014) are key factors in the growing numbers of mobile workers. At the same time, the increasing interconnectedness of market participants and the attendant division of work on a global scale, the growing market power of multinational corporations, and the growing number of intracompany transactions that stretch across locations have completely reshaped the organization of production and work (Gareis et al, 2006).”¹⁰⁵

Industry 4.0

“The so-called fourth industrial revolution, which the number refers to, is characterized by individualization (including in series production) or hybridization of products (coupling of products and services) and the integration of customers and business partners in business and value creation processes. Key components include embedded systems and (partially) automated machines, which move in and through environments without human controllers and make decisions independently, and developments like the 3D printer. The networking of technologies and objects equipped with chips results in highly-complex structures and cyber-physical systems (CPS), as well as in the Internet of Things.”¹⁰⁶

Interim management

“Interim management describes an employment form in which a company ‘leases out’ workers to other companies temporarily and for a specific purpose. Such leasing of workers is the main objective of the employer company, but unlike a temporary employment agency, its staff is limited to highly specialized experts who are sent to the receiving companies to solve a specific management or technical challenge or assist in economically difficult times.”¹⁰⁷

101 Springer Gabler Verlag (publisher), Gabler Wirtschaftslexikon, keyword: Crowdsourcing.

102 Springer Gabler Verlag (publisher)/ Gabler Wirtschaftslexikon: keyword: Cyber-physische Systeme.

103 IT Wissen: RFID.

104 Eurofound (2015), p. 11.

105 Eurofound (2015), p. 72.

106 Springer Gabler Verlag (publisher), Gabler Wirtschaftslexikon, keyword: Industrie 4.0.

107 Eurofound (2015), p. 40.

Internet of Things (IOT)

"Describes the networking of objects with the internet, so that these objects can communicate independently over the internet and carry out various tasks for their owners. The scope of application for these networks ranges from general information supply to automatic ordering all the way to warning and emergency functions."¹⁰⁸

Job sharing

"Job sharing refers to employment relationships in which one employer hires several workers, but normally just two, to jointly fill a single full-time position. It is a form of part-time work, whose purpose is to ensure that the shared job is permanently staffed. The job sharers are a group formed by the employer rather than a self-constituted employee group."¹⁰⁹

Platform capitalism

Electronic platforms market services as needed for relatively low fees. Work contracts are deconstructed into the smallest possible components and advertised on various digital platforms. These contracts could be awarded both to a company's own employees (internal crowdworking) or to third parties. "Hiring on demand" or crowdworking clearly deviates from a so-called "normal working relationship." Usually, it involves "solo independent contractors" working for a client worldwide and involved in highly precarious and risky work relationships. These forms of work have a large influence on social safety nets, social partnerships, co-determination, and employee rights. These new and flexible forms of work must be actively shaped, from the standpoint of workers' representatives, to avoid an increase in job insecurity for these employee groups due to a lack of a social safety net, and to prevent staff cuts in favor of using flexible crowdworkers.¹¹⁰

Portfolio work

"While in the available literature, portfolio work covers a range of forms of employment from freelancers and self-employed workers (Kitching and Smallbone, 2008) to employed workers (Eurofound, 2013c), in this project it is understood as small-scale contracting by freelancers, the self-employed or micro enterprises who work for a large number of clients."¹¹¹

Voucher-based work

"Voucher-based work is a form of employment where an employer acquires a voucher from a third party (generally a governmental authority) to be used as payment for a service from a worker, rather than cash. Often the services provided are specific tasks or fixed-term assignments and consequently are related to casual and portfolio work."¹¹²

Wearables

"Wearables are computer technologies one wears on the body or on the head. They are a way to make ubiquitous computing concrete, and part of the Internet of Things. They are sometimes called wearable technology or wearable computers. The purpose of wearables is usually to support a task in the real world, for instance by providing (additional) information, analysis, or instructions."¹¹³

108 Springer Gabler Verlag (publisher), Gabler Wirtschaftslexikon, keyword: Internet der Dinge.

109 Eurofound (2015), p. 31.

110 cf. IG Metall: FairCrowdWork Debate.

111 Eurofound (2015), p. 103.

112 Eurofound (2015), p. 82.

113 Springer Gabler Verlag (publisher), Gabler Wirtschaftslexikon, keyword: Wearables.



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