Environmental protection expenditures in the building industry

Final report

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1 Introduction

This report deals with the environmental protection expenditures in the building industry in the Netherlands in 2007. Statistics Netherlands wants to explore the building industry because of its expenditures for construction waste and the energy performance of buildings that are considered as important missing environmental protection expenditures in contemporary statistics.

In the interim report an overview is given of the most important characteristics from the building industry in the Netherlands (Statistics Netherlands, July 2010). In further research the usability of the mentioned source materials is examined. Concerning the environmental protection expenditures choices are made for the costs that can be ascribed to the building industry. Important is that the building activities are related to the building standards enshrined in legislation and incorporated by the building industry.

The building industry according to NACE 45 (NACE rev1) is monitored by Statistics Netherlands with the primary economic survey: Production Statistics (PS) and the costs of building materials used in the Input Output tables of National Accounts. These sources turned out not to be sufficient for answering the foregoing points of interest. NACE 45 also contains activities (e.g. dredging) from which the environmental costs cannot be related to the building industry. The insulation activities for the industry are another example. Economic motivations instead of environmental motivations play a role by the insulation of industrial installations.

The building industry has two main environmental related responsibilities for which the government sets the objectives. The first objective is the reduction of the energy consumption of the build environment by building new buildings according to the *'Energie Prestatie Norm'* (EPN) (energy performance standards). The costs that have to do with the EPN – regarding to the specific environmental part – are assigned to the building industry by Statistics Netherlands. This means 100% of the isulation measures and a percentage of the installation measures (see chapter 2). The second objective is the treatment of (waste) materials stemming from building and demolition activities. Other environmental costs and investments related to the building industry are stemming from the administrative burden and stimulation policies of the government.

Statistics Netherlands calculated the own environmental protection costs of the building industry. The transfers to other sectors are not part of this study. The part households are responsible for will be elaborated in the specific households research carried out in 2011 (also Eurostat financed). In this study Statistics Netherlands does not discuss if the insulation costs

are part of EPEA or RUMEA (this discussion will take place in the Taskforce RUMEA).

2 *Energy performance standard*

The build environment is responsible for the use of 30% a 40% of all energy consumption (EU, 2010). Heating, cooling, the use of warm water and electricity are the most important applications. In Europe and the Netherlands the objective for the reduction of energy consumption by the build environment is related to the climate issue and the reduction of CO_2 emissions. Measures to reduce the use of energy are taken by placing insulation in existing and in new buildings and the application of sustainable techniques. Techniques like the use of geothermal energy, biomass, solar and wind energy are already important and their relevance for the build environment will increase.

In the Netherlands there is the ambition to make new buildings self-sufficient in their use of energy by the year 2020. This means buildings, building blocks or districts will be for an important part responsible for the generation of their own energy needs. Since 1995 the EPN sets the standard for the energy performance of the build environment. New build dwellings, offices, schools, hospitals etc. have to meet the energy performance in terms of the Energy Performance Coefficient (EPC) since then. In table 2.1 the EPC is given for the most important types of buildings. The EPC is an expression for the energy transmission - from the inside to the outside - through the shell of the building. The lower the EPC is the less the lost of energy is. Table 2.1 shows that for dwellings the EPC requirement is most strict. The restriction on the loss of energy for dwellings is almost twice as strict as for offices.

Table 2.1: Energy Performance Coefficients per building type (EPC)

EPC by type of building and year	1995	1998	2000	2003	2006	2009
dwellings	1,4	1,2	1	1	0,8	0,8
lodging	1,4	1,4	1,4	1,4	1,4	1,4
offices	1,9	1,9	1,6	1,5	1,5	1,1
schools	1,5	1,5	1,5	1,4	1,4	1,3
hotels	2,4	2,4	2,1	1,9	1,9	1,8
sportfacilities	2,8	2,8	2,2	1,8	1,8	1,8
meetingfacilities	3,4	3,4	2,4	2,2	2,2	2
shops	3,6	3,6	3,5	3,4	3,4	2,6
hospitals	4,7	4,7	3,8	3,6	3,6	2,6

Source: SenterNovem

The Building Act prescribes the building standards including requirements for the EPC. Since 1995 the calculation of the EPC comes with the request for a building permission. More insulation and '*Hoog Rendement*' (HR) (high efficiency) applications met the standard in the first years. In the last decade with stricter demands the emphasis is also on heat recovery and the use of alternative energy sources. All these measures count in the calculation of the EPC. Insulation and installation

measures are incorporated in the building process, alternative energy is not standard but will become more important when the EPC goes to 0 in 2020.

The current EPC requirement is met by taking insulation and installation measures relevant for new build buildings. In this research the calculation is made for the insulation and installation measures taken by the building industry for new built dwellings. The costs for insulation materials - used for the shell (floor, wall's, glass and roof) - to comply with the EPC standard (0,8) are calculated. In table 2.2 the building parts and costs for the non-insulated and insulated shell are given. These costs are used in the calculation and compared with the costs without EPC requirements. The building standard with no or limited insulation is also given in the table.

Table 2.2: New build dwellings by type and insulation costs for the shell (floor, walls, glass, roof) (2007)

Part of shell	building material	insulation	Costs per square meter (ex. VAT) (2007)	Extra costs per square meter for putting on
ground floor	- prefab slab d=200	uninsulated	25,24	no
	- prefab slab d=200	Rc = 4,0	34,54	no
facade closed	- mineral wool	uninsulated	x	x
(cavity)	- mineral wool	110mm	9,73	0,21
facade open	- double glazing (6-4)	U = 2,9	59,22	no
	- HR++ glazing (6-4)	U = 1,1	78,13	no
roof	- roof with mineral wool	Rc = 2,5	32,92	no
	- roof with mineral wool	Rc = 4,0	52,25	no

Source: NBI

The rock wool used in the cavity wall (closed façade) is the only building material in table 2.2 that needs to be put on separately. The other building materials are put on - with or whitout insulation material/ measures - whitout extra costs. The costs for putting on the insulation material is estimated on €0,21 per square meter. With almost 5 million square meters of closed facades the labour costs are about 1 million euros.

Senter Novem determined standardized dwelling types and their energy consumption in relation with the EPC (SenterNovem, 2006). These standardized types with assumptions for the dimensions of the shell are used in this research. Table 2.3 shows the total amount of completed dwellings in the Netherlands and gives an estimation of the insulation costs by dwelling type. The costs per square meter for building materials (table 2.2) are together with the amount of new build dwellings and surface of the shell used to calculate the total costs.

In column A the total costs for materials of the non-insulated shell are given by dwelling type. Column B shows the costs for the insulated shell by dwelling type. In the last column C the costs for insulation measures are calculated by subtracting column A from B.

Table 2.3: New build dwellings by type and insulation costs (2007)

Dwelling types and costs for insulation	new dwellings	A Costs shell non-insulated	B Costs shell insulated (EPC = 0,8)	C = B - A Costs for insulation
Detached	534	4.876.728	7.418.494	2.541.765
Duplex	16.089	105.475.668	160.203.669	54.728.002
Townhouse: corner	12.472	72.977.952	110.871.750	37.893.799
Townhouse: between	12.815	55.786.627	84.477.281	28.690.654
X other	9.393	x	x	x
Apartment	21.079	55.720.344	84.207.209	28.486.866
Subtotal	62.989	294.837.318	447.178.404	152.341.086
Total	**72.382**	**338.803.860**	**513.862.256**	**175.058.396**

Source: CBS

In table 2.4 an estimation of the costs for installations in new build dwellings is given. The costs are related to the research of ECN and Rigo, where five common building methods are calculated and compared. In the research the costs for installations measures related to the EPC = 0,8 (in 2006) are evaluated (ECN/ Rigo, 2010). In this research the most expensive building method for installations (package 3) is taken to calculate the upper limit of the costs. Only the extra costs for installations and fitting are brought into account. At this moment 100% of the installation costs are increased. Further research will determine which percentage of the installation costs can be appointed as environmental costs.

Dwelling types and costs for insulation	new dwellings	installation costs by dwelling	installation costs by dwelling type
Detached	534	4.721	2.522.417
Duplex	16.089	4.358	70.115.102
Townhouse: corner	12.472	3.607	44.984.989
Townhouse: between	12.815	4.029	51.631.645
X other	9.393	x	x
Apartment	21.079	4.029	84.928.459

Table 2.4: New build dwellings by type and installation costs (2007)

Subtotal	62.989	x	254.182.613
Total	**72.382**	x	**292.086.670**

Source: ECN/ Rigo

The insulation costs together with the installation costs for new build dwellings in 2007 are 468 million euros. For utility buildings – buildings other then dwellings and lodging shown in table 2.1 - this is approximately 250 million euros (based on figures of building permissions).

3 *Construction and demolition waste*

Statistics Netherlands is depending on the information from Agentschap NL and the National Registration Centre for Waste (LMA). Amice is the electronic registration database in which industrial waste and dangerous waste is reported. Eural – codes make it possible to show the amount of construction and demolition waste and the subdivision in waste flows. On basis of registration numbers the LMA and Statistics Netherlands use, like numbers from the Chamber of Commerce (KvK) and the Basic Company Registration (BBR), Statistics Netherlands coupled the <wastereportID> numbers to the enterprise names. Research points out that the reported waste flows go back to the disposer. The disposer is mostly not the owner of the waste itself. The disposer is often an enterprise out of the building industry or the transport sector or a governmental institution, like a municipality. The waste is reported by the disposer to the LMA before it is transported. The LMA uses a location for the waste enforcement in Amice. This is often a zip code with a house number, but also often there is no data or only a description of the location in case it is a new building plot or a civil work like a bridge. The locations of where the waste is coming from do not lead to an enterprise that is the owner of the waste, even in case the zip code and house number is known. The conclusion is that waste flows are not traceable to the owner of the waste (Statistics Netherlands, 2010).

In table 3.1 costs for the transportation and processing of most common building and demolition waste is given. The responsibility for transportation and processing building and demolition waste comes with activities carried out by the building industry. Based on Amice the ammount of waste materials (in tons) by waste stream is related to information about costs compared on the internet.

Table 3.1: Costs for transportation and proccesing building and demolition waste (2007) (in euros)

Waste streams quantities and costs	weight in tons	kg/ m3	costs per m3	factor	estimated costs
Debris	14.689.904	2.000	14,29	1,5	69.951.922
Wood	1.585.394	400	10,50	1,5	27.755.504
Bituminous substance	6.329.345	2.000	42,02	1,5	88.646.287
Soil and sand	9.292.133	2.000	31,09	1,5	96.305.018
Mixed waste	5.560.392	1.000	25,21	1,5	93.451.959
Total	**37.457.167**				**376.110.690**

Source: Amice/ Afval.nl/ CBS

The costs are estimated by using the price by average mass (kg/m3) and reduced with a factor of 1,5. This reduction is needed because the used prices from the internet are an upper limit. Without the reduction the total costs for the five waste streams is estimated on 564 million euros.

Five important waste streams which cover over 82% of all waste streams related to the building industry – Amice: Euralcode 17 - are brought into account. When these waste streams are compared with building and demolition waste – this means without waste from dredging activities and railway ballast (also Euralcode 17) – it covers over 92% of all Euralcode 17 waste streams. Plastics, glass and metals (part of the 8% rest) are left out of this calculation because most times they are still valuable and stripped and seperated from the above mentioned waste streams before processing. In further research Statistics Netherlands wants to settle the costs and revenues stemming from different waste streams.

4 *Stimulation policy*

Environmental policies in the building industry are stimulated in multiple ways and on different scale levels. Agentschap NL provides subsidies and regulations for tax reduction that comply with environmental policies on a national level. The appliance of energy and environmental friendly building materials and installations is supported. Also the generation of alternative energy, wind, solar and earth warmth and the reduction of CO2 are supported. Measures – for example related to the EPC - for alternative energy are not yet incorporated in the building process but depending on the initiative principals take. In this research only the stimulation policy the building industry itself applied for is taken into account. The five stimulation policies that are taken into account are stated below

1/ EIA =
Energy Investment Deduction; This fiscal stimulation policy is used for investments in energy saving techniques and the use of sustainable energy by lowering energy costs and the reduction of income tax for companies;

2/ MEP =
Environmental quality of the Electricity Production;
This subsidy intends to improve the environmental quality of the Dutch electricity production. The electricity production is improved by using inexhaustible sustainable resources (like wind, biomass, hydropower, sun) and the use of cogeneration;

3/ SMT =
Subsidy for Environment & Technology; This subsidy intends to stimulate innovative and environmental friendly processes, products and services which are new for the Netherlands;

4/ MV =
Mia & Vamil; These two fiscal stimulation policies are often combined and used for environmental equipment (MIA) and the introduction of environmental friendly assets (Vamil);

5/ CO2 =
Carbon dioxide reduction plan; This subsidy intends to support the investments in all kinds of projects that contribute to the reduction of the emission of greenhouse gases.

In table 4.1 the five most important subsidies that Dutch companies in the building industry applied for are given. Also the percentage of the subsidies given to the building industry is given. Five measures are taken into account:

Tabel 4.1: Subsidies assigned to the building industry (NACE 45) in the Netherlands in 2007 (in euros)

Subsidy	granted to building industry	% of regulation
EIA	655.190	0,49
MEP	388.371	0,09
SMT	134.362	1,81
MV	128.886	0,07
CO_2	9.358	0,04
Total	**1.316.167**	**0,16**

Source: Statistics Netherlands

The method Statistics Netherlands uses for the environmental protection costs concerning stimulation policy is that the investment is the same as the amount of subsidy. The part of the investment that is subsidized is equated to the environmental part of the investment in our statistics. We use this method because in the context of administrative burden, we can not send more (new) surveys (Statistics Netherlands, 2010).

5 *Environmental administrative burden*

On different governmental levels the legislation for building initiatives is organized. The building industry directly and indirectly has to comply with the Building Act, the Act on Spatial Planning, the Environmental Protection Act and the Building Materials Act. All this legislation is also concerning environmental issues.

For the determination of the administrative burden it is important for Statistics Netherlands to know what the environmental legislation is about and for whom it is applicable. In the building process of initiation, designing and building only a part of the administrative burden is applicable for the building industry itself.

In table 5.1 the environmental administrative burden the building industry has to cope with according to the second baseline analysis of VROM and V&W is given. The calculation of these costs are based on the research Environemntal administrative burden of Statistics Netherlands (Statistics Netherlands, 2010).

Tabel 5.1: Administrative environmental burden for the builing industry in the Netherlands

in 2007 (in euros)

Costs by Ministry and legislation	Costs	A: International	B: European	C: National
VROM	1.957.214	0	161.658	1.795.556
V&W	215.040	1.837	1.837	211.366
Totaal	**2.172.254**	**1.837**	**163.495**	**2.006.922**

Source: Statistics Netherlands

6 *Conclusion*

The costs and investments the building industry is responsible for are determined in foregoing chapters. The costs are calculated by counting the waste and environmental administrative burden together. The investments are calculated by counting the measures for dwellings under EPC regulation and subsidies. From the measures according to the energy performance of buildings – chapter 2 - only the insulation measures for dwellings are taken into account. The costs and investments are compared with the overall environmental costs and investments of Statistics Netherlands in 2007. Table 6.1 shows the costs and investments and their percentage of the overall total.

Tabel 6.1: Costs and investments related to the Building Industry in 2007 (in euros)

Building industry (2007)	Environmental administrative burden	Waste	Subsidies (NACE45)	Insulation measures	Total	% of overall environmental costs and investments
Costs	2.172.254	376.110.690	x	x	378.282.944	3,3%
Investments	x	x	1.316.167	176.058.396	177.374.563	4,4%

Source: Statistics Netherlands

Next year further coordination for EPEA-purposes will take place with the environmental accounts of Statistics Netherlands. On the basis of this fact principles (as mentioned in this report) can still change.

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