Environmental profile of building elements details per variant

8. Window openings

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9. *Summary*
Building professionals and the government currently have to resort to foreign environmental classification systems to acquire an insight into the Environmental Performance of Materials used in Buildings and Building Elements (MMG: Milieugerelateerde Materiaalprestatie van Gebouw(element)en). However, often the tools and information involved are not transparent and/or not specifically related to the Flemish-Belgian building context. This publication proposes a database of environmental profiles of 115 variants of building elements, all of which are specific for the Flemish-Belgian building context. It offers an open and transparent presentation of the MMG method of determination that was used as the basis for the calculation of the environmental profiles. Although the resulting building materials methodology is far from final, it is a dynamic model (including a determination method) that will be fine-tuned and expanded in the future. In that context, this publication should be perceived as a communication tool to facilitate the dialogue with stakeholders in the future.

10. *Guidance group and/or author*
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12. *Other titles on this subject*
Milieugerelateerde Materiaalprestatie van Gebouwelementen (MMG report) (www.ovam.be/bouwmaterialenmethodiek)

Environmental profile of building elements: details per variant

8. Window openings

Table V 8: overview of the composition of the variants “window openings” (including cabinet work)

(31) window openings including cabinet work: environmental impact per m² of window, 10 types			
1	PVC_glass1.1	PVC frame1	standard double-glazed (U=1.1 W/m²K)
2	ALU_glass1.1	ALU frame1	standard double-glazed (U=1.1 W/m²K)
3	wood_tropical hardwood_glass1.1	Tropical hardwood frame1	standard double-glazed (U=1.1 W/m²K)
4	wood painted_glass1.1	painted wood frame1	standard double-glazed (U=1.1 W/m²K)
5	wood_alu_glass1.1	Wood-alu frame 1	standard double-glazed (U=1.1 W/m²K)
6	PVCtherm_glass0.5	PVC frame2	standard triple-glazed (U=0.65W/m²K)
7	ALUtherm_glass0.6	ALU frame2	standard triple-glazed (U=0.65W/m²K)
8	wood therm_tropical hard_glass0.8	Tropical hardwood frame2	standard triple-glazed (U=0.65W/m²K)
9	wood therm_painted_glass0.8	painted wood frame2	standard triple-glazed (U=0.65W/m²K)
10	PVC_glass1.1_safe	PVC frame 1	standard double wire glass (U=1.1 W/m²K)
11	PVC_glass1.1_acoust	PVC frame 1	standard double acoustic glazing (U=1.1 W/m²K)

Table CEN 8: overview of the individual CEN indicators for the variants 'window openings'

	climate change	ozone depletion	acidification (land)	eutrophication	photochem. oxidant form.	depletion non-fossil	depletion fossil
	kg CO2 eq	kg CFC-11 eq	kg SO2 eq	kg PO4--- eq	kg C2H4	kg Sb eq	MJ, net cal
Window							
PVC_glass1.1	2,94E+02	1,59E-05	1,74E+00	5,60E-01	7,38E-02	4,83E-03	3,87E+03
ALU_glass1.1	3,94E+02	3,02E-05	1,68E+00	6,21E-01	1,22E-01	2,40E-03	4,85E+03
wood_tropical hardwood_glass1.1	2,02E+02	1,72E-05	1,08E+00	3,69E-01	5,88E-02	2,04E-03	2,57E+03
wood painted_glass1.1	1,86E+02	1,58E-05	1,01E+00	4,02E-01	5,43E-02	2,09E-03	2,46E+03
wood_alu_glass1.1	3,15E+02	2,46E-05	1,51E+00	6,08E-01	9,63E-02	2,69E-03	3,94E+03
PVCtherm_glass0.5	3,75E+02	2,11E-05	2,14E+00	7,55E-01	9,16E-02	7,38E+00	4,91E+03
ALUtherm_glass0.6	5,01E+02	3,75E-05	2,20E+00	8,68E-01	1,50E-01	7,69E+00	6,13E+03
wood therm_tropical hard_glass0.8	2,92E+02	2,36E-05	1,54E+00	5,94E-01	8,11E-02	7,53E+00	3,73E+03
wood therm_painted_glass0.8	2,76E+02	2,21E-05	1,46E+00	6,26E-01	7,65E-02	7,53E+00	3,62E+03
PVC_glass1.1_safe	3,18E+02	1,74E-05	1,87E+00	6,04E-01	7,91E-02	4,87E-03	4,22E+03
PVC_glass1.1_acoust	3,03E+02	1,68E-05	1,81E+00	5,70E-01	7,65E-02	4,87E-03	3,99E+03

Table CEN+ 8: overview of the individual CEN+ indicators for the variants 'window openings'

	human toxicity	particulate matter formation (PM)	Ionising radiation (humans)	ecotox. (terrestrial)	ecotox. (fresh water)	ecotox. (marine)	land occupation (forest)	land occupation (urban)	land transf. (nature)	land transf. (rainforest)	water
	DALY	DALY	DALY	kg 1,4-DB eq	kg 1,4-DB eq	kg 1,4-DB eq	species.yr	species.yr	species.yr	species.yr	m^3
Window											
PVC_glass1.1	1,03E-04	5,54E-04	8,83E-07	3,62E-02	3,53E+00	3,64E+00	1,02E-07	7,44E-08	7,25E-08	8,81E-08	2,46E+00
ALU_glass1.1	1,03E-04	7,06E-04	1,55E-06	3,28E-02	3,68E+00	3,76E+00	1,11E-07	5,87E-08	1,03E-07	1,08E-08	2,36E+00
wood_tropical hardwood_glass1.1	6,12E-05	1,98E-03	9,17E-07	7,99E-02	1,77E+00	1,87E+00	5,72E-05	6,21E-08	-2,65E-03	2,65E-03	2,30E+00
wood painted_glass1.1	6,61E-05	3,96E-04	9,84E-07	6,81E-02	1,94E+00	2,01E+00	7,48E-06	1,88E-07	1,52E-07	2,34E-08	2,51E+00
wood_alu_glass1.1	1,04E-04	6,25E-04	1,62E-06	9,13E-02	3,28E+00	3,39E+00	6,19E-06	1,85E-07	1,89E-07	4,22E-08	5,15E+00
PVCtherm_glass0.5	1,30E-04	6,92E-04	1,54E-06	4,26E-02	4,38E+00	4,48E+00	1,22E-07	8,28E-08	8,60E-08	8,89E-08	3,12E+00
ALUtherm_glass0.6	1,39E-04	8,98E-04	2,35E-06	4,17E-02	4,84E+00	4,93E+00	1,35E-07	6,99E-08	1,23E-07	1,23E-08	3,13E+00
wood therm_tropical hard_glass0.8	9,34E-05	2,15E-03	1,67E-06	9,78E-02	2,72E+00	2,82E+00	5,78E-05	8,33E-08	-2,65E-03	2,65E-03	3,03E+00
wood therm_ painted_glass0.8	9,82E-05	5,58E-04	1,74E-06	8,63E-02	2,88E+00	2,95E+00	8,15E-06	2,10E-07	1,76E-07	2,43E-08	3,24E+00
PVC_glass1.1_safe	1,08E-04	5,96E-04	1,03E-06	3,80E-02	3,69E+00	3,80E+00	1,11E-07	7,62E-08	7,71E-08	8,85E-08	2,65E+00
PVC_glass1.1_ acoust	1,04E-04	5,77E-04	8,97E-07	3,68E-02	3,55E+00	3,67E+00	1,05E-07	7,54E-08	7,55E-08	8,83E-08	2,54E+00

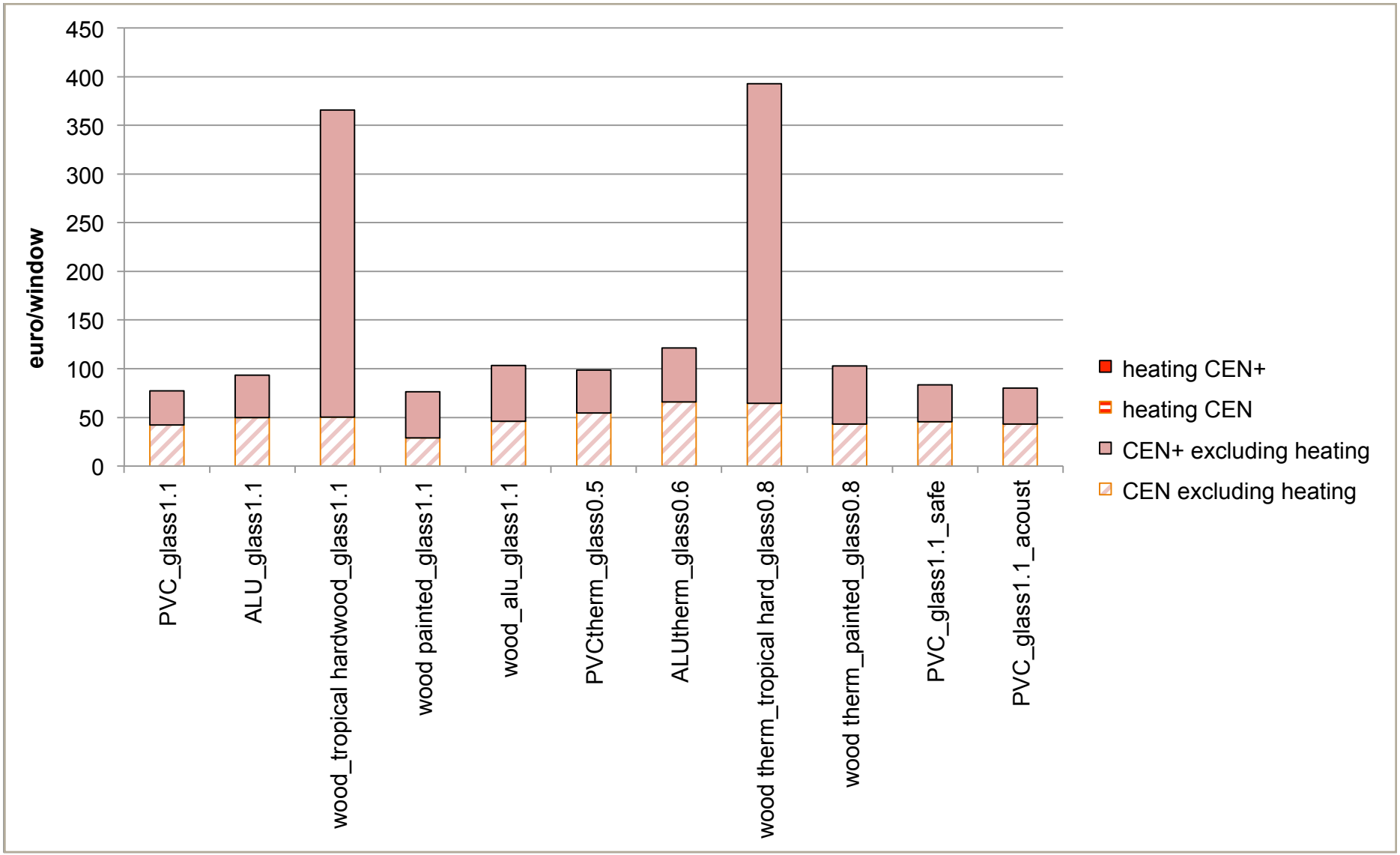

Figure E 8: Aggregated environmental profiles (split up into CEN and CEN+) of several building element variants 'window openings', expressed in monetary units and distinguishing between purely materials-related and heat-transfer-related environmental impact.

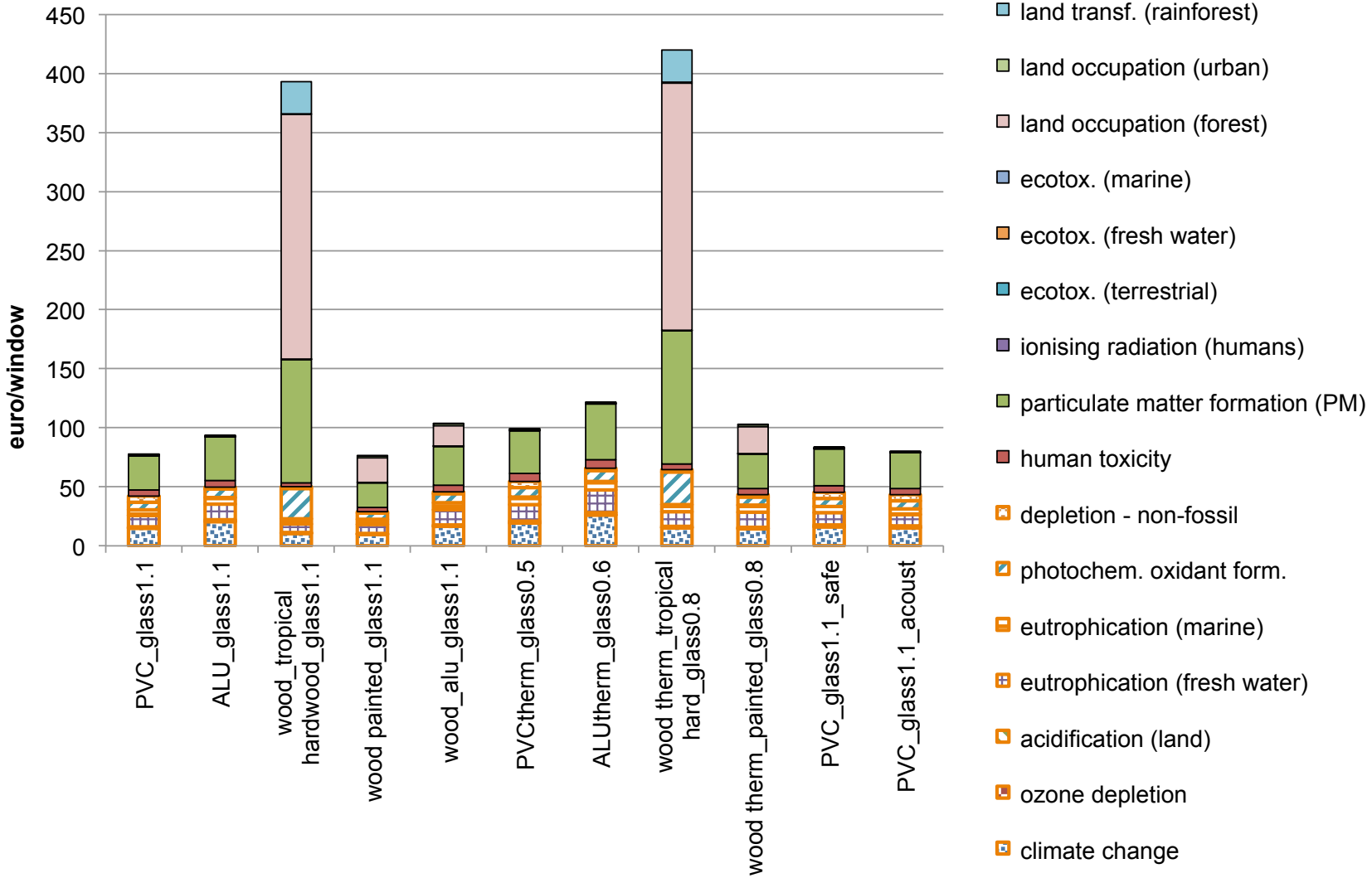

Figure I 8: Aggregated environmental profiles (split up into CEN and CEN+) for several building element variant 'window openings' per environmental indicator, expressed in monetary units.

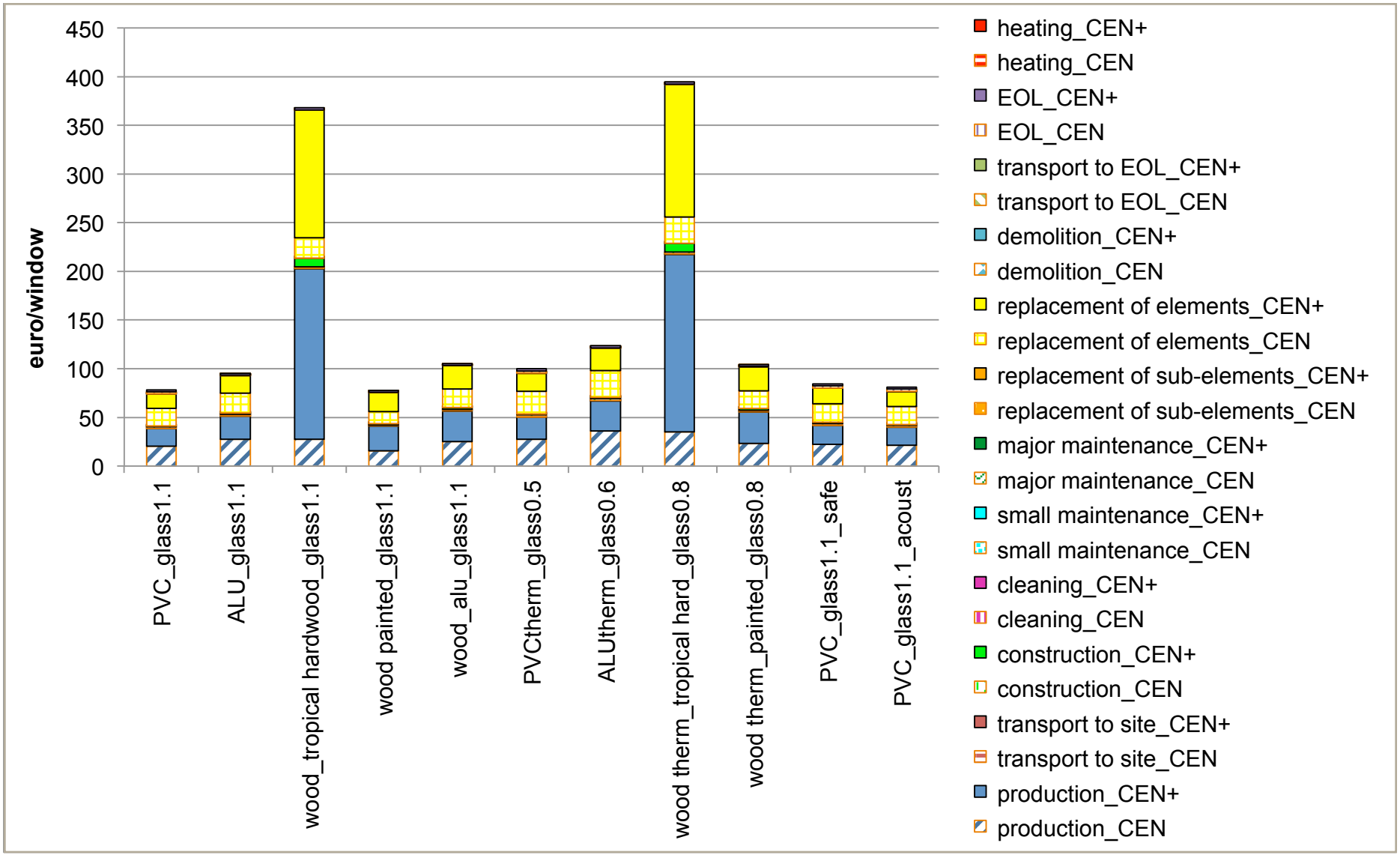

Figure L 8: Aggregated environmental profiles (split up into CEN and CEN+) for several building element variants 'window openings' per life cycle stage, expressed in monetary units.

Table 8.1: overview of the detailed composition of the variants 'window openings"

Description (window = frame and glass type; lifetime: 60 years)	Uf (W/m2K)	Ug (W/m2K)
PVC_glass1.1	1,5	1,1
ALU_glass1.1	2,7	1,1
wood_tropical hardwood_glass1.1	1,8	1,1
wood painted_glass1.1	1,8	1,1
wood_alu_glass1.1	1,6	1,1
PVCtherm_glass0.5	0,8	0,5
ALUtherm_glass0.6	1,4	0,5
wood therm_tropical hard_glass0.8	0,74	0,5
wood therm_painted_glass0.8	0,74	0,5
PVC_glass1.1_safe	1,5	1,1
PVC_glass1.1_acoust	1,5	1,1

8.1. PVC_glass1.1

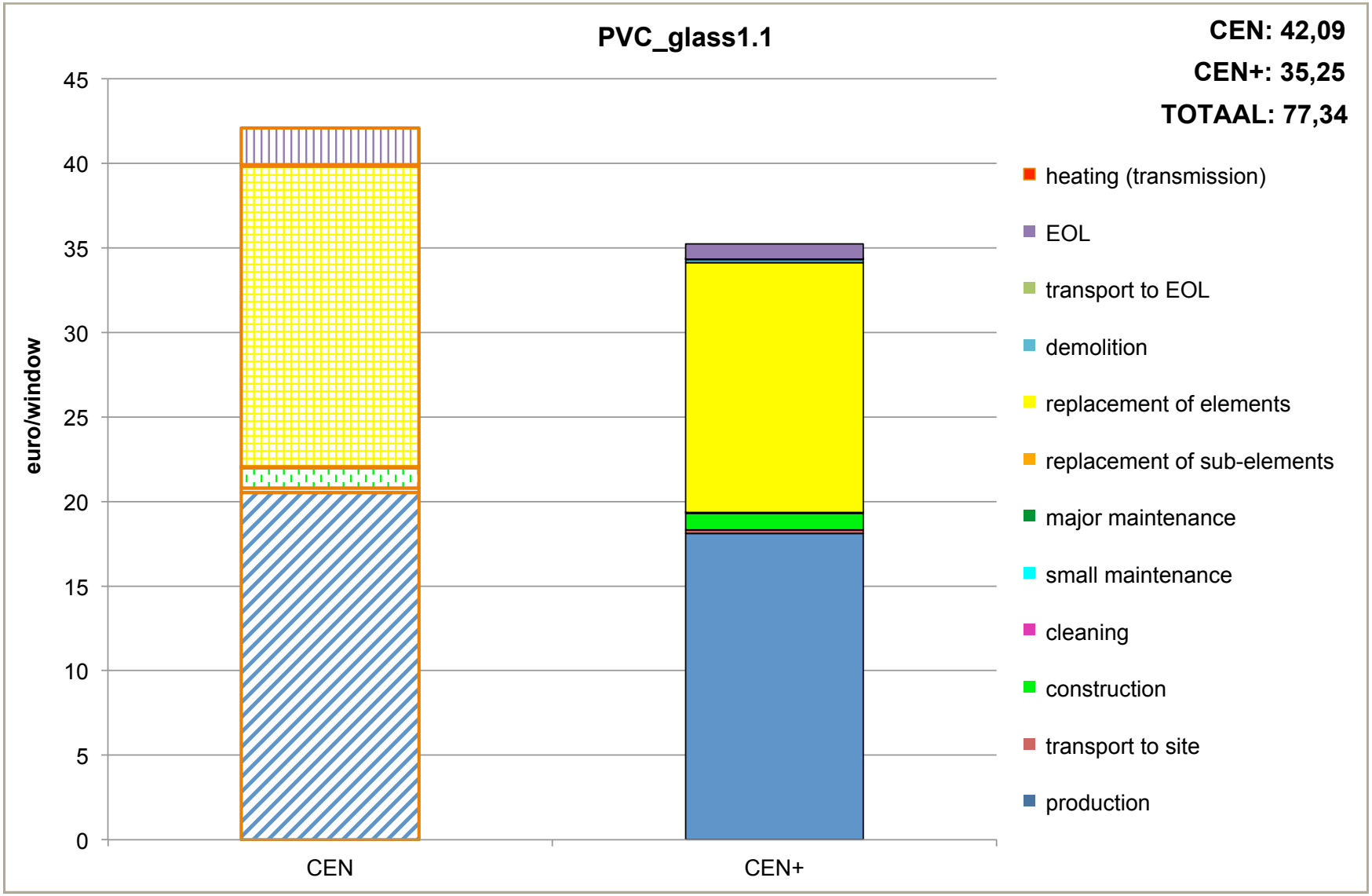

Figure window 8.1.1: Aggregated environmental profile (divided into CEN and CEN+) of variant 'PVC_glass1.1' per life cycle stage, expressed in monetary units.

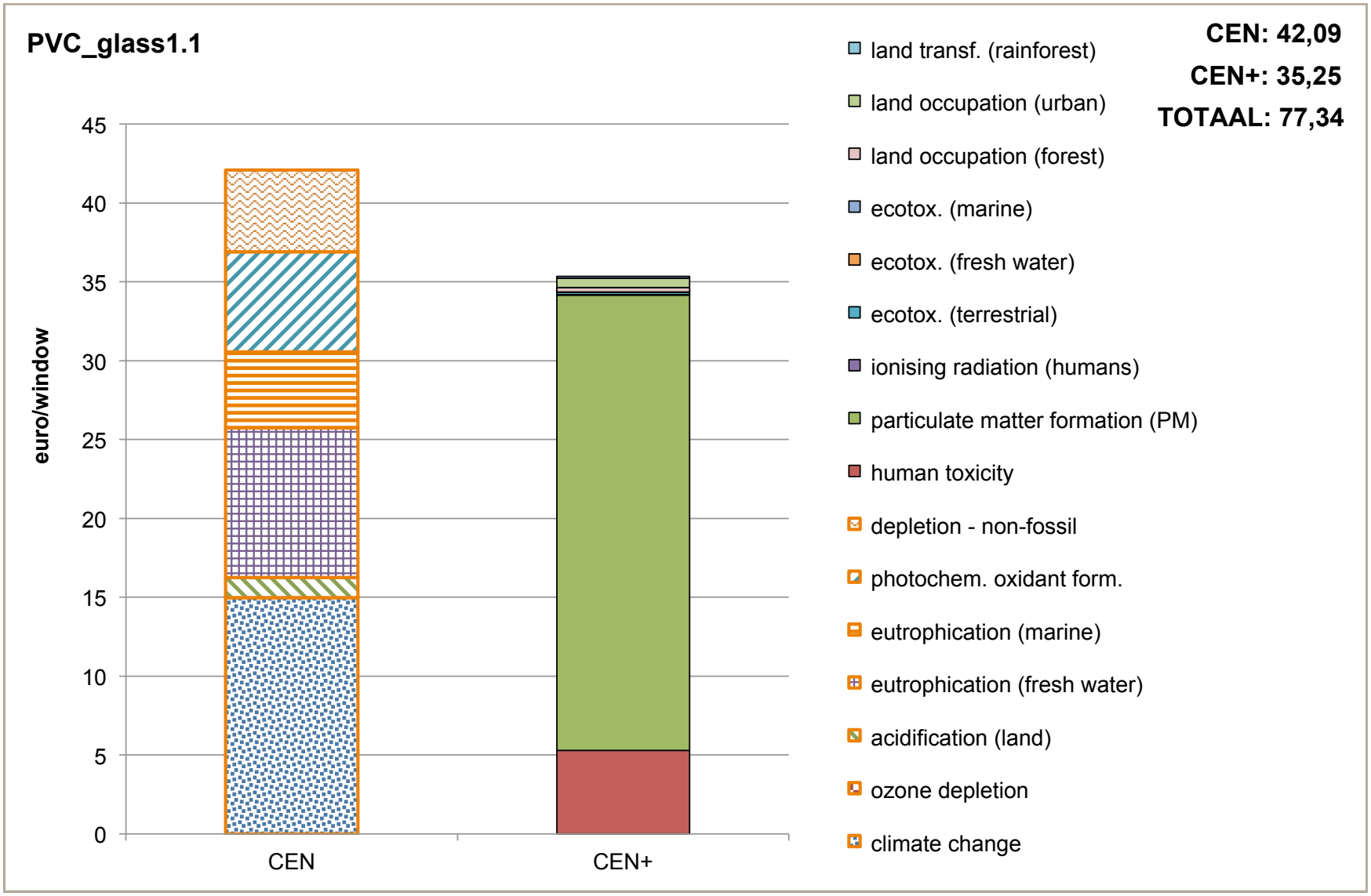

Figure window 8.1.2: Aggregated environmental profile (divided into CEN and CEN+) of variant 'PVC_glass1.1' per environmental indicator, expressed in monetary units.

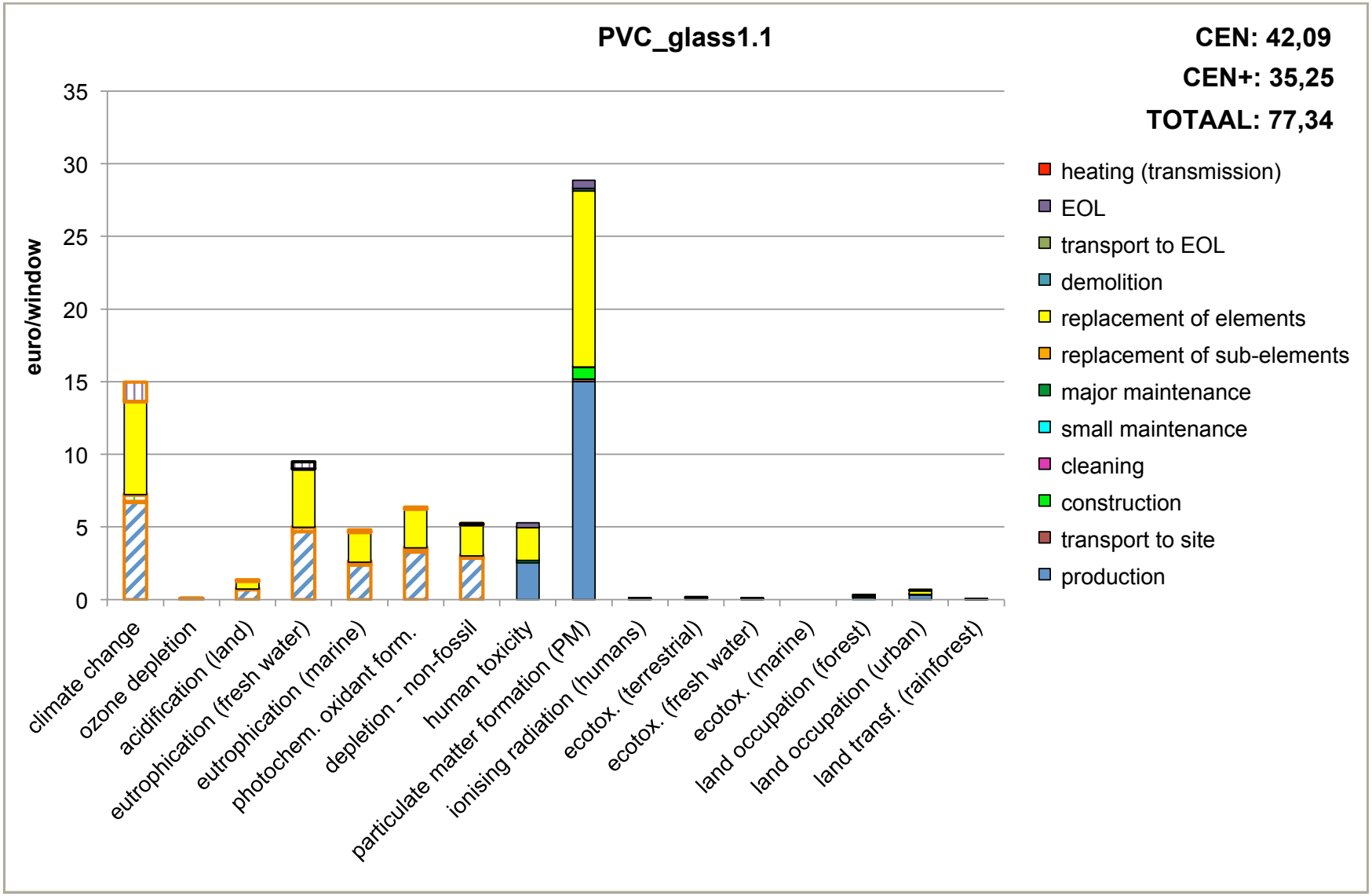

Figure window 8.1.3: Aggregated environmental profile (divided into CEN and CEN+) of variant 'PVC_glass1.1' per life cycle stage and per individual environmental indicator, expressed in monetary units.

8.2. ALU_glass1.1

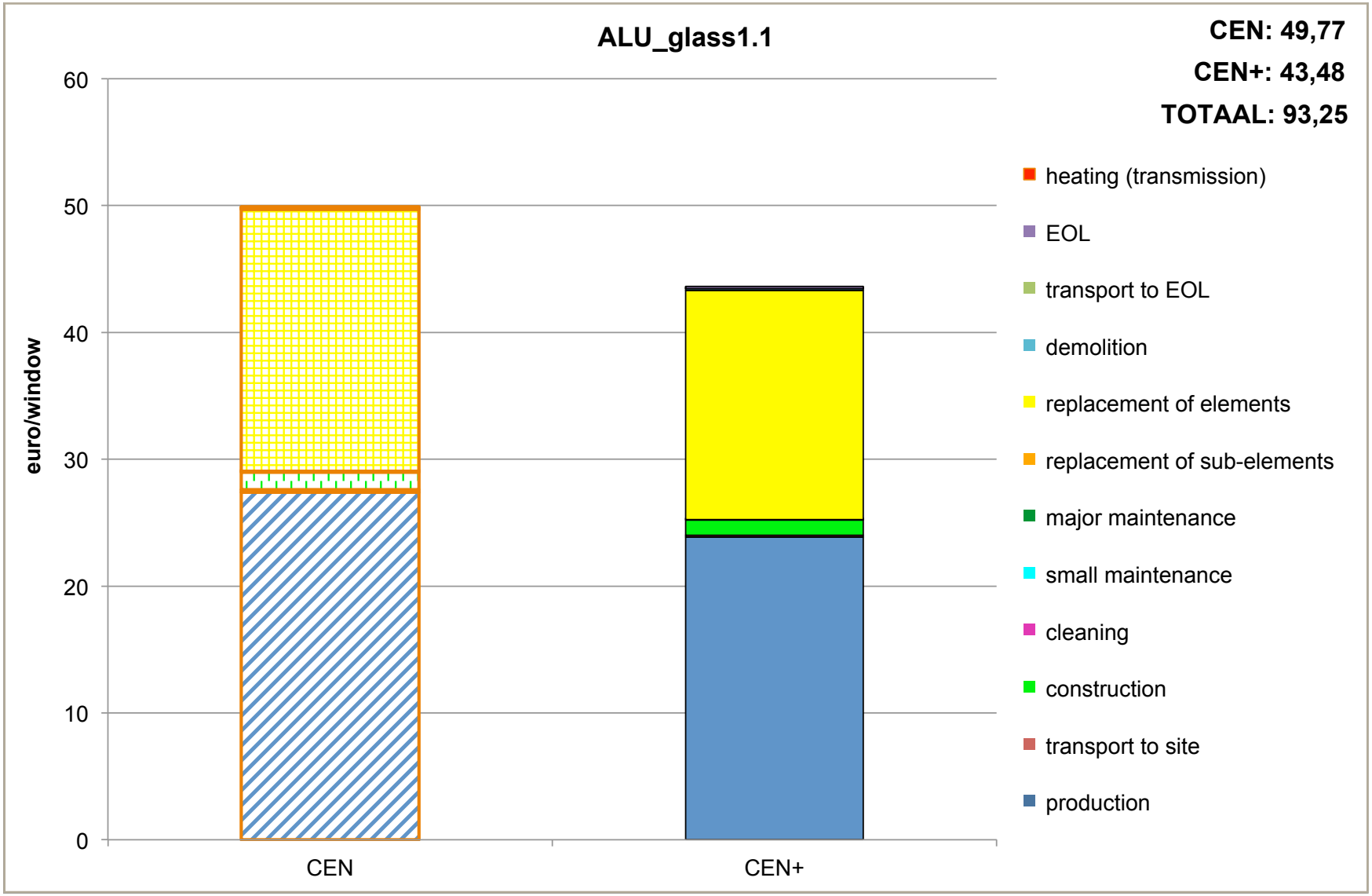

Figure window 8.2.1: Aggregated environmental profile (divided into CEN and CEN+) of variant 'ALU_glass1.1' per life cycle stage, expressed in monetary units.

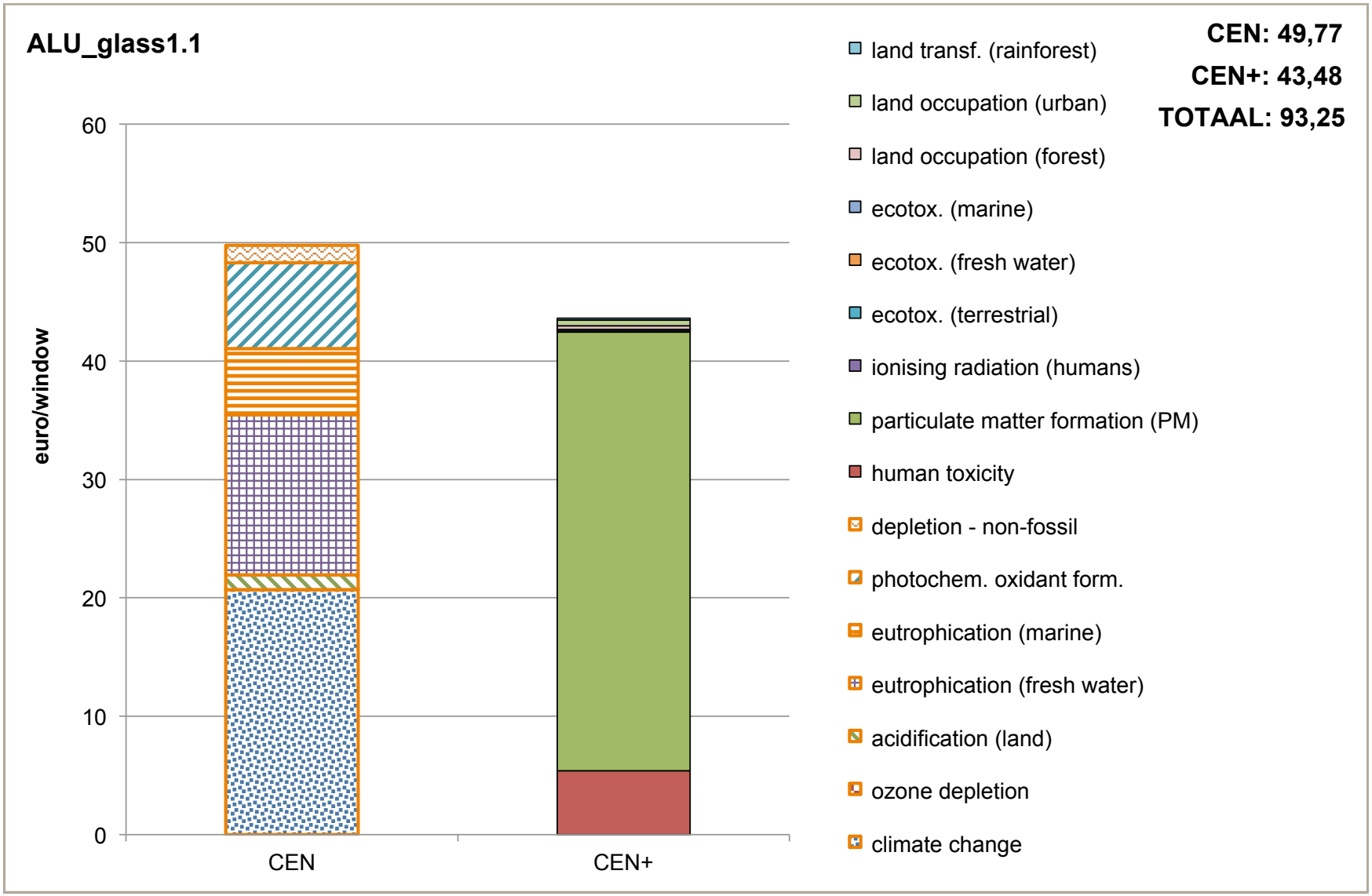

Figure window 8.2.2: Aggregated environmental profile (divided into CEN and CEN+) of variant 'ALU_glass1.1' per environmental indicator, expressed in monetary units.

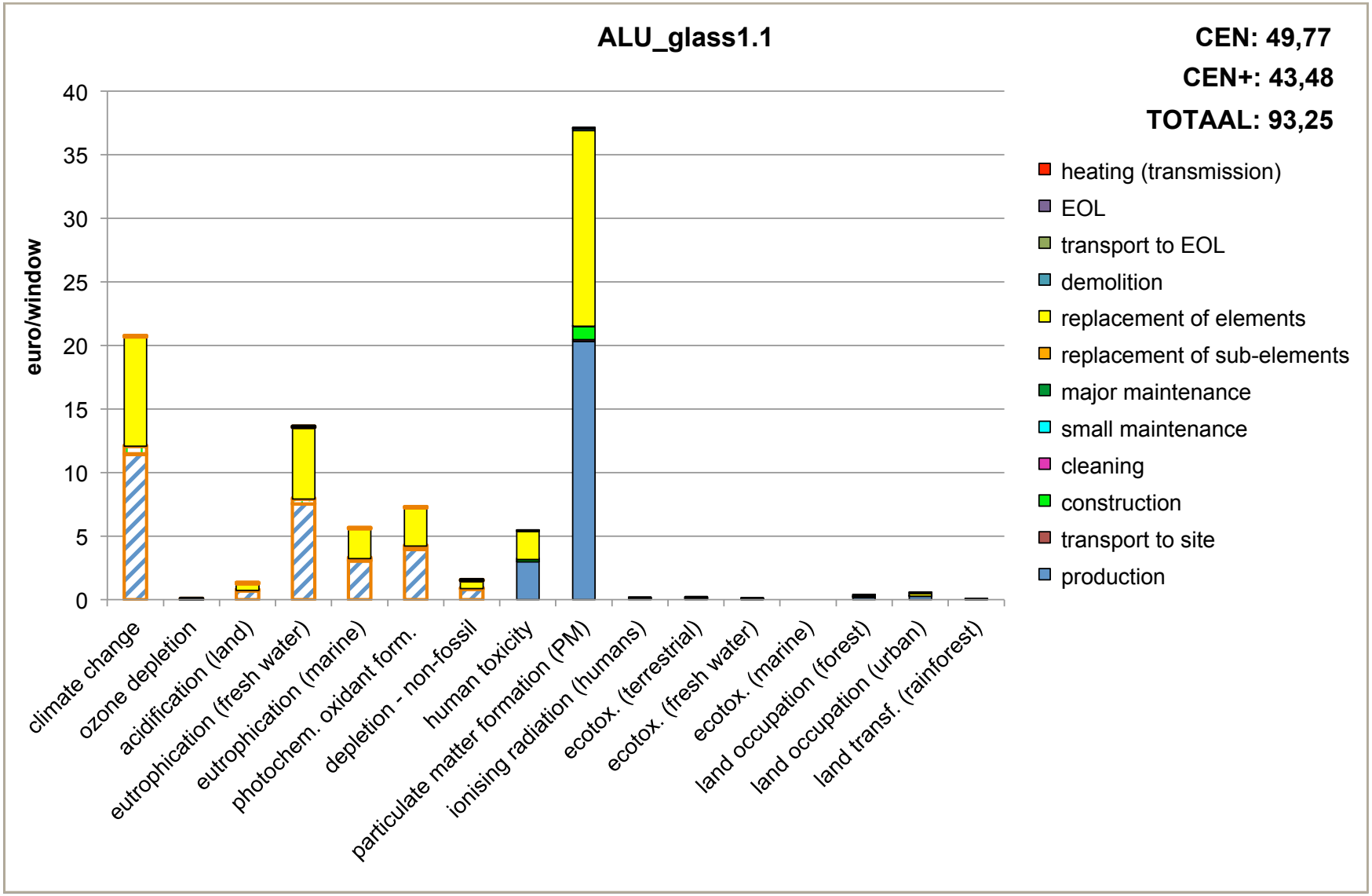

Figure window 8.3.3: Aggregated environmental profile (divided into CEN and CEN+) of variant 'ALU_glass1.1' per life cycle stage and per individual environmental indicator, expressed in monetary units.

8.3. wood_tropical hardwood_glass1.1

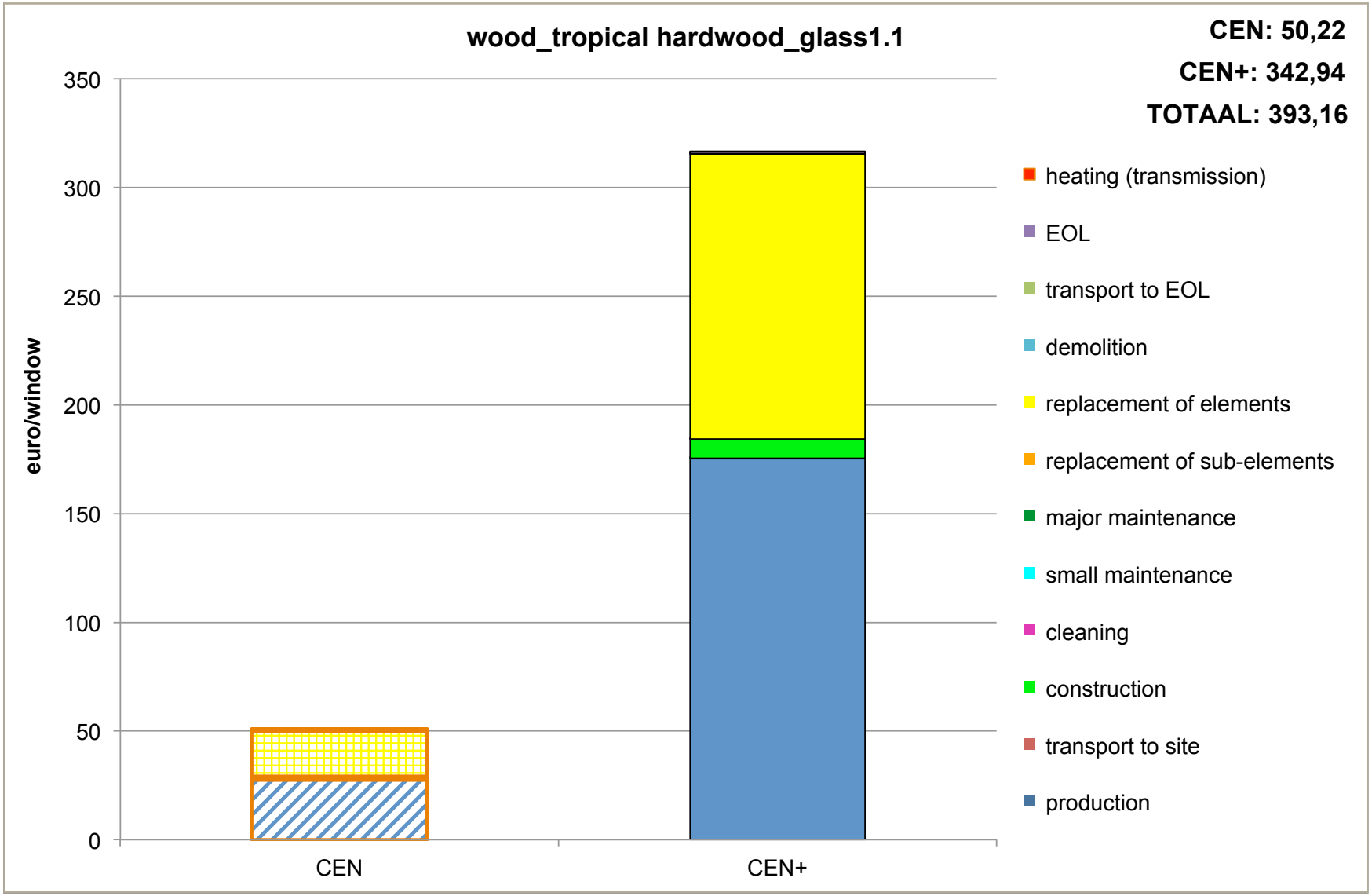

Figure window 8.3.1: Aggregated environmental profile (divided into CEN and CEN+) of variant 'wood_tropical hardwood_glass1.1' per life cycle stage, expressed in monetary units.

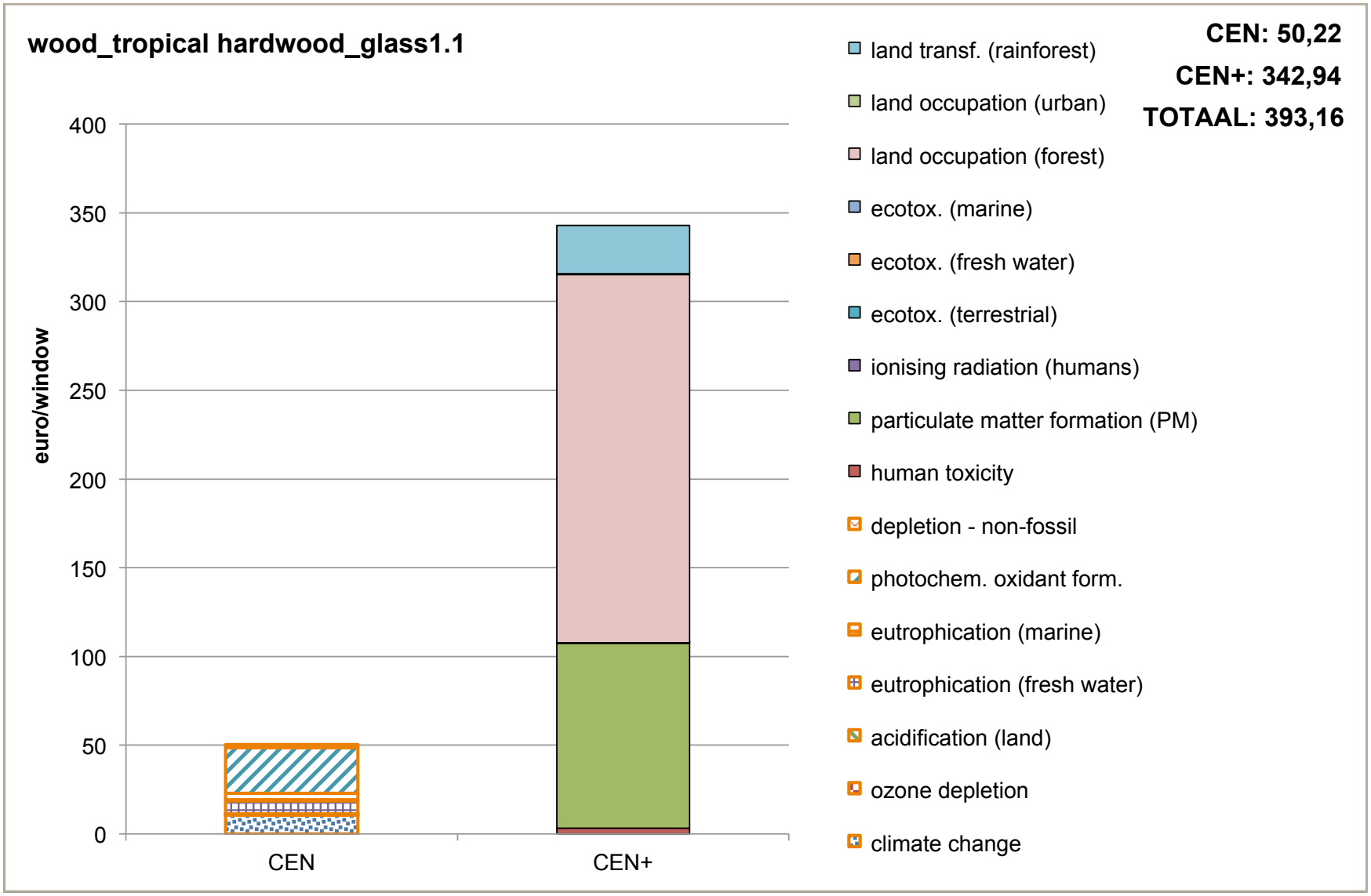

Figure window 8.3.2: Aggregated environmental profile (divided into CEN and CEN+) of variant 'wood_tropical hardwood_glass1.1' per environmental indicator, expressed in monetary units.

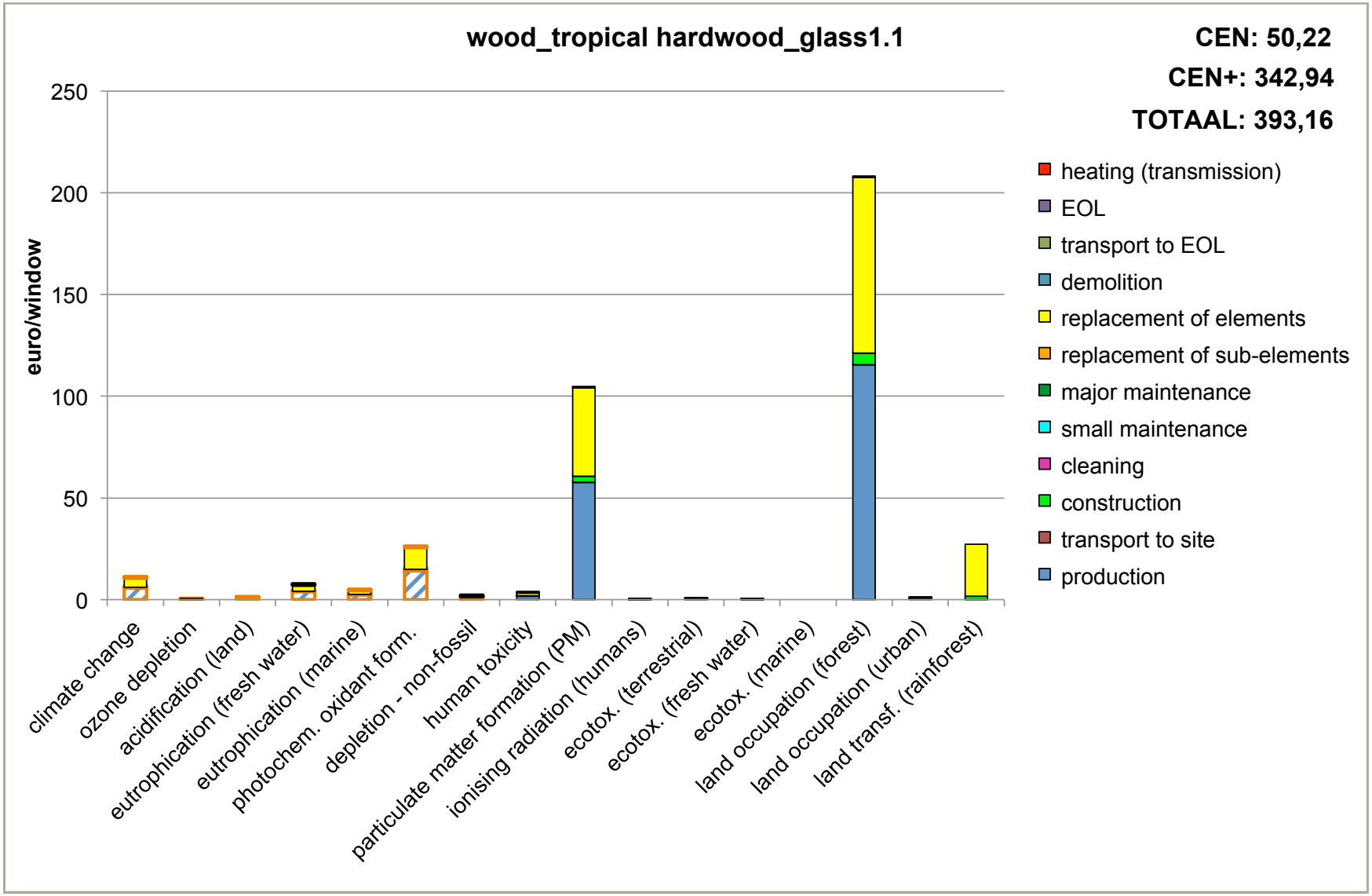

Figure window 8.3.3: Aggregated environmental profile (divided into CEN and CEN+) of variant 'wood_tropical hardwood_glass1.1' per life cycle stage and per individual environmental indicator, expressed in monetary units.

8.4. wood painted_glass1.1

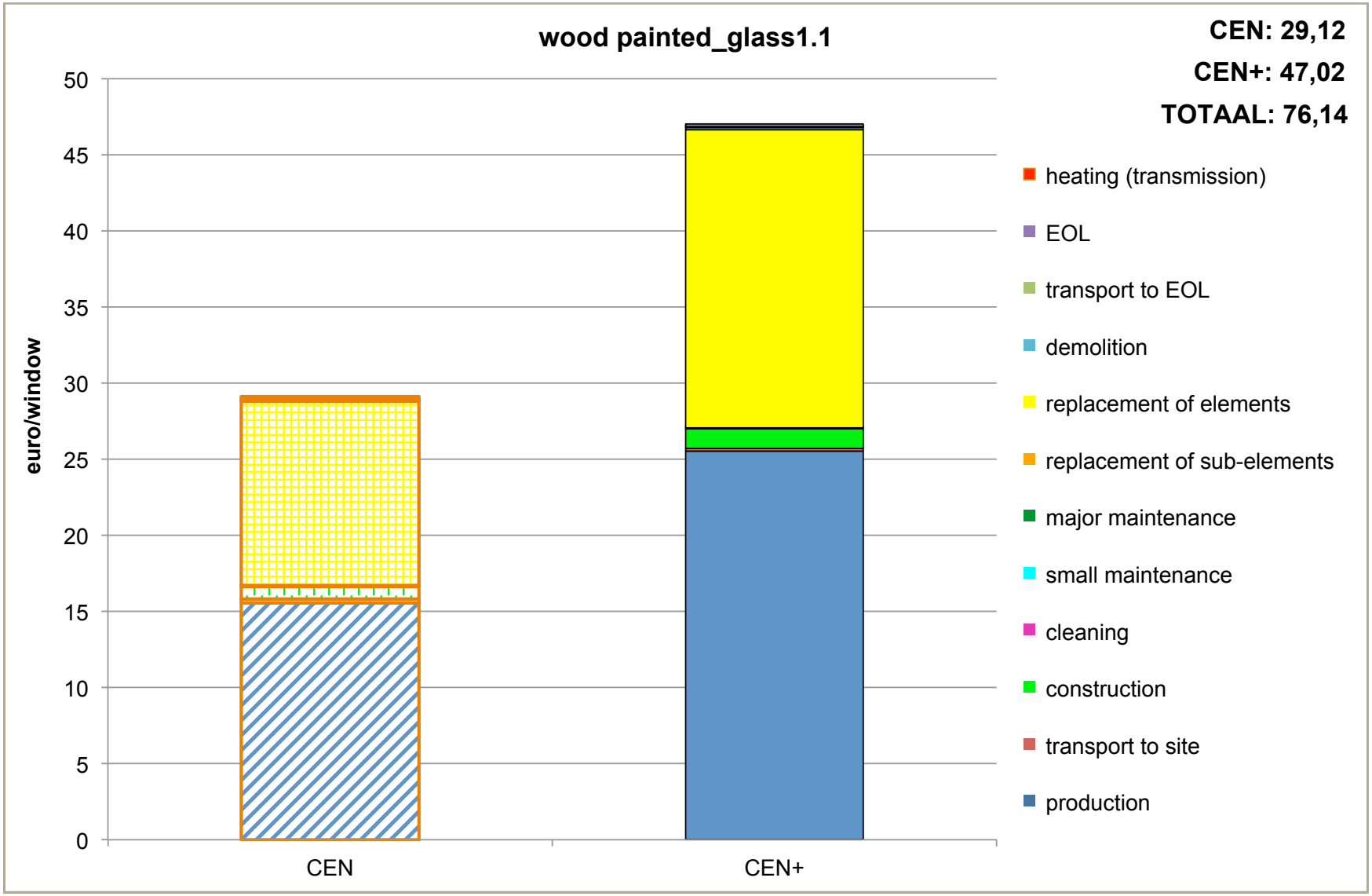

Figure window 8.4.1: Aggregated environmental profile (divided into CEN and CEN+) of variant 'wood painted_glass1.1' per life cycle stage, expressed in monetary units.

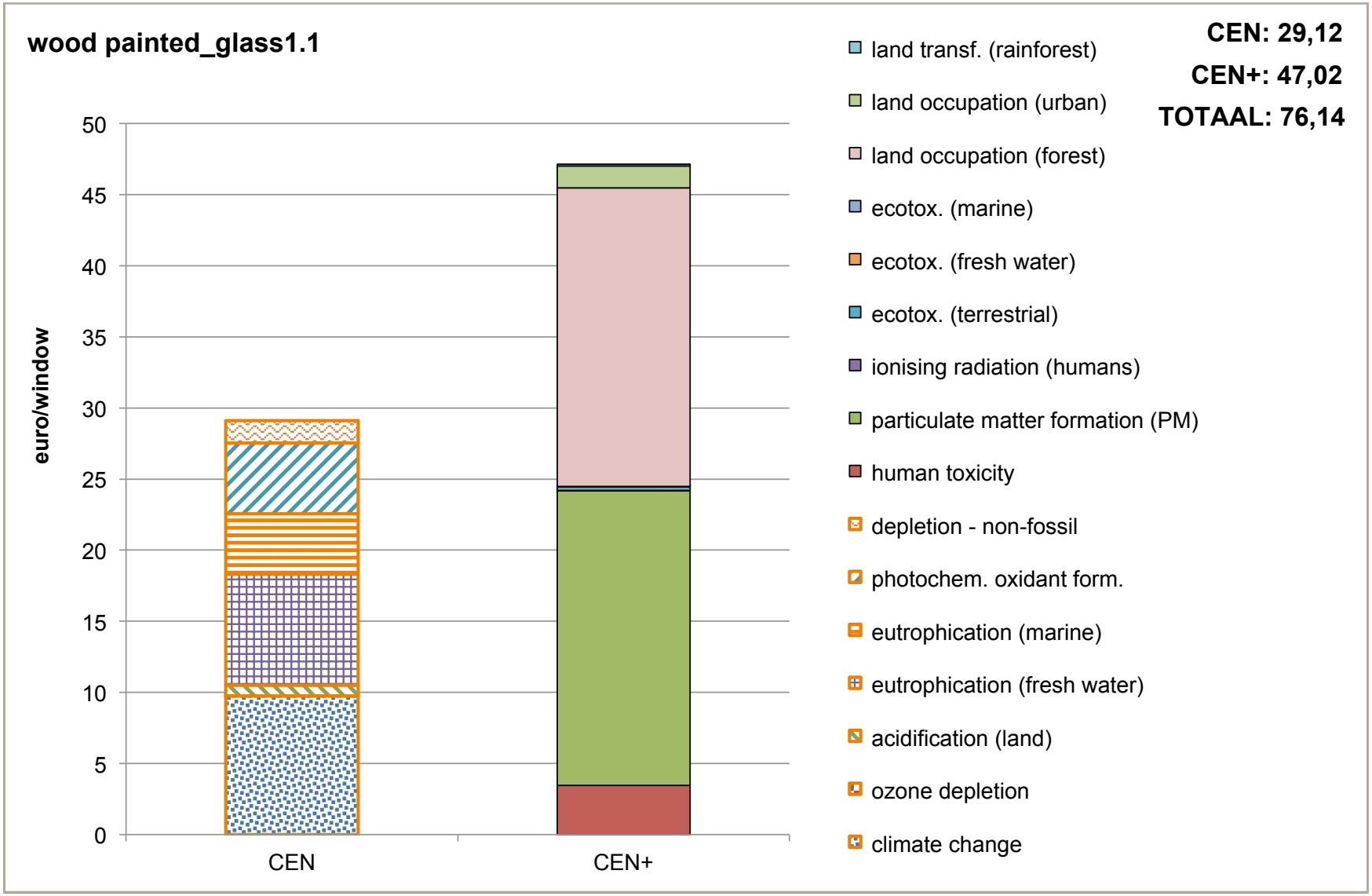

Figure window 8.4.2: Aggregated environmental profile (divided into CEN and CEN+) of variant 'wood painted_glass1.1' per environmental indicator, expressed in monetary units.

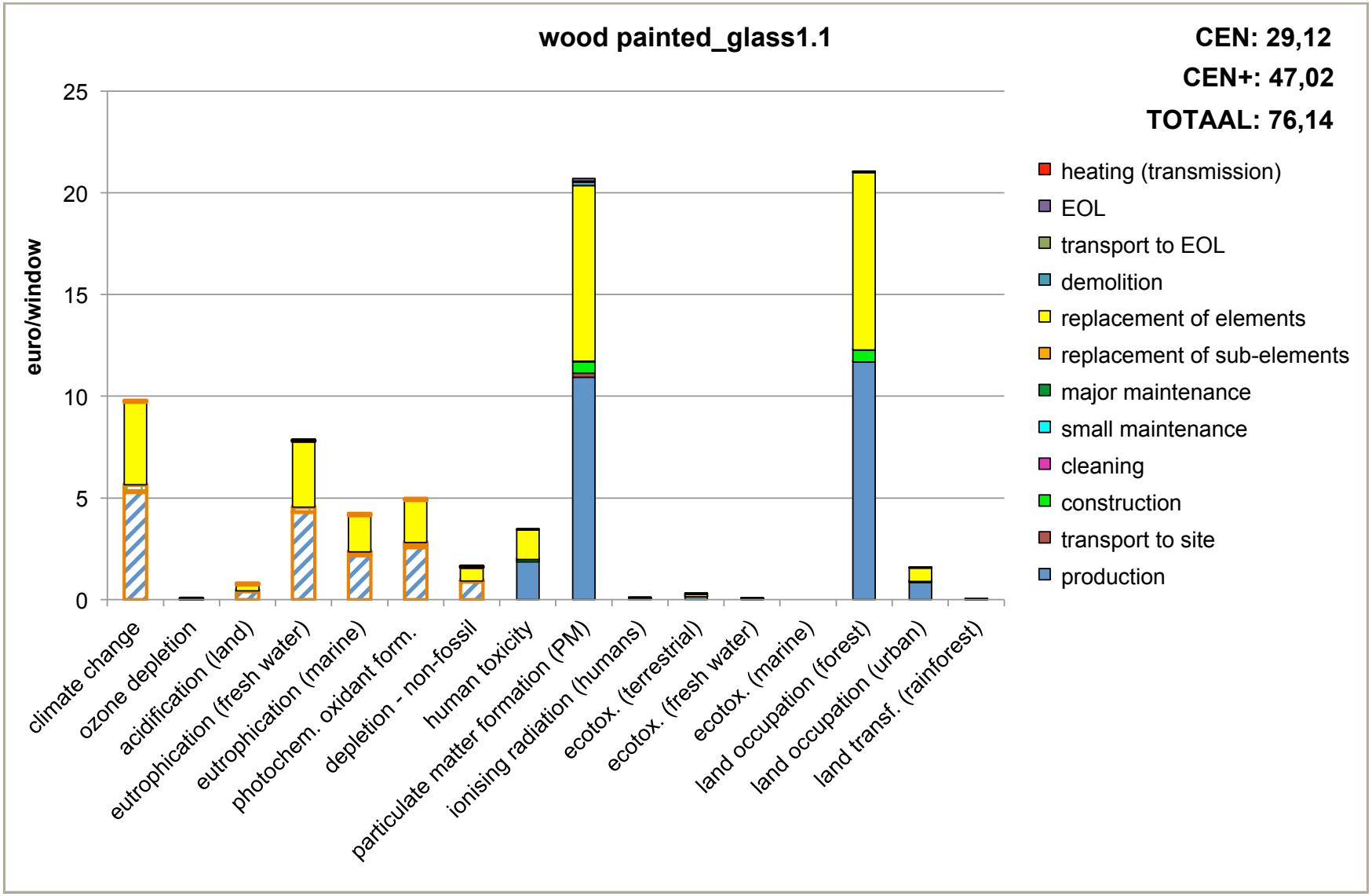

Figure window 8.4.3: Aggregated environmental profile (divided into CEN and CEN+) of variant 'wood painted_glass1.1' per life cycle stage and per individual environmental indicator, expressed in monetary units.

8.5. wood_ALU_glass1.1

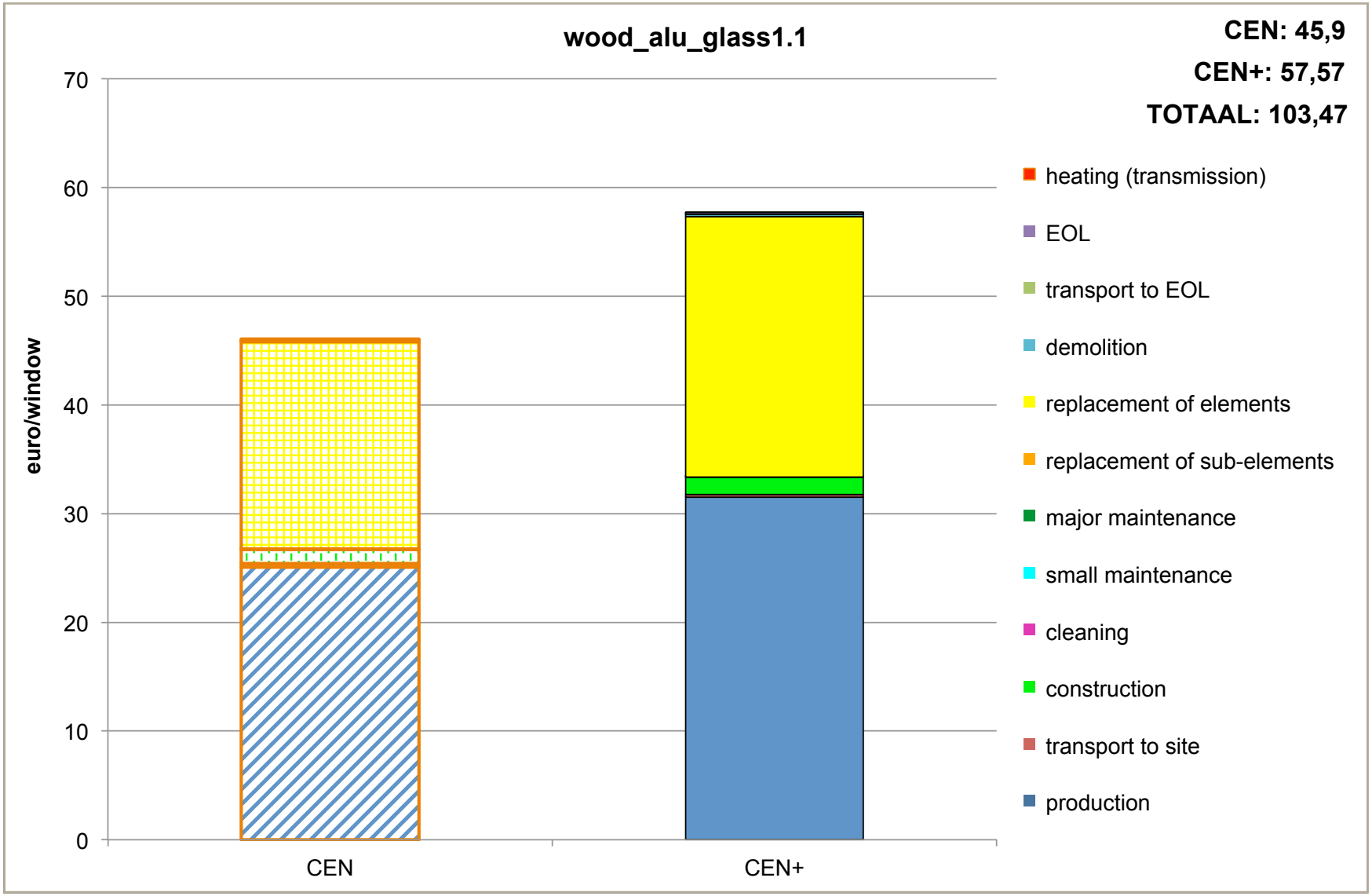

Figure window 8.5.1: Aggregated environmental profile (divided into CEN and CEN+) of variant 'wood_ALU_glass1.1' per life cycle stage, expressed in monetary units.

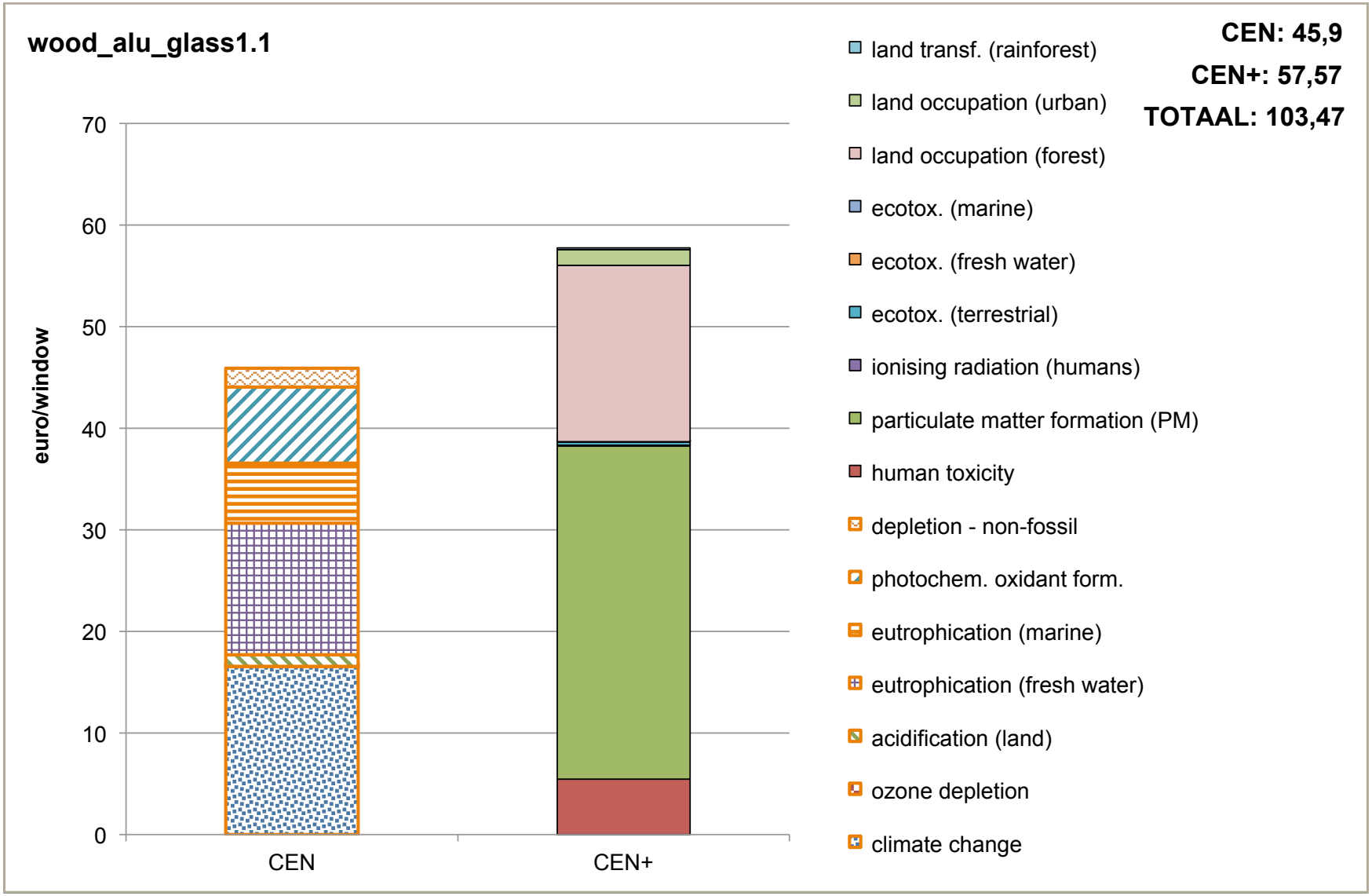

Figure window 8.5.2: Aggregated environmental profile (divided into CEN and CEN+) of variant 'wood_ALU_glass1.1' per environmental indicator, expressed in monetary units.

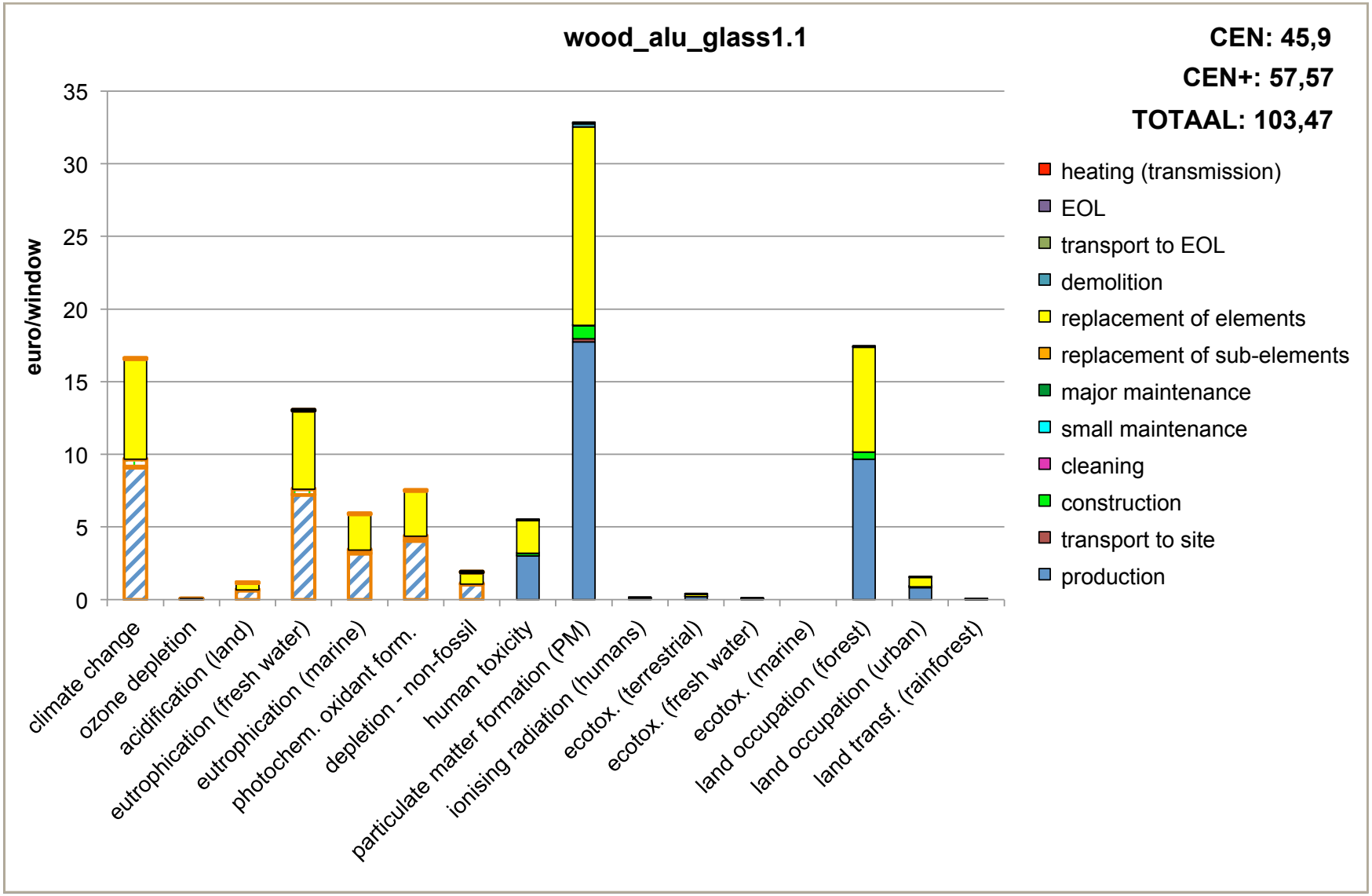

Figure window 8.5.3: Aggregated environmental profile (divided into CEN and CEN+) of variant 'wood_ALU_glass1.1' per life cycle stage and per individual environmental indicator, expressed in monetary units.

8.6. PVCtherm_glass0.5

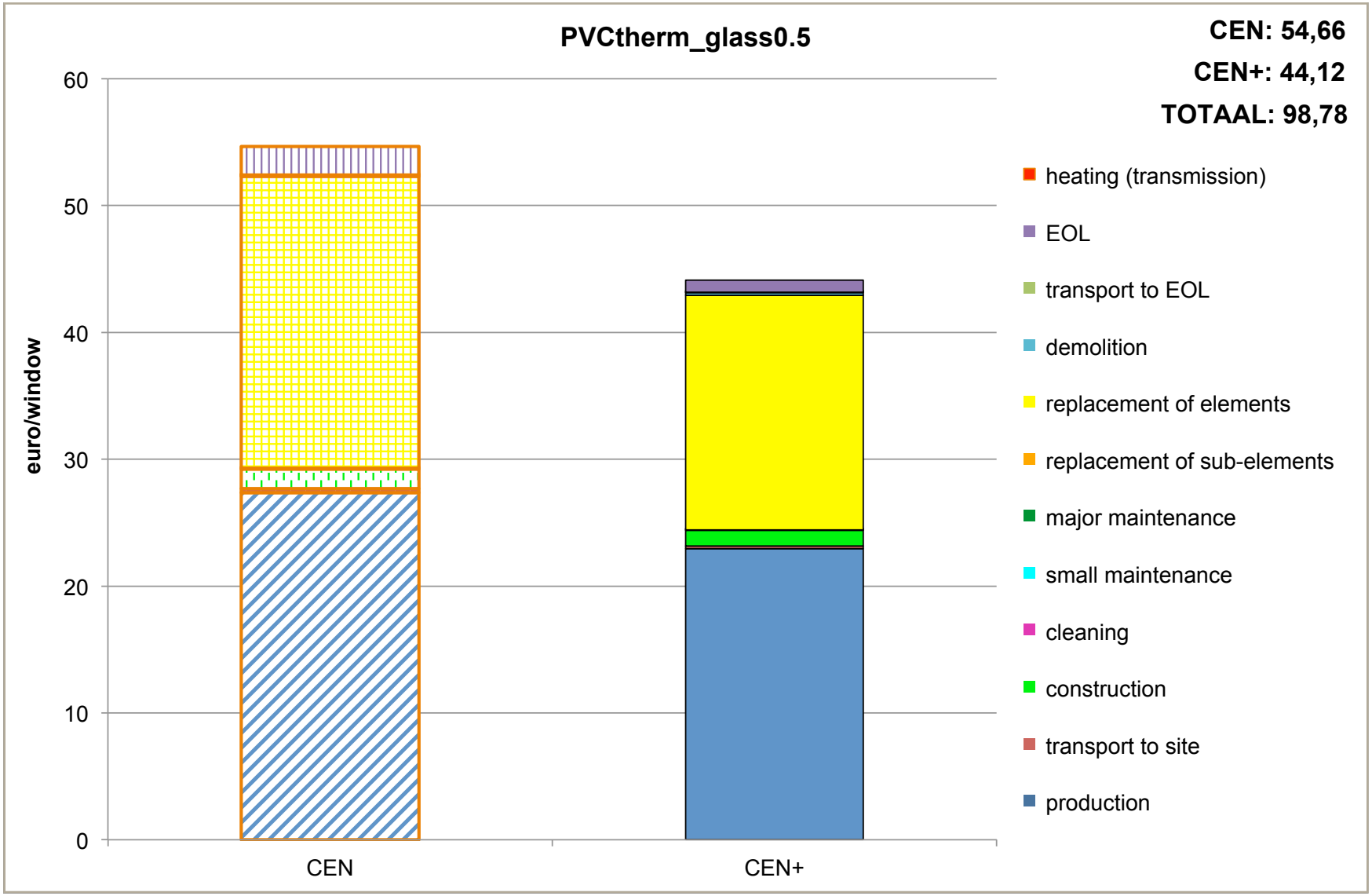

Figure window 8.6.1: Aggregated environmental profile (divided into CEN and CEN+) of variant 'PVCtherm_glass0.5' per life cycle stage, expressed in monetary units.

overview overview CEN overview CEN+

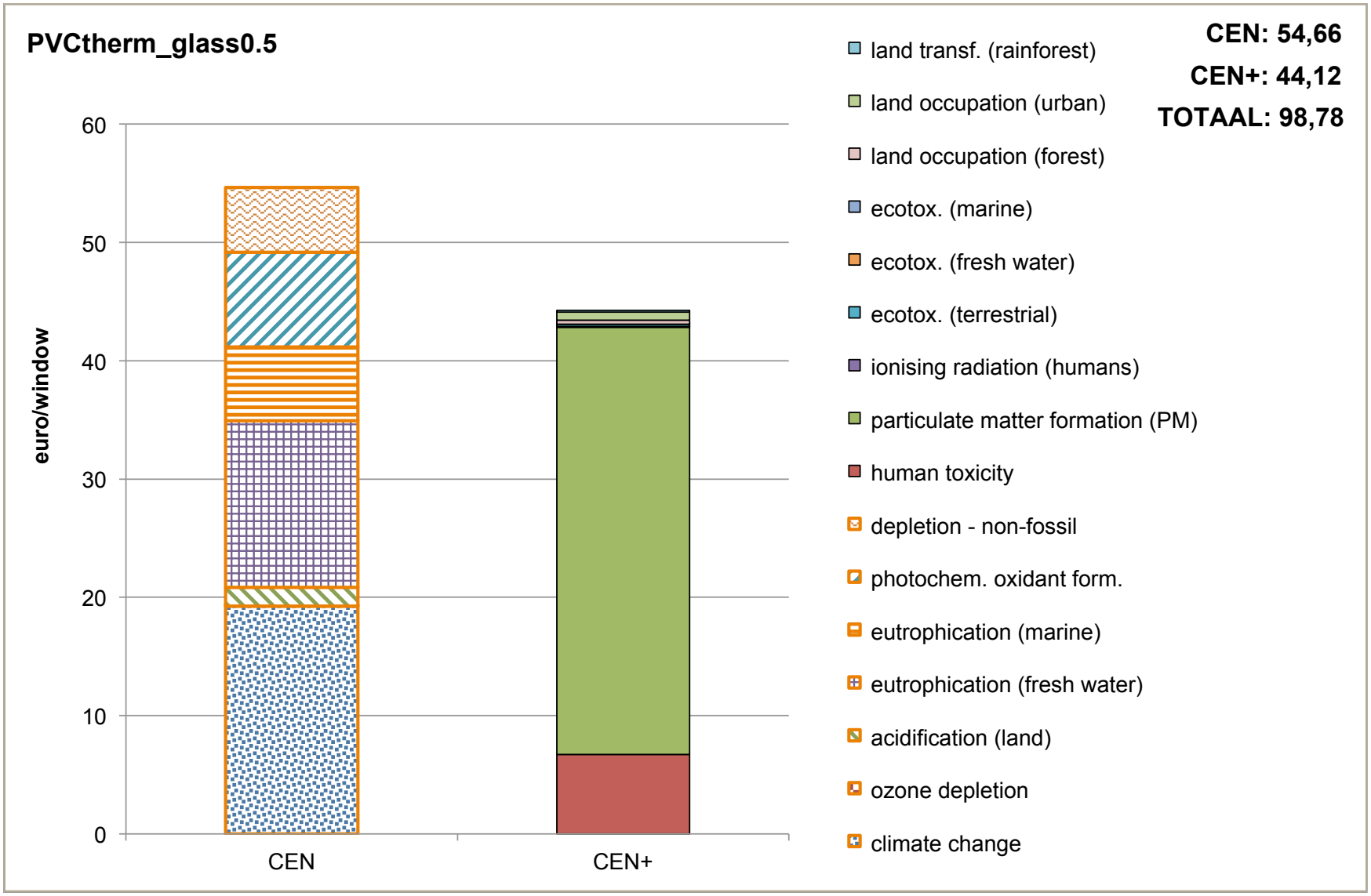

Figure window 8.6.2: Aggregated environmental profile (divided into CEN and CEN+) of variant 'PVCtherm_glass0.5' per environmental indicator, expressed in monetary units.

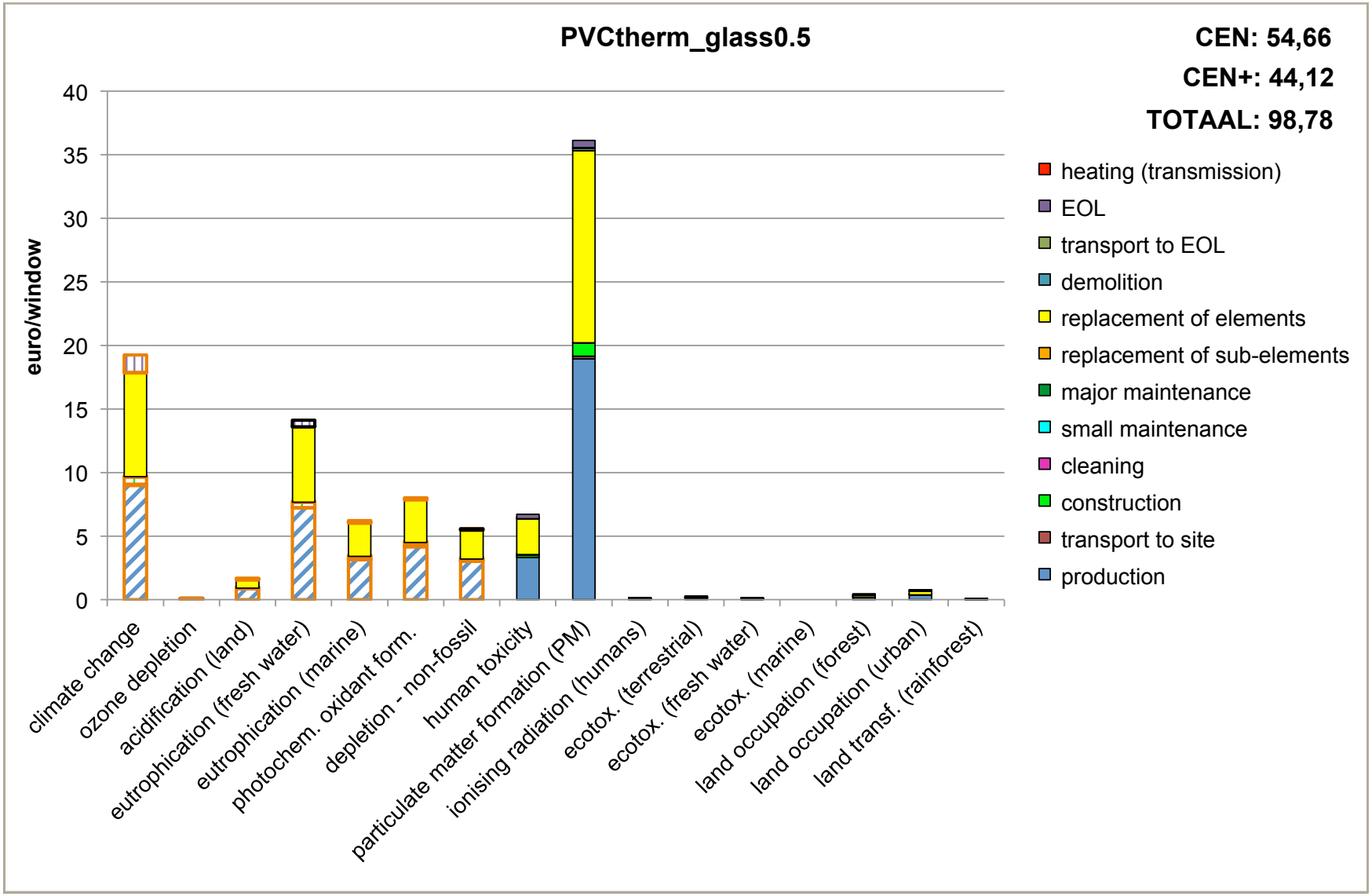

Figure window 8.6.3: Aggregated environmental profile (divided into CEN and CEN+) of variant 'PVCtherm_glass0.5' per life cycle stage and per individual environmental indicator, expressed in monetary units.

8.7. ALUtherm_glass0.6

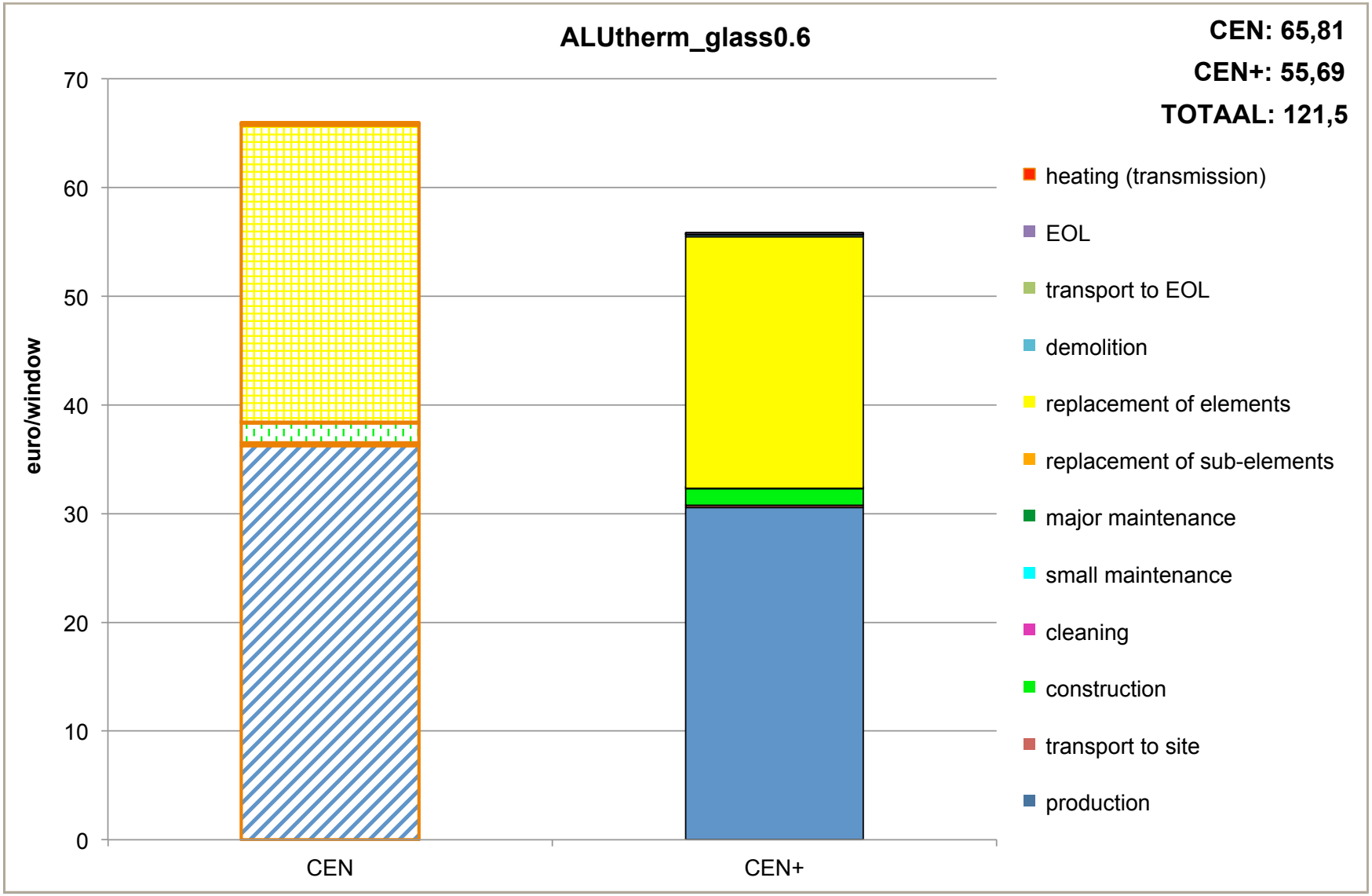

Figure window 8.7.1: Aggregated environmental profile (divided into CEN and CEN+) of variant 'ALUtherm_glass0.6' per life cycle stage, expressed in monetary units.

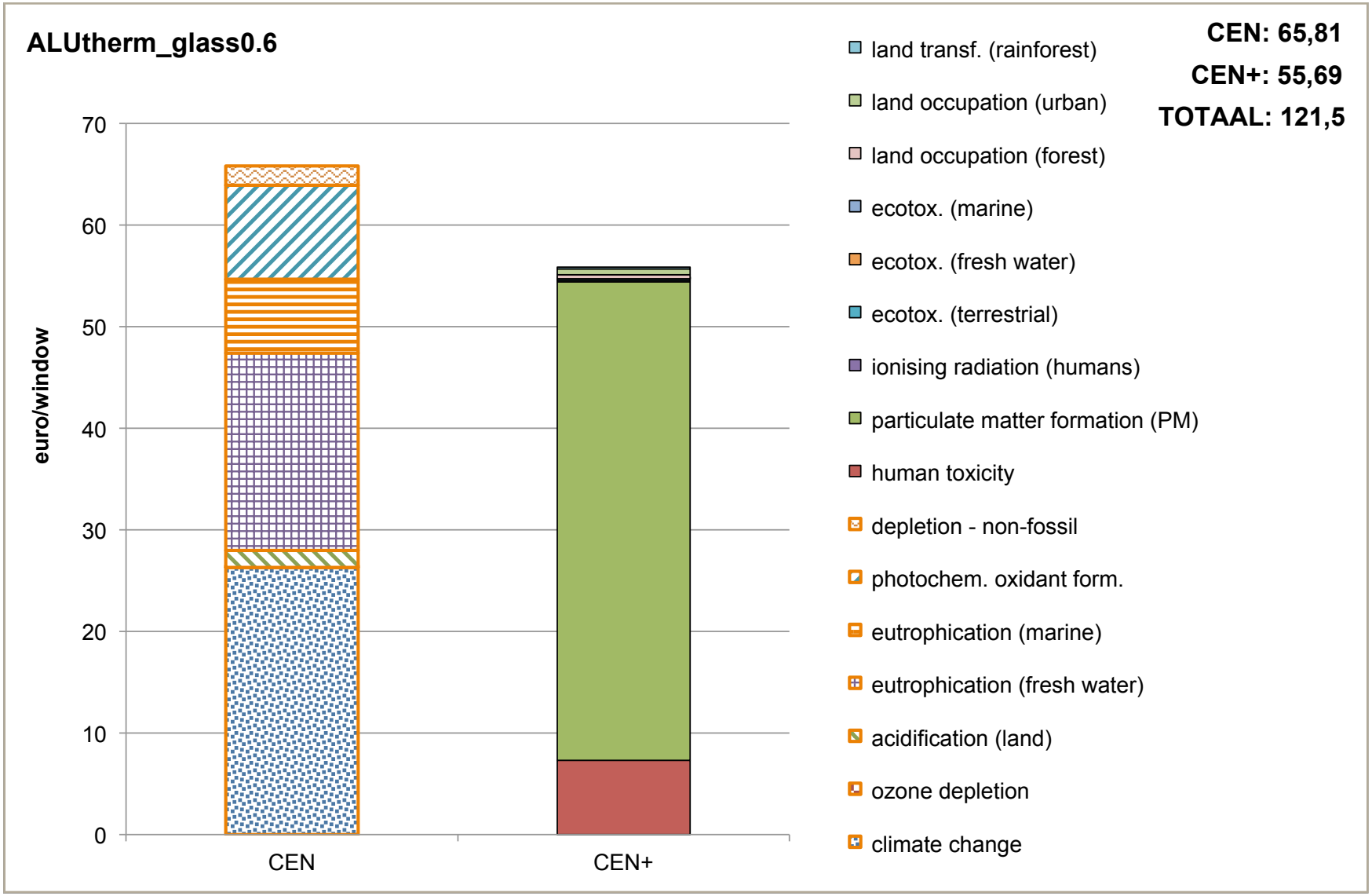

Figure window 8.7.2: Aggregated environmental profile (divided into CEN and CEN+) of variant 'ALUtherm_glass0.6' per environmental indicator, expressed in monetary units.

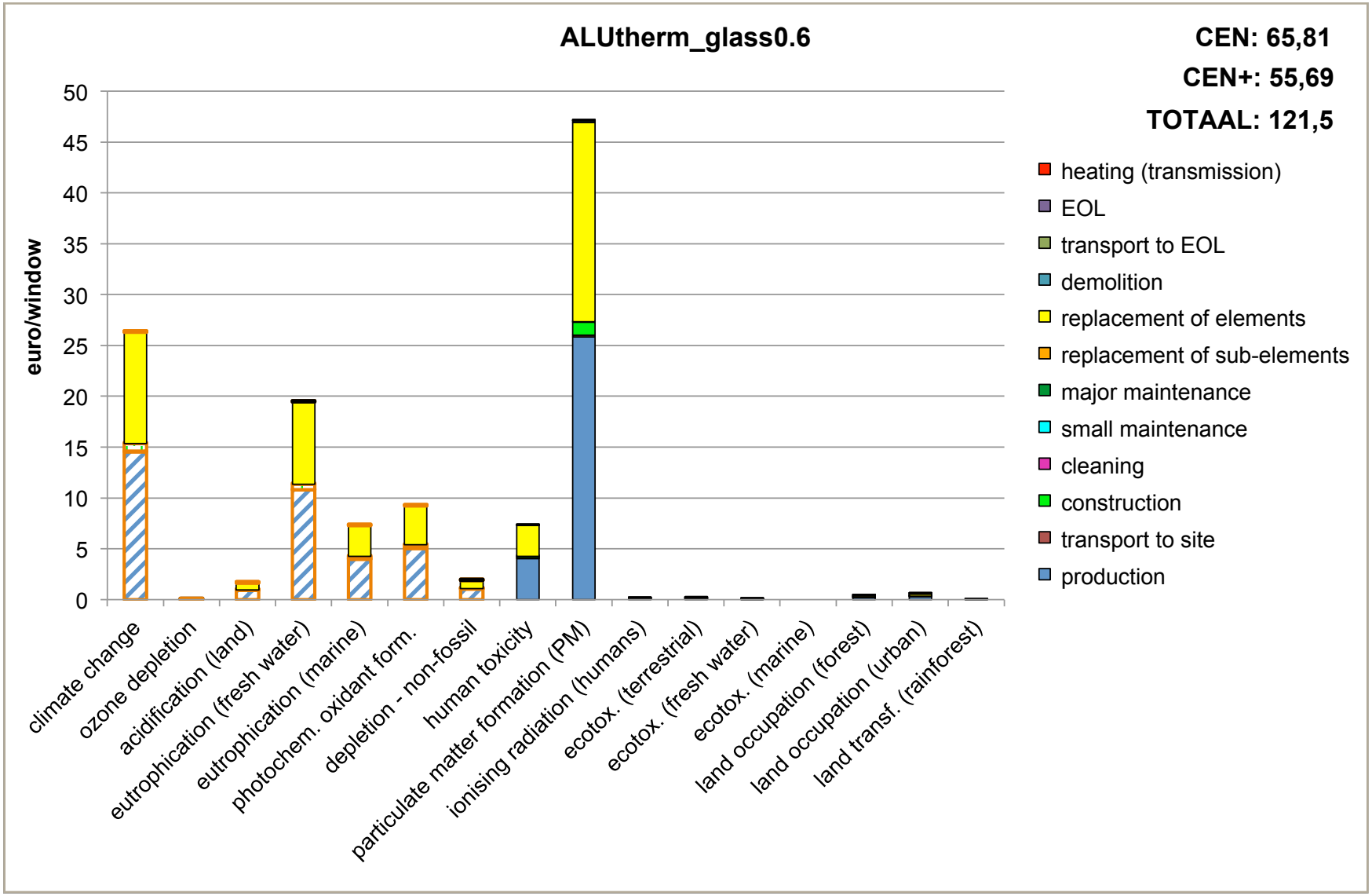

Figure window 8.7.3: Aggregated environmental profile (divided into CEN and CEN+) of variant 'ALUtherm_glass0.6' per life cycle stage and per individual environmental indicator, expressed in monetary units.

8.8. wood therm_tropical hard_glass0.8

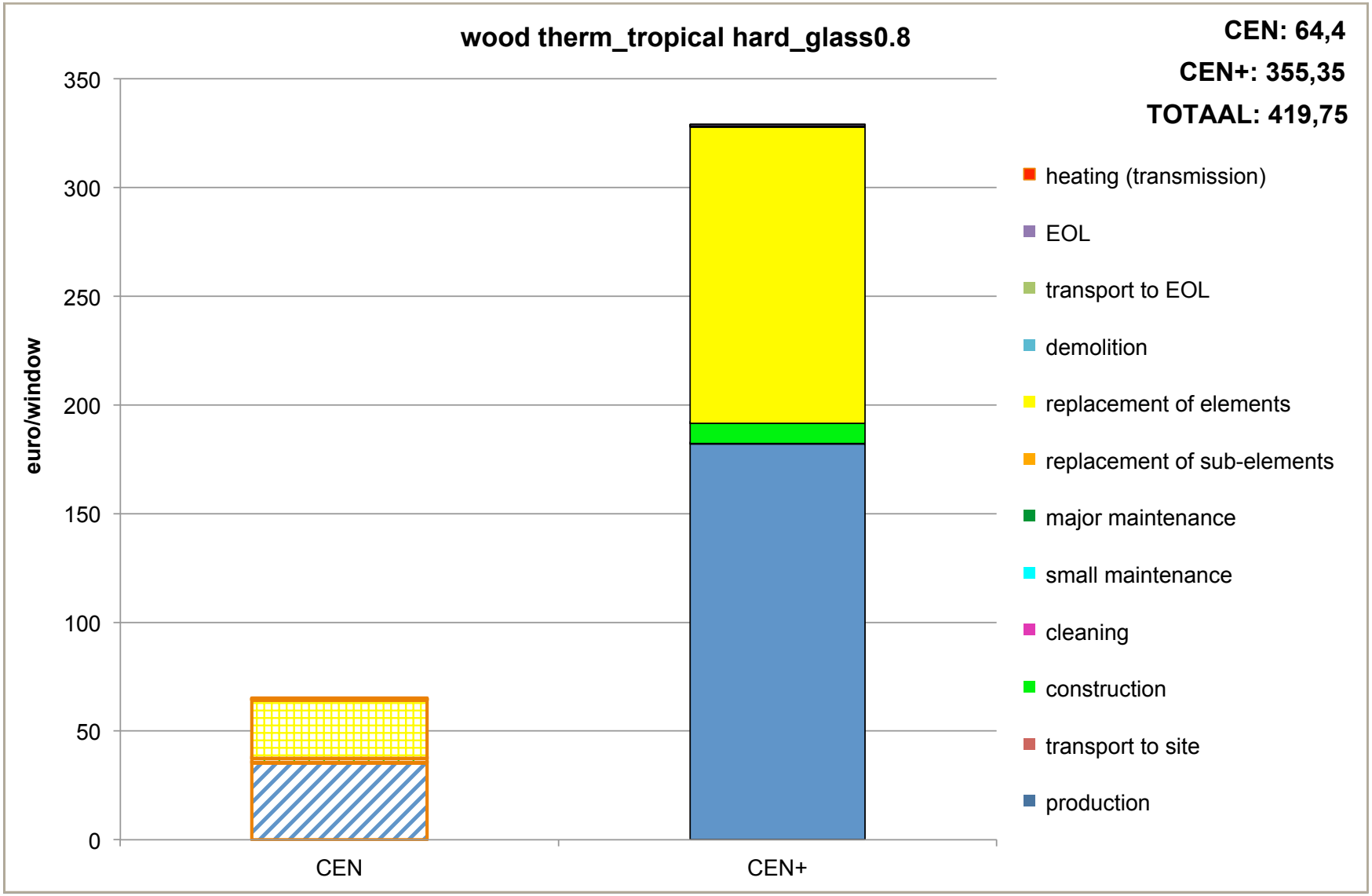

Figure window 8.8.1: Aggregated environmental profile (divided into CEN and CEN+) of variant 'wood therm_tropical hard_glass0.8' per life cycle stage, expressed in monetary units.

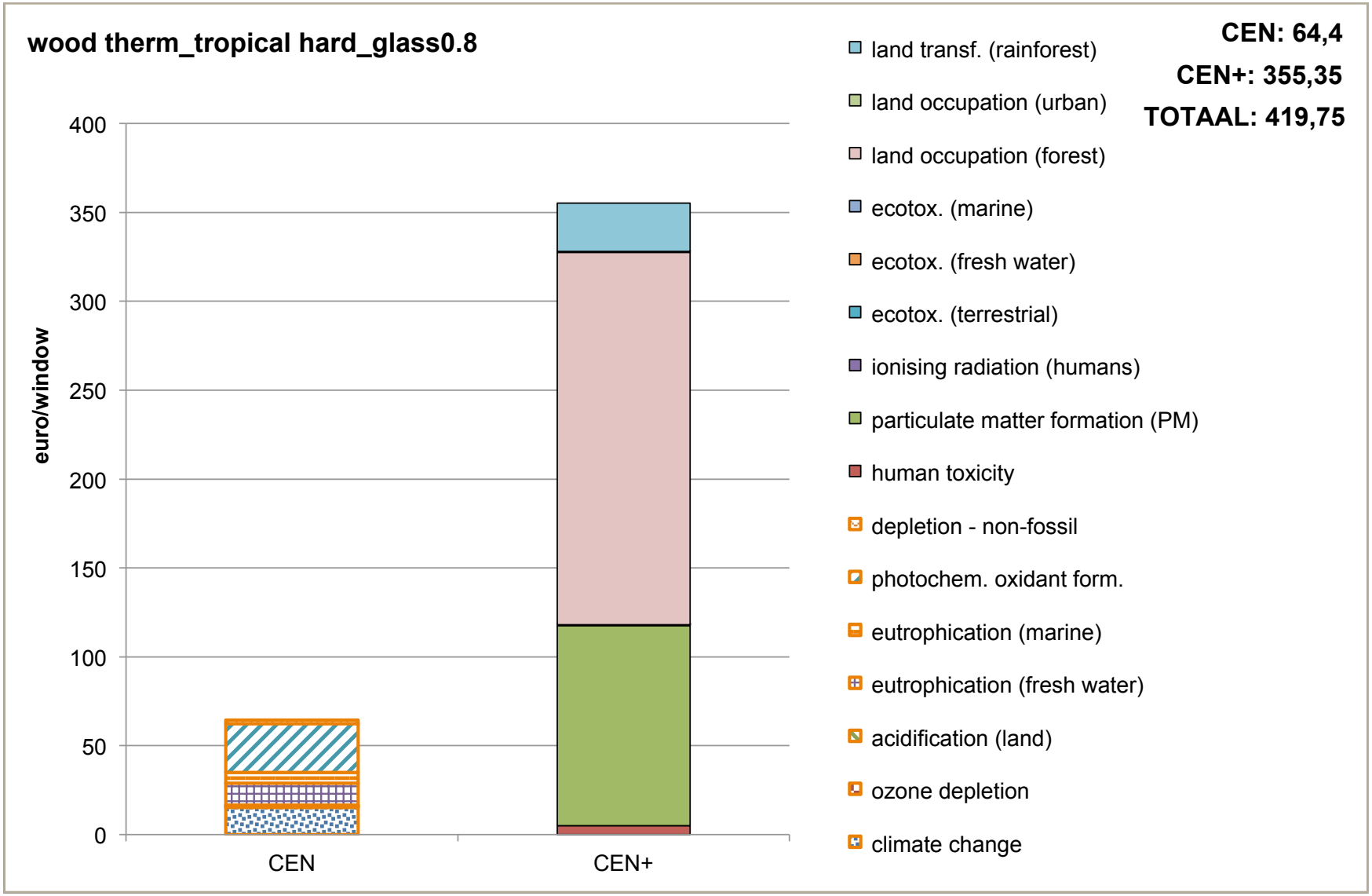

Figure window 8.8.2: Aggregated environmental profile (divided into CEN and CEN+) of variant 'wood therm_tropical hard_glass0.8' per environmental indicator, expressed in monetary units.

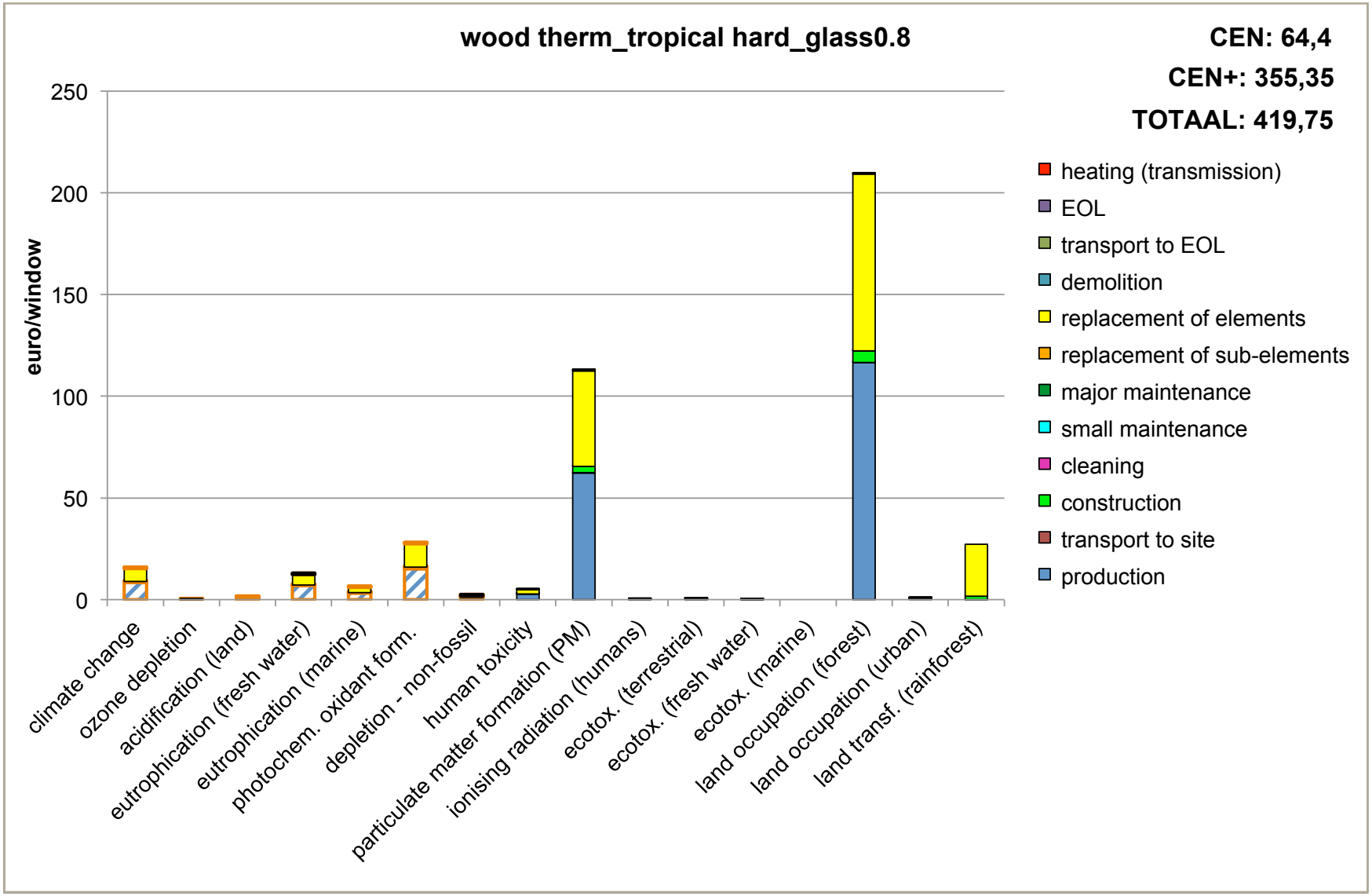

Figure window 8.8.3: Aggregated environmental profile (divided into CEN and CEN+) of variant 'wood therm_tropical hard_glass0.8' per life cycle stage and per individual environmental indicator, expressed in monetary units.

8.9. wood therm_painted_glass0.8

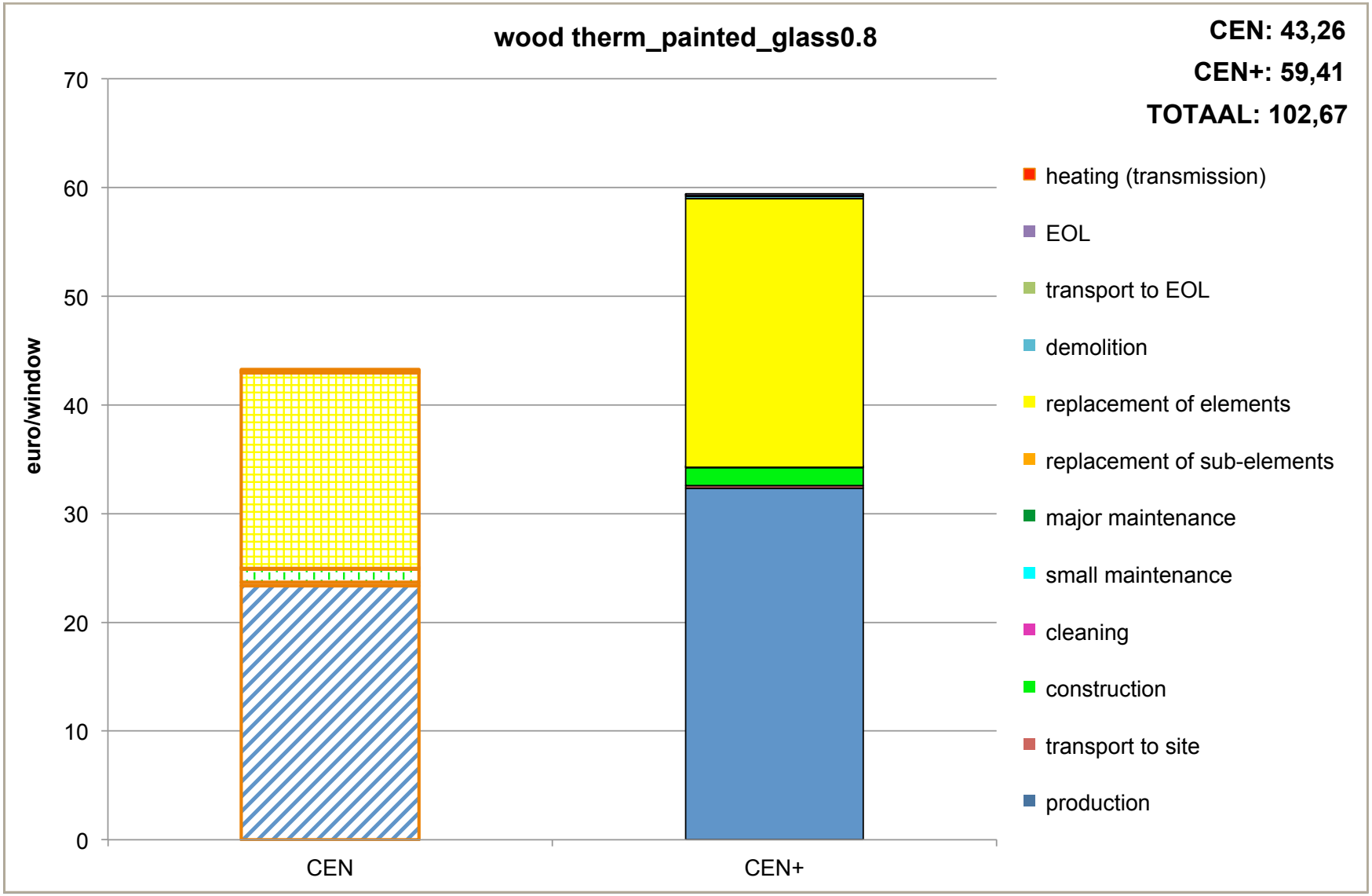

Figure window 8.9.1: Aggregated environmental profile (divided into CEN and CEN+) of variant 'wood therm_painted_glass0.8' per life cycle stage, expressed in monetary units.

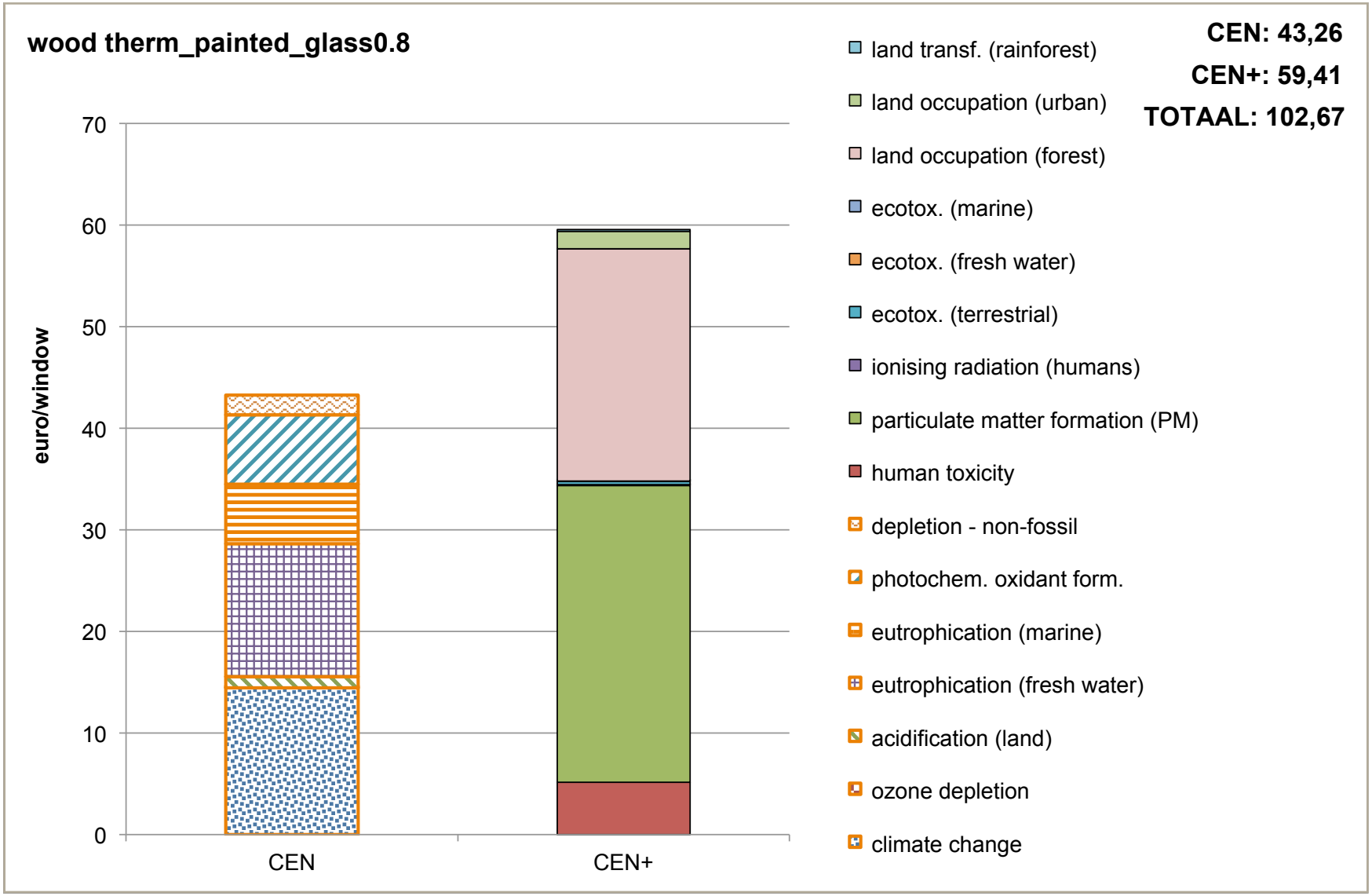

Figure window 8.9.2: Aggregated environmental profile (divided into CEN and CEN+) of variant 'wood therm_painted_glass0.8' per environmental indicator, expressed in monetary units.

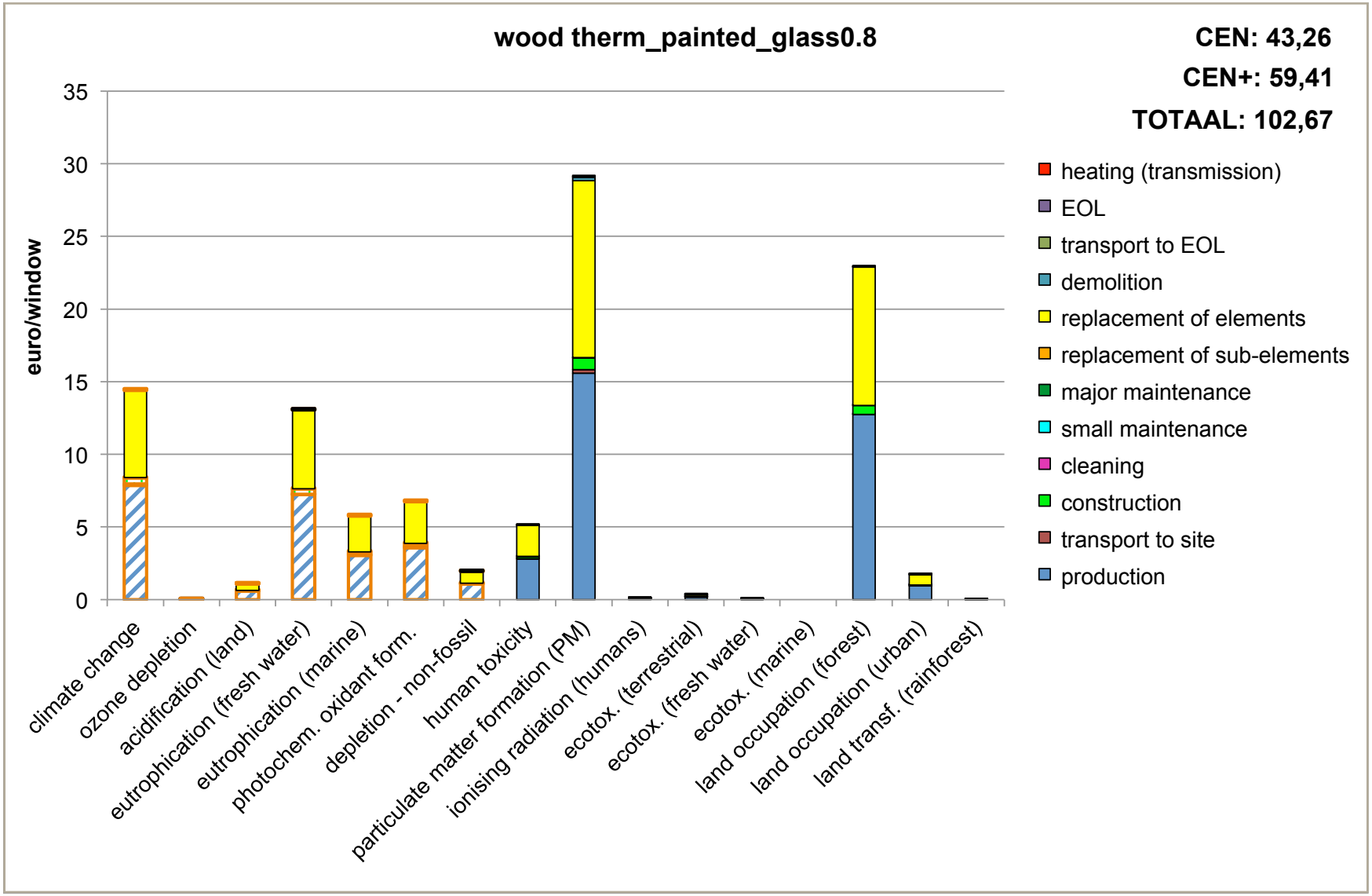

Figure window 8.9.3: Aggregated environmental profile (divided into CEN and CEN+) of variant 'wood therm_painted_glass0.8' per life cycle stage and per individual environmental indicator, expressed in monetary units.

8.10. PVC_glass1.1_safe

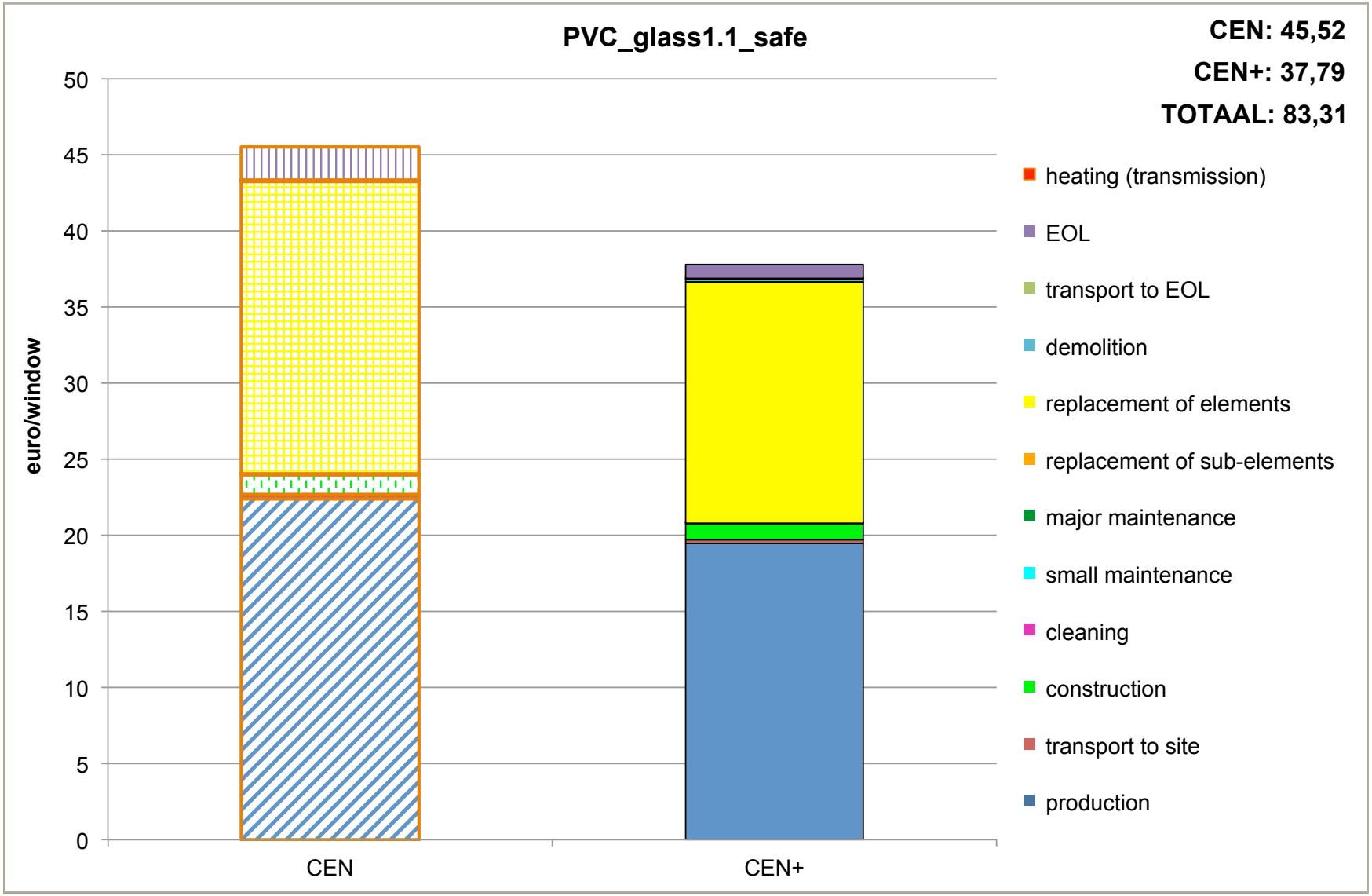

Figure window 8.10.1: Aggregated environmental profile (divided into CEN and CEN+) of variant 'PVC_glass1.1_safe' per life cycle stage, expressed in monetary units.

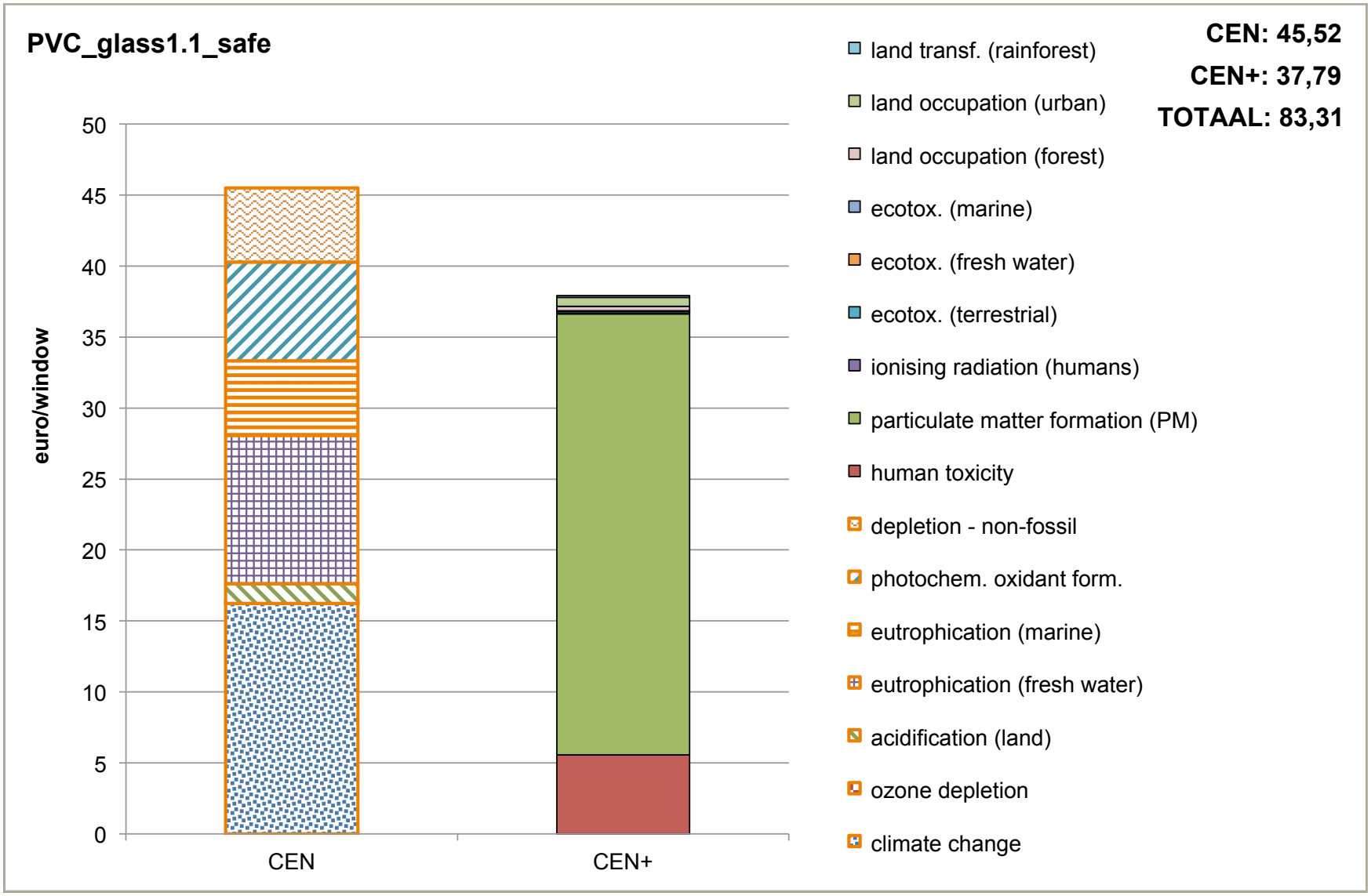

Figure window 8.10.2: Aggregated environmental profile (divided into CEN and CEN+) of variant 'PVC_glass1.1_safe' per environmental indicator, expressed in monetary units.

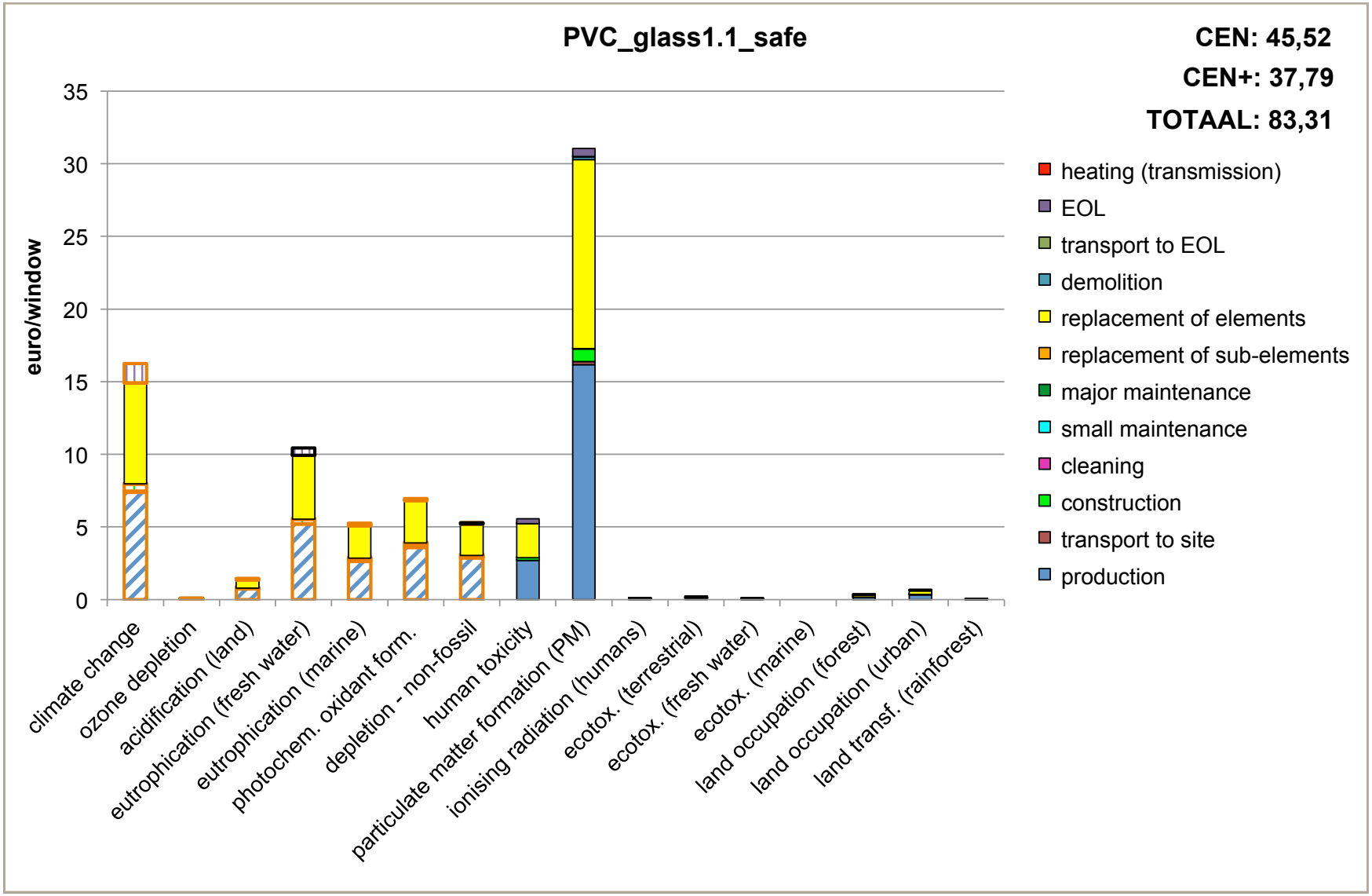

Figure window 8.10.3: Aggregated environmental profile (divided into CEN and CEN+) of variant 'PVC_glass1.1_safe' per life cycle stage and per individual environmental indicator, expressed in monetary units.

8.11. PVC_glass1.1_acoust

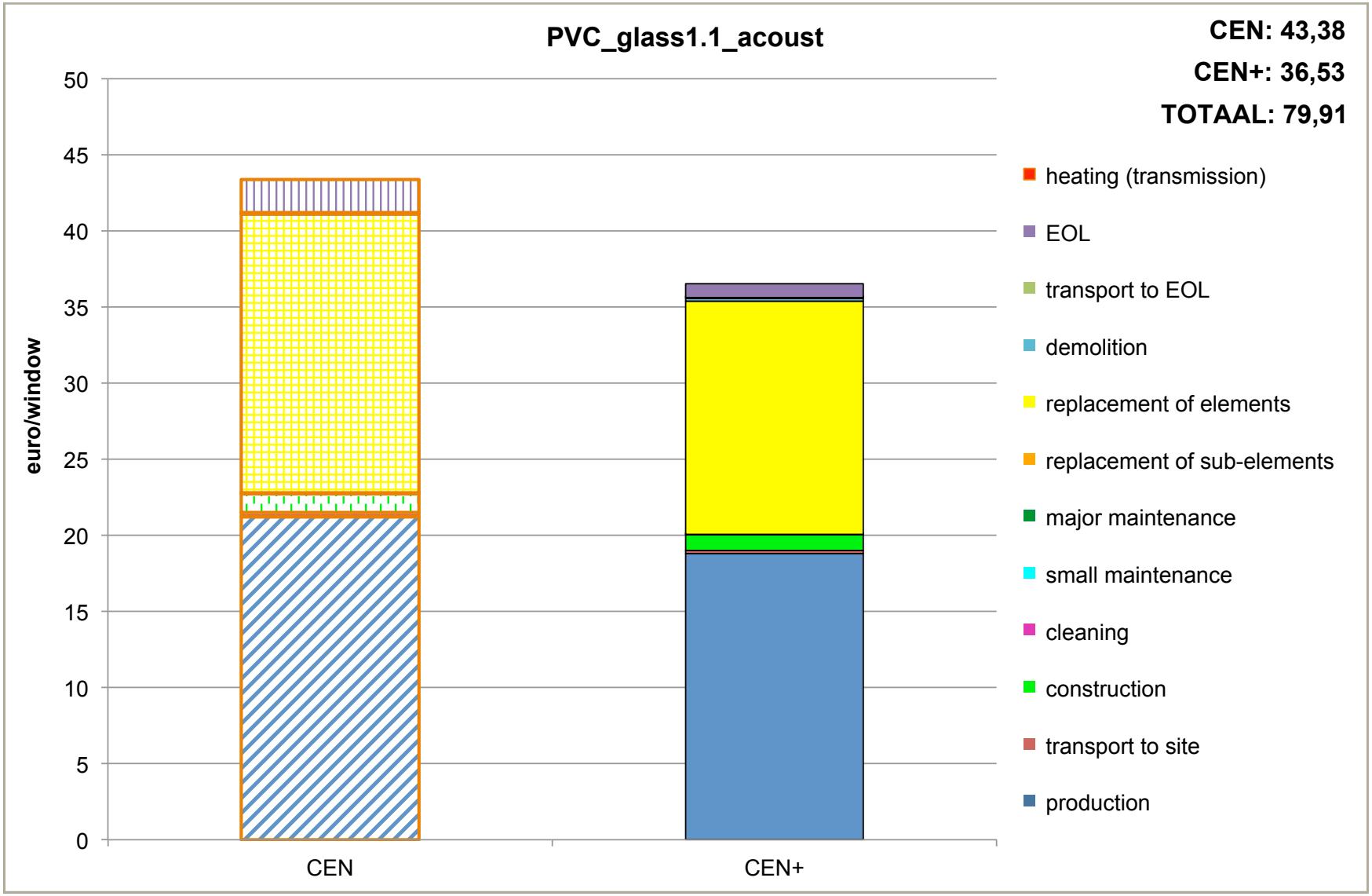

Figure window 8.11.1: Aggregated environmental profile (divided into CEN and CEN+) of variant 'PVC_glass1.1_acoust' per life cycle stage, expressed in monetary units.

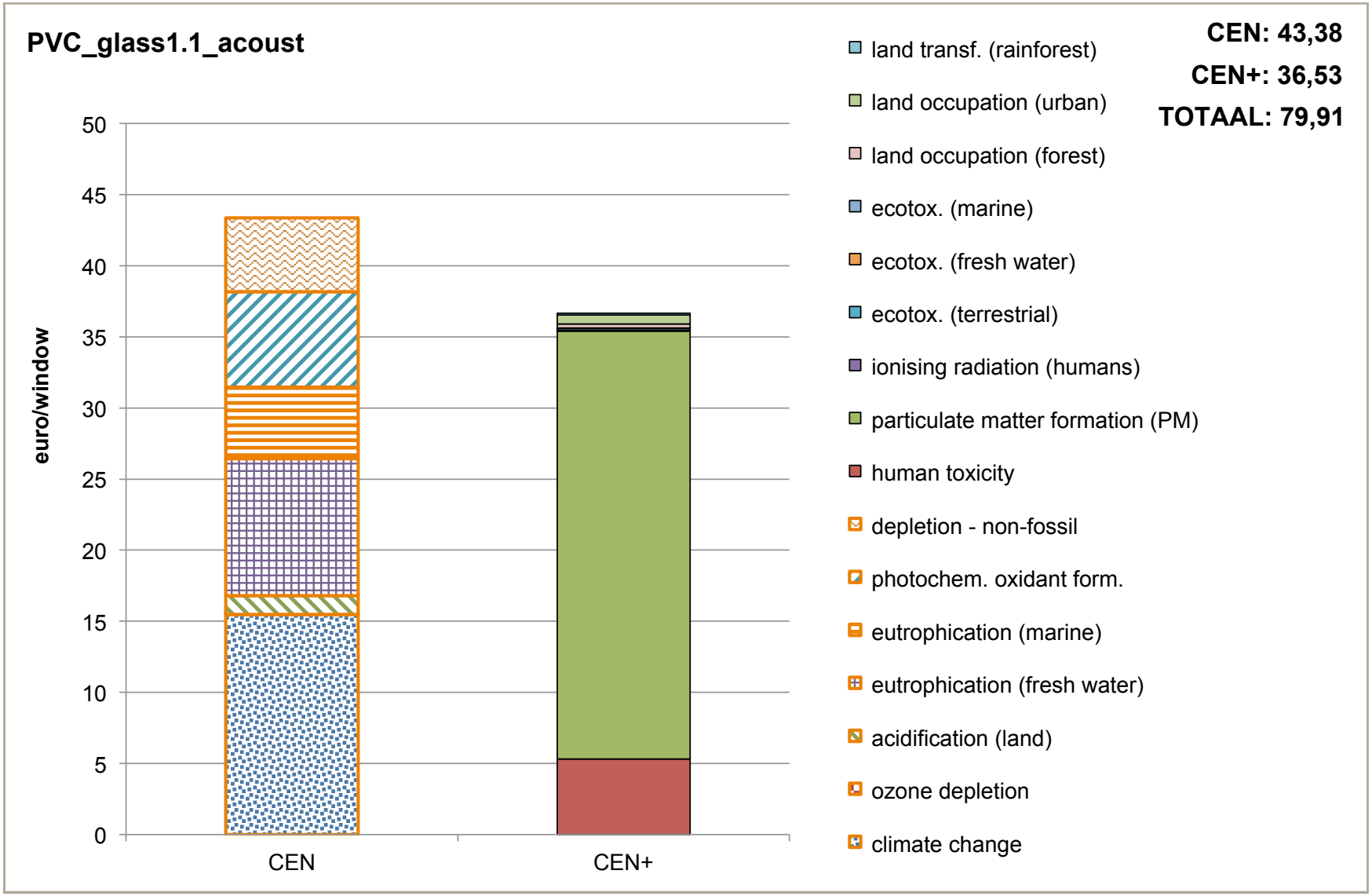

Figure window 8.11.2: Aggregated environmental profile (divided into CEN and CEN+) of variant 'PVC_glass1.1_acoust' per environmental indicator, expressed in monetary units.

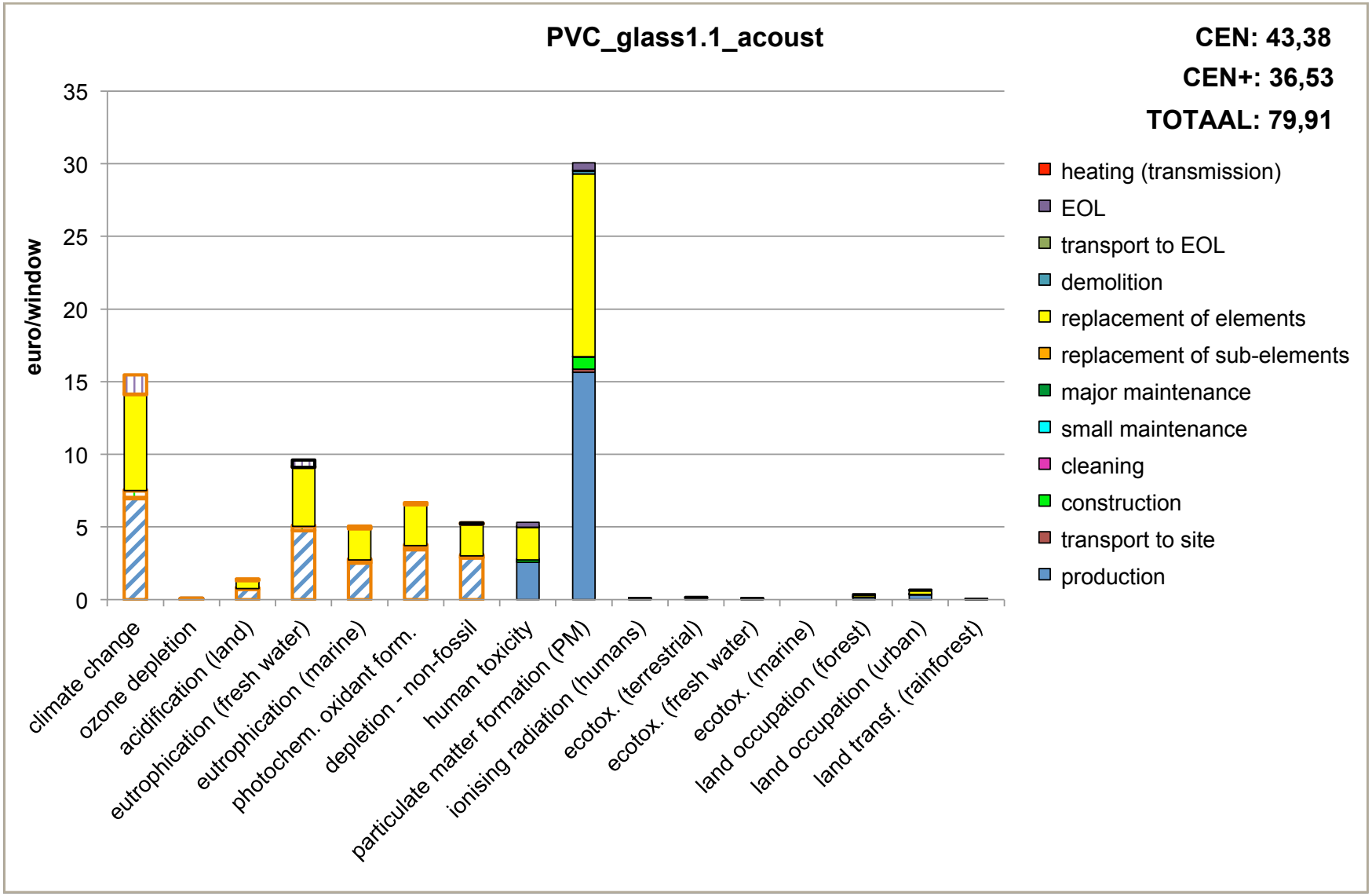

Figure window 8.11.3: Aggregated environmental profile (divided into CEN and CEN+) of variant 'PVC_glass1.1_acoust' per life cycle stage and per individual environmental indicator, expressed in monetary units.

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