



Addenda

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Addendum n°2: Clarifications on the quantification of safety effects due to competence-based approach

Content of addendum n°1 – administrative costs for examination

1	Background	2
2	Current situation	3
2.1	Boatmasters	3
2.2	Operational workers	3
3	Costs for examination	3
3.1	Boatmasters	3
3.2	Operational workers	4
3.2.1	Administrative exams	4
3.2.2	Practical exams	5
3.2.3	Total costs	5
4	Methodology	6
4.1	Policy option C1	6
4.2	Policy option C2	6
5	Assessing the options	7
5.1	Policy option C1	7
5.1.1	Boatmasters	7
5.1.2	Operational workers	8
5.1.3	Total costs for policy option C1.	11
5.2	Policy option C2	12
5.2.1	Boatmasters	12
5.2.2	Operational workers	13
5.2.3	Total costs for policy option C2.	16



6 Conclusion

17

1 Background

Following the remarks of the Impact Assessment Board, substantial modifications are made and it has a number of consequences on the treatment of impacts. One of the substantial change relates to the fact that it has been decided to provide an option C with two variants (see also table below):

Table 1 Overview of policy options and policy measures

POLICY MEASURES	POLICY OPTIONS			
	A	B	C1	C2
<u>Boatmasters</u>				
1. Business as usual	X	X		
2. Competence-based (c) EU wide minimum requirements (a + b) for boatmasters certificates tested through theoretical and practical exams (d) by an administrative authority for candidates from experience path (d') [and for candidates from education path (d'') under C2] + mutual recognition of boatmaster certificates			a,b,c, d'	a, b, c, d'+d''
3. EU wide minimum competence-based standards for examination of future boatmasters in schools and training institutes implying mutual recognition of their diplomas and certificates			X	
<u>Operational workers</u>				
4. Business as usual	X			
5. Extension of the CCNR system of multilateral agreement		X		
6. Use of new instruments under directive 2005/36/EC (CTT and CTF)		X		
7. EU wide minimum requirements for harmonized qualifications and mutual recognition			X	X
8. EU wide competence-based (a) minimum requirements for candidate-boatmen tested through exam by an administrative authority for candidates using the experience path (b') [and those using the education path (b'') under C2].			a, b'	a, b'+ b''
9. EU wide minimum competence-based standards for examination of candidate-boatmen in schools and training institutes necessary for mutual recognition of their diplomas and certificates			X	
10. Harmonization of required information in SRBs/logbooks + mutual recognition			X	X
<u>Workers from outside the sector</u>				
11. Business as usual	X	X		
12. Mutual recognition of a third path with practical exam that may be introduced by MS			X	X
<u>Knowledge of specific situations (KSS)</u>				
13. Business as usual	X			
14. Commission guidelines on KSS		X		
15. Binding EU criteria framing the use of KSS but leaving the main responsibility to MS			X	X
16. All MS can organise exams and issue authorisation for all KSS in Europe			X	X

Source: European Commission (e-mail by Christelle Rousseau on Monday 16th March)



Policy option C envisages the recognition of professional qualifications based on minimum competence requirements for boatmen and boatmasters. It proposes a regulatory intervention from the EU for mutual recognition of professional qualifications for operational staff at EU level with minimum competence requirements for boatmen and boatmasters. Two options are proposed:

- C1 including examination standards for training and education institutes
Option C1 addresses the use of these competence based-standards both in exams carried by administrative authorities and by education and training institutes to prevent that candidates with a school diploma have to go again through a set of examination to obtain their qualifications.
- C2: excluding examination standards for training and education institutes
It should be emphasized that option C2 addresses the use of competence based-standards only through a mandatory administrative examination but for 100% of the boatmasters and boatmen (i.e. regardless of the fact they use the experience-based path or the education path).

Knowing this, the main difference between the two variants will be at the level of the investment and administrative costs (i.e. savings under C1 due to the possibility of exemption).

2 Current situation

2.1 Boatmasters

In the current situation, obliged practical exams for obtaining a boatmaster certificate are in place for Austria, France, Hungary, Romania and Poland. In other countries, no mandatory practical exam is required to obtain the 96/50/EC Boatmaster license.

2.2 Operational workers

In the current situation, practical exams are in place for boatmen in Poland. In other countries, no mandatory practical exam is required to obtain the function of boatmen.

3 Costs for examination

3.1 Boatmasters

Two options will be considered here:

- **Candidates bring their own ship**
The examination will take two hours and will be carried out by two examiners. These will have to travel 50 kilometres to the candidates' ship. Kilometre costs are obtained from the main report, Table 7.9. No costs are incurred for the candidates' ship.
- **Candidates use a school ship**
A school ship will be chartered (€ 3,577 a day) for the practical examination. The examination will be carried out by two examiners and will last for two hours.

See Table 2 for an overview of costs for practical exams carried out on the candidates' ship and a dedicated school ship.



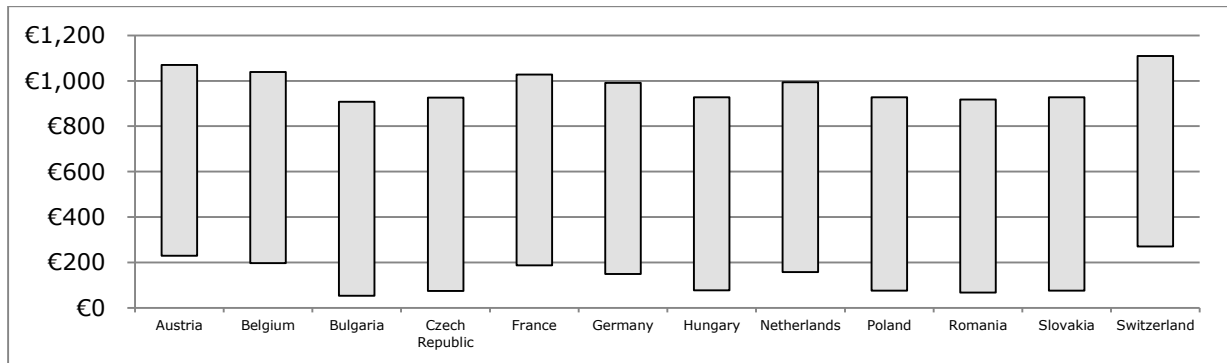
Table 2 Costs for exams in Europe

Total	Factor for examiners costs	Practical exam – own ship	Practical exam – school ship
Belgium	122%	€ 197	€ 1039
Bulgaria	16%	€ 54	€ 908
Czech Republic	41%	€ 74	€ 926
Germany	89%	€ 149	€ 991
Netherlands	100%	€ 158	€ 994
Slovakia	36%	€ 76	€ 928

Source: Panteia

It can be observed that the difference between the minimum costs and the maximum costs are severe, up to € 850 per exam. Figure 1 illustrates the bandwidth of the examination costs.

Figure 1 Bandwidth of costs for practical boatmaster exams in Europe (2013)



Source: Panteia

3.2 Operational workers

3.2.1 Administrative exams

Various options can be considered here:

- **One single administrative exam covering all competences of operational workers, such as in place in Austria;**

In the Netherlands, the costs are € 82.60 per exam.

Source: Memorandum of 28/08/2014

- **Multiple exams, one for each competence, such as in place in the Netherlands.**

If a candidate for a boatmaster license has graduated from an IWT-boatmen educational program, he will benefit from dispensations on certain topics. This concerns four topics:

- *Regulations;*
- *Safety and environment;*
- *Ship construction;*
- *Loading/unloading.*

This means that candidates for an administrative exam for boatmen need to prove the knowledge for which dispensation is given once a boatman with education opts for his boatmaster license. Candidates thus need to pass four administrative exams. In the Netherlands, the costs are € 82.60 per exam and thus € 330.40 in total.

Source: Memorandum of 28/08/2014



3.2.2 Practical exams

Two options will be considered here:

- **Candidates bring their own ship**
The examination will take two hours and will be carried out by two examiners. These will have to travel 50 kilometres to the candidates' ship. No costs are incurred for the candidates' ship.
- **Candidates use a school ship**
A school ship will be chartered (€ 3,577 a day) for the practical examination. The examination will be carried out by two examiners and will last for two hours. No travel costs are incurred.

Costs for examination are calculated based upon the Dutch price level. Here, a € 25 per hour fee is assumed for examiners and a travel costs of € 0,29 per kilometre travelled.

3.2.3 Total costs

The total costs for each type of exam is presented in Table 3.

Table 3 Costs for exams in Europe (2013)

Total	Factor for examiners costs	Administrative exam – single	Administrative exam – multiple	Practical exam – own ship	Practical exam – school ship
Austria	134%	€ 111	€ 442	€ 230	€ 1070
Belgium	122%	€ 101	€ 403	€ 197	€ 1039
Bulgaria	16%	€ 13	€ 53	€ 54	€ 908
Czech Republic	41%	€ 34	€ 135	€ 74	€ 926
France	100%	€ 83	€ 330	€ 188	€ 1028
Germany	89%	€ 74	€ 294	€ 149	€ 991
Netherlands	100%	€ 83	€ 330	€ 158	€ 994
Hungary	28%	€ 23	€ 93	€ 77	€ 927
Romania	16%	€ 13	€ 53	€ 67	€ 917
Slovakia	36%	€ 30	€ 119	€ 76	€ 928

Source: Panteia

This brings a range of options. See Table 4 for the costs options.

Table 4 Costs for the options of exams (2013)

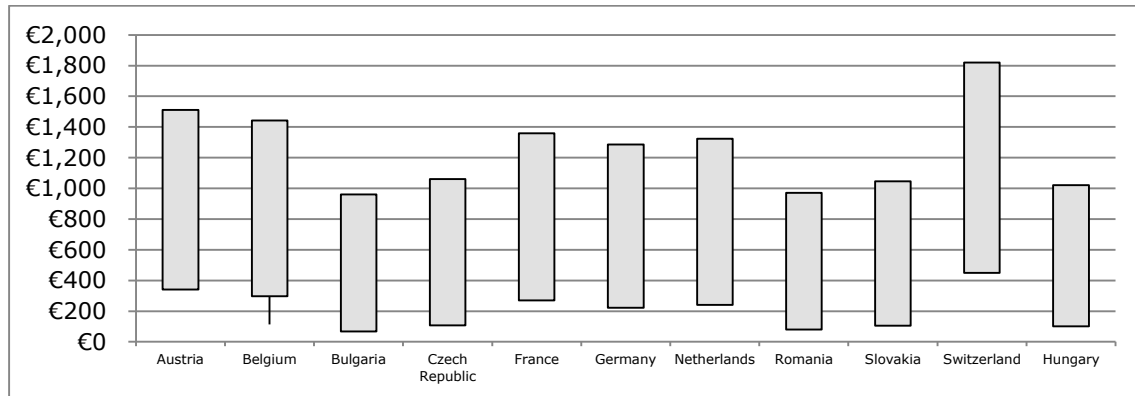
Total	(1) Single exam, own ship	(2) Multiple exams, own ship	(3) Single exam, school ship	(4) Multiple exams, school ship
Austria	€ 341	€ 672	€ 1,181	€ 1,512
Belgium	€ 298	€ 600	€ 1,140	€ 1,442
Bulgaria	€ 67	€ 107	€ 921	€ 961
Czech Republic	€ 108	€ 209	€ 960	€ 1,061
France	€ 271	€ 518	€ 1,111	€ 1,358
Germany	€ 223	€ 443	€ 1,065	€ 1,285
Hungary	€ 100	€ 170	€ 950	€ 1,020
Netherlands	€ 241	€ 488	€ 1,077	€ 1,324
Romania	€ 80	€ 120	€ 930	€ 970
Slovakia	€ 106	€ 195	€ 958	€ 1,047

Source: Panteia



The bandwidth of the costs for examination for boatman is illustrated in Figure 2.

Figure 2 Bandwidth of costs for practical boatmaster exams in Europe (2013)



Source: Panteia

4 Methodology

4.1 Policy option C1

For Policy option C1, the following methodology is applied in order to calculate the administrative costs incurred with the policy option:

1. Based upon the inflow figures per year, the number of boatmasters and operational workers can be estimated. The inflow consists of entrants only from the experience path).
2. The measure only applies to countries listed in section 2.
3. It has been estimated that the lateral entrants account to 0.3% of the total population size.
4. Summing up 15% of the total inflow per year and the population size per target group (boatmaster and operational workers) multiplied by 0.3%, gives us the total number of entrants per year that will do exams to prove their competence.
5. Multiplying the number of participants by the costs (all options considered and average taken) gives the total number of costs per year.
6. This has been discounted over time, using a 4% discount ratio per year.

4.2 Policy option C2

For Policy option C2, the following methodology is applied in order to calculate the administrative costs incurred with the policy option:

1. Based upon the inflow figures per year, the number of boatmasters and operational workers can be estimated. The inflow consists of entrants from both the education path and the experience path).
2. The measure only applies to countries listed in section 2.
3. It has been estimated that the lateral entrants account to 0.3% of the total population size.
4. Summing up the total inflow per year and the population size per target group (boatmaster and operational workers) multiplied by 0.3%, gives us the total number of entrants per year that will do exams to prove their competence.
5. Multiplying the number of participants by the costs (all options considered and average taken) gives the total number of costs per year.
6. This has been discounted over time, using a 4% discount ratio per year.



5 Assessing the options

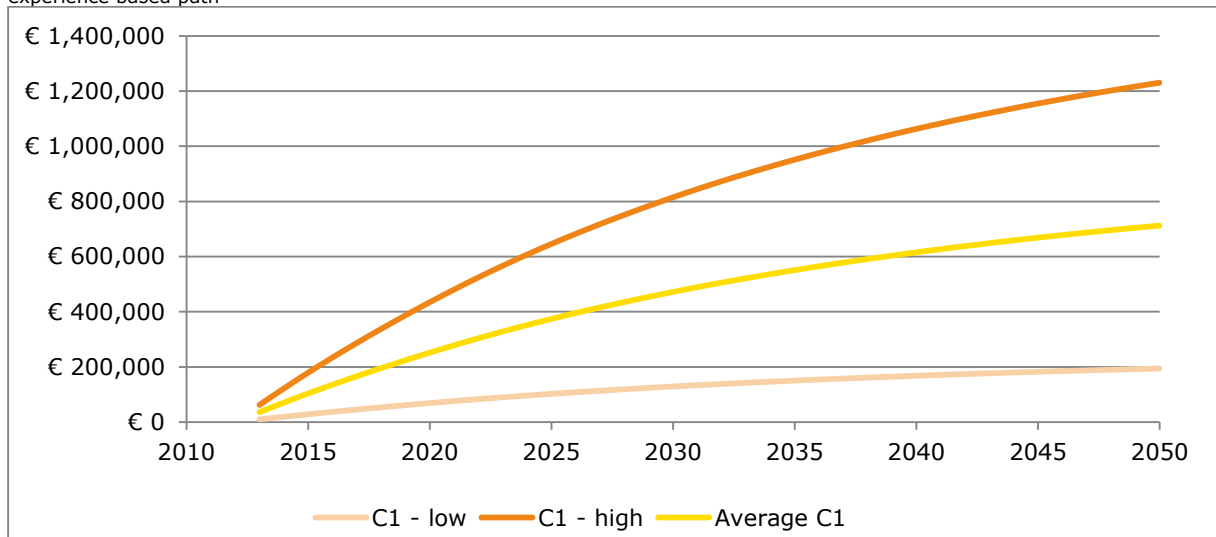
5.1 Policy option C1

5.1.1 Boatmasters

Only boatmaster obtaining their professional qualifications via the experience based path will do a practical exam in case of option C1. Here, differences exist in the total costs. It is more expensive if the exam has to be carried out on a dedicated school ship that needs to be chartered for a day than in case the candidate can use his own ship.

For boatmasters, the NPV is presented in Figure 8.

Figure 8 Net Present Value of administrative costs for a mandatory boatmaster exam for candidates via the experience based path



Source: Panteia

Conclusions

The following conclusions can be drawn from Figure 3. See also Table 6.

- The NPV of measure C1 reaches € 128,940 in 2030 if the candidate can bring his own ship. This will be € 194,153 by 2050.
- This NPV equals € 814,845 in case school ships need to be used. This will be € 1,230,429 by 2050.
- The average NPV for the C1-policy option equals € 471,893 by 2030 and € 712,291 by 2050.

Table 6 NPV's of administrative costs for various options for practical exams for boatmasters entering the sector via the experience based path

Type of ship used	2030	2050
Own ship	€ 128,940	€ 194,153
School ship	€ 814,845	€ 1,230,429
Average	€ 471,893	€ 712,291

Source: Panteia

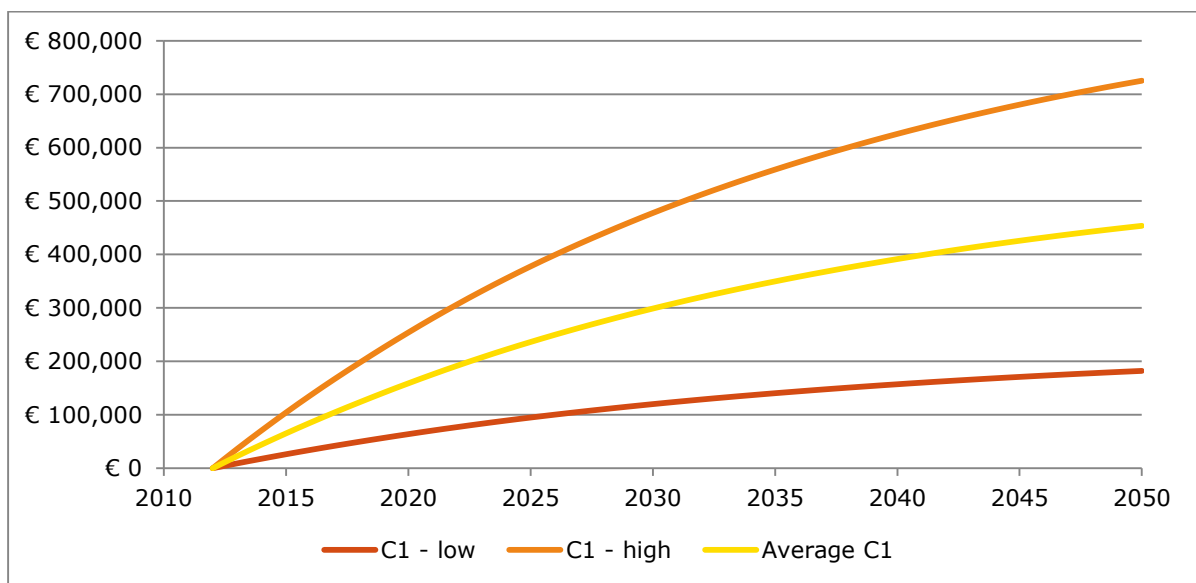


5.1.2 Operational workers

Administrative exam

Under Policy option C1, operational workers that enter the sector via the experience based path will need to undertake a theoretical exam and a practical exam. For theoretical exams, two options exist: the candidate will carry out one single exam, asking the candidate to show knowledge of all competences, **or** multiple exams, each coping with one single competence. Under Dutch regulations, the boatmen school curricula cover four competences. Thus, the “high-costs” option is the four-fold of the “low costs” option. See Figure 9.

Figure 9 Net Present Value of administrative costs for a mandatory **theoretical** boatmen exam for candidates via the experience based path only.



Source: Panteia

Conclusions

The following conclusions can be drawn from Figure 9. See also Table 7.

- The Net Present Value of the Policy option will be € 119,980 in 2030 in case only one exam covering all competences is required. In 2050, this will be € 182,154.
- In case multiple **theoretical exams** covering several competences are needed, this NPV equals € 477,627 by 2030 and € 725,156 by 2050.
- The average NPV for the C1-policy option for **theoretical exams** for operational workers equals € 298,803 by 2030 and € 453,655 by 2050.

Table 7 NPV's of administrative costs for various options for **theoretical exams** for operational worker candidates via the experience based path only.

Number of exams needed	2030	2050
Single exam (low costs option)	€ 119,980	€ 182,154
Multiple exams (high costs option)	€ 477,627	€ 725,156
Average	€ 298,803	€ 453,655

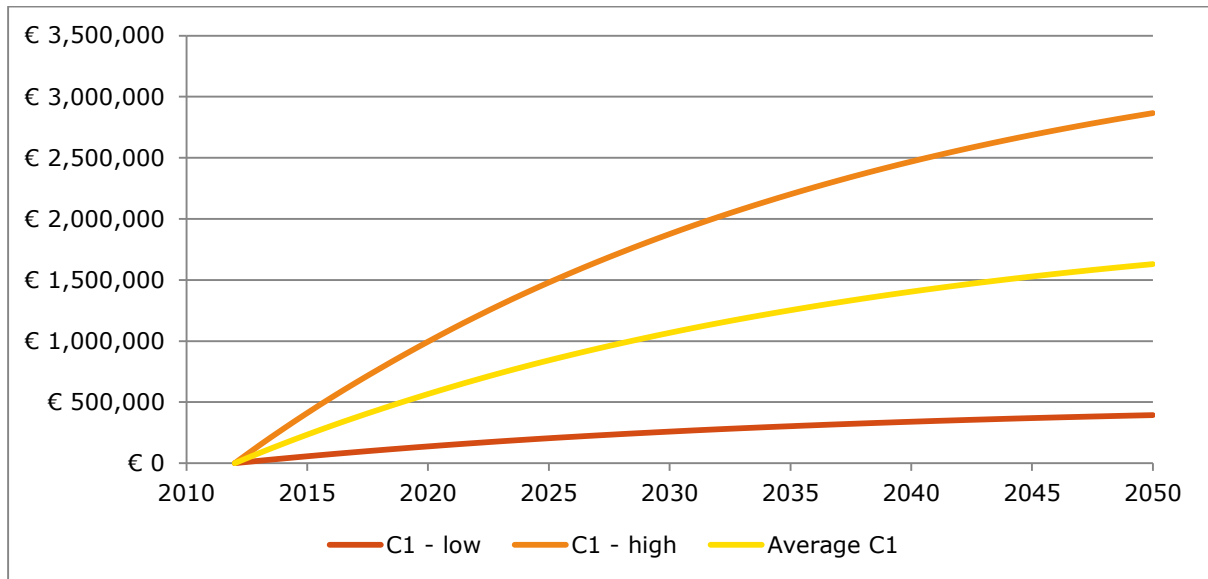
Source: Panteia



Practical exam

Under Policy option C1, operational workers that enter the IWT sector via the experienced based path may also be subjected to a practical exam. Here, two options exist: **i)** using the ship on which a candidate is working ("low costs option") or **ii)** using a school ship ("high costs option"). The Net Present Values of these two options are presented in Figure 10.

Figure 10 Net Present Value of administrative costs for a mandatory **practical** boatmen exam for operational worker candidates via the experience based path only.



Source: Panteia

Conclusions

The following conclusions can be drawn from Figure 10. See also Table 8.

- The Net Present Value of the Policy option will be € 258,603 in 2030 in case the candidate can do the exam on his own ship. In 2050, this will be € 393,538 .
- In case the exam is carried out a school ship, this NPV equals € 1,876,177 by 2030 and € 2,866,060 by 2050.
- The average NPV for the C1-policy option for **practical exams** for operational workers equals € 1,067,390 by 2030 and € 1,629,799 by 2050.

Table 8 NPV's of administrative costs for various options for **practical exams** for operational workers

Type of ship used	2030	2050
Own ship (low costs option)	€ 258,603	€ 393,538
School ship (high costs option)	€ 1,876,177	€ 2,866,060
Average	€ 1,067,390	€ 1,629,799

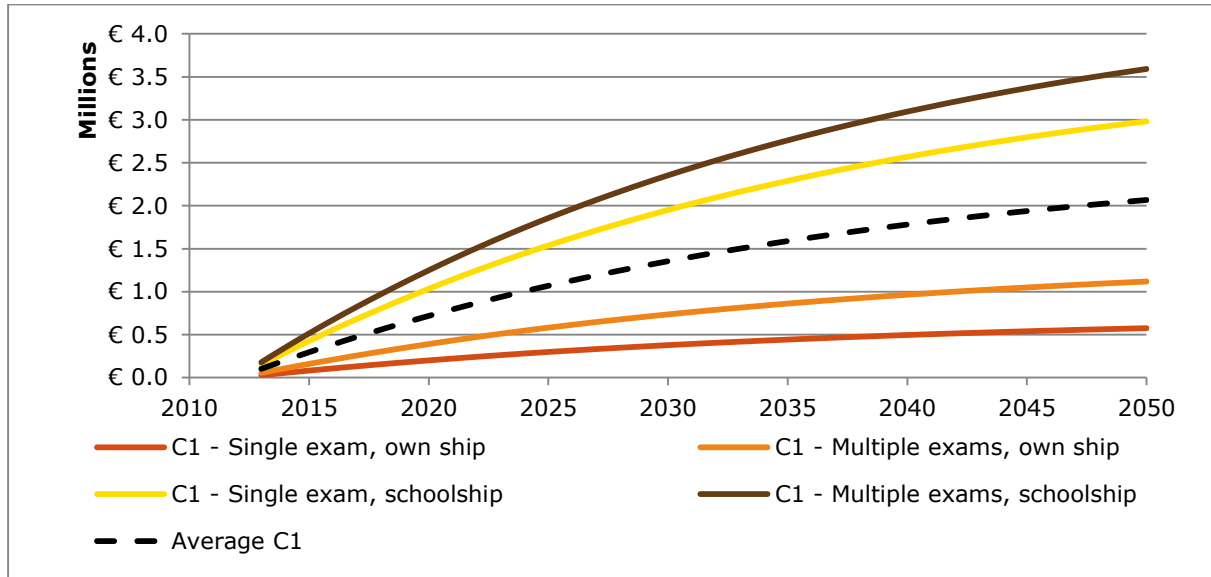
Source: Panteia

Both an theoretical exam and a practical exam

If both an theoretical and a practical exam are needed to prove competence of workers that enter the sector via the experienced based path, the costs will even go up. Four different pairs of options exist here (regarding the number of exam and the type of ship involved). The Net Present Values of all four options are presented in Figure 11, as well as an average.



Figure 11 Net Present Value of administrative costs for various combinations of theoretical and practical exams for operational worker candidates that enter the sector via the experienced based path.



Source: Panteia

Conclusions

The following conclusions can be drawn from Figure 11. See also Table 9.

- In case the candidates' ship can be used for practical examination **and** only one single exam covering all boatmen's competences is required, the NPV will be € 378,583 by 2030. In 2050, this will be € 575,692.
- In case the candidates' ship can be used for practical examination **and** multiple exams are needed to assess the knowledge of the candidate on the competences, the NPV will be € 736,230 by 2030. In 2050, this will be € 1,118,693.
- In case a school ship is required for practical examination **and** only one single exam covering all boatmen's competences is required, the NPV will be € 1,951,040 by 2030. In 2050, this will be € 2,982,151.
- In case a school ship is required for practical examination **and** multiple exams are needed to assess the knowledge of the candidate on the competences, the NPV will be € 2,353,804 by 2030. In 2050, this will be € 3,591,215.
- The average NPV for the C1-policy option for **a combination of theoretical and practical exams** for operational workers equals € 1,354,914 by 2030 and € 2,066,938 by 2050.

Table 9 NPV's of administrative costs for **various combinations of theoretical and practical exams** for operational worker candidates that enter the sector via the experienced based path.

Type of ship used	Number of exams	2030	2050
Own ship (low costs option)	Single exam (low costs option)	€ 378,583	€ 575,692
Own ship (low costs option)	Multiple exams (high costs option)	€ 736,230	€ 1,118,693
School ship (high costs option)	Single exam (low costs option)	€ 1,951,040	€ 2,982,151
School ship (high costs option)	Multiple exams (high costs option)	€ 2,353,804	€ 3,591,215
Average		€ 1,354,914	€ 2,066,938

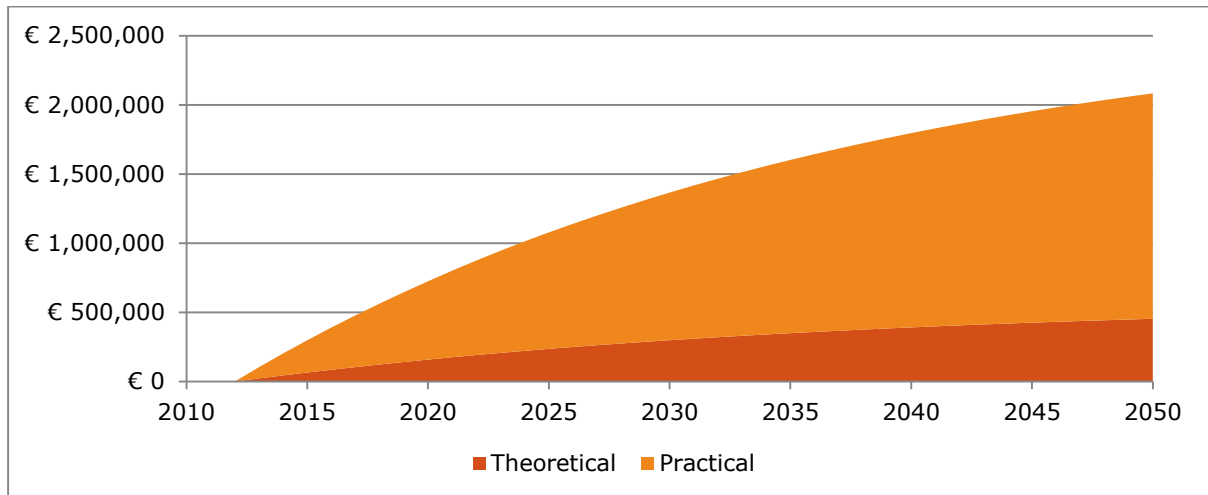
Source: Panteia



Both an theoretical exam and a practical exam

Figure 12 presents the share of the costs for both the theoretical and practical exams for operational workers. It can be concluded that the practical exams have a very large share in the total costs, mainly the result of the school ships option. If the candidates' ships can be used, costs can be reduced to a great extent (nearly a halve).

Figure 12 Share of theoretical and practical exams in the total price (**only average costs**) for operational worker candidates that enter the sector via the experienced based path.

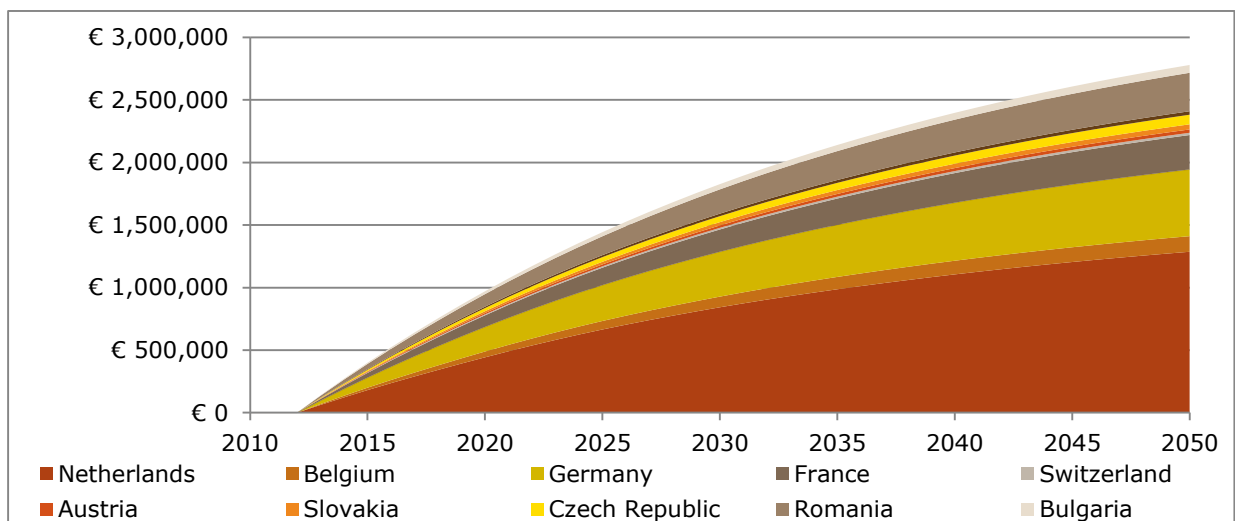


Source: Panteia

5.1.3 Total costs for policy option C1.

If the average costs per MS are summed up for both the practical exams for boatmasters and the theoretical and practical exams for operational workers, the total costs per MS and for all countries can be obtained. See Figure 13.

Figure 13 Total NPV of administrative costs per Member State for both boatmasters and operational workers that enter the sector via the experienced based path.



Source: Panteia

The total costs add up to € 1,838,086 by 2030 and € 2,795,745 by 2050.



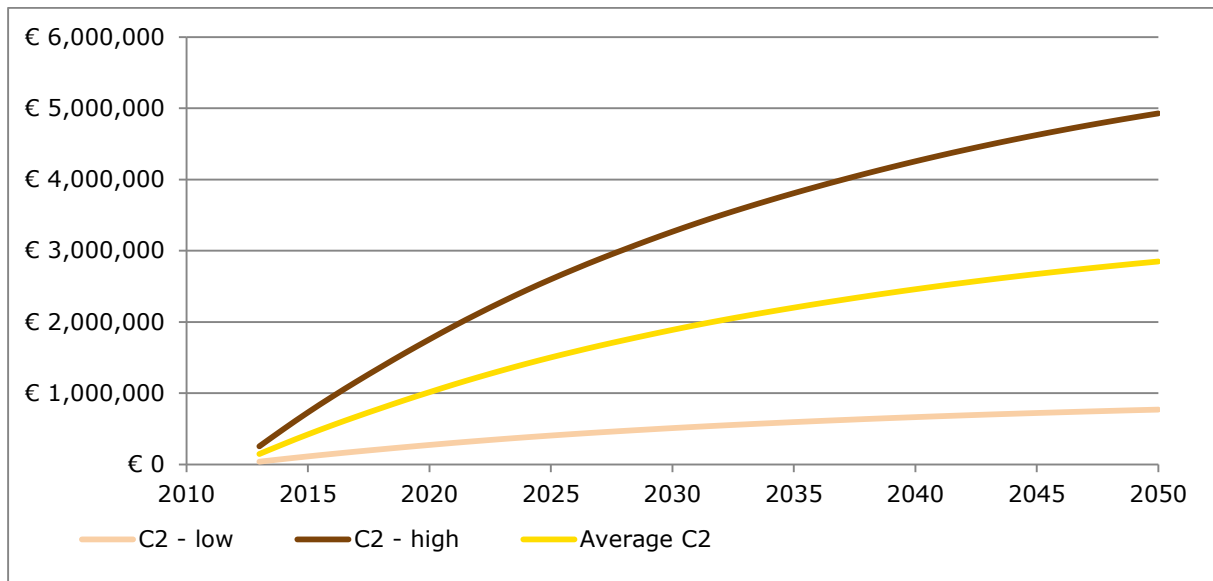
5.2 Policy option C2

5.2.1 Boatmasters

100% of the candidate boatmasters will need to have an theoretical exam (including practical exam) in case of variant C2. It is more expensive if the practical exam has to be carried out on a dedicated school ship that needs to be chartered for a day than in case the candidate can use his own ship.

For boatmasters, the NPV is presented in Figure 3.

Figure 3 Net Present Value of administrative costs for a mandatory boatmaster exam for all candidates.



Conclusions

The following conclusions can be drawn from Figure 3. See also Table 4.

- The NPV of measure C2 reaches € 511,201 in 2030 if the candidate can bring his own ship. This will be € 770,797 by 2050.
- This NPV equals € 3,267,662 by 2030 in case school ships need to be used. This will be € 4,928,129 by 2050.
- The average NPV for the C2-policy option equals € 1,889,431 by 2030 and € 2,849,463 by 2050.

Table 4 NPV's of administrative costs for various options for practical exams for boatmasters

Type of ship used	2030	2050
Own ship	€ 511,201	€ 770,797
School ship	€ 3,267,662	€ 4,928,129
Average	€ 1,889,431	€ 2,849,463

Source: Panteia

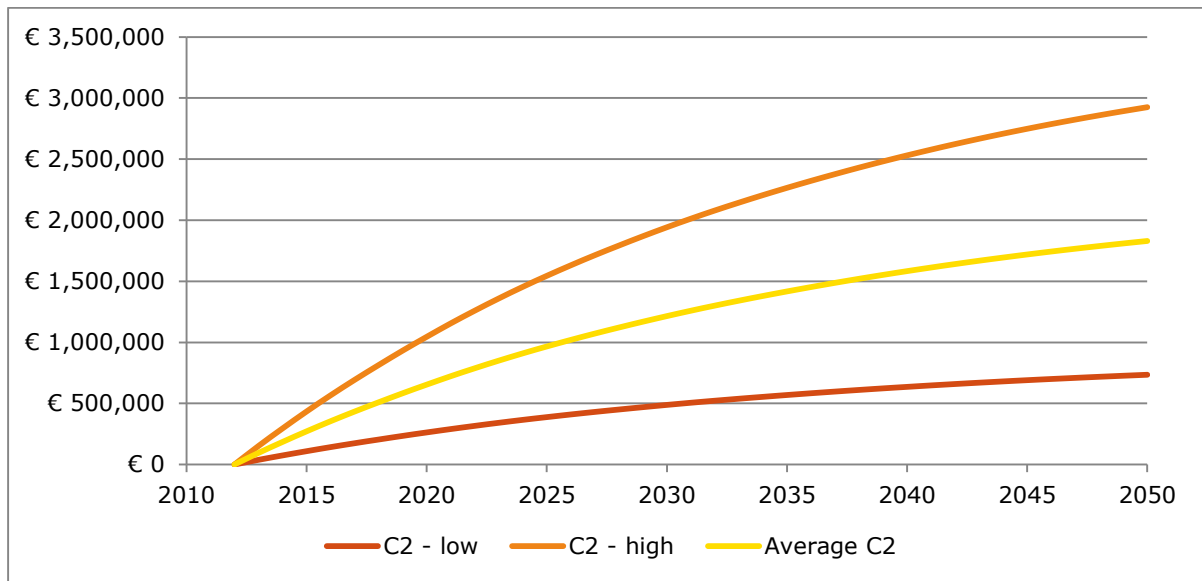


5.2.2 Operational workers

Theoretical exam

Under Policy option C2, operational workers will need to undertake a theoretical exam and a practical exam. For theoretical exams, two options exist: the candidate will carry out one single exam, asking the candidate to show knowledge of all competences, **or** multiple exams, each coping with one single competence. Under Dutch regulations, the boatmen school curricula cover four competences. Thus, the “high-costs” option is the four-fold of the “low costs” option. See Figure 4.

Figure 4 Net Present Value of administrative costs for a mandatory **theoretical** boatmen exam for all candidates.



Conclusions

The following conclusions can be drawn from Figure 4. See also Table 5.

- The Net Present Value of the Policy option will be € 487,776 in 2030 in case only one exam covering all competences is required. In 2050, this will be € 734,671.
- In case multiple **theoretical exams** covering several competences are needed, this NPV equals € 1,942,209 by 2030 and € 2,925,274 by 2050.
- The average NPV for the C2-policy option for **theoretical exams** for operational workers equals € 1,214,992 by 2030 and € 1,829,972 by 2050.

Table 5 NPV's of administrative costs for various options for **theoretical exams** for operational workers

Number of exams needed	2030	2050
Single exam (low costs option)	€ 487,776	€ 734,671
Multiple exams (high costs option)	€ 1,942,209	€ 2,925,274
Average	€ 1,214,992	€ 1,829,972

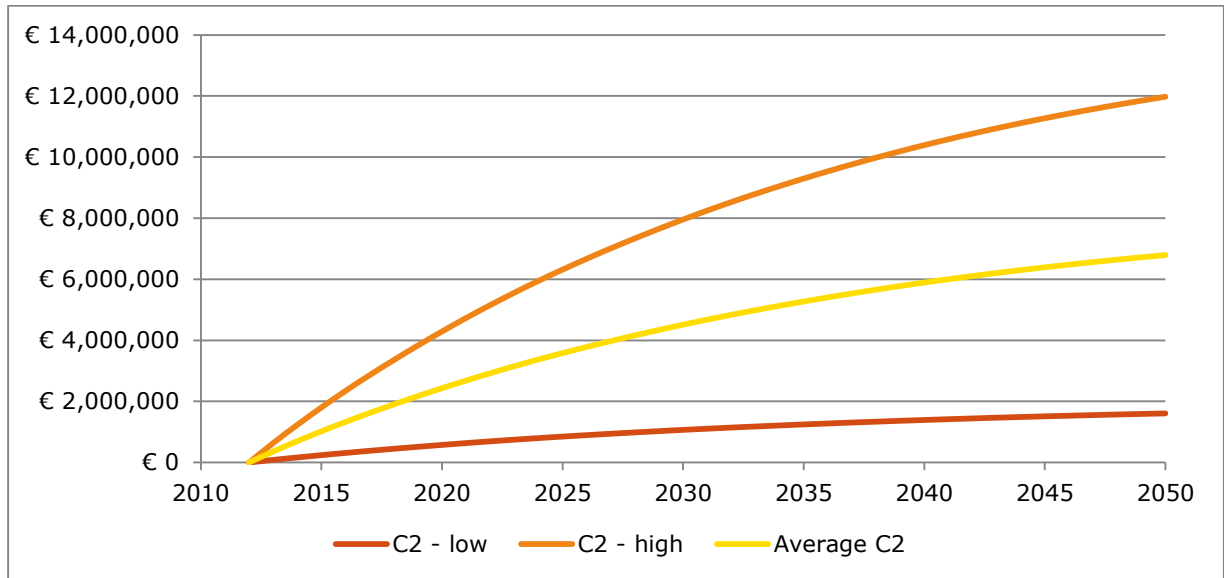
Source: Panteia



Practical exam

Under Policy option C2, operational workers can also be subjected to a practical exam. Here, two options exist: **i)** using the ship on which a candidate is working (“low costs option”) or **ii)** using a school ship (“high costs option”). The Net Present Values of these two options are presented in Figure 5.

Figure 4 Net Present Value of administrative costs for a mandatory **practical** boatmen exam for all candidates.



Source: Panteia

Conclusions

The following conclusions can be drawn from Figure 5. See also Table 6.

- The Net Present Value of the Policy option will be € 1,066,203 in 2030 in case the candidate can do the exam on his own ship. In 2050, this will be € 1,605,868.
- In case the exam is carried out a school ship, this NPV equals € 7,957,062 by 2030 and € 11,976,413 by 2050.
- The average NPV for the C2-policy option for **practical exams** for operational workers equals € 4,511,632 by 2030 and € 6,791,141 by 2050.

Table 5 NPV's of administrative costs for various options for **practical exams** for operational workers

Type of ship used	2030	2050
Own ship (low costs option)	€ 1,066,203	€ 1,605,868
School ship (high costs option)	€ 7,957,062	€ 11,976,413
Average	€ 4,511,632	€ 6,791,141

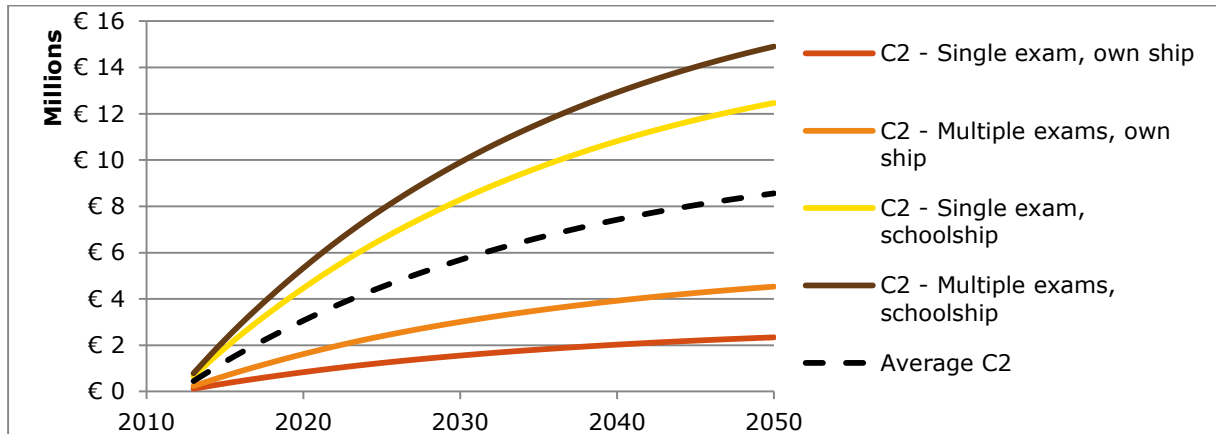
Source: Panteia



Both an theoretical exam and a practical exam

If both an theoretical and a practical exam are needed to prove competence, the costs will even go up. However, four combinations of options (regarding the number of exam and the type of ship involved) exist here. The Net Present Values of all four options are presented in Figure 5, as well as an average.

Figure 5 Net Present Value of administrative costs for various combinations of theoretical and practical exams for all candidates of operational workers



Source: Panteia

Conclusions

The following conclusions can be drawn from Figure 5. See also Table 6.

- In case the candidates' ship can be used for practical examination **and** only one single exam covering all boatmen's competences is required, the NPV will be € 1,553,978 by 2030. In 2050, this will be € 2,340,540 .
- In case the candidates' ship can be used for practical examination **and** multiple exams are needed to assess the knowledge of the candidate on the competences, the NPV will be € 3,008,411 by 2030. In 2050, this will be € 4,531,142 .
- In case a school ship is required for practical examination **and** only one single exam covering all boatmen's competences is required, the NPV will be € 8,283,874 by 2030. In 2050, this will be € 12,463,659 .
- In case a school ship is required for practical examination **and** multiple exams are needed to assess the knowledge of the candidate on the competences, the NPV will be € 9,899,271 by 2030. In 2050, this will be € 14,901,686 .
- The average NPV for the C2-policy option for **a combination of theoretical and practical exams** for operational workers equals € 5,686,384 by 2030 and € 8,559,257 by 2050.

Table 5 NPV's of administrative costs for **various combinations of theoretical and practical exams** for operational workers

Type of ship used	Number of exams	2030	2050
Own ship (low costs option)	Single exam (low costs option)	€ 1,553,978	€ 2,340,540
Own ship (low costs option)	Multiple exams (high costs option)	€ 3,008,411	€ 4,531,142
School ship (high costs option)	Single exam (low costs option)	€ 8,283,874	€ 12,463,659
School ship (high costs option)	Multiple exams (high costs option)	€ 9,899,271	€ 14,901,686
Average		€ 5,686,384	€ 8,559,257

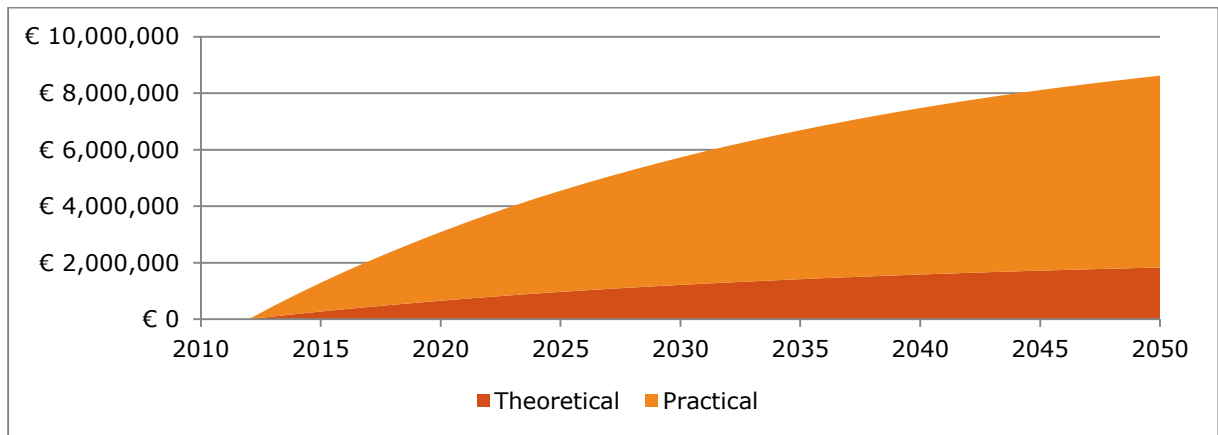
Source: Panteia



Both an theoretical exam and a practical exam

Figure 6 presents the share of the costs for both the theoretical and practical exams for operational workers. It can be concluded that the practical exams have a very large share in the total costs, mainly the result of the school ships option. If the candidates' ships can be used, costs can be reduced to a great extent (nearly a halve).

Figure 6 Share of theoretical and practical exams in the total price (**only average costs**) for operational worker candidates

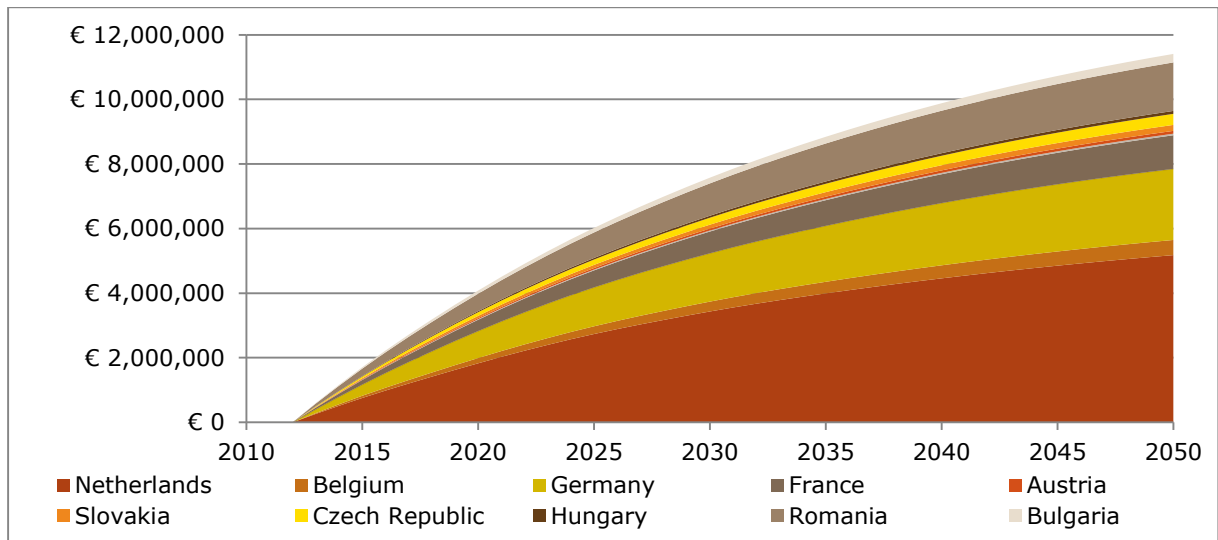


Source: Panteia

5.2.3 Total costs for policy option C2.

If the average costs per MS are summed up for both the practical exams for boatmasters and the theoretical and practical exams for operational workers, the total costs per MS and for all countries can be obtained. See Figure 7.

Figure 7 Total NPV of administrative costs per Member State for all boatmasters and operational workers.



Source: Panteia

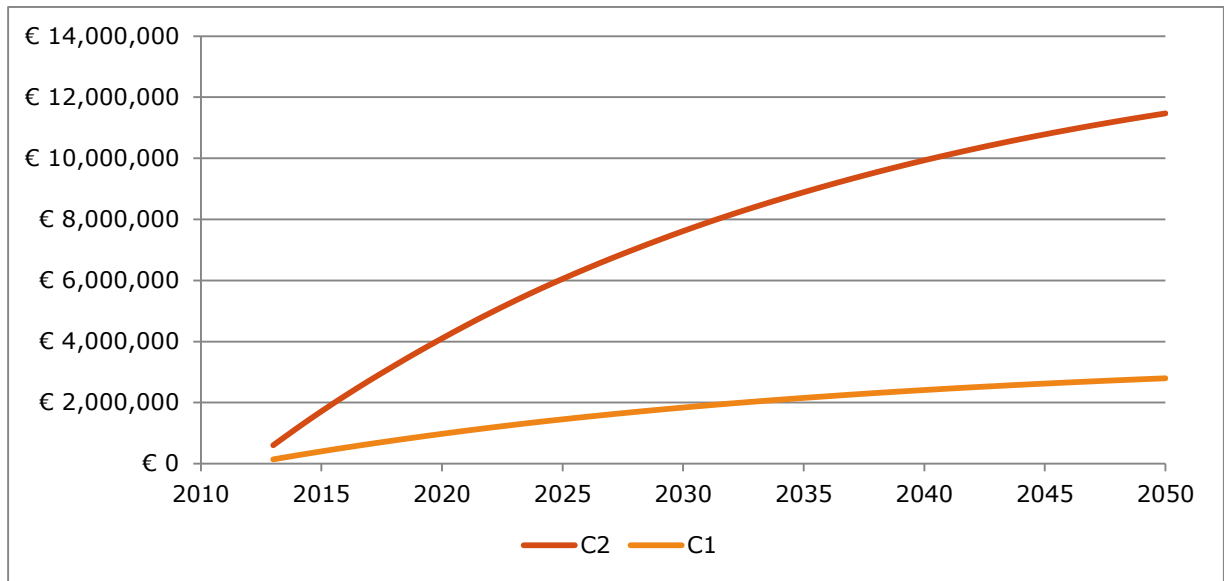
The total costs add up to € 7,616,056 by 2030 and € 11,470,576 by 2050.



6 Conclusion

If both the average Net Present Values for the C1-policy option (that targets IWT-personnel that enters the sector via the experience based path only) (this covers all candidates, regardless of them choosing the education or experience based path) and the C2-policy options (this covers all candidates, regardless of them choosing the education or experience based path) (that targets IWT-personnel that enters the sector via the experience based path only) are drawn of a graph, the following conclusions can be taken:

Figure 13 Average Net Present Values of administrative costs for the C1 and C2 policy option for both operational workers and boatmasters



Conclusions

- By 2030, the Net Present Value of the administrative costs for measure C1 equal € 1,838,086. By 2050, this equals € 2,795,745 .
- By 2050, the Net Present Value of the administrative costs for measure C2 equal € 7,616,056. By 2050, this equals € 11,470,576 .

Table 10 NPV's of average administrative costs for various options for **theoretical and practical exams** for both operational workers and boatmasters

Policy option	2030	2050
C1: including examination standards for training and education institutes	€ 1,838,086	€ 2,795,745
C2: excluding examination standards for training and education institutes	€ 7,616,056	€ 11,470,576

Source: Panteia



Addendum n°2 - Clarifications on the quantification of safety effects due to competence-based approach

a) Measures:

The proposed commission act will improve safety on the European waterways by three separate measures:

- **The competence based approach** - in comparison to the baseline scenario – sets high standards. Increasing the coverage of competence required and by making them up-to-date with technological development will unavoidably have a positive effect on safety with the inflow of all new entrants both in CCNR and non-CCNR countries.

The measure as analysed by the consultants (see sections 2 and 3 and yellow line under figure 1) targets the population of non-CCNR countries that enter the sector via the **both the experience and education based path**. It is assumed that after applying measure, the accident frequencies level the accident frequencies of CCNR-workers. **This is an underestimation, as STCIN standards would also slightly improve the standards for CCNR-workers.**

- **The practical examination** as a prerequisite to becoming a boatmaster in order to ensure that every candidate has the required competencies. Under the baseline scenario, only a theoretical examination is imposed. This new practical examination will target the entire new boatmaster population. This should result in a yearly increasing safety effect in countries where such an exam was not required (e.g. the Netherlands, Germany, Slovakia, Czech Republic.) and particularly in relation to the candidates using the experience path.

The measure as analysed by the consultants (see sections 2 and 3 and light brown line under figure 1) targets the population of the above countries that enter the sector via the **experience based path**. It is assumed that a mandatory practical exam for those that wish to enter the sector via the experience based path will increase safety levels as it includes practical examination of the skills before being able to become a boatmaster. Currently, one can become a boatmaster without a proof of competences. **Four years of professional experience does not necessarily guarantee the development of any knowledge and skills: i.e. the "potato peeler syndrome".**

- **Increased mutual recognition** in itself will also slightly improve safety by increasing the size of the workforce and thereby ending (or at least limiting) the use of the "hidden reserve" which is more accident-prone as not active on a regular basis.

This measure targets to reduce the use of the so-called "hidden reserve". Thus, it will slightly improve safety by increasing the size of the workforce and thereby ending (or at least limiting) the use of the "hidden reserve" which is more accident-prone as not active on a regular basis. See Figure 5.17 of the Impact Assessment report.



b) Methodology

In order to quantify the effects of the measures, the following parameters have been taken into account:

- Age of the boatmaster' population in any given year;
- Nationalities of the boatmaster' population in any given year.
- A accident frequencies taken into account for BAU (5.18 for CCNR, and 9.54 for non-CCNR, see PD report)
- Accident frequencies per age group (cfr Figure 5.17 of IA report), per nationality (CCNR, non-CCNR, see PD report chapter 7), and per level of education (yes/no parameter).
- Demand and supply on the labour market
- Transport flow forecasts

Based on expert judgment and for the purpose of quantitative analysis aiming at generating cost estimates, it is assumed that:

- The competence based approach will level the accident frequencies of non-CCNR workers to the level of CCNR-workers. Both workers that enter the sector via the experience and the education based path will be targeted.
- The practical examination will decrease the accident frequency of those that enter the sector via the experience based path. Based on expert judgement, it is assumed that the relative difference in accident frequencies between those that enter via the education based path and those that enter via the experience based path is equal to the relative difference between the accident frequency of boatmasters from CCNR-countries and non-CCNR countries. Thus, the accident frequency of workers from CCNR countries that have undergone professional training, is equal to 4.60. Using the same percentage of decrease for non-CCNR workers (-12,25%), the average accident frequency for this group would be 8,47' In other words, the average accident frequency of the total group of workers from CCNR-countries and non-CCNR countries is expected to drop by 12,25%.

$$(1) 85\% \cdot x + 15\% \cdot \left(\frac{9,54}{5,18}\right) \cdot x = 5,18$$

$$(2) x = 4,60$$

$$(3) x_{non-ccnr} = 8,47$$

See Table 1 for the average accident frequencies per group. Please note that the changes will be taken up gradually by the new inflow.

Table 1 Average accident frequencies (in accidents per million vessel kilometre) per measure for total population sample

Accident frequency	BAU	Practical examination	Competence based approach	CBA & PE	Adding effects (wrong!)
CCNR	5,18	4,60 (-0.58)	5,18 (0)	4,60 (-0.58)	4,60 (-0.58)
Non-CCNR	9,54	8,47 (-1.07)	5,18 (-4,36)	4,60 (-4.94)	4,11 (-5,43)

The results of the safety effects of both the practical examination and the competence based approach may not be added for non-CCNR countries. If we apply a competence based approach, the effect of the practical examination for those that have not undergone professional training is expected to be of slightly minor magnitude. This is due to the fact that the population of workers from some non-CCNR countries using the experience based path is taken into account as a beneficiary population of the two measures.

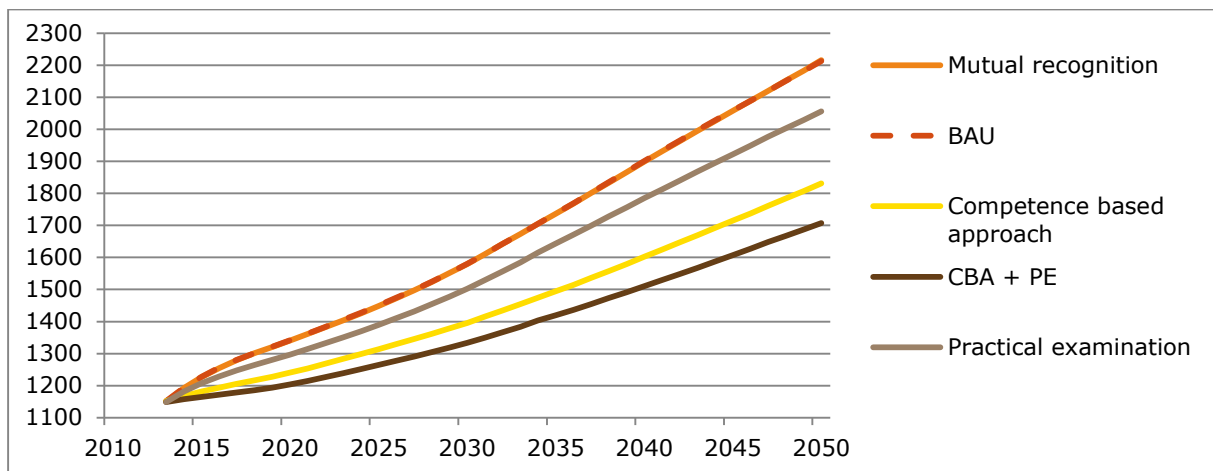


The 12.25% percentage should be seen as a maximum reduction percentage. As some countries (Austria, France, Hungary, Romania, Poland) already do have a mandatory practical exam in place to obtain the boatmaster license, the total reduction percentage will be less. This has been modelled, in such a way that the proportion of the targeted group (the countries not listed) to the demographic composition of an age category (i.e. 21 year olds) at a certain year will be taken as a multiplier to the maximum. Within the period of scope, the share of the group of countries that do not have a practical exam to the total group will decrease from 91% of the new boatmaster inflow to 73% as a minimum and 79% by 2050.

c) Results

- The number of accidents per year is expected to decrease for all scenarios, even in case of mutual recognition (but to a very minor extent).
- By 2030, the competence based approach will have prevented 184 accidents per year. In 2050, this will be 382 accidents.
- Practical examination will save 103 accidents as compared to BAU by 2030 and 205 accidents by 2050.
- The combination of a competence based approach and practical examination will result into 246 saved accidents by 2030 ($<184+77$) and 506 saved accidents by 2050 ($<382+157$).

Figure 1 Development of the number of accidents per year



In order to estimate the monetized effect of the measures, the difference in accident frequency as compared to BAU is taken and multiplied by the costs of an navigation related accident (€ 40,357, see PD). This then is discounted, and summed up.



This will result in the following NPV:

Figure 2 Net Present Value of safety measures

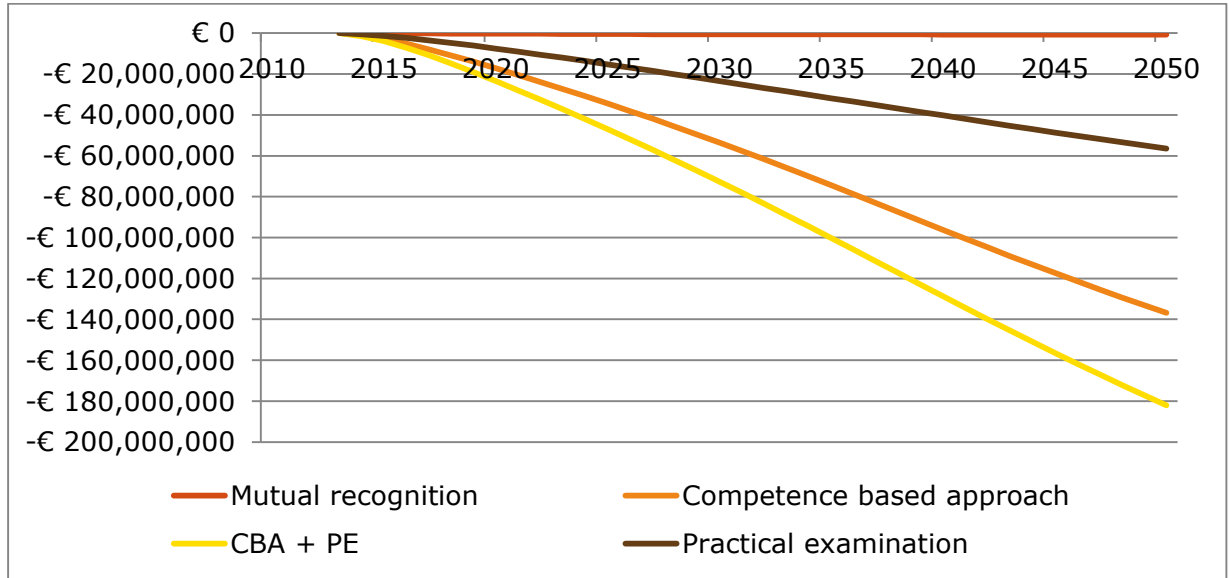


Table 2 Net present Value of measures

Measure	2030	2050
Mutual recognition	€ -538,927	€ -719,205
Competence based approach	€ -53,483,236	€ -136,808,427
Practical examination	€ -23,421,503	€ -56,533,185
CBA + PE	€ -72,567,242	€ -182,808,427