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Contribution to the problem definition in the context of the preparation of the Impact Assessment

Regarding the recognition of professional qualifications and training standards in inland navigation

Final Report

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PART 1: INTRODUCTION AND STATE OF PLAY

1 Introduction

1.1 Project set-up

The Directorate General for Mobility and Transport (DG MOVE) is preparing an impact assessment that examines options towards the recognition of professional qualifications in inland navigation. This is a basis for the proposed EU legal instrument.

This report contributes to the problem definition in the context of the preparation of the impact assessment regarding the recognition of professional qualifications in inland navigation.

Support is provided through the project "Provision of Support Services in the Field of IWT LOT 4: Provision of TA for the Preparation of New Initiatives as Regards the Future Development of the IWT Sector", number *MOVE/B3/2011-548/SI22.630066 - LOT 4.* The following project partners have provided input for this support:

- Panteia b.v. (coordinator),
- STC B.V.,
- Maritieme Academie Harlingen (MAH) and
- Bundesverband der Deutschen Binnenschifffahrt e.V. (BDB).

1.2 Involvement of stakeholders

Consultation of external experts and stakeholders has taken place through:

- regular meetings with the Expert Group E01036 Recognition and modernisation of professional qualifications in inland navigation.[1]
- a questionnaire sent to the members of the Expert Group E01036.
- public consultation through an online questionnaire.[2]

The following groups of stakeholders, represented in the Expert Group E01036, are consulted:

- Intergovernmental organisations involved in legislative activities regarding inland waterway transport, in particular:
  - the international river commissions: Central Commission for Navigation on the Rhine (CCNR), Danube Commission (DC);
  - the United Nations Economic Commission for Europe (UNECE);
- National administrations – national EU Member States' competent authorities in charge of IWT policy-making and legislative and administrative activities;
- Professional organisations: European Barge Union (EBU-UNEF) – representing the interests of the barge owners and barge operators of eight European countries, and the European Skippers Organisation (ESO) - representing the interests of private European inland shipping entrepreneurs;
- Trade unions: European Transport Workers' Federation – IWT section;
- PLATINA – Platform for the implementation of NAIADES – the Leader of the "Jobs & Skills" Working Package (WP3);
- IWT Training and education institutions in Europe – EDINNA

The findings in this report are largely based on desk research. Where relevant, Panteia's own research data were utilised or non-public data files were used that were made available by

[1] This Expert group is co-chaired by the European Commission (EC) and CCNR.
[2] European Commission (2013), Public consultation regarding the recognition and modernisation of professional qualifications in inland navigation (open for the period 26 March 2013 – 21 June 2013).

Member States. For further reference to the input used for this study, see the footnotes in this report and the Bibliography.

Also, the results of a questionnaire were used that was set out within the context of the Evaluation of the framework of relevant directives[3]. Further, the public consultation document[4] formed an input to this study.

Lastly, results were used from regular meetings with the Expert Group E01036. In total nine Expert Group meetings have taken place, the most recent one held on the 22nd of January 2014.

1.3 Content of this document

This document is built up out of four parts:

- Part 1: Introduction and state of play. It is composed of this chapter and continues hereafter with Chapter 2 that provides an overview of the state of play of the IWT sector in Europe, in particular focusing on the characteristics of the IWT workforce.
- Part 2: Problem definition, It is composed of Chapter 3, 4 and 5 and deals with the problem definition and the barriers that exist. These barriers in particular concern two areas: labour mobility and safety. The policy and legislative context are discussed.
- Part 3: Baseline scenario. It is composed of Chapter 6 and 7 and presents the baseline scenario for both labour mobility and safety.
- Part 4: Conclusions, Presents the conclusions in Chapter 8.

In the Annexes, background data and calculations are included that form the input for this study.

[3] Panteia et al. (2013), Evaluation of the framework of relevant directives related to the initiative on recognition and modernisation of professional qualifications in inland navigation, http://ec.europa.eu/transport/facts-fundings/evaluations/inland_air_maritime_en.htm

[4] European Commission (2013), Public consultation regarding the recognition and modernisation of professional qualifications in inland navigation (open for the period 26 March 2013 – 21 June 2013), http://ec.europa.eu/transport/media/consultations/2013-06-21-inlandnaviggualifications_en.htm

2 State of play of the IWT sector in the EU

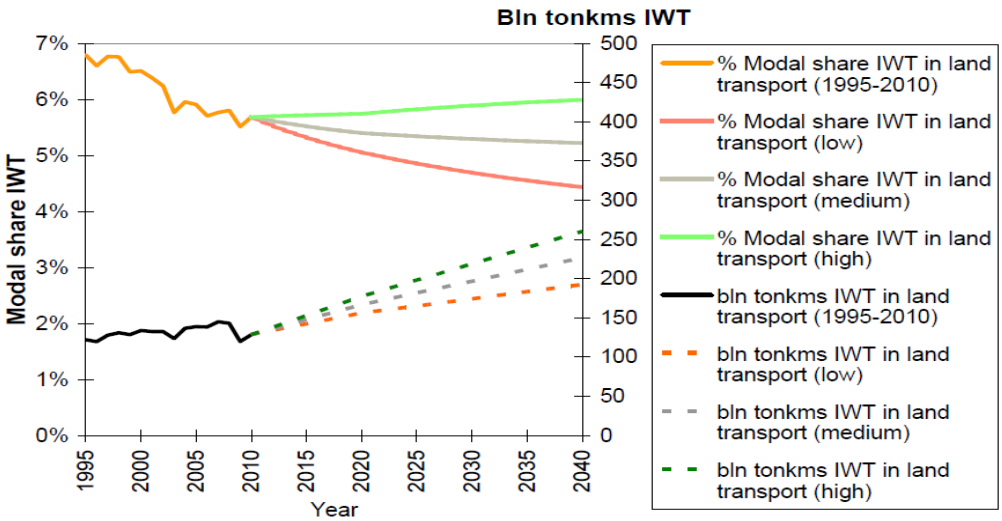
In this chapter, a general overview of the state of play of the IWT sector in the European Union will be provided. The information presented forms the basis on which the in-depth problem analysis in the subsequent chapters of this report is based. First, the performance is shown of the IWT sector in the EU in terms of tonkms and its modal share. Then, the labour force characteristics are presented: number of workers in IWT in the EU, forecasted development of employment in IWT, age distribution of the current workforce, share of non-national workers, professional qualifications required, level of education, salaries earned and number of students at educational institutes.

2.1 Performance of the IWT sector

Out of the 28 Member States in Europe, 13 of them are having interconnected waterways[5]. The performance of inland waterway transport (IWT) differs greatly across Europe. The Rhine market is by far the most dominant market, with a share of almost 70% in total transport performance in EU-27[6].

The following Figure 2.1 presents the overall IWT performance outlook on EU-27 level. The overall performance in tonne kilometres showed an increasing trend in the decade before the economic crisis (end of 2008). However, in 2009 the situation changed drastically due to the decline of freight flows. In 2010, the IWT performance recovered somewhat. Nevertheless, the performance is still below pre-crisis levels. This has had a significant impact in the financial position of many IWT companies, especially companies in the dry cargo sector sailing with large vessels.

Figure 2.1 Actual and the forecasted IWT performance in the European Union (1995-2040)



Source: NEA et al, Medium and Long Term Perspectives of IWT in the European Union (2011)

In total, the external trade value by inland waterway transport was 7.4 billion euro for EU-27[7]. The added value and employment is mainly provided in Germany and the Netherlands.

[5] European Foundation for the Improvement of Living and Working Conditions (2010), Representativeness of the European social partner organisations: Inland water transport
[6] NEA et al. (2011), Medium and Long Term Perspectives of IWT in the European Union
[7] Data for 2010. Source: Eurostat (2012), EU transport in figures, Statistical pocketbook

2.2 Number of workers in the IWT sector

Table 2.1 gives a more detailed overview of the number of IWT workers in the freight and passenger sector for the year 2011. The countries with the highest IWT labour force are the Netherlands, Germany, France, Italy, Belgium and Romania. They represent around 75% of the total IWT labour force in Europe. In total, 43,826 persons were employed in the IWT sector in 2011.

Table 2.1 Estimated number of workers in 2011

Countries	Total freight	Total passenger	Total IWT employment	Total boatmasters	Total operational staff
Netherlands*	10,820	3,088	13,908	6,053	7,855
Germany*****	*2,774*	*2,815*	5,589	1,337	4,252
France*	*1,673*	*2,027*	*3,700*	790	2,910
Luxembourg**	*2,555*	*256*	*2,811*	668	2,143
Italy*	634	1,919	2,553	1,290	1,263
Belgium*	*1,851*	*548*	2,399	1,659	740
Romania*	2,081	248	2,329	491	1,838
Bulgaria*/***	1,385	*294*	*1,679*	911	768
Switzerland	417	1,197	1,614	416	1,198
Sweden*	118	983	1,101	250	851
United Kingdom*	299	752	1,051	263	788
Hungary*	267	600	867	201	666
Portugal**	0	853	853	55	798
Czech Republic*	*517*	*283*	*800*	135	665
Poland*	*313*	*303*	616	284	332
Slovakia*	*413*	*31*	444	89	355
Spain*	44	344	388	62	326
Finland*	39	228	267	41	226
Austria*	*51*	*157*	208	88	120
Lithuania*	*0*	145	145	11	134
Denmark*/**	*48*	*95*	*143*	24	119
Croatia*/**	*121*	*12*	133	20	113
Latvia*	89	17	106	5	101
Estonia**	0	61	*61*	7	54
Slovenia*	*40*	*21*	*61*	38	23
Total	**26,549**	**17,277**	**43,826**	**15,190**	**28,636**

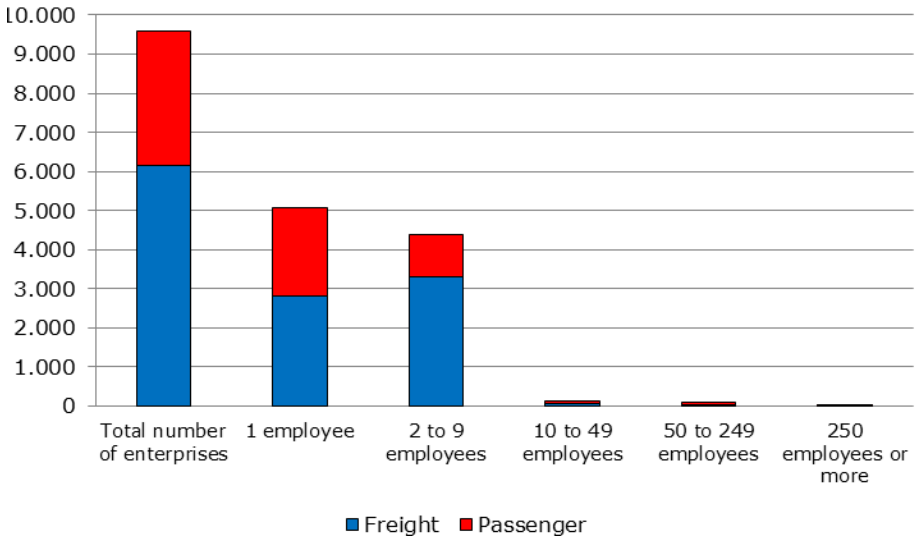
* Based on division between mobile workers and self-employed given by EUROSTAT for 2010
** Based on number of enterprises in 2010 (or most recent information) and the average number of self-employed and average number of workers per enterprise.
*** Based on survey carried out in 2013 under Ministries, Trade unions and Employer organisations in EU-28.
**** Based on share freight and passenger vessel within the IVR ship registration for the 2011.
***** Based on available statistics for 2011.

Source: Ecorys (2013), updated by Panteia.

It is important to note that the numbers presented in the section above do not include a certain 'hidden reserve' in personnel of people with the necessary sailing licenses, but not active on a regular basis. For example, there are family members with a boatmaster certificate that could be called in to assist during temporary busy periods or to operate the vessel during holiday periods. There are also some operators that employ seasonal mobile workers only during busy months of the year[8]. Part of this 'hidden reserve' in personnel can be seen from the number of boatmaster certificates compared to the IWT labour force per country. In order to shed light on this, a questionnaire[9] was sent to national authorities, international organisations and experts. These stakeholders were asked to provide information on the number of boatmasters. For example, for France a total of 5,922 boatmasters certificates have been reported in 2012 (excluding certificates for other operational personnel). This is much higher than the total IWT labour force reported for France by EUROSTAT/national statistics (i.e. around 3,700 persons).

In 2010, a total of 9,579 IWT companies have been recorded in the IWT market in Europe[10]. Around 44% of these companies are Dutch enterprises. The majority of the enterprises are small companies with only a few employees. This can be seen from the following Figure 2.2 that provides an overview of the number of enterprises in the Netherlands by employee size-class. In many cases vessels are family owned and operated by a family (e.g. husband and wife owning/operating the vessel). This kind of business can be observed in the Netherlands, Belgium and Germany.

Figure 2.2 Number of European IWT enterprises by number of employees (2011)



Source: Eurostat, 2011 (sbs_sc_1b_se_r2)

[8] For example, the Eurostat statistics indicate a total of around 300 people are employed in the IWT sector in Finland. Based on information presented in Eurofound, these statistics seem to be related to people with permanent contracts. During the summer period there are also about 3,000 temporary workers in the IWT sector holding employment contracts of between two and five months, which is seasonal and enterprise-led. Source: University of Vienna (2010), Representativeness of the European social partner organisations: Inland water transport. Based on information from Statistics Finland.

[9] Evaluation of the framework of relevant directives related to the initiative on recognition and modernisation of professional qualifications in inland navigation, 2013, Panteia et al. http://ec.europa.eu/transport/facts-fundings/evaluations/inland_air_maritime_en.htm, Annex 1: Questionnaire sent to the members of the Expert Group E01036 - Recognition and modernisation of professional qualifications in inland navigation.

[10] Data for the year 2010. Source: Eurostat and Destatis (Statistische Bundesamt)

For the EU Member States with registered enterprises the total number of is shown per country in Table 2.2. In the Netherlands, the majority of the enterprises are small companies with only a few employees. This can also be seen when comparing Table 2.2 with Table 2.1. It shows the small size of the enterprises in the IWT sector.

Table 2.2 Number of IWT enterprises per country (freight and passenger) in 2010

Country	Number of enterprises	Country	Number of enterprises
Netherlands	4,259	Finland	76
France	1,023	Spain	63
Germany	970	Portugal	41
Italy	926	Slovenia	33
Poland	535	Bulgaria	32
Sweden	487	Denmark	18
Belgium	304	Lithuania	15
United Kingdom	246	Croatia	13
Romania	166	Latvia	12
Luxembourg*	*132*	Slovakia*	*8*
Hungary	108	Estonia	1
Czech Republic	95	**Total**	**9,645**
Austria	82	** Based on estimations.*	

Source: Panteia based on Eurostat; Destatis (for Germany) and University of Vienna (for Luxembourg).

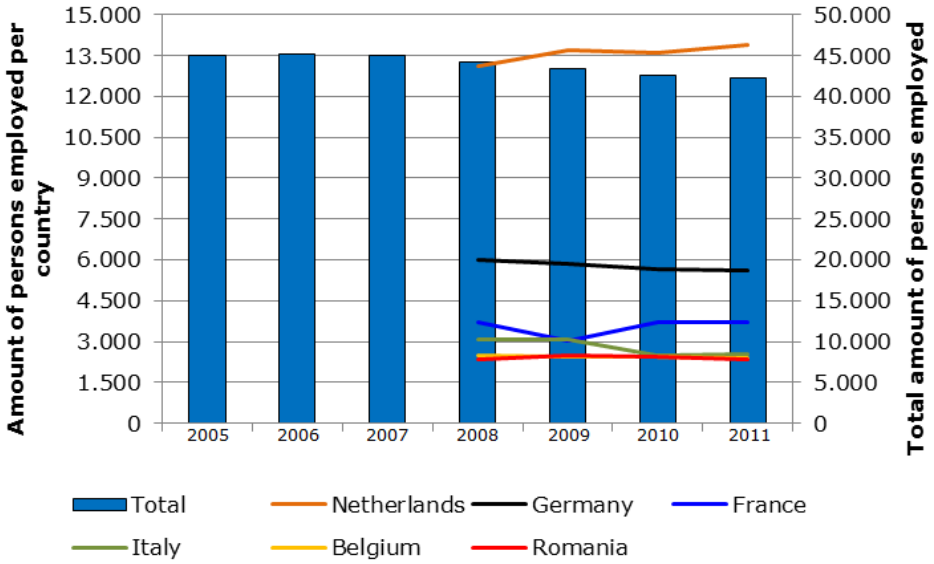
2.3 Development of IWT employment

Figure 2.3 presents the development of the total IWT employment (freight and passenger) from time period 2005 to 2011 in Europe[11]. According to CCNR[12], the decline seen in the total number of IWT employment could be the result of the financial crisis, where operators have less cargo to transport and have a decreased demand for nautical personnel. Lower transport demand can also trigger IWT companies to switch the operational mode to a mode with less operating hours: e.g. switching from continuous exploitation to semi-continuous mode or from semi-continuous mode to daytime navigation. This also results in a lower demand for operational workers.

The analysis carried out also showed that the number of self-employed, generally boatmasters, has increased slightly since 2008. This could be related to the increase in the number of new vessels that were ordered before the economic crisis and came in service between 2008 and 2011. Another possible explanation is that vessel owner/operators themselves have become more active in the actual navigation of the vessel in order to reduce labour costs for hired nautical staff and therefore, to cope with the reduced revenues.

[11] The development presented includes IWT employment in the following countries: EU-28, plus Switzerland, and Norway.
[12] CCNR (2013), IWT Market Observation Report 2012

Figure 2.3 Development of the total IWT employment from 2005 to 2011 in EU[13]



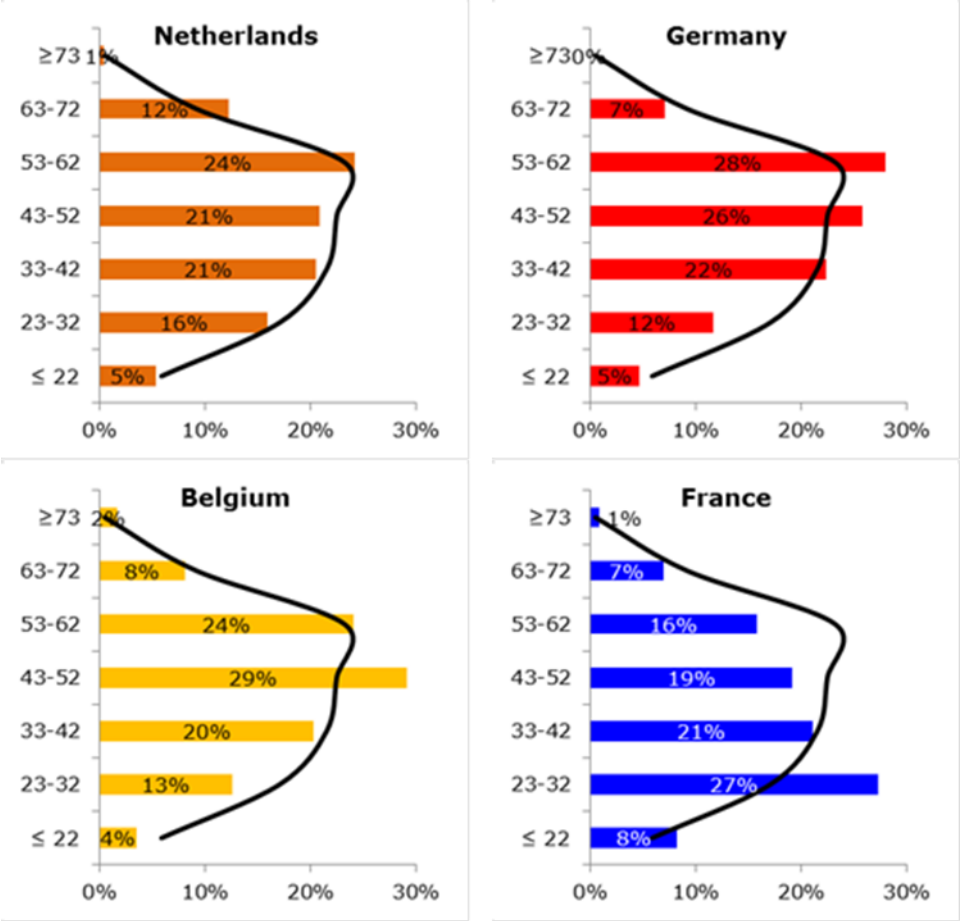
Source: Ecorys, 2013, Study on the costs and benefits of the implementation of the European Agreement on working time in inland waterway transport – A comparison with the status quo

2.4 Age distribution of the IWT workforce in the EU

Generally, the IWT workforce in the EU is ageing. Figure 2.4 shows an example for various countries. Germany and Belgium show an ageing IWT workforce, similar to the EU average age structure. France (and the Netherlands to a lesser extent) show a different pattern, with an on average younger workforce. Other countries, such as Italy, Romania, Bulgaria, Luxembourg, Poland, Hungary, Slovakia, the Czech Republic, Austria and Croatia, show a picture close to the EU-average and thus, Germany and Belgium. Partly because of this problem of an ageing workforce, it is a common concern of social partners to stimulate the attractiveness of the IWT sector to new entrants[14]. Significant differences exist in the age distributions of (mobile) workers and the self-employed. The ageing problem is seen more clearly for the self-employed compared to the (mobile) workers. In general, (mobile) workers tend to be younger than the self-employed. In the inland navigation sector, the self-employed are usually also the boatmasters. To become a boatmaster, more experience is required compared to other IWT functions. The self-employed also stay longer in the IWT sector compared to the (mobile) workers, even after they turn 65 years[15].

[13] There is no data available for individual countries in Eurostat (Structural Bussiness Statistics) before 2008.
[14] De Leeuw van Weenen, R., et al, 2013, Living and working conditions in inland navigation in Europe, Working Paper no. 297, International Labour Organisation, Geneva
[15] Based on the Questionnaire sent to the members of the Expert Group E01036 - Recognition and modernisation of professional qualifications in inland navigation, the average career length of boatmasters is 30 years for versus 22 years for other navigational personnel. See: Evaluation of the framework of relevant directives, Annex 1.

Figure 2.4 Age structure of workers in IWT in various EU-countries (2013)



**Black lines show EU-average age structure. Source: IWT Market Observation Report 2010-II, CCNR (2010), based on INASTI / RSVZ and ONSS / RSZ, Questionnaire[16], and De Nederlandse Maritieme Cluster, Monitor 2012 by Policy Research Corporation, Ministry of Ecology, Sustainable Development and Energy; DG for Infrastructures, Transport and the Sea; Department of Transport Services Division for Ports and Inland Waterway Transport*

2.5 Share of non-national workers

In recent years the inflow of personnel has been rather low, resulting in a shortfall of qualified personnel. A study by Buck Consultants, et al. (2009)[17] for the European Parliament's Committee on Transport and Tourism indicated, based on interviews with industry stakeholders, that the friction on the labour market in Western-Europe has partially been resolved by hiring crew members from Eastern European Member States and other non-EU countries (e.g. Philippine nationals).

For example, the share of foreign EU (mobile) workers in the IWT sector in the Netherlands and Germany has seen an increasing trend during the past years. A decline in the registered IWT employment in most of the Eastern European countries could be linked to the migration of Eastern European workers to Western Europe.
In recent years, the share of non-EU (mobile) workers has also been increasing. For example, in the Netherlands the register of service for non-nationals recorded in 2008 a figure of about 6,8% of non-EU (mobile) workers (from a total of 13,6% non-national

[16] Questionnaire sent to the members of the Expert Group E01036.
[17] Buck Consultants et al. (2009), The shortage of qualified personnel in maritime and inland waterway transport. http://www.europarl.europa.eu/RegData/etudes/etudes/join/2009/419096/IPOL-TRAN_ET(2009)419096_EN.pdf

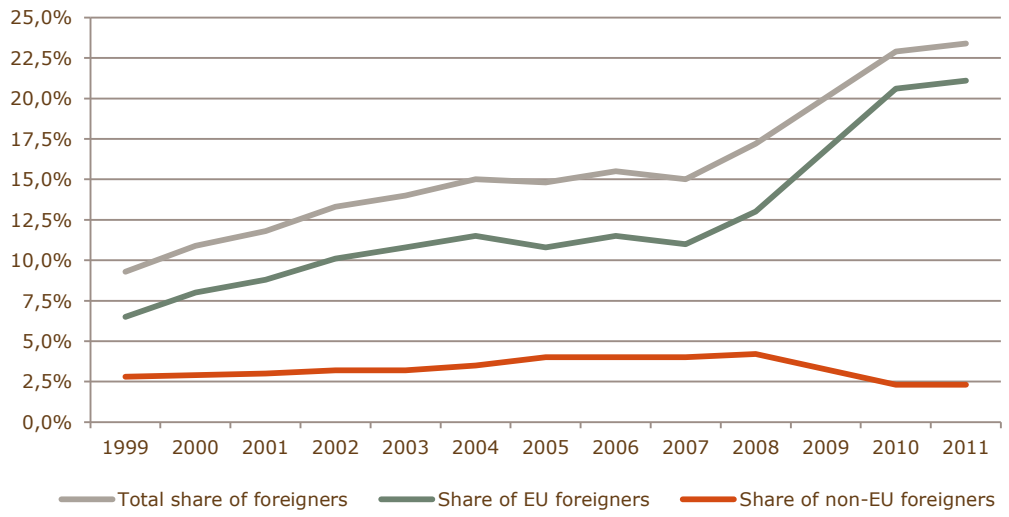
(mobile) worker)[18]. These (mobile) workers came mainly from the Philippines. Nevertheless, this percentage of non-EU (mobile) workers in the Netherlands is much lower now. In 2012, the Employee Insurance Agency (UWV) announced that it will become more difficult to obtain working permits for workers from outside the European Economic Area (EEA)[19]. The requirement for employers of looking first for employees from the Netherlands or other EU countries will be applied more strictly. Based on the survey carried out for this study in 2013, the employment organisations in the Netherlands reported a share of 1% of non-EU (mobile) workers compared to 26% of (mobile) workers from other EU countries.

Nevertheless, not all boatmasters are compelled to hold a Dutch register of service, especially if they hold a Rhine patent. Other estimates come out with a higher share of foreigners for the Netherlands.

In Belgium, the share of foreign IWT workers in 2007 covered by social security was 9,1% EU-foreigners and 1,5% non-EU foreigners[20].

The evolution of the share of foreign IWT workers covered by social security in Germany is presented in Figure 2.5. Germany reported a total share of 22.9% of foreign workers[21] in 2010, of which: 20,6% EU non-nationals (mostly from Poland, Czech Republic and Romania) and 2.3% non-EU foreign (mobile) workers (mostly from Turkey, Ukraine and Philippines)[22]. In 2011, this share of foreign workers covered by social security increased to 23.4%[23].

Figure 2.5 Share of foreign mobile workers covered by the social security in German inland navigation (1999-2011)



Source: IWT Market Observation Report 2009-I, CCNR (2009)

[18] CCNR (2010), IWT Market Observation Report 2009-I
[19] From 1 January 2014, working permits for employees from Bulgaria and Romania will not be necessary anymore.
[20] CCNR (2010), IWT Market Observation Report 2009-I), based on information from the Flemish government.
[21] This value captures all the IWT employees covered by the social security system.
[22] CCNR (2010), IWT Market Observation Report 2009-I, based on information from Bundesagentur für Arbeit.
[23] CCNR (2010), IWT Market Observation Report 2009-I, based on information from the Institute for Employment Research (IAB).

Based on information from the Hungarian state labour administration, there were 4 foreign IWT workers employed in 2010 of which 3 from EU countries[24].

2.6 Professional qualification

Obtaining a certificate, as a proof of professional competence, can in general take place in two different ways in Europe:

1) Professional qualification
This requires gaining the applicable mandatory sailing time in relation to the function one wishes to perform and passing an exam taken with the competent authority or passing the exam of a recognised vocational education programme on various levels of education leading to a school diploma.

2) Vocational education in accordance with the mandatory national curriculum
The vocational education must fulfil the requirements based on the national curriculum of the Ministry of Education in a Member State. The requirements set by the competent authority need to be fulfilled; in most countries this concerns the Ministry of Transport. The corresponding vocational exam has to be passed.

Existing legislation and regulations regarding certification of professional qualification in the inland navigation sector does not interfere with the mandatory requirements of the national Ministry of Education. The national curriculum related to a vocational education on various levels of education is the responsibility of each EU member state. Subjects within the national curriculum can be mathematics, physics, history, language, etc.

2.7 Level of education

Vocational training is important to meet qualification requirements. Furthermore, it is the base for sufficient high-qualified navigational staff in the future. The shares of theoretical and practical components in training are different among EU Member States, thus leading to differences in knowledge and skills between IWT workers from different Member States[25]. Upon finishing vocational training, depending on country after 1 to 4 years, the basic profession of boatman is achieved[26].

Subsequently to vocational training further qualification of workers during their IWT career is important to meet requirements of high-qualified staff. Building on the basic profession boatman additional theoretical knowledge and experience on-board is included in the course to become helmsman. A Helmsman may further graduate to become boat master. Boatman with sufficient experience receives patents for particular rivers such as the Rhine patent. For higher qualifications other courses such as radar, radiophone and handling of dangerous goods are required in most countries.

Apart from navigational skills other aspects such as business management, linguistic capabilities and logistical know-how will become more relevant given the major challenges for IWT to further integrate in intermodal transport chains and to become familiar with and be able to apply new ICT-technology. It will also be required to include more knowledge on the specific environmental impacts of IWT and strategies to mitigate these impacts into training courses, since this will become increasingly important in the future.

[24] Source: CCNR (2011), IWT Market Observation Report 2010-II, CCNR, based on information from the Hungarian state labour administration
[25] Source: PLATINA (2009), Deliverable 3.1, Inventory of existing IWT education and training institutes and curricula
[26] Ibid.

Linguistic qualification is, moreover, increasingly important due to the increasing share of non-nationals on-board of vessels. This is also relevant for safety reasons, as misunderstandings could lead to accidents. Regarding qualification of logistical skills of staff in IWT, there is still room for improvements. IWT-related logistics education is at present still rather limited in most European countries[27].

The general educational level of workers in IWT is at present still rather low. For instance, the majority of trainees starting vocational training in German IWT have mastered only a lower or medium school education. Although the share of workers with a high school and university degree has increased over the past years, it is still on a low level. In 2009, only 1.3% of workers covered by social security system had finished high school and another 1.3% of workers had completed a course at universities or universities of applied science.[28] Interestingly, this percentage is about 10% in the IWT-sector in the Netherlands[29].

It has to be noted that the educational systems concerning navigational personnel are quite different in the Danube countries. In most countries there is a supply of navigational training in one form or the other (from little training to education at university level). In general there is no obligatory training for operational level.

The European Union as well as the River Commissions have recognised the problems which are caused by differences in training and certification systems in an international business sector like inland navigation and have undertaken efforts to achieve more harmonisation in this field. The two following on-going initiatives are to be mentioned:

- Within PLATINA, the European network of nautical schools (EDINNA) is elaborating STCIN Standards for Training and Certification in Inland Navigation (STCIN). Similar to the existing system of Standards for Training and Certification and Watch keeping for Seafarers (STCW) by the international maritime organisation (IMO), STCIN could be the future of a harmonised IWT training and certification in Europe.
- In 2010, the Danube Commission published "Recommendations on the organisation of the education of inland navigation personnel (deckhands)"[30]. The document recommends a three years dual vocational training, very similar to existing training systems applied for example in Germany or Austria. Member States of the Danube Commission decided to implement the recommendations as of 1st June 2011. But recommendations of the Danube Commission are not legally binding for the Member States.

In the project NELI[31], it was found that IWT plays only a minor role within general transport and logistics education at all levels (from high school to university). Future transport decision makers therefore often do not acquire enough knowledge on how to integrate inland waterway transport into multimodal transport chains.

[27] Source: PLATINA (2010), Deliverable 3.6, Inventory of IWT related logistics education institutions and training content
[28] Source: NEA et al. (2011), Medium and Long Term Perspectives of IWT in the European Union
[29] Source: See Table 2.58 in Aa van der R. et al (2009). Monitor Maritieme Arbeidsmarkt 2008, NML
[30] Source: Dok. DK/TAG 75/21. German version available at: www.danubecommission.org/index.php/de_DE/publication.
[31] Cooperation-Network for logistics and nautical education focusing on Inland Waterway Transport in the Danube corridor supported by innovative solutions: www.neliproject.eu.

General Requirements for obtaining one of the functions mentioned in the various manning requirements

Next to vocational education programs, there are ways to qualify for a function as mentioned in the various manning requirements. For all functions, a medical examination and Service Record Book (SRB) are mandatory. General requirements for obtaining one of the functions mentioned in the various manning requirements are indicated in Table 2.3.

Table 2.3 General requirements for obtaining one of the functions mentioned in various manning requirements

Functions		Education or Experience	Exam
Deckhand		No education, training or experience required;	No
Apprentice		learning agreement with IWT school required	No
Ordinary crewman	≥19 y	minimum 3 years (3 x 180 days) sailing time in SRB (no education or training requirements),	No
	≥17 y	diploma of recognised IWT school	Yes
	Other[1]	Not needed	Yes
Able crewman		1 or 2 years of experience as Ordinary crewman (differs from country to country or river basin)	No
Helmsman		1 year experience as Able crewman	No
		3 years as Ordinary crewman	No
		Having a boatmaster certificate or Rhine patent or Danube patent (depending on the sailing area or river basin)	Yes
Chief Mate[3]		Shall hold a boatmaster's license issued in accordance with the Rules on Minimum Requirements for the Issuance of Boatmaster's Licenses on the Sava River Basin.	No
Boatmaster		4 years of sailing experience[4]	Yes
		Diploma of recognised IWT school + 1 year of sailing experience[5]	Yes
		For the river basins a Rhinepatent, Danubepatent or recognised boatmaster certificate + prove of sailing journeys on the applying stretches + local knowledge exam with content applicable to the applying stretches.	Yes
Engine minder		Rang as Ordinary crewman + exam recognised by the competent authority	Yes
		1 year experience as Ordinary crewman on a motorised vessel	No
Engineer	≥18 y	exam of recognised school for engineers	Yes
	≥19 y	2 years of experience as an Engine minder	No

[1] curricula differ strongly from country to country, see Platina D 3.4
[2] applying to NL, B, F but different requirements with respect to sailing time and content of exam program.
[3] The person in charge for navigational watch who has the necessary aptitude and qualifications to navigate a vessel on the Sava River waterway and who has nautical responsibility on board during the watch.
[4] 4 x 180 days with exemption of France 4 x 100 days
[4] the time in school can be awarded with a maximum reduction of 3 years sailing time. This differs from country to country or river basin

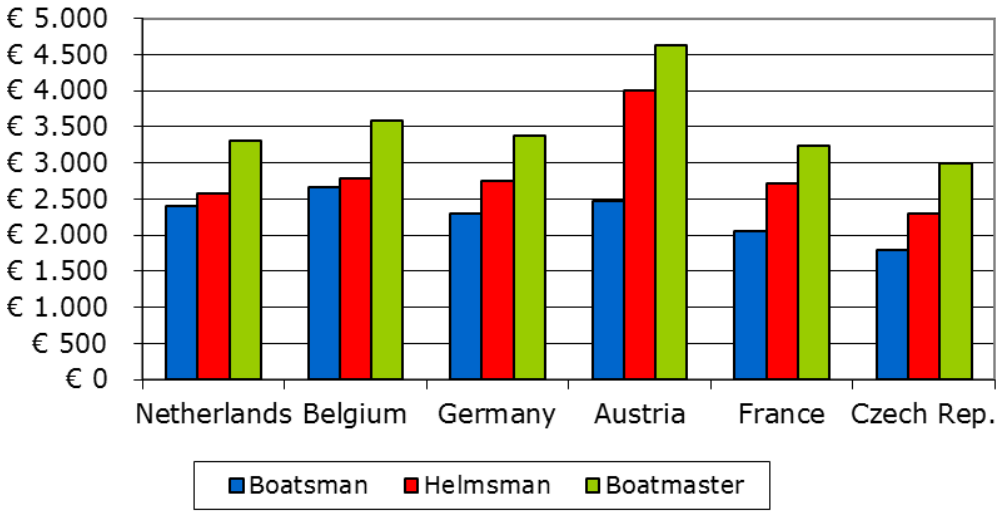
Source: Manning Requirements CCNR, Sava River Commission, Danube Commission, UNECE

Broadly speaking, a distinction can be made between personnel at management level (boatmaster) and personnel at operational level (other than boatmaster, such as helmsman, able crewman, etc.).

2.8 Salaries earned in the IWT sector

Potential earnings are an important determinant of the attractiveness of IWT for workers and there are marked regional differences among the countries in Europe. Crews in the ITW sector in Western Europe can expect to earn between €14,000 (ordinary seaman) to €35,000 (boatmaster) per year. In general, IWT workers earn less in Central and Eastern European countries compared to workers from Western Europe. The wage differential has however narrowed over the past years, with rapidly increasing wage levels in countries in Central and Eastern Europe. For instance, average wage level in Czech IWT has increased by 44% between 2005 and 2008 to a wage of € 738 per month. Workers from the Czech Republic nowadays still earn about 10-15% less than their Western-European colleagues, as can be seen in Figure 2.6.

Figure 2.6 Gross wages in IWT per month



Source: CCNR Market Observation 2013, corrected for social security costs (Eurostat data)

In Romania, average annually earnings of employed were about € 7,000 in 2008. Slightly higher are average monthly earnings in Hungarian inland navigation with € 687 (this adds up to € 8,136 per year).[32] Considering wages in purchasing power parities, due to higher price levels in Western Europe the advantage is smaller.

2.9 Number of students at educational institutes

Given the ageing of workers in IWT, as shown in 2.4, it is important that the number of students passing their exams is sufficient to compensate for retirements of workers in order to keep a stable-sized workforce. Job perception and expected working conditions are important parameters that determine the number of young people interested in an IWT career in a certain period.

Because of a decreasing amount of persons that enrol in IWT training programmes and a growing shortage of qualified personnel, the industry decided to enhance recruiting activities and to improve the image and increase awareness of IWT among potential trainees[33]. The figures reported by PLATINA in 2009[34] indicate a total number of approximately 5,500 students in Europe. Among countries, the number of students is comparatively large in the Netherlands, accounting for 40% of the total students in

[32] CCNR (2011), Inland navigation in Europe, Market Observation 2010/2.
[33] PLATINA (2009), Deliverable 3.1, Inventory of existing IWT education and training institutes and curricula
[34] Ibid.

Europe. The PLATINA study registered 1,500 to 3,000 students in the Netherlands. Fewer students are registered in Germany (18%). In the Danube region, Romania (16%) and Bulgaria (7%) have the largest number of IWT students compared to other countries in the region.[35] Other countries with IWT students are: France, Switzerland, Czech Republic, Poland, Serbia, Belgium, Hungary, Austria and Slovakia.

In the Netherlands and Germany, a large part of the students that enrol in an educational programme will also successfully complete it. Over the period 2006-2008, the average percentage of students that finish their studies successfully is above 90%. Detailed statistics on the amount of students enrolled and eventually graduating can be found in Table 2.4.

Table 2.4 Statistics on the amount of students enrolled and graduating

Institute	Time[36]	Year	Students enrolled	Students graduating	Percentage graduating[37]
STC (NL)	2	2006	185	184	99,5%
		2007	177	172	97,2%
		2008	169	172	101,8%
		2009	180	178	98,9%
	4	2006	135	121	89,6%
		2007	124	126	101,6%
Harlingen (NL)	2	2005	57	48	84,2%
		2006	70	55	78,6%
		2007	52	35	67,3%
		2008	61	61	100,0%
		2009	40	43	107,5%
Duisburg Schullschiff (DE)	3	2005	108	101	93,5%
		2006	94	87	92,6%
		2007	98	91	92,9%
		2008	119	99	83,2%
Duisburg SBK (DE)	3	2005	116	83	71,6%
		2006	106	91	85,8%
		2007	123	99	80,5%
		2008	144	134	93,1%
Total	**N/a**	**N/a**	**2158**	**1980**	**91,8%**

Source: Data collected by STC (2013)

[35] CCNR, Inland navigation in Europe, 2009/1; PLATINA (2009), Deliverable 3.1, Inventory of existing IWT education and training institutes and curricula
[36] Duration of Education Program (2 years for boatsmen, 3 years for helmsman and 4 years for captain)
[37] This number can be above 100%, when students double a year.

PART 2: PROBLEM DEFINITION

3 Defining the problem

3.1 Introduction: what are the issues or problems that require action?

Inland waterways in Europe, according to the White Paper on Transport[38], have to play an increasing role in moving goods to the hinterland and in linking the European seas. To create the conditions for inland navigation transport to become a quality mode of transport, the European Commission adopted an action programme on the promotion of inland waterway transport called NAIADES (Navigation and Inland Waterway Action and Development in Europe). NAIADES II was recently published, setting out the programme for policy action in the field of inland waterway transport for the period 2014-2020.

Actions are taken in the following key areas of intervention:

- Quality infrastructure
- Quality through innovation
- Smooth functioning of the market
- Environmental quality through low emissions
- Skilled workforce and quality jobs
- Integration of inland navigation into the multimodal logistics chain

Although current directives have improved the working of the Internal Market for Inland waterway transport, the potential of inland waterways transport is utilised in a suboptimal way and barriers that limit its increased use must be further removed. This is partly caused by a number of existing barriers to the mobility of workers, as a result of differences in national and regional[39] rules and regulations, including those on professional qualifications, training standards and certifications. Between EU Member States, these rules and regulations are not similar and furthermore not entirely mutually recognised.

The general problem is presented in Box 3.1 below. An evidence base for the general problem which is composed of two dimensions: labour mobility barriers and safety issues, is presented below.

Box 3.1 General problem definition

The inland navigation labour market is hampered by a number of obstacles, characterised by deficits related to professional qualification, training and certification of IWT workers, which also negatively affects safety in inland navigation.

Figure 3.1 shows that regional differences in the demand and supply of workers exist among the corridors of Europe. Regional surpluses in one region may compensate shortages in another region. Lowering existing labour market barriers may stimulate this process. For example, in order to decrease the labour shortages on the Rhine corridor, personnel may be hired from other regions/ corridors. This can only be done if the CCNR recognises the professional qualifications of the staff involved.

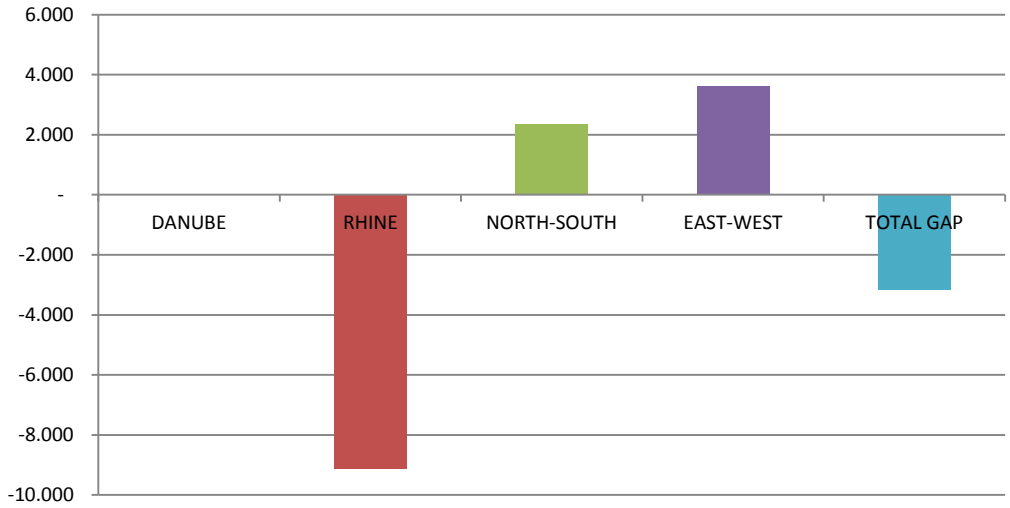
At this moment, 24.0% of the boatmasters' certificates in Europe are not mutually recognised by the CCNR[40]. This includes 3,244 boatmasters from France, whose licenses

[38] COM(2011) 144 final
[39] For example, through the CCNR (Commission Centrale pour la navigation du Rhin)
[40] This includes France and Switzerland, but also countries such as Italy, the United Kingdom and Luxembourg.

are not mutually recognized as in France, 100 days of navigation counts as one year. Besides, there are 420 national certificates delivered for freight vessels shorter than 20 meters[41]. Furthermore, national boatmaster licenses from Switzerland do not fall under the CCNR system of mutual recognition. This represents about one third of the licenses issued by Switzerland[42]. For the other countries, it is assumed that nearly all boatmaster certificates are issued under the conditions of Directive 96/50/EC. The largest contributors to this group are Italy and the United Kingdom. Both countries issue their boatmaster licenses according to the Directive. However, also these countries reported some lack of boatmasters[43].

For operational workers, this number adds up to 38.3%. In general, 37.5% of the professional qualifications of workers in IWT in Europe are not mutually recognised by the CCNR. For freight transport only, these numbers are 18.6% for boatmasters and 30.0% for operational workers. These workers are thus not able to work on the Rhine corridor[44]. If they could, deficits on the Rhine corridor could be compensated by the surpluses on other corridors. Figure 3.1 shows the regional differences in demand and supply on the corridors in 2013. More detailed figures on workers (both boatmasters and operational staff) not being able to work on the Rhine corridor, are presented in Figure 4.2.

Figure 3.1 Gap between demand and supply for corridors in Europe in 2013



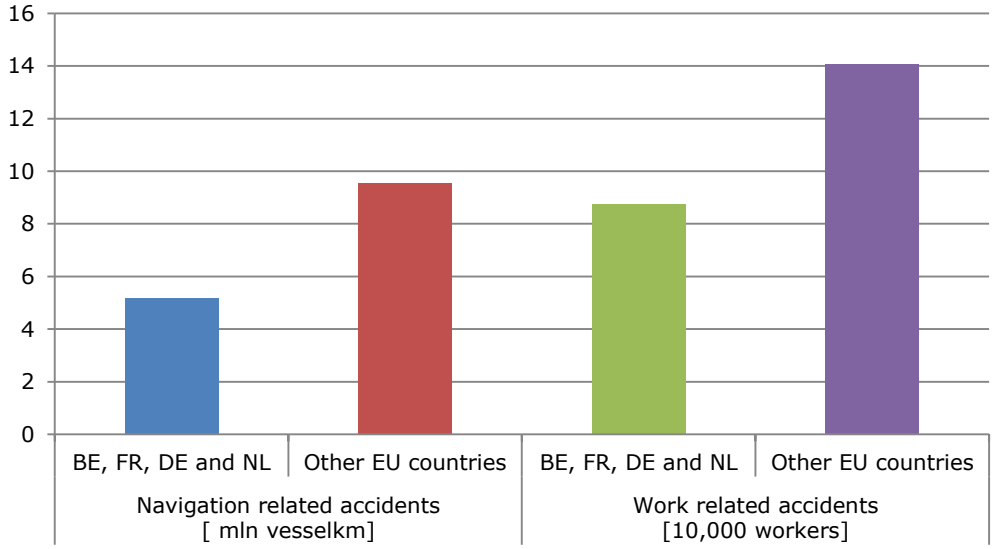
Source: Panteia (2013), see Annex 5 or Chapter 6.

An additional issue is the safety aspect. It can be observed that when accident risks of the group of workers/vessels originating from the Netherlands, France, Belgium and Germany are compared to the group of workers/vessels from other countries, the latter run an accident risk that is nearly twice as high: a factor 1.84 for navigation related, and a factor 1.61 for work related accidents, see Figure 3.2. For the calculation of these figures, see Chapter 7 and Annexes 8 and 9. Below, input is provided on what it thought

[41] Questionnaire concerning the initiative towards a new EU legal instrument on recognition and modernisation of professional qualifications in inland navigation, submitted by French Ministry for Ecology, Sustainable Development and Energy
[42] The other two thirds are Rhine patents issued in the capacity as Rhine authority.
[43] Questionnaire concerning the initiative towards a new EU legal instrument on recognition and modernisation of professional qualifications in inland navigation, submitted by the UK Maritime and Coastguard Agency
[44] See Chapter 4 for the exact figures. Numbers originate from Study on the costs and benefits of the implementation of the European Agreement on working time in inland waterway transport – A comparison with the status quo (Ecorys, 2013)

to be the cause for the differences between these two groups: language problems and to what degree training is able to keep up with technological developments.

Figure 3.2 Accident frequencies per unit (mln vesselkm or 10,000 workers) for navigation and work-related accidents in The Netherlands[45]



Source: Panteia (2013), based on data from Dutch Human Environment and Transport Inspectorate (2012) and Dutch Labour Inspectorate (2009)

In the Public Consultation[46], 85% of the respondents indicated that language problems are highly relevant or somewhat relevant in contributing to the problem of safety. And around 76% of all respondents find that the standards for professional training in inland navigation, which are set at a national level, have not kept up with the technological development, making it a highly relevant problem driver[47].

In addition to these statements from the Public Consultation, the effect on safety of language problems and the differences in training standards, is also determined in a more quantitative manner by comparing available statistics of accidents on Dutch territory for two groups of countries: workers and vessels that come from Germany, the Netherlands, Belgium and France on the one hand, and the workers and vessels from other Member States on the other hand.

From the perspective of language problems that affect safety, housing Germany, the Netherlands, Belgium and France in one group can be motivated as follows[48]:

- German and Dutch are mandatory languages on the river Rhine;
- Many French and German skippers speak also Dutch, while many French, Dutch and Belgium skippers that are operating on the river Rhine also speak German;[49]
- Dutch and German are closely related languages;
- Besides of English, the German language is taught in IWT education institutes in France, Belgium[50] and the Netherlands.

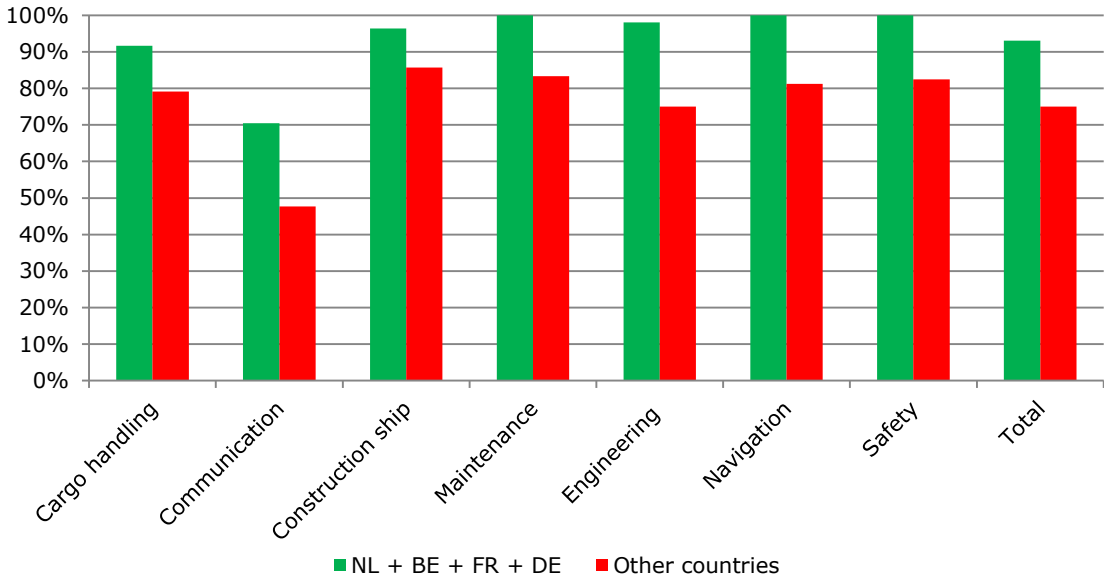
[45] Period of scope: 2006-2012 for navigation related accidents, 2004-2009 for work related accidents
[46] European Commission (2013), Public consultation regarding the recognition and modernisation of professional qualifications in inland navigation (open for the period 26 March 2013 – 21 June 2013).
[47] Ibid.
[48] Adding Luxembourg to this group was considered, but as 100% of the workers are non-nationals (Ecorys, 2013), the origin of these workers cannot be determined. Therefore Luxembourg is not included in this group. In addition to this, there are no IWT training institutes in Luxembourg.
[49] PLATINA 1 D3.8, Strategy for harmonized IWT education and training standards, Annex II (BDB, 2010)
[50] The IWT school in Huy (Wallonia) is an exception to this: Platina D3.8 reports English is not taught here.

Subsequently, it is now assumed that for accidents that are caused by communication problems, the difference in accident frequency between the two groups can be attributed to differences in the ability to understand and make oneself understood in a foreign language[51].

From the perspective as to whether IWT training is able to keep up with technological developments, housing Germany, the Netherlands, Belgium and France in one group can be motivated by a detailed analysis of training curricula of EU Member States. Within the PLATINA I project[52], an inventory of IWT schools and their curricula has been made. In order to compare curricula, the coverage of relevant[53] competences were counted per competence category from the Standards of Training and Certification in Inland Navigation (STCIN)[54] for the training institutes in PLATINA I. This was done for both staff at operational level as well as management level. Subsequently, the amount of competences covered by the curricula were divided by the maximum possible amount competences per category. This way, scores per training institute are presented per competence category. For the data used, see Annex 1 (operational workers) and 2 (boatmasters).

A comparison of the curricula for operational staff between the two groups is presented in Figure 3.3. In this figure, the percentage of the relevant competences covered by the subjects mentioned in STCIN is shown.

Figure 3.3 Percentage of relevant competences mentioned in STCIN covered by operational staff curricula in two groups of Member States

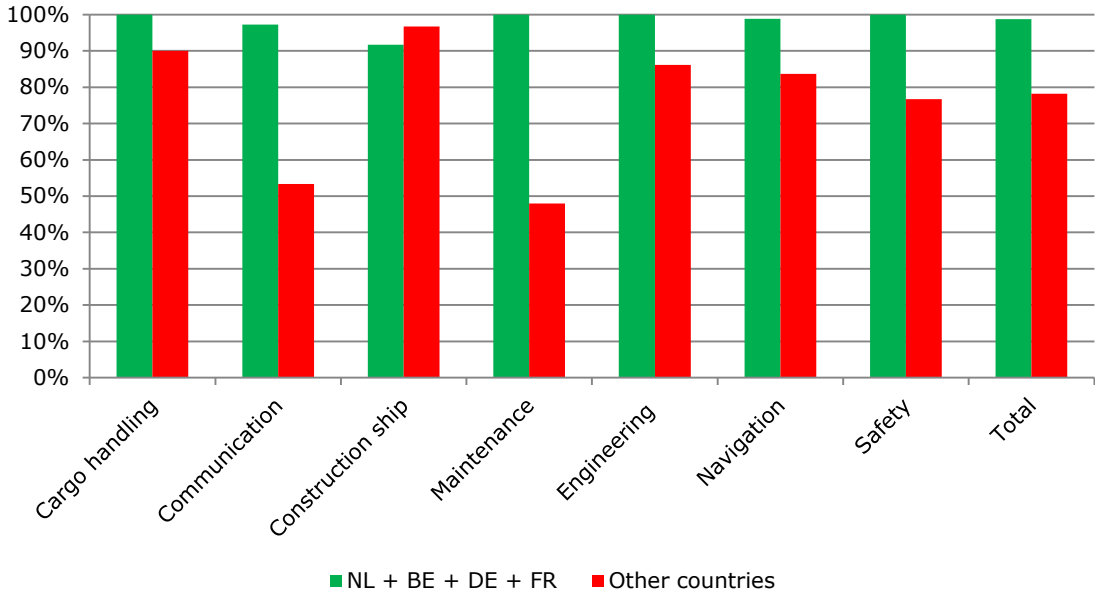


Source: Panteia (2013), based on data from PLATINA 1 D3.8.

[51] It must be noted that the contribution of French vessels to accidents on Dutch waterways is virtually zero. For further background, see Table 7.2.
[52] PLATINA 1 D3.8, Strategy for harmonized IWT education and training standards, Annex II (BDB, 2010)
[53] Specific information about passenger transport has been considered irrelevant, as both our analysis on safety focus on freight transport only.
[54] EDINNA (2011), Development of the Standards of Training and Certification in Inland Navigation. http://www.unece.org/fileadmin/DAM/trans/doc/2011/sc3wp3/ECE-TRANS-SC3-WP3-inf10e.pdf

The same was done for the curricula of boatmasters. Results are presented in Figure 3.4.

Figure 3.4 Percentage of relevant competences mentioned in STCIN covered by boatmaster curricula in two groups of Member States



Source: Panteia (2013), based on data from PLATINA 1 D3.8

From Figures 3.3 and 3.4 it can be seen that for almost all competence categories the group with Germany, the Netherlands, Belgium and France scores consistently higher then the group with other EU Member States. Regarding the other group, it can be observed that the picture with regards to the competences related to technological development is mixed. Important subjects such as RIS, the usage of navigation equipment such as AIS and radar may not be part of the curricula. Furthermore, many safety topics (safety procedures and methods to prevent any damage to ship, environment and material) of the Standards of Training and Certification in Inland Navigation (STCIN) are not covered within the curricula. In addition, how to navigate is for operational staff not part of the curriculum, boatmasters are not familiar with tidal currents in Maritime Areas and apprentices do not speak other languages than their mother tongue.

Lastly, it must be noted that the underlying documents to prepare Annex 1 and 2 were of a different legitimacy. For example, in the case of Bulgaria the background consisted of a filled in questionnaire, while officially published curricula were provided by the Netherlands, Belgium, Germany and France.

Altogether, this provides a justification for the assumption that the quality of education and training institutes for Belgium, France, Germany and the Netherlands is likely to differ from training institutes elsewhere in the EU. Therefore, it is now assumed that the difference in accident frequencies between both groups for accidents that are specifically related to education and training can be attributed to differences in the level of training standards and the degree to which is kept up with technological developments. However, it must be noted that this is a conservative approach, as only the differences between the two groups are taken into account while from Figure 3.3 and Figure 3.4 it can also be seen that both groups do not have a maximum score on all competence categories.

3.2 Relevant legislation: Overview of Legal and Procedural Framework

The present section presents an overview of the various legislative frameworks that are relevant for labour mobility in European inland navigation. The structure of this section will be delineated along the lines of the main regulatory actors in the inland navigation sector, namely the European Union (EU), the Central Commission for Navigation on the Rhine (CCNR) and the United Nations Economic Commission for Europe (UNECE) and the river commissions, each having a different (but to an extent overlapping) regulatory and geographical scope.

3.2.1 European Union

First, on the EU level, two sets of rules are relevant for labour mobility in inland navigation. The first set emanates from the fundamental principle of free movement of workers, inherent in the nature of the EU,[55] which envisages that EU citizens may freely take up employment in another Member State without the need for a work permit[56]. This is especially relevant for all crew members, other than the boatmaster (e.g. helmsmen or boatmen), who operate on the vessel. For this category of IWT workers, Directive 2005/36/EC is also an important legislative act.[57] The scope of this Directive is to facilitate the temporary mobility of certain categories of professionals through a simplified and expedited recognition process of the applicant's professional qualifications. Activities allied to IWT explicitly fall within the scope of the Directive.[58] However, they do not fall under the system of automatic recognition. The central role of Directive 2005/36 in the IWT labour sector is oriented towards facilitating market opening for IWT professionals, with the prospect of progressive expansion of its scope. Such an expansion was evidenced in the case of Poland, which requested the addition of further IWT professions (in this case, the profession of inland navigation engineer) to Annex II to Directive 2005/36.[59] This meant that Poland was prepared to recognise professional qualifications of inland navigation engineers obtained in other Member State, effectively allowing the beneficiaries access to the same profession under the same conditions as its nationals[60].

The second set of EU rules are characterised by separate sectoral laws, where the EU has adopted a comprehensive set of sector specific legislative instruments that has a direct impact on IWT labour mobility. This is especially relevant for the two directives that were subject of evaluation, i.e. Council Directives 91/672/EEC and 96/50/EC. Both Council Directives are introduced in Box 3.2 below.

[55] Article 45 of the Treaty on the Functioning of the European Union. See also, Regulation (EEC) No. 1612/68 of the Council of 15 October 1968 on freedom of movement for workers within the Community, OJ L. 257, 19.10.1968, p. 2.
[56] The exception from this rule is Croatia.
[57] Directive 2005/36/EC of the European Parliament and of the Council of 7 September 2005 on the recognition of professional qualifications, OJ L. 255, 30.09.2005, p. 22.
[58] Ibid. See List II of Annex IV in conjunction with Article 18. The range of IWT activities are relatively broad, and include, *inter alia*, operation and maintenance of waterways, ports and other installations for inland water transport; tug and piloting services in ports, setting of buoys, etc.
[59] Commission Regulation (EU) No. 623/2012 of 11 July 2012 amending Annex II to Directive 2005/36/EC of the European Parliament and of the Council on the recognition of professional qualifications, OJ L. 180, 12.07.2012, p.9.
[60] Ibid. See also the obligation under Article 4(1) of Directive 2005/36/EC.

Box 3.2 Council Directives 91/672/EEC and 96/50/EC

Directive 91/672/EEC

Council Directive 91/672/EEC of 16 December 1991 on the reciprocal recognition of national boat masters' certificates for the carriage of goods and passengers by inland waterway provides for the mutual recognition by the Member States of each other's boat masters' certificates, and establishes a committee to facilitate the process by delivering its opinion on the draft for the amendment of Annex I, i.e. the list of national boat masters' certificates for the carriage of goods and passengers by inland waterway.

Directive 96/50/EC

Council Directive 96/50/EC of 23 July 1996 on the harmonisation of the conditions for obtaining national boat masters' certificates for the carriage of goods and passengers by inland waterway in the Community laid down harmonised basic conditions for obtaining national boat masters' certificates for inland waterway navigation between the EU member States.

The Directive distinguishes between an "A" type certificate which is valid for all inland waterways not falling under Rhine regulations[61], and the "B" type which is similar but not valid on inland waterways with a maritime character, such as estuaries.

3.2.2 CCNR - Regulations for the Rhine Navigation Personnel

With respect to the CCNR, labour mobility is impacted by the Rhine Regulations, specifically the Regulations for the Rhine Navigation Personnel (RPN)[62]. In addition, labour mobility is affected by the CCNR initiated process of mutual recognition[63].

Rhine Regulations

One of the elements of the Mannheim Convention is the possibility for the CCNR Member States to adopt common regulations. These regulations are designed to:

- Ensure uniform regulations for the entire navigable length of the Rhine;
- Stimulate the safety of navigation on the Rhine, for both people and the environment;
- Provide qualifications and a social framework suited to the people working in navigation on the Rhine.

There are four categories of Rhine regulations, dealing with: (i) river and traffic regulations; (ii) technical requirements that must be met by vessels sailing on the Rhine; (iii) crew and staff working on vessels on the Rhine (performing nautical functions); and (iv) transport of dangerous goods on the Rhine.

Regulations for the Rhine navigation personnel

CCNR has adopted the Regulations for Rhine navigation personnel[64], which came into force on 1 July 2011. The RPN incorporates all the existing Rhine regulations for navigation personnel, based on the following three sets of regulations: (i) Regulations for issuance of patents/licences, adopted in June 2007; (ii) Chapter 23 of the Inspection regulations for vessels on the Rhine; and (iii) Regulations for safety personnel on passenger vessels, adopted in December 2004[65]. The RPN integrates mostly existing rules in one document and as such increases the ease of reading of Rhine regulations.

[61] Waterways to which the Regulation on the issue of Rhine navigation licenses applies are not covered by Directive 96/50/EC.
[62] CCNR (June 2010), Regulations for the Rhine Navigation Personnel
[63] A more detailed description of CCNR and the process of mutual recognition is included in the report: Panteia et al. (2013), Evaluation of the framework of relevant directives related to the initiative on recognition and modernisation of professional qualifications in inland navigation. http://ec.europa.eu/transport/facts-fundings/evaluations/inland_air_maritime_en.htm
[64] RPN was adopted through Resolution 2010-I-8-Annex 1.
[65] CCNR website, http://www.ccr-zkr.org/12020300-en.html.

The RPN is an important document, not only because it applies to all staff working on the Rhine and consequently affects working conditions, but also because it is at the basis of the process of mutual recognition of professional qualifications, as presented in the section below.

Mutual recognition

CCNR has initiated a process of mutual recognition of (i) boatmasters' certificates and (ii) Service Record Books, as described below:

- *Recognition of boatmasters' certificates*: the adoption of Additional Protocol No. 7 on 27 November 2002, based on information provided by CCNR[66], amended the Mannheim Convention to permit the recognition of non-Rhine qualifications. This means that holders of recognised boatmaster certificates or radar certificates can operate on the Rhine, simplifying professional obligations and contributing to the development of a large European inland navigation market. This has resulted in recognition by bilateral administrative arrangements of the national boatmasters' certificates of seven European States that are not CCNR members, i.e. Austria, Bulgaria, Hungary, Poland, Romania, the Czech Republic and Slovakia. In addition, CCNR also recognised the national boatmasters' certificates of three CCNR member States, i.e. Belgium, Germany and the Netherlands. The process of bilateral recognition is open for third countries. Croatia has requested to join on 28 November 2013.
- *Recognition of Service Record Books:* in order to be able to work on the Rhine, as presented by CCNR[67], all boatmen were required to hold a Rhine SRB up to 1 July 2011. Because the Czech Republic, Poland and many of the Danube States issued SRBs in a format similar to that of the Rhine SRB, it was considered recognising the validity of the non-Rhine SRBs on the Rhine. This has resulted in a multilateral Administrative Arrangement, signed on 8 December 2010 by the CCNR and the competent ministries of seven central European States, i.e. Austria, Bulgaria, Hungary, Poland, Romania, the Czech Republic and Slovakia. The signatories agreed to mutually recognise the SRB issued by their respective competent authorities. This means that for example the Austrian or Romanian SRB is not only recognised on the Rhine, but in all countries that signed the bilateral agreement. As a result, boatmen no longer have to obtain a new SRB each time they change country. They are able to present their original SRB. The Arrangement came into force on 1 July 2011. All the SRBs that fall under the Arrangement have a similar format.

The agreements on mutual recognition are seen as a transitional step towards a new EU legislative initiative. This is also reflected in the text of the Administrative Arrangement (2013) between the EU and CCNR, as presented in Box 3.3.

Box 3.3 Transitional step towards a new EU legislative initiative

The new Arrangement (2013) fosters cooperation on, among others, the modernisation of professional qualifications of IWT workers. More specifically, the purpose of this cooperation is to contribute to the preparation of new initiatives that will result in the modernisation of the legal framework currently outlined under Directive 96/50/EC.

Source: Administrative Arrangement concerning a Framework for Cooperation between the Secretariat of the Central Commission for the Navigation of the Rhine and the Directorate-General for Mobility and Transport of the European Commission (2013)

[66] See CCNR website: http://www.ccr-zkr.org/12020300-en.html#06.
[67] Ibid.

The agreements on mutual recognition have contributed to the convergence of various national regulations. As such, the agreements can be seen as a step towards harmonisation at a European level.

3.2.3 UNECE and river commissions

With respect to the remaining legislative actors, the lowest level of harmonisation on labour mobility laws is under the UNECE mechanism. The main instrument that aims to adopt measures in this respect is Resolution 31 - Minimum Requirements for the Issuance of Boatmasters Licenses in Inland Navigation with a view to their Reciprocal Recognition for International Traffic[68]. The Recommendations of the Danube Commission on boatmasters' licenses is built substantively on the provisions of Resolution 31 of the UNECE and Directive 96/50/EC, and entered into force as of 1 January 2013[69]. Similarly to the Danube Commission's Recommendations, the Sava River Basin Commission's Rules on Minimum Requirements for the Issuance of Boatmasters' Licenses rely on the already established frameworks of Directive 96/50/EC and Resolution 31 of the UNECE.[70]

[68] UNECE, 'Resolution No. 31 Minimum Requirements for the Issuance of Boatmasters Licenses in Inland Navigation with a view to their Reciprocal Recognition for International Traffic', Doc ECE/TRANS/SC.3/WP.3/2009/8/Rev.1 (18 May 2009).
[69] Danube Commission, 'Recommendations of the Danube Commission on Boatmasters' Licenses', Doc. CD/SES/77/7. *See also,* Danube Commission (15 December 2011), Press Release, 77th Session, available at: www.danubecommission.org/uploads/doc/press/2011/77%20sess/Press%20release_77%20session_en.pdf
[70] International Sava River Basin Commission (Zagreb, 2009), Rules on Minimum Requirements for the Issuance of Boatmaster's Licenses on the Sava River Basin

4 Identification and description of Labour Mobility Barriers

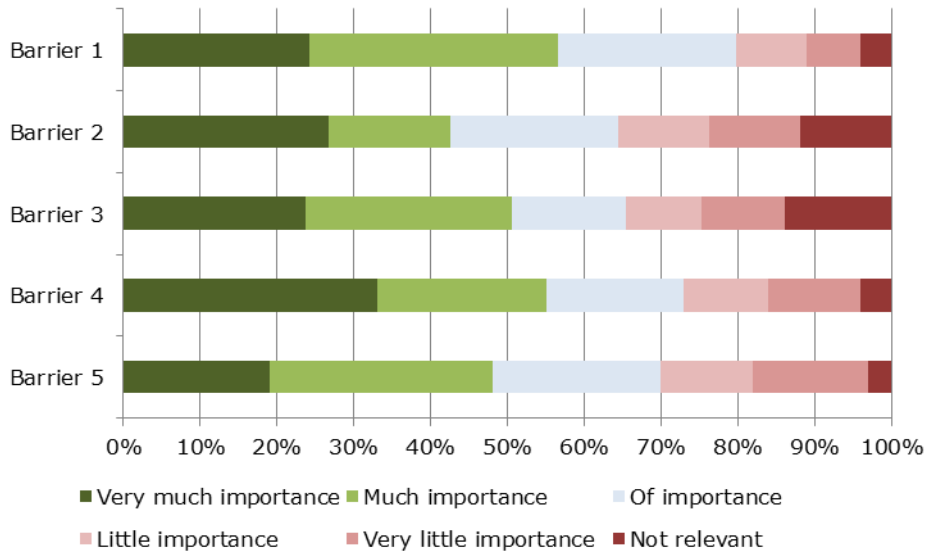
From Chapter 2 it can be concluded that regional differences exist in the structure, the development and the quality of the EU IWT labour market. In order to create optimal conditions to overcome these regional differences and to contribute to the development of one common EU IWT labour market, labour mobility obstacles should be removed. These obstacles may concern barriers between regions, so that for example the labour shortages in one region/corridor are inadequately compensated by the surplusses in other regions/corridors. Moreover, the obstacles could concern the lack of inflow of new workers in IWT and insufficient attractivity of an IWT-profession on, in particular, the North-South corridor and Rhine corridor. Other obstacles may concern the lateral outflow from the sector.

This chapter outlines current barriers to labour mobility in inland navigation across Europe. It builds on five main barriers:

1. Barriers in recognition of professional qualifications within the IWT sector.
2. Barriers in recognition of relevant qualifications from outside the sector.
3. Barriers imposed through Local Knowledge Requirements.
4. Barriers emanating from differing contents of Service Record Books.
5. Language barriers.

The Public Consultation[71] has asked to what extent the five above-mentioned barriers contribute to the problem of labour mobility in the IWT sector. The scores are presented in Figure 4.1.

Figure 4.1 Public consultation responses on importance of labour mobility barriers



Source: Public consultation on recognition and modernisation of professional qualifications in inland navigation, 2013

[71] European Commission (2013), Public consultation regarding the recognition and modernisation of professional qualifications in inland navigation, open for the period 26 March 2013 – 21 June 2013

Figure 4.1 indicates that the greater majority of respondents consider all five barriers of (very much) importance to the IWT sector. This supports the initiative for new legislation in order to deal further with these barriers. This concerns the whole IWT workforce, meaning: boatmasters for which legislation exists as well as operational workers, for which legislation does not exist.

The five barriers to labour mobility are described in more detail below.

4.1 Recognition of professional qualifications within the IWT sector

As a result of the various regulatory regimes operating simultaneously in Europe, the adopted laws and regulations tend to vary, leading to barriers in labour mobility. From a general perspective, the CCNR framework (the smallest in geographical scope) provides the most stringent and harmonised requirements on the issuance of certificates, while the UNECE (the largest in geographical scope) has the least restrictive and harmonised set of rules[72] . Since boatmasters and other operational staff on board the vessels are facing different legislative frameworks, these two categories are addressed separately below.

4.1.1 Recognition of professional qualifications of boatmasters

For boatmasters, labour mobility barriers have been reduced over the last two decades, as a substantial level of harmonisation of professional qualifications at European level has already taken place, i.e. through Directive 96/50/EC, Rhine regulations, Danube recommendations, and UNECE resolutions. In addition, the function of boatmaster is covered by the bilateral agreements between the CCNR and seven EU Member States, as presented in Section 3.2. as well as by the recognition by the CCNR of the national certificates issued by Belgium, Germany and the Netherlands.

However, differences in professional qualifications at European level still remain. Directive 96/50/EC is not applicable to the Rhine, effectively creating two separate regimes as concerns the boatmasters' certificates. The fact that EU boatmasters' licenses, based on Directive 96/50/EC, are not recognised by CCNR creates a labour mobility problem, as elaborated below (part a). The differences between Directive 96/50/EC and the Rhine regulations, which are presented below (part b), indicate areas where harmonisation between the two systems is lacking and present another barrier to labour mobility.

a) No recognition of EU Boatmasters' Licenses on the Rhine

The bilateral agreement on mutual recognition of boatmasters' certificates, as established in the additional Protocol No. 7 to the Mannheim Convention[73], allows the CCNR to recognise boatmasters' certificates issued by other EU or non-EU countries, provided that these certificates are equivalent to those issued pursuant to the CCNR. The requirements as included in the Rhine Patent must be implemented into the national authorisation procedures of the individual States, willing to acquire acceptance of its certificates for the navigation on the Rhine. This leads to the need for modification of national laws and regulations governing the authorisation procedures to the extent that they become harmonised with that of the CCNR.

[72] UN Economic and Social Council (25 March 2009),'Resolution No. 31, Minimum Requirements for the Issuance of Boatmaster's Licenses in Inland Navigation with a View to Their Reciprocal Recognition for International Traffic,, UN Doc. ECE/TRANS/SC.3/WP.3/2009/20, para. 6.
[73] CCNR (27 November 2002), Additional Protocol No. 7 to the Revised Convention for Rhine Navigation (Protocol adopted in Strasbourg)

In principle this mechanism could act as a facilitator in labour mobility between the Rhine market and the EU. This under the CCNR established condition of equivalence on the general requirements between the Rhine Patents and the other certificates. The bilateral agreement was signed by seven countries, and as such labour mobility has been improved. However, the equivalency claim has been an obstacle for other countries to sign the bilateral agreement. For example, France, a CCNR Member State, has a national system that differs from the Rhine regulations, as illustrated in Section 3.2, and is not willing to adopt its national systems on the basis of equivalence to that of the CCNR. In the absence of a signed agreement with the CCNR, the national boatmasters' licenses, based on Directive 96/50/EC are not recognised by CCNR, creating a barrier to labour mobility. Besides of France, Luxembourg, Italy, Sweden, Finland, the United Kingdom, Portugal, Spain, Lithuania, Denmark, Croatia, Latvia and Estonia do not have their boatmasters' certificates recognised by the CCNR[74].

By not mutually recognising the boatmaster certificates in these countries, as much as 2,919 boatmasters are not permitted access to the Rhine corridor[75]. This equals 24.0% of the boatmasters in Europe. For freight transport, this number is 1,155, equalling 13.3%. For passenger transport, these figures are 1,764 and 50.5% respectively.

b) Different general requirements for Boatmasters' Certificates

The mobility of boatmasters in the IWT sector is hindered by the differing requirements to obtain the necessary certificates between the Rhine Patent and Directive 96/50/EC[76]. The Rhine Patent imposes a higher threshold on, inter alia, age, physical and mental fitness, as well as experience and professional knowledge, as illustrated in Table 4.1.

Table 4.1 Comparison between Rhine Patent regulation and Directive 96/50/EC on requirements for issuing boatmasters' certificates

General Requirements	The Rhine Patent Regulation	Directive 96/50/EC
1. Minimum Age	21 years	21 (*18*) years Exception: MS may still issue certificates to persons 18 years old or older.
2. Physical and mental fitness	Physical and mental fitness, certified by a document issued by a doctor recognised by the competent authorities.	Examination carried out by a doctor recognised by the competent authority.
Additional medical examination	Every five years between 50– 65 years; every year after 65 years	Every year starting from the age of 65 years
3. Professional experience	4 years, including, at least, 2 years as rating, engine-minder or, at least, 1 year as leading crewman. The experience must be acquired on a self-propelled vessel for which a Rhine patent is required. A year is defined as 180 days of inland navigation.	Min. 4 years of professional experience as a member of the deck crew on an inland waterway vessel. No definition is given on how many working days should be included in a year.
The proof of professional experience	Service record book delivered by the Rhine authorities or a valid administrative document as described in article 2.09.	Validated by the competent authority of the MS - personal service record.

[74] CCNR, http://www.ccr-zkr.org/12020300-en.html#06
[75] Ecorys (2013), Study on the costs and benefits of the implementation of the European Agreement on working time in inland waterway transport – A comparison with the status quo
[76] Article 1(3), Directive 96/50/EC.

General Requirements	The Rhine Patent Regulation	Directive 96/50/EC
Reduction of the required professional experience	By a max. 3 years for the time spent in a training programme;	By a max of 3 years - if the applicant has a diploma recognised by the competent authority which confirms specialised training in inland navigation comprising practical navigation work; If the applicant has passed a practical examination in sailing a vessel; the certificate shall in that case cover only vessels with nautical characteristics similar to those of the vessel which underwent the practical examination.
4. Examination of professional knowledge	The candidates must demonstrate their professional knowledge and skills by passing an examination	The applicant must have passed an examination of professional knowledge

Source: Rhine Patent regulation and Directive 96/50/EC

Table 4.1 indicates specific differences in requirements for issuing boatmasters' certificates, including:

- For the minimum age to obtain a boatmasters' certificate the Rhine Patent Regulation and Directive 96/50/EC both include 21 years, however, Directive 96/50 adds the exception in which Member States can issue a boatmasters' certificate at age 18. This exception is used, e.g. by the Netherlands and France.
- Regarding proof of physical and mental fitness, systems are basically similar, except for the additional medical examination. In the Rhine regulation this needs to be done every five year between age 55-65, and each year afterwards. Directive 96/50 just states each year starting from the age of 65 years.
- The years of professional experience is treated differently between the two regimes. Not in terms of duration, this is 4 years for both, but in terms of how this time is to be spent. Directive 96/50/EC does not provide any specifications on how time is to be spent on board and does not define how many working days should be considered as one year. The Rhine Patent regulation prescribes at least two years as rating, engine-minder or at least one year as leading crewman. A year is defined as 180 days of inland navigation.
- Also with regard to the reduction of the required professional experience, differences prevail. Although under both systems reductions up to a maximum of 3 years exist, for the Rhine Patent regulation one year is calculated on the basis of 180 effective working days, whereas for the Directive no definition is given on how many working days should be included in a year. Moreover, the Directive allows for a reduction of the required professional experience if the applicant has passed a practical examination. This is not the case for the Rhine patent regulation, which only allows for a reduction on the basis of time spent in a training programme.

Considering that the CCNR framework imposes higher level requirements than Directive 96/50/EC, the EU Member States will find themselves under pressure to comply with a higher legislative burden that mandates modification of national laws beyond the scope envisaged by the EU Directive. This may have contributed to the decision of some countries not to join the bilateral agreement in the past.

4.1.2 Recognition of professional qualifications of operational staff

Directive 96/50/EC only concentrates on the function of boatmaster. In the public consultation[77] the question is raised whether harmonising requirements, notably on minimum age, physical and mental fitness and experience and training standards, should apply to boatmasters or also to other crew members. The responses indicate a tendency towards broadening the scope of the new initiative by also including other crew members. 60% of respondents states that harmonisation of minimum age, physical and mental fitness and experience should apply to both the boatmaster and other crew members. For training and education this is 61%. Below, the lack of harmonisation of functions and professional qualifications is presented. In addition, a section is dedicated to differences in training and education.

a) No harmonisation of functions and professional qualifications

With regard to operational functions on board a vessel, there is no harmonised system of professional qualifications existing to date at European level. Functions on board the vessel and qualification profiles are defined at national level and at the level of the River Commissions.

Table 4.2 shows the existing functions of crew members in the main manning regulations in force or recommended in the Rhine-Main-Danube corridor[78]. The Rhine region works with the Rhine regulations whereas the Danube countries work according to UNECE regulations or recommendations by the Danube Commission. The manning regulation of the Sava River Commission does not recognise the two starting functions. Member States have national manning regulations, based on the existing manning regulations of the River Commissions. As said, countries from the Rhine region have based their manning regulations on the Rhine regulation and this applies to the waterway network as defined in the Mannheim Convention. For the waterways not covered by the Mannheim Convention, different manning regulations can be applied at national level. A similar principle applies to the Danube countries, i.e. UNECE regulations or recommendations by the Danube Commission apply, however, countries can apply their own regulations for their national waterways.

Table 4.2 Comparison of functions on board the vessel

CCNR	UNECE	Danube Commission	Sava River Commission
Decksmann	Deck-hand	Decksmann	
Leichtmatrosen	Apprentice	Leichtmatrose	
Matrosen	Ordinary crewmen	Matrose	Ordinary crewman
Matrosen-Motorwart	Engine-minder	Matrosen-Motorwart	Engine-minder
Bootsmann	Able crewmen	Bootsmann	Boatswain
Steuermann	Helmsmen	Steuermann	Helmsman
			Chief Mate
Schiffsführer	Boatmasters	Schiffsführer	Boatmaster
Maschinist	Engineer	Maschinist	Engineer
	Electrician-engineers	Elektromechaniker	
	Radio operator	Funker	

Source: EDINNA

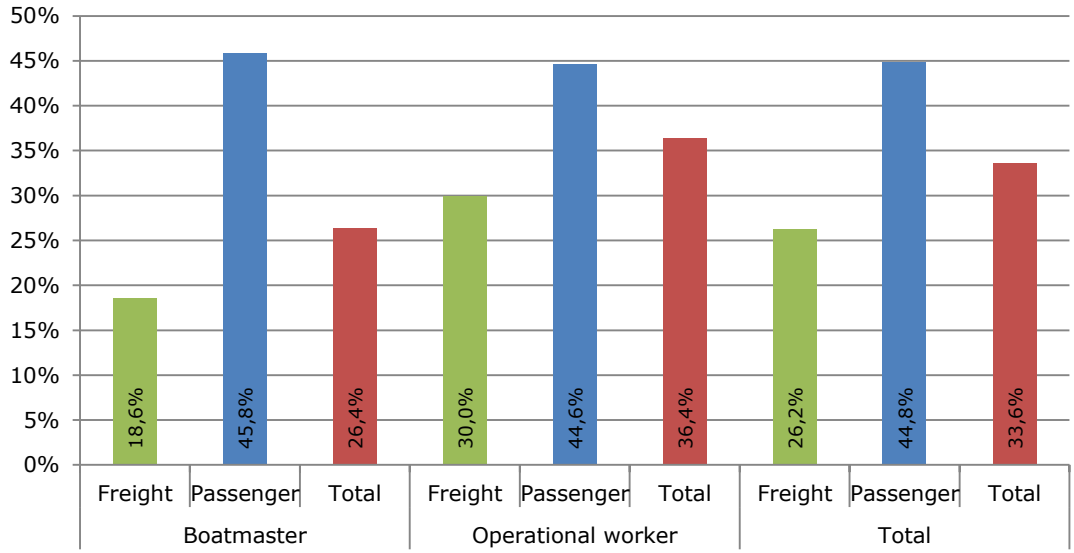
[77] European Commission (2013), Public consultation regarding the recognition and modernisation of professional qualifications in inland navigation, open for the period 26 March 2013 – 21 June 2013.

[78] Overview prepared by EDINNA as input for meetings with the Common Expert Group E01036, focused on recognition and modernisation of professional qualifications in inland navigation. This overview was meant to support the discussion and to reach an agreement on the relation between the existing functions and professional qualifications. EDINNA is the educational network of inland waterway navigation schools and training institutes, see http://www.edinna.eu

Linked to the functions presented in Table 4.2, professional qualifications are described in the relevant regulations of the governing bodies. Annex 3 presents an overview of function descriptions and professional qualifications from the relevant regulations. Annex 3 indicates that professional qualifications are to some extent harmonised, however, differences remain. The differences in defined functions and related professional qualifications prevent a common understanding of what a function stands for and what qualifications are required to carry out the function. There is no harmonised basis providing such common understanding. Consequently, the differences in defined functions and related professional qualifications are an obstacle to recognition of functions and as such provide a barrier to labour mobility.

In absence of recognition of a Service Record Book, crew members of certain countries[79] may be refused access to the river Rhine. This adds up to 12,126 workers, thus equalling 38.3% of the total number of operational workers. A more detailed view on the freight and passenger sector, shows us that 4,921 operational workers in freight transport are not allowed to navigate on the Rhine corridor (27.6%). For passenger transport, these figures are 7,205 and 52.2% respectively (see also Figure 4.2).[80] In Figure 6.9, a graph is presented, showing the amount of workers subject to labour mobility barriers in relation to the deficits on the Rhine. From this figure, it can be derived that the total gap between demand and supply of workers on the Rhine corridor can be bridged by permitting access to these workers. For example, the boatmasters of France contribute for 98% to the North-South corridor, which has a current surplus of 2,365 workers. As France has a different system for recognizing professional experience (100 days count as a year, instead of 180) and it issues special national certificates, 3,244 boatmasters are not permitted access to the Rhine corridor.

Figure 4.2 Number of staff as a % of the total EU staff not allowed on the Rhine due to absence of recognition of SRB (boatmasters and operational staff) or navigation license (boatmasters) in 2013.



Source: Panteia, based on Ecorys (2013) data

[79] These countries concern: France, Switzerland, Italy, Estonia, Denmark, Latvia, Lithuania, Luxemburg, Slovenia, Sweden, United Kingdom, Croatia

[80] Study on the costs and benefits of the implementation of the European Agreement on working time in inland waterway transport – A comparison with the status quo (Ecorys, 2013)

b) Differences in training and education

Standards for IWT training and certification are defined at national level and differ substantially between Member States. There are different standards for training and certification on the Rhine, the Danube, the Sava and other European rivers. The training curricula and certification requirements are not transparent and thus difficult to compare with each other across Europe. The lack of common training curricula and certification requirements makes it difficult to assess the knowledge and skills of an inland navigation worker, especially for new entrants to the market. For that reason, IWT administrations are reluctant when it comes to recognition of qualifications obtained elsewhere in Europe. As such, potential candidates, notably from Central and Eastern Europe, are effectively prevented from moving across borders in search for jobs.

The differences in training and education have been discussed in the Expert Group E01036. Reported results from this discussion are presented in Box 4.1.

Box 4.1 Summarised results of Expert Group discussions on training and education

- The education and training through the existing vocational IWT programmes is not merely based on existing deck functions, as laid out by the existing manning requirements, but sometimes a mix of elements from the different functions.
- The curricula of the schools are based on national legislation or, if existent, on professional profiles determined by the social partners and in line with the demands of the competent authorities.
- Education and training through existing vocational IWT programmes differs from country to country. Some countries follow an integrative approach, i.e. the skills needed for a deckhand are included in the education of a boatman in many Western European countries. The reason can be found in the reference to the manning requirements which acknowledge integrated crewman for deck as well as for engine room functions. Other countries, i.e. Romania and other countries of the Danube basin, have a more specialised educative system which differentiates between IWT deck licenses, certificates of competence for deck personnel and licenses for engine room personnel.
- Vocational IWT education programmes differ on content of the professional IWT qualifications and show differences on move up qualifications depending on the demands of national legislative requirements.

Source: Common Expert Group E01036

These results have been confirmed by the PLATINA project[81], which has made an inventory of existing training and education institutes and curricula[82]. The inventory indicates that educational systems, and related curricula, in the different states differ significantly. Educational systems can hardly be compared with each other. All vocational courses are integrated into the general national educational systems.

Based on the above, EDINNA has worked together with several parties in a Joint Working Group[83] on the development of Standards of Training and Certification in Inland Navigation (STCIN). A first draft was prepared of a working document on core competencies both at operational (OL) and management level (ML), establishing competence matrices with (i) competence; (ii) knowledge, understanding and

[81] Platform for the Implementation of NAIADES (PLATINA), available at: http://www.naiades.info/platina/page.php?path=12&id=9
[82] PLATINA (2009), Inventory of existing IWT education and training institutes and curricula
[83] The Joint Working Group consists of the following members: EBU (European Barge Union), ESO (European Skippers Organisation), ETF (European Transport Workers Federation), PLATINA, Danube Commission, CCNR and EDINNA.

proficiency; (iii) methods of demonstrating and (iv) criteria for evaluation competence for selected competence areas[84].

The process towards recognition of training is not always easy. The complexity and length of the recognition process of a training programme by the CCNR is demonstrated by the case of the School for Shipping and Technical Crafts in Děčín, the Czech Republic, as presented in Box 4.2. The Děčín case illustrates the complexity and lengthiness of the recognition process of a training programme of a non-CCNR Member State.

Box 4.2 Recognition of training programme at Děčín

In mid-2011, the Děčín School for Shipping and Technical Crafts requested the CCNR to recognise its training programme as a legitimate qualification for navigation on the Rhine. Recognition is needed because of Article 23.02 of the Rhine Vessels Inspection Regulations (1995) of CCNR, describing that an ordinary crewman[85] must have passed an examination on completion of training in a professional boatmasters' school. CCNR stopped the recognition of Děčín as professional boatmasters' school in 2011. The CCNR, together with EDINNA, engaged in a comparative assessment of the teaching curriculum of Děčín, comparing it to a German counterpart (Schönebeck). The process resulted in a lengthy comparison between the training material of the two institutions and has not yet resulted in recognition of the Děčín training programme.

Source: Information provided by Rob van Reem, STC, 2014

The framework of the multilateral agreement for the mutual recognition of SRB was initially intended to be used by the CCNR for the recognition of training courses for boatmen. However, putting in place such an instrument proved to be a complex task with significant inherent limitations, which led the CCNR to suspend further work in this direction. Instead, the CCNR will limit its work on ad hoc agreements with individual training institutes.

4.2 Recognition of relevant professional qualifications of workers from outside the sector

For some potential employees, barriers to IWT professions exist with regard to the recognition of relevant professional qualifications from outside the sector. Even in a sector as close to inland navigation as the maritime and fishing sector, the experience (sailing time) of candidates gained on seagoing vessels is not readily recognised for working on IWT vessels. Both Directive 96/50/EC and the Rhine Patent Regulation define the maximum reduction of the required professional experience. In the case of Directive 96/50/EC four years of experience in maritime navigation acquired on a seagoing vessel as a member of the deck crew leads to a reduction of three years. The Rhine Patent Regulation defines a maximum of two years reduction for maritime experience. Other employees with technical background and years of relevant experience are treated as complete newcomers and not allowed to gain some time as staff on training based on their previous working experience.

The case describes in Box 4.3 illustrates the barriers that workers from the maritime sector are facing in the Netherlands while trying to enter the inland navigation market.

[84] EDINNA (2011), Development of the Standards of Training and Certification in Inland Navigation

[85] Equivalent to function of "Matrosen", see Table 4.3.

Box 4.3 Obstacles for career switchers from sea

STC, an inland navigation training school in the Netherlands, is approached on a weekly basis by sailors that are interested in making a career switch to inland navigation. Directive 96/50/EC[86] states in Article 7 that the minimum duration of the professional experience needed to get a boatmasters' certificate may be reduced by a maximum of three years where the applicant can provide proof of professional experience acquired on a seagoing vessel as a member of the deck crew. In order to obtain the maximum reduction of three years, the applicant must provide proof of at least four years' experience in maritime navigation, according to Directive 96/50/EC. Thus, a maximum reduction of three years of professional experience may be granted to a sailor. However, this reduction varies per country. For example, in the Netherlands only a reduction of two years is granted to a seafarer[87]. As a consequence, in the Netherlands a sailor still needs to get two years of professional experience in inland navigation in order to be able to become a boatmaster. In addition, there are problems with recognition of acquired diplomas in maritime navigation. For example, a sailor that has acquired the status of "Master of all Ships" – effectively allowing him to navigate a ship without restrictions (except in ports where pilotage is required) – would need to start onboard an inland navigation vessel as deck-hand. This because the "Master of all Ships" is not recognised in inland navigation. As a result a career switcher from sea needs to start at the bottom of the career ladder in inland navigation, with obvious consequences for wage levels. In conclusion, an experienced sailor in the Netherlands needs to spend two years at the lowest rank on board an inland navigation ship, at a low income level, in order to be able to qualify as a boatmaster.

Source: Information provided by Rob van Reem, STC, 2014

4.3 Local Knowledge Requirements

In order to navigate on certain river stretches in Europe, the Member States may impose the requirement to obtain a certificate that attests the boatmasters' knowledge of the local situation.[88] An overview of Local Knowledge Requirements (LKRs) in Europe is presented in Table 4.3[89].

There are no clear criteria for defining LKRs. The absence of clear criteria for defining LKRs and the Member States' mandate to define and change LKRs may have resulted in too many LKRs, negatively impacting labour mobility. In some cases LKRs are not justified by safety reasons. Furthermore, in some cases LKR can be replaced by RIS. In addition, certain LKR can and should be implemented in such a way that it reduces negative labour mobility effects. As indicated in Table 4.3, countries have different requirements for professional knowledge and experience required to obtain a LKR certificate. In addition, the examination procedure is different.

[86] Directive 96/50/EC applies in the Netherlands through the adaptation in the "Binnenvaart wet, besluit en regeling".
[87] This is based on Dutch regulations: Besluit tot goedkeuring examenreglementen en examenprogramma's voor de binnenvaart 2013
[88] Article 8(2) of Directive 96/50/EC, *supra* note 4; Article 2.05 of the Rhine Patent Regulation, *supra* note 5.
[89] Information in this table is a combination of the following documents: (i) Europe Economics (2009), Impact Assessment and Evaluation Study "Proposal for a Legal Instrument on the harmonisation of boatmasters' certificates in Inland Waterway Transport" and (ii) "Exchange of Information on local knowledge requirements in the ECE countries" by UNECE (2010) .

Table 4.3 LKR in EU Member States

Country	Stretch	Required knowledge / experience	Procedure
Austria	a) Km 2094,5 (Wallsee)– km 2060,4 (Persenbeug) (b) Km 2032.8 (Melk) –km 1979,8 (Altenwörth) (c) Km 1921 (Wien–Freudenau)–the Austrian–Slovak border	16 trips on the respective stretch (8 upstream, 8 downstream)	Experience is shown through service booklet
Bulgaria	Danube (E 80) – total of 11 stretches	At least 16 runs for each sector of Danube for which the certificate is delivered.	Several examinations, including a written test.
Croatia	All of Danube (E80) Km 1433–km 1295.5	16 trips on the respective stretch (8 upstream, 8 downstream)	Experience is shown through service booklet and take exam
	Sava (E80-12)	16 trips on the respective stretch in the last 3 years (and 3 times in each direction in the last 3 years) plus local conditions and regulations.	Experience is shown through service booklet and take exam
France	Rhine (E 10). There is a 18 km stretch of the Rhine at the border with Germany between Iffezheim and Lauterbourg		
	Seine Maritieme (E80) – Km 260.100 to Atlantic Ocean, a total of five stretches	For barges or convoys with a length smaller than or equal to 135 metres: at least 12 trips on the respective stretch in the last year prior to the exam, plus local conditions and regulations. For barges or convoys with a length greater than to 135 metres: at least 20 trips on the respective stretch in the last year prior to the exam, plus local conditions and regulations.	Experience is shown trough service booklet and take exam. If the applicant passes the exam, his license will be valid for a maximum of three years. In order to renew the license, at least 6 trips on the respective stretch should have been made in the past three years, of which at least 2 in the last year prior to renewal for barges with a length smaller than or equal to 135 metres. For barges larger than 135 metres, at least 12 trips should have been made on the respective stretch in the last three years, of which at least 4 in the last year prior to renewal. Besides, a proof of physical and mental fitness, not being older than three months, should be

Country	Stretch	Required knowledge / experience	Procedure
			provided in order to renew the license.
	Harbour of Marseille-Fos and connecting channels to the Rhône (E10) [90]	10 trips on the respective stretch/area in the last year prior to the exam, plus local conditions and regulations.	Experience is shown through service booklet and take exam. The Local Knowledge Certificate will be valid for a year. In order to renew this license, the applicant should have made at least five trips in the year prior to renewal. Besides, a proof of physical and mental fitness, not being older than three months, should be provided in order to renew the license.
Germany	Rhine (Iffezheim - Spijksche Veer);	16 trips on the respective stretch in the last 10 years (and 3 times in each direction in the last 3 years) plus local conditions and regulations.	Experience is shown through service booklet and take exam
	- Elbe (Schöna - Hamburg Port); - Weser (Hannover-Münden - Oberweser); - Danube (Vilshofen - Straubing); - Untere Havel-Wasserstraße (Plaue - Havelberg), if water at Unterpegel Rathenow is above 130 cm; - Oder (Ratzdorf - Widochowa); - Saale (Elbe - Calbe).	16 trips on the respective stretch in the last 10 years (and 3 times in each direction in the last 3 years).	Experience is shown through service booklet
Hungary	All of Danube (E80) Km 1811–km 1433	16 trips on the respective stretch (8 upstream, 8 downstream) plus local conditions and regulations. Half of the practice should be carried out in the quality of helmsman and within 18 months prior to the examination	Experience is shown through service booklet and take exam. Use of interpretation is allowed.
Poland	There are some stretches on Vistula and Oder affected		
Slovakia	All of Danube (E80) Km 1880.3 – 1708.2	At least four years[91] of experience on a particular stretch.	Experience is shown through service booklet and take exam

[90] For vessels with a length smaller than 70 metres and not transporting hazardous cargoes, no Local Knowledge Certificate is needed. For vessels transporting hazardous cargoes, this limit is 50 metres.

Country	Stretch	Required knowledge / experience	Procedure
Schweiz	Basel – Augst KM 167 – KM 156	16 trips on the respective stretch in the last 10 years (and 3 times in each direction in the last 3 years).	Experience is shown through service booklet
	Augst – End of Rhine MK 156 - KM 150	8 trips on the respective stretch (4 upstream, 4 downstream in the last two years).	Experience is shown through service booklet
United Kingdom	Tidal River Thames (Putney Bridge - eastern limit of the Thames Barrier Control Zone)	6 months / 60 days of service, including work in different directions, in varying conditions and darkness Local conditions and regulations	Show experience through service booklet and take exam
	Portsmouth Harbour Isles of Scilly	6 months / 60 days of service Local conditions and regulations	Show experience through service booklet and take exam
	Padstow Harbour	6 outward, 6 inward journeys under supervision of a Harbour Authority representative Local conditions and regulations	Show experience through service booklet and take exam
	Bristol Port Caernarfon and Menai Strait Dee Conservancy Dover Harbour Fowey Harbour Gloucester Harbour Port of Liverpool Teignmouth	Local conditions and regulations	Take exam

Source: Combination of Europe Economics (2009) and UNECE (2010), Sava Commission (2011) and the authorities in Croatia and Slovakia (2014) , ARRÊTÉ N° 21/2011 DU 21 MARS 2011 (Calvados) and Arrêté du 8 août 2008.

Directive 96/50/EC also vests the Member States with the power to unilaterally change the LKR subject only to a non-binding consultation with the Commission[92]. The most relevant river stretch requiring the possession of a local knowledge certificate is on the German sector of the Rhine between Iffezheim and Spijksche Veer. For this sector, the Rhine Regulation expressly mandates that without an appropriate certificate, no boatmaster may navigate a vessel[93]. This diversity across Europe on the different certificates to attest local knowledge effectively hinders the mobility of IWT labour force.

[91] For the purpose of uniform calculation of navigation experience, 180 navigation days shall be considered as one calendar day of navigation experience.
[92] Article 8(2) of Directive 96/50/EC on the harmonisation of the conditions for obtaining national boatmasters' certificates for the carriage of goods and passengers by inland waterway in the Community, OJ L. 235, 17.09.1996, p. 31; Article 2.05 of the Rhine Regulation, 'Reglement Betreffende het Scheepvaartpersoneel' [Regulations for the Rhine Navigation Personnel] (June 2010).
[93] Article 2.05 of the Rhine Regulation, 'Reglement Betreffende het Scheepvaartpersoneel' [Regulations for the Rhine Navigation Personnel] (June 2010).

In addition, it is interesting to note the interaction between the LKRs on the different rivers, particularly between the Danube and the Rhine. On the Danube, the Rhine patents are accepted by Austria as a valid proof of LKR. Moreover, boatmasters who hold EU certificates issued in accordance with Directive 96/50/EC by a Danube country are not required to obtain additional local knowledge certificates on the Danube, as their theoretical knowledge of all relevant stretches is tested when doing the boatmaster exam. However, this does not necessarily mean they have actually navigated on those stretches. This does not apply for boatmasters of non-Danube countries, who will have their knowledge of any of the specific situations to be examined, as it was not part of their boatmaster exam.[94]

Local Knowledge Requirements (LKR) are intended to increase safety in inland navigation. At the same time, the implementation of LKR regimes may negatively affect labour mobility. There are two specific aspects related to LKRs and the way they affect labour mobility[95]:

- Examination is often conducted in local language and if language knowledge is lacking there is an obvious obstacle in passing the examination for obtaining a certificate for LKR. This barrier is apparent on the Rhine, where, in order to obtain a local knowledge requirement, an exam must be passed which is held only in the official languages of the CCNR (i.e. German, Dutch or French). The exam is designed to test the candidates' knowledge of the navigability conditions of the relevant Rhine stretch, as well as their knowledge of certain local laws and regulations. As a result, boatmasters who do not have knowledge of the relevant language will not be able to sit the exam required for a local knowledge certificate.
- Grounds for establishing LKRs are not clearly defined and are not transparent. The Member States can define LKRs and unilaterally change the LKR subject only to a non-binding consultation with the Commission.

4.4 Differences in content and format of Service Record Books

Service Record Books (SRBs) are designed to register service time and experience on board IWT vessels. Consequently, SRBs serve as proof for service time and experience on board. SRBs also serve as proof that requirements concerning the mental and physical fitness have been met by a given crew member. In this respect, SRBs are an important factor related to obtaining a certificate to operate in a certain Member State or river basin. Given the current format and contents included, the SRBs are cause for problems related to recognition and enforcement. These aspects are elaborated below.

4.4.1 Problems related to recognition of SRBs

SRBs are generally governed by national laws and are not subject to regulation on EU level. Therefore, for SRBs the main barrier to labour mobility is caused by difficulties in the recognition of the information contained in the SRBs. In particular, the recognition process is obstructed by the way sailing time on different EU rivers is valued. In December 2010, the CCNR and seven EU Member States (i.e. Austria, Bulgaria, Hungary, Poland, Romania, Slovakia and the Czech Republic) signed a multilateral Administrative Arrangement[96], which ameliorates this barrier to a substantial extent, allowing the signatories to recognise the service record books issued by their respective

[94] Information by Mr. Horst Schindler of the Danube Commission.
[95] Panteia et al. (2013), Evaluation of the framework of relevant directives related to the initiative on recognition and modernisation of professional qualifications in inland navigation, http://ec.europa.eu/transport/facts-fundings/evaluations/inland_air_maritime_en.htm
[96] CCNR (December 2010), 'Administrative Arrangement on the Mutual Recognition of Service Record Books, Strasbourg

competent authorities[97]. However, this Arrangement recognises only qualifications acquired through experience in navigation, and does not relate to qualifications obtained, for instance, through training outside the CCNR Member States. Furthermore, the 2010 Administrative Arrangement is applicable to the signatory countries alone, leaving a substantial number of countries outside the scope of the recognition of SRBs. This includes the CCNR Member States France and Switzerland, as well as the United Kingdom and Luxembourg. The main reason for not joining the multilateral agreement is likely to be the condition of equivalence that is posed by CCNR. In total, 12,126 mobile workers are potentially affected as their SRBs are not recognised by the CCNR, equalling 38,3% of the operational workers in Europe[98], see also Figure 4.2.

Another relevant barrier stemming from the 2010 Arrangement was evidenced by the uncertainties surrounding the recognition of navigation time carried out prior to the date of entry into force of the Arrangement (i.e. 1 July 2011) on rivers other than the Rhine.[99] Prior to this date, navigation time listed in non-Rhine SRBs were taken into account (most notably by the German authorities) for entering a Rhine qualification in Rhine SRBs.[100] This changed when the CCNR Member States concluded on 7 July 2011 that only the navigation time carried out after 1 July 2011 could be taken into consideration.[101] In the meantime this issue is settled, with the opportunity provided to still register time before 1 July 2011 during a transition period.

4.4.2 Problems related to enforcement

The present format and technology of SRBs, currently in paper format, is considered to be largely outdated, making it easy to impede verification leading to unfair competition between those that play by the rules and those that do not. As a result, the issued SRBs could be easily manipulated as the SRBs do not contain any protection mechanism. Therefore, the entries in the SRBs are in some cases regarded as not fully trustworthy by the authorities. Outdated forms for keeping SRB increase enforcement problems.

Box 4.4 Problems related to enforcement and control

- The variety of documents (certificates of competence, sailing licences and service record books) in inland navigation is a serious hindrance for effective control. It is estimated that there are at least 500 different types of manning documents going around in the EU Member States.
- The variety of documents is a very serious hindrance for effective control. This is especially so in case the documents are only in the language of the issuing country. Control can easily be avoided, for example by having more than one service record book or by presenting documents that are not known abroad.
- Effective control is also obstructed because it cannot be checked on the spot if a certain document was issued to a certain person. It has shown that a considerable number of persons have more than one service record book on their name, thus faking to be present on board of more than one vessel at the same time.
- Service Record Books and documents that must prove qualification for the job are many times subject to fraud.
- Cross-border AQUAPOL operations in inland shipping that are carried out twice a year, in general three days per operation (which are only a very minor part of the complete control

[97] Belgium, Germany and the Netherlands are included in this multilateral agreement as CCNR Member States. France is not part of the multilateral agreement.
[98] Study on the costs and benefits of the implementation of the European Agreement on working time in inland waterway transport – A comparison with the status quo (Ecorys, 2013)
[99] CCNR, 'Recognition of navigation time carried out before 1 July 2011 other than on the Rhine – Analysis and result of the consultation', STF/G (13) 41 (5 September 2013).
[100] CCNR, 'Draft Minutes of the meeting held in Strasbourg on 31 January 2013', MQ/G (13)m 1, 15 July 2013, p. 3 (per comment of the German delegation).
[101] CCNR Document STF/LS (11) 2 of 7 July 2011.

operations in Europe) indicated that forged documents are found rather often (40-50 per year). These illegal practices are no incidents, but becoming a structured and expanding practice.

- The inland shipping industry is many years behind on the road transport sector in relation to harmonisation of legislation at EU level and control practices. In road transport, EU harmonised documents are quiet common already for many years.

Source: AQUAPOL

Moreover, due to the fact that there is no central register for SRBs, it is possible for one person to be in possession of several SRBs. Box 4.4 presents the difficulties with enforcement of SRBs, as registered by AQUAPOL[102] (see also Annex 4 for an interview with AQUAPOL).

[102] Statements are based on a questionnaire, prepared by the consortium and answered by Ad Hellemons, Director of AQUAPOL on the 13th November 2012. The questionnaire and answers are included in Annex 3.

5 Identification and description of barriers that negatively affect safety

A major advantage of IWT compared to other modes is its relatively low rate of accidents, compared to other transport modes, in particular rail and road[103]. However, if they occur, accidents can have far-reaching consequences. For example, the accident with the tanker "Waldhof", apart from a tragedy in itself, caused a considerable societal loss due to the blockage of the river Rhine, as the blockage took 33 days (See Box 5.1).

Box 5.1 The Waldhof case

On 13 January 2012, the tanker vessel "Waldhof" (length 105 meters) capsized and sank, with the loss of two lives. The ship was carrying 2,400 tonnes of concentrated sulphuric acid. As a result, downstream shipping on this stretch of the Rhine was blocked for several weeks, at times resulting in a backlog of over 400 vessels causing considerable financial losses.

Source: Panteia (2011), Closure of River Rhine at the Lorelei Rock: Estimate of Impact and Allocation of Damage

In the Netherlands, in 2009 and 2010, 4 and 5 workers respectively lost their life in accidents in IWT (see Table 5.1).

Table 5.1 Accident Statistics on Inland Waterways in the Netherlands (2000-2010)

No./year	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Total no. of ship accident	638	642	616	605	705	714	735	816	1,024	926	1,046
Significant accidents	145	125	112	111	117	96	123	150	126	121	173
Accidents with fatalities or injured	17	21	23	14	27	29	23	16	28	31	36
No. of fatalities	2	2	2	1	4	7	3	4	4	4	5
No. Of injured	21	29	38	40	29	49	54	30	51	56	48

Source: Inspectorate for Transport, The Netherlands

Although inland navigation is a safe mode of transport in comparison with other transport modalities in terms of accidents per tonnekm, the number of accidents can also be linked to the number of workers in the IWT sector. If on that basis, IWT is compared with the construction industry, the amount of casualties reported is 1.65 times higher in IWT[104].

Also, when comparing the amount of fatalities in IWT with the amount of fatalities reported for truck drivers, the balance for IWT turns negative. Although the number of fatalities for truck drivers is higher than the number of fatalities in IWT, it must me noted that the number of workers in road haulage is more than 9 times the amount of workers in IWT. Taking this into account, it appears that the risk for an IWT worker in the Netherlands being involved in a fatal accident is 1.8 times higher for IWT, compared to the road sector[105]. Consequently, from the viewpoint of the worker, the IWT sector cannot be referred to as a very safe sector (see Table 5.2).

[103] CE Delft (2008), Handbook on estimation of external costs in the transport sector Produced within the study Internalisation Measures and Policies for All external Cost of Transport (IMPACT)
[104] RIVM, report Bouwnijverheid
[105] Transport en Logistiek Nederland (TLN), Series Transport in Cijfers (2004-2010)

Table 5.2 Comparing fatalities for road and IWT in The Netherlands (2004-2009)

Sector	Fatalities per year (avg. 2004-2009)	Amount of workers	Accident frequency per 10,000 workers
Road	7.2	91,000	0.79
IWT	1.5	10,820	1.39

Source: Series Transport in Cijfers (2004-2010), Transport en Logistiek Nederland (TLN) for road data. Table 2.1 and Annex 8 for IWT data.

5.1 Limited availability of useful accident statistics

In many EU Member States, the availability of accident statistics in IWT leave much to be desired. When data is available, there is often no classification of accidents and/or a possibility to perform a detailed analysis of the causes of these accidents. A survey among EU Member States led to the following country data with respect to accident numbers (see Table 5.3).

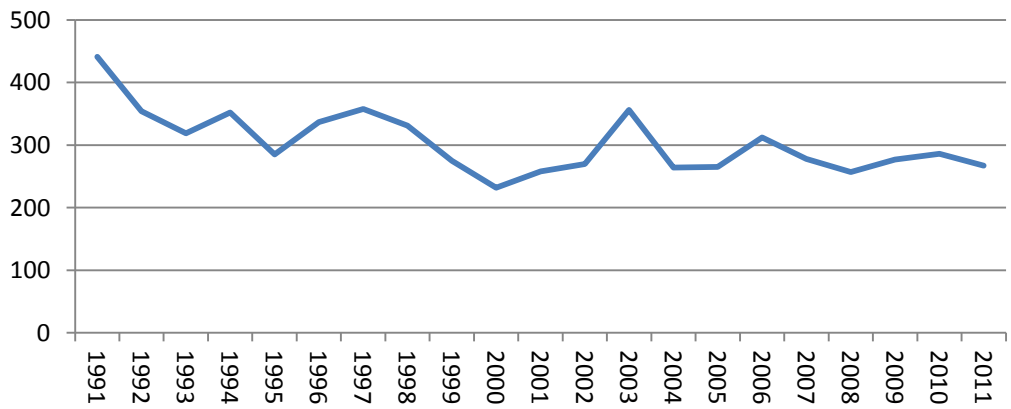
Table 5.3 Accident numbers in IWT for various EU countries per year (2004-2012)

Year	NL[106]	DE	FR	CH	AT	SK	HU	UK
2012	161	N/A	26	N/A	40	2	7	N/A
2011	1072-159	767	26	7	38	2	7	36
2010	987-164	866	37	N/A	48	15	13	27
2009	903-121	838	39	N/A	33	8	6	30
2008	982-127	832	23	N/A	36	3	12	42
2007	795-150	890	34	N/A	37	3		49
2006	710-123	875	36	N/A	172	7		
2005	686-96	875		N/A	≤			
2004	678-117	825		N/A	2006			

Source: questionnaire sent to Expert Group E01036 Recognition and modernisation of professional qualifications in inland navigation

In particular, the accident rates on the Rhine River are shown in the following graph (Figure 5.1). From this figure, it can be seen that for the past decade, the accident rate was around 250-300 per year.

Figure 5.1 Accidents on the river Rhine



Source: Bundesministerium für Verkehr, Bau und Stadtentwicklung

[106] Where there are two numbers mentioned in the column with IWT accident rates for the Netherlands, the left hand number is the total amount of accidents, while so-called significant accidents are mentioned on the right. Significant accidents involve fatalities, injured, blockades of the fairway or damage to ship, infrastructure or its cargo.

From the data presented in Tables 5.1 and 5.3 and Figure 5.1, it can be seen that the number of accidents per year is relatively small. In many EU Member States, the IWT sector is in fact too small to build up reliable accident statistics. If recorded, these data are often aggregated with accident data from related sectors and branches. Furthermore, in order to be useful for this study, an accident database should not only contain a reasonable amount of events, but also background information should be recorded, such as the nationality of those who were involved, as well as the exact cause of accidents.

The Labour Inspectorate and the Human Environment and Transport Inspectorate in the Netherlands possess and maintain accident databases that fulfil the above mentioned criteria. These organisations have made data available for this research concerning the number of accidents recorded in the Netherlands per flag of the ship in the period 2006-2012 and the accident causes.[107] In this study, these data will be used as a starting point for further analysis. It is important to note that the accident database managers presume that there is considerable underreporting and misreporting of accidents and accident causes.

Based on statistical accident data from the Netherlands showing accidents, causes and nationalities of ships and vessels involved, an investigation was made to see if differences exist between workers and vessels that are originating from different regions in the EU with respect to the probability of becoming involved in an accident[108]. Two situations were looked at:

- While working on board of a vessel
- During navigation

This will be further worked out in Chapter 7.

Concerning the cause of the accidents, special attention needs to be paid to causes that may result from human error. According to a PLANCO study[109], human error played a role in approximately 80% of all registered incidents in inland navigation in Germany (geographically, not only by German vessels) between 2000 and 2005. Data from the Dutch DG Rijkswaterstaat[110] from 2004 confirms that for the Netherlands, human error also plays an important role. Against the background of this study, human error is a very important determinant of accidents in IWT.

Human error can be split up in a number of different, more specific, causes. Accidents that are caused by insufficient knowledge and skills and through communication errors fall under the header of human error. Also other causes may fall under the header of human error, such as lack of awareness (that can be caused by tiredness, distraction, etc.). Insufficient knowledge and skills may be caused by training deficiencies. Communication errors may be caused by language problems. These issues will be dealt with in the next section.

From Chapter 4 it can be understood that there are regional differences in the quality of the EU IWT labour market. These differences may form a labour market barrier. However, next to being a labour market barrier, these barriers may also have a negative influence on safety.

[107] The databases from which these data originate are not publicly available.
[108] Dutch Labour Inspectorate, Dutch Human Environment and Transport Inspectorate
[109] PLANCO Consult (2007), Verkehrswirtschaftlicher und ökologischer Vergleich der Verkehrsträger Schiff, Straße, Schiene, Gesamtgutachten, pp 138
[110] Ministerie van Verkeer en Waterstaat (2004), Veiligheid in de binnenvaart in relatie tot andere modaliteiten, p19

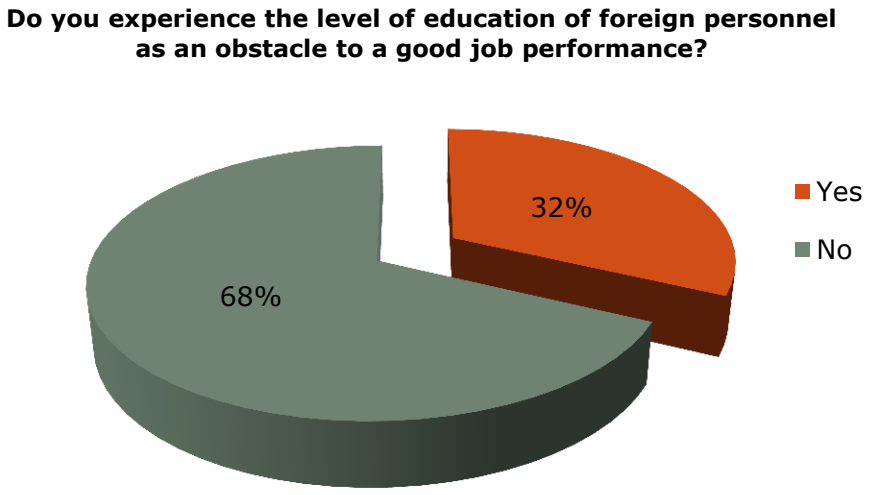
From the five main labour market barriers that have been identified, there are two that have a negative influence on safety. These concern (1) barriers regarding non-harmonised training and education standards within the IWT sector and (2) language barriers.

5.2 Harmonisation of training and education standards within the IWT sector

In the Expert Group E01036 on inland water transport, IWT schools in the EU were compared[111]. Based on PLATINA work it was concluded that training curricula in a number of Member States have not kept up with the technological developments on vessels in recent years[112]. Training programmes also show regional differences that may affect accident frequencies and adequate accident responses. Compared to IWT training institutes in Central and East Europe, institutes in Western Europe focus more on developing practical skills aboard a vessel, for example by means of a realistic simulation the conditions aboard a vessel.

Training deficiencies and/or training curricula that are not geared to practical situations may be an important cause of accidents. Compared to the past, there are more demands on workers in IWT and proper training is of paramount importance to keep up with these higher demands while avoiding accidents to happen. Aspects that may have a direct influence on safety, such as emergency procedures, safety culture, stability calculations, etc. all can be integrated in an EU-harmonised curriculum. This is also supported by a survey, held in the Netherlands[113] showing that about 30% of the respondents experience the level of education of foreign personnel as an obstacle to a good job performance on board (see Figure 5.2).

Figure 5.2 Experience with non-Dutch employees in IWT in the Netherlands (2012)



Source: Panteia IWT Survey concerning demand for mooring places and miscellaneous topics, 2012, N=138

In Chapter 7, the effect of non-harmonised training standards will be investigated quantitatively, based on accident databases.

[111] http://www.naiades.info/platina/page.php?path=12&id=9.
[112] PLATINA (2009), Deliverable 3.1 and PLATINA (2010), Deliverable 3.6
[113] Panteia (2011), IWT Survey concerning demand for mooring places and miscellaneous topics

5.3 Language

A mix of different nationalities with different language backgrounds and poor ability to communicate may easily lead to misunderstandings. This could also lead to accidents, with material damage and/or casualties and even fatalities as a result. Good communication is an important determinant of safety on European waterways. General research on human error shows that language related human errors may mount up to 35% of all human errors[114]. General industry figures resulting from accident investigations covering all sectors show that approximately 10% of all accidents are language related[115]. Anecdotal support on how language barriers may negatively impact safety is presented in Box 5.2.

Box 5.2 Inadequate emergency response due to language problem

Man overboard	
Date:	28-10-2008 06:42
Place	Heel (Limburg, the Netherlands)
Text:	A man fell overboard in the lock of Heel at 4.30 this morning. His body was found at 6.15 am. The victim was a Czech boatman operating on a German vessel. Further information on the identity of the man cannot be provided at this time. The man falling down in the water has been noticed by a French skipper. He has tried to inform to the lock operator. However, as the French skipper was only capable of speaking French and the lock operator not being able to understand this language, the exact situation and the required need of urgency was not directly clear to the lock operator. The only thing the lock operator understood was that the police needed to be warned, which he did. At 5.00 am it became clear that a person had fallen overboard. The diving team of the fire brigade was informed and other emergency services were called. At 6.15 am the divers found the lifeless body of the man. In order to find out the reason why the boatman fell overboard, the Forensic Investigation Services of the Police Department Limburg-Noord started an investigation.

Source: Police Department Limburg-Noord, The Netherlands

Ships are stopped and will not be allowed to proceed, if none of the crew members are able to communicate in one of the prescribed languages (the language of the country, plus English in seaports and German on the Rhine). The policy of the Dutch authority is presented in Box 5.3.

Box 5.3 Enforcement of language requirements on Dutch waterways

The prescribed languages for radiotelephony on the Dutch waterways are Dutch and German. Near the seaports, English is allowed as well. These regulations are laid down in the RAINWAT convention.

The traffic density with larger ships is increasing. Therefore, clear communication between ship stations and between ship stations and VTS stations becomes increasingly important.

Enforcement of the regulations

It often occurs that ships are not able to communicate with either VTS personnel or with other ships, because crew members don't speak the required languages. This can cause very dangerous

[114] Lindhout, P., Ale, B.J.M., (15 December 2009), Language issues, an underestimated danger in major hazard control? Journal of Hazardous Materials Volume 172, Issue 1, Pages 247–255
[115] Ibid.

situations. For this reason the Dutch authorities have started a more strict enforcement of the abovementioned regulations.

Enforcement policy

The Dutch authorities act upon the following policy:

- In any situation where it's not possible to carry out a normal radio communication* but without immediate danger to other vessels, the authorities will inform the boat master about the current language requirements and the enforcement of these requirements.

** There has been some discussion about "normal". What level of understanding is acceptable? It is agreed that VN/ECE Resolution 35 (standardised vocabulary for radio connections) provides a useful reference as to phrases in ship to ship and ship-shore communications which should be understood. At the same time Resolution 35 is not an exhaustive catalogue. Bottom line remains that boatmasters are able to understand and respond to commonly used safety and traffic messages. In daily practice it's normally quite clear whether this is the case or not*.

- When on a next journey the same offence happens again, a fine will be given;
- If a ship causes immediate danger - meaning dense traffic situations in which other ships have to undertake emergency measures to avoid a collision, due to failing communication - it will be stopped and not allowed to proceed until the boat master has taken proper precautions. For example, taking aboard a pilot or a crew member that masters one of the prescribed languages.

Source:http://www.rijkswaterstaat.nl/water/veiligheid/verkeersregels_op_het_water/voertaal_marifonie/voertaal_marifonie_engels/

In the years 2010 to 2011, several Dutch and French ships have been stopped due to not speaking the language in either France (Dutch ships) or The Netherlands (French ships). A case study is presented in Box 5.4.

Box 5.4 French ship stopped due to language barriers

The French skipper Mr. Bruno Baussart of the m/s Okinawa was stopped by Dutch Rijkswaterstaat on Friday, November 26 at 17 pm at the lock of Eefde, as Rijkswaterstaat considered him not able to communicate sufficiently in either the Dutch, English or German language. According to Rijkswaterstaat, the ship hindered safe and smooth traffic. The skipper received a police report.

The French skipper is angry. He wants to take the situation to the court, so he can prove to the judge that he is able to speak and understand an adequate amount of the Dutch language. The ship – 80 metres long – continued its journey to its destination Delden the next day with a Dutch skipper on board.

'More often French skippers do come here', says Sander Wels from Rijkswaterstaat. 'Mostly, they can communicate in Dutch sufficiently. Here, this was not the case. The French skipper came from the IJssel and wanted to sail into the Twente canals, but traffic was very busy at that time. He was about to be locked the 9th position, so the lock operator asked him to moor his ship at another location. The man did not understand and wanted to moor at the lock. We could not make clear to him that that this was not possible. A mobile traffic manager entered his ship, but he could not speak a word with him. Then we decided to stop the ship'.

Baussart does not understand the fuss: "I'm not dangerous, I've never had a collision. I think they just wanted to bother me. I have no explanation'. The ban on sailing was lifted on Monday . 'I sailed towards Maastricht and have so far no problems with the locks. In Weurt I had contact with traffic control, and they understood me well', says Baussart.

Source: Weekblad Schuttevaer, December 1st, 2010.
http://www.schuttevaer.nl/nieuws/actueel/nid14840-opnieuw-struikelt-franse-schipper-over-taal.html

In a number of situations (narrows, construction sites in the river, etc.) communication is essential and obligatory. The language used in these communications is, according to the Bucharest Agreement (RAINWAT), the language of that country the canal or river belongs to[116]. Furthermore, on a vessel itself, the crew often consists of persons with different nationalities. For a boatmaster, as well as for the operational workers on a vessel, it is not possible to have sufficient proficiency in all the languages spoken on the European waterways, or even on the important Rhine-Danube axis. This circumstance prevents a coherent and mutually understandable communication in many cases.

In Chapter 7, the effect of language differences will be investigated quantitatively, based on accident databases.

[116] Paragraph 2.1 of Annex 4 of the Bucharest Agreement: In communications between ship stations and land stations, the language of the country in which the land stations are situated shall be used. In communications between ship stations, the language of the country in which the vessels concerned sail shall be used. In case of difficulties of understanding, the language specified in the appropriate Police Navigation Regulations has to be used. the languages German, French or any other suitable language may be used where no police regulation exists. After a transition period ending on 1 February 2022, where no Police Navigation Regulations exist, the following provisions for communications will be applicable: - Ship-to-port authorities: primarily the English language should be used. As fall back the language of the country in which the land stations are situated can be used. - Ship-to–ship: primarily the English language should be used for navigational purposes.

PART 3: BASELINE SCENARIO

6 Base case: evolution of current IWT labour market

In this chapter, the evolution of the IWT labour market will be further described. Building on the data from the earlier chapters, a labour market model is set up that takes account of the demand for IWT workers on the one hand and the supply of IWT workers on the other hand. This will be done for the EU as a whole and for different IWT corridors, so that regional differences in the demand/supply gap over time can be identified. A sensitivity analysis will test for the impact of changes in the assumptions that have been made.

6.1 Demand for workers for different IWT corridors

The demand for workers in the inland navigation sector is related to the total number of vessels (and the amount of cargo transported) and the manning requirements. In a study concerning the European Agreement on Working Time in IWT[117], the total amount of workers needed in EU IWT has been forecasted from now up to 2050, taking into account the enlargement of the fleet and the prospected growth of IWT transport.

This demand of labour has been distributed proportionally over four main IWT corridors in Europe. The corridors and the countries which are in these corridors can be seen in Table 6.1.

Table 6.1 Corridor-country matrix

	Rhine	North-South*	Danube	East-West**
Netherlands	X	X		X
Belgium	X	X		
Germany	X			X
Poland				X
France	X	X		
Switzerland	X			
Austria			X	
Slovakia			X	
Czech Republic				X
Hungary			X	
Romania			X	
Bulgaria			X	

** The North-South corridor includes the following river basins: Scheldt, Rhône, Meuse and Seine*
*** The East-West corridor includes the following river basins: Elbe, Weser and Odra*

Source: Panteia (2013)

[117] Ecorys (2013), Study on the costs and benefits of the implementation of the European Agreement on working time in inland waterway transport – A comparison with the status quo

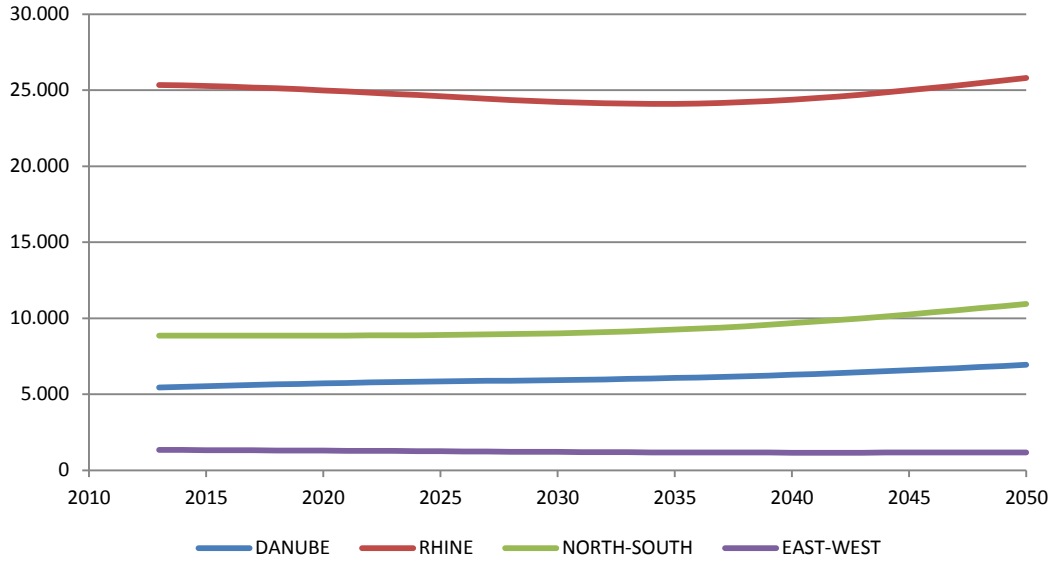
Demand of workers

The demand of workers is determined as follows:

1. The distribution of the demand for workers over the various corridors is related to the amount of cargo transported on these corridors.
2. The total amount of cargo transported on the corridors has been determined for 2007, 2020 and 2040 (NEA et al., 2011).
3. Extrapolating this data resulted in the amount of cargo transported in the years in between the intervals and after 2040.
4. As smaller vessels operate on the North-South and East-West and thus traffic on these corridors is more labour-intensive. A multiplication factor of 1.5 is used for traffic on these corridors for the extra personnel needed.
5. Dividing the values for each corridor by the total, will give the ratios for the distribution for demand of workers.
6. Multiplying the ratios by the total demand of workers as determined in Ecorys (2013) will give the demand of workers per corridor per year.

The results of the proportional distribution of labour demand (for both operational workers and boatmasters) for the period 2013 - 2050 can be seen in Figure 6.1. Figures are presented in Annex 5, table 2.

Figure 6.1 Demand for workers in IWT sector (operational workers and boatmasters)



Source: Panteia (2013), based on Study on the costs and benefits of the implementation of the European Agreement on working time in inland waterway transport – A comparison with the status quo (Ecorys, 2013), adjusted for corridors and the projected transport performances in 2020 and 2040 in Medium and Long Term Perspectives of IWT in the European Union, Annex 2. NEA (2011).

Figure 6.1 shows that the demand for workers is expected to increase at the start of 2035. This can be seen for all corridors, however, the amount of workers needed in the Rhine corridor will increase more steeply. A small decline can be noted on the Rhine corridor up to 2035, whilst the demand of workers on the Danube and North-South corridor is expected to increase slightly. In general, the demand of workers is expected to decrease up to 2035, as can be seen from Figure 6.1 and Annex 5, Table 2.

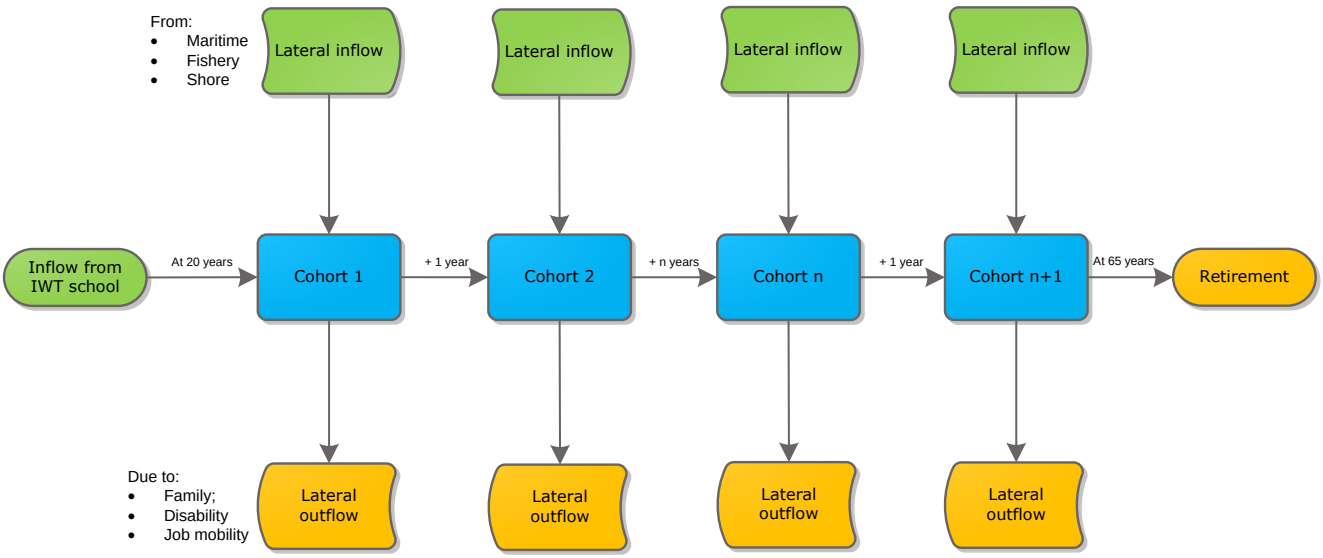
6.2 Supply of workers for different corridors

The supply side of IWT workers is modelled according to the scheme that is shown in Figure 6.2. The core of the model consists of a subdivision of the workforce in different age cohorts. Over a certain time span, the various age cohorts either increase or decrease, because of:

- Inflow from younger workers from a lower age cohort
- Outflow of workers to a higher age cohort
- Lateral inflow of workers in an age cohort from other sectors (fishery, maritime, shore side)
- Lateral outflow of workers in an age cohort (family circumstances, disability, job mobility)

As special cases, the lowest age cohort also has inflow from IWT training institutes (demonstrating the attractiveness of the IWT sector), while the highest age cohort has an outflow due to retirement.

Figure 6.2 Schematic overview of evolution of age structure of IWT workforce



The following assumptions are made in order to estimate the supply of workers:

- All persons that enrol in a IWT-training institute will have an IWT job, either by graduating or by a pathway via gaining experience in practice;
- All people entering the IWT workforce, enter at the age of 20.
- Outflow (apart from retiring at the age of 65) and lateral inflow from other sectors balance each other for all age categories, as currently no data is available concerning lateral entrants or people leaving the sector before retiring[118].
- Attractiveness of IWT-education remains constant over the years, meaning that a constant proportion of 20-year olds choose to enrol in an IWT training institute per year.
- The age of retirement for all workers has been set at 65 years.
- The distribution of IWT workers over the corridors remains proportionate.

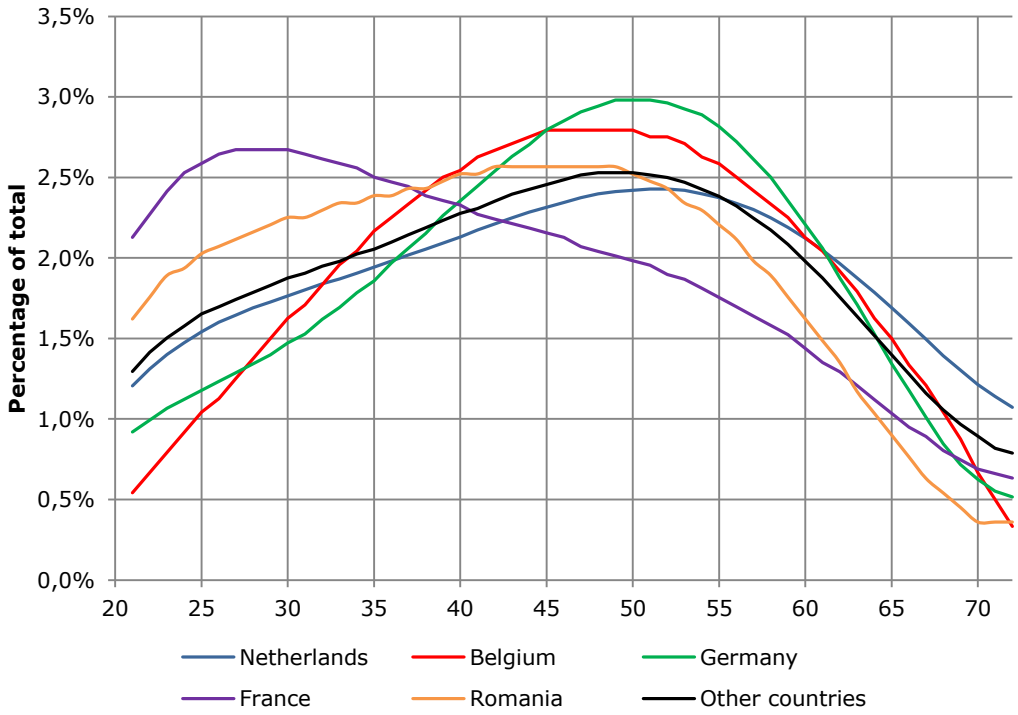
In this study, the supply of workers is therefore determined by the current amount of workers plus the amount of new students entering in training institutes, minus the amount of retirements per year.

[118] Apart from the fact that in the base case, lateral entrants are not taken into account due to the absence of reliable data, it must be noted that lateral inflow/outflow may help to level a labour market imbalance between demand and supply.

6.3 Current age distribution

The age distributions for the five countries with the largest workforce in inland water transport can be seen in Figure 6.3. These age distributions are continuous, while the one from Figure 2.4 have been divided into cohorts that span 10 years. In addition, an estimation was made for the age distributions for Romania and other countries[119], due to lack of data for these Member States. An average of the total EU IWT workforce population was used to estimate the age distributions in these countries. For Romania, data was only available for boatmasters and not for operational workers.

Figure 6.3 Age distributions for the five countries with most workers in IWT for 2013



Source: Panteia (2013) based on data from ITB and Ecorys (2013)

Figure 6.3 is in line with what has been presented earlier in section 2.4.

6.4 Future developments of IWT labour market

6.4.1 Attractiveness of IWT sector (representing the students outflow from training institutes)

For the evolution of the IWT workforce in time it is important to predict the outflow from training institutes. Partly, this depends on the amount of youth available. In the base case, it is assumed that a constant proportion of youth will choose to enrol (and graduate) in IWT training. The proportion of students enrolled in IWT training institutes compared to the total amount of students is defined as the attractiveness of IWT training. In this study, we have assumed the amount of 20-year-olds per country as a proxy to the total amount of students per country. The attractiveness of IWT education is further assumed to remain constant over time and it is estimated, based on the current proportion between new entrants to IWT education and current 20-year-olds.

[119] Other countries include Poland, Switzerland, Austria, Slovakia, the Czech Republic, Hungary and Bulgaria, as well as all the other countries listed in table 2.1 and not specifically mentioned in this footnote and in figure 6.3. This involves countries with isolated IWT networks, such as Italy, the United Kingdom, etc.

The Europop2010[120] population projections on country level have been taken for the Netherlands, Belgium, Germany, France and Austria to determine the amount of 20-year-olds within the period of scope (2013 – 2050). For all the other countries, data from the World Bank has been used[121]. By multiplying this amount by the attractiveness of IWT education, the amount of young people entering the profession can be determined for each year.

Attractiveness of IWT education in 2013

STC[122] determined the amount of students entering in IWT training institutes. The survey comprised 12 countries and 26 training institutes. The attractiveness of IWT education is calculated as follows:

1 The amount of 20-year-olds for each country, is taken from Europop2010 or World Bank population projections;
2 The amount of new entrants per year as reported by STC is taken and divided by the amount of 20-year-olds from the population projections.

As not all of these institutes provided data for the amount of graduates per year, the amount of new entrants per year has been taken as a proxy for the amount of people eventually entering the IWT sector, either by a path through the education institutes or by gaining experience. See section 2.9 for further evidence of this.

The attraction of IWT education in 2013 per 10,000 adolescents of 20 years old can be observed in Table 6.2. In total, it is estimated that the sector attracts 923 new entrants in 2013.

Table 6.2 Attractiveness of IWT education in 2013, per country

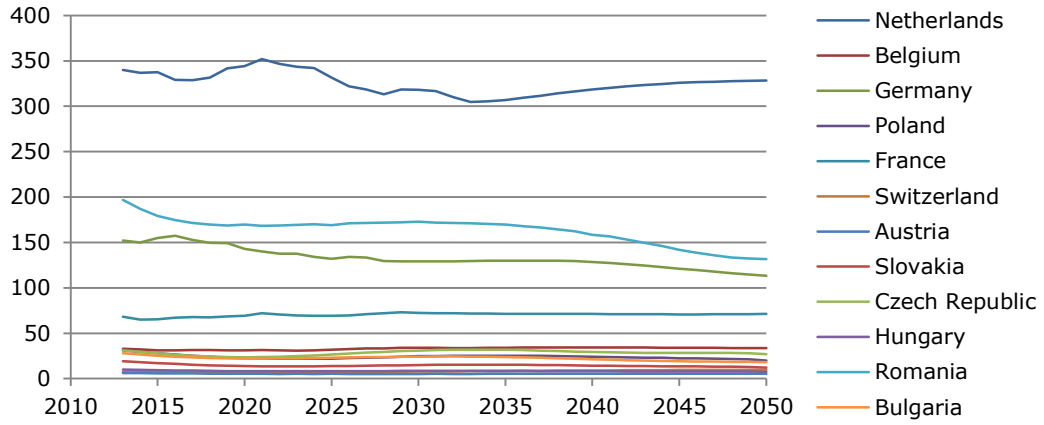
Country	Entrants in IWT	Attraction (per 10,000)	Country	Entrants in IWT	Attraction (per 10,000)
Netherlands	340	16.3	Germany	152	1.9
Romania	197	7.9	France	68	0.9
Bulgaria	28	3.7	Switzerland	8	0.8
Slovakia	19	2.6	Hungary	10	0.8
Belgium	33	2.4	Poland	31	0.6
Czech R.	31	2.4	Austria	6	0.6

Source: STC (2013), adjusted by Panteia based on Europop2010 population projections for the Netherlands, Belgium, Germany, France and Austria and Worldbank-projections for the other countries.

As we have assumed the attractiveness of IWT education institutes to remain constant over time, multiplying the amount of 20-year-olds per year by the attractiveness of IWT (divided by 10,000) will give the amount of new entrants per year. This can be seen in Figure 6.4.

[120] http://epp.eurostat.ec.europa.eu/statistics_explained/index.php/Population_projections
[121] The national statistical institutes of the mentioned countries have shown disaggregated data for the Europop2010 population projections. Eurostat, the data source for the other countries, showed the population projections in age groups of five years. World Bank data, however, provided disaggregated data for these countries.
[122] STC B.V. provides tailor-made training and education for the complete logistics chain, offshore, dredging, shipping, maintenance and process industry.

Figure 6.4 New entrants to IWT sector per country (2013-2050)



Source: STC, 2013, adjusted by Panteia based on Europop2010 population projections for the Netherlands, Belgium, Germany, France and Austria and World Bank-projections for the other countries.

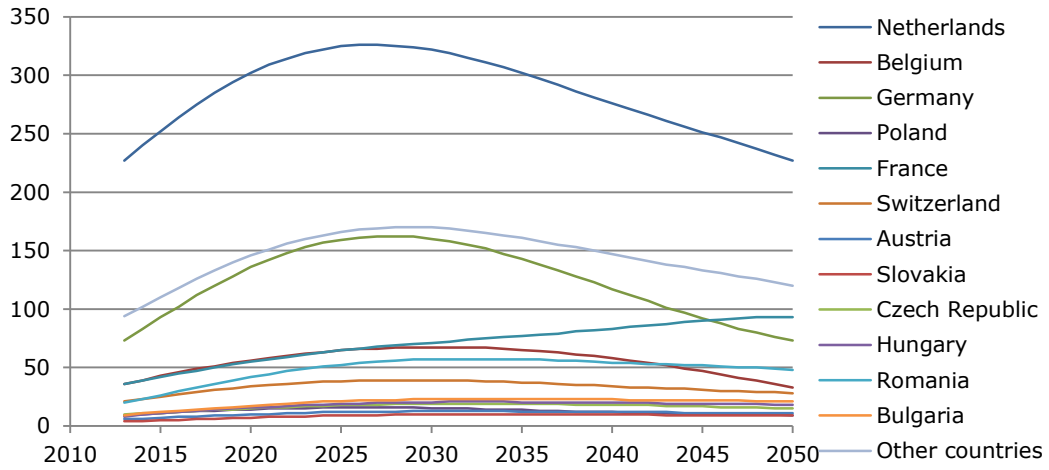
Figure 6.4 shows that, in general, the amount of new entrants to the sector is expected to decrease over time. Starting with 923 new entrants in 2013, the number of new entrants will drop to 860 in 2020, 823 in 2040 and 778 in 2050. The main 'contributors' to this decrease over time are Romania, the Czech Republic and Germany. In the case of Romania, 197 new entrants to the sector have been observed in 2013 and this is expected to decrease to 132 new entrants in 2050. In other countries, the number of new entrants to the sector each year is expected to be rather constant.

Annex 5, Table 4 provides the exact figures on the new entrants to the sector.

6.4.2 Retirements

In this study, we have made the assumption that IWT workers will retire at the age of 65. As we know the age distribution per country, the amount of retirements per year can be determined. This can be seen in Figure 6.5.

Figure 6.5 Amount of retirements in IWT per country per year



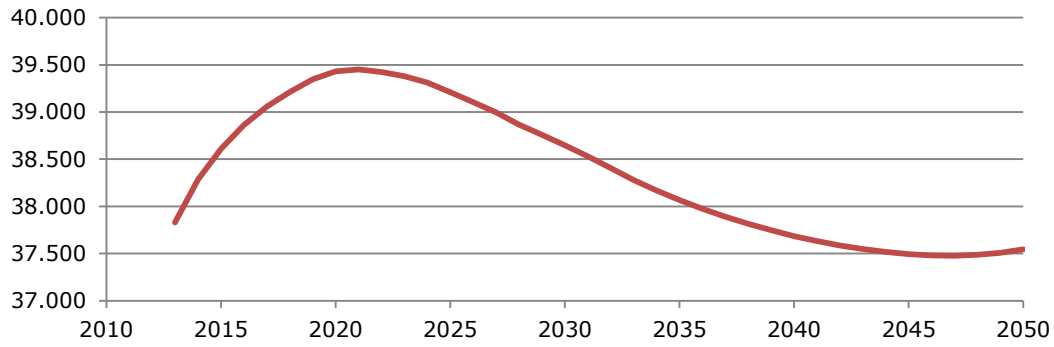
Source: Panteia (2013)

The amount of retirements per year will reach its maximum levels in the period 2025 – 2030. All current workers aged 50 or more – the majority of IWT workers as can be observed from Figure 6.5 – will retire during this period.

6.4.3 Evolution of total supply of workers

The total amount of workers can be determined by summing up the amount of workers in the previous year and the new entrants to the sector, minus the amount of retirements per year. The expected evolution of the amount of workers in the period of scope (2013 – 2050) can be observed in Figure 6.6. The exact figures per country are listed in Annex 5.

Figure 6.6 Total aggregated supply of workers in IWT sector (2013-2050)

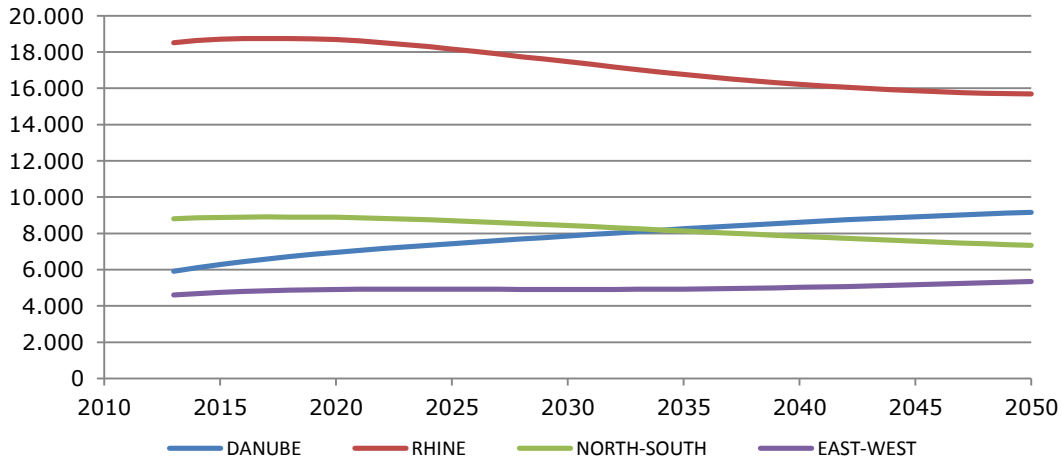


Source: Panteia (2013)

In order to distribute the workers among the corridors, a distribution has been applied. The values and further background on the calculation of this distribution can be found in Annex 7. This distribution is assumed to remain constant over time.

The distribution of workers among corridors is determined by multiplying the total amount of workers per year by the distribution rate per corridor (see Annex 5). The amount of workers per corridor is shown in Figure 6.7 (see Annex 5 for a table with the data that was used for this figure).

Figure 6.7 Total supply of workers in IWT sector per corridor (2013-2050)



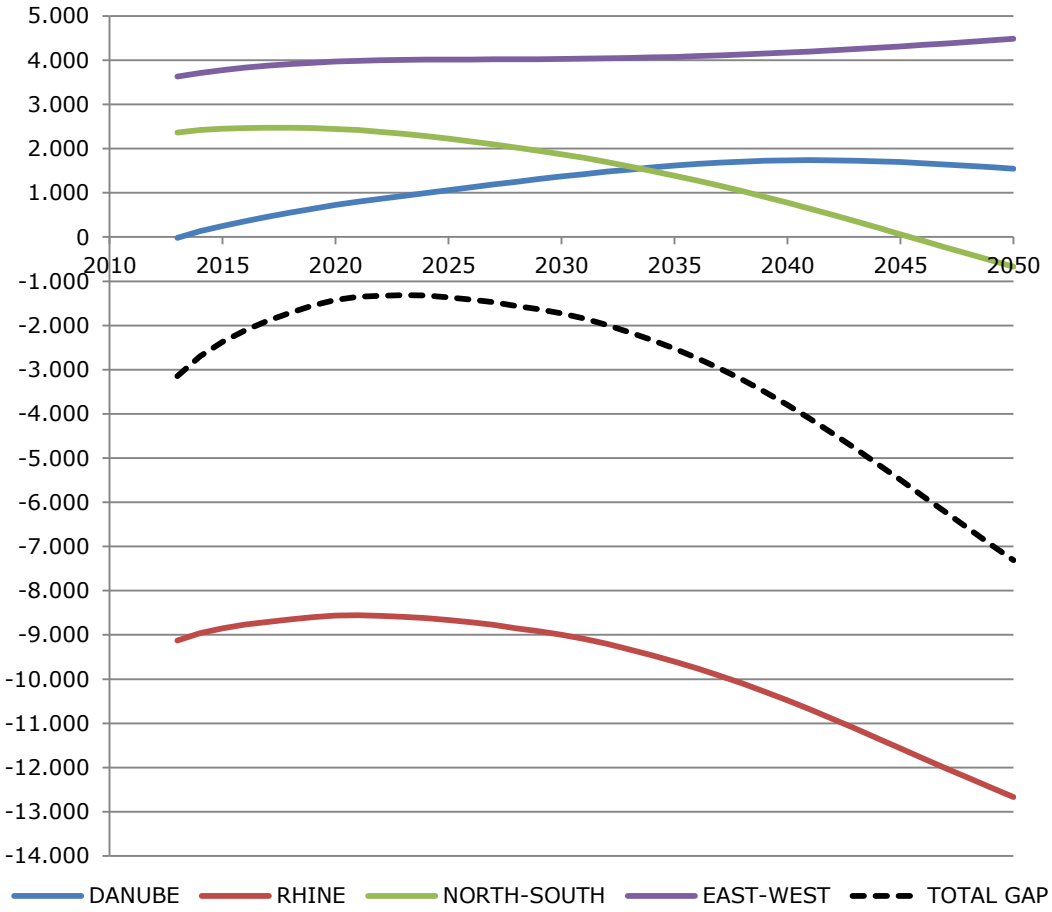
Source: Panteia (2013)

It can be concluded from Figure 6.7 that the supply of workers in the Rhine corridor and North-South corridor is expected to decrease over the period 2013-2050, whilst the amount of workers in the Danube corridor and East-West corridor is expected to increase.

6.4.4 *Evolution of the gap between demand and supply of workers in IWT per corridor*

The gap between the demand for workers and the supply of workers can be determined by subtracting the graphs in Figure 6.1 and Figure 6.7. The difference between demand and supply for each of the corridors shows the regional differences. Also the total EU gap between demand and supply has been included (see Figure 6.8).

Figure 6.8 Gap between demand and supply of workers in IWT per corridor (2013-2050)



Source: Panteia (2013)

As shown in Figure 6.8, regional differences between corridors are expected to increase in the long term. On the Danube corridor and the East-West corridor, there will be a surplus of about 1,500 and 4,500 workers respectively. On the other hand, on the North-South and Rhine corridor there will be a shortage of labour.

It must be noted that deficits exist at this moment for the Rhine corridor, while there is a surplus of workers on the Danube, the North-South and East-West corridor. This gap is the reason for which so many workers from Eastern-Europe are working on vessels sailing under the flag of the Netherlands and Germany, as can be seen in Table 6.3.

Table 6.3 Amount of workers per country of origin in the Netherlands in 2011

Nationality	Numbers counted in survey of Dutch Inspectorate	Total workers in IWT in the Netherlands[123]	% of total workers in IWT in the Netherlands
Dutch	414	6,473	60%
Czech	69	1,079	10%
German	64	1,001	9%
Polish	38	594	5%
Belgian	32	500	5%
Romanian	25	391	4%
Philippine	16	250	2%
French	14	219	2%
Slovenian	4	63	1%
Hungarian	3	47	0%
Bulgarian	2	31	0%
Spanish	2	31	0%
Serbian	2	31	0%
Russian	2	31	0%
Ukrainian	2	31	0%
British	1	16	0%
Yugoslavian[124]	1	16	0%
Cape Verdian	1	16	0%
Total	**692**	**10,820**	**100%**

Source: Dutch Human Environment and Transport Inspectorate, inspection language problems (2011)

Figure 6.8 shows that labour mobility is very important for the functioning of the IWT labour market. Restrictions on accessibility on the Rhine occur even now with a shortage of over 8,000 workers on the Rhine corridor. These figures are expected to increase over time, up to a shortage of nearly 12,000 workers in 2050.

Although agreements exist between a certain number of countries, ensuring mutual recognizing of Service Record Books and boatmaster licences, these agreements are not yet perfect and further legislation on these subjects can help the IWT sector.

6.5 Sensitivity analysis

In order to test the sensitivity of the model to the parameters used, five scenarios have been tested. The assumptions apply for the whole period of scope. The scenarios include:

A) 10% dropout at the age of 35, due to paternity and movement to 'shore';
B) 10% dropout at the age of 45, due to disabilities;
C) 10% influx at the age of 35 from other sectors, such as maritime or fishery;
D) 10% extra attractiveness of IWT education;
E) 10% less attractiveness of IWT education;

For each of these scenarios, the impact has been determined:

- Inflow of employees (Figure 6.10);
- Outflow of employees (Figure 6.11);
- Difference between inflow and outflow (Figure 6.11);
- Gap between demand of workers and supply (Figure 6.12);

[123] Percentage multiplied by amount of workers in IWT in the Netherlands, see Table 2.1.
[124] The exact nationality could not be retrieved in the database.

In the Figures mentioned above, also the Base Case has been included (as "0"). The impacts of the five scenarios on the inflow, outflow and thus the balance can be observed from Table 6.4.

Table 6.4 Impact of scenarios on parameters compared to the baseline for the whole period

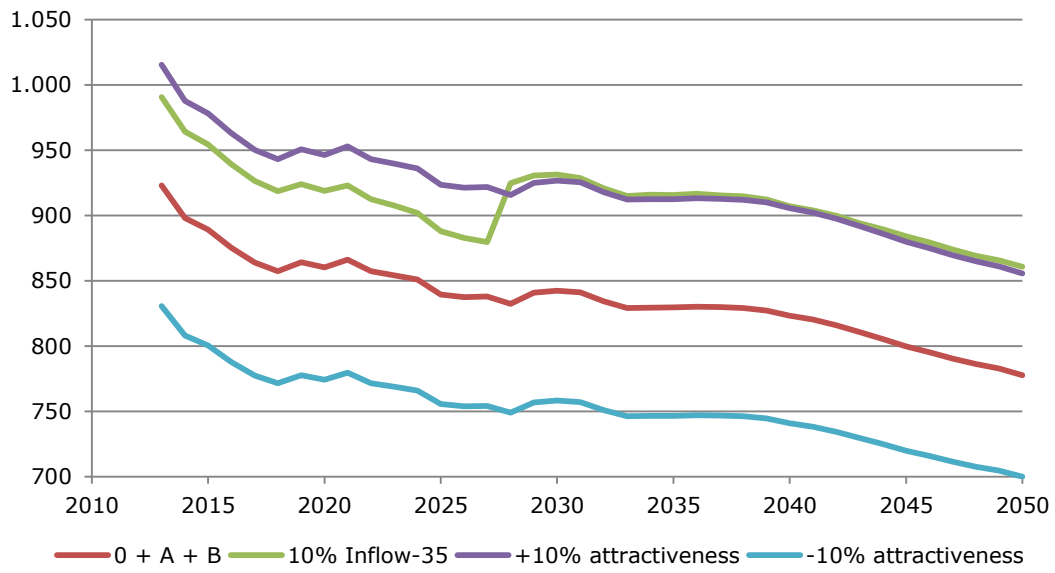
	Inflow	Outflow	Difference
A	0	+	-
B	0	+	-
C	+	+[125]	+
D	+	0	+
E	-	0	-
0 means no difference compared to the baseline scenario; + means an increase compared to the baseline scenario; - means a decrease compared to the baseline scenario.			

Source: Panteia (2013)

6.5.1 Inflow

Figure 6.10 shows the amount of new entrants to the sector for all the scenarios. It can be observed that the 10% influx at the age of 35 from other maritime sectors (scenario C) gives the total inflow a boost, when compared to the baseline scenario. The sharp increase (2028) is the result of the enlarged inflow in 2013 compared to the years before and the multiplier of 10% on 35-year-olds. The age distribution of 2013, only involves 513 21-year-olds. Compared with the projected increase of 923 new entrants at the age of 20[126], there will be a sharp increase of the amount of 35-year-olds in 2028 compared to 2027. The amount of new entrants to the sector does not change for scenarios A and B compared to the baseline scenario The new entrants in scenarios D and E are either 10% higher and 10% lower than the baseline scenario.

Figure 6.9 Total inflow of workers per scenario (2013-2050)



Source: Panteia (2013)

[125] The extra inflow at the age of 35 will retire within the period of scope, starting in 2043, thus causing extra outflow in this scenario as well.
[126] See Annex 5, table A 4

6.5.2 Outflow

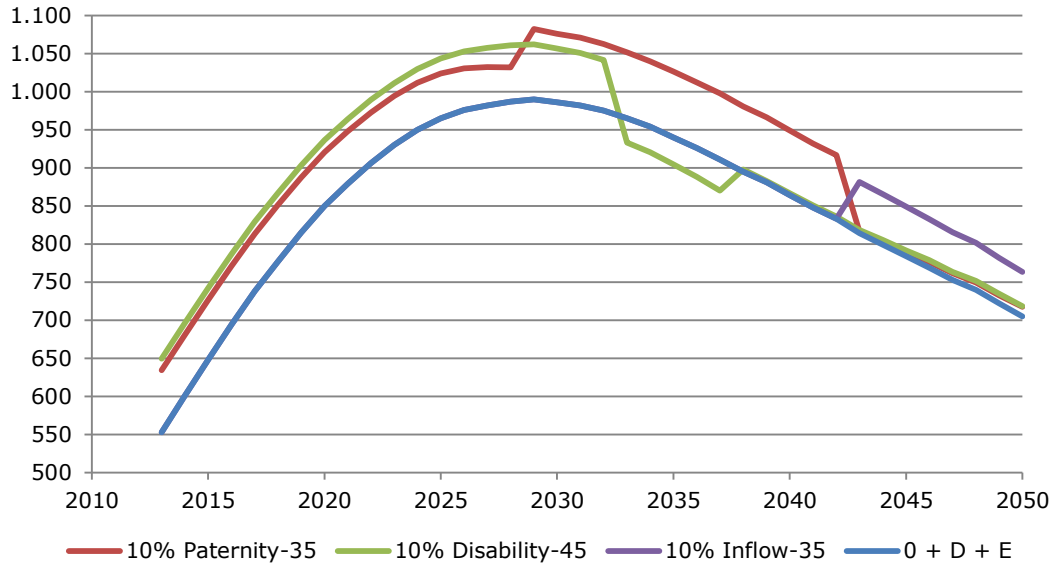
Figure 6.11 shows the amount of outflow of workers in the IWT sector for all the scenarios. It can be observed that the outflows follow a pattern that resembles a parabola, mainly due to current age characteristics of the IWT sector. However, minor differences between the curves can be seen. Firstly, scenarios O, D and E (green line) and scenario C follow the same line, until 2043. At that time, the new entrants due to lateral inflow (which again was a result of the enlarged inflow in 2013, compared to the years before[127] and the multiplying effect) from other maritime sectors retire, thus causing extra retirements compared to the baseline scenario.

The same goes for scenario A in 2028. Here, at the age of 35, 10% of the employees are supposed to leave the sector due to paternity. Since the inflow in 2013 was enlarged compared to the years before, this causes a sharp rise. However, the amount of retirements drops to normal levels in 2043, which is the result of the fewer amount of 65-year olds at that time. It must be noted that 10% of these workers already left the sector in 2013 at the age of 35.

Scenario B seems much alike scenario A at first sight. However, big differences can be observed from the graph. This is the result of people first leaving the sector, before the big wave of new entrants (in 2013) will cause an increase in the outflow. It takes 20 years before the graph 'benefits' from the fewer amount of 65-year olds, and it takes 25 years before the new entrants in 2013 reach the age of 45.

[127] In 2013, there are 923 new entrants to the sector. In 2012, only 503 new entrants have been reported.

Figure 6.10 Total outflow of workers in scenarios

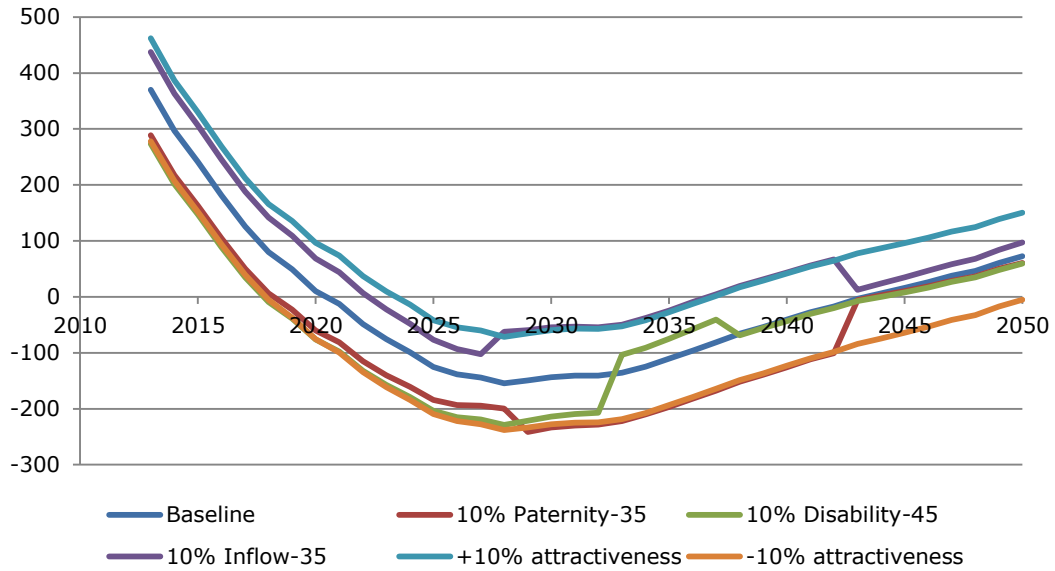


Source: Panteia (2013)

6.5.3 Differences between inflow and outflow

From Figure 6.11 it can be observed that all graphs follow the same pattern. All scenarios start with a surplus of entrants compared to the workers leaving the sector. Compared to the baseline scenario, scenario D (10% more attractiveness of IWT education) seems to show the best results in terms of net inflow, as inflow overcomes outflow for most of the years. On the other hand, a less attractive IWT sector (scenario E) would mean a deficit for nearly all the years. No scenario manages to create positive numbers all the time, mainly due to the large amount of 40-55-year-olds that will retire between 2020 and 2040.

Figure 6.11 Net result of inflow minus outflow for all scenarios



Source: Panteia (2013)

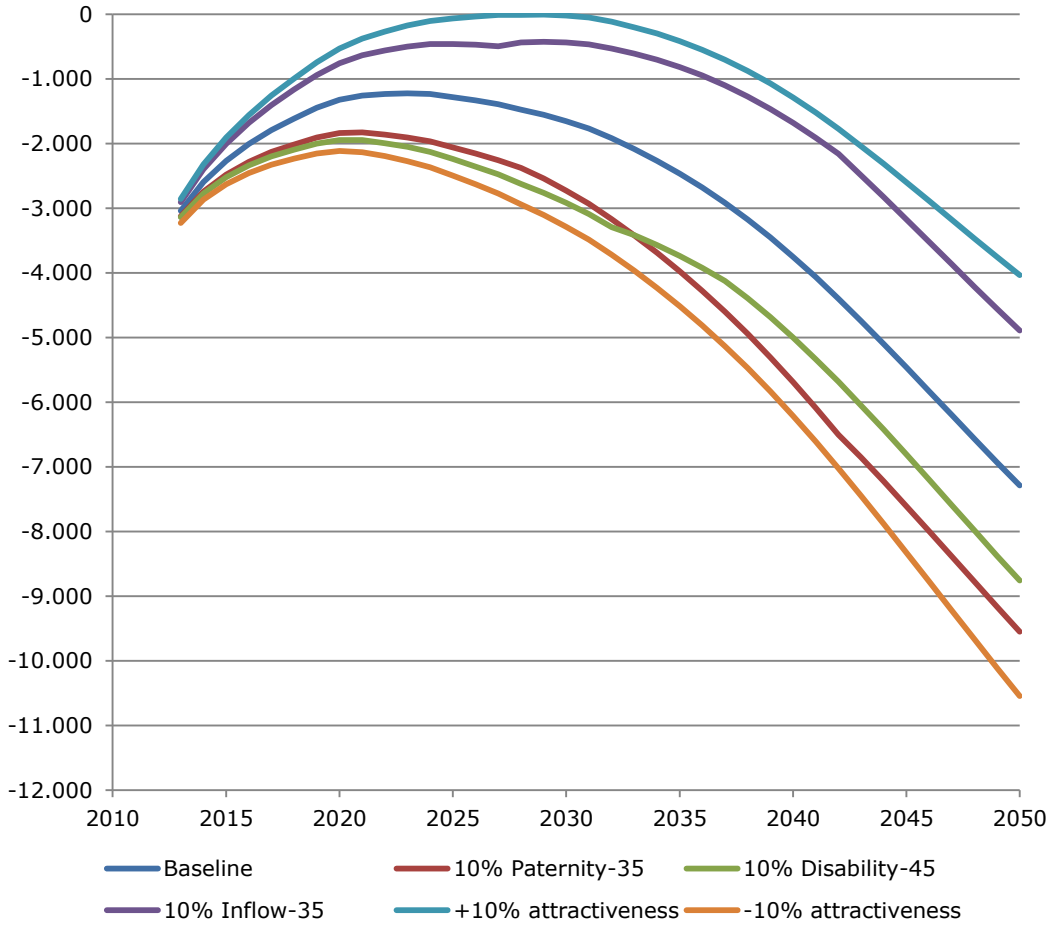
6.5.4 Gap between demand and supply of workers

Figure 6.12 shows us the gap between the demand of workers (which remains the same for all scenarios) and the supply of workers, which of course varies depending on the situation. It can be observed that the baseline scenario results in a smaller deficit of workers on the short term, whilst a much bigger gap would emerge in the long run.

None of the scenarios is able to keep up with the increased demand of workers in the long term. This holds even for the most positive scenarios: scenarios that increase the attractiveness of the IWT sector and scenarios that increase lateral inflow from other maritime sectors are not able to keep up with the increasing demand. This emphasises even more the need for measures to lower the entry barriers to the IWT labour market. The more negative scenarios show that there is a possibility that the situation may end up even worse, with shortages of labour of up to 10,000 workers in 2050, meaning a vacancy rate of more than 20%.

In the medium term, unemployment can be seen in IWT for scenario D (10% more attractive IWT sector). This happens when the 40-55-year-olds at this time reach their retirement. Unemployment rates will be low however; this scenario never exceeds a surplus of more than 500 workers.

Figure 6.12 Gap between demand and supply of workers for scenarios



Source: Panteia (2013)

7 Base case: safety effect of language problems and non-harmonised training standards

In the following sections, the base case with regards to safety is further worked out by means of an estimation of the safety effect of language problems and non-harmonised training standards which have not kept up with technological developments. This will be done for both work-related accidents and navigation related accidents. Annexes 8 and 9 contains a more in-depth treatment of the calculations made, including formulas.

7.1 Accident databases used

The starting point for the analysis is the accident databases from the Labour Inspectorate and the Human Environment and Transport Inspectorate in the Netherlands[128]. These databases provide the specific information on inland water transport accidents that is needed for this analysis: a sufficient number of registered events, including the accident causes and the nationality of those who were involved. For the approach that is taken here, the data in these databases is assumed to be a representative sample for European IWT. The fact that about 25% of European IWT takes place on Dutch territory provides reasonable support for this assumption. Moreover, no other databases of the same scale are available in other Member States, let alone at European level.

7.1.1 Work-related accidents

Workers on board of ships do not only expose themselves to accidents due to collisions with other ships or infrastructure, but they also run the risk of an accident working on board. The Dutch Labour Inspectorate recorded 43 accidents with workers from the Netherlands, France, Belgium and Germany and 23 accidents with workers from other countries (of whom 4 non-EU) within the period 2004-2009[129].

For every accident that was recorded, the Dutch Labour Inspection determined the causes for these accidents. Possible accident causes, according to the Dutch Labour Inspection, are included in Table 7.1.

Table 7.1 Accident causes according to the Dutch Labour Inspection

Accident cause	Description
Planning and procedures;	"Procedures" describe detailed specific performance targets. This will ensure that tasks are carried out uniformly. Tools to do this are: check- and task lists, roadmaps, plans and user manuals. "Plans" refers to activities in a time frame, i.e. the frequency of and time of maintenance, who conducts it. This task includes the rules, permits, programs and risk assessments.
Availability of people	"Availability" refers to the amount available and competent employees suitable for the job. Are the right employees available at the right time, when the task should be performed?
Competence	"Competence" refers to the knowledge and skills of the people who have to perform the task. It also refers to the selection and training process of the company, so that workers have sufficient knowledge to properly carry out their tasks. "Is the right man put in the right place?" The employee must have sufficient knowledge to perform his task.

[128] These databases are not publicly available
[129] These accidents refer to cargo transport only.

Accident cause	Description
Communication and collaboration	"Collaboration" refers to the internal communication and coordination. Implicitly or explicitly, we communicate with each activity. Internal communication is seen as the communication during the execution of a task to ensure that it is carried out in accordance with the relevant guidelines. This accident cause includes work instructions and communication channels (such as meetings, logs, telephone and radio) Note: This task is only relevant if there are two or more people working together on an activity which should be collaborative.
Conflicts of interest	"Conflicts of interest" refers to the balance between security and other business objectives. It depends on mechanisms (such as supervision, monitoring, procedures, study and an open culture) when a possible conflict between security and other criteria, such as the provision of adequate staff, equipment, knowledge, could arise. This favours operation, instead of safety. This task is closely related to motivation / principals: if an individual chooses safety over other matters that are covered under motivation / awareness. "Conflicts of interest" (conflict resolution) covers the organisational aspects.
Motivation, Commitment and Awareness	"Motivation, Commitment and Awareness" refers to the intention and motivation of employees that perform their tasks. An example here is the motivation or concentration of an employee and if it is it sufficient to safely perform the task(s). This management task also includes the awareness of an employee, care and attention, safety awareness for themselves and others, risk avoidance behaviour and the willingness to learn and improve. This task is closely related to conflicts of interest (conflict resolution). In both accident causes, the employee chooses work over safety, convenience over security, time saving, etc. Organisational aspects are placed with conflicting interests and more personal aspects, such as non-compliance with procedures, are placed in this group.
Ergonomics	Ergonomics / Man Machine Interface (MMI) refers to the fit between the user and the machine. It refers to all the material that is used for inspection or service to offer, use, maintain and monitor barriers. This process refers on the one hand to the suitability of the control panels in order to carry and on the other hand to the user to perform the tasks.
Materials	"Materials" refers to the required equipment to remove, maintain and monitor barriers. It includes checks whether the material is suitable for the task (appropriateness, quality) and available when needed. It also includes the availability of spare parts and tools to repair the hardware.

Source: Dutch Labour Inspection

It must be noted that accidents can have more than one cause. As often a chain of events is required for an accident to occur, it is not correct to identify one unique cause. However, there are accidents recorded where no cause could be identified. These accidents are recorded with an unknown cause.

7.1.2 Navigation-related accidents

Whilst sailing the rivers and canals of Europe, skippers expose themselves to a risk of being involved in a navigation related accident. These accidents can be collisions with infrastructure (locks and bridges), groundings or collisions with other ships. There are a multitude of causes for these accidents to happen, such as technical failure, an error made by the skipper or miscommunication between two skippers.

The Dutch Human Environment and Transport Inspectorate recorded accidents on Dutch waterways between 2006 and 2012, their causes and the country registration of vessels involved (see Table 7.2). These data will be used as a starting point for further analysis of the risks that are related to standards for training and language problems. The accident database

managers of the Dutch Human Environment and the Transport Inspectorate presume that there is a considerable underreporting and misreporting of accidents and accident causes.

Table 7.2 Amount of accidents recorded in the Netherlands per flag of the ship in the period 2006-2012[130]

Flag of ship	Unknown	Other causes...(specified)	Operational errors[1]	Communication other causes	Communication miscommunication	Communication HF-related	External factors[2]	Technical or material[3]	No errors found	Grand Total
Netherlands	30	23	960	25	20	5	370	221	3	1,657
Germany	3	4	119	2	6	1	43	42	-	220
Belgium	6	9	98	5	1	-	39	24	-	182
France	1	0	8	1	0	0	9	1	-	20
Other Countries[131]	9	3	93	5	5	1	61	33	1	211
Total	49	39	1,278	38	32	7	522	321	4	2,290

1 Operational errors include the use of alcohol and/or drugs, wrong decisions, not paying attention, reckless sailing, navigational mistakes, mistakes due to fatigue, and not following procedures.
2 External factors include hindrance from wind, water of currents, operational mistakes by lock and bridge operators, etcetera.
3 Technical and material mistakes include engine problems, mechanical problems, problems with the helm, etcetera.

Source: Rijkswaterstaat, Dutch Human Environment and Transport Inspectorate

Communication errors

Communication, VHF-related refers to not listening to the VHF, using a wrong channel and thus being unable to receive the VHF-messages or a poor quality of reception. These errors are not related to language problems and are thus not taken into account in further analysis.

Miscommunication relates to language related problems and insufficient agreements.

Not all accidents related to miscommunication can be subscribed to language related problems. However, here we assume a differential approach. This means that the differences in accidents due to communication errors between Belgian, France, Dutch and German ships on the one hand and ships from other countries on the other hand, can be traced back to language-issues. See chapter 3 and section 7.2 for a justification of these assumptions.

Operational errors

Operational errors include the usage of alcohol and drugs, making wrong decisions while navigating, the wrong usage of navigation equipment (such as the radar and AIS), unawareness, black-outs of the operator, reckless sailing, navigational mistakes, following procedures improperly or fatigue.

Not all accidents due to operational errors can be subscribed to differences in training and education standards. However, also here we assume a differential approach, meaning that the differences in accidents due to operational errors between Belgian,

[130] These are absolute numbers. In order to be compared in an objective/relative manner, one should take into account the transport performance or the amount of kilometers sailed per flag.
[131] Nationalities of the vessels are not specified for other countries. The larger part of these vessels sails under a European flag. Vessels from Serbia and Ukraine are the only non-EU vessels that could possibly have entered. The exact number of accidents caused by vessels sailing under a non-EU flag is estimated as smaller than five.

France, Dutch and German ships on the one hand and ships from other countries on the other hand, can be traced back to differences in training and education. See chapter 3 and section 7.2 for a justification of these assumptions.

7.1.3 *Virtually no overlap between databases*

The two databases that will be used do not overlap. In the years that have been analysed, only one accident (out of 2,290 accidents) in the Dutch Human Environment and Transport Inspectorate accident database has been recorded as a work-related accident[132].

7.2 Methodology

This section starts with a short recapitulation of the assumptions that have been described earlier in Chapter 3. Starting point is that differences in accident frequencies between the Netherlands, France, Belgium and Germany on the one hand and other EU Member States on the other hand, exist due to language problems and differences in training and education.

In the Public Consultation[133], 85% of the respondents indicated that language problems are highly relevant or somewhat relevant in contributing to the problem of safety. Around 76% of all respondents find that the standards for professional training in inland navigation, which are set at a national level, have not kept up with the technological development. This is supported by comparing available statistics of accidents on Dutch territory for two groups of countries with different nationalities.

To investigate the effect of language problems and training that does not keep up with developments, Workers and vessels from different Member States have been allocated to two categories: workers and vessels from Germany, the Netherlands, Belgium and France on the one hand, and the other Member States on the other hand.

7.2.1 *Language problems*

Concerning the language problems influencing safety, Germany, the Netherlands, Belgium and France are housed in one group[134]. This can be motivated by the following observations:

- German and Dutch are mandatory languages on the river Rhine
- Many French and German skippers speak also Dutch, while many French, Dutch and Belgium skippers that are operating on the river Rhine also speak German[135]
- Dutch and German are closely related languages
- Besides of English, the German language is taught on IWT education institutes in France, Belgium and the Netherlands

These observations result in the assumption that the difference in accident probability between both groups for accidents that are specifically communication related can be attributed to differences in the ability to understand and make oneself understood in a foreign language.

[132] This work-related accident has been an explosion on board, which eventually caused the vessel to sink. Thus, it has been recorded as a navigation accident as well.
[133] European Commission (2013), Public consultation regarding the recognition and modernisation of professional qualifications in inland navigation (open for the period 26 March 2013 – 21 June 2013).
[134] Adding Luxembourg to this group was considered, but as 100% of the workers are non-national s(Ecorys, 2013), the origin of these workers can not be determined. Therefore, Luxembourg has not been included in this group. In addition to this, there are no IWT training institutes in Luxembourg.
[135] PLATINA 1 D3.8, Strategy for harmonized IWT education and training standards, Annex II (BDB, 2010)

7.2.2 *Training does not keep up with technological developments: observations and related assumptions*

In order to analyse the differences between Member States to which IWT training is able to keep up with technological developments, housing Germany, the Netherlands, Belgium and France in one group can be motivated by a detailed analysis of training curricula. Within the PLATINA I project[136], an inventory of IWT schools and their curricula has been made. Analysing this data provided evidence for the assumptions. We have counted the amount of relevant[137] competences per topic from the STCIN-standards[138] for the training institutes represented in PLATINA I for both the staff at operational level and management level, and divided the amount of competences covered by the curricula by the total number of competences per category. This way, scores per training institute are presented per topic. See Figures 3.3 and 3.4 for an overview. For the data used, see Annex 1 and 2.

The difference in accidents between both groups for accidents that are specifically related to operational errors can be attributed to differences in the level of training standards and the degree to which is kept up with technological developments. As a conservative approach, only the differences between groups are taken into account. In fact, in both groups there is room for improvement as they do not score 100%. IWT training and education institutes in countries other than Belgium, France, Germany and the Netherlands have less kept up with technological development of the sector. Issues such as RIS, and the usage of navigation equipment such as the AIS system and radar are not part of the curricula, while they are in the first group. Furthermore, many safety topics (safety procedures and methods to prevent any damage to ship and material) of the Standards of Training and Certification in Inland Navigation (STCIN) are not covered within the curricula.

This information provides evidence for the assumption that the quality of education and training institutes for Belgium, France, Germany and the Netherlands differs from training institutes elsewhere in the EU[139].

7.2.3 *Work-related accidents*

In order to determine the amount of accidents that are caused by language barriers and non-harmonised training and education standards which have not kept up with technological development, we have been taken proxies of accident risks for workers from the Netherlands, France, Belgium and Germany on the one hand, and for workers from other countries on the other hand. Multiplying the difference in accident risks between the two groups by the amount of workers will give the amount of accidents that are caused by these drivers.

In order to determine the amount of work-related accidents due to language barriers and non-harmonised training and education standards which have not kept up with technological development, the following data are needed:

- The amount of accidents due to knowledge-based mistakes or communication/language mistakes.
- The amount of workers on cargo vessels in the Netherlands per nationality;
- The share of workers per group in the European IWT freight workforce.

[136] PLATINA 1 D3.8, Strategy for harmonized IWT education and training standards, Annex II (BDB, 2010)
[137] Specific information about passenger transport has been considered irrelevant, as both our analysis on safety focus on freight transport only.
[138] EDINNA (2011), Development of the Standards of Training and Certification in Inland Navigation. http://www.unece.org/fileadmin/DAM/trans/doc/2011/sc3wp3/ECE-TRANS-SC3-WP3-inf10e.pdf
[139] Detailed information about the curricula of the education institutes is presented in Annex 1 and 2.

Communication and language
In order to determine the maximum costs of barriers due to miscommunication and language barriers, a proxy has been taken from the column "communication" in Table 7.3 for workers from the Netherlands, France, Belgium and Germany on the one hand, and workers from other countries on the other hand.

Training and education standards
In order to determine the costs of barriers due to education and training standards, a proxy has been taken from the columns "competence", "conflicting interests" and "motivation and commitment" in Table 7.3 for workers from the Netherlands, France, Belgium and Germany on the one hand, and for workers from other countries on the other hand.

7.2.4 Navigation related accidents

An estimation will be made of the societal damage with regards to safety that may arise from language problems and from non-harmonised training standards which have not kept up with technological development.

In order to determine the related yearly amount of navigation related accidents, one should know about:

- The amount of accidents due to operational mistakes or language mistakes;
- The risk of a vessel causing an accident per kilometre in the Netherlands;
- The amount of vessel kilometres in the Netherlands per flag of the ship;
- The share in vessel kilometres in Europe per determined group (which can be related to the amount of tonne kilometres and the average vessel size).

Communication and language
In order to determine the total costs related to the miscommunication and language barriers, a proxy has been taken from the column "communication, other causes" and "communication, miscommunication" in Table 7.4 for workers from the Netherlands, France, Belgium and Germany on the one hand, and for workers from other countries on the other hand.

Training and education standards
In order to determine the total cost related to the education and training standards barrier, a proxy has been taken from the columns "operational errors" in Table 7.4 for workers from the Netherlands, France, Belgium and Germany on the one hand, and for workers from other countries on the other hand.

7.3 Effect of the barriers on accident frequencies

7.3.1 Work-related accidents

Table 7.3 shows the accident frequencies per 10,000 workers per year for each cause as defined in Table 7.1. The calculations for these accident frequencies can be found in Annex 8.

Table 7.3 Accident risks per 10,000 workers per year per cause

Nationality	Planning	Availability	Competence	Communication	Conflicting interests	Motivation and Commitment	Ergonomics	Material	**∑ Frequencies**
∑ BE + FR + NL + GE	*1.12*	*0.22*	*0.90*	*0.78*	*0.11*	*3.70*	*0.56*	*1.34*	***8.74***
∑ Other EU countries	*0.70*	*0.00*	*1.41*	*2.11*	*0.70*	*6.33*	*0.70*	*2.11*	***14.06***

Source: Panteia, based on data from the Dutch Labour Inspectorate

Communication and language

The risk of workers from other countries than France, Germany, Belgium and the Netherlands (mostly originating from countries in Eastern Europe) being victim of a work-related accident due to miscommunication is 2.69 times as much as it is for workers from Germany, Belgium and the Netherlands.

Accident frequency due to language (per 10,000 workers, per year):

FR, DE, BE and NL-workers: 0.78
Workers from other EU countries: 2.11

The amount of workers originating from these other countries in Europe (but within EU-28) and working in the freight transport sector can be estimated as around 9,431 persons (see Table 2.1)[140]. With the accident risks as stated above, it can be concluded that about 1.25[141] accidents each year are due to language issues in Europe.

Training and education standards

The risk of workers from other countries than Germany, Belgium and the Netherlands (mostly originating from countries in Eastern-Europe) being victim of such a work related accident is 1,51 times as much as it is for workers from Germany, Belgium and the Netherlands.

Accident frequency due to training and education standards (per 10,000 workers, per year):

FR, DE, BE and NL-workers: 4.71
Workers from other EU countries: 8.44

The amount of workers originating from countries other than Germany, Belgium and the Netherlands (but within EU-28) can be estimated to be around 9,431 persons (see Table 2.1, only freight transport). With the accident risks as stated above, it can be concluded that each year in Europe about 3.52 accidents are caused by problems related to training and education standards.

7.3.2 Navigation related accidents

Table 7.4 shows the accident risk per vessel kilometre per year for the two groups. The calculations for these accident frequencies can be found in Annex 9.

[140] Freight transport only, as the accident database only takes into account accidents on inland water freight transport.
[141] Subtracting the accident frequencies and then multiplying by the amount of workers from other countries than Belgium, Germany or The Netherlands will give this number.

Table 7.4 Accident frequency recorded in the Netherlands per million vessel kilometres per flag of the ship in the period 2006-2012

Flag of ship	Unknown	Other causes	Operational mistakes	Communication other causes...	Communication miscomunnuication	Communication VHF-related	No mistakes found	External factors	Technical or material	**Grand Total**
Σ NL+DE+BE+FR	0.10	0.09	2.95	0.08	0.07	0.01	1.15	0.72	0.01	**5.18**
Σ OTHER COUNTRIES	0.41	0.14	4.20	0.23	0.23	0.05	2.76	1.49	0.05	**9.54**

Source: Panteia (2013), based on Rijkswaterstaat data

Communication and language

The risk of vessels from other countries than France, Germany, Belgium and the Netherlands being victim of a navigation related accident due to miscommunication is 2.81 times as much as it is for vessels from Germany, Belgium and the Netherlands.

Accident frequency due to miscommunication (per vessel kilometre, per year):
FR, DE, BE and NL-vessels: 0.15
Vessels from other countries: 0.45

The amount of vessel kilometres made by ships from countries other than Belgium, France, Germany or the Netherlands can be estimated as around 58.97 million vessel kilometres per year (see Annex 9). With the accident frequencies per vessel kilometre as stated above, it can be concluded that each year about 17.8 accidents are caused by the language barrier.

Training and education standards
Taking into account the amount of vessel kilometres by ships from countries other than France, Germany, Belgium or the Netherlands through the Netherlands, the amount of accidents due to operational errors per million vessel kilometres is 1.42 times as much as for vessels from Germany, Belgium or the Netherlands.

Accident frequency for accidents due to operational errors (per million vessel kilometre, per year):
FR, DE, BE and NL-vessels: 2.95
Vessels from other countries: 4.20

The amount of vessel kilometres in Europe made by ships from countries other than France, Belgium, Germany or the Netherlands can be estimated as around 58.97 million vessel kilometres per year (see Annex 9). With the accident frequencies per vessel kilometre as stated above, it can be concluded that around 73.72 accidents are caused by the barrier of training and education standards.

7.3.3 Total amount of accidents caused by the barriers related to language and training & education standards

Table 7.5 shows the total amount of accidents that are caused by language barriers and the barrier related to training and education standards. It can be observed that language barriers cause 19.09 accidents per year and training and education standard

barriers cause 77.24 accidents per year. This brings the total amount of accidents caused by these barriers to a number of 96.3 accidents per year.

Table 7.5 Amount of accidents due to language barriers and to barriers on training and education standards, per year

	Communication barrier	Training and education standard barrier	Total
Work related accidents	1.25	3.52	4.77
Navigation related accidents	17.84	73.72	91.56
Total accidents	19.09	77.24	96.33

Source: Panteia

7.4 Monetising effects: yearly cost of accidents

7.4.1 Work-related accidents

An average work related accident in IWT has an economic impact of € 364,675 as can be observed from Annex 10.

Communication and language

The costs of the accidents caused by language barriers are estimated at € 455,578 per year, which is the number of language related accidents multiplied by the average work related accident cost.

Training standards

The costs of the accidents caused by the training and education barrier are estimated at € 1,282,789 per year, which is the number of training and education related accidents multiplied by the average work related accident cost.

Total costs

The total costs of work-related accidents linked to the identified barriers can thus be monetised at € 1,738,366 a year.

7.4.2 Navigation related accidents

The external costs for accidents are approximately € 0.0003 per tonne kilometre for IWT[142]. With an average of 44,0 billion tonne kilometres made in the Netherlands each year[143] and 327 accidents occurring each year, this means each accident costs € 40,357.

Communication and language

The costs of the navigation related accidents caused by the language barriers are estimated at € 719,892 per year, which is the number of language related accidents multiplied by the average navigation related accident cost.

Training standards

The costs of the navigation related accidents caused by the training and education barrier are estimated at € 2,975,154 per year, which is the number of training and education related accidents multiplied by the average navigation related accident cost.

[142] http://www.ebu-uenf.org/fileupload/GREENING%20TRANSPORT.pdf
[143] Average of 2006-2012 (iww_go_atygo07 + iww_go_atygo)

Total costs

The total costs on navigation-related accidents linked to the identified barriers can be monetised as an amount of € 3,695,046 per year.

7.4.3 *Total costs per year*

The total yearly costs caused by accidents due to language barriers and deficiencies in knowledge and skills is shown in Table 7.6.

Table 7.6 Total yearly costs caused by accidents related to language barriers and deficiencies in knowledge and skills

	Costs linked to language issues	Costs linked to education and training standards	Total yearly costs per type of accident
Work related accidents	€ 455,578	€ 1,282,789	€ 1,738,366
Navigation related accidents	€ 719,892	€ 2,975,154	€ 3,695,046
Total costs per barrier	€ 1,175,470	€ 4,257,942	€ 5,433,412

Source: Panteia

7.5 Net Present Value

The Net Present Value (NPV) of the total costs that are caused by accidents due to language barriers and deficiencies in knowledge and skills adds up to € 78,738,259 in case of time horizon 2030 and € 134,354,468 in case of time horizon 2050, using a discount rate of 4%[144]. It must be noted accident numbers are expected to increase over time, just like the transport performance as based upon NEA et al. (2011). This is seen as a multiplication of the accident frequency per boatmaster.

Table 7.7 Total costs (NPV) caused by accidents related to language barriers and deficiencies in knowledge and skills in 2030

	Costs linked to language issues	Costs linked to education and training standards	Total yearly costs per type of accident
Work related accidents	€ 6,602,006	€ 18,589,530	€ 25,191,536
Navigation related accidents	€ 10,432,311	€ 43,114,427	€ 53,546,738
Total costs per barrier	€ 17,034,317	€ 61,703,957	€ 78,738,274

Source: Panteia

Table 7.8 Total costs (NPV) caused by accidents related to language barriers and deficiencies in knowledge and skills in 2050

	Costs linked to language issues	Costs linked to education and training standards	Total yearly costs per type of accident
Work related accidents	€ 11,265,286	€ 31,720,111	€ 42,985,397
Navigation related accidents	€ 17,801,099	€ 73,567,996	€ 91,369,095
Total costs per barrier	€ 29,066,385	€ 105,288,107	€ 134,354,492

Source: Panteia

[144] European Commission (2009), Impact Assessment Guidelines

PART 4: CONCLUSIONS

8 Conclusions

8.1 Conclusions regarding labour market barriers

In a perfect labour market with no obstacles for labour mobility of IWT workers, regional differences would not exist. In the case of the IWT labour market, it can be shown that there are regional differences regarding a surplus or deficit of workers in IWT.

For 2013, shortages and deficits exist of several thousands of workers. This is consistent with what is observed in practice: many IWT workers from Central and Eastern Europe work in the Rhine region. Regional differences will further increase in the long term when no measures are taken, as shown in Figure 6.8.

However, as in the calculations the lateral in/outflow has not been taken into account, it is not possible to exactly predict how large the gaps exactly are. Furthermore, it must be noted that there is a certain "hidden" reserve. This capacity reserve consists of persons with the right qualifications but that are available for IWT work on an incidental basis only. This concerns for example persons that are of an age greater than 65 years and/or relatives that may provide support in exceptional cases.

Although it is not possible to include lateral in/outflow labour in the market model, it is clear from the sensitivity testing that the lateral in/outflow is one of the key variables to leveling out the regional imbalances, next to the attractiveness of the IWT sector.

Lowering the barriers to labour mobility will have an effect on lateral in/outflow and/or the attractiveness of a career in the IWT sector. Allowing for an unhindered mobility between different regional parts of the EU IWT labour market or related sectors can help to level imbalances now and in the future.

8.2 Conclusions regarding barriers that negatively affect safety

Accident databases of sufficient size, that contain information about nationality of those involved in accidents and the exact cause of accidents, are scarce. However, by using accident databases from the Netherlands, it can be shown that nationality of workers and vessels has an influence on the probability of getting involved in an accident that is work or navigation related.

The accident databases from the Netherlands contain accident causes. It can be seen that the root cause of why some nationalities can be more accident-prone lies with language differences and differences in training and education (no-harmonised training and eduction).

It is possible to monetise total damage as a result of the accidents that are specifically caused by these causes. The total yearly damage amounts € 5,433,412. In the Baseline Scenario, the Net Present Value of this damage amounts € 71,534,504 in case of a time horizon until 2030 and € 109,442,930 in case of a time horizon until 2050, using a discount rate of 4%.

Annex 1 Curricula for operational workers in different IWT training institutes

		Operational workers	AT	BE	CZ	FR	DE	NL	PL	RO
Navigation	Assists the ships management in situations of manoeuvring and handling a ship on inland waterways, using all types of waterways and ports and is able to:	assist with mooring, unmooring and hauling (towage) operations	X	X	X	X	X	X	X	X
		assist with couple operations of push barge combinations	X	X	X	X	X	X	X	X
		assist with anchoring operations	X	X	X	X	X	X	X	X
		steer the ship complying to helm orders using steering gear properly	X	X	X	X	X	X	X	X
		apply knowledge of influence of wind and current	X	X	X	X	X	X	X	X
		apply knowledge of navigational aids, tools and materials such as fenders	X	X	X	X	X	X	X	X
		undertake actions to be taken in terms of safety in navigation	X	X	X	X	X	X	X	X
		describe the main European inland waterways		X	X	X	X	X	X	X
		describe the characteristics of various types of inland waterways		X		X	X	X	X	X
		apply the knowledge of day and night signs, sound signals and general rules of the inland waterway police regulations	X	X		X	X	X	X	X
		describe the various types of locks in relation to lock operations		X		X	X	X		X
		use systems of traffic control	X	X		X	X	X		X
		TOTAL NAVIGATION	**9**	**12**	**8**	**12**	**12**	**12**	**10**	**12**
Cargo handling, stowage and passenger transport	Assists the ships management in preparation, stowage and monitoring of cargo during loading and unloading operations and is able to:	read stowage plans	X	X		X	X	X	X	X
		monitor the stowage and securing of cargo	X	X	X	X	X	X	X	X
		apply knowledge of the use of ballast		X		X	X		X	X
		measure gauge marks and to check the amount of cargo	X	X		X	X	X	X	X
		work according to regulations and safe working rules	X		X	X	X	X	X	
		distinguish various types of ships	X	X		X	X	X	X	X
		TOTAL CARGO HANDLING	**5**	**5**	**2**	**6**	**6**	**5**	**6**	**5**

		Operational workers	AT	BE	CZ	FR	DE	NL	PL	RO
Controlling the operation of the ship	Assists the ships management in controlling the operation of the ship and care for persons on board and is able to:	apply knowledge of the inland waterway ships construction and their behaviour in water, especially in terms of stability and strength	X	X		X	X	X	X	X
		apply knowledge of the ships structural parts and identifies the parts by name and function	X	X	X	X	X	X	X	X
		apply knowledge of the ships watertight integrity	X	X	X	X	X	X	X	X
		apply knowledge of the ships certificate of approval		X	X	X	X		X	X
		apply knowledge of various types of anchors and handling anchor winches		X	X	X	X	X	X	X
	Uses the ships equipment and is able to:	apply knowledge of deck equipment and lifting devices	X	X	X	X	X	X	X	X
		apply knowledge of construction and functioning of monitoring operations and daily maintenance work	X	X	X	X	X	X	X	X
		TOTAL CONTROLLING THE OPERATION OF THE SHIP	**5**	**7**	**6**	**7**	**7**	**6**	**7**	**7**
Communication	Performs general and professional communication. Is able to:	solve different tasks with the help of information- and communication systems		X		X	X		X	
		collect and store data including backup and data update	X				X		X	
		follow instructions for data protection	X		X		X		X	
		present facts using technical terms in the home country language and in at least one foreign language, preferably English	X	X		X	X	X	X	
		use river speak in case of difficulties in communication		X	X			X		
		obtain information according to nautical, technical and safety subjects		X		X	X	X	X	
		understand and follow instructions and to communicate with others in terms of shipboard duties		X	X	X	X	X	X	X
	Performs social behavior and is able to:	contribute to good social relation and cooperation with others on board		X	X	X	X	X		
		accept social responsibility, conditions of employment, individual rights and duties, danger of alcohol and drug abuse	X		X		X	X		
		plan, purchase and prepare simple meals			X		X	X	X	
		understand the importance of following instructions regarding the safety at work and prevention of accidents	X	X	X	X	X	X	X	X
		TOTAL COMMUNICATION	**5**	**7**	**7**	**6**	**10**	**8**	**8**	**2**

Operational workers			AT	BE	CZ	FR	DE	NL	PL	RO
Marine engineering an electrical, electronic and control engineering	Assists the ships management in marine-, electrical, electronic-, control engineering to ensure general technical safety and is able to:	to prepare main engines and auxiliary equipment for operation	X	X	X	X	X	X	X	
		apply knowledge of machinery malfunctions and correction of faults to prevent any damage	X	X	X	X	X	X	X	
		operate machinery including pumps, piping systems, bilge- and ballast systems	X	X	X	X	X	X	X	
		apply basic knowledge of electronic devices	X	X	X	X	X	X	X	
		prepare starting, connecting and changing generators and control their systems	X	X	X	X	X	X	X	
		apply knowledge of electrical malfunctions, common faults and actions to prevent damage		X	X	X	X		X	
		use suitable tools	X	X	X	X	X	X	X	
		perform the daily maintenance work at the main engines, auxiliary machinery, and control systems	X	X	X	X	X	X	X	
	Performs maintenance work on marine, electrical, electronic-, control engineering equipment to ensure general technical safety and is able to:	perform the daily maintenance work at machinery including pumps, piping systems, bilge- and ballast systems	X	X	X	X	X	X	X	
		apply knowledge of qualities and limits of different materials used on board to maintain and repair equipment and technical devices	X	X	X	X	X	X	X	
		follow procedures of maintenance and repair	X	X	X	X	X	X	X	
		understand technical information material and documenting technical procedures	X	X	X	X	X	X	X	
		work with different materials and tools used for maintenance and repair operations	X	X	X	X	X	X	X	
		TOTAL ENGINEERING	**12**	**13**	**13**	**13**	**13**	**12**	**13**	**0**
Maintenance and repair	Performs maintenance of the ship and the ship's devices and is able to:	apply knowledge of the use of cleansing and preserving agents regarding the protection of health and environment	X	X	X	X	X	X	X	
		maintain technical devices according to technical instructions	X	X	X	X	X	X	X	
		apply knowledge of production and qualities of different wires and ropes	X	X	X	X	X	X	X	X
		make knots and splices according to their use and maintain them	X	X	X	X	X	X	X	X
		prepare and carry out working plans by teamwork and control the results		X	X	X	X	X	X	X
		use information- and communication systems	X	X		X	X	X	X	X
		TOTAL MAINTENANCE AND REPAIR	**5**	**6**	**5**	**6**	**6**	**6**	**6**	**4**

Operational workers			AT	BE	CZ	FR	DE	NL	PL	RO
Safety, health and environmental protection	Works according to safe working rules and understands the importance of the care for safety, health and environment. Is able to:	apply knowledge of safety equipment to prevent accidents	X	X	X	X	X	X	X	X
		take precautions to be taken before entering enclosed spaces		X	X	X	X	X		X
		apply knowledge of national and international regulations to prevent accidents and to protect health and environment	X	X	X	X	X	X	X	X
		apply knowledge of different types of emergency	X	X	X	X	X	X	X	X
	Acknowledges the importance of training and acts immediately in case of emergencies and is able to	follow procedures in case of an alarm	X	X	X	X	X	X	X	X
		perform medical first aid	X	X	X	X	X	X	X	X
		use and maintain personal safety equipment and shipboard life saving equipment	X	X	X	X	X	X	X	X
		swim and assist in case of rescue operations	X	X		X	X	X	X	X
		use emergency escape routes	X	X		X	X	X	X	X
		use internal emergency communication and alarm systems	X	X	X	X	X	X	X	X
		distinguish the elements of a fire and their classification	X	X	X	X	X	X	X	X
	Fire fighting. Takes precautions to prevent fire. Uses in case of fire the fire fighting equipment and is able to:	distinguish types and sources of ignition	X	X		X	X	X	X	X
		distinguish and use different types of fire extinguishers	X	X		X	X	X	X	X
		act according to shipboard fire fighting procedures and organisation	X	X		X	X	X	X	X
		follows instructions concerning: outfit of a fire fighter, personal equipment, methods, extinguishing materials, procedure, breathing apparatus and its use during fire fighting and rescue operations	X	X	X	X	X	X	X	
		apply knowledge of regulations to protect the environment	X	X		X	X	X	X	
	Perform duties taken into account the protection of the environment and is able to:	take precautions to prevent pollution of the environment	X	X	X	X	X	X	X	
		use materials in an economical and energy saving way		X	X	X	X	X	X	
		dispose waste goods environmentally friendly	X	X	X	X	X	X	X	
TOTAL SAFETY, HEALTH AND ENVIRONMENTAL PROTECTION			**17**	**19**	**13**	**19**	**19**	**19**	**19**	**14**
GRAND TOTAL (Σ ALL TOPICS)			**58**	**69**	**54**	**69**	**73**	**68**	**69**	**44**

Source: PLATINA 1 D3.8, Strategy for harmonized IWT education and training standards, Annex II (BDB, 2010)

Annex 2 Curricula for boatmasters in different IWT training institutes

Boatmaster - Management Level			AT	BE	BU	CZ	DE	NL	RO
Navigation	*Plans a journey on inland and maritime waterways and conducts navigation on European inland waterways. Is able to:*	navigate on European inland waterways including locks and lifts according to navigation agreements with agent	X	X	X	X	X	X	X
		respect all traffic regulations on navigable waterways	X	X	X	X	X	X	X
		consider economic and ecological aspects of ship operation in order to use vessel efficiently		X	X		X	X	
		observe technical structures and profiles of the waterways and use precautions	X	X	X	X	X	X	X
		work with up-to-date charts/ maps, Notices to skippers/mariners and other publications in order to determine vessel position exactly	X	X	X	X	X	X	X
		use tidal datum's, tidal currents, periods and cycles, time of tidal current and time of tide, variations across an estuary		X	X		X	X	
		use SIGNI and IALA on maritime waterways for safe navigation		X	X		X	X	
		use traffic supervision tools and ability to apply them	X	X	X	X	X	X	X
	Sails and manoeuvres ensuring safe operation of the vessel in all conditions on inland and maritime waterways. Is able to:	Navigate and manoeuvre taking into account geographical, hydrological and morphological characteristics of the main inland waterways	X	X	X	X	X	X	X
		give order to moor and unmoor vessels and to haul towage operations	X	X	X		X	X	X
		apply local knowledge when conducting navigation		X	X		X	X	X
		provides ship's access to competent authorities	X	X	X		X	X	X
		use modern electronic navigational aids, with specific knowledge of their operating principles, limitations, sources of error, detection of misrepresentation of information and methods of correction	X	X	X	X	X	X	X

Boatmaster - Management Level			AT	BE	BU	CZ	DE	NL	RO
		apply knowledge and abilities to use radar navigation as well as modern navigation equipment to ensure safe vessel operation	X	X	X	X	X	X	X
		consider effects of current, wind and water-levels in connection with interactions of crossing, meeting and overtaking vessels as well as ship-shore (canal effect) in order to determine draught	X	X	X		X	X	X
		use propulsion and manoeuvring systems as well as appropriate communication and alarm systems	X	X	X		X	X	X
	Responds to navigational emergencies on inland and maritime waterways. Is able to:	apply knowledge of precautions in an emergency when internationally beaching a ship in order to prevent greater damage	X		X	X	X	X	X
		apply knowledge of refloating a grounded ship with and without assistance	X	X	X	X	X	X	X
		apply knowledge of actions to be taken if collision is imminent	X	X	X	X	X	X	X
		apply knowledge of actions to be taken after a collision and assessment of damage control	X	X	X	X	X	X	X
	Uses VHF equipment during navigation on inland and maritime waterways. Is able to:	apply knowledge of VHF communication and procedures contained in the (Basel) regional arrangement concerning the radiotelephone service on inland waterways	X	X	X	X	X	X	X
		apply knowledge of equivalent regulations on radiotelephone services such as UBI		X	X	X	X	X	X
		TOTAL NAVIGATION	**17**	**21**	**22**	**14**	**22**	**22**	**19**

Boatmaster - Management Level			AT	BE	BU	CZ	DE	NL	RO
Cargo handling, stowage and passenger transport	*Plans and ensures safe loading, stowage, securing, unloading and care of cargoes during the voyage. Is able to:*	apply knowledge of relevant national, European and international regulations, codes and standards concerning the operation of transporting cargoes	X	X	X	X	X	X	X
		apply knowledge of the effect on trim and stability of cargoes and cargo operations	X	X	X	X	X	X	X
		use calibration tables in order to assess effective tonnage, use stability and trim diagrams and stress calculating equipment, including ADB (Automatic Data-Based) to develop a stowage plan	X	X	X	X	X	X	X
		compose stowage plans including knowledge of loading cargoes and ballast systems in order to keep hull stress within limits	X	X	X		X	X	X
		control loading and unloading procedures with regard to a safe transport including procedures for sea transport	X	X	X	X	X	X	
		Differentiate various goods and their characteristics in order to monitor and ensure safe and secure loading of goods as laid down in the stowage plan	X	X	X		X	X	X
		TOTAL CARGO HANDLING	**6**	**6**	**6**	**4**	**6**	**6**	**5**
Controls the operation of the ship	*Building, construction and operation of various types of ships. Is able to:*	Apply knowledge of inland waterway ship building and construction	X	X	X	X	X	X	
		distinguish construction methods of ships and their behaviour in the water especially in terms of stability and strength	X	X	X	X	X		X
		apply knowledge of structural parts of ship and identification thereof, i.e. for damage control and analysis	X	X	X	X	X	X	X
		watertight integrity	X	X	X	X	X	X	X
	Controls and monitors the mandatory equipment as mentioned in the ship's certificate of investigation. Is able to:	apply knowledge of functionalities of deck equipment and lifting facilities (cranes)	X	X	X	X	X	X	X
		apply knowledge of specific requirements for transport of goods with tankers, passenger ships, tug boats and push barge combinations	X	X	X	X	X	X	X
TOTAL ON CONTROLS THE OPERATION OF THE SHIP			**6**	**6**	**6**	**6**	**6**	**5**	**5**

Boatmaster - Management Level			AT	BE	BU	CZ	DE	NL	RO
Marine engineering an electrical, electronic and control engineering	*Plans the workflow and is able to:*	apply technical knowledge of the functionality of the main engines and auxiliary equipment and their control systems	X	X	X	X	X	X	X
		Monitors and controls crew members when operating and maintaining the main engines and auxiliary equipment including pumps, piping systems, steering mechanisms		X	X		X	X	X
	Monitors main engines and auxiliary equipment and is able to:	Give instructions to prepare main engines and auxiliary equipment	X	X	X	X	X	X	X
		detect malfunctions, common faults and take actions to prevent damage	X	X	X	X	X	X	X
		apply knowledge of material sciences as well as physical and chemical conditions of oil and other lubricants	X	X	X	X	X	X	X
	Plans and gives instructions for ballast procedures in relation to the ship's pumping and pumping control system. Is able to:	apply technical knowledge on the evaluation of engines performance	X	X	X	X	X	X	X
		Monitor routine pump works, ballast and loading pump systems	X	X	X		X	X	X
	Organises safe use and application, maintenance and repair of the ship's electro-technical devices. Is able to:	prevent potential damages on electric and electronic devices on board due to knowledge of malfunctions and common faults in ship electro-technology	X	X	X		X	X	X
		test control systems and instruments to recognize faults and at the same time take actions to repair and maintain electric or electronic control equipment like automation	X	X	X	X	X	X	X
		give instructions to crew members in the pre- and after activities to connect or disconnect technical shore based facilities		X	X	X	X	X	
	Controls the safe maintenance and repair of technical devices and is able to:	ensure appropriate use of tools to maintain/repair technical devices		X	X	X	X	X	X
		assess characteristics and limits of materials as well as necessary procedures which are used to maintain/repair technical devices		X	X	X	X	X	X
		evaluate technical and internal documentation		X	X	X	X	X	X
		TOTAL ON ENGINEERING	**8**	**13**	**13**	**10**	**13**	**13**	**12**

Boatmaster - Management Level			AT	BE	BU	CZ	DE	NL	RO
Maintenance and repair	*Organizes safe maintenance and repair procedures of the ship and its equipment. Is able to:*	control safe behaviour of crew members with regard to properties and use of materials and additives		X		X	X	X	X
		define, monitor and control work orders so that crew members are able to perform maintenance and repair works independently		X		X	X	X	X
		order, buy and control material and tools considering health and environmental protection, i.e. conservation or cleaning materials		X		X	X	X	X
		control if wires and ropes are being used according to the their manufacturing properties and intended purpose. Repair or replace them if required		X			X	X	X
		motivate crew members to work independently in a team by formulating clear aims and objectives and control results of the work executed by the crew members by giving feedback		X			X	X	
		TOTAL ON MAINTENANCE	**0**	**5**	**0**	**3**	**5**	**5**	**4**
Communication	*Performs human resource management and social responsibility for staff, takes care of organisation and training on board, assures at all times good communication. Is able to:*	organise and stimulate teambuilding and coach the crewmembers and instruct crew in order to be understood in relation to shipboard duties and if necessary take disciplinary actions		X	X		X	X	
		guide crew on information- and communication systems on board including internet for the operation of the ship		X	X		X	X	
		collect, safe and manage data with regard to data protection laws	X	X	X		X	X	
		describe circumstances by using relevant technical terminology in first language or if necessary in English (riverspeak)		X	X		X	X	X
	Uses "Riverspeak" in situations with communication problems and is able to:	Retrieve, evaluate and use information with relevance to safety on board as well as nautical-technical issues.		X	X		X	X	X

Boatmaster - Management Level			AT	BE	BU	CZ	DE	NL	RO
	Cares for a well balanced and social working atmosphere on board and is able to:	take social responsibility for crew members and realize added value of a well balanced working atmosphere on board; be considerate of individual rights and duties of crew members, mediate and solve interrelational issues and disputes		X	X		X	X	
		adhere to national, European and international social legislation	X	X	X		X	X	X
		follow strict alcohol and drug prohibition and react appropriately in cases of infringements, take responsibility and demonstrate consequences of misbehaviour		X	X		X	X	X
		organise preparation of meals on board after consultation of crew members, plan shopping possibilities according to suitable berths			X		X	X	
		TOTAL ON COMMUNICATION	**2**	**8**	**9**	**0**	**9**	**9**	**4**
Safety, health and environmental protection	*Monitor and control the applicable legislative requirements and measures to ensure safety of life. Is able to:*	adhere to national, European and international legislation and takes appropriate measurements for the care of health protection to prevent accidents	X	X	X	X	X	X	X
		control and monitor validity of the ship's certificate and other documents to be carried on board	X	X	X	X	X	X	X
		comply with safety regulations during all working procedures by using relevant safety measures in order to avoid accidents	X	X	X	X	X	X	X
		control and monitor all safety measures necessary for cleaning closed spaces before persons open, enter and clean those facilities	X	X	X	X	X	X	X
	Maintain safety and security for people on board and is able to:	apply the rules of life saving appliances for victims and own personal safety	X	X	X	X	X	X	X
		organise training exercises for behaviour in fire, emergencies, damages, leakage warning, explosion, collision, "Man over Board" and evacuation of the ship in order to limit damage	X	X	X		X	X	X

Boatmaster - Management Level			AT	BE	BU	CZ	DE	NL	RO
		give instructions related to fire prevention, personal protection equipment, methods, fighting material, respirators and possible application of these devices in emergencies	X	X	X	X	X	X	X
		perform first aid	X	X	X		X	X	X
		establish an effective on-board system to control life saving appliances and correct application of personal protection clothing	X	X	X		X	X	X
		Recognise dysfunctions on board, evaluate them and take appropriate actions to restore operation of ship	X	X	X		X	X	X
	Sets-up emergency and damage control plans and handle emergency Situations and is able to:	initiate preparations for rescue plans of different types of emergencies in order to instruct the crew correctly	X	X	X		X	X	
		train on methods to prevent fire, recognition of origin of fire and fire fighting according to different competencies of crew members	X	X	X		X	X	X
		training with life saving appliances	X	X	X		X	X	X
		give instructions on rescue plans, escape routes and internal communication and alarm systems	X	X	X		X	X	X
	Ensures compliance with requirements for environmental protection and is able to:	take precautions to prevent environmental pollution and use relevant equipment	X	X	X	X	X	X	X
		adhere to valid environmental protection laws to prevent pollution of the environment	X	X	X		X	X	X
		use equipment and materials in an economical and environmental friendly way		X	X		X	X	X
		instruct and monitor sustainable waste disposal	X	X	X		X	X	X
		TOTAL ON SAFETY	**18**	**19**	**19**	**7**	**19**	**19**	**18**
		GRAND TOTAL	**57**	**78**	**75**	**44**	**80**	**79**	**67**

Source: PLATINA 1 D3.8, Strategy for harmonized IWT education and training standards, Annex II (BDB, 2010)

Annex 3 Overview of functions and qualifications of selected regulations

CCNR

With Resolution 2010-I-8-Annex 1, the Central Commission has adopted the Regulations for Rhine navigation personnel (RPN), which came into force on 1 July 2011.

Title II: Manning requirements

This section sets out the manning requirements and minimum crew on board, formerly set out in Chapter 23 of the RVBR regulations. It also contains additional requirements applicable to safety personnel required on passenger vessels, previously covered by a separate regulation.

Function	Requirement
Deck-hand	must be not less than 16 years of age;
Apprentice (ship's boy)	must be not less than 15 years of age and have an apprentice's contract which provides for attendance at a professional boatmasters' school or for a correspondence course approved by the competent authority to be taken in preparation of an equivalent diploma.
Ordinary crewman	a) must be not less than 17 years of age and • have passed an examination on completion of the training referred to in 2.2, or • have passed an examination on completion of training in a professional boatmasters' school, or • have passed any other examination for able crewman recognised by the competent authority, or b) must be not less than 19 years of age and have had not less than three years' experience as a deck-hand, including not less than one year in inland navigation and two years either in inland navigation or at sea in coastal navigation or fishing;
Engine-minder	a) must be either an ordinary crewman and have passed an engine-minder's examination recognised by the competent authority, or b) must have had not less than one year's experience on board a motorised inland navigation vessel and have a basic knowledge of engines.
Able crewman	a) must have had not less than one year's experience in inland navigation as an ordinary crewman and • have successfully completed the training, or • have passed the final examination of a professional boatmasters' school, or • have passed any other examination for ordinary crewman recognised by the competent authority, or b) must have successfully completed training of a duration of not less than three years or have passed a final examination following training of not less than three years in a professional boatmasters' school provided the training includes not less than one year's experience in inland navigation, or c) must have had not less than one year's experience in inland navigation as an ordinary crewman, and have passed a practical examination in accordance with the Rhine Licensing Regulations, or d) must have had not less than two years' experience in inland navigation as an ordinary crewman.

Helmsman	a) must have had not less than one year's experience in inland navigation as an able crewman or not less than three years' experience as an ordinary crewman, or b) must hold a boatmaster's certificate established under Directive 96/50/EC or a boatmaster's certificate in accordance with appendix I to Directive 91/672/EEC, or c) must have had not less than four years' experience in inland navigation and hold a certificate of proficiency equivalent to the Principal Licence, permitting him to act as helmsman of a vessel on the inland waterways of a member State of the Central Commission for the Navigation of the Rhine, or d) must have had not less than four years' experience in inland navigation and hold a certificate of proficiency recognised by the Central Commission for the Navigation of the Rhine as equivalent to the Principal Licence in accordance with the Rhine Licensing Regulations, permitting him to act as helmsman on vessels on other inland waterways.
Boatmaster	must hold the licence required under the Rhine Licensing Regulations.
Engineer	a) must be at least 18 years of age and have passed an examination on completion of a full training course in the engine and mechanics sectors, or b) must be at least 19 years of age and have worked for not less than two years as an engine-minder on a motorised inland navigation vessel

Sava River Commission

Rules on minimum manning requirements for the vessels on the Sava river basin

Article 2.1 - Crew Members

1. The minimum crew of a vessel, ensuring the safety of its operation, may consist of the following crew members:

(i) Boatmaster;
(ii) Chief Mate;
(iii) Helmsman;
(iv) Boatswain;
(v) Ordinary crewman;
(vi) Engineer;
(vii) Engine-minder.

Article 2.2 - Minimum Requirements for Crew Members

Function	Requirement
1. Boatmaster	a) means the person referred to in the Article 1.02 of the Navigation Rules on the Sava River Basin who has the necessary aptitude and qualifications to navigate a vessel on the Sava River waterway as well as the general responsibility for the ship and navigation; b) shall hold a boatmaster's license issued in accordance with the Rules on Minimum Requirements for the Issuance of Boatmaster's Licenses on the Sava River Basin.
2. Chief Mate	a) means the person in charge for navigational watch who has the necessary aptitude and qualifications to navigate a vessel on the Sava River waterway and who has nautical responsibility on board during the watch. b) shall hold a boatmaster's license issued in accordance with the Rules on Minimum Requirements for the Issuance of Boatmaster's Licenses on the Sava River Basin.

3. Helmsman:	a) shall have not less than one year of navigation service on board of the motorised vessel in inland navigation as an boatswain or not less than three years of navigation service on board of the motorised vessel as an ordinary crewman including not less than one year in inland navigation and two years either in inland navigation or at sea, or b) shall have successfully completed vocational training and have passed final examination approved by the competent authority, provided that the training includes navigation service in inland navigation as a helmsman-apprentice or as an ordinary crewman for a period determined by the competent authority.
4. Boatswain:	a) shall have not less than one year of navigation service in inland navigation as an ordinary crewman and - have successfully completed the vocational training and have passed the final examination at a professional college of inland navigation or a correspondence course approved by the competent authority to be taken in the preparation of an equivalent diploma, or have passed any other examination for ordinary crewman recognised by the competent authority, or b) shall have successfully completed vocational training referred to in item (a) above of a duration of not less than three years or have passed a final examination following training of not less than three years in a professional college of inland navigation provided the training includes not less than one year of experience in inland navigation, or c) shall have not less than two years of navigation service in inland navigation as an ordinary crewman within the meaning of paragraph 3. item (a).
5. Ordinary crewman:	a) shall be not less than 17 years of age and have passed an examination on completion of the vocational training referred to in paragraph 4 (a) above, or have passed any other examination for ordinary crewman recognised by the competent authority, or b) shall have not less than three years of navigation service as a member of the vessel's deck department, including not less than one year in inland navigation and two years either in inland navigation or at sea.
6. Engineer:	a) Shall be at least 18 years of age and have passed an examination on completion of a full vocational training course in the engine or mechanics sectors, or b) Shall have worked for not less than two years as an engine-minder on a motorised inland navigation vessel.
7. Engine-minder:	Shall be not less than 17 years of age and either: a) be an ordinary crewman and have passed an engine-minder's examination recognised by the competent authority, or b) have not less than one year of navigation service on board of a motorised inland navigation vessel as an ordinary crewman and have a basic knowledge of engines.

DONAUKOMMISSION *not available in English language*

8. Sitzung der Kleinen Gruppe zur Vereinheitlichung der Schiffsführerzeugnisse
5. – 6. November 2012
Neue Fassung von Kapitel 23

BESATZUNG UND PERSONAL
der „Empfehlungen über die technischen Vorschriften für Binnenschiffe"

a) Schiffsführer;
b) Steuermann;
c) Bootsmann;
d) Matrosen-Motorwart;
e) Matrose;
f) Leichtmatrose;
g) Decksmann;
h) Elektromechaniker;
i) Maschinist;
j) Funker.

Function	Requirement
Schiffsführer	der Besitz eines auf der Grundlage der „Empfehlungen der Donaukommission über Schiffsführerzeugnisse" erteilten Schiffsführerzeugnisses für die Führung von Binnenschiffen oder eines als gleichwertig anerkannten Schiffsführerzeugnisses.
Steuermann	a) eine Fahrzeit in der Binnenschifffahrt von mindestens einem Jahr als Bootsmann oder von mindestens drei Jahren als Matrose nach oder b) erfolgreicher Abschluss einer Ausbildung, wenn diese Ausbildung eine Fahrpraxis in der Binnenschifffahrt als Steuermann-Lehrling oder Matrose während einer von der zuständigen Behörde festgelegten Zeit einschließt, oder c) eine andere mit Erfolg abgelegte, von der zuständigen Behörde anerkannte Steuermannsprüfung
Bootsmann	a) eine Fahrzeit in der Binnenschifffahrt von mindestens einem Jahr als Matrose und • ein erfolgreicher Abschluss der Ausbildung oder • eine mit Erfolg abgelegte Abschlussprüfung an einer Binnenschifferberufsschule oder einer gleichwertigen, staatlich anerkannten Ausbildungsstätte oder • eine andere mit Erfolg abgelegte, von der zuständigen Behörde anerkannte Matrosenprüfung Bootsmannprüfung oder b) ein erfolgreicher Abschluss einer mindestens dreijährigen Ausbildung oder eine mit Erfolg abgelegte Abschlussprüfung nach einer mindestens dreijährigen Ausbildung an einer Binnenschifferberufsschule, wenn diese Ausbildung eine Fahrzeit in der Binnenschifffahrt von mindestens einem Jahr einschließt oder c) eine Fahrzeit in der Binnenschifffahrt von mindestens zwei Jahren als Matrose.

Function	Requirement
Matrosen-Motorwart	ein Mindestalter von 17 Jahren und a) die Befähigung als Matrose und eine von der zuständigen Behörde anerkannte, mit Erfolg abgelegte Prüfung als Matrosen-Motorwart, oder b) eine Fahrzeit von mindestens einem Jahr als Matrose auf einem Binnenschiff mit eigener Triebkraft und nachgewiesene Grundkenntnisse in der Motorenkunde und Mechanik.
Matrose ein	a) Mindestalter von 17 Jahren und • ein erfolgreicher Abschluss der Ausbildung oder • eine mit Erfolg abgelegte Abschlussprüfung an einer Binnenschifferberufsschule, wenn diese Ausbildung eine Fahrpraxis in der Binnenschifffahrt einschließt oder • eine andere mit Erfolg abgelegte, von der zuständigen Behörde anerkannte Matrosenprüfung, oder b) ein Mindestalter von 19 Jahren und eine Fahrzeit als Angehöriger der Decksmannschaft von mindestens drei Jahren; davon müssen mindestens ein Jahr in der Binnenschifffahrt und zwei Jahre in der Binnenschifffahrt oder in der See- oder Küstenschifffahrt abgeleistet sein.
Leichtmatrose	Ein Mindestalter von 15 Jahren und ein vertraglich geregeltes Lehrverhältnis mit Besuch einer Binnenschifferberufsschule oder mit Teilnahme an einem von der zuständigen Behörde anerkannten Fernkurs, der auf ein gleichwertiges Abschlusszeugnis vorbereitet. Er darf nur unter Aufsicht einer ausgebildeten Person an Bord arbeiten.
Decksmann	Ein Mindestalter von 16 Jahren . Er darf nur unter Aufsicht einer ausgebildeten Person an Bord arbeiten.
Elektromechaniker	*Besatzungsmitglied gemäß der nationalen Gesetzgebung* a) Ein Mindestalter von 18 Jahren und eine mit Erfolg abgelegte Abschlussprüfung eines Berufsausbildungskurses auf dem Gebiet der Schiffselektromechanik. Oder b) ein Mindestalter von 18 Jahren und eine von der zuständigen Behörde festgelegte Fahrzeit als Mitglied der Besatzung.
Maschinist	a) ein Mindestalter von 18 Jahren und eine mit Erfolg abgelegte Abschlussprüfung eines Berufsausbildungskurses in Motorenkunde und Mechanik, oder b) ein Mindestalter von 18 19 Jahren und eine von der zuständigen Behörde festgelegte Fahrzeit und eine Fahrzeit von mindestens zwei Jahren als Matrosen-Motorwart auf einem Binnenschiff mit eigener Triebkraft.
Funker [2]	*Besatzungsmitglied gemäß der nationalen Gesetzgebung*: Ein Mindestalter von 18 Jahren und eine mit Erfolg abgelegte Abschlussprüfung eines Berufsausbildungskurses auf dem Gebiet des Schifffahrtsfunks und eine von der zuständigen Behörde festgelegte Fahrzeit als Mitglied der Besatzung. oder Abschluss einer entsprechenden, mindestens zweimonatigen Probezeit an Bord von Binnenschiffen.

UN-ECE Resolution No. 61 (23-2.1)

The minimum crew of a vessel, ensuring the safety of its operation, may consist of the following crew members:

a) Boatmaster;
b) Helmsmen;
c) Able crewmen;
d) Ordinary crewmen;
e) Engineer;
f) Electrician-engineer;
g) Engine-minder;
h) Radio operator. *In accordance with the national rules of the Russian Federation and Ukraine only*

On inland waterways, where national or international legislation so allows, the minimum crew of vessels, ensuring the safety of its operation may also include apprentices and deck-hands.

Function	Requirement
Boatmaster	Shall hold a boatmaster's certificate issued in accordance with the Recommendations on Minimum Requirements for the Issuance of Boatmaster's Certificates in Inland Navigation with a view to their Reciprocal Recognition for International Traffic (Resolution No. 31 of 12 November 1992, revised).
Helmsman	Shall be not less than 17 years of age and a) Shall have had not less than one year's experience in inland navigation as an able crewman or not less than three years' experience as an ordinary crewman, or b) Shall have successfully completed training provided the training includes experience in inland navigation as a helmsman-apprentice or as an ordinary crewman for a period determined by the competent authority.
Able crewman	a) Shall have had not less than one year's experience in inland navigation as an ordinary crewman and • Have successfully completed the training referred to in 23-2.3.5 below, or • Have passed the final examination of a professional college of inland navigation, or • Have passed any other examination for ordinary crewman recognised by the competent authority, or b) Shall have successfully completed training referred to in 23-2.3.5 below of a duration of not less than three years or have passed a final examination following training of not less than three years in a professional college of inland navigation provided the training includes not less than one year's experience in inland navigation, or c) Shall have had not less than two years' experience in inland navigation as an ordinary crewman.

Function	Requirement
Ordinary crewman	a) Shall be not less than 17 years of age and • Have passed an examination on completion of the training referred to in 23-2.3.5 below, or • Have passed an examination on completion of training in a professional college of inland navigation, or • Have passed any other examination for ordinary crewman recognised by the competent authority, or b) Shall have had not less than three years' experience as a member of the ship's deck department, including not less than one year in inland navigation and two years either in inland navigation or at sea, in coastal navigation or fishing.
Apprentice	Shall be not less than 15 years 11 of age and have an apprentice's contract which provides for attendance at a professional college of inland navigation or for a correspondence course approved by the competent authority to be taken in the preparation of an equivalent diploma.
Deck-hand	Shall be not less than 16 years of age. (The age limitation of an apprentice may be higher depending on national legislation)
Engineer	a) Shall be at least 18 years of age and have passed an examination on completion of a full training course in the engine and mechanics sectors, or b) Shall have worked for not less than two years as an engine-minder on a motorised inland navigation vessel.
Electrician-engineer	a) Shall be at least 18 years of age and have passed an examination on completion of a full training course in on-board electrical systems; or b) Shall be at least 18 years of age and have experience of working in a ship's crew for a period determined by the competent authority.
Engine-minder	Shall be not less than 17 years of age and either a) Be an ordinary crewman and have passed an engine-minder's examination recognised by the competent authority, or b) Have had not less than one year's experience on board a motorised inland navigation vessel as an ordinary crewman and have a basic knowledge of engines.
Radio operator	Shall be at least 18 years of age, have passed an examination on completion of a full training course in on-board radio systems and have navigational experience as part of a vessel crew for a period determined by the competent authority, or have completed an appropriate probationary period of at least two months' duration aboard inland navigation vessels.

Annex 4 Interview with Aquapol

Interview organised by the contractors, answered by Ad Hellemons, Director of AQUAPOL on the 13th November 2012.

Block 1: Issues with the variety of existing documents

In AQUAPOL's opinion: Is the variety of existing relevant documents (certificates of competence, sailing licences and service record books) a serious Issue in Inland navigation?
It is. The variety of documents is a serious hindrance for effective control.

How many different relevant manning documents are granted on European waterways? (Sheer number)
If the question refers to the total of issued documents to persons: I have no idea and there are no electronic databases to check that. If the question refers to the number of types of documents I estimate that there are at least 500 different types of manning documents going around in the 27 EU Member States.

Is there a significant number of objections regarding the violation of manning rules and regulations during police-controls on European waterways?
The variety of Documents is a very serious hindrance for effective control. Certainly when the documents are only in the language of the issuing country. Control can easily be avoided, for example by having more than 1 service record book of by presenting documents that are not known abroad.

Is there an existing tool to compare the relevant national manning documents on a reliant legal basis?
AQUAPOL has developed TDW (Transport Documents System for Water Police). This multi-lingual database with transport-over water-related documents was created, because the AQUAPOL members found that control of foreign vessels had become almost impossible due to the endless variety of documents, often only in the language of the country that had issued the document.

Is it desirable/possible to implement a standardised European service record book?
That is certainly desirable. At this moment there are many different types of documents for this purpose (often even differences in the same member state). This makes control difficult, not only because it is impossible to know all variations, but also because it cannot be checked on the spot if a certain document was issued to a certain person. It has shown that a considerable number of persons have more than 1 book on their name, thus faking to be present on board of more than 1 vessel at the same time. It is possible to have one type of document; that only takes a political decision. Compare this to the road transport sector, where EU harmonised documents are quiet common already for many years.

Block 2: Fraud issues / illegal employment

In AQUAPOL's opinion: Are forged documents and illegal employment a serious issue in inland navigation?
They really are. Often we see the combination of both.

What are the immanent dangers of fraud in the sector?
A danger is that crew is not qualified. Another danger is that crew members are exploited in such a way that they make very long working hours (in this context the

German press wrote about "***modern slavery in inland shipping***"). Criminal investigations in the Netherlands have led to convictions of persons of criminal organisations, who organised illegal (extremely cheap) labour from crew members from the Philippines on Dutch inland vessels. In this way organised crime can infiltrate and influence the inland shipping business. Language problems often form risk. Accidents have happened because of this. The total mess in relation to the existing documentations really facilitates fraud.

What are the main varieties in which fraud occurs within inland navigation?
Approached from the sector itself it is mostly about fraud in relation to navigation times, under-qualified crew and lack of crew (reducing costs). There is also fraud, where inland shippers are used in criminal processes, without knowing, for instance when transporting waste that is illegally exported on forged documents.

Are there reliable numbers regarding the amplitude of forged documents illegal employment in the sector?
I do not think these statistics were kept. But from our cross-border AQUAPOL operations in inland shipping (2 per year/in general 3 days per operation), which are only a very minor part of the complete control operations in Europe we know that forged documents are found rather often (40-50 per year) and also illegal employment is found on a regular basis. My estimate is that the time that these were incident lies behind us. It is getting more and more the character of a structured and expanding practice.

Which particular documents have been a subject to fraud?
Service Record Books and documents that must prove qualification for the job.

Block 3: Issues arising from a shortage of manning

In AQUAPOL's opinion: Is a shortage of manning a serious issue in inland navigation?
It is. When there is not enough crew people work for too long hours and perhaps even more important: in crisis situation an adequate response is often not possible. Compare this to road transport where huge fines are issues when a driver drives for only a few hours too long or misses (part of) a rest period between the driving times. And these drivers are checked electronically (digital tachograph) connected to driver card) for the last 28 days of work.

Is it possible to divide all recorded incidents on European waterways between those stressed to human failure and those stressed to other causes?
I think that is not possible and when possible it would cost an enormous amount of time.

In case of Human failure:

Is there a reliable number of incidents that happened due to a not sufficient qualified and trained crew?
These statistics were never kept at EU level. Personally I know of a number of incidents, where under-qualified crew in combination with language problems and another culture (do not comment the captain on his decisions) have led to serious accidents.

Is there a reliable number of incidents that happened as a result of an insufficient amount of crewmembers on board?
I do not know. See previous question.

General comment: The inland shipping industry is 30-40 years behind on the road transport sector in relation to harmonisation at EU level and control practices. (Rules, documents, tachograph, cooperation sector/enforcement). I am under the impression, that many operators in the sector (mostly small, family businesses) like to keep effective control away as far as possible. What they do not realise enough, is that certain operators that start illegal practices (illegal employment/chap labour, insufficient crew etc.) will cause an permanent effect of decreasing transport prices. In the end individual companies have the choice to follow the bad companies or to disappear from the market. I can understand that individual operators think like this, but I have the impression that at sector level the representing associations also still have the same attitude and live in the past. On the long run that is a disaster for the sector as a whole, because nobody will be able to compete anymore, while at the same time respecting the rules.

Annex 5 Data evolution of labour market

Table A 1 Gap between demand and supply per corridor

Year	Danube	Rhine	North-South	East-West	Total Gap
2013	-17	-9,127	2,365	3,633	-3,146
2014	130	-8,959	2,421	3,708	-2,701
2015	252	-8,849	2,450	3,773	-2,373
2016	361	-8,767	2,465	3,830	-2,110
2017	461	-8,704	2,472	3,876	-1,896
2018	553	-8,652	2,469	3,913	-1,716
2019	641	-8,598	2,462	3,945	-1,549
2020	724	-8,562	2,447	3,969	-1,423
2021	798	-8,556	2,420	3,985	-1,353
2022	865	-8,570	2,381	3,997	-1,327
2023	933	-8,590	2,335	4,006	-1,316
2024	998	-8,618	2,283	4,011	-1,325
2025	1,060	-8,665	2,223	4,013	-1,368
2026	1,124	-8,717	2,159	4,016	-1,417
2027	1,188	-8,775	2,093	4,019	-1,474
2028	1,250	-8,849	2,020	4,020	-1,558
2029	1,310	-8,917	1,949	4,023	-1,634
2030	1,370	-8,998	1,872	4,028	-1,728
2031	1,426	-9,091	1,788	4,035	-1,843
2032	1,478	-9,202	1,696	4,042	-1,987
2033	1,527	-9,327	1,597	4,051	-2,152
2034	1,572	-9,460	1,495	4,062	-2,331
2035	1,615	-9,604	1,388	4,075	-2,526
2036	1,651	-9,758	1,276	4,091	-2,740
2037	1,682	-9,923	1,159	4,108	-2,975
2038	1,706	-10,099	1,036	4,128	-3,228
2039	1,724	-10,285	909	4,149	-3,503
2040	1,734	-10,482	777	4,172	-3,799
2041	1,738	-10,686	641	4,197	-4,111
2042	1,736	-10,899	501	4,222	-4,441
2043	1,728	-11,117	357	4,251	-4,781
2044	1,715	-11,341	211	4,280	-5,134
2045	1,695	-11,565	64	4,311	-5,495
2046	1,670	-11,790	-84	4,344	-5,860
2047	1,642	-12,014	-233	4,379	-6,226
2048	1,611	-12,236	-381	4,414	-6,593
2049	1,579	-12,454	-528	4,451	-6,952
2050	1,546	-12,668	-673	4,488	-7,308

Table A 2 Demand of workers per corridor

Year	Danube	Rhine	North-South	East-West	Total Demand
2013	5,930	27,633	6,442	973	40,977
2014	5,982	27,596	6,437	969	40,984
2015	6,031	27,553	6,433	965	40,982
2016	6,077	27,503	6,432	960	40,972
2017	6,121	27,447	6,431	955	40,954
2018	6,161	27,386	6,432	950	40,928
2019	6,198	27,318	6,434	944	40,894
2020	6,232	27,245	6,437	939	40,853
2021	6,264	27,168	6,441	933	40,805
2022	6,293	27,087	6,446	926	40,753
2023	6,320	27,002	6,453	920	40,696
2024	6,345	26,917	6,461	914	40,637
2025	6,369	26,831	6,471	907	40,578
2026	6,391	26,746	6,483	901	40,521
2027	6,413	26,665	6,497	894	40,470
2028	6,435	26,588	6,514	888	40,426
2029	6,458	26,519	6,534	882	40,393
2030	6,481	26,460	6,558	876	40,375
2031	6,506	26,411	6,585	871	40,373
2032	6,533	26,376	6,616	866	40,392
2033	6,564	26,355	6,653	862	40,433
2034	6,597	26,350	6,694	858	40,499
2035	6,634	26,363	6,741	855	40,593
2036	6,675	26,394	6,793	852	40,714
2037	6,720	26,444	6,851	850	40,864
2038	6,769	26,511	6,915	848	41,043
2039	6,823	26,597	6,984	847	41,250
2040	6,880	26,699	7,058	846	41,484
2041	6,942	26,818	7,138	846	41,743
2042	7,006	26,950	7,222	847	42,026
2043	7,075	27,096	7,311	848	42,329
2044	7,146	27,253	7,403	849	42,651
2045	7,220	27,420	7,499	850	42,989
2046	7,296	27,595	7,598	852	43,341
2047	7,374	27,777	7,700	854	43,704
2048	7,454	27,965	7,804	856	44,078
2049	7,535	28,157	7,910	858	44,461
2050	7,618	28,354	8,019	860	44,851

Table A 3 Supply of workers per corridor

Year	Danube	Rhine	North-South	East-West	Total Supply
2013	5,913	18,507	8,806	4,606	37,831
2014	6,112	18,637	8,857	4,677	38,283
2015	6,283	18,704	8,883	4,738	38,608
2016	6,439	18,736	8,897	4,790	38,862
2017	6,582	18,743	8,903	4,831	39,058
2018	6,714	18,734	8,901	4,863	39,212
2019	6,839	18,720	8,896	4,890	39,345
2020	6,956	18,683	8,883	4,907	39,430
2021	7,062	18,612	8,861	4,918	39,452
2022	7,159	18,517	8,827	4,923	39,426
2023	7,253	18,413	8,788	4,926	39,380
2024	7,343	18,299	8,745	4,925	39,311
2025	7,429	18,166	8,694	4,920	39,209
2026	7,516	18,029	8,642	4,917	39,104
2027	7,602	17,890	8,590	4,914	38,995
2028	7,685	17,740	8,535	4,909	38,868
2029	7,768	17,603	8,484	4,905	38,759
2030	7,851	17,462	8,429	4,905	38,646
2031	7,932	17,320	8,373	4,906	38,530
2032	8,012	17,173	8,312	4,908	38,405
2033	8,091	17,027	8,250	4,913	38,281
2034	8,169	16,890	8,189	4,920	38,169
2035	8,249	16,759	8,129	4,930	38,066
2036	8,326	16,636	8,069	4,942	37,974
2037	8,402	16,520	8,010	4,957	37,889
2038	8,475	16,413	7,951	4,976	37,815
2039	8,546	16,312	7,893	4,996	37,747
2040	8,614	16,218	7,835	5,019	37,685
2041	8,680	16,131	7,778	5,043	37,633
2042	8,742	16,051	7,723	5,069	37,585
2043	8,803	15,979	7,668	5,098	37,548
2044	8,861	15,912	7,615	5,129	37,517
2045	8,914	15,855	7,563	5,162	37,494
2046	8,966	15,805	7,514	5,196	37,481
2047	9,016	15,763	7,467	5,233	37,478
2048	9,064	15,728	7,423	5,270	37,485
2049	9,114	15,703	7,382	5,309	37,509
2050	9,163	15,686	7,346	5,348	37,543

Table A 4 New entrants to the sector per year

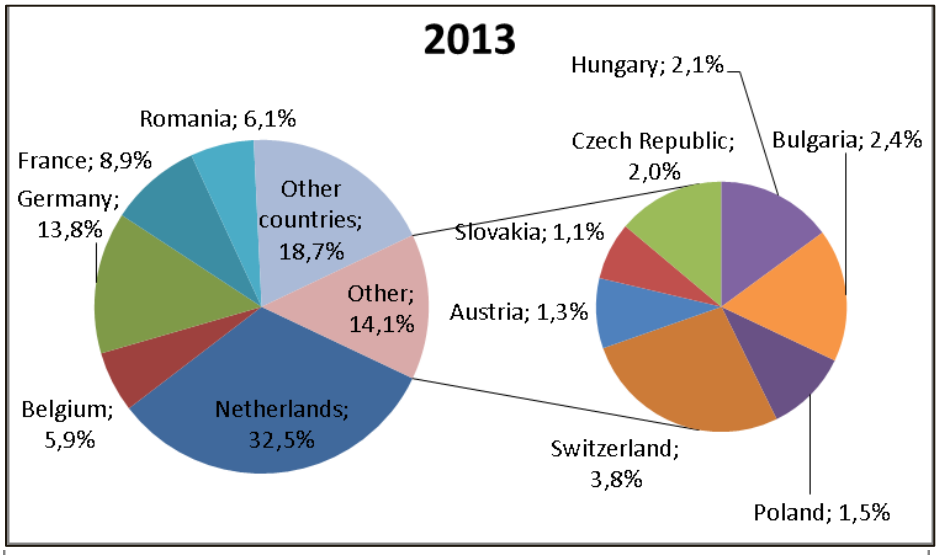
Year	NL	BE	GE	PL	FR	CH	AT	SK	CZ	HU	RO	BU	TOTAL
2013	340	33	152	31	68	8	6	19	31	10	197	28	923
2014	337	32	150	29	65	8	6	18	29	10	187	26	898
2015	337	31	155	28	65	8	6	17	28	9	179	25	889
2016	329	31	158	26	67	8	6	16	26	9	175	24	875
2017	329	31	153	25	68	8	6	15	25	9	172	23	864
2018	332	32	150	24	67	8	6	15	24	9	170	23	857
2019	342	31	149	23	69	8	5	14	24	8	169	22	864
2020	344	31	143	23	69	8	5	14	24	8	170	22	860
2021	352	32	140	22	72	7	5	14	24	8	168	22	866
2022	347	31	138	22	71	7	5	13	24	8	169	22	857
2023	344	31	138	22	70	7	5	13	25	8	169	22	854
2024	342	31	134	22	69	7	5	14	26	8	170	23	851
2025	331	32	132	22	69	7	5	14	27	8	169	23	839
2026	322	32	134	23	70	7	5	14	28	8	171	23	838
2027	319	33	133	23	71	7	5	14	29	8	171	24	838
2028	313	33	130	24	72	8	5	14	29	8	172	24	832
2029	318	34	129	24	73	8	5	15	30	8	172	24	841
2030	318	34	129	25	72	8	5	15	31	8	173	24	842
2031	317	34	129	25	72	8	5	15	31	9	172	24	841
2032	310	34	129	25	72	8	5	15	32	9	172	24	834
2033	305	34	129	25	72	8	5	15	32	9	171	24	829
2034	305	34	130	25	72	8	5	15	32	9	170	24	829
2035	307	34	130	25	71	8	5	15	32	8	170	24	830
2036	309	34	130	25	71	9	5	15	31	8	168	23	830
2037	312	34	130	25	71	9	5	15	31	8	166	23	830
2038	314	34	130	25	71	9	5	15	30	8	165	22	829
2039	316	34	130	24	71	9	5	15	30	8	162	22	827
2040	318	34	129	24	71	9	5	14	29	8	159	21	823
2041	320	34	127	24	71	9	5	14	29	8	157	21	820
2042	322	34	126	23	71	9	5	14	29	8	153	20	816
2043	323	34	125	23	71	9	5	14	28	8	150	20	811
2044	324	34	123	23	71	9	5	14	28	8	146	20	805
2045	326	34	121	22	71	10	5	14	28	8	142	19	800
2046	327	34	119	22	71	9	5	13	28	8	139	19	795
2047	327	34	118	22	71	10	5	13	28	8	136	19	791
2048	328	34	116	22	71	10	5	13	28	8	133	18	786
2049	328	34	115	21	71	10	5	13	28	8	132	18	783
2050	328	34	113	20	71	10	5	12	27	8	132	18	778

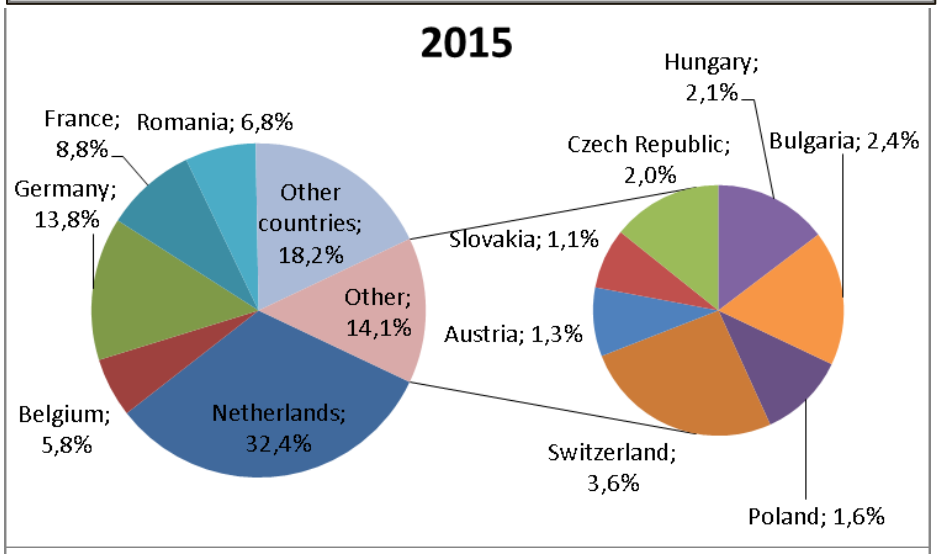
Table A 5 Supply of workers per country per year

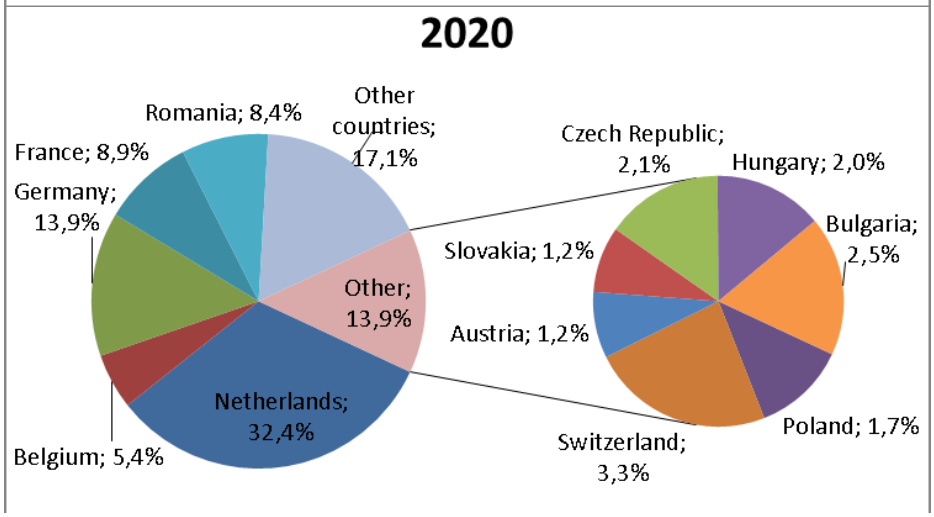
Year	NL	BE	GE	PL	FR	CH	AT	SK	CZ	HU	RO	BU	Other	TOTAL
2013	12,307	2,253	5,219	570	3,324	1,434	482	396	739	794	2,321	912	7,080	37,831
2014	12,404	2,246	5,286	589	3,350	1,419	482	410	757	794	2,485	927	7,133	38,283
2015	12,489	2,234	5,348	606	3,374	1,402	481	422	774	792	2,638	941	7,107	38,608
2016	12,554	2,219	5,403	621	3,396	1,383	479	433	789	789	2,783	952	7,061	38,862
2017	12,608	2,202	5,444	633	3,417	1,361	476	443	801	785	2,921	961	7,006	39,058
2018	12,654	2,182	5,474	644	3,434	1,338	473	451	811	780	3,055	968	6,946	39,212
2019	12,702	2,160	5,495	653	3,450	1,314	469	459	821	773	3,184	975	6,890	39,345
2020	12,744	2,135	5,502	662	3,464	1,287	465	466	829	765	3,312	980	6,819	39,430
2021	12,787	2,108	5,500	669	3,479	1,260	460	471	837	757	3,437	984	6,703	39,452
2022	12,820	2,080	5,490	676	3,490	1,231	454	477	845	749	3,558	987	6,569	39,426
2023	12,844	2,048	5,475	683	3,499	1,201	448	482	853	739	3,679	989	6,439	39,380
2024	12,865	2,017	5,452	689	3,505	1,171	441	487	861	729	3,798	991	6,307	39,311
2025	12,871	1,983	5,425	695	3,510	1,140	435	491	870	718	3,914	993	6,164	39,209
2026	12,867	1,950	5,398	701	3,513	1,109	428	496	880	707	4,032	994	6,030	39,104
2027	12,859	1,917	5,369	709	3,516	1,077	421	502	890	695	4,148	996	5,896	38,995
2028	12,847	1,883	5,337	716	3,519	1,046	414	506	901	684	4,264	998	5,753	38,868
2029	12,842	1,850	5,304	724	3,522	1,014	406	511	912	672	4,379	999	5,624	38,759
2030	12,838	1,817	5,273	734	3,524	983	399	516	924	661	4,495	1,000	5,484	38,646
2031	12,836	1,784	5,244	744	3,524	952	391	521	936	648	4,610	1,002	5,340	38,530
2032	12,831	1,751	5,218	754	3,522	921	383	526	949	636	4,724	1,003	5,188	38,405
2033	12,824	1,718	5,195	765	3,518	891	375	531	962	623	4,838	1,004	5,035	38,281
2034	12,823	1,686	5,178	776	3,514	861	368	537	975	611	4,952	1,005	4,884	38,169
2035	12,828	1,655	5,165	787	3,508	833	361	542	988	599	5,064	1,006	4,732	38,066
2036	12,840	1,625	5,157	799	3,502	804	354	547	1,000	588	5,175	1,006	4,577	37,974
2037	12,859	1,596	5,154	811	3,494	777	348	552	1,012	576	5,286	1,006	4,419	37,889
2038	12,888	1,569	5,156	824	3,484	751	341	557	1,024	564	5,394	1,005	4,257	37,815
2039	12,923	1,544	5,162	837	3,474	725	334	561	1,036	552	5,502	1,004	4,093	37,747
2040	12,965	1,520	5,174	849	3,462	700	328	566	1,047	541	5,606	1,003	3,925	37,685
2041	13,015	1,499	5,189	861	3,448	676	321	570	1,058	529	5,709	1,002	3,756	37,633
2042	13,071	1,479	5,208	874	3,433	652	315	574	1,069	517	5,809	1,000	3,585	37,585
2043	13,133	1,461	5,232	886	3,417	629	308	579	1,080	506	5,906	998	3,413	37,548
2044	13,201	1,447	5,258	899	3,399	606	303	584	1,092	495	6,000	995	3,239	37,517
2045	13,276	1,434	5,287	911	3,380	585	297	588	1,103	483	6,090	993	3,068	37,494
2046	13,355	1,423	5,318	924	3,359	564	291	593	1,116	472	6,177	989	2,897	37,481
2047	13,440	1,416	5,353	936	3,338	544	286	597	1,128	461	6,263	986	2,730	37,478
2048	13,531	1,411	5,389	947	3,316	525	280	601	1,140	450	6,347	984	2,564	37,485
2049	13,627	1,409	5,428	959	3,294	505	275	605	1,153	440	6,430	981	2,404	37,509
2050	13,728	1,409	5,468	970	3,272	487	269	608	1,166	429	6,514	978	2,246	37,543

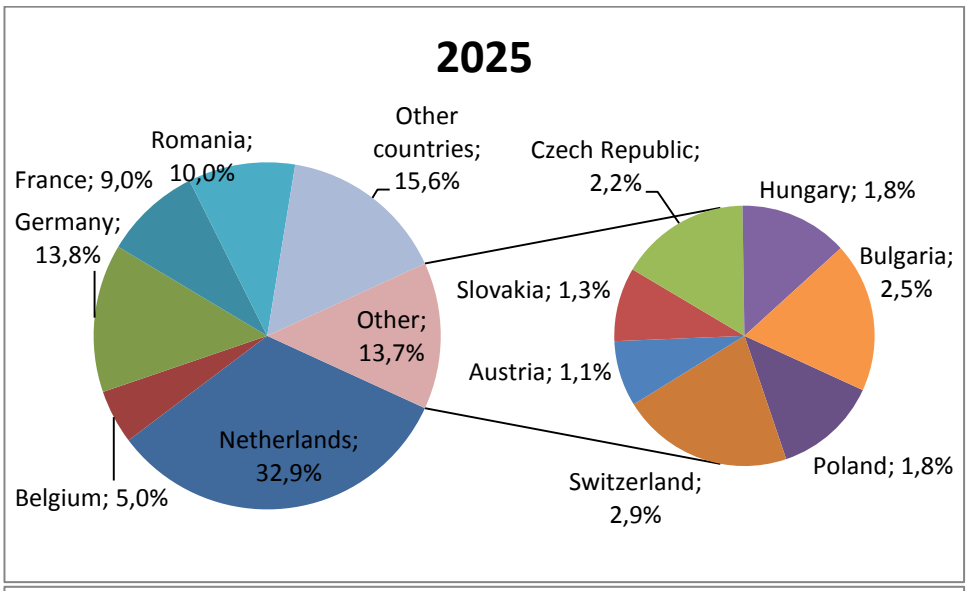
Graphs of the ratios between countries are presented in Annex 6.

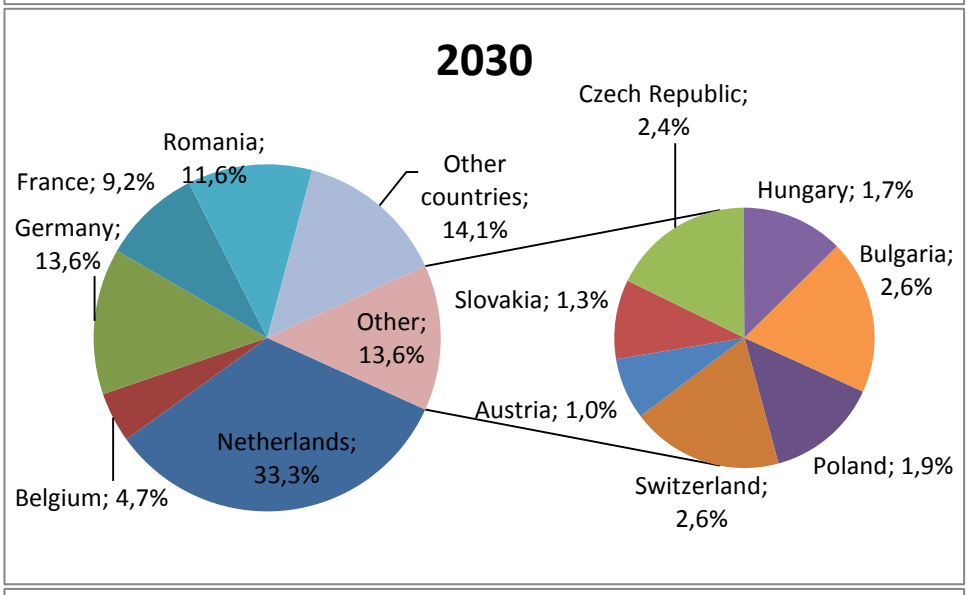
Annex 6 Estimated supply of workers by country and by year

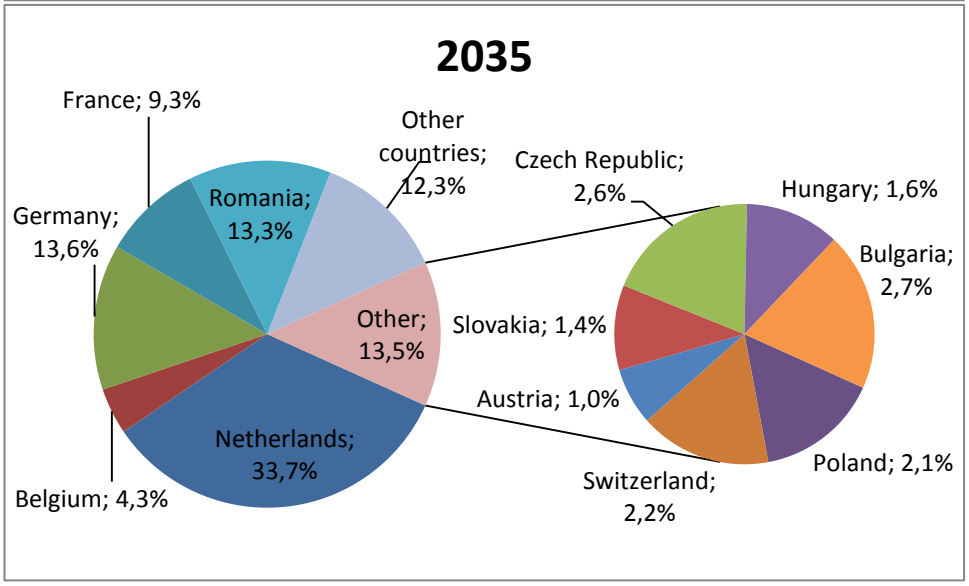


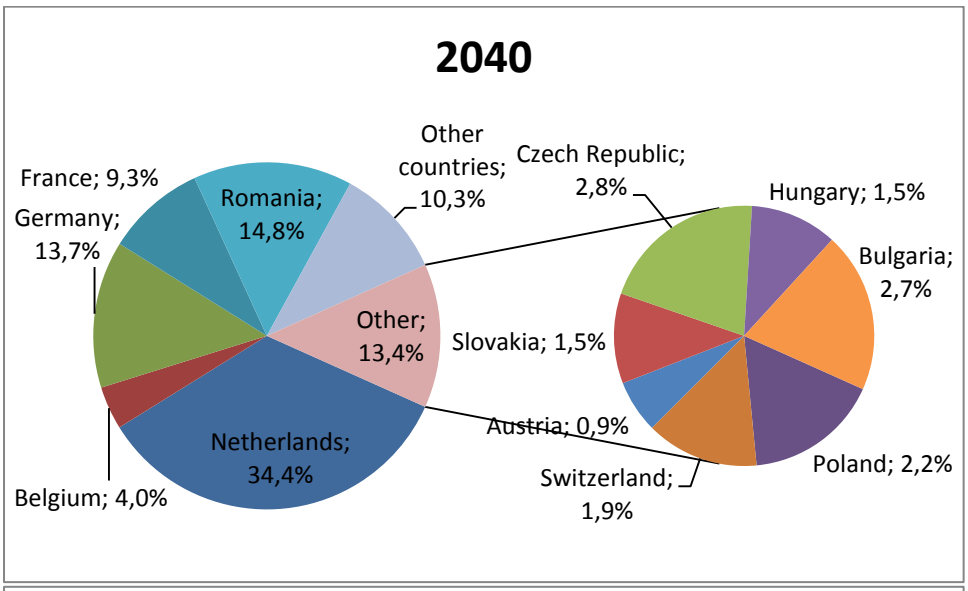


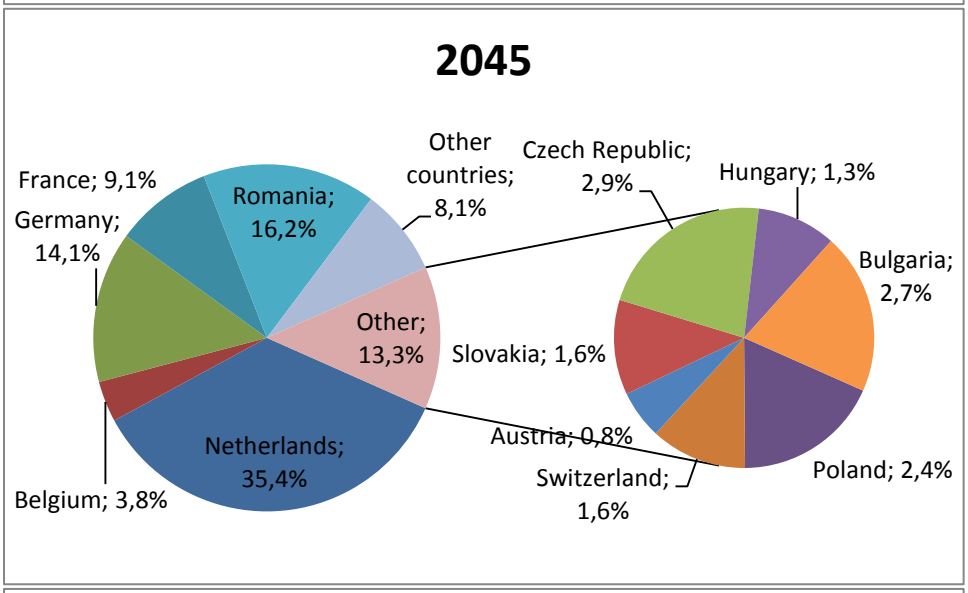


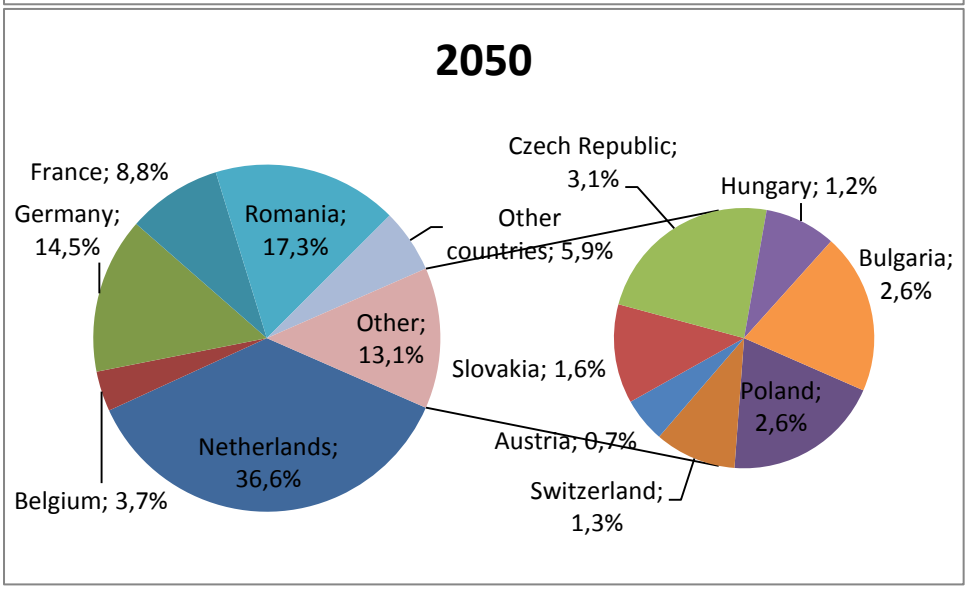

2025
Romania; 10,0%
Other countries; 15,6%
France; 9,0%
Czech Republic; 2,2%
Hungary; 1,8%
Germany; 13,8%
Bulgaria; 2,5%
Slovakia; 1,3%
Other; 13,7%
Austria; 1,1%
Netherlands; 32,9%
Poland; 1,8%
Switzerland; 2,9%
Belgium; 5,0%


2030
Czech Republic; 2,4%
Romania; 11,6%
France; 9,2%
Other countries; 14,1%
Hungary; 1,7%
Germany; 13,6%
Bulgaria; 2,6%
Slovakia; 1,3%
Other; 13,6%
Austria; 1,0%
Netherlands; 33,3%
Poland; 1,9%
Switzerland; 2,6%
Belgium; 4,7%


2035
France; 9,3%
Other countries; 12,3%
Czech Republic; 2,6%
Romania; 13,3%
Hungary; 1,6%
Germany; 13,6%
Bulgaria; 2,7%
Other; 13,5%
Slovakia; 1,4%
Austria; 1,0%
Netherlands; 33,7%
Poland; 2,1%
Switzerland; 2,2%
Belgium; 4,3%


2040
France; 9,3%
Germany; 13,7%
Romania; 14,8%
Other countries; 10,3%
Czech Republic; 2,8%
Hungary; 1,5%
Bulgaria; 2,7%
Other; 13,4%
Slovakia; 1,5%
Austria; 0,9%
Poland; 2,2%
Switzerland; 1,9%
Netherlands; 34,4%
Belgium; 4,0%


2045
France; 9,1%
Germany; 14,1%
Romania; 16,2%
Other countries; 8,1%
Czech Republic; 2,9%
Hungary; 1,3%
Bulgaria; 2,7%
Other; 13,3%
Slovakia; 1,6%
Austria; 0,8%
Poland; 2,4%
Switzerland; 1,6%
Netherlands; 35,4%
Belgium; 3,8%


2050
France; 8,8%
Germany; 14,5%
Romania; 17,3%
Czech Republic; 3,1%
Hungary; 1,2%
Other countries; 5,9%
Bulgaria; 2,6%
Other; 13,1%
Slovakia; 1,6%
Poland; 2,6%
Austria; 0,7%
Switzerland; 1,3%
Netherlands; 36,6%
Belgium; 3,7%

Annex 7 Distribution of the supply of workers

The distribution for workers of EU Member States over corridors has been obtained by analysing the following Eurostat table: "*iww_go_anavefl*"[145] For this analysis, the year 2012 has been used and the regional scope has been limited to NUTS 1-regions. A large set of criteria has been used, in order to make the data suitable to obtain a distribution rate.

1. Only ships from the countries listed in Table 2.1 are taken into account.

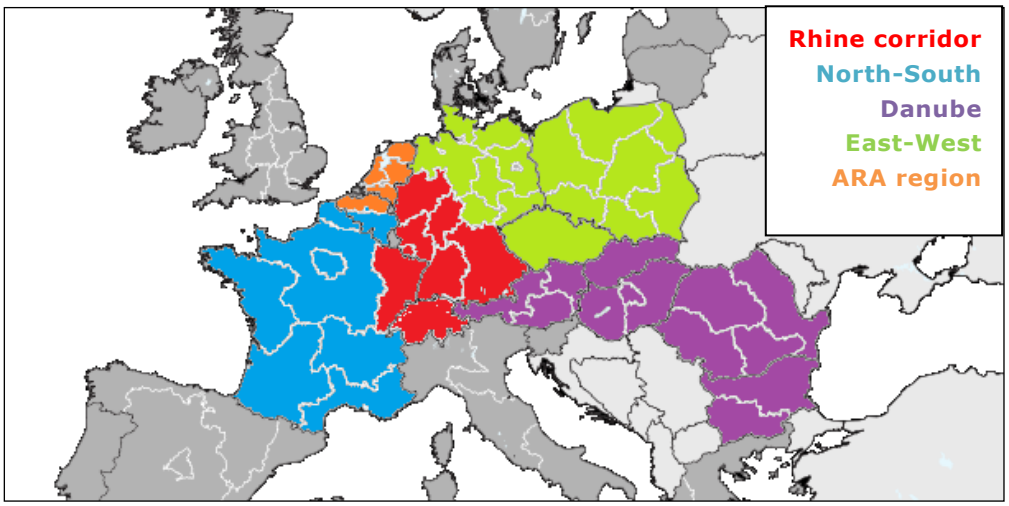
2. A selection has been made; only ships loading **and** unloading in the following countries have been analysed:

a. Austria;	**e.** Czech Republic;	**i.** The Netherlands;
b. Belgium;	**f.** Germany;	**j.** Poland;
c. Bulgaria;	**g.** France;	**k.** Romania;
d. Switzerland;	**h.** Hungary;	**l.** Slovakia

3. Furthermore, only reports by the countries of origin or destination of the vessel are used. This prevented vessels entering the list more than twice. For instance, a ship loading in Belgium and unloading on the German Rhine will be reported in three countries: Belgium, the Netherlands (on transit) and Germany. This way, all reports for ships on transit are left out of the analysis. A correction factor of 0.5 has been used for international traffic, in order to correct for the double reporting of international traffic in the country of origin and the country of destination.

4. All regions (with the exception of the ARA region) have been assigned to a corridor. See Figure A 1 for the overview of regions.[146]

Figure A 1 Overview of regions assigned to corridors



[145] http://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=iww_go_atyvefl
[146] The ARA region is the start of three corridors: the North-South, the Rhine and the East-West corridor. Intraregion traffic can thus not be assigned to a corridor.

5. Traffic (in tonnes) will be assigned to corridors. The following rules apply here:
    a. Traffic from one corridor to another corridor will be equally divided among the corridors, i.e. a ship sailing from Paris (North-South) to Berlin (East-West) will be accounted 50% on the North-South corridor and 50% on the East-West corridor.
    b. Traffic from the ARA-region to any of the corridors has been assigned for 100% to that certain corridor, i.e. a ship sailing from Rotterdam to the Danube will be completely assigned to the Danube region.
    c. Intra corridor traffic will be assigned completely to the corridor, i.e. a ship sailing from Constanta (Danube) to Vienna (Danube) will be accounted for 100% to the Danube corridor.
    d. Traffic within the ARA-region will not be taken into account, as this traffic cannot be assigned to any of the corridors. This area can be seen as the beginning of the North-South, the Rhine and the East-West corridor.

6. For each nationality of vessels, the amount of cargo transported on each of the corridors is summed up.

7. Smaller vessels operate on the North-South and East-West and thus traffic on these corridors is more labour-intensive. A multiplication factor of 1.5 is used for traffic on these corridors for the extra personnel needed.

All these operations led to the corridor distribution of workers as presented below in Table A 6.

Table A 6 Distribution rate of workers in IWT among corridors

	Rhine	North-South	Danube	East-West
Netherlands	74%	18%	1%	7%
Belgium	27%	71%	0%	2%
Germany	52%	1%	3%	43%
Poland	5%	2%	0%	92%
France	2%	97%	0%	0%
Switzerland	90%	7%	0%	3%
Austria	2%	0%	98%	0%
Slovakia	11%	1%	88%	1%
Czech Republic	7%	8%	0%	85%
Hungary	12%	0%	88%	0%
Romania	1%	0%	99%	0%
Bulgaria	3%	0%	96%	1%
Other countries	62%	22%	13%	3%

Source: Panteia, based on Eurostat data (iww_go_anavefl), 2012.

Annex 8 Estimation of effects of language and training on safety for work-related accidents

The following 5 steps have been used to determine the effects of language on safety:

1 Amount of accidents in the Netherlands

The Dutch Labour Inspectorate recorded and analysed work-related accidents on inland freight ships in the Netherlands in the period 2004-2009[147]. Within this period, 66 work-related accidents have been recorded. Workers from Belgium, France, Germany and the Netherlands were involved in 43 cases. Workers from other European countries were victim 19 times and in 4 casualties, workers from outside the European Union were reported.

2 Accident frequencies for the two European groups

The figures in step 1 might implicate that workers from Belgium, France, Germany and the Netherlands are involved in work-related accidents more often than their colleagues from other European countries. In absolute terms, this is true. However, if we compare the amount of casualties per group with the size of the group, a different view will be presented.

The Dutch Human Environment and Transport Inspectorate determined the amount of workers per nationality in the Netherlands in their theme-inspection on language related problems. The results are shown in Table A 7.

Table A 7 Amount of workers per nationality in the Netherlands in 2011

Nationality	Numbers counted in survey of Dutch Inspectorate	Total workers in IWT in the Netherlands[148]	% of total workers in IWT in the Netherlands
Dutch	414	6,473	60%
German	64	1,001	9%
Belgian	32	500	5%
French	14	219	2%
∑ BE + NL + GE	**524**	**8,193**	**76%**
Czech	69	1,079	10%
Polish	38	594	5%
Romanian	25	391	4%
Slovenian	4	63	1%
Hungarian	3	47	0%
Bulgarian	2	31	0%
Spanish	2	31	0%
British	1	16	0%
∑ OTHER EU	**144**	**2,252**	**21%**
Philippine	16	250	2%
Serbian	2	31	0%
Russian	2	31	0%
Ukrainian	2	31	0%
Yugoslavian[149]	1	16	0%
Cape Verdian	1	16	0%
∑ NON-EU	**24**	**375**	**3%**
TOTAL	**692**	**10,820**	**100%**

Source: Dutch Human Environment and Transport Inspectorate, theme inspection language problems (2011)

[147] It was not possible to retrieve information about the amount of accidents per year due to privacy reasons.
[148] Percentage multiplied by amount of workers in IWT in the Netherlands, see Table 2.1
[149] The exact nationality could not be retrieved in the database.

The relative accident frequencies can be obtained by dividing the accident numbers by the amount of years (six years, for the period 2004-2009) and the 'population size' from Table A 7.

Equation 1: Calculation of accident frequencies

Accident frequency:	(Number of accidents recorded / years in time span) / amount of workers * 10,000
Example:	43 accidents for workers from Belgium, France, Germany and The Netherlands within 6 years, for an average of 8,193 workers. 43 / 6 / 8,193 * 10,000 = 8.74

Accident frequency:

BE, DE and NL: 8.74 accidents per 10,000 workers per year
Other Europe: 14.06 accidents per 10,000 workers per year

The accidents frequencies show a different view on safety. Out of every 10,000 workers from Belgium, France, Germany or The Netherlands, each year 8.74 get involved in a work-related accident. For workers from other European countries, this accident frequency can be determined at 14.06. This is 60.8% higher than their colleagues from Belgium, Germany or The Netherlands.

3 Accident frequencies per cause

For every accident that was recorded, the Dutch Labour Inspection determined the causes for these accidents. As often a chain of events is required for an accident to occur, it is not correct to identify one unique cause. However, there are accidents recorded where no cause could be identified. These accidents are recorded with an unknown cause.

Table A 8 shows an overview of possible causes.

Table A 8 Accident causes reported within the timeframe 2004-2009

Nationality	# Accidents	Planning	Availability	Competence	Communication	Conflicting interests	Motivation Commitment	Ergonomics	Material	Unknown	**Σ Causes**
∑ BE + FR + NL + DE	*43*	*10*	*2*	*8*	*7*	*1*	*33*	*5*	*12*	*13*	***91***
∑ Other EU countries	*19*	*1*	*0*	*2*	*3*	*1*	*9*	*1*	*3*	*14*	***34***

Source: Dutch Labour Inspectorate

Table A 8 shows us that significantly more accidents are reported with an 'unknown' cause for workers from other European countries. In order to compare the numbers, a correction has been made for all the accidents with unknown causes by dividing the accidents proportionally among the other causes.

Equation 2: Proportional distribution of unknown accidents over the other groups

Formula:	Amount of accidents per cause + (Amount of accidents per cause / (Total number of accident causes reported – Amount of unknown causes) * Amount of unknown causes reported.
Example:	33 times an accident due to a lack of 'Motivation, Commitment and Awareness' have been reported. 33 + (33 / ((10 + 2 + 8 +7 +1 + 33 +5 +12 + 13) **- 13**) * 13 = 33 + (33 / (91 – 13) * 13 = 33 + 42.3% * 13 = 39

The results of these calculations for all accident causes are shown in table A9.

Table A 9 Accident causes reported within the timeframe 2004-2009[150], corrected for unknown causes.

Nationality	# Accidents	Planning	Availability	Competence	Communication	Conflicting interests	Motivation Commitment	Ergonomics	Material	**∑ Causes**
∑ BE + FR + NL + DE	*43*	*12*	*2*	*9*	*8*	*1*	*39*	*6*	*14*	***91***
∑ Other EU countries	*19*	*2*	*0*	*3*	*5*	*2*	*15*	*2*	*5*	***34***

Source: Panteia (2013), based on data from the Dutch Labour Inspectorate

By dividing the numbers from Table A 9 by the amount of accidents reported per group (43 or 19), the amount of years and the amount of workers per group, the accident frequencies per cause per year per worker can be obtained.

Equation 3: Calculation of the accident frequencies per accident cause

Accident frequency:	**(**Amount of accident causes from Table A 9 / years in time span) / amount of workers * 10,000
Example:	38.5 accidents for workers from Belgium, France, Germany and The Netherlands within 6 years, for 8,193 workers. 38.5 / 6 / 8.193 * 10.000 = 7.83

The results of these calculations are shown in Table A 10.

Table A 10 Accident frequencies per 10.000 workers per year per cause

Nationality	Planning	Availability	Competence	Communication	Conflicting interests	Motivation Commitment	Ergonomics	Material	**∑ Frequencies**
∑ BE + FR + NL + GE	*2.37*	*0.47*	*1.90*	*1.66*	*0.24*	*7.83*	*1.19*	*2.85*	***18.51***
∑ Other EU countries	*1.26*	*0.00*	*2.52*	*3.77*	*1.26*	*11.32*	*1.26*	*3.44*	***24.83***

Source: Panteia (2013), based on data from the Dutch Labour Inspectorate

[150] Numbers are rounded in this table. In further calculations, the unrounded numbers are used.

As accidents can have more than one cause, the numbers have been corrected. For Belgium, France, Germany and The Netherlands, 8.74 accidents per 10.000 workers per year occur. For workers from other EU countries, this number is 14.06. Summing up all the accident frequencies from Table A 10, will give higher numbers than the real accidents frequencies: 18.51 for workers from Belgium, France, Germany and The Netherlands and 24.83 for workers from other EU countries. In order to correct this, we have divided the numbers in Table A 10 by the sum of all accident frequencies and then multiplied the number by the real accident frequency.

Equation 4: Calculation of the corrected accident frequencies per 10.000 workers per year per cause

Accident frequency:	(Accident frequency from Table A 10 / Sum of all accident frequencies from Table A 10) * Real accident frequency
Example:	**Communication mistakes** (1.66 / (2.37 + 0.47 +1.9 + 1.66 + 0.24 + 7.83 +1.19 + 2.85)) * 8.74 = (1.66 / 18.51) * 8.74 = 0.784 accidents per 10.000 workers per year

The results of these calculations are shown in Table A 11.

Table A 11 Corrected accident frequencies per 10.000 workers per year per cause

Nationality	Planning	Availability	Competence	Communication	Conflicting interests	Motivation Commitment	Ergonomics	Material	**∑ Frequencies**
∑ BE + FR + NL + GE	*1.121*	*0.224*	*0.896*	*0.784*	*0.112*	*3.698*	*0.560*	*1.345*	***8.740***
∑ Other EU countries	*0.703*	*0.000*	*1.406*	*2.109*	*0.703*	*6.327*	*0.703*	*2.109*	***14.060***

In this section, we focus on language and training and education related problems. In Table A 8 to Table A 10, all accident causes related to language are marked blue, and all accident causes related to training and education standards are marked red.

It can be observed from Table A 11 that workers from other European countries than Belgium, France, Germany or the Netherlands expose themselves to higher risks: 2.109 vs. 0.784 for language related accidents (factor 2.71) and 8.436 vs. 4.706 for training and education related casualties (factor 1.79).

4 Total amount of accidents caused by the barriers

The total amount of accidents caused by the barriers can be obtained by multiplying the delta[151] of the accident frequencies by the amount of workers on freight ships from other countries than Belgium, France, Germany and The Netherlands in Europe (9,431 as can be observed from Table 2.1)[152].

Equation 5: Calculation of the amount of accidents caused by the barriers

Accidents caused by barriers:	((Δ accident frequencies)/10,000) * Amount of workers from other EU countries
Example on language :	((2.11 – 0.78) /10,000) * 9,431 = 1.25

Barriers on language cause 1.25 work-related accidents per year, and barriers on training and education account for 3.52 work related accidents per year.

5 Economic impact of accidents caused by the barriers

The economic impact of the accidents caused by the barriers in Europe can be obtained by multiplying the amount of accidents per year by the economic impact of a work-related accident (€ 364,675 as can be observed from Annex 10).

Equation 6: Calculation of the amount of accidents caused by the barriers

Economic impact:	(# of accidents caused by barriers) * Economic impact of accidents
Example on language:	1.25 * € 364,675 = € 455,578

The monetary impact of the safety effect of language differences adds up to € 455,578 per year.

The monetary impact of the safety effect of non-harmonised training and education adds up to € 1,282,789 per year.

[151] Absolute number of the difference in accident frequencies between workers from Belgium, Germany and The Netherlands and workers from other European countries.
[152] Only Inland Water Freight Transport is taken into account in this calculation.

Annex 9 Estimation of effects of language and training on safety for navigation-related accidents

The following 5 steps have been used to determine the effects of language on safety:

1 Amount of accidents in the Netherlands

The Dutch Human Environment and Transport Inspectorate recorded and analysed navigation-related accidents within the Netherlands in the period 2006-2012[153]. Within this period, 2,290 accidents have been recorded. Ships from Belgium, France, Germany and the Netherlands were involved in 2,079 accidents. Ships from other countries were involved in 211 accidents.

Table A 12 Amount of accidents recorded in the Netherlands per flag of the ship in the period 2006-2012[154]

Flag of ship	Unknown	Other causes (specified)	Operational errors[1]	Communication other causes	Communication miscommunication	Communication VHF-related	External factors[3]	Technical or material[4]	No errors found	Grand Total
Netherlands	30	23	960	25	20	5	370	221	3	1,657
Germany	3	4	119	2	6	1	43	42	-	220
Belgium	6	9	98	5	1	-	39	24	-	182
France	1	0	8	1	0	0	9	1	-	20
Other Countries[155]	9	3	93	5	5	1	61	33	1	211
Total	49	39	1,278	38	32	7	522	321	4	2,290

1 Operational errors include the use of alcohol and/or drugs, wrong decisions, not paying attention, reckless sailing, navigational mistakes, mistakes due to fatigue, and not following procedures.
2 External factors include hindrance from wind, water of currents, operational mistakes by lock and bridge operators, etcetera.
3 Technical and material mistakes include problems with the engine, helm, mechanics, etcetera.

Source: Rijkswaterstaat, Dutch Human Environment and Transport Inspectorate

2 Accident frequencies for the two European groups

The figures in step 1 might implicate that ships from Belgium, France, Germany and the Netherlands are involved in navigation-related accidents more often than ships from other European countries. In absolute terms, this is true. However, if we compare the amount of accidents per group with the size of the group, a different view will be presented. In this calculation, the average load capacity of ships from Belgium, France, Germany and the Netherlands is assumed to be 1,271 tonnes per vessel and for ships from other countries, an average load capacity of 1,118 tonnes per vessel has been used[156]. Furthermore, in order to make the amount of vessel kilometres comparable to the numbers in 'iww_tf_vetf', a load factor of 80%[157] and an empty shipping factor of 27.5% have been taken into account[158].

[153] It was not possible to retrieve information about the amount of accidents per year due to privacy reasons.
[154] These are absolute numbers. In order to be compared, one should take into account the transport performance or the amount of kilometers sailed per flag.
[155] Nationalities of the vessels are not specified for other countries. The larger part of these vessels sail under a European flag. Vessels from Serbia and Ukraine are the only non-EU vessels that could possibly have entered. The exact number of accidents caused by vessels sailing under a non-EU flag is estimated as smaller than five.
[156] Based on averages obtained from CCNR Market Observation 2012-I
[157] Panteia (2014), based on freight rate analysis between sept-2009 and march-2014, consisting of 21,693 trips.
[158] This (more or less) equals the ratio between loaded and unloaded vessel kilometres in the Eurostat table 'iww_tf_vetf'.

Table A 13 Transport performance and vesselkms in the Netherlands per flag of ship (2006-2012)

Flag	Transport performance average 2006-2012 (mln tonnekm)	Share of total	Load capacity avg.	Vessel km (mln) per flag[159]	Share of total vessel km
FRANCE	393	0.89%	850	0.797	1.32%
BELGIUM	5,175	11.77%	943	9.460	15.65%
GERMANY	5,071	11.53%	1,170	7.475	12.36%
THE NETHERLANDS	31,604	71.86%	1,377	39.572	65.45%
Σ BE + DE + FR + NL	**42,243**	**96.05%**	**1,271**	**57.304**	**94.77%**
LUXEMBOURG	457	1.04%	847	0.930	1.54%
POLAND	49	0.11%	519	0.163	0.27%
CZECH REPUBLIC	83	0.19%	587	0.244	0.40%
SWITZERLAND	668	1.52%	1,698	0.678	1.12%
OTHER COUNTRIES	481	1.09%	725	1.144	1.89%
Σ OTHER COUNTRIES	**1,738**	**3.95%**	**1,118**	**3.160**	**5.23%**
ALL FLAGS	43,981	100%	1,254	60.464	100.00%

Source: Eurostat, 2006-2012 (http://appsso.eurostat.ec.europa.eu/) and Market observation 2012-1.

Equation 5 Calculation of vessel kilometres from tonne kilometres

Vessel kilometres :	(tonne kilometres / (avg. load capacity * load factor)) / (1 – empty shipping factor)
Load factor:	80%
Empty shipping factor:	27,5%
Example:	(42,243 / (1,271 * 80%)) / (1-27.5%) (42,243 / 1,016) / (1-0.275) = 50.48 million vessel kilometres

The relative accident frequencies can be obtained by dividing the accident numbers by the amount of years (7, for the period 2006-2012) and the amount of vessel kilometres from Table A 12.

Equation 6: Calculation of accidents frequencies

Accident frequency:	**(**Number of accidents recorded / years in time span) / vessel Kilometres
Example:	(1657 + 220 + 182 + 20) accidents for ships from Belgium, France, Germany and the Netherlands within 7 years, for an average of 57.3 mln vessel kilometres per year. 2079 / 7 / 57,3 = 5.183 accidents per mln vessel kilometres

Accident frequencies:

BE, FR, GE and NL: 5.183 accidents per 1,000,000 vessel kilometres per year

Other Europe: 9.539 accidents per 1,000,000 vessel kilometres per year

These accidents frequencies show a different view on safety. In every 1,000,000 vessel kilometres originating from Belgium, France Germany or The Netherlands per year, 5.18 ships get involved in an accident. For ships from other European countries, the accident

[159] Vessel kilometres (in millions) are obtained by dividing the transport performance by the average vessel load capacity, taking into consideration a load factor of 80% and an empty shipping factor of 27,5%.

frequency is 9.54 accidents per 1,000,000 vessel kilometres per year. This is 84.1% higher than ships from Belgium, Germany or The Netherlands.

3 Accident frequencies per cause

Rijkswaterstaat determined the causes for every accident that was recorded, as can be observed from Table A 12.

By dividing the accident numbers from Table A 12 by the amount of vessel kilometres reported per group (Table A 13) and the amount of years involved (2006-2012, thus 7), the accident frequencies per cause per year per million vessel kilometres can be obtained.

Equation 7 Calculation of accident frequencies from Table A 12 and Table A 13.

Accident frequency:	**(**Number of accidents recorded / years in time span) / vessel Kilometres
Example:	(960 + 119 + 98 +8) accidents for ships from Belgium, France Germany and the Netherlands within 7 years, for an average of 57.3 mln vessel kilometres per year. 1185 / 7 / 57,3 = 2.95 accidents per mln vessel kilometres

The results of these calculations for each cause and the two groups are shown in Table A 14.

Table A 14 Accident frequency recorded in the Netherlands per million vessel kilometres per flag of the ship in the period 2006-2012

Flag of ship	Unknown	Other causes	Operational mistakes	Communication other causes...	Communication miscomunnuication	Communication VHF-related	No mistakes found	External factors	Technical or material	Grand Total
Σ NL+DE+BE+FR	0.100	0.090	2.954	0.082	0.067	0.015	1.149	0.718	0.007	5.183
Σ OTHER COUNTRIES	0.407	0.136	4.204	0.226	0.226	0.045	2.758	1.492	0.045	9.539

Source: Panteia (2013), based on data received from Rijkswaterstaat

In this section, we focus on language and training and education related problems. In Table A 14, all accident causes related to language are marked blue, and all accident causes related to training and education standards are marked red. It can be observed from Table A 14 that ships from other countries than Belgium, Germany or The Netherlands have higher risks: 0.150 vs. 0.452 for language related accidents (factor 3.022) and 2.954 vs. 4.204 for training and education related casualties (factor 1.423).

4 Total amount of accidents caused by the barriers

The total amount of accidents caused by the barriers, can be obtained by multiplying the delta[160] of the accident frequencies by the average amount of vessel kilometres in Europe of other ships than ships from Belgium, France, Germany or The Netherlands.

Within 2006-2012, an average of 142,961 million tonne kilometres per year were transported on the European Inland Waterways[161]. Ships from Belgium, France, Germany or The Netherlands contributed for 118,622 million tonne kilometres, equalling 83% of the grand total. Thus, ships from other countries accounted for 24,339 million tonne kilometres, 17% of the total.

In million vessel kilometres, taking into consideration the same assumptions as in step 2[162], the ratios change slightly: ships from Belgium, France, Germany and The Netherlands contribute for 169 million vessel kilometres. For ships from other countries, this number is 58.96 million vessel kilometres.

Equation 8 Calculation of the total amount of accidents in Europe caused by the barriers

Accidents caused by barriers:	(Δ accident frequencies) * vessel kilometres
Example on training:	(4.20 – 2.95) * 58.96 = 73.72

Barriers on language cause 17.84 accidents per year, and barriers on training and education account for 73.72 navigation related accidents per year.

5 Economic impact of accidents caused by the barriers

The economic impact of the accidents caused by the barriers in Europe can be obtained by multiplying the amount of accidents per year, by the economic impact of a navigation -related accident.

The external costs for accidents are approximately € 0.0003 per tonne kilometre for IWT[163]. With an average of 44.0 billion tonne kilometres made in the Netherlands each year[164] and 327[165] accidents occurring each year, this means each accident costs € 40,357[166].

Equation 9: Calculation of economic impact of accidents

Economic impact:	(# of accidents caused by barriers) * Economic impact of accidents
Example on training:	73.72 * € 40.357 = € 2.975.154

The monetary impact of the safety-effects of language differences adds up to € 719,892 per year. The monetary impact of the safety-effects of non-harmonised training and education adds up to € 2,975,154 per year.

[160] Absolute number of the difference in accident frequencies between ships from Belgium, Germany and The Netherlands and ships from other European countries.
[161] Eurostat, iww_go_anave, average for 2006-2012.
[162] Vessel kilometres (in millions) are obtained by dividing the transport performance by the average vessel load capacity, taking into consideration a load factor of 80% and an empty shipping factor of 27,5%.
[163] http://www.ebu-uenf.org/fileupload/GREENING%20TRANSPORT.pdf
[164] Average of 2006-2012 (iww_go_atygo07 + iww_go_atygo)
[165] The total amount of accidents from table A11 divided by the amount of years involved (seven).
[166] (44 billion ton kilometres * 0,0003 €/ accident) / 327 accidents per year = € 40,357 per accident.

Annex 10 Monetary valuation of work-related accidents

Table A 15 Economic Impact of Accidents

Type of accident	# Accidents	Death	Permanent injury	Recoverable injury	Unknown injury	Economic Impact
Infringement	13	0%	81%	19%	0%	€ 2,830,377
Fall of deck, roof, dock or platform	6	13%	7%	67%	13%	€ 1,817,889
Contact with streaking object	6	6%	19%	25%	50%	€ 1,148,165
Drowning	6	81%	0%	19%	0%	€ 9,832,008
Fall of height - unprotected	5	14%	29%	43%	14%	€ 1,875,945
Contact with swinging objects	5	25%	25%	38%	13%	€ 2,898,883
Contact with falling objects (not from cranes)	4	0%	33%	33%	33%	€ 409,622
Other	4	0%	6%	33%	61%	€ 139,512
Fall from ladder or stairs	3	8%	31%	46%	15%	€ 747,866
Collision with vehicle	2	0%	33%	33%	33%	€ 204,811
Hit by rolling or sliding object	2	0%	67%	33%	0%	€ 366,876
Contact with object that is been used	2	0%	67%	33%	0%	€ 366,876
Fall at level	1	0%	8%	69%	23%	€ 40,072
Contact with falling objects from cranes	1	0%	29%	43%	29%	€ 90,829
Contact with hand tools	1	0%	0%	50%	0%	€ 10,686
Contact with moving part of machines	1	8%	62%	23%	8%	€ 324,088
Stumbling against something	1	0%	6%	33%	61%	€ 34,878
In/on moving vehicle with lose of control	1	11%	56%	11%	22%	€ 377,596
Contact with electricity	1	0%	6%	33%	61%	€ 34,878
Contact with hazardous substance due to leakage	1	20%	40%	20%	20%	€ 516,715
Total	**66**	**9**	**23**	**22**	**12**	**€ 24,068,574**
Average						**€ 364,675**

Source: Panteia (2013), based on data from Dutch Labour Inspectorate

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Terms and descriptions

Terminology that has been used in the report text, is explained in the table below.

Term	Description
Administrative burden	Administrative costs are the costs incurred by enterprises, the voluntary sector, public authorities and citizens in meeting legal obligations to provide information on their activities (or production), either to public authorities or to private parties. A distinction must be made between information that would be collected by an entity even in the absence of the legislation and information that would not be collected without the legal provisions. The costs generated by the latter type of information are often called administrative burdens.
Boatmaster	A person with the responsibility associated with serving as captain or skipper on board of inland waterway ships and ensuring that all functions within the designated area of responsibility are properly performed.
Directive 96/50/EC	Council Directive 96/50/EC of 23 July 1996 on the harmonisation of the conditions for obtaining national boatmasters' certificates for the carriage of goods and passengers by inland waterway in the Community.
EU legal instrument	The instruments available to the European institutions to carry out their tasks are listed EU Treaty. The relevant instruments for this initiative are: (i) regulations: these are binding in their entirety and directly applicable in all Member States; (ii) directives: these bind the Member States as to the results to be achieved; they have to be transposed into the national legal framework and thus leave margin for manoeuvre as to the form and means of implementation.
Internal market	The establishment of an "internal market" (i.e. an area without internal frontiers in which the free movement of goods, persons, services and capital is ensured) is a central objective of the European Union. This requires, among other things, the harmonisation of rules set at Member State level.
Job quality	The term 'job quality' refers to a range of inter-connected employment concerns, including job satisfaction; remuneration levels; job security; social protection; safety and health concerns; human resource development; management and organisation; and freely chosen employment.
Labour mobility	Labour mobility is the movement of workers between EU member states allowing workers to perform duties on vessels sailing in the EU inland waterway system without restriction[167].
Local Knowledge Requirements (LKR)	Specific knowledge required on a river section which goes beyond the knowledge obtained through the regular training and certification processes.
PLATINA	The PLATINA project is a major trans-European project for the promotion of inland navigation. Launched by the European Commission on 1 October 2008, PLATINA was designed as a platform to provide support for the implementation of the NAIADES European inland navigation programme. More on http://www.naiades.info/platina.

[167] See also "free movement of workers" website: http://ec.europa.eu/social/main.jsp?langId=en&catId=457

Professional qualifications	A license or patent earned by a person to assure qualification to perform a job or task. The document is issued by a Member State or a River Commission allowing a worker to operate in a vessel working on inland waterways.
Service Record Book (SRB)	Personal (held) register with qualification, physical and mental fitness and service time. A paper way of a worker recording detail of the work history.
Small and medium-sized enterprises (SME)	Enterprises which employ fewer than 250 persons and which have an annual turnover not exceeding 50 million Euro, and/or an annual balance sheet total not exceeding 43 million Euro.
River Speak	A standardised language that can be used on all European waterways and can be helpful especially if there are situations of misunderstanding. It can consist of navigation terms, both ship-ship and ship-shore, as well as of intra-ship communication, e.g. from nautical to social speak.
Electronic Service Record Book (e-SRB)	An electronic form of a Service Record Book. Like the traditional SRB, the e-SRB also includes information on qualification, physical and mental fitness and service time. Currently there is not yet a standard for an e-SRB. However, initial systems are developed and tested that are based on a device that can be logged on to by the skipper or the crew member though an on board terminal (GPS), which is linked to a personal webpage in a central server. The connection to the server will be encrypted to guarantee high level of data protection. Data like sailing time, rest time and travels made, will be gathered automatically and transmitted to the central server.

Abbreviations

Abbreviations used in the report text, are presented in the table below.

Abbreviation	Description
AT	Austria
BE	Belgium
CCNR	Central Commission for the Navigation of the Rhine
CESTE	European Committee for the Creation of Technical Standards in the field of inland navigation
CH	Switzerland
CZ	Czech Republic
DC	Danube Commission
DE	Germany
DG MOVE	Directorate General for Mobility and Transport
EBU	European Barge Union
EC	European Commission
EDINNA	Education in Inland Navigation
ESO	European Skippers Organisation
e-SRB	Electronic Service Record Book
EU	European Union
FR	France
HINT	Harmonised Inland Navigation Transport through education and information technology
HR	Croatia
HU	Hungary
ICT	Information and communication technology
ISRBC	International Sava River Basin Commission
ITB	Instituut voor Transport over de Binnenwateren
IWT	Inland Waterway Transport
LK	Local Knowledge
LKR	Local Knowledge Requirement
ML	Management level
NA	Not Available
NAIADES	Navigation and Inland Waterway Action and Development in Europe
NL	Netherlands
NPV	Net Present Value
OL	Operational level
PTC	PLATINA competencies tables
RO	Romania
RPN	Regulations for Rhine navigation personnel
SB	Serbia

Abbreviation	Description
SK	Slovak Republic
SME	Small and Medium-Sized Enterprises
SRB	Service Record Book
STF	Committee on Social issues, Employment and Professional Training
UK	United Kingdom
UNECE	United Nations Economic Commission for Europe
VHF	Very High Frequency