

SUPPLEMENTARY INFORMATION

Supplementary Materials S1: Analysis of criteria found in the sample

Table S1 List of words used for the text mining of the tenders per product group. The words are in Dutch because the tender texts are in Dutch.

Search term	Productgroup
Afgedankte Work wear	Work wear
AOX – OX	Work wear
Biotextiel	Work wear
CFK	Work wear
Convenant	Work wear
Duurzaam inkopen Work wear	Work wear
Gehalogeneerd	Work wear
ISO Work wear	Work wear
Öko-Tex	Work wear
RCS	Work wear
Reinigen	Work wear
Textielvezels	Work wear
Waterzuivering	Work wear
COC	Buildings
DuboCalc	Buildings
Duurzaamheidscategorie	Buildings
Duurzaamheidsprestatie	Buildings
Energiewinning	Buildings
FSC	Buildings
Inbouwpakket	Buildings
Levensduurverlenging	Buildings
Milieubeheermaatregelen	Buildings
Milieubelasting	Buildings
Milieuwet- en regelgeving	Buildings
MPG	Buildings
MTCS	Buildings
PEFC	Buildings
SFM	Buildings
Sociale voorwaarden	Buildings
STIP	Buildings
TPAC	Buildings
Duurzame teelt	Furniture
Levensduur	Furniture

Search term	Productgroup
Reinigingsmiddelen	Furniture
Toegankelijkheid	Furniture
Verpakkingsmateriaal	Furniture
<i>Close the loop</i>	ICT hardware
Duurzame	ICT hardware
<i>Energy star</i>	ICT hardware
Grondstoffen	ICT hardware
Gerecyclede content	ICT hardware
Reserve-onderdelen	ICT hardware
Verpakkingen	ICT hardware
Brandstoffen	Cars
Criteria	Cars
EEV	Cars
Emissies	Cars
Overige maatregelen	Cars
Asfalt	Road construction
COC	Road construction
Duurzaamheidscategorie	Road construction
Duurzaamheidsprestatie	Road construction
Emissiegrenswaarden	Road construction
Energiebron	Road construction
Energiewinning	Road construction
Flexibel inbouwpakket	Road construction
FSC	Road construction
Grondbalans	Road construction
KOMO	Road construction
Levensduurverlenging	Road construction
Milieubeheermaatregelen	Road construction
Milieubelasting	Road construction
Milieuklassen	Road construction
Milieuprestatie	Road construction
Milieuvriendelijke coating	Road construction
Milieuwet- en regelgeving	Road construction
MTCS	Road construction
Opslag	Road construction
PEFC	Road construction
SFM	Road construction
Sociale voorwaarde	Road construction
STIP	Road construction
TPAC	Road construction

Search term	Productgroup
2009/28/EG	Solar Panels
Afvalbeheer	Solar Panels
Hernieuwbare energiebronnen	Solar Panels
Onderhoudsplan	Solar Panels
PV-cycle	Solar Panels
Recyclingprogramma	Solar Panels
Tüv-certificaat	Solar Panels
Verduurzaming	Solar Panels
Afvalstoffen	General search terms
Biobased	General search terms
Biobrandstoffen	General search terms
C2C	General search terms
Circulariteit	General search terms
CO ₂	General search terms
Demontage	General search terms
Duurzaam	General search terms
Duurzaam2	General search terms
Duurzaam3	General search terms
Ecologisch	General search terms
Emissienorm	General search terms
Energiete rugwinning	General search terms
ERU – VER	General search terms
<i>Fairtrade</i>	General search terms
FSC	General search terms
Geluid	General search terms
Gevaarlijke stoffen	General search terms
Grenswaarden	General search terms
Groene stroom	General search terms
GvO	General search terms
Herbruikbaar	General search terms
ILO – ISV	General search terms
ISO14001	General search terms
Klimaat	General search terms
LCA	General search terms
Milieu	General search terms
MKI	General search terms
MVO – MVI	General search terms
Nano	General search terms
PIANOo	General search terms
Recycling	General search terms

Search term	Productgroup
Refurbished	General search terms
Reststoffen	General search terms
Restwaarde	General search terms
Retour	General search terms
<i>Second life</i>	General search terms
SROI	General search terms
<i>Supply chain</i>	General search terms
TCO	General search terms
Verpakkingen	General search terms
Waardebehoud	General search terms
Water	General search terms
WEEE	General search terms

Table S2 overview of criteria found in the sample of 72 tenders, the circularity (R) strategy stimulated with the criteria, the number of tenders that apply the criteria, the number of tenders in which the criteria was also operationalized during the contract phase, the number of tenders in which the criteria was applied in a more ambitious way than common practice and the number of tenders for which the effect of the criteria could be estimated. R2 = Reduce, R3 = Reuse, R4 = Repair, R5 = Refurbish, R8a = recycled content, R8b = recyclability.

Product group	Criteria	R strategy	N Tenders	Operational	> common practice	effect measured
Buildings	Require a BREEAM sustainability score	General	2	2	?	0
Buildings	Reuse of clinkers	R3	1	1	0	1
Buildings	Secondary materials are removed as monostreams. This increases the chance of reuse or recycling	R8b	1	1	0	1
Cars	Plan with circularity measures	General	1	0	?	1
Furniture	Guarantee a product with a longer life span: 15 instead of 10	R2	2	2	2	2
Furniture	Guarantee a product with a longer life span: 20 instead of 10	R2	3	3	3	2
Furniture	Repair service contract	R4	6	6	?	0
Furniture	Easy disassembling of parts. This increases the repair and recycle opportunities.	R4, R8b	6	?	?	0
Furniture	Refurbishment of old furniture instead of supplying new	R5	2	2	2	1
Furniture	Product with recycled content	R8a	1	1	1	0
Furniture	Take recycling after use into account in the design	R8b	2	0	2	2
Furniture	Supplier also (partly) responsible for maintenance. This might result in a longer life span.	R2	4	4	?	0
ICT hardware	One year longer guarantee	R2	1	?	1	?
ICT hardware	Spare parts are available for at least ## years	R4	8	8	0	8
ICT hardware	Supply of refurbished devices possible within contract	R5	1	?	1	?
Road construction	Require a carbon performance ladder certificate	General	4	4	3	4
Road construction	Apply a technique that increases the life span of the roads	R2	1	0	1	1
Road construction	Use concrete with higher content of recycled concrete	R8a	2	0	2	2
Road construction	Secondary materials are removed as monostreams. This increases the chance of reuse or recycling	R8b	2	2	0	2
Solar Panels	PID free solar panels IEC 62804	R2	2	2	0	2
Solar Panels	Membership of a foundation which arranges dismantling and recycling after use	R8b	4	4	0	4
Work wear	Repair service contract	R4	2	2	?	0
Work wear	Product with recycled content	R8a	3	3	3	2
Work wear	Recollect work wear after disposal	R8b	1	0	0	1
			62	47	21	36

Supplementary Materials S2: Data used for calculations

This appendix contains details on the calculations of the realized effect of CPP in 2017-2018 in the Netherlands and the potential effect of a selection of CPP measures when applied to all tenders within that time-period for the product groups Buildings, Furniture, Road construction and Workwear. This information is again a summary of background documents (in Dutch):

- Furniture and Road construction: Zijp et al., 2020: <https://www.rivm.nl/bibliotheek/rapporten/2020-0002.html> (latest access 19-05-2021)
- Workwear: CE Delft, 2021: https://ce.nl/wp-content/uploads/2021/03/CE_Delft_200147_Effect_meten_van_circulair_inkopen_bedrijfsklaring_Def.pdf (latest access 19-05-2021)
- Buildings: RIVM, 2021: <https://www.rivm.nl/maatschappelijk-verantwoord-inkopen/effect-circulair-inkopen> (latest access 19-05-2021)

Buildings-Potential

Scenario: Replacing 50% of CEM I concrete with CEM III concrete or replacing sand and gravel with concrete granulate.

Amount of office buildings build every year: 34484 m²

Total GHG saved when all new office buildings are build using CEM III concrete: 311 ton CO₂-eq

Total materials saved when all new office buildings are build using CEM III concrete: 595 ton

Extra GHG emissions when all new office buildings are build using concrete granulate: 19 ton CO₂-eq

Total materials saved when all new office buildings are build using concrete granulate: 3700 ton

Total GHG saved when scenarios combined: 282 ton CO₂

Total materials saved when scenarios combined: 4200 ton

Furniture realized

Longlist: 162 tenders; € 345 million

Sample: 10 tenders; € 69 million

Circularity strategy: extended life time (R2), refurbishing (R5)

Type of furniture: chairs, desks, tables

Material: plastics, wood, steel, iron, polyester

Reference profiles for new and refurbished furniture:

Type of furniture (new)	Weight (kg)	CO ₂ -eq emissions (kg)	New material (kg)	Recycled material (kg)	Biobased material (kg)
Desk chair	18,54	100,9	10,43	8,11	-
Chair	7,24	32,3	5,76	0,78	0,67
Desk type 1	50,11	117,9	29,95	4,72	15,44
Desk type 2	55,55	152,2	35,55	5,96	14,03
Table	47,35	78,9	16,91	4,43	26,01
Cabinet	100,3	257,4	61,38	35,25	3,67

Source: DGBC, 2021b

Type of furniture (refurbished)	Weight (kg)	CO2-eq emissions (kg)	New material (kg)	Re-used material (kg)	Recycled material (kg)	Biobased material (kg)
Desk chair	18,53	11,7	1,04	16,62	0,87	-
Chair	7,24	3,80	0,49	6,32	0,32	0,09
Desk type 1	50,11	12,68	0,78	41,76	0,13	6,29
Desk type 2	55,55	13,86	3,27	41,54	0,41	6,58
Table	47,35	23,47	2,97	23,97	0,46	19,95
Cabinet	100,6	71,89	1,35	4,11	0,33	-

Source: DGBC, 2021b

Total material saved sample: 130 ton

Total GHG saved sample: 630 ton CO₂-eq

Total material saved extrapolated: 590 ton

Total GHG saved extrapolated: 2.960 ton CO₂-eq

Furniture potential

Scenarios:

Type of scenario	Material saved (kg)	CO2-eq emissions reduction (kg)
Extended life time of 10 years	9000	51000
Refurbished 5%	140	760
Refurbished 10%	360	1900

Total GHG saved potentially: 53.000 ton CO₂-eq

Total material saved: 9.400 ton

Road construction realized

Longlist: 222 tenders; € 1249 million

Sample: 10 tenders; €49 million

Circularity strategy: Longer life expectancy in 1 tender; More recycled content in 3 tenders

Type of roads: Highways, provincial roads an municipal roads

Total material saved sample: 11.460 ton

Total GHG saved sample: 870 ton CO₂-eq

Total material saved extrapolated: 291.580 ton

Total GHG saved extrapolated: 23.840 ton CO₂-eq

Road construction potential

Scenario: extended life expectancy or additional recycled content

Life expectancy reference: 11 years right lane (highway); 17 years left lane (highway); 15 years (other roads)

Life expectancy extended: 17 years right lane; 17 years left lane; 20 years (others)

Total acreage of asphalt roads: 81.780 km; 5.866 km of highway and 75914 km of other roads

Material	GWP (kg CO ₂ -eq/ton asphalt)	Source
Reference	86	R10814
Extended lifetime	86	R10814
50% recycled content	69	R10814

Amount of GHG spared when all roads have extended life expectancy: 315.355 ton CO₂-eq

Amount of materials spared when all roads have extended life expectancy: 3.698.782 ton

Amount of GHG spared when all roads have 50% recycled content: 285.870 ton CO₂-eq

Amount of materials spared when all roads have 50% recycled content: 8.010.225 ton

Workwear-realised

Longlist: 93 tenders; € 82 million

Sample: 10 tenders; € 7 million

Circularity strategy: recycled content in 3 tenders

Type of clothing: sweaters, polo's, overalls, trousers, shirts, jackets, socks

Material: replace virgin polyester and polyamide by recycled polyester and polyamide

Weight of materials per type of clothing: Table below, based on Rodrigues, R. et al., 2017.

Type of clothing	Weight (gram)	Material
Sweater	550	100% cotton
Polo	250	100% polyester
Overall	760	100% cotton
Trouser type 1	680	100% cotton
Trouser type 2	500	100% polyester
Shirt	240	100% cotton
Jacket	500	100% polyester
Sock type 1	100	27% recycled polyamide / 73% other*
Sock type 2	100	24% recycled polyester / 23% polyamide / 53% other*

LCA data:

Material	GWP (kg CO ₂ -eq/per kg)	Source
Polyester (PET/PES)	3,0	Ecoinvent database v.3.5
Recycled polyester (rPET)	0,3	CE Delft, 2015*
Polyamide (PA/nylon)	9,2	Ecoinvent database, v.3.5
Recycled polyamide (Econyl)	1,7	EPD Econyl, 2018
Cotton, conventional	3,3	Ecoinvent database, v.3.5
Recycled cotton	0,4	Modint Ecotool**

Biological cotton	1,0	PE International, 2014
Wool	38,0	Ecoinvent database, v.3.5
Recycled wool	0,7	Spinelli, 2018***

*CE Delft, 2011. LCA: recycling van kunststof verpakingsafval uit huishoudens, Delft: CE Delft.

**INretail, Modint en VGT, 2019. Op weg naar een circulaire keten: Sectorplan Nederlandse kleding- en textielsector.

Available at: https://assets.website-files.com/5d7b6ad83a8c253b394ddbae/5dc01f739bf13ea3f357f29f_Sectorplan_Nederlandse_Kleding-en_Textiel_Sector_sept2019.pdf [Geopend 2020].

***Spinelli, R., 2018. Data obtained via direct communication with R. Spinelli, author of the study 'Environmental Footprint of Production of Recycled Wool' [Interview] 2018.

Total material saved sample: 7.082 kg

Total GHG saved sample: 32.322 kg CO2-eq

Total material saved extrapolated: 82 ton

Total GHG saved extrapolated: 380 ton CO2-eq

Workwear-potential

Scenario: 10% recycled material for all purchased clothing by the government

Total purchase of clothing: data available on which data in which amount were purchased for 52 of the 93 tenders. Weight was estimated based on the table above. Total weight was estimated by extrapolation the weight for the 52 tenders to the 93 by the financial ratio.

General share of type of materials in clothing was taken from national database: CPB, 2019. Textiel als secundaire grondstof, Den Haag: Centraal Planbureau (CPB):

- 64% cotton
- 5% viscose
- 19% polyester
- 5% polyamide
- 1% wool
- 6% other

It was assumed that no recycled material was applied for the material groups viscose and other.

LCA data: see table above

Total estimated material saved when the whole Dutch government purchases work wear with 10% recycled content: 190 ton

Total estimated GHG emissions saved when the whole Dutch government purchases work wear with 10% recycled content: 600 ton