BUILD UP Skills – The Netherlands –

Analysis of the national status quo

August 2012

Further information

More details on BUILD UP Skills can be found at www.buildupskills.eu

More details on the IEE programme can be found at http://ec.europa.eu/intelligentenergy

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0. Executive summary

Dutch building sector

- GDP 6,5%
- ~350.000 employees in total, out of which ~135.000 installations related
- Total value of real estate above € 2.000 billion
- € 33 billion investments per year, out of which € 21 billion in housing
- Maintenance works around € 8 billion per year

A large number of companies in the construction sector are SME's, there are many very small enterprises. Only a few companies in the sector are big concerns. A majority of companies form temporary partnerships, collaborations, in order to tackle larger and complex assignments. Almost one third of the work is subcontracted. Most companies are regionally active, and only a small number operate in the whole Netherlands.

National energy strategies

- Memorandums of Agreement
- Topsector Energy
- Innovation Agenda Energy Built Environment
- Climate Agreement (Municipalities and State)
- 'Woonvisie' ('Housing vision')
- Second National Energy Efficiency Action Plan

The Netherlands has an active energy policy, which is characterized by three goals: the energy supply has to be as reliable, affordable and sustainable as possible. The energy goals for the year 2020 are set in the government programme from 2007 called 'Clean and Efficient': 20% sustainable energy, 30% reduction of CO2 compared to 1990, and energy savings of 2% per year. In the coalition agreement from 2010 these goals were adjusted. In contrast to 'Clean and Efficient', government aims to realise 14% sustainable energy and 20% CO2 reduction in 2020. These ambitions are conform European goals. The expectations are that without 'Clean and Efficient' the share of sustainable energy would decrease to 2,6% (compared to 3,6% in 2008).

Average energy use (gas and electricity) in housing in the Netherlands:

	2005	2006	2007	2008
av. gas use per household [m^3]	1.664	1.643	1.560	1.625
av. electricity use per household [kWh]	3.397	3.402	3.521	3.558

The biggest potential, in absolute numbers, lies in the existing building stock: regarding cost savings for households / users, as well as investment potential for the sector, and potential for CO2 reduction. However, the implementation of sustainable measures in the existing stock is more complex than in new construction, both technically and instrumentally. For the new construction there exist building regulations as a strong instrument of the state. In the existing stock, one is dependent on the voluntarily investments from the house owners.

Current energy use reduction installation measures: high-efficiency furnace placing, solar water & photovoltaic systems, DC ventilation, low temperature heating, energy efficient lighting.

Installation sector contribution towards 2020 (based on UNETO-VNI): active government, three scenarios - 'slow train', 'intercity' and 'high-speed train'. Construction sector contribution towards 2020 (based on Bouwend Nederland): sustainability through/by market forces.

VET-sector

- Reduction of the number of qualification descriptions; more than 650 to be clustered into 16 domains.
- Sustainability not in qualification dossiers descriptions.
- Lots of enthusiastic pioneers, no real incorporation or embedding.
- The National Coordination point NLQF exists from 1 February 2012.

The VET and adults education sector has almost 53.000 employees and 630.000 participants, out of which 485.000 follow VET education. Almost 40% of the Dutch working force is trained in these schools.

The regional education centres (ROC's) know by now that during recession the number of BOL (full-time, professional training path) participants increases, and number of BBL (part-time, the so-called professional coaching path) participants decreases. This is mainly the case regarding lower education levels. Currently the sector faces sharply decreasing numbers both regarding BOL and BBL participants.

Barriers

- Short term 'survival' focus of companies, instead of 2020 goals.
- Building capacity strategy only.
- Products instead of systems based approach.
- Persistent division in 'thinkers' and 'doers'.
- Bad reputation of the sector; partly because of often low/wrong quality in relation to clients demands/wishes.
- Fragmentation within VET-sector.
- Large 'outflow'; 25% leaves sector within 4 years after graduation.
- Knowledge gap at consumers side regarding energy savings.
- Lack of (focus on) 'soft skills', also in education.
- Educators are often not aware of developments within practice.
- Failure costs.

The economic crisis poses on the short term the biggest barrier, mainly because SME's focus on bare survival. And sustainability issues do not automatically form a part of it. The economic potential of sustainability is not broadly seen or experienced as evident.

Construction of energy neutral buildings requires in the first place adjusted work processes. In the new work processes the quality, related to norms and methods, has (to play) a central role. It is evident that new ways of building are needed. This means that the teachers need to be 'up skilled'. It is their job and responsibility to train the students with knowledge and skills which they can apply in construction of energy neutral buildings. The ROC's face an additional tough task to replace many old construction and installation technology teachers, which is currently one of the biggest concerns regarding education in the construction sector.

Generally, trainings need to put more emphasis on the quality of work and use of material in context, than on speed of production and use of materials in isolation. The focus has to be on integral preparation of work, evaluation and collaboration, combined with emphasis on 'soft skills'.

1. Introduction

The large contribution expected from the building sector to the 2020 objectives (reduction of energy consumption by 20%, reduction of greenhouse gas emissions by 20%, and 20% of energy needs through renewable resources) is a major challenge to the construction sector and to industry as a whole, which needs to be ready to deliver renovations offering a high energy performance as well as new, nearly zero-energy buildings. This calls for a major effort to increase the number of qualified workers on the market along with measures that facilitate decision-making for building-owners. As qualification is an 'upstream' measure, it is time to act now, so that a qualified workforce can deliver by 2020 and on the way to 2020.

Through the Build Up Skills Initiative the Intelligent Energy Europe therefore aims to unite forces to increase the number of qualified workers in Europe's building workforce. Build Up Skills focuses on the continuing or further education and training of craftsmen and other on-site construction workers and systems installers in buildings, after their initial education and training or after they have entered working life.

Build Up Skills Netherlands unites national forces to increase the number of qualified 'blue collar' workers covering all relevant crafts and professions in order to meet the 2020 objectives in the built environment, the flagship initiative for a resource-efficient Europe.

Implementing intelligent energy solutions for buildings and constructing nearly zero-energy buildings in The Netherlands requires new skills for the existing and new workforce. The main focus is placed on barriers and gaps in relation to the following professions:

- the workforce involved in renewing and upgrading thermal shells of existing buildings (inclusive restoration business) and in making the thermal shells of new buildings
- the workforce involved in choosing, maintaining, tuning and replacing installations in existing buildings as well as professions involved in choosing, installing and tuning RES in new buildings
- on-site supervisors who ensure effective instruction, control and validation of the work on thermal shells and on energy systems.
- professions on middle / management level: advisors, calculators, construction engineers etc.

A consortium has been formed with parties from Dutch training and building sector: Fundeon, Hibin, ISSO, Kenteq, MBO-diensten, OTIB and SBR. In May 2011 this consortium submitted a proposal to draw down funding from the Intelligent Energy Europe programme. Following the acceptance of this proposal, the programme of research began in November 2011 and is due to conclude in April 2013.

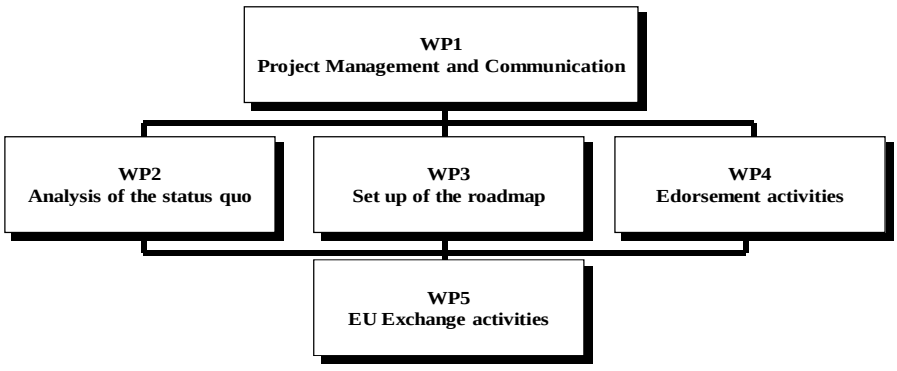

Figure 1.1. The research programme will be delivered through a series of work packages

Work Packages 2, 3, and 4 form the core activities. All consortium partners were involved in the analysis of the status quo (WP2) and will be involved the development of the roadmap (WP3). To ensure endorsement the consortium consists of organizations that have national status. These organizations will function as linking pins for the endorsement of the roadmap. These organisations together act as a national energy-efficiency and renewable energy training and qualification platform.

Although there is a natural transition between WP2 and WP3, this report presents the findings and conclusions from the Work Package 2 only.

The main objective of the status-quo analysis was the identification of barriers and gaps between the current situation and the needs in the coming years. Collateral ´spin off´ includes evaluation of existing occupational profiles, qualifications and qualification structures in the building and installation sector and identification of adjustments to be made focusing on the actual domain discussions (creating new overlapping job profiles). During WP3 a method to keep the analysis up to date will be fine-tuned.

2. Objectives and methodology

2.1 Objectives

One of the aims of the Build Up Skills initiative is to identify and quantify, for all relevant professions and skills levels, the need for a workforce qualified in energy efficiency and renewable energy, and discuss necessary changes to the current system as well as concrete training measures to meet this need.

With this report, the result of the WP2 activities of the Build Up Skills Netherlands project, the abovementioned objective is met for the Dutch situation, which lays the foundations for the development of a national roadmap for the realisation of the 2020 targets. The development of the national roadmap, which falls under the WP3 activities of the Build Up Skills Project, also includes the development of a method to keep the status quo data up-to-date.

The focus for this report are the following aspects:

- information about the current policy and strategy in the field of energy in the built environment and continuous education and training of the 'blue collar workforce';
- quantitative data about the built environment (building supply, renovation and new construction plans), statistics in relation to EE and RES in buildings, the labour market, training and courses;
- qualitative data about the current situation and stakeholders in relation to the national (continuous) education system in the construction sector, and about existing training and course programs.

2.2 Methodology

The composition of the project team (OTIB, ISSO, SBR, Kenteq, Fundeon, Hibin and MBO-Diensten) has had direct influence on the choice of methodology. All partners are well informed of the substance of positive developments in their ‘own' part of the building, they all have a direct relationship with the relevant market actors, they are themselves in possession of a great deal of knowledge and they also have a large network to draw from. Partners were well–informed and, when the right partners were brought together, it was to their mutual benefit. This approach also meant that relations between partners improved, which is a positive outcome in itself. There is a solid basis for the planned Build Up Skills NL platform activities.

Before Build Up Skills, most partners had not often been working together directly in projects. This stems from the fact that the Dutch building industry is divided in a number of clearly separated sectors, namely the construction industry (split into B&U (civil and utility construction) and GWW (ground-, road-and water works construction, or civil engineering), the installation companies, the initial training and refresher training.

Because of the chosen approach the data and information collection proceeded largely linear, and in a number of clear and well defined steps.

Step 1
At first each project partner was regarded as a separate source of relevant information; each project partner delivered documentation that it deemed relevant.

Step 2
Based on the first set of collected data a second step desk research was carried out as a second step, in particular by SBR, going beyond mere organization knowledge. Although the work and themes were split up, various partners appeared to be using partly the same resources. Organizations that appeared to deliver much data and information in the construction industry to several partners were EIB (Economic Institute for construction), CBS (the Central Bureau for Statistics), USP Marketing Consultancy, Bouwkennis (literally: construction knowledge) and ITS (Research Institute affiliated with the Radboud University Nijmegen). The fact that the methodological approach was chosen in this way has also ensured a certain degree of validation of the external sources that were used.

Step 3
The first two steps yielded a concept report with an inventory of the actual state-of-affairs. This was complemented with the first exploration of the 'gap-definition' and barriers description, which was discussed during the Working Conference with market actors. The specific approach for desired interaction with market actors had the form of a work conference with four parallel content work sessions. Each work session had its own content experts (project partners involved in creation of the first draft report), a private discussion leader, and its own note taker.

The following parties were collectively designated by the partners as 'Market actors Core group'

- AFNL (Contractors Federation for Construction & Infra);
- Agency NL (the implementing organisation of the Dutch national Government when it comes to sustainability, innovation and international entrepreneurship),
- Bouwend Nederland (the Association of construction and infrastructure companies),
- DE-Dome (Sustainable Energy Dome),
- NVTB (Dutch Federation for Construction Supplies),
- UNETO-VNI (the entrepreneurs organisation for the installation industry and electro-technical retail trade).

This Market actors Core group market actors will be extra involved during the implementation of WP3 to reinforce endorsement.

Step 4
The results of the Work Conference, the obtained feedback, were used for the definition and distribution of additional research and analysis activities between the partners. This led to the final adoption of the actual status quo, on the basis of which then the gap with the 2020 objectives as well as barriers could be defined. An essential 'step-in-between' was the construction-wide analysis of existing professions and competences, mainly performed by HIBIN and ISSO, which provided for a clearer focus on missing competencies (in relation to existing and innovative techniques (see Chapter 7).

Step 5
The final description of the actual state-of-affairs in Netherlands, compiled as described above, then served as the basis for joint identification of missing skills and barriers. This was initially based on (an analysis of) the professions framework, which was taken as a starting point wherever possible, but was also (necessarily) supplemented by the technical supply structure because of discipline transcending effects. The broad elaboration followed the analysis line of professions - (emerging) competencies - qualifications (needs).

Step 6
Translation of the defined gap and barriers to the final report, which serves as the basis for WP3 activities: development of a national roadmap and a method to keep the status quo data (analysis) up-to-date. In the first four months of WP3, in association with the research institutes mentioned, attention will be paid to future data collection and the market research that is yet to be carried out.

3. Characterisation of the building sector

The Dutch construction industry is generally divided into the following sectors:

- Civil and utility construction (including the construction of homes, offices etc)
- Civil engineering (construction of structures other than buildings, such as land improvements, roads and waterways)
- Installation companies (electrical installations, radiators, etc)
- Painting and finishing contractors (painters, plasterers)
- Other, specialised companies (including piling and concrete reinforcement using braided steel).

In the context of Build Up Skills, we will focus on civil and utility construction, installation companies and painting and finishing contractors.

Economic contribution

The civil and utility construction sector accounts for 6.5% of the Netherlands' gross domestic product (GDP). The sector directly provides employment to approx. 350,000 people (excluding interior builders, etc.) The current residential and commercial building stock is valued well over € 2,000 billion. Approx. € 33 billion is invested annually in restructuring/replacement and expansion of the real estate stock, taking into account fluctuation over the years. On average, approx € 21 billion of that amount is destined for residential construction and over € 12 billion is spent on utility construction. On average, another € 8 billion is spent annually on maintenance.

Make-up of the construction industry

Many companies in the construction industry belong to the category of small or middle-sized enterprises, and there is a large number of very small contractors. There are only a few large corporate actors. In the case of substantial projects, it is common for construction companies to temporarily join forces. Almost a third of the work is outsourced to subcontractors. Most companies are active in their own region. Only a small number of companies work in the whole of the Netherlands. Essentially, most of the companies in the construction industry are capacity suppliers, each contributing only partially to the construction process and attempting to leverage their own capacity as best they can.

Construction capacity

In the construction market, construction capacity is an open-ended term and hardly a distinguishing strategic concept. This, and the fact that subcontracting takes place on a large scale, explains how in the construction industry, there is a so-called "shifting" capacity, impacting supply. Shifting capacity exists because contractors and subcontractors are offering the same capacity at the same time to multiple parties. Hence market capacity appears to be considerably larger than actual available capacity. This of course strongly affects competitive positions, price setting and ultimately the quality delivered. Especially in construction management, it is relatively easy to offer construction capacity and to enter competitive markets. The open-ended and shifting nature of construction capacity is visible in both more and less prosperous times, and impacts the way the construction capacity market works.

Characteristics

The construction industry is (was) generally characterized (until recently) as follows: product and process oriented, rather than focused on demand/consumers; highly specialised/ vertically fragmented (according to roles in the construction chain), which is also reflected in the wide array of industry organisations and research institutes, bureaucratic construction hardly using industrial processes or new (automated) technologies, highly regulated, with a predominant national/regional orientation, a strong focus on new housing developments, technology and large volumes, and less interested in (re)use, restructuring, service and smaller (privately financed) projects.

Impact of the economic crisis

The construction industry suffered as a result of the financial crisis and the Euro crisis. Since 2009 investments, results and employment have decreased sharply. Interestingly, independent contractors are more numerous. They account for a significant percentage of total employment in the construction industry. In spite of the crisis, their share has grown rather than dwindled, from 13% 15 years ago, to a

current 22%. It remains to be seen how this trend will develop in the next few years. Meanwhile, we are now starting to see the first real signs of an ageing population, with a first wave of baby boomers now ready to retire. The main question is how to retain the expertise and experience of the older generations on their way out and how to transfer it to the young generations. Dejuvenation is also setting in, meaning that fewer young people are available on the job market, and the construction sector has lost its appeal for young employees. It is also worth noting that the construction industry employs less than 2.5% workers of foreign descent, whereas non-Western migrants account for approximately 11% of the Dutch population. This is hardly proportionate. In neighbouring countries, the percentage of non-natives working in the construction industry is much closer to the overall percentage they represent of the population. The main reasons being: migrants know little of the sector and/or associate it with negative experiences; recruitment of workers is informal and not geared towards foreigners, and there is an (unintended) practice of discrimination in the workplace.

The construction industry further finds itself confronted with the results of a number of structural developments, including levelling off of population growth/numbers of households, increasing pressure to deliver sustainable solutions (energy and raw material prices on the rise), behaviour changes driven by technology (e-commerce, new ways of working, etc.), increasing flexibility on the job market, restructuring of the financial sector, internationalisation and regionalisation (including growing disparity – in terms of economic growth, relaxation and decline – and competition between regions), and increasing "political volatility." The combination of these factors has entailed a drastic drop in demand, especially for private housing, offices and commercial buildings. It has also led to hesitation on the part of banks with regard to financing demand (including mortgages) and supply (financing the existing stock, project and enterprise financing) – due in part to stricter government rules and control of application of those rules. Further effects include pressure on value assessment/ value development of real estate and land, and pressure on public funding/withdrawal of government subsidies.

In the meantime, influenced by these developments, the construction industry has faded substantially. Except for the rental market outside of areas in decline, what used to be a supplier's market has now become a demand market. What is built is no longer always sold. Buyers of homes are stalling for time (either through necessity or temporarily). The office market faces large-scale (partly structural) overcapacity and the same is threatening to occur in the commercial buildings market. Buyers/consumers are demanding a better price-quality ratio and guarantees and no longer accept to play a marginal role. Instead, they demand tailor-made solutions and they wish to be actively consulted along the way leading to the final product. Clients and end users increasingly have a voice in the production of buildings. This trend has been going on for a while, but the economic crisis is accelerating it. This means that the construction industry must make a serious effort to find new ways of enhancing innovation, client-orientation, entrepreneurialism and cooperation.

Keeping the future in mind

Meanwhile there is widespread recognition, particularly in the construction industry, that sustainability is not just an inevitable societal requirement. It is an economic necessity. And it affords attractive opportunities to invest and make profit. In absolute numbers, the biggest potential for sustainability lies in remodelling existing buildings: both in terms of savings for households/consumers and in terms of investment potential for the sector, as well as potential for reducing CO_2 emissions. Realising these objectives in existing buildings however is considerably more complex, both from a technical and an instrumental point of view, than in new buildings. Construction legislation pertaining to new buildings is a strong government instrument. In existing buildings on the other hand, owners of buildings must be persuaded to invest of their own accord. Points to work on include client communication (how to motivate and get them to act), national policy to support and complement efforts at other levels (integrated approach and lifetime costing are currently not in place), knowledge within the construction industry itself (such as quality assurance and ensuring that education meets industry needs), and offering financial security (i.e. making sure that measures taken benefit energy/sustainability performance, security of return on investment and security in terms of the development of prices.)

Various programmes have been launched in 2012 which focus (more) on improvement, such as supply chain cooperation, lean construction, new kinds of contracts and Building Information Management (BIM). Efforts are being made to improve cooperation, thereby reducing costs of failure, which by now, have become notorious. Stimulated to participate in various platforms, leaders in the industry are exchanging ideas and working on issues like supply chain integration, BIM, co-makership, PPS, lifetime costing and business-to-consumer models. The aim is not just to reduce considerable

failure costs in the construction industry but also to deliver the quality as demanded. Thanks to impulses on the part of innovative organisations like the “H-team” (a restructuring team) and the “Nationaal Renovatieplatform” (National Renovation Platform), more attention is paid to maintenance, renovation and recycling. For these trends to have a positive impact, companies will have to address developments not just by using their technological know-how, but also by playing into the market and changing the way their business is organized. This requires entrepreneurs who are ready to innovate, both technologically and, more importantly, socially. The entrepreneur of the future will have to welcome and participate in new and constantly changing networks. The necessary innovation draws on both technological and social competencies, i.e. commercial strategic skills (managing the relationship with the market, or the client groups), organisation skills (managing the relationship with employees and the business network), ability to stay ahead of technological developments in the direct field of business, and actual technology skills.

4. National policies and strategies to contribute to the EU 2020 energy targets in buildings

4.1 Energy

The Netherlands' strategy towards achieving nearly zero energy buildings in 2020 is laid down in the Second National Energy Efficiency Action Plan (NEEAP-II, 2011) and the Plan of Action for Energy Saving in the Built Environment (2011). Section 4.1.1 provides a detailed explanation of The Netherlands' energy policy and strategy towards achieving 2020 targets. Section 4.1.2 outlines actual planned activities.

4.1.2 National (and regional) energy policy and strategy for 2020 targets

The Netherlands pursues an active energy policy, the objective of which is threefold: energy supply must be as reliable, affordable and sustainable as possible. Dutch energy policy is based on European objectives. The energy targets of Dutch policy for 2020 have been laid down in 2007 in the Clean & Energy Efficient programme [Schoon & Zuinig]: 20% sustainable energy, 30% CO2 reduction compared to 1990 and 2% energy savings per year.

In the government coalition agreement established by the Dutch liberal Democrats (VVD) and the Dutch Christian Democrats (CDA) in 2010, the targets for energy savings have been adjusted. Instead of the targets prescribed by the Clean & Energy Efficient programme [Schoon & Zuinig], targets were set at 14% sustainable energy and 20% CO2 reduction by 2020 (VVD-CDA Coalition Agreement). These ambitions comply with European objectives. Without the Clean & Energy Efficient programme [Schoon & Zuinig], the share of sustainable energy is expected to drop to 2.6% (cf. 3.6% in 2008).

The Clean & Energy Efficient programme details a separate policy on innovation, which is found in the Energy Innovation Agenda for the Built Environment. In 2008, in order to implement the Clean & Energy Efficient programme [Schoon & Zuinig], the government and private sector players signed three different covenants: Meer met Minder [More with Less], Lente-Akkoord [Spring Agreement on energy saving in new constructions] and the Covenant on Energy Saving in the Corporate Sector.

Evaluation of the Clean & Energy Efficient programme [Schoon & Zuinig] led to a review of the energy saving policy in the built environment in 2010. The Dutch Cabinet set out this policy review in its Vision document on Housing [Woonvisie]. The government was bent on influencing consumer behaviour and on improving the energetic quality of the built environment. The afore-mentioned covenants (see section 4.1.2) form an important instrument. Policy review was elaborated in the Plan of Action for Energy Saving in the Built Environment (Explanation Vision document on Housing 2010-2011). Actual measures taken are described in the Second National Energy Efficiency Action Plan (NEEAP-II, 2011).

Many aspects concerning content, funding and support for government policy are still unclear. Lack of support for government policy is often due to insecurity as to funding, awarding of bank guarantees, granting of licenses, excessive bureaucracy and unrealistic requirements as part of incentive schemes. Strong growth of sustainable energy is expected however, partly in response to international developments in the fields of climate and energy, European legislation and domestic lobby groups which leave the government with no other choice but to invest (van den Bosch and Rietveld, 2010).

The Dutch Cabinet intends to further reinforce priority sectors in which the Netherlands holds strong global positions. In order to achieve this, government, businesses, universities and research centres plan to cooperate in the fields of knowledge and innovation. Cooperation agreements have been laid down in so-called innovation contracts. Innovation contracts were finalized in April 2012. The Dutch government has designated nine priority sectors: Horticulture and base materials, Water, Agri-Food, Life Sciences & Health, Chemicals, High-Tech Materials and Systems, Energy, Logistics and the Creative Industry. An innovation contract has been drawn up for each sector. The construction industry has not been labelled as a priority sector in itself, but because of its close link with the

innovation topic Energy Saving in the Built Environment, is considered part of the priority sector having to do with Energy . More jobs are expected in the sector, as well as an increasing demand for refresher trainings in which new technologies are applied (Human Capital Agenda Priority Sector Energy, 2012).

As one of the nine priority sectors of Dutch government trade and industry policy, the Energy Sector aims to make a transition by 2020 to a more sustainable sector with low CO2 levels and at the same time, to tap into the potential for structurally higher revenues.
Nationwide, within the energy sector labelled as a priority sector, the labour market for workers with technical training is expected to tighten. The number of jobs will continue to grow: in terms of employment, there is a growing demand for additional people and for new people to replace retiring workers. The necessary level of education and training is generally lower than in other priority sectors (larger share of preparatory vocational training and lower vocational training as opposed to higher vocational or university education.) Looking at the horizon 10 years from now, it is clear that the Human Capital Agenda must solidly focus on existing workforce and on the influx of foreign labour.

4.1.3 Planned activities in a nutshell

Energy saving by means of EPC requirements for new construction output
The goal of EPC (energy performance coefficient) is to make optimal use of opportunities for energy efficiency. EPC requirements also apply to installations in buildings, which in addition must comply with complementary regulations regarding thermal insulation and air permeability. These regulations are relevant for reconstruction and temporary construction, in which cases EPC requirements do not apply.

In practice, minimum EPC requirements for new construction output are being implemented through new construction legislation. In the coming years, stepping up the minimum requirements is expected to yield an EPC value of zero for new constructions by 2020 (AgentschapNL, 2012).

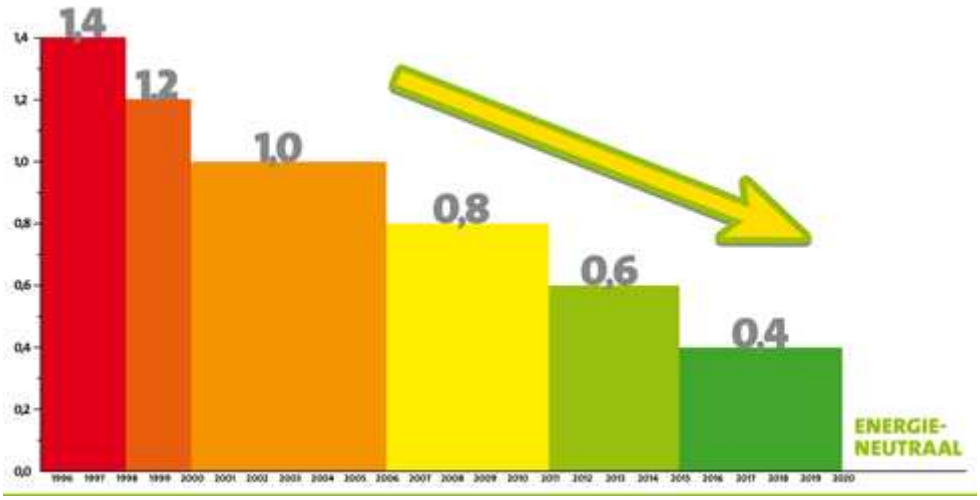

Figure 2.1 – Development of EPC values

The existing housing stock may only be expanded with energy efficient buildings. In practice, new construction legislation demands that EPC minimum requirements are applied in new buildings. Over the next years, tighter control of the minimum requirements will lead to an EPC value of zero for new buildings by 2020.

The public sector: a leader in energy savings
Because it sets an example for other sectors, (the government being a “buyer” on the market of energy savings), government buildings are expected to step up their performance quicker than other parties. By 2015, they will be required to be 50% more energy efficient than they were in 1997 (instead of complying with EPC requirements) and by the end of 2018, all public sector buildings must be energy neutral. In view of its exemplary function, the Dutch government has committed to ensuring

that as of 31 December 2018, all government buildings will be energy neutral (Plan of Action for Energy Saving in the Built Environment 2011).

Investigation on tightening EPC
An investigation on the tightening of the EPC norms needs to take place in order to achieve energy saving targets as per 2015 (NEEAP II 2011).

Minimum requirements for renovating existing buildings
In the revised EU Directive on Energy Performance of Buildings, (EPBD 2010/31/EU), no specific target was set for the renovation of buildings. Stricter minimum standards for insulation were laid down in the Building Decree, which requires that the Rc value of insulation of the building shell is ensured against optimal costs. The EPC requirement does not apply in the case of renovation. In revising the EPBD, member states agreed to elaborate national policy plans to make existing buildings more energy efficient (Agentschap NL, 2010). The following measures were agreed in the Second National Energy Efficiency Action Plan (NEEAP II, 2011): the innovation programmes *Energiesprong* [Energy Leap] and *Meer met Minder* [More with Less], the Covenant for Energy Saving in the Corporation Sector and the large scale approach towards existing buildings, under the name *Blok-voor-blok* [Block by Block]. Further measures to encourage energy efficient renovation of existing buildings include the so-called Energy Label and a lower VAT–rate for insulation related activities and cost of labour for housing maintenance and renovation.

Energy label, energy certification for buildings
The energy label was made compulsory in 2008, however since then, it has hardly been applied in new facilities, nor has it been an issue for the sale or rental of residential and non-residential buildings. The energy label provides insight into the energy performance of an existing or new building. New government policy introduced a compulsory energy label for new buildings as of 1 July 2012 (Vision document on Housing [Woonvisie], 2011). In the revised EPBD, it was agreed that the member states would introduce more detailed and stricter procedure for the issuance of energy labels including verification systems in order to ascertain whether the energy performance certification had been justly attributed and sanctions for non-compliance. As of 2013, all publicly accessible government buildings with a surface area greater than 500m^2 will be issued with a visible energy label. The same will apply as of 2015 to public buildings with a surface area larger than 250m^2 (NL Agency - b 2012).
Various instruments have been developed to facilitate decision making on energy saving measures and help implement energy labelling:

- Energy Saving Scan for existing residential buildings
- Energy Saving Scan for non-residential buildings
- Installation Performance Scan (IPS)
- Examples of energy efficient housing based on the Lente-akkoord [Spring Agreement on energy saving in new buildings]
- Delivery label

Definitions
For clarity's sake, definitions have been drawn up for the terms "near zero-energy" and "public buildings" (NL Agency, revised EPBD, 2011).

Review of the Housing Assessment Scheme (2011)
The housing assessment scheme is under review in order to incorporate the energy label. It is hoped that this will encourage investments in energy savings. The energy label will impact maximum property rents.

Environmental Protection Act
Under the Environmental Protection Act, companies are required to take energy saving measures improving energy efficiency of company buildings. They should be able to recover the costs of these measures within five years. Municipalities however appear to be having difficulties implementing this act, which explains why a considerable potential for energy savings is left untapped. Consultations are due to take place between the ministries of Infrastructure & the Environment and Home Affairs, the Association of Dutch Municipalities and relevant industry representatives to explore possible actions for improvement. A joint action plan is in the making.

Covenant on Energy Saving in the Corporation Sector (2008)
This covenant from 2008 reflects agreements made between the national government (the former Ministry of Housing, Spatial Planning and the Environment [VROM] and the former Ministry for Housing, Communities and Integration, [WWI]), the Dutch association of social housing organizations [Aedes] and the Dutch National Tenants Association [Woonbond]). The objective is to secure commitment on the part of corporations to the realisation of energy saving targets. Corporations own approximately 2.3 million homes. Hence, they have a major role to play with regard to energy savings. The aim is to save 24 PJ between 2008 and 2020. In new buildings, a reduction target of 25% energy consumption was set for 2011, and 50% by 2015, both figures in relation to 2007. How these targets are to be achieved is a matter of local agreements between corporations and tenants associations. By now, over half of the entire domestic housing stock has been issued with energy labels and there is a solid basis for further progress. The revised Housing Assessment Scheme, which is currently pending parliamentary approval, links the setting of the maximum rent to the energy performance of the building (the Plan of Action for Energy Saving in the Built Environment, 2011). It is considered important in order to achieve the desired energy savings.

Covenant More with Less [Meer met Minder] (2008)
The programme More with Less [Meer Met Minder] from 2008 is a joint initiative of the national government: the former Ministry of Housing, Spatial Planning and the Environment [VROM], the former Ministry for Housing, Communities and Integration, [WWI]), the Ministry of Economic Affairs, the Dutch association of social housing organizations [Aedes]), the Dutch Construction and Infrastructure Federation [Bouwend Nederland], the Netherlands association of contracting installing companies and technical retailers [UNETO-VNI] and the Dutch energy trade associations [EnergieNed en VME].
More with Less aims to achieve a 20% to 30% energy efficiency improvement for 3.2 million homes by 2020. Up to 2011, the aim was to increase energy efficiency 20% to 30% for approximately 500.000 buildings. As of 2012, the annual target is to improve energy efficiency in 300,000 buildings. In addition in 2011, 100,000 existing homes were to be equipped with sustainable energy facilities such as solar water heating, heat pumps and solar pv installations by providing these facilities at cost efficient prices for consumers. By organising supply and facilitating demand, a market will emerge for energy saving measures. More with Less will focus exclusively on improving the energy efficiency of existing buildings (NEEAP II, 2011).

More with Less sets a target of 100 PJ additional savings in the existing houses and utility stock. The way to achieve this target will be to help and to tempt and by means of integrated one-stop-shop approach. Evaluation of Clean and Efficient [Schoon & Zuinig] in early 2010 showed that although progress had been made towards achieving the target, it was not qualified as a new trend.

Spring Agreement on energy saving in new buildings [Lente-akkoord] (2008-2015)
This was an agreement reached in 2008 between the national government, i.e. the former Ministry of Housing, Spatial Planning and the Environment [VROM], the former Ministry for Housing, Communities and Integration, [WWI] and market players, including the Dutch Construction and Infrastructure Federation [Bouwend Nederland], the Association of Dutch Property Developers [NEPROM] and the Dutch association for developers and construction companies [NVB] to increase energy efficiency in the construction of buildings. The aim of the Spring Agreement was to improve energy performance in new buildings by 25% in 2011 and 50% in 2015 (in relation to building requirements set in 2007), and to pave the way for new buildings to be energy-neutral by 2020. It is expected that the Spring Agreement targets will be met, partly also because of the implicit legal obligations. In order to achieve this, the government regularly issues stricter legislation and regulations. Trade organisations are implementing knowledge transfer and stimulation programmes for the companies they represent, hoping thereby to improve knowledge levels of their members and bringing their energy performance up to par.

Climate Agreement between Municipalities and State (2007-2011)
Municipalities form an important link between the national government, citizens and businesses. The 2007 Climate Agreement between Municipalities and State laid down shared ambitions with regard to sustainability and energy savings. These ambitions had much in common with the Clean & Energy Efficient programme [Schoon & Zuinig]. Municipalities are seen to have a number of different roles, including development of a vision, demonstrating leadership in stimulating innovation, taking the lead

and leading by example as contractors (Climate Agreement between Municipalities and State, 2007-2011).

Block by block approach (2011)
In 2011, five pilot projects were launched, each spanning a period of two years, designed to develop concepts (standard packages) which a potential for large-scale application. The approach is based on local management, influencing behaviour of tenants and residents and market funding. The goal is to gain experience with various financing and marketing models and different forms of local working units.

Energy Innovation Agenda for the Built Environment [IAGO], (2009)
The Energy Innovation Agenda for the Built Environment is in fact a compilation of innovative policies set out in Clean & Energy Efficient [Schoon & Zuinig] and "The Netherlands, Land of Entrepreneurial Innovation." The goal is to reduce CO_2 in the built environment. The underlying conviction is that the energy transition can only be done by taking large steps. The focus is on innovation, developing new working processes in the building chain, developing new technological concepts and developing and implementing energy concepts. An energy transition requires an industry transition (the former Ministry for Housing, Communities and Integration [WWI], 2009).

Energy Leap [Energiesprong], (2011-2014)
Energiesprong [Energy Leap] is a programme designed to implement the Energy Innovation Agenda for the Built Environment (IAGO, 2009). It involves research into how existing buildings can be transformed to become nearly energy-neutral.
Looking at the long term, a breakthrough is needed in order to realise more energy savings. Such a breakthrough requires innovations. The innovation programme *Energiesprong* encourages innovations. Its aim is to achieve a 50% reduction of energy consumption in the built environment by 2030 (as compared to 1990). The target is 45% to 80% energy savings in the built environment and energy-neutral new buildings per 2020. The approach is to remove obstacles which stand in the way of innovations or upscaling.
The programme's priorities are:

- Accelerated development and introduction in existing buildings of high performance energy saving packages with which can be upscaled.
- Accelerated development in the market of energy saving concepts which take an integrated approach to design and implementation. These are necessary for the realisation of higher ambitions in new and existing buildings (chain integration).
- Incorporation of aspects related to consumers and user friendliness in designing energy efficient buildings.

Energy Neutral Areas [GEN] (2009)
The objective of GEN is to ensure that entire areas are energy neutral. This includes making blueprints with practical solutions which can be applied in similar areas. The GEN project focuses largely on acquiring knowledge on such matters as processes, technologies and their application and the forms of organisation that are required.

Green Deal for the built environment
The Dutch government is bent on concluding a Green Deal with society, which contributes to more sustainability in the short and long term and which is profitable for the government and society alike. The aim of the Green Deal is to show that 'green' and 'growth' can go hand in hand. A first call for ideas in 2011 generated over 200 useful propositions. This resulted in 59 Green Deals. Later, more deals were closed in the fields of energy savings (insulation) and biodiversity. Late 2011, at the beginning of the second round, over 70 Green Deals were already in place. Citizens, businesses and institutions had until 1 March 2012 to submit their suggestions for Green Deals through the online portal. The government is currently working on a new set of deals, expected to be announced in the course of 2012.

Future projects yet to be determined
Concrete projects geared towards acceleration and innovation are eligible for funding via the Energy Innovation Agenda for the Built Environment (IAGO). Part of the IAGO budget (€ 30 million) and IAGO-II have already been allocated. Remaining funds will be allocated to projects for which proposals have

yet to be submitted between now and 2014, focussed on residential and utility construction as well as area development.

4.1.4 Relevant national codes of conduct and legislation pertaining to Construction, renewable energy requirements for buildings, etc.

National legislation on energy savings must be seen in relation to the EU "Energy Performance of Buildings Directive," (EPBD), which was revised in 2010 (2010/31/EU). It was originally based on another directive, 2002/92/EG, which led to the "Decision to implement the directive on the energy performance of buildings" and the "Regulation on Energy performance of Buildings." NL Agency, a department of the Dutch Ministry of Economic Affairs, was contracted by the ministries of VROM/WWI and the NEEAPs to proceed with implementation through the "Energy & the Built Environment" programme. The revised EPBD 2010 is due to be transposed into national legislation ultimately by 1 January 2013 (Ministry of Economic Affairs, Agriculture and Innovation, 2011).

EU Directive	Implementation by the Netherlands
2002/92/EG EPBD (2002)	Decision to implement the Directive on Energy Performance of Buildings (2006)
	Regulation on Energy Performance of Buildings (REG) (2006)
	Decision on Energy Performance of Buildings (BEG) (2006)
	National Energy Efficiency Action Plan NEEAP-1 (2007)
	Work programme Clean & Energy Efficient [Schoon & Zuinig] (2007)
	Lente-akkoord (2008-2015)
	Implementation through the Energy & Built Environment programme of NL Agency
2010/31/EU revised EPBD (2010)	Second National Energy Efficiency Action Plan NEEAP-2 (2011)
	Energy Label (2008)
	Building Decree on EPC requirement

Table 4.1: overview of implementation of EU Directive in Dutch policy

The EPBD requires all EU member states to take the following five measures (NL Agency – b 2012):

- Energy performance shall be calculated in accordance with methodology for the calculation of integral energy performance of buildings (as laid down in EPG: NEN 7120)
- Minimum requirements shall be set for energy performance of new buildings and of existing large buildings which are undergoing major renovation (cf. Building Decree)
- Energy certification of buildings will be introduced (cf. Energy Label)
- Hot water boilers and air conditioning systems in buildings will be checked on a regular basis and heating installations with boilers that go back 15 years or more will be subjected to a one-off full review (yet to be approved)

Building Decree 2012, EPC requirement
The new Building Decree of 2012, in particular chapter 5 (Technical building regulations from the perspective of energy efficiency and the environment in new buildings) forms an important contribution towards achieving the established national and EU targets (Directive 202/91/EG and its revised version 2010/31/EU) in terms energy and climate.
The EPC requirement is a limit value, determined by the user function, which indicates the degree of energy efficiency of a building. The EPC method of determination (NEN 7120) is meant to leave room for design, integral design and the development of energy efficient building concepts.

A number of European flagship initiatives have been launched in order to realise the EU 2020 strategy and meet core objectives. The resource-efficient Europe flagship initiative, for example, sets out how member states can use "legislation, construction regulations and market instruments such as taxes,

subsidies and tenders to reduce national energy and resource consumption" (Europa-nu, 2012). The tightening of the new 2012 Building Decree is an example of implementation in practice.

Energy Performance of Buildings [EPG] and method of determination [NEN 7120] (2011)
These norms describe the terms, definitions and methods to assess the energy performance of a building or part of a building. Norms set by the Netherlands Normalisation Institute [NEN] are applied in new and existing residential and utility construction. The new NEN 7120 standard is valid as of 1 July 2012. According to the NEN, practical experiences from the past few years have been taken into consideration and the NEN believes to be well-tuned into the realities of the present-day world of construction.

EMG, NVN 7125
These energy performance norms are complementary to NEN 7120, applicable at regional level. The NVN 7125 standard provides terms, definitions and methods to assess energy performance of a region and of the energy infrastructure at regional level. The NVN 7125 is accompanied by the EMG Calculation tool, developed by NL Agency.

4.1.5 Proposed contribution of the construction industry

Investments in the construction industry are of prime importance in achieving the 2020 targets. (Ministry of Economic Affairs, Agriculture and Innovation, 2011). An estimated 24 to 35 billion Euros is invested in energy savings in the existing built environment (homes and utility buildings).

The built environment (utility and homes) accounts for 34 percent of CO_2 emissions. Industry, utility buildings and homes jointly represent a huge potential for CO_2 reduction and energy saving. The ambition for the entire built environment is a reduction of CO_2 emissions of 6 - 11 Mton/year by 2020. Actually realising energy savings however is easier said than done. Parties like housing corporations, project developers and industrial entrepreneurs generally have little experience with incorporating efficient and sustainable energy supply systems. The afore-mentioned working programme Clean & Energy Efficient [Schoon & Zuinig] provides options for the introduction of compulsory policy in the built environment, which could facilitate energy savings. An example is making sale and rent of homes subject to a mandatory energy label (the Ministry of the Interior and Kingdom Relations, 2011).

European legislation requires that in 2020, all construction must be energy-neutral (EPC=0). Based on concepts as they are currently applied for residential housing, the six most important installation technology concepts are as follows:

- Solar boiler in combination with a large storage tank
- Domestic ground source heat pump system, integrated with solar-thermal energy
- Domestic ground source heat pump system and balanced ventilation
- Ground source heat pump with collective open source in multi-storey residential buildings
- Air-to-water heat pump with storage tank
- Collective heat pump utilising ground soil as heat source in combination with heat and cold storage
- Heat pump in combination with (hybrid) central heating boiler

Without using sustainably generated electricity (solar power, wind energy), it seems that it would not be possible to build in an energy-neutral way.

Until 2011, the construction sector has certainly not been able to contribute to energy savings as has been intended (Council for the Environment and Infrastructure, RLI, 2011). In 2008, only 10% of homes for sale had the energy label (according to data from the former Ministry of Housing, Spatial Planning and the Environment [VROM] & Statistics Netherlands [CBS], 2010). In 2011, it became apparent that the energy label was still not relevant to the housing market (The Netherlands Court of Audit, 2011).

In terms of policy development for instance, the More with Less covenant had raised high expectations. Meanwhile however, it has become obvious that fewer buildings boast an improved energy efficiency than was intended. More with Less aims to achieve a 20% to 30% energy efficiency improvement for 3.2 million homes by 2020 (NEAAP-2, 2011). On the other hand, in 2011, NL Agency

published a different target figure of 2.4 million homes which were to achieve this target. Between 2008 and 2010, a total of 314,000 homes have been made more energy efficient by 20-30% (according to research conducted by NL Agency). As a consequence, More with Less will produce considerably less energy savings than was originally expected. Of the intended 100PJ energy savings, it appears that that in 2012, 44PJ was the maximum achievable result (Daniëls et al., 2010, p. 52, The Netherlands Court of Audit, 2011)

The generic ambitions for 2020 in the construction industry, as described by the Dutch Construction and Infrastructure Federation [Bouwend Nederland], show that, besides a few general ideals, realising the intended sustainability targets is seen to be best left to the market:

1. In 2020, the construction industry will ensure that clients and users no longer need to worry about energy efficiency when buying, using, maintaining or transforming buildings.
2. In 2020, the construction industry will provide clients with full service concepts which will combine building, funding, energy supply, facility management and service.
3. In 2020, the construction industry will be characterised by the versatility of construction entrepreneurs, who will consciously choose to play their roles in the chain as total solution providers, specialists or capacity suppliers.
4. In 2020, construction entrepreneurs will take the lead in the construction chain and they will draw on the innovative power of suppliers and chain partners in order to provide client focussed solutions.
5. In 2020, the relationship between clients and contractors will be constructive and challenging and products will satisfy the changing needs of users.
6. In 2020, the construction industry will be recognized for its products which will represent sustainable answers to societal matters regarding housing, work, mobility and nature.
7. In 2020, the construction industry will have a positive image and be considered an attractive employer, with an eye for craftsmanship and the added value of people.

In 2007, the Netherlands association of contracting installing companies and technical retailers, UNETO-VNI, introduced three scenarios to achieve the climate and energy targets (vision document “Good advice is sustainable”). They were: “the slow train,” “the intercity train,” and the high speed train.” In a new/next vision document (A green shot into an open goal, 2010), in spite of economic hardship, UNETO-VNI still has its hopes set on the high speed train scenario, whereby sustainability is part of a wider development emphasising the creation of value, provision of service and process management. If we stay in the “slow train” (in which developments follow the trend of the years behind us), or if we elect the Intercity train scenario, increase in sustainability and energy savings will remain limited.

Calculations by the Economic Institute for the Construction Industry (EIB) show that the high speed train scenario has a positive side-effect. According to the EIB, execution of the high speed train scenario will not only lead to reduction of energy consumption and of CO2 emissions. In addition, it will be a significant impulse for investments, added value and jobs in the construction industry. The high speed train scenario predicts that the number of businesses which actively work on energy efficiency will increase sharply as a result of cross-industry knowledge-building , integral design and new products which are easy to install and concepts for more comfort with less energy.

Increasingly stricter conditions imposed on the energy performance of buildings (and the new energy performance norm NEN 7120) leads to technological innovations and stimulates sustainable energy applications. It also leads to a greater need for qualified employees, knowledge development and training. This in turn creates new professions, specialised in sustainable technology.

In 2012, the Dutch government and market players agreed on a mandatory certification procedure for designers and installers of ground soil energy systems, as well as a self-regulating certification procedure for other sustainable energy applications. The quality assurance system which has yet to be developed will give installation companies the option of earning a “Sustainable Energy Installer” certificate, with a qualification (or more) for certain specialisations: Sustainable Energy Installer for Solar, Sustainable Energy Installer for heat pumps and underground heat sources, and Sustainable Energy Installer for bio energy. Taking all activities into account, certification is done by an independent agent (a certification agency) which determines whether a certain clearly defined object can be trusted to comply with pre-existing requirements.

4.2 Lifelong learning schemes for education and training at intermediate vocational level

4.2.1 National (and regional) policy and strategy on "green" skills and jobs

This chapter focuses on initial/lifelong learning schemes at intermediate vocational level (MBO). Het post-initial offer of intermediate vocational courses and trainings in the field of energy efficiency and renewable energy in the built environment is described in chapter 6, section 2.

Sustainability is currently not a specific policy topic on the Dutch educational agenda for intermediate vocational training, hence it does not form a separate qualification in the qualification structure which defines the various professions. This is not to say that sustainability is entirely absent in education and training at intermediate vocational level. In their individual lessons, many teachers touch on subjects related to sustainability. In addition, a group of leaders on this topic has joined hands to create a knowledge network called Sustainable Intermediate Vocational Education [Duurzaam MBO]. An overview of available lessons and lesson topics is presented on their website, www.duurzaammbo.nl.

New developments in intermediate vocational education (MBO) and preparatory secondary vocational education (VMBO)

It used to be the case that research (conducted by universities, knowledge institutes and consultants) and education (at universities, technical schools, intermediate vocational education schools and craftsman schools /on-the-job trainings) contributed significantly to how the construction industry performed, partly thanks to funding made available by the sector for education & training. That contribution is under serious pressure due to a combination of the following developments: high degree of specialisation/fragmentation, increasing preoccupation with efficiency measures and waning commitment /efforts on the part of businesses in programming and delivering research and education.

In order to work out the roadmap (working package 3, preconditions) in the structural way required by DuBUS (Dutch Build Up Skills, a knowledge and skills enhancement project), it is necessary to tune into and anticipate the following developments.

Intermediate vocational education (MBO)

An important recent development is the reduction of the number of qualifications (at one point, there were over 650 qualifications at intermediate vocational level) by introducing the so-called domain structure. Qualifications which are clearly related to each other are grouped in 16 domains. The Education Minister's action plan for Intermediate vocational education "Focus on craftsmanship 2011-2015" enhances strategic choices. The domain structure makes it possible to cooperate with other sectors, thus to reorganise education and incorporate innovative topics such as sustainability.
As a result of this development, a nation-wide review of qualification files is underway. The aim is to reduce the number of qualifications, to focus much more on common aspects and from there, to work out specialist profiles.

The new qualification files will contain three parts:

1. Basic, common knowledge, skills and attitude aspects for the set of professions (the professional field) described in the file,
2. Profiles, based on current core tasks of the elected profession,
3. An elective, which regions are free to plan and develop as they deem fit

From a DuBUS perspective, this offers various opportunities:

a. The basic component could describe groups of qualifications which belong together and overlap, including both existing and new qualifications (DuBUS: building installation technique) organising them according to the new domain structure. Profiles could subsequently be detailed in part 2.
b. The basic component could define sustainability as a competency in terms of knowledge, skills and attitude aspects for a set of professions (a professional field). In the profiles component (part 2), this could be detailed for specific elected professions in terms of concrete core tasks.

c. The regional component (part 3) is where the link with actual professional reality is made. Regional developments/innovations in the chain of knowledge institutions (academic, higher and intermediate vocational education) and the labour market (builder/ installers) can immediately be incorporated, serving as a basis for internships and work.

Sub a Domain structure
Legislation and regulations are being adapted. Per 1 August 2012, educational institutes will be in a position to offer MBO students (fulltime route, levels 2,3 and 4) a more comprehensive educational curriculum, based on domains. In the future, it will be possible to integrate construction and installation technology.

Sub b Sustainability competency
The concept of sustainability has become increasingly complicated to describe. For the qualification structure, it is important to describe a competency which explicitly draws the link between attitude, behaviour and knowledge. This would however, require specification. Sustainable behaviour is different for a mason than for a carpenter. What is at stake here is the chain. Where do products/materials come from? How are they used? What happens after use? What impact do they have on the ground soil, water, air (the planet) and social circumstances (people)? Also, what is the impact of one's own actions on these elements? In addition, it is important to consider the costs (profit). And to invest in energy savings, sustainable energy technology and using waste products as efficiently as possible (Trias Energetica). Incorporating these aspects applies to the entire technical domain and all levels of the qualification structure.

For these reasons, the discussion now taking place among process managers at the Foundation for the Cooperation on Vocational Education, Training and the Labour Market (SBB) on the setting up of new qualification files, needs to be closely followed and if necessary, fed by knowledge institutes, educational institutes and the government.

Preparatory secondary vocational education (VMBO)
Similarly, in the field of preparatory secondary vocational education (VMBO), processes to renew education and make it more topical are in full swing. The main objectives are:
- To provide attractive education which prepares for the future and tunes into current (professional) reality.
- To improve the transition between preparatory secondary vocational education (VMBO) and intermediate vocational education (MBO), thereby making it possible to offer more attractive and future-proof education.

Intermediate Vocational Education – Higher Vocational Education – Small & Middle-sized Enterprises
The Human Capital Agenda (HCA) for Energy points out the importance of Regional Education Centres (ROCs) and higher professional education as the "connective tissue" between regions, because of their links with small & middle-sized enterprises, both in the field of education and research and development. This is why it has been proposed to support regional thematic initiatives, such as Centres for Innovative Craftsmanship and Centres of Expertise. The HCA for Energy emphasises the importance of regionalisation, as innovation activities are often regionally concentrated. Declining regions for example, offer important facilities for the energy sector but require investments in education and in the labour market, so that they start attracting businesses from that sector.

4.2.2 National and regional implementation of the EQF and other EU policy on education and training in the construction industry

The European Qualification Framework describes levels of learning outcomes in terms of knowledge, skills and competencies. It acts as a translation device to make national qualifications more readable across Europe, promoting workers' and learners' mobility between countries. As it makes it easlier for workers to indicate their level of qualification, the EQF is highly instrumental in turning Europe into a leading economy.
Every member state has developed its own national Qualification Framework, usually abbreviated by as QF, preceded by the first letters of that country: hence for the Netherlands, it would be NLQF.

Besides the standard educational formats at intermediate (mbo) and higher vocational (hbo) levels and academic level, the NLQF also takes into account so-called unpaid education.

The NLQF

NLQF 1 mbo-1	VMBO basic profession-oriented learning path;
NLQF 2 mbo-2	VMBO middle management-oriented learning path, mixed learning path, theoretical learning path;
NLQF 3	MBO-3
NLQF 4	MBO-4; higher general secondary education
NLQF 4+	pre-university high school (VWO)
NLQF 5	associate degree (higher education)
NLQF 6	bachelor
NLQF 7	master
NLQF 8	university degree, designer, medical specialist

The NLQF also has a tenth level: basic education level 1. This is seen as the entry level, below NLQF 1.

The Office of the National Coordinator for the NLQF was established per 1 February 2012. Schools and learning institutes can submit requests to the NLQF to have their educational programmes qualified. At the moment, qualification is limited to courses of a t least 400 hours. The NLQF offers both formal and informal educators the option of indicating the reference level of their education/course/training based on an independent and transparent assessment.

Other interesting instruments available at European level include:

- The **Europass** document, used by students to promote themselves and to describe their academic, training and professional accomplishments, in particular their international experience (such as an internship abroad)
- The **European CV** is a standard European CV format students and workers can use to detail their curriculum vitae
- The **European Credit Transfer in Vocational Education and Training (ECVET**) is a European system, intended to facilitate the recognition of learning outcomes, acquired by individuals in different countries, and transfer their credits to their (next) learning environment in another European country
- The **European Quality Assurance Reference Framework (EQARF)** is being developed within European professional education, establishing guidelines to develop quality management practices
- The recognition, validation and certification system of acquired non-formal and informal learning in what is called Qualifications Acquired Elsewhere (Elders Verworven Competenties (EVC), in the Netherlands.

These European instruments are intended to enhance European labour market integration. Competencies acquired in one country must be acknowledged and recognized in the other, so that people (both students and workers) do not need to do things twice.

These instruments apply to the full breadth of educational systems in each of the European member states and are not specified according to specific content, such as sustainability.

5. Statistics on building and energy sectors

This chapter provides information on the construction sector and the labour market in the Netherlands. It describes the domestic building stock in the Netherlands, taking recent changes into account, as well as numbers of businesses and people employed in the construction industry. The focus is on the sectors which can contribute to achieving targets for energy savings in the built environment by 2020. In addition, data is provided on (sustainable) energy use in the Netherlands and the role of dispersed generation.

Three figures are used in the text: numbers, estimates and prognoses. Numbers are exact figures based on available information. Estimates are based on partly available information, extrapolated to the market as a whole. Prognoses, on the other hand, are calculations based on known numbers, adjusted for expected developments in the future. The reliability of these figures is in decreasing order.

5.1 Statistics on the construction industry

Having reached a peak in 2008, the production of buildings decreased in 2009 and 2010 by over 15% in total. New construction output was most affected. During this period, total new construction output of homes decreased by over 25%, and output of utility buildings decreased by almost 25%. Repair and renovation work also saw a sharp decline over those two years: residential and utility construction decreased by approximately 15%. Maintenance, which generally shows a moderate growth trend, showed a slight shrink (Economic Institute for the Construction Industry [EIB] 2011).

5.1.1 Domestic building stock

To better understand the Dutch situation, the domestic building stock in the Netherlands has been differentiated according to different types of buildings.

Dwellings
According to data published by Statistics Netherlands (CBS), a total of over 115,000 additional dwellings were built in 2009 and 2010. In 2011, over 45,000 more dwellings were built. See
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Table 1: Domestic building stock in the Netherlands (CBS 2012)

Domestic building stock in the Netherlands (numbers)			
	2009	**2010**	**2011**
Stock of dwellings	7,104,518	7,172,436	7,217,803
Stock of housing units	115,872	116,927	117,573
Stock of recreational lodgements	103,041	104,794	105,884
Capacity of special residential buildings	349,899	351,431	356,612

Domestic building stock per 1 January		7,104,518	7,172,436	7,217,803
Additions to the building stock	total	89,880	62,003	
	new construction output	82,932	55,999	
	other	6,948	6,004	
Reductions in the building stock	total	19,004	15,110	
	due to renovation	3,641	2,675	
	urban plan amendment	1,131	813	
	due to demolition	14,232	11,622	
Domestic building stock balance		70,876	46,893	
Dwellings administratively adjusted		-108	-1526	-
Domestic building stock per 31 December		7,172,436	7,217,803	-

The increase in the number of dwellings is not entirely due to new construction output. Some of the additions to the stock are the result of multiple occupancy or transformation of office buildings into dwellings.
When comparing the different years, the growth of the number of dwellings decreases from almost 83,000 in 2009, to almost 56,000 in 2010 to slightly over 45,000 in 2011. Decreasing growth is explained by the economic crisis which started in 2008 and started hitting the construction sector hard in 2009 and 2010.

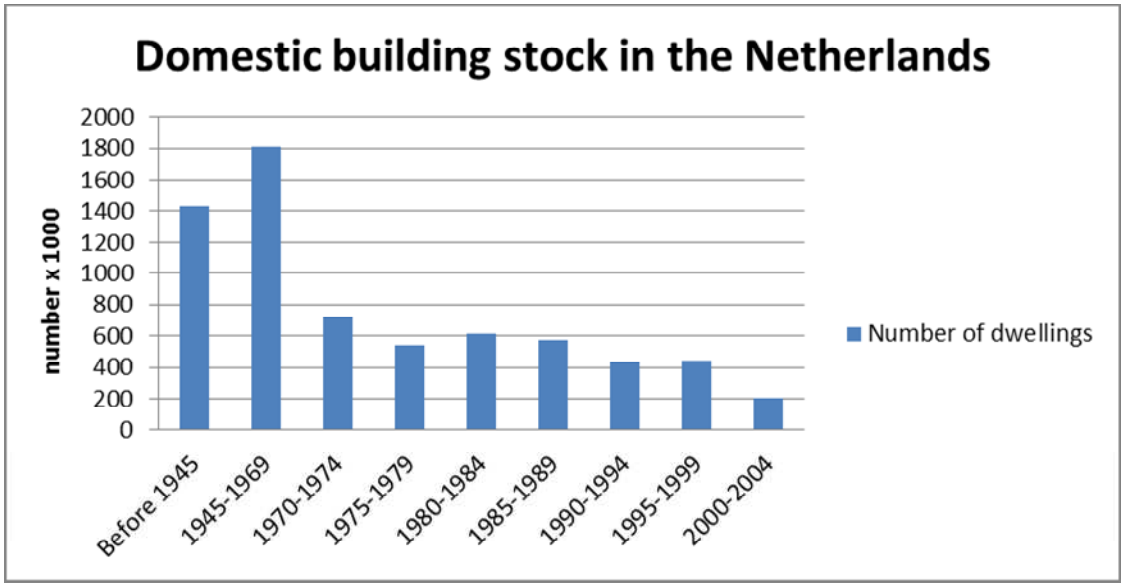

Figure 1: domestic building stock in the Netherlands in 2003 per construction period (CBS 2012)

Construction of non-residential buildings

Non-residential construction can be divided into different types of functions. The exact number of buildings is not known, but thanks to a method developed in the Netherlands by Mobius Consult, it can be estimated (Prendergast and Jeths 2010).
For new construction output, a decline of 17% is expected in 2010. Light growth was observed only in the new construction of health care buildings and the so-called category of “other” buildings. The new construction output of business buildings, buildings with a logistics function, offices, retail and agrarian buildings decreased in 2010. In comparison, repair and reconstruction decreased less, by only 7.5% (Economic Institute for the Construction Industry - EIB - 2011).

Table 2: Number of non-residential buildings in the Netherlands (Mobius Consult, via NL Agency 2012)

Function	Number
Offices	78,700
Schools /education	14,600
Hospitals	700
Nursing and care homes	5,200
Shops	140,800
Catering (excl. hotels)	33,900
Hotels	3,400
Commercial & industrial spaces	159,700
Sports accommodations	8,300
Swimming pools & sauna's	400
Meeting spaces	28,600
Lodgings	1,600

Table 3: Non-residential surface area output in the Netherlands (EIB 2011)

*1000 m^2	2008 (1)	2009 (1)	2010 (2)	2011 (2)
Commercial spaces	4,375	4,625	3,550	3,125
Offices	1,100	1,050	825	525
Shops	175	200	175	150
Logistics buildings	1,400	1,575	975	875
Agricultural buildings	8,450	7,800	6,625	6,900
Educational buildings	750	675	600	550
Care buildings	1,075	1,200	1,200	1,325
Other buildings	1,100	1,075	1,100	1,000

(1) estimates
(2) prognoses

Commercial buildings are taken to include buildings which one would typically expect to find on premises of an industrial site: halls, depots, warehouses, or manufacturing areas and larger or smaller administrative facilities (offices).
Economic recession has brought a halt to high output levels seen prior to the recession. In 2009, construction output did not yet show a strong decline, due to projects already underway and a considerable number of buildings permits already issued. The offer of commercial spaces showed a steep increase, leading to a sharp decrease of new construction output in 2010. Declining output means that companies are forced to delay realisation of their expansion plans (EIB 2011).

Table 4: Commercial property market in the Netherlands (DTZ Zadelhoff 2011, 2012)

Nederland	2009	2010	2011
Offer [m2]	8,734,000	9,317,000	9,593,000
Supply [ha]	50,271	51,377	52,396

Offices are commercial buildings where mostly administrative work is done. They are independent buildings units which are largely used for office-related activities and no or hardly any other purposes.
The office market is affected in two ways: firstly, demand has dropped as a result of the recession. Second, there is a surplus of available surface area. Perspectives for office construction are therefore looking bleak, and the expectation is that construction of offices will not re-establish itself in the near future, contrarily to the economy and utility construction as a whole (EIB 2011).

Table 5: Office market in the Netherlands (DTZ Zadelhoff 2011, 2012)

The Netherlands	2009	2010	2011
Offer [m2]	6,709,000	7,152,000	7,561,000
Supply [m2]	46,199,000	46,800,000	48,195,000

5.1.2 Number of energy efficient buildings

Two methods are used to assess the energy efficiency of buildings: the energy performance coefficient (EPC) for new buildings, and the energy label for existing buildings.

EPC
New buildings must meet certain energy efficiency requirements. This is expressed by the energy performance coefficient (EPC). The lower the EPC, the more efficient the building. EPC ratings are valid indefinitely, unless the building is subjected to major renovation. The Netherlands has applied this standard to determine the EPC of new residential houses since 15 December 1995. If the construction license for a dwelling is not older than 10 years, the EPC rating for that dwelling may be used instead of the energy label.

In line with EU regulations, the EPC standard for homes is continuously tightened: in 2000, the EPC was 1.0. As of 1 January 2006, residential houses are expected to score an EPC value of 0.8. Per 1 January, an EPC of 0.6 is required. In the case of new utility buildings (offices, schools, factories , barracks, hospitals, etc), different limit values are required, depending on the function of the building.

Energy label

The energy label provides various pieces of information on the energy efficiency of a dwelling.
It tells something about:

- The insulation of the roof, facade, walls, windows and floors
- The energy consumption of heating, ventilation and hot water installations
- How the energy efficiency of the dwelling could be improved

An energy label is valid for 10 years and must be issued by a certified energy advisor. An energy advisor may complete an assessment of an entire apartment building, thereby reducing the cost of individual energy labels per apartment.

The energy label for buildings gives owners a better understanding of the energy performance of their building or dwelling. Since 1 January 2008, construction, sale and rent of residential and non-residential properties are subject to a mandatory energy label. All energy labels are registered in the energy label database. The register has been operational since September 2007 and it is managed by NL Agency. The energy label is based on the European Energy Performance of Buildings Directive (EPBD).
The ultimate date by which the energy label requirement will apply to new residential houses is 1 January 2013. The labels are issued on the basis of the dwelling's EPC rating. See also Table 6. Dwellings with an EPC rating of 0.8 are issued an equivalent energy label A. Dwellings with an EPC rating of 0.6 are given an A++ energy label (Association of Dutch Property Developers, Neprom, 2011). This means that all dwellings for which a construction license is given from 2011 onwards will obtain an energy label with a rating of at least A++.

Table 6: Energy label equivalents for EPC ratings in new buildings (Spring Agreement 2012)

EPC (construction of homes)	**Label**
EPC ≤ 0.2	A ++++
0.2 < EPC ≤ 0.4	A +++
0.4 < EPC ≤ 0.6	A ++
0.6 < EPC ≤ 0.8	A +
0.8 < EPC ≤ unknown at this time	A

Dwellings

The majority of dwellings in the Netherlands have an energy label C or D (Table 7 and Figure 2).
Of the total number of dwellings in the Netherlands (almost 7.2 million in 2010), almost 1.8 million had an energy label in 2010. 739,000 of those dwellings had a label C or better. It is worth noting that dwellings belonging to housing corporations have been issued more labels than private homes and that on average, dwellings belonging to housing corporations are given better labels, due to renovation projects. This means that Table 7 and Figure 2 may show a slight distortion, and that the total domestic building stock in the Netherlands may show relatively lower scores in terms of labelling.

Table 7: Energy labels for dwellings in the Netherlands (NL Agency 2012)

Number of labels	**2009**	**2010**	**2011**
A++	22	60	88
A+	194	321	501
A	30,635	42,503	47,730
B	140,840	179,577	203,991
C	432,083	516,331	563,674
D	421,212	500,828	539,702
E	250,162	300,151	322,799
F	154,107	181,366	193,628
G	64,635	75,340	79,177

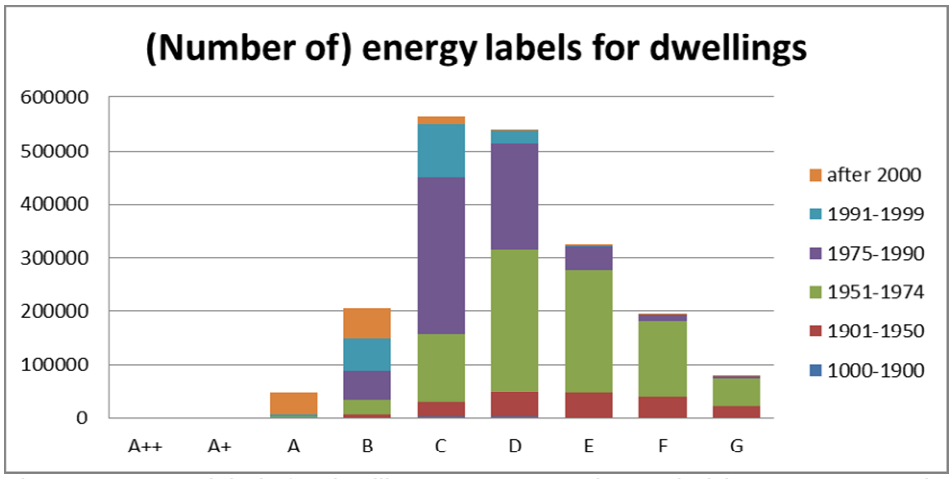

Figure 2: Energy labels for dwellings per construction period (NL Agency 2012)

In the meantime, most of the dwellings in the Netherlands have been equipped with double glass panes and roof insulation. Wall and particularly floor insulation are found to be lagging behind (see Table 8).
When interpreting these figures, note that even if only a single window has double panes in a dwelling, that will be reflected in the percentages. Moreover, the quality of the double panes (i.e. of insulation) cannot be expressed in the percentage values.

Table 8: Insulation figures (%) for dwellings in the Netherlands (NL Agency 2012)

	2005	**2006**	**2007**
Roof insulation	73	75	77
Double panes	80	81	83
Wall insulation	53	54	54
Floor insulation	40	41	42

Of the total domestic housing stock, almost 4 million dwellings date from the period preceding the 1973 energy crisis. Assuming that those dwellings were originally built with no or very limited insulation, the potential for savings is huge.

The target for energy savings in existing buildings is 100 PJ by 2020. This means that between 2008 and 2011, 500,000 homes will have to improve their energy efficiency by 20-30% and between 2012 and 2020, another 300,000 homes will have to achieve that target each year.
Between 2008 and 2010, a total of 314,000 dwellings achieved additional savings of at least 20% (on top of independent developments). In 2010, 112,000 dwellings achieved similar results. Home owners undertook more actions in 2010 than in previous years. In the housing corporation sector on the other hand, we see a decline in the number of actions undertaken. Two thirds (66%) of the corporations indicate that the budgets for energy saving investments have come under pressure.

The most frequent energy saving measure taken in the past few years by both home owners and corporations was installation of high-efficiency glass and high-efficiency boilers. Meanwhile, a large part of the Dutch housing stock is equipped with double paned windows and high-efficiency boilers. Application of these measures in the future will increasingly entail replacement, hence lower energy savings. In order to keep improving the energy efficiency of measures in the future, other energy saving measures will have to be applied on a large scale.

Licenses for residential construction issued in 2010 represented a considerable increase in energy efficiency when related to requirements in 2007. Almost 6% of those licenses accounted for at least 25% savings. The past few years show a growing trend: more and more licenses are issued with an EPC rating which is significantly lower than what is required. Tighter requirements planned for construction of new homes means the targets for 2015 are expected to be achieved (Bosshardt et al 2011).

Utility construction

Most energy labels for utility construction were awarded to buildings with an office function (Figure 3). Looking at office square metres per label, it is striking that between 2009 and 2011, the office surface area issued with a green label (C or better) grew by almost 3.9 million m^2 whereas the surface area issued with an energy label D or less grew by over 2.6 million m^2. As the Building Decree sets out clear requirements as to the energy performance of new buildings, (depending on the type of building, although new buildings always fall in the range from A++ to C),this means that a large part of the office buildings still lacks of lacked an energy label and that most of the office building stock has an energy label D or less.

Of the total number of office buildings in the Netherlands (estimated at 78,700 according to Mobius Consult), only 10,518 had an energy label in 2011. Half of them had a label C or better (NL Agency 2012).

Table 9: Energy labels for utility buildings according to surface area (m^2) (NL Agency 2012)

m^2 per label		**2009**	**2010**	**2011**
Office function	**A++ - C**	5,667,426	7,680,545	9,553,871
	D - G	8,376,934	10,001,962	11,016,689
Commercial function	**A++ - C**	413,211	905,225	1,397,399
	D-G	77,084	384,521	537,845
Sports function	**A++ - C**	937,460	1,060,484	1,193,324
	D-G	805,844	918,974	976,135
Meeting function	**A++ - C**	1,074,611	1,243,159	1,329,941
	D-G	573,976	741,387	845,616
Educational function	**A++ - C**	447,782	705,407	1,031,787
	D-G	673,347	1,082,984	1,242,507
Lodging function	**A+ - C**	286,131	297,537	312,561
	D-G	480,828	488,494	515,028
Health care function	**A+ - C**	168,467	211,936	338,923
	D-G	124,835	152,992	158,669

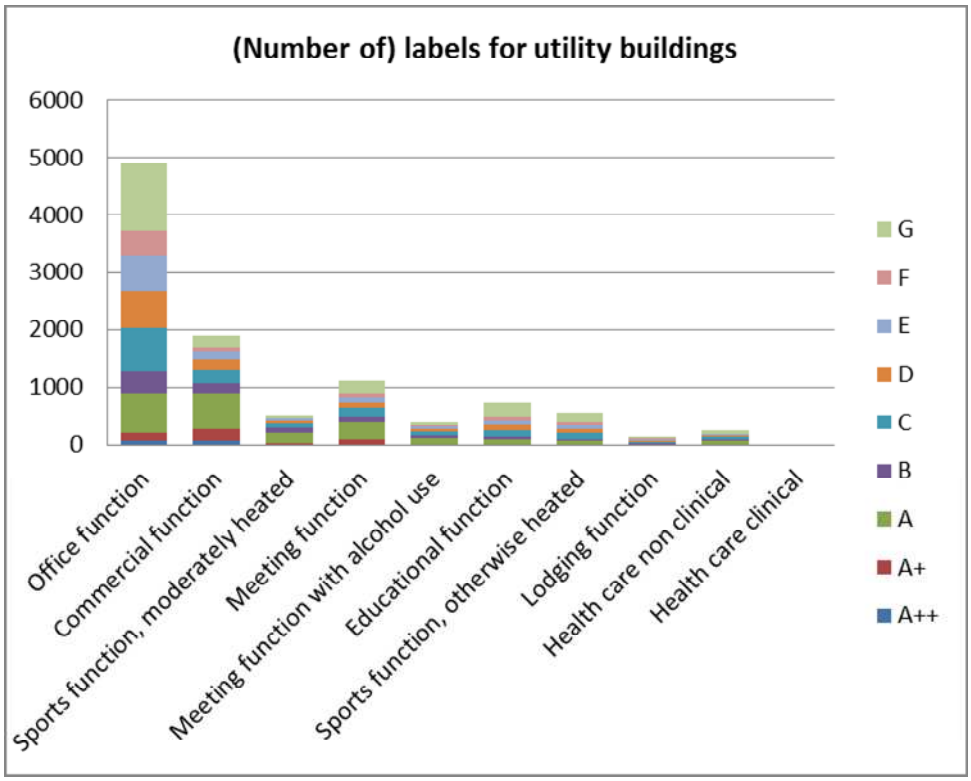

Figure 3: Energy labels for utility buildings (number of) (NL Agency 2012)

Research among facility managers has demonstrated that in the past 3 years, energy saving measures were applied in over 50% of the existing office buildings in the care of facility managers. In 31% of those buildings, 2 or more energy saving measures were taken. These cannot be related to the savings percentage however, because utility construction is too diverse and these results are not available. The most frequent energy saving measure in offices was the application of high-efficiency glass and the installation of high efficiency boilers (Table 10) (Bosshardt et al 2011).

Table 10: Application of energy saving measures in 2008-2010 (Bosshardt et al 2011)

	offices
Insulation roof/ facade	17%
Use of high efficiency glass	28%
Installing floor insulation	14%
Installing high efficiency boiler	26%
Placing heat pump	11%
Installing heat and cold storage system	11%
Installing Combined Heat & Power system	8%
Installing solar boiler	2%
Installing solar panels (photovoltaic cells)	3%

5.1.3 Companies working in the Construction industry

According to data published by Statistics Netherlands (CBS), the largest number of companies in the construction industry is involved in civil and utility construction and in finishing (Table 11).

Table 11: Numbers of companies and their sizes 2007 – 2009 (SBI'93) (CBS 2012)

		Total number of companies	Number of employees in the company							
			1	2	3 - 5	5 - 10	10 - 20	20 - 50	50 - 100	100 - …
Business branch	**Period**	**number**								
451 Site preparation	2007	**2,505**	1,350	295	220	265	200	145	25	5
	2008	**2,845**	1,675	315	240	250	200	140	20	5
	2009	**3,410**	2,190	355	250	255	185	140	30	5
452 Civil and utility construction; civil engineering, land, roads and waterways	2007	**42,465**	27,360	5,405	2,755	2,795	2,075	1,480	335	255
	2008	**48,195**	33,180	5,530	2,870	2,645	1,950	1,410	360	250
	2009	**55,405**	39,600	6,110	3,035	2,695	2,010	1,335	375	255
453 Installation in buildings	2007	**11,195**	4,660	1,605	1,270	1,480	1,115	730	195	140
	2008	**12,340**	5,885	1,690	1,300	1,445	1,055	675	165	125
	2009	**13,910**	7,255	1,755	1,325	1,440	1,090	715	200	130
454 Finishing of buildings	2007	**28,835**	19,410	4,150	2,100	1,780	850	445	75	20
	2008	**32,320**	23,065	4,225	2,100	1,610	830	415	50	20
	2009	**35,740**	26,335	4,385	2,165	1,560	785	425	70	15
455 Renting of construction and demolition equipment with operators	2007	**910**	540	105	55	60	55	65	20	10
	2008	**960**	590	110	55	65	50	65	20	10
	2009	**960**	630	105	60	55	40	45	15	10
45 Construction industry total	**2007**	**85,910**	**53,320**	**11,565**	**6,405**	**6,385**	**4,295**	**2,865**	**645**	**430**
	2008	**96,660**	**64,395**	**11,875**	**6,565**	**6,015**	**4,085**	**2,700**	**620**	**405**
	2009	**109,425**	**76,005**	**12,705**	**6,835**	**6,005**	**4,105**	**2,660**	**690**	**420**

Specialised contractors carry out specialist activities such as bricklaying, scaffold building and roofing. These companies are often involved in parts of the building process as sub-contractors.

Table 12: Number of companies involved in specialist contracting by size per 1 January 2010 (Fundeon 2012)

Business branch/trades (SBI2008)	1 employee	Small 2-10	Middle-sized 10-50	Middle-sized 50-100	Large 100 >	Total
2370 Natural stone industry	135	180	40	5	0	*360*
4332 Carpentry (buildings)	11,550	2,355	180	10	5	*14,100*
4333 Floor and wall tiling industry	4,195	1,500	180	5	0	*5,880*
4391 Roofing companies	1,390	735	205	10	5	*2,345*
43992 Steel braiding companies	515	145	45	10	0	*715*
43993 Bricklayers and masonry	3,395	805	150	10	5	*4,365*
43999 Other specialised construction trades[1]	1,485	578	183	18	8	*2,270*
Total specialised contractors	**22,665**	**6,298**	**983**	**68**	**23**	**30,035**

Source: Statistics Netherlands (CBS)

[1] This code includes specialised contractors and infrastructure companies. Each sector is attributed with half.

Specification of the technical installation business

The technical installation business is part of the business branch numbered *453 Installation in buildings* featuring in Table 11. It includes all companies which are members of Mn Services (an organisation which takes care of pensions for employees in the installation business, among others) and all companies in the trade register of the Chamber of Commerce listed under *4531/4533 (buildings installation)* and *29230 (manufacturing of machines/ equipment for industrial cooling technology / climate control)*.

Table 13: Number of companies with employees in the technical installation business (TI) per trade and size of staff (mid 2011) (Mn Services, Tillaart et al, 2012)

Number of employees	Electrical engineering		Installation technology		Cooling engineering		Total	
	number	%	number	%	number	%	number	%
1-5	2,102	50.0	2,183	51.4	150	48.9	4,435	50.6
6-15	1,089	25.9	1,128	26.6	79	25.7	2,296	26.2
16-50	690	16.4	693	16.3	58	18.9	1,441	16.5
51-100	183	4.3	159	3.7	13	4.2	355	4.1
100 or more	144	3.4	81	1.9	7	2.3	232	2.6
Total	**4,208**	**100**	**4,244**	**100**	**307**	**100**	**8,759**	**100**

Mid 2011, 8,759 technical installation companies were registered with Mn Services. Together, at that time, they employed 137,030 workers. Of those 8,759 companies, 4,244 are listed as technical installation company. 4,208 are listed as electrical engineering company. 307 are listed as cooling engineers. Of the 137,030 workers, 54 percent is employed in an electrical engineering company, 42 percent in a technical installation company and 3 percent in a cooling engineering company (see also Table 13).

Besides the 8,759 technical installation businesses registered with Mn Services, approximately 9,200 more building installation companies are registered at the Chambers of Commerce. Of those 9,200 building installation companies approximately 7,000 have no staff. In other words, there are some 7,000 self-employed contractors. Another 1,000 of the 9,200 companies employ staff from time to time. The remaining 1,200 building installation companies have employees working for them. Further research showed that these companies too, were technical installation businesses. These 1,200 companies employ a total of approximately 17,000 staff (Tillaart et al, 2012).

5.2 Statistics on the current labour force in the construction industry

According to Statistics Netherlands (CBS), during the peak period of construction output in the Netherlands in 2008, almost half a million people were working in the construction industry (Table 14). Since then, employment has decreased considerably, by approx. 40,000 fte. Remarkably, the decrease in employment is relatively limited among employees: based on preliminary statistics, total employment loss among employees in 2009 en 2010 was 20,000 fte in the entire construction sector. Hence, the flexible outer ring of independent contractors and temporary workers seems to have taken the brunt of job losses (EIB 2011).

5.2.1 Number of workers per trade

In the process of describing the status quo, an inventory was made of the various occupations currently found in the Netherlands. This resulted in a long list of professional occupations as they appear in professional competency profiles and in qualification files. The list also includes alternative names for professions as used in the professional competency profiles. Names of occupations have been used as they appear in the titles of the qualification files, as well as names of professions as used to describe the jobs to choose from after completion of education (differentiation).

As there are many synonyms and, in addition, a number of homonyms to denote certain professions, this inventory initially takes into account only those professions which appear in the titles of the qualification files and the professional competency profiles. Furthermore, for practical purposes, professions have been concentrated per area of expertise and per level. For Build Up Skills NL, this has resulted in practical overview (Figure 4), whereby all occupations found in a single matrix cell are backed by a database containing names of professions. For example, the following professions are to be found behind the cell B11 – level 2 (carpenter, basic specialist):

- New construction carpenter
- Finish carpenter
- Timber frame carpenter
- Restoration carpenter
- Workshop carpenter
- Maintenance carpenter

This figure shows only occupations (or clusters of occupations) in the construction and installation sectors which are directly connected with the task of realising zero-energy dwellings. For many occupations, this is taken for granted. This is the case, for example, for carpenters and roofers. For other occupations, the fact that they have been included requires some explanation. This applies for instance to scaffolding builders who, when attaching the scaffolding to a building, must be aware of the need to leave the thermal envelope intact and to repair it if necessary. The areas of expertise which have been coloured black have the closest links to BUS-NL .Theses are the areas requiring most effort in order to achieve the desired level for the workers in these professions.

Figure 4 shows professions which cover a number of occupations in a separate table. These are professions which embrace more than one area of expertise.

Data re. size and/or education level is not available for each selected occupation. This is because various organisations (including the Statistics Netherlands (CBS), Fundeon, Training and Development Fund for the Technical Installation Sector (OTIB)) each have their own methods of data gathering and aggregation, which may differ from that of others.

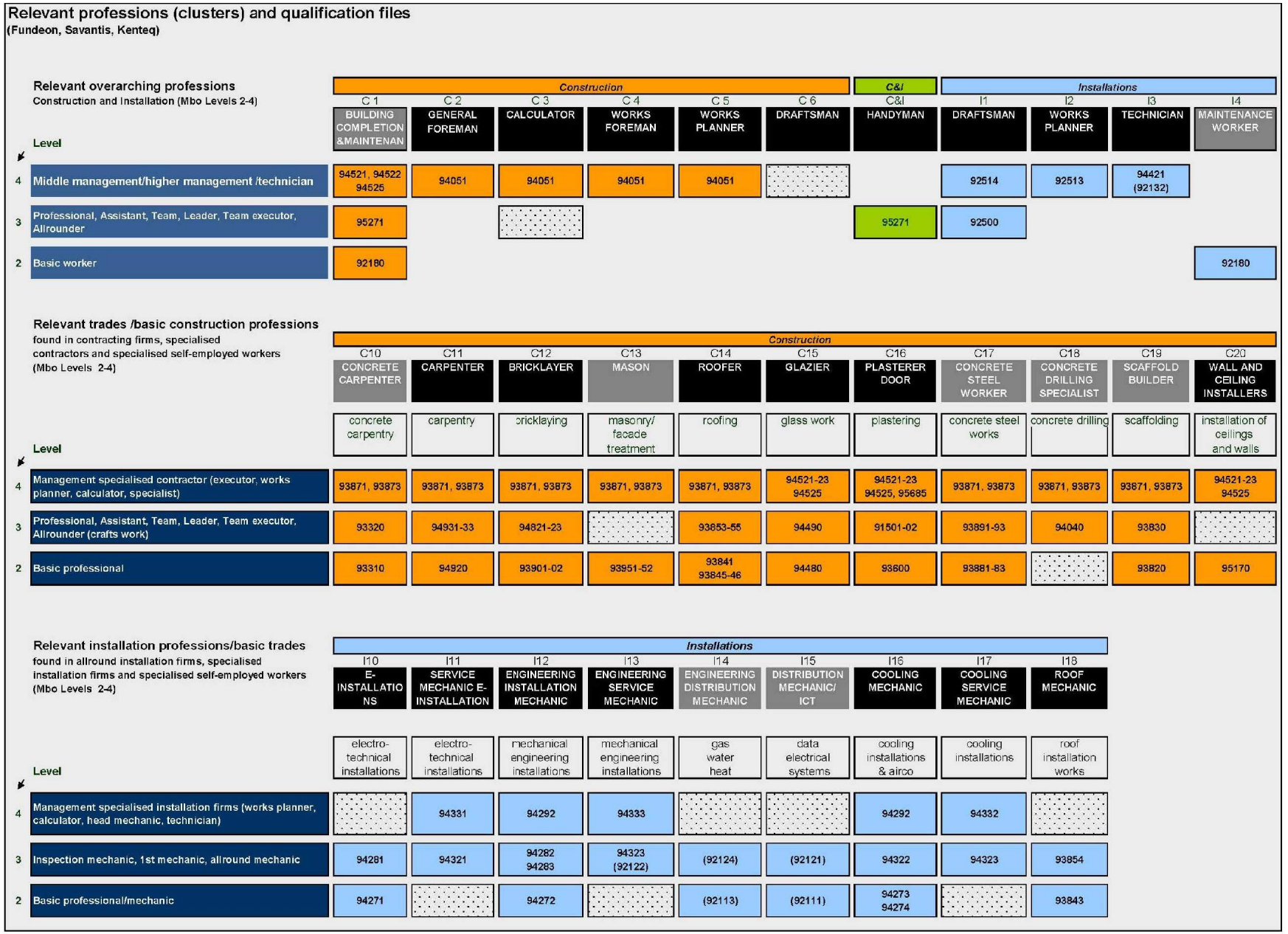

Figure 4: Occupations in the construction and installation sectors related to zero-energy construction

Table 14 must be seen in connection to Table 11. Table 14 shows the number of employees per business branch. These numbers go back to 2008. More recent numbers have not yet been made available by Statistics Netherlands (CBS).

Each business branch has a code, indicating which area of expertise it belongs in. This matches the Standard Industrial Classification used by Statistics Netherlands (CBS) to classify economic activities: SBI'93, which was drastically revised leading to SBI 2008. The first two numbers indicate the overall level (e.g. 45 is the construction industry). The next number stands for the group of professions (e.g. 452 is civil and utility construction, and civil engineering related to land, roads and waterways.) The last number indicates a specific occupation (e.g. 4522 is roofing). The professional groups *453 Building installation companies* and *454 Finishing of buildings* have been split into a number of specific disciplines. For each discipline, the corresponding number of employed people is indicated.

Table 14 shows the number of people employed in the entire construction industry. The 16 groups of professions considered relevant to the BUS-NL enquiry account for an important part, but not for the entire construction industry.

Table 14: Number of people employed in the construction industry (SBI'93) (CBS 2012)

		Number of people employed	Number of fte
Business branch	**Period**	**x 1 000**	**x 1 000**
45 *Entire Construction industry*	*2006*	*475.4*	*434.9*
	2007	*489.8*	*446.2*
	2008	*499.1*	*456.7*
4522 Roofing, building of roof construction	2006	12.0	10.6
	2007	11.6	10.6
	2008	11.9	10.8
4525 Other specialised construction activities	2006	33.2	29.8
	2007	32.5	29.6
	2008	33.9	31.4
453 Building installation companies	2006	136.6	125.4
	2007	147.6	133.4
	2008	152.5	138.1
4531 Electrical engineering Building installation companies	2006	55.7	51.9
	2007	62.2	57.1
	2008	62.1	57.8
4532 Insulation companies	2006	5.3	4.7
	2007	5.2	4.4
	2008	5.3	4.7
4533 Plumbers, boiler/ air conditioning installation	2006	64.0	57.8
	2007	67.1	60.7
	2008	72.9	64.2
4534 Other building installation companies	2006	11.6	10.9
	2007	13.1	11.2
	2008	12.2	11.4
454 Building finishing	2006	67.9	60.4
	2007	69.5	61.4
	2008	70.7	62.7
4541 Plastering	2006	11.1	10.1
	2007	11.0	10
	2008	12.6	10.9
4542 Carpentry	2006	11.7	10.6
	2007	12.9	11.3
	2008	12.8	11.3

4543 Finishing floors and walls	2006	9.4	8.4
	2007	9.7	8.6
	2008	10.7	9.1
4544 Painting and glass fitting	2006	33.3	29.3
	2007	33.1	29.4
	2008	32.2	29.3
4545 Other finishing activities	2006	2.3	2
	2007	2.7	2.1
	2008	2.5	2.1
455 Renting of construction equipment with operators	2006	8.5	7.7
	2007	9.2	8.5
	2008	8.3	7.6
4511a Civil and utility construction	2006	158.7	147
	2007	161.1	148.9
	2008	161.5	150
4525a Non civil & utility construction and civil engineering (land, roads and waterways)	2006	233.2	211.5
	2007	247.3	222.5
	2008	252.1	227.3

The **construction industry** is defined as follows (CBS 2012):

General and specialised construction and civil engineering works, installations in buildings and the finishing of buildings. The construction industry also includes new build, repair, extensions and alternations, modular or on-site construction and erecting temporary buildings.

> **General construction** is taken to include the building of homes, offices, commercial spaces and other forms of civil and utility construction, etc, or the building or placement of heavy constructions such as motorways, roads, bridges, tunnels, railways, airports, harbours and other hydraulic engineering projects, irrigation systems, sewerage systems, industrial installations, pipelines and power lines, sports facilities and so on. Contractors may carry out these activities either as their own investment/development, for lump sum or on the basis of a contract. Part of the activities, and sometimes even all of the operational activities can be done by sub-contractors.
>
> **Specialised construction** includes the building or putting in place of parts of constructions and civil engineering works or the necessary preparatory activities. Normally, specialised activities for various constructions involve specific experience or special gear. This includes piling, laying foundations, drilling water wells, shell construction, casting concrete, masonry, natural stone work, buildings scaffolds, roofing, and so on. Specialised construction activities are usually carried out by subcontractors, but particularly repair work on construction is carried out directly for the owner of the real estate property.
>
> **Building installation** includes installation of all facilities which make a building operational. These activities are generally carried out on the construction site, though certain jobs may be done back at the work place. Installation includes plumbing, installation of heating and climate control systems, alarm and other electrical systems, sprinkler installations, elevators, escalators and so on. Further activities also considered as installation work include insulation (moisture control, thermal and acoustic insulation), fitting metal plates, installing commercial cooling systems, public lighting installations and electrical traffic signal systems for roads, railways, airports, harbours, and so on. Repair of such installations is also included.
>
> **Building finishing** includes activities related to the finishing or completion of a building, such as glass fitting, plastering, painting, glazing, wall and floor tiling, floor covering with parquet or carpet, wall papering etc, sanding of floors, joinery, noise control and so on. Repair in relation to these activities is also included.

Table 15 shows the development of employment for a number of professions, as assembled by the EIB (2011). These numbers differ from those in Table 14. This is mainly due to a different method of

classification. For example, in Table 14 *Carpentry* is a part of building finishing, whereas in Table 15 *Carpenters* have a much broader job description, and therefore represent a larger group of people.

Table 15: Employment development in civil and utility construction (EIB 2010)

	2009	**2010**	**2011**
Carpenters	50,620	44,800	44,325
Bricklayers and masons	8,640	7,600	7,450
Other general civil&utility construction jobs	9,215	8,200	8,150
Tile setters and tile finishers	3,295	2,900	2,850
Roofers	5,365	4,800	4,775
Other specialised constructors	13,865	12,200	12,025

Table 16: Number of occupations according to age (EIB 2011)

	0-19	**20-24**	**25-29**	**30-34**	**35-44**	**45-54**	**55-59**	**60+**	**Total**
Roofer	92	487	622	519	978	921	326	151	**4,096**
Ground worker	120	318	286	236	629	751	308	159	**2,807**
Mason	386	813	747	779	1.624	2.488	1.410	660	**8,907**
Scaffold builder	13	116	151	158	296	214	84	47	**1,079**
Carpenter	2,610	5,656	5,609	5,034	8,373	9,696	5,829	2,806	**45,613**
Total									**62,502**

Technical installation business

Of the 136,350 workers who were employed in the technical installation business in 2012, 12 percent are of foreign descent, both Western and non-Western. Among them, we find fewer first generation (7,429) than second generation (9,434) workers.

The majority of workers of foreign descent has at least one parent born in one of the following countries:

Indonesia/Dutch East Indies (w)	2,809
Suriname (nw)	2,077
Germany (w)	2,003
Turkey (nw)	1,628
Morocco (nw)	1,524
The Netherlands Antilles (nw)	1,042
Former Yugoslavia(w)	620
Belgium (w)	644

Over three quarters (79%) of the foreign workers in the technical installation business come from these eight countries (Tillaart et al, 2012).

Table 17: Personal characteristics of employees per specialisation, mid 2011 (Tillaart et al, 2012)

		Electrical engineering	**Installation technology**	**Cooling technology**	**Total**
		%	%	%	%
Sex	Male	90	90	87	90
	Female	10	10	13	10
	Total	*100*	*100*	*100*	*100*
Age	<25 years	12	17	10	14
	25-34 years	25	24	23	24
	35-44 years	28	27	31	28
	45-54 years	22	20	24	21
	>54 years	12	12	12	12
	Total	*100*	*100*	*100*	*100*

Average age in years		39,3	38,3	39,9	38,9
Marital status	Single	50	50	46	50
	Married	50	50	54	50
	Total	*100*	*100*	*100*	*100*
Ethnic origins*	Foreign	86	89	88	88
	Morocco	1	1	1	1
	Turkey	1	1	1	1
	Suriname	2	1	1	2
	NL Ant/Aruba	1	1	1	1
	Other non-Western	2	1	2	2
	Western	7	6	7	6
	Total	*100*	*100*	*100*	*100*
Generation**	Dutch	86	89	88	88
	2nd generation of foreign descent	7	6	7	7
	1st generation of foreign descent	6	5	5	5
	Total	*100*	*100*	*100*	*100*

* In differentiating between Dutch and foreign descent, we adhere to the standard definition and classification of Statistics Netherlands (CBS).
According to this definition, people considered to be of foreign descent are:
. born outside the Netherlands with at least one alien parent born outside the Netherlands *(first generation)*
. born in the Netherlands with at least one alien parent, born outside the Netherlands *(second generation)*
Statistics Netherlands (CBS) does not differentiate between W*estern and non-Western foreign descendants.* We define Western countries as all European countries (except Turkey), North America, Oceania, Japan and Indonesia (including former Dutch East Indies). Non-Western countries include Turkey and all countries in Africa, Latin America and Asia (except Japan and Indonesia).
** In the CBS definition, the criterion used to differentiate between *first and second generation* is the land of birth. This criterion has little social implications however. It is much more relevant where a person has spent his/her formative years. Based on this argument, it would seem advisable to qualify persons born elsewhere but who came to the Netherlands before the age of six, as second generation Dutch citizens.

5.2.2 Level of skills

The level of skills of a worker can be established in a professional competency profile (pcp), which describes various competencies belonging to a certain profession, and qualification files. A qualification(file) is a legally compulsory description of knowledge and skills requirements which participants who are being trained for a certain profession must meet. A qualification can embrace several specialisations and levels.
A qualification file indicates the minimum level which a participant must have achieved at the end of a training or course. In principle, every employee in a certain sector or branch should comply with the qualification file for his/her profession. A professional competency profile provides additional competencies, which the employee may have gained from practical working experience. No (central) register is kept however, of numbers of people with additional competencies, hence no information is available as to complementary skills levels among the labour force in the construction industry.
Professional competency profiles and qualification files do not provide separate information on energy efficiency and sustainability. Still, these aspects are firmly embedded, though in more generic terms (Fundeon, 2012).
Examples:

- Practically all professional competency profiles and qualification files mention the environment, in terms of the environmental impact of specific materials and substances, sorted waste disposal, noise control and noise pollution, as well as energy and sustainability. Most professions and qualifications further include paragraphs on working according to regulations and plans. In turn, these regulations and plans contain guidelines as to energy and sustainability, if applicable.
- The qualification files and professional competency profiles mention expected developments and their effects for the exercise of certain professions in the years ahead. This includes market trends, international developments, technical evolutions, and changes in legislation

and regulation. Often, environmental developments are also addressed, including energy and sustainability.

- The newest professional competency profile (planner/calculator for underground networks; not yet part of the qualification structure therefore still under embargo) mentions new tendering methods, whereby awarding the tender strongly depends on attention paid to environmental aspects.

The second example also answers the question, to what extent qualification files take new developments into account. New developments and their effects for the exercise of certain professions can be described in qualification files. They are not reflected in exam requirements, as participants cannot be practically examined in fields which do not yet exist. Only a theoretical examination is conceivable. Laws and regulations are seldom explicitly mentioned, because they are amended so often.

In the spectrum of construction training and education, the track most often chosen is the working & learning track in vocational education. The biggest difference between working & learning and learning & practical training is that participants in a working & learning track earn a salary, thus are employed. In the learning & practical training track, participants spend more time in class and less time in practice. They are remunerated for internships. Industry representatives believe that craft professions are best learned in practical exercise of the profession and therefore stimulates the working & learning track sponsoring employers who take on these apprentices.

Table 18 shows the development of the number of participants having chosen the working & learning track in specialist vocational training. Table 19 shows the number of participants in the working & learning track and in the learning & practical track for the civil & utility sector. Table 20 shows the number of students in the technical installation business.

Table 18: Participants in Fundeon qualifications, currently following the working & learning track for the specialised contracting sector[2], per 1 October 2011 (Fundeon 2012)

Level	**Qualification file**	**2009**	**2010**	**2011[1]**
2	Concrete mould manufacturers	4	2	2
	Concrete repair contractor	76	89	64
	Concrete steel worker	89	57	64
	Roofer	226	159	151
	Natural stone carver	79	77	60
	Scaffold builder	74	124	101
	Tile setter	237	139	152
	Tile setter learning & practical training	*30*	*21*	*17*
	Mason/ External wall coating specialist	100	82	83
	Mason learning & practical training	*1*	*1*	*0*
3	Concrete drilling specialist	9	33	83
	All-round concrete repair contractor	0	18	17
	All-round concrete steel worker	11	19	58
	All-round roofer	72	60	77
	All-round natural stone carver	5	7	3
	All-round tile setter	21	21	26
4	Manager	63	56	45
Total		**1.066**	**943**	**986**

[1] Preliminary

[2] Fundeon considers masons to be specialist contractors, even though they are trained for civil & utility construction.

Table 19: Current participants in the Fundeon qualifications for the civil & utility sector, per 1 October 2011 (Fundeon 2012)

		Working & learning track			Learning & practical training track		
Level	**Training & Education**	**2009**	**2010**	**2011[1]**	**2009**	**2010**	**2011[1]**
1	Construction and infrastructure Assistant	426	386	408	425	343	303
2	Primary concrete carpenter	10	13	11			
2	Mason	749	620	544	118	135	94
2	Carpenter	3,964	3,199	3,089	1,210	1,056	774
3	All-round mason	344	354	307			
3	All-round carpenter	2,776	2,700	2,505	9	13	27
4	Construction and infrastructure (middle) manager	46	47	52	4,492	3,981	4,130
4	Construction, infrastructure and specialist contractors manager	772	753	625			
Total		**9,088**	**8,072**	**7,541**	**6,254**	**5,528**	**5,328**

Source: Fundeon for statistics on working & learning track; DUO for statistics on learning & practical training track
[1] Preliminary

Table 20: Number of students following the theoretical learning path 2008/09 – 2010/11 (Tillaart et al 2012)

		Working & learning track			Learning & practical training track		
	Training & Education	**2008/09**	**2009/10**	**2010/11**	**2008/09**	**2009/10**	**2010/11**
	Electrical engineering	10,579	9,336	8,060	3,942	3,192	2,693
	Installation technology	7,320	6,810	7,038	827	818	857
	Cooling and refrigeration	578	392	321	32	26	20
Total		**18,477**	**16,538**	**15,419**	**4,801**	**4,036**	**3,570**

Source: DUO-Cfi, processed by ITS

5.3 Statistics on energy consumption and renewable energy in buildings

5.3.1 Energy consumption

Table 21 provides information on the average domestic energy consumption (both gas and electricity consumption) in the Netherlands.

Table 21: Average domestic energy consumption in the Netherlands (NL Agency 2012)

	2005	**2006**	**2007**	**2008**
Average gas consumption per household [m^3]	1,664	1,643	1,560	1,625
Average electricity consumption per household [kWh]	3,397	3,402	3,521	3,558

Table 22 and Table 23 provide information on the average energy consumption in utility buildings in the Netherlands.

Table 22: Gas consumption per m^2 in various utility buildings (NL Agency 2012)

	2004	**2005**	**2006**	**2007**
Gas consumption in office buildings	16	18	18	20
Gas consumption in schools	14	15	15	15
Gas consumption in nursing and care facilities	23	29	29	31
Gas consumption in hospitals	27	33	32	34

Table 23: Electricity consumption in kWh/ m^2 in various utility buildings (NL Agency 2012)

	2004	**2005**	**2006**	**2007**
Electricity consumption in office buildings	81	82	83	83
Electricity consumption in schools	36	32	33	33
Electricity consumption in nursing and care facilities	68	70	73	73
Electricity consumption in hospitals	104	97	103	104

5.3.2 Renewable energy

In the action plan for renewable energy submitted to the EU, the Netherlands indicated that the government currently expects to achieve 9 percent heat recovery by 2020.
The most important source of renewable heat are wood burning fireplaces in homes. There is a noticeable shift from use of open and insertable fireplaces to free standing wood burners. The heat contribution of wood burners remains limited: in households, they represent just over 0.5 % of total energy consumption. In businesses, it is a mere 0.1 %.
The biggest growth potential for heat recovery is in geothermal energy and heat which can be extracted from outside air, often with the help of heat pumps (Statistics Netherlands [CBS] 2011).

In 2008, the use of sustainable heat showed a moderate growth to 2.1% of the required useful heat effect. This was due mainly to greater use of heat pumps and heat and cold storage systems. They are particularly applied in new large-scale utility buildings. Over the last few years, heat and cold storage systems have seen rapid growth: from 3 PJ in 1990 via 220 PJ in 2000 to 821 PJ in 2008.

The share of sustainable heat grew less than the share of sustainable electricity as part of the total electricity production, as less subsidies were made available for sustainable heat generation. This explains in part why the generation of sustainable electricity grew more that the generation of sustainable heat.

Although the total use of renewable sources remains limited in comparison to overall energy consumption in the Netherlands, it is clearly on the rise, in particular the use of geothermal energy and heat extraction from outside air, as shown in Figure 5.

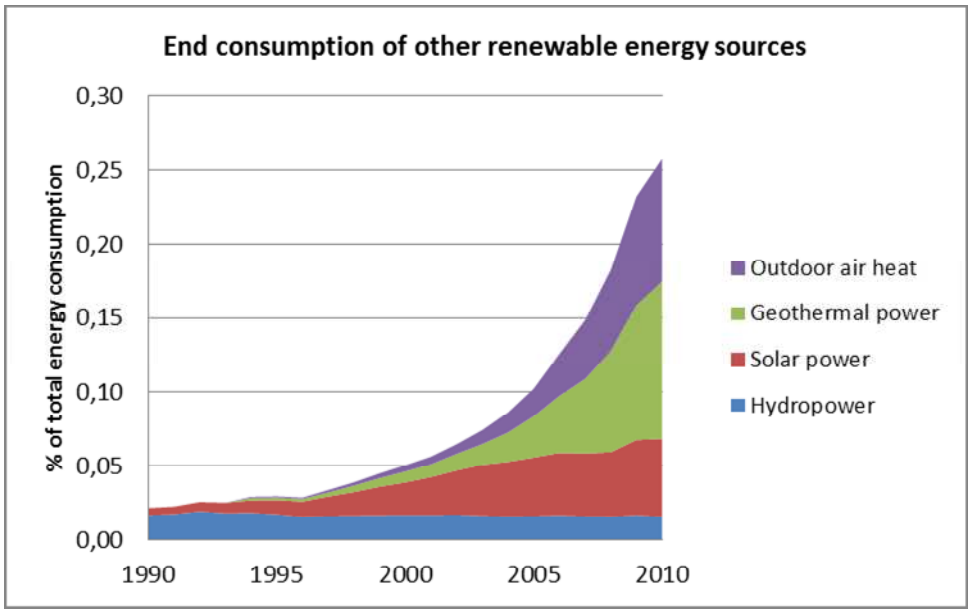

Figure 5: End consumption of other renewable energy sources (Statistics Netherlands [CBS] 2012)

In the Netherlands, dispersed generation of renewable energy is not yet taking place on a large scale, as illustrated by Table 24. Whereas total renewable electricity (generated from solar, wind, hydro and biomass power) in the Netherlands in 2010 represented 6.7 % of total energy production, the share of energy that was generated by solar collectors and solar panels as less than one percent of the total share of renewable energy.

Table 24: Dispersed energy generation in the Netherlands (Statistics Netherlands [CBS] 2012)

		Gross electricity and heat production				
		Total (TJ)	Electricity			Heat
			MWh	TJ	%[1]	TJ
	year					
Total renewable energy	**1998**	10,243	2,245,291	8,083	2.4	2,160
	2000	11,828	2,784,397	10,024	3.1	1,804
	2005	16,956	4,017,158	14,462	4.0	2,494
	2010*	32,268	7,873,556	28,345	6.7	3,923
Solar power	**1998**	13	3,500	13	0.0	
	2000	28	7,710	28	0.0	
	2005	123	34,199	123	0.0	
	2010*	210	58,333	210	0.0	

* preliminary values
[1] percentage of the total volume of generated energy

5.4 Non-available information

For this study, information has been requested on the size of various professional groups and their respective knowledge and skills levels.

Nearly all the data available on the labour force has been aggregated in professional groups which do not necessarily match those defined as relevant in the context of this study. Hence, it is difficult to give exact figures as to the size of the relevant labour force.

Limited or no information is available on the level of knowledge and skills of people exercising the professions described. We can safely assume that a craftsman will have the knowledge described in the qualification file belonging to his profession. However, additional knowledge gained through courses and /or experience, as described in the professional competency profile, is not centrally registered, and so no further information as to this aspect is available.

6. Existing VET provisions

6.1 National system for training of construction workers and other construction site professionals at intermediate vocational level

6.1.1 Overview of structure and responsibilities

6.1.1.1 Training and education at intermediate vocational level

Intermediate vocational training and education prepares students for the exercise of a profession or for further education. In order to warrant a smooth transition to the job market, schools offering intermediate vocational training and education have an extensive outreach to regional corporate employers, municipalities and social organisations. Graduates who wish to pursue further education go on to follow-up courses within their school or in a learning institution offering higher vocational training. Transition to the reality of professional practice is a priority for all intermediate vocational training and education. Its legal basis is provided by the Education and Professional Training Act (*Wet Educatie en Beroepsonderwijs* or WEB).

The intermediate vocational training and adult education sector employs approximately 53,000 people and enrols 630,000 students. Of them, 485,000 are training at intermediate vocational level (MBO). Almost 40 percent of the economically active population in the Netherlands is trained at intermediate vocational level.

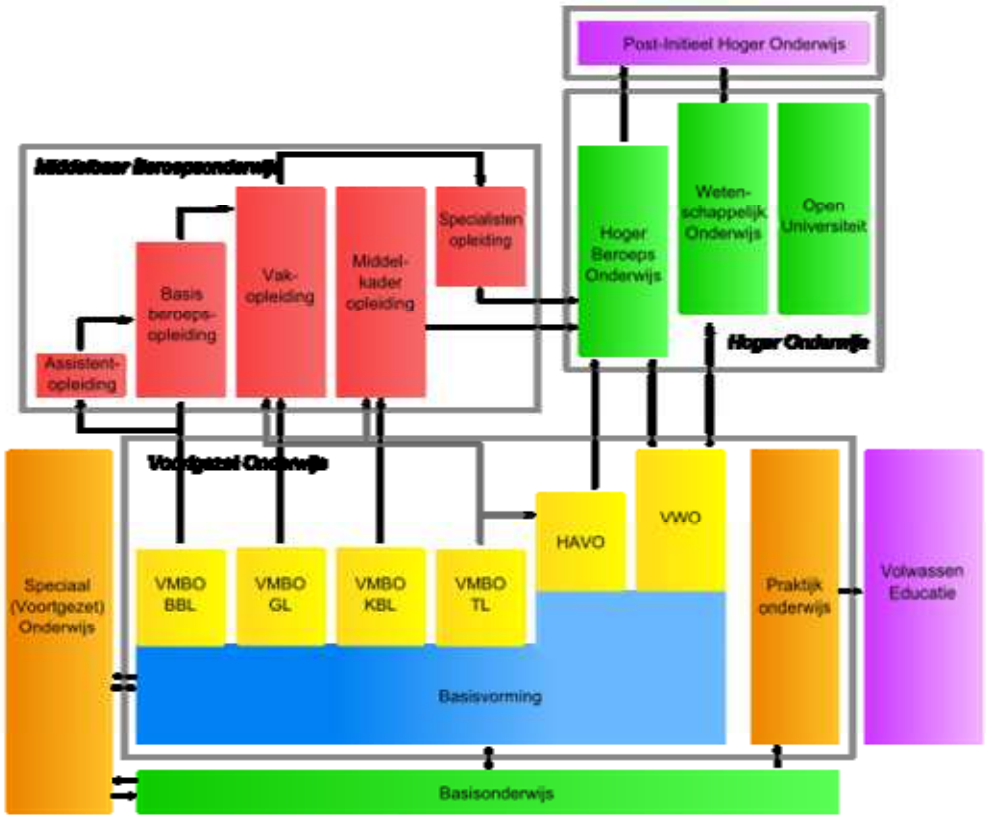

Figure 6.1 Structure of the educational system in the Netherlands

Suppliers

Formal training for technical, health/welfare and economic professions in the Netherlands is provided through the Regional Training Centres. For Agricultural or so-called green professions, vocational training is offered through Agricultural Training Centres (AOC). A number of specific professions, such as graphic designers, are covered by trade schools.

In the technical sector, employers have formed regional cooperation networks in order to offer sufficiently varied training in their own sector. In the construction world, on the other hand, they have

chosen to organize themselves on a national level in the Dutch Construction and Infrastructure Federation [Bouwend Nederland].

The Dutch Regional Training Centres and trade schools provide a broad and varied array of educational trainings at different levels and along distinct learning paths. All students are welcome as of the age of 16. This basic premise makes education in these schools very diverse. Depending on prior education, age and experience, training is tailored for each individual in the intermediate vocational and adult education system (website MBO Council 2012.) The system offers two distinct learning paths. The first is full-time (professional training path, abbreviated as *BOL* in Dutch). Participants learn a profession mainly at school (60-80%) and acquire practical knowledge through in-house company training (at least 20%). In the case of part-time education (the so-called professional coaching path, abbreviated as *BBL* in Dutch), participants sign an employment contract with an employer (a company) and learn the trade mainly through training on–the-job (60%) and follow theoretical courses at a Regional Training Centre or sometimes via a cooperation network.

The degrees awarded upon completion of the trainings are equal, in other words it does not make a difference whether someone has followed the full-time professional training or the part-time coaching. In both cases, successful trainees obtain the same degree. This helps to deal with fluctuations in the educational market. The Regional Training Centres have come to understand that in times of slump, the number of participants in full-time courses (BOL) increases whereas when the economy is booming, the number of part-timers (BBL) is more likely to rise. This applies in particular to lower-level education. In times of economic growth, part-time participants with a level 4 BOL diploma are more likely to pursue their education at higher vocational level (HBO).

The Confederation of Netherlands Industry and Employers (known as VNO-NCW) encourages shorter education programmes (two years) which aim for a level in between 4 and 5, i.e. between intermediate and higher vocational education. It is hoped that this will help increase knowledge among the current labour force. Trainings result in an Associate Degree. They are offered at higher vocational level, though in practice, it appears difficult to recruit sufficient numbers of participants from companies.

Career Scheme
Employees in the construction and infrastructure sector have the option of retraining for a different profession through the Construction & Infra Career Scheme. This may involve a step up, or a step sideways. If work is found to be too difficult, it is even possible to retrain for an entirely unrelated profession. The career scheme offers employees a chance to develop themselves. The Construction & Infra Career Scheme is open to all employees regardless of age, educational level or degrees. Participants may apply once every five years. A career scheme advisor is appointed to provide support for the duration of the training programme. Together with the participant, the advisor will look into which job best suits the participant and what training or course is required.
The Career Scheme aims to keep as many employees as possible in the construction and infra industry healthy and at work. Only in the situation where an employee cannot continue to perform his/her job, will he/she qualify for retraining for a job in a different sector. Engaging in a career scheme is voluntary.

EVC procedure: Qualifications Acquired Elsewhere
At a higher age too, currently employed workers may train to be formally qualified. Fiscal arrangements make this even more attractive for employers. Via a procedure known as Qualifications Acquired Elsewhere (*Elders Verworven Competenties* or EVC), adults may obtain a degree based on their acquired knowledge and skills. In an EVC procedure, participants prove that they have acquired competencies which are considered necessary for a certain degree. The EVC procedure ascertains this. If the results are satisfactory, the participant receives a formal qualification. In many cases, complementary training is required.

6.1.1.2 From professional competency profile and qualification file to curriculum
Diploma requirements set by intermediate vocational education (MBO) are described in so-called qualification files, which together, form a structure of professional qualifications. The basis of the qualification files is a professional competency profile. Together, all the different qualification files create the qualification structure. A qualification file describes the requirements for beginning professionals upon completing their education and obtaining their degree. It differs substantially from

the professional competency profile, which describes the experienced performance of any given profession.

New subjects are not automatically embraced by the Dutch educational structure, which tends to be formal. Vocational education is organised according to professional sectors or industries. Centres of expertise bring together certain professional sectors which are closely related. For the construction industry for example, this would be Fundeon. For installation technology, it is Kenteq. Every centre of expertise has a joint committee: a structural platform for business and vocational training representatives to meet and reach agreements on qualification files.

The Netherlands counts seventeen industry-related centres of expertise for vocational education and the business community (KBB). These centres of expertise represent some forty different economic sectors. They act as a link between education and business. They are responsible for the development of professional competency profiles, the accompanying qualification files and accreditation of internship positions. Centres of expertise check whether student internship positions comply with the set criteria. For a position to comply, the internship activities must offer students sufficient learning opportunities. The intern's tasks must not be solely geared towards production.
In addition, the company is expected to make a qualified mentor available. These mentors are trained at the centres of expertise. All centres of expertise are members of the Foundation for the Cooperation on Vocational Education, Training and the Labour Market (Stichting Beroepsonderwijs Bedrijfsleven, or SBB.)

Professional competency profile
A professional competency profile is a general description of a profession using a number of concepts such as professional context, tasks, role and responsibilities, complexity, attitude expected from a professional. It also describes trends and innovations in the (changing) market in which the professional works. A professional competency profile sets out how a profession is exercised by an experienced professional.

From professional competency profile to qualification file
A qualification file is not just invented out of thin air. It only comes into existence once an expertise centre has investigated the relevance of the required qualification for the labour market.
- Is there sufficient work? Is there sufficient demand for trained professionals in the sector?
- Is a separate diploma necessary or can an existing qualification meet the needs of the sector?

If the relevance for the labour market is judged sufficient, a professional competency profile is drawn up for that particular profession. Based on this profile, the knowledge centre will determine the skills and knowledge required from a beginner in that profession, after having completed training. This constitutes the content of the qualification file.

The Coordination Unit for the Testing of Qualifications at intermediate vocational level [Toetsingskamer SBB] performs entry level tests for new qualifications and qualification files. After the "go" from the Coordination Unit, the sector, schools and expertise centres, which form the joint committee can start putting together the qualification file.

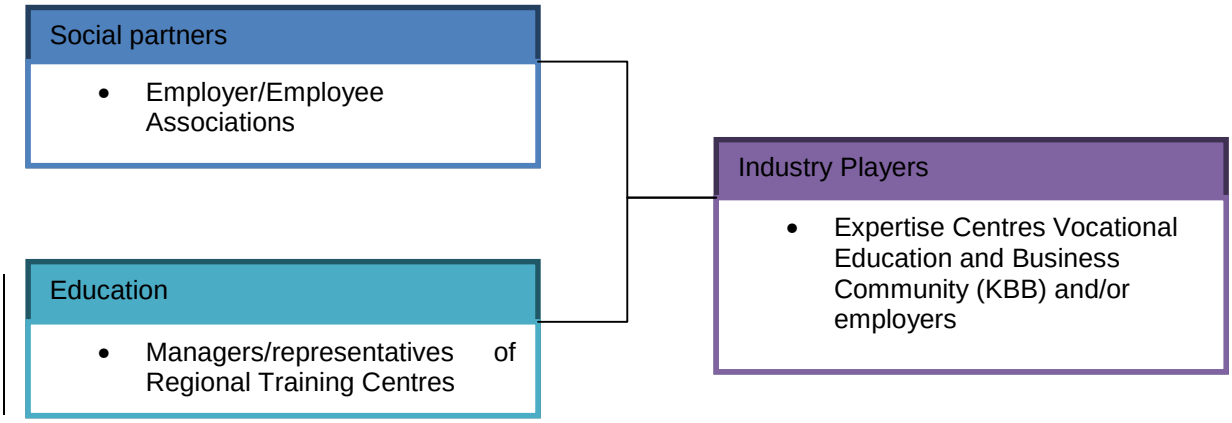

Figure 6.1 Joint Committee Membership

The earlier professional competency profile serves as the basis. That profile, which describes an experienced professional, is in fact redrafted to describe the beginner requirements in a certain profession. This includes core tasks, working procedures and competencies, which together form the description of a profession in a qualification file. A qualification file contains one or more qualifications. Core tasks involve working procedures. For each working procedure, the required competency is indicated. Hence, the qualification in a qualification file describes the level achieved by students at the end of their training: what they must know and what they must be able to do after having completed their training.

From qualification file to curriculum
Subsequently, qualification files are used by learning institutions as a basis to establish their curricula a t intermediate vocational level. The Regional Training Centres are responsible for the translation of professional requirements into educational requirements. This is where the content starts to reflect diversity. Professional on-the-job training in accredited learning companies is an essential part of education: for the full-time learning path (BOL), at least 20% of learning time must be devoted to practice, as opposed to 80 % devoted to theory.

6.1.1.3 How a subject is assimilated into the qualification structure

It is interesting to look into how any given subject is assimilated into the qualification structure or files. We distinguish a number of different ways:

Through courses requested by employers. An employer or a group of employers has expressed the need for a specific training or course for their staff and have requested proposals from private learning institutions. Many of their questions are answered by the regional employers' cooperation networks. These are grouped in the Dutch Construction and Infrastructure Federation [Bouwend Nederland] and the Regional Policy Platforms for Installation Technology [RBPIs.] These requests and the responses to them in the shape of courses and/or trainings often prove to be a precursor of subjects which are later assimilated into the qualification structure.

By following the regular route through the joint committee.

Through regional initiatives undertaken by the Regional Training Centres. In their contacts with the business world, eager and proactive teachers often detect innovations in an early stage and try to incorporate them into their curriculum. The Regional Training Centre in the province of Twente for example, has taken on the topic of sustainability by cooperating with Pioneering and other clients and by creating student construction sites (following the Finnish model) in the region, based on sustainability.

Through pilot studies involving the government, businesses and educational institutions. Together, they facilitate specific initiatives to experiment with innovative concepts and test them for their usefulness. The idea is to make the educational content topical in cooperation with the regional industry. This approach has a number of advantages:

- It makes it possible for all parties directly involved (businesses, students and teachers) to become acquainted with any given subject through learning on the job, and for actual learning to take place for all parties.
- Cooperating partners share best practices.
- Clients (e.g. housing corporations and municipalities) are directly involved in exploring the topic at hand.

In exceptional cases, the results of pilot studies may be ignored, if this is considered more beneficial to the quality, access and efficiency of vocational education.

The Ministry of Education, Culture and Science is working towards implementing a legal framework by 1 August 2013. The framework will allow preparatory secondary vocational schools (vmbo) and institutions offering professional training and adult education (bve) to experiment with continuous learning paths. The idea is to ease the transition from preparatory to intermediate level vocational education (vmbo to mbo). Experiments focus on the organisation of education, examinations and covering the costs of an uninterrupted learning continuum leading to a degree at intermediate vocational level (mbo). Experiments may be conducted for all vocational learning paths, (basic profession-oriented, middle management-oriented, blended learning and theoretical learning and intermediate vocational levels 2, 3 and 4), both full-time and part-time, and in all sectors covered by preparatory secondary vocational education (vmbo). In addition, it is possible to conduct an experiment for a learning line which goes on to higher vocational education (hbo).

6.1.1.4 Review and development of the qualification structure/qualification files

In 2002, the Minister of Education, Culture and Science called on the centres of expertise to review the qualification structure in order to achieve a more coherent structure in intermediate vocational education (mbo). The goal was to substantially reduce the number of qualifications (approximately 650) thereby reducing both the number of qualifications and their overlap. Reducing their number would help to deal with specific regional labour market situations, giving regional businesses more of a say in the form and content of the qualification files. “The field of education should reflect the actual combination of business professions in a region.” (Regional Training Centres 2012). In 2010 however, intermediate vocational education was still facing the same bottlenecks. The Ministry of Education, Culture and Science has attempted to classify existing qualifications into fields which correspond more or less with various economic sectors. Further definition of the structure of those fields is underway (2012).

6.1.2 Warranting the quality of education: examination, certification and accreditation

Learning companies

6.1.2.1 Examination/ certification

How a learning institution ensures that its students obtain their degree is entirely up to that institution. Schools are free to shape their education programmes as they deem fit. The Ministry of Education, Culture and Science does intend however to standardize (some of the) examinations (exam profiles). A final decision in this matter is still pending.

The examination method depends on the preference of the Regional Training Centre. A common examination is the aptitude test. This involves simulations, practical performance tests and work observations to establish whether students have the required competencies. Assessments can also be a part of an examination. Students then have to complete a project or practical assignment.

The Dutch Education Inspectorate monitors the quality of education and of examinations held in certified schools. It regularly conducts audits in intermediate vocational (MBO) schools. The audits include all parties involved: enquiries may be made of teachers, businesses and students. Should the examination quality fall short, the intermediate vocational (MBO) school is granted the opportunity, albeit limited, to deliver the required quality. In some cases, when the expected quality is lacking altogether, the Inspectorate may apply a fine. If the targets are not met within the allocated time, the Inspectorate may withdraw the school’s licence for that particular course.

6.1.3 Information on educational provisions

All professional educational programmes recognized by the Ministry may be found in the Crebo, a central registration system for vocational trainings. It is a systematic data collection on vocational trainings and the corresponding training and examination institutions. The register is updated annually. Crebo trainings included vocational education programmes which have been recognized by the Ministry of Education, Culture and Science and by the (former) Ministry of Agriculture, the Environment and Food Quality, (now the Ministry of Economic Affairs, Agriculture and Innovation).

Current vocational training profiles may be found on these websites. They are classified according to fields of education.
http://toetsingskamer.sbb.
nl/crebo.html?file=tl_files/bestanden/Overzichten/Crebolijst%20OCW%202011-2012.xls

6.1.4 Extent to which the current system incorporates skills for the application of energy efficient and renewable energy measures in buildings

Assimilation of skills in qualification files: BCW (Bosch Communicatie Werk 2010) concludes that for the topic of sustainability (general or related to energy technologies), qualification files are not related to professional or functional competencies. BCW indicates that for the 18 trainings that fall under Kenteq (Centre of Expertise for vocational education and training in metal, electrical and mechanical technology), no concrete information is available as to the how these trainings address the topic of sustainable energy.
The extent to which skills for applying sustainable energy are being developed depends on the regional choices made by the intermediate vocational (MBO) schools and on how individual teachers incorporate this topic in their lessons. The website for Sustainable Vocational Education (www.duurzaammbo.nl/dmbo/web/) provides an overview of available teaching material which has been developed by teachers in the Netherlands on the topic of sustainability. Each Regional Training Centre and every teacher is free to determine the content of the educational programme. A national assurance system is not yet available.
The Regional Training Centres have indicated that they are working on this issue within the regional networks, making use of their expertise. An example is the Regional Training Centre in the province of Twente, which cooperates with the Pioneering network (ROC 2012).

According to BCW, while sustainable energy may be greatly relevant to a particular industry, this does not necessarily mean that the corresponding educational programme(s) are dealing with the subject. They note that competencies related to sustainability mainly prove to be relevant for jobs with a general job description and where technologies are involved. For more specific and specialized positions which do not directly imply technology, creating the right mind-set or awareness among students is often sufficient. In other words, for every student or employee, regardless of the position and of whether they are dealing with Technologies, what counts in relation to sustainability is the right mindset or awareness.
New curricula are being developed but it is not clear to what extent sustainability skills have a part to play. In support of the renewed curricula, the joint committees are updating the current qualification structures and the qualification profiles (ROC 2012).

6.1.5 Existing instruments to monitor market developments in the field of technology, skills requirements and trainings

The professional competency profiles draw on input from various sources, instruments and institutions:

- Labour market studies (e.g. by Centres of Expertise)
- Research conducted by the social partners e.g. FNV, the largest trade union in the Netherlands, the Dutch Construction and Infrastructure Federation [Bouwend Nederland] etc.
- Industry related institutes such as the Economic Institute for the Construction Industry (EIB)
- Statistics by Statistics Netherlands (CBS)

- Due to major changes in Europe, increasing international input: European statistics (Eurostat) and policy documents, some of which focus on vocational education and training (the Bruges Communiqué etc., Euroskills)

A last step is the official certification and accreditation framework: the so-called testing benchmark.

Before industry and education representatives start putting together a qualification file, an entry-level test is carried out by the Testing Panel of the SBB, using the testing benchmark. (The Testing Panel is part of the Foundation for the Cooperation on Vocational Education, Training and the Labour Market (SBB), which coordinates the testing of qualifications at intermediate vocational level). The testing benchmark is designed as a means for the Minister of Education to test whether the qualification files comply with statutory regulations. The testing benchmark assesses once again the relevance of the "entry test" for the labour market, as well as the right of existence of the desired qualification within the overall qualification structure: does it overlap with any other qualifications?

The creation of the Foundation for the Cooperation on Vocational Education, Training and the Labour Market (SBB) marks the beginning of a new approach on the part of different economic sectors. Actors in different industries are being stimulated to step up their cooperation in establishing the content of the qualifications. Market research is expected to reflect this new development.

6.2 Existing (independent) courses and trainings

In post-graduate vocational education and training at intermediate level (MBO), there are many courses and trainings in the field of energy-efficiency and renewable energy in buildings. Most of the schooling options have not (yet) been integrated into the national ongoing intermediate level vocation training and education.

The overview below lists current post-graduate vocational education programmes on offer, as well as new programmes being developed, at intermediate level. The focus is on the following professions, which fall within the scope of Build Up Skills:

- Professionals involved in renewing and upgrading the thermal insulation of building shells (including renovation) and creating thermal building shells for new buildings
- Professionals involved in the choice, maintenance, setting up, regulating and replacing installations in existing buildings as well as professionals involved with choosing, installing, setting up and regulating sustainable energy installation in new buildings
- On-site supervisors to warrant effective instruction, control and validation of work on the thermal shell as well as application of the energy systems
- Professions at middle management level: advisors, calculators, constructors, etc.

6.2.1 Provision of schooling at intermediate vocational level (MBO)

The inventory of current and future provision of post-graduate schooling follows a set framework. A Dutch version of this extensive survey is included in the appendix (Task2.3AnalyseBUS-NL_rapportWP2.xslx). In order to cover the full range of schooling on offer, the survey includes the following aspects:

Category
When taking stock of the courses on offer, categories were defined which correspond to distinct professional skills requirements. The overall categories Construction, Energy, Thermal Shell, Installation and Communication have been further split into subcategories as follows:

Overall category	Subcategory
Construction	Building information modelling (BIM)
	Design
	Other

Overall category	Subcategory
Energy	Saving
	Sustainable Lighting
	Energy performance of buildings
	Monitoring
	Power generation
	Other
	Power quality
Thermal shell	Building materials
	Roofs
	Sustainable building
	Insulation
	Draught-proofing
	Passive house/building
	Restoration
Installations	Concrete core activation
	Sustainable management and maintenance
	Geothermal systems (shallow)
	LTV
	Design
	Other
	Regulation
	Ventilation
	Heat pumps
	Solar power
Communication	Project management
	Reading construction drawings
	Finance

Names of courses/trainings
The survey indicates the names of courses and trainings currently on offer or being developed. Topics or subjects not (yet) covered by a course but which should be, considering the scope, have also been included here.

Starting level
Although the general focus is on professions which fall within the scope of Build Up Skills, the inventory of existing courses on offer is limited to the following intermediate vocational (MBO) education levels:

- Level 1: Assistant (simple routine work)
- Level 2: Basic worker (practical skills)
- Level 3: Professional worker (skills and independence)
- Level 4: Middle management officer or specialist

These education levels are relevant both for the required entry level and for the final level upon completion of the course or training.

Duration of training
The duration of the course or training is indicated in days (or half days). If known, the ratio of theory to practice (including educational excursions) is also indicated.

Content base/quality standard
Under this heading, quality standards, if applicable, are indicated per course. Examples are the NEN-norms (Netherlands Normalisation Institute), SBR-/ISSO publications (published by the Expertise

Centre for the Installation Industry), assessment guidelines issued by KOMO (collective certification mark for the building industry), etc.

In cases where there is no applicable standard, the teaching material is indicated (hand-outs, syllabus, reader etc.)

Status
A distinction is made between courses already being administered and courses (usually educational programmes) which are being developed and scheduled to be implemented soon (mid 2012). In addition, several topics or subjects have been identified which it is hoped, will become the object of a course, though it is unknown whether such a course already exists or is currently being developed. These are indicated as unknown.

Working form (Theory/Practice)
Almost all courses/trainings consist of a theory component (T). If they also involve practical working forms (P) then this too is indicated.

Target group
For the purpose of the analysis, professions have been defined in terms of target groups, as shown below.

Sector	Target Group
Construction	Civil Servant
	Architect
	Engineer
	Construction worker
	Facility manager
	Building manager
	Mason
	General contractor
	Project developer
	Joiner
	Subcontractor
	Property manager
Installation	Advisor
	Assistant mechanic
	Engineer
	Inspector
	Installer
	Head mechanic
	Management and maintenance officer
	Corporation officer
	Mechanic
	Maintenance mechanic
	Designer
	Project leader
	Service mechanic
	Technical maintenance officer
	Work preparer

Remark: These target groups have been identified by the learning institutions, independently of the nationally recognized professional qualifications in mainstream intermediate vocational education (MBO) and for professions as defined for the purpose of this project (Chapter 5.2 Statistics on the current labour force in the construction industry).

6.2.2 Education Results

In the survey the following aspects have taken into account with regard to the final results upon completion of courses or trainings:

Education level
Please see the explanation provided under 'Starting Level' in section 6.2.1.

Examination
If the course or training is completed by an examination, this is indicated with a "T" for the theory – exam and a "P" for the practical exam. If examination results are known, these too, will be indicated.

Credential/certificate
For final results upon completion of a course or training, the following definitions apply:

- *Certificate:* a written authentication that a person has successfully passed a final examination. Unlike a diploma, a certificate is only valid for a determined period of time. It usually needs to be renewed after a few years.
- *Credential:* this is obtained after participation in a course or training and therefore only proves that a person has taken part in the course or training. Unlike a diploma or certificate, candidates do not need to pass a final examination in order to receive a credential.

6.2.3 Institutes providing courses and trainings

In assembling this information, we drew on information provided by the education and training institutes listed below.

Name of the educational & training institute	Information on the educational & training institute
BDA roof and facade trainings	www.bda.nl
Construction Circle trainings	www.bouwcirkel.nl
Construction Radius Training and Counselling	www.bouwradius.nl
DWA courses	www.dwa.nl
EBR trainings	www.ebr-waalwijk.nl
FilosoofBV	www.filosoofbv.nl
HIBIN trainings	www.hibinopleidingen.nl
IMKO professional trainings	www.imko-opleidingen.nl
ISSO instruction and master class	www.isso.nl
Expertise Centre for Project Consultancy and Education	www.kpe.nl
Kenteq courses	www.kenteq.nl
Mikrocentrum trainings	www.mikrocentrum.nl
NVOE courses	www.nvoe.nl
OTIB course display	www.etalage.otib.nl
Passive House Academy	www.passiefbouwen-academy.nl
RIBO trainings	www.ribo.nl
SBR meetings and courses	www.sbr.nl
Training Fund for the construction industry	www.scholingsfonds.nl
Tectum courses and trainings	www.tectum.nl
Uneto-VNI course counter	www.cursusloket.nl
Heat Pump Academy	www.warmtepomp-academy.nl

In addition to specialised (industry-wide) education and training institutes, there are many more individual trainers offering courses. We have not (yet) looked into this group.

6.2.4 Inventory results

For innovative technologies and or specific topics, we looked into whether a training or course was available or not. The inventory results provide a general picture and are reflected in the chart below.

Overall category	Specific technologies or topics	Training available in 2012
Construction	Building information modelling (BIM)	Yes
	Design	Yes
Energy	Saving	Yes
	Sustainable lighting (HR/LED)	Yes, limited
	Energy performance of buildings (EPG)	Yes
	Monitoring	Yes, limited
	Generation, biomass boilers and stoves	No, being developed
	Power quality	Yes
	Fuel cell heaters	No
	High performance boilers	Yes, limited
	Residual heat recovery	No
	Urban wind turbines	No
Thermal shell	Building materials	Yes
	Roofs Green roofs	Yes Yes
	Sustainable building	Yes
	Insulation Phase change materials	Yes No
	Draught proofing	Yes
	Passive house/building	Yes
	Restoration of old buildings	Yes
	Green facades	Nee
Installations	Concrete core activation	Yes, limited
	Sustainable management and maintenance	Yes
	Geothermal systems (shallow), heat and cold storage systems	Yes
	LTV	Yes
	Design	Yes
	Regulation Home automation	Yes Yes
	Ventilation Balanced ventilation systems High performance ventilation Demand-driven ventilation Decentralised ventilation systems with heat recovery	Yes Yes No, being developed No Yes
	Heat pumps Water/water Air – Air Air - Water	Yes Yes No, being developed No, being developed
	Solar energy Solar power Solar heat	Yes Yes, limited Yes
Communication	Project management	Yes
	Reading construction drawings	Yes
	Finance, preventing failure costs	Yes, limited
	Communication team	Yes

For new technologies (such as green facades, sustainable lighting, phase change materials), the number of courses currently on offer is limited. There is a larger market for familiar technologies. The number of courses with regard to preventing failure costs in the construction industry is somewhat limited, although economic slump is currently causing the construction to review its position on this subject, in the form of Building Information Modelling (BIM) and lean projects.

6.3 Relevant national and regional initiatives, supported by the EU

6.3.1 EURO EN.EFF Project

Objective
The main objective of project team is to develop a “Handbook for sustainable building in the renovation sector: “building foundation”, “outer walls”, “doors and windows”, "heating installation” , “alternative energy”.
The handbook contains active learning methods and techniques.

Project description
This project was developed in response to the high number of apartment buildings in need of renovation in Bulgaria. A knowledge backlog and insufficient intermediate vocational education and training also enter into play. The project targets teachers and people involved in practical knowledge transfer. Naturally, the sector as a whole benefits, albeit indirectly, from this project. In the past few years, construction of new homes and renovation of apartment buildings has increased by 12%.
The development of training modules for this sort of knowledge is essential for the Bulgarian government.

The following factors are important for the project:

- Training in energy efficient building with regard to renovation projects. Training modules for the participating partner countries must be available.
- Developing additional training modules.
- Developing and testing the handbook which will be specially developed for Bulgarian construction technology.
- Additional improvement to the handbook.
- Setting up seminars in Bulgaria for participants from the building sector.
- Valorisation of the project.

Parties

- Bulgarian Construction Chamber
- AIDICO
- DBBZ Pleven
- GOA Infra Groep
- Vocational House of Builders
- Glavbolgarstroy
- The Federation of Construction Industry in NRW
- MGM Ltd.

Info
www.euroeneff.eu/

6.3.2 Education and Training in Fuel Cell Heating (ZuHause 3)

Objective
Zu Hause is a Leonardo Da Vinci project aimed at sharing knowledge on fuel cell heating systems. A learning module is being developed as part of this project.

Partners

- FPB – University of Bremen, Germany

- Handwerkskammer Osnabrück-Emsland, Germany
- Modern Learning GmbH, Bildung mit neuen Medien, Germany
- LVH Bildung & Service Gen., Italy
- Dublin Institute of Technology, Ireland
- Kenteq, the Netherlands
- Kaunas Regional Innovation Centre, Lithuania
- FRAEMA, Spain
- Aspremetal, Spain

Info
www.adam-europe.eu/adam/project/view.htm?prj=6926
www.fuelcellknowhow.com

6.3.3 Green skills

Objective
The objective of this project is to explore how the transition to a more green economy affects employment, skills requirements and policy. The main aim is to investigate the expected impact of the environment and climate on future skills. In addition, the project aims to shed light on the effectiveness of modifications to training and education policy.

6.3.4 Developing and Operating a Machine Tools VOC-TEST Centre Project

Objective
The objective of this project is to develop and implement Test Centres (skills, knowledge, and certification) in 11 elected sectors. The idea is to establish a sustainable national qualification system (NQS) which would allow for all education and training levels to be evaluated, assessed and certified in a fitting manner, in compliance with the European qualification framework.

7. Skills gaps between the current situation and the needs for 2020

7.1 Introduction

This chapter provides an analysis of the skills gaps between the current situation in the Netherlands and the needs for 2020. It describes the labour force evolution, identifies new emerging skills and expected skill shortages/skills needs.

In addition to the evolution of the labour force, we looked at expected quality improvement of new and renovated buildings in order to determine anticipated skills gaps in the coming years. After outlining developments, this chapter provides an analysis of initial and post-initial trainings, followed by a final section with tables which sum up our findings and conclusions.

7.2 Labour force evolution: quantitative indication of work force which needs to be trained, basis premises

Expected construction volume in the short term (2012-2014)
In June 2012, Euroconstruct published its three-year construction forecast.[1] It was the fourth year in a row that forecasts were revised downwards. For 2012, expected Dutch housing production volume has been downgraded by 5% compared with 2011. Continued decline is forecast for housing production in 2013 and only slight improvement is expected in 2014. The Dutch Economic Institute for Construction and Housing (EIB) made an earlier, therefore slightly more hopeful forecast for 2012. On the other hand, prognoses published by the construction division of the Netherlands Organisation for Applied Scientific Research TNO in December 2011 seem to resonate more with those made by Euroconstruct. This is why, for the housing construction market, we have taken TNO's figures.[2]

The EIB expects slight improvement in the construction sector as early as 2013. In a press release on 16 August 2012 however, Statistics Netherlands (CBS) reported a near 60% increase in a single year of unemployment benefits going to the construction sector (July 2011-July 2012). Such increases are unprecedented. In addition, it must be taken into account that almost 10% of unemployment payments were ended because the maximum period of allocation had been exceeded and not because people had found new jobs in the construction sector.

Renovation and maintenance account for about 55% of total production in the housing sector. The volume of production is relatively constant. The share of renovation and maintenance in overall production in the construction sector is slightly on the rise. The decline is mainly found in the production of new housing.[3]

Prognoses for utility construction for 2012 and 2012 are based on a recent survey conducted by Bouwkennis (Dutch strategic information centre on construction, installation and real estate).[4] Bouwkennis indicates that new budget housing production is expected to shrink by nearly 10% in 2012 whereas over 6% decline is expected in the free market sector. In 2012, new production in the field of utility construction accounts for over € 5.1 billion according to Bouwkennis. For 2013, a further 3% decline in the production of new buildings is expected. The total value of new production in the utility sector is not expected to exceed € 5 billion. For new construction in the utility sector, we opted to use forecasts by Bouwkennis, because in a period in which the construction sector as a whole faces rapid decline, we needed to process the most recent data available.

Figures for utility production in 2014 and major and minor maintenance work between 2012 and 2014 are based on TNO forecasts for 2012-2016. For the short term, they correspond to current reports on developments in this field of the construction industry.
Table 7.1: Forecasts Building Production 2012-2014 (housing and utility construction incl. maintenance)

[1] 73rd Euroconstruct Conference London June 2012
[2] TNO-Bouw Forecasts 2012-2016, December 2011
[3] Cobouw 21 August 2012: decrease in new housing by 10% in one year
[4] Bouwkennis Forecast for New Construction Projects in Utility Construction 2012-2015 June 2012

	2012	2013	2014
Housing construction: new housing and major maintenance on existing housing	15,420	15,190	16,070
Housing construction: maintenance existing housing	4,490	4,530	4,640
Total housing construction	*19,910*	*19,720*	*20,710*
Utility construction: new buildings and major maintenance on existing buildings	8,810	8,750	8,870
Utility construction: maintenance	3,409	3,420	3,500
Total utility construction	*12,219*	*12,170*	*12,370*
Production in the construction sector not including civil engineering	*32,129*	*31,890*	*33.080*

Sources: TNO Construction Forecasts for 2011-2016 (December 2011) and New Utility Construction Forecast for 2012-2015 (June 2012)

Long-term forecast for construction volume (2015-2020)

Many of the existing buildings in the Netherlands do not meet the requirements of their inhabitants nor do they fulfil the sustainability ambitions set by the Dutch government. Knowing that this is the case, the Dutch government plans to stimulate higher sustainability ambitions for existing buildings in the coming years. One of the ways to do this is to introduce a European standard for existing buildings (the CEN norm[5]).

Research institutes like ECN and TNO and the sector itself recognize the flaws of the existing building stock. They respond through research, policy proposals and new products, especially developed to enhance the sustainability of existing buildings. Meanwhile, there is an international market for energy saving installations and construction materials which has meant much better value for money for certain products (e.g. solar panels). The implementation of the Dutch Spring Agreement is expected to raise the use of renewable energy by 9-11%.

In terms of demand, change is also underway. Clients (owners, renters) are showing growing interest in the benefits of making existing buildings more sustainable. They increasingly commit themselves to renovation targets and are more and more involved in the process. The label issued upon completion of work gives clients more influence on the energy performance of buildings. Innovative construction and installation firms committed to sustainable renovation afford valuable opportunities.[6] The expectation for renovation of existing new buildings from 2015-2020 is less positive. Trends such as the less government interference, financial pressures in the housing market, uncertain economic times, fluctuating real estate value and the advent of telecommuting limit the demand for new buildings and funding options for new construction (see the report by *Bouwend Nederland*, the Dutch Construction and Infrastructure Federation, entitled Forecasts for the Construction Sector.)[7] *Bouwend Nederland* believes the most likely scenario will entail low production of new buildings in small quantities, highly demand-driven. It predicts great regional disparity. The application of commodity product combined with tailored solutions is expected to increase.

Bouwend Nederland foresees market opportunities in new construction for active, innovative companies aiming for sustainability. Firms which lag behind and more traditional companies will be pushed out of the market.

[5] Cf. Letter from the Dutch Minister J.W.E. Spies to the Dutch Parliament dated 1-6-2012.
[6] It is worth noting that recovery of building production and making the existing building stock more sustainable in the years 2015-2020 will depend on leeway in the financial sector and on government policy (on regulation and targeted public investments.)
[7] See The Construction Industry in 2020: *Bouwend Nederland* (April 2012).

Table 7.2: Forecast for Building Production 2015-2020 in billions of Euros (construction excluding Dutch Industrial Classifications "SBI" codes 42 (civil engineering), 411 (project development) and 431 (demolition and preparing for construction)

	2015	**2016**	**2017**	**2018**	**2019**	**2020**
Housing: new housing and major maintenance of existing buildings	17,060	17,700	18,100	18,500	18,900	19,475
Housing construction: maintenance	4,700	4,740	5,000	5,300	5,600	6,050
Total housing construction	*21,760*	*22,440*	*23,100*	*23,800*	*24,500*	*25,525*
Utility construction: new buildings and major maintenance of existing buildings	10,370	10,430	10,600	10,900	11,300	11,875
Utility construction: maintenance	3,560	3,700	3,950	4,250	4,525	4,800
Total utility construction	*13,930*	*14,050*	*14,300*	*14,800*	*15,650*	*16,675*
Construction sector excluding civil engineering, project development, demolition and preparing for construction	35,690	36,490	37,400	38,600	40,150	42,200

Sources: TNO Construction Forecasts 2011-2016 (December 2011), EIB The Construction Industry in 2020, *Bouwend Nederland*, April 2012 (Forecasts 2020)

For 2015 and 2016, this table is based on forecasts by TNO. For 2020, figures are based on the scenario as described in "The Construction Industry in 2020." This scenario foresees low growth in the production of buildings and takes the so-called Rijnlands construction policy into account, in which *innovation* and *entrepreneurship* form core values*.* The values for construction production for the years in between are estimates.

How forecasts for building production will affect relevant employment from 2012-2020

New working procedures, technological development and changes in the design and work processes in construction are intended to lower costs (of failure) and to improve the quality of buildings.[8]

A survey of the sector has shown that general labour productivity, hence labour productivity in the Dutch construction industry has barely increased since 2005 and is low by comparison with other countries.[9/ 10]

In its study[11] TNO estimated labour productivity (output per labour year) for 2011 at 60,100 Euro, and down to 57,270 Euro in 2012. An explanation lies in the fact that declining production leads to empty hours and often staff is not fired until the consequences of declining productivity become tangible. Workers in the construction industry are professionals and often have longstanding working relationships with their employers. In this time of economic difficulty, self-employed workers on the other hand, often work longer hours than what they can charge for.

In its forecast for employment over the next few years, the EIB reckons with a slight growth of labour productivity (1.4% per year).[12] Labour productivity in the construction industry is the result of many influences, such as smaller scale of new construction projects, inner city building/ renovation, chain integration, information exchange, attempts to keep costs of failure down and efficient ways of dealing with clients' demands during the construction process.

When the construction industry emerges from the recession, and this is expected to happen in 2014, improved labour productivity will be an important objective.

[8] Developments in the fields of installations, construction materials, ICT, BIM, SMART Building, Conceptual Building, Industrial Construction and others

[9] ING Sector vision on suppliers in the construction industry, 13-6-2012

[10] P. de Bruyn and W. Jonkhoff: TNO 2006

[11] TNO Construction Forecasts 2011-2016

[12] The Construction Industry in 2012 EIB

In the table below, the predicted construction volume has been translated into labour years and numbers of people at work. These were then further divided into employees, self-employed workers, temp workers/ hired workers.[13]

Table 7.3: Construction sector (SBI 4): Exclusive Project Development (SBI 411), Civil engineering (SBI 42), Demolition and preparing for construction (SBI 431)

Year	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**
Production (Euros in billions)	32,135	31,890	33,080	35,690	36,490	37,300	38,800	40,300	42,200
Employment (x thousand labour years)	350	347	351	352	353	354	356	358	360
Of which employees	236	234	237	237	238	239	240	241	243
Of which other	114	113	114	115	115	115	116	117	117

Table 7.4: Labour years in previous table, divided into sectors following the report by Statistics Netherlands, Labour Market and Financial Data, 2010

		2012	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**
Employees	Civil &Utility	87	86	87	87	87	88	88	89	89
	Finishing buildings	34	33	34	34	34	34	34	34	35
	Specialised tasks	25	25	25	25	25	25	25	26	26
	Construction installation	91	90	91	91	91	92	92	93	93
		236	234	237	237	238	239	240	241	243
Other	Civil &Utility	40	40	40	40	40	40	41	41	41
	Finishing buildings	37	37	37	37	37	37	38	38	38
	Specialised tasks	16	15	16	16	16	16	16	16	16
	Construction installation	21	21	21	21	21	22	22	22	22
		114	113	114	115	115	115	116	117	117
Total	Civil &Utility	127	126	127	127	128	128	129	130	130
	Finishing buildings	71	70	71	71	71	72	72	72	73
	Specialised tasks	41	40	41	41	41	41	41	42	42
	Construction installation	112	111	112	113	113	113	114	115	115
		350	347	351	352	353	354	356	358	360

The labour market report published by Otib in 2010 indicates that technical installations employ a total of approximately 165,000 people, of whom 60% are involved in construction-related installations. It is remarkable that the number of self-employed workers in construction-related installations is much lower than in construction.

[13] EIB, Trends and developments in field of construction finishing 2012-2017 p.23 April 2012 and Statistics Netherlands, Labour market and Financial data on the Construction sector in 2010

In the context of BUS-NL, in order to determine the share of jobs occupied by Blue Collar Workers, relevant professions and levels of education for these professions were included (in particular intermediate vocational education levels 2, 3 and 4).

Table 7.5: Estimated numbers of trained professionals needed in construction

	2012	2013	2014	2015	2016	2017	2018	2019	2020
Employment x 1000 labour years (Construction sector excluding civil engineering and firms with SBI codes 411 and 431)	350	349	353	354	355	356	358	360	362
Of which in relevant professions[14]	80%	80%	79%	79%	78%	78%	77%	77%	76%
Of which Vmbo and Mbo levels 2-4*	80%	80%	79%	79%	78%	78%	77%	77%	76%
Relevant employment x 1000 labour years (rounded off)	224	223	220	221	216	217	212	213	209
Calculation factor to number of persons employed[15]	1.07	1.07	1.08	1.08	1.09	1.09	1.1	1.1	1.2
Need for trained professionals	240	239	238	239	235	236	233	235	251

*) Shift from preparatory vocational education (Vmbo) to intermediate vocational education (Mbo) and from intermediate vocational education (Mbo) to higher vocational education (Hbo) in the period 2012-2020

In order to achieve the required minimum levels set for use of renewable energy in the built environment by 2015, upskilling of workers in the construction industry will need an extra boost, no later than the second half of 2013. This means in the first place that approximately 50,000-70,000 people currently at work in the installation sector will need training. Just as important however, is training of professionals working on the thermal shell of buildings and who are involved in setting and finishing construction parts containing installation components.

If both the construction and the installation sectors commit to this ambition and successfully meet their targets on the way to 2015, this will stimulate companies and individuals to invest in sustainability of buildings and use of renewable energy.[16]

The following table indicates how the need for professionals is distributed across various professions and sectors in the construction industry.

For the installation sector, we used findings from the 2010 Labour Market report published by Otib and data provided by Statistics Netherlands (CBS). For the construction sector, sources included Report on the Labour Market and Education Information 2012 by Fundeon and various structural studies conducted by the Dutch Board for Craft Trades (HBA) and reports mentioned earlier by the EIB, TNO and *Bouwend Nederland*.

[14] Workers in professions which fall within the scope of BUS-NL account for approximately 80% of the total number of working individuals (see Labour Market Report TI 2012).
[15] The percentage of part time jobs in the construction sector is increasing. Further, self-employed workers are generally not able to bill a full week's worth of work. Cf. TNO Construction Forecasts 15 December 2012
[16] The share of renewable energy in 2020 may stay below the European objective. It is expected that, upon implementation of agreed policy, the share of renewable energy will increase from the current 4% to 8% in 2020 (with margins between 7 and 10%). The strong increase is mainly due to extra wind energy production, greater use of bio fuels in transportation and more use of sustainable heat in the built environment. ECN report Reference Estimates for Energy and Emissions: update 2012

Table 7.6: Numbers of trained people in professions directly related to zero-energy buildings and use of renewable energy

Professions	**2012**		**2020**	
(direct labour in numbers of persons)	**(Construction) installation**	**Construction**	**(Construction) installation**	**Construction**
carpenter		61,111		61,000
bricklayer		13,531		10,500
mason		2,263		2,000
roofer (flat, sloped, thatched, metal)		10,609		11,000
scaffold builder		1,426		1,300
Steel bender		1,323		1,300
floor installer		3,333		3,500
concrete worker		1,762		1,800
plasterer		10,916		11,250
glazier		9,000		8,500
wall and ceiling installer		6,699		6,900
mechanical fitter of block components		838		800
tiler		3,015		3,200
mechanic	26,370		26,500	
electrical installations mechanic	16,780		18,000	
plumber	8,390		8,500	
cooling installations mechanic	1,200		1,300	
mechanic other	23,970		24,000	
new professions				7,000
	76,710	125,826	78,300	130,050
management (indirect labour in numbers of persons)				
(chief) executor	3,600	9,595	3,800	9,500
works planner	2,400	6,374	2,500	6,500
calculator/planner	4,790	3,236	5,030	3,400
other management		1,900	0	1,900
team leaders	4,790	6,238	4,500	6,000
	15,580	27,343	15,830	27,300
Column total	92,290	153,169	94,130	157,350
Total installation and construction		245,459		251,479

For provisional estimates of numbers of people per profession in 2020 we looked at development of productivity as described above. Trends in the construction industry were also taken into account, such as:

- the shift from new construction to renovation, maintenance and transformation
- the development of prefab construction
- the development of construction materials which are relatively easy to use
- increasing focus on work preparations and attention to details
- implementation of new working procedures and tools
- innovations in the field of installation technology, home motion and intelligent systems.

Notwithstanding the above, further research is needed for a sound and reliable approximation of the numbers of workers per profession.

7.3 Context: towards energy-neutral buildings

A quality improvement is anticipated in the next few years for buildings yet to be built, due to a combination of the following six factors:

1. Stricter statutory requirements (EPG, energy labels for new buildings)
2. (Professional) clients becoming increasingly aware of good value for money and more demanding as to living comfort, healthy indoor climate and limited utilities expenses (energy and maintenance) while relations with contractors are becoming more constructive and challenging[17]
3. The emergence of total concepts which address clients' needs and are developed and realised by cooperating partners in the construction chain
4. Increasing awareness among construction project planners and executors that construction and technical installation aspects are best dealt with in a coherent manner, thus increasing the quality of housing
5. Improved methods, techniques and procedures to verify construction quality during and upon completion of the building process (aspects such as ventilation, air-tightness, insulation, thermal bridges) and related preventative effects
6. Economic developments forcing construction firms to build cost efficiently and to minimise costs of failure.
7. Increasing awareness of Total Cost of Ownership on the part of clients

An important prerequisite for a positive impact of these factors on construction quality is a sense of urgency which needs to permeate all levels and all disciplines involved in the construction process[18]. In relation to BuildUpSkillsNL, this holds true in particular for professionals and construction managers involved in the implementation of construction projects.

In order to describe the imminent challenges faced by construction workers, we need to discuss what final products are required to deliver energy-neutral buildings.
This description will serve to then identify professional skills necessary to realise energy-neutral buildings and which specialisations or changes in the nature of the work are anticipated in the next eight years.

We use the term *skill gap* as defined by Cedefop: "a skill gap is a situation in which the level of skills of the currently employed is less than that required to perform the job adequately or the type of skill does not match the requirements of the job." (Cedefop, 2010b).

Skill shortages are defined as "a situation in which the demand for a particular type of skill exceeds the supply of available people with that skill" (Cedefop, 2010b). This is marked by the absence of sufficient appropriately qualified and experienced people to undertake particular roles when employers seek them. Skill shortages may be caused by a shortage of applicants with the relevant knowledge, personal qualities, qualifications or experience or by low pay and unattractive working conditions, which may deter suitable recruits from applying.

Characteristics of zero-energy buildings
Energy-neutral buildings generally exhibit the following construction features[19]:

- High degree of air tightness
- Absence of thermal bridges / low line heat loss
- High R value (thermal resistance of roofs, facades, floors)
- Low U factor for window frames, windows and doors (insulation and window glazing)
- Optimal thermal mass, opportunities for cooling, shading, orientation

[17] *Bouwend Nederland* (Dutch Construction and Infrastructure Federation): Construction in 2020 (Looking to the future (2012) Conditions for Success
[18] *Bouwend Nederland* (Dutch Construction and Infrastructure Federation): Construction in 2020 (Looking to the future (2012) Reservations about ambitions for 2020
[19] Qv;10 value, ψ value. R-value, U-factor and F-factor

Besides these construction features, energy neutral buildings are usually equipped with:

- Systems to further reduce heat and cooling need
- One or more installation and systems using sustainable energy sources to satisfy the remaining energy demand
- Optimal access to daylight and use of solar control systems and sun shade materials.

Construction concepts for new housing developments and renovation of existing buildings
The past few years have seen several new construction concepts for the Dutch market to realise energy neutral dwellings, both in new housing developments and in renovated buildings.

New housing
The table below shows a number of concepts[20], derived from the Passive House.

Concepts for energy neutral new housing with cavity walls[21]			
	Inner leaf of cavity wall	**Outer leaf of cavity wall**	**Floor**
1	Wood-frame construction without cavity wall insulation	Brickwork /bonded	Ribbed slab floor or hollow core slab
2	Wood-frame construction with cavity wall insulation	Brickwork /bonded	Ribbed slab floor and wooden floor
3	Wood-frame construction with cavity wall insulation	Cladding	Hollow core floor and wooden floor
4	Brickwork /bonded/ story high brick-like prefab elements	Brickwork /bonded	Ribbed slab (ground) floor and slab formwork
5	Poured concrete	Brickwork /bonded	Ribbed slab floor, hollow core slab and poured floor
Concepts for energy neutral new housing without cavity walls			
	Wall assembly	**Extra insulation**	**Exterior finish of walls**
6	Facade made of brick-like blocks or elements with high insulating R values	Outside insulation (insulation material with a stone look, mineral wool or hard insulation panel)	Stucco siding/ cladding/ stone strips

Half of the new housing concepts in this overview are related to wood-frame construction. The main reason is that the insulation elements used in wood-frame construction have low environmental impact[22] and are manufactured in factories which adhere to high quality, insulation and dimensional tolerance standards.[23]
In addition to the passive house concepts, various market players have developed dynamic concepts for energy neutral buildings which focus on:

- Using multiple natural energy sources
- Daylight control, natural ventilation and sunlight entrance[24] systems for a healthy indoor climate
- Ecological and environmental balance (local and global)

Regardless of the concept that is chosen, on site cooperation and professionalism are needed in order to realise energy neutral buildings. As more construction elements (floors, facades and roofs) come straight from the factory, there is a shift from work on the construction site and on site production to fitting, installing, and assembly. Just as in traditional construction, it is imperative that workers are knowledgeable and pay great attention to detail in implementing construction plans so that low line heat loss, heat loss from buildings through infiltration and exposure of the building to humidity and vermin are prevented.

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[20] Nieman, SBR reference details, and manufacturers like Isover, Rockwool, Ytong, Wienerberger
[21] New housing often makes use of insulated roof construction elements with I-joist roof rafters
[22] Sustainable Building, Sustainability Considerations for Construction Systems, Department of Industrial Science and Technology: Braems and Croene
[23] WTCB study 2010: Wood-frame construction: a system still developing. The expectation is that in Flanders, 10-15% of new single-family dwellings will be built in this way by 2020.
[24] www.Activehouse .info

Renovation

In the Netherlands, there are three common types of homes which qualify for renovation and transformation into energy neutral buildings.[25] They have been detailed in the table below.

Dwelling type	Renovation measures
Dwelling with: - Brick inner leaf - Brick outer leaf - Un-insulated ground floor made of stone - Cavity walls, sometimes with insulation	- insulation under ground floor
	- insulating foundation beams for walls, inner leaf of cavity wall/ subfloor walls
	- outer insulation of foundation beams for walls (below ground level)
	- cladding facade with insulation material (plus cavity wall insulation where necessary)
	- door insulation, with optional vestibule
	- ensuring air tightness and providing drainage for windows and doors
	- applying triple glazed windows
	- building retaining walls in front of existing walls (optional)
	- adding insulation over existing roof
	- attic floor insulation using resilient planks
Old dwelling with - brick walls - wooden floor at ground level Renovation preserving historic features	- installing damp proof course to stop rising damp in stone walls
	- applying ground floor insulation
	- insulating under the ground level floor using mineral wool and insulation support plates
	- installing double floor plates
	- insulating stone wall on the inside combined with retaining walls using regulating systems, insulation material and plates
	- installing addition wooden window frames on the structure used to cover wall insulation and the insulated retaining wall
	- applying triple glazed windows
	- building insulated retaining walls in front of existing walls
	- insulating upper floors by fixing mineral wool and plasterboard beneath the floors
	- widening purlins, filling the space between them with insulating material, cladding with roof insulation system or regulating mechanism, plates and insulation
	- covering attic floor with resilient floor planks
	- waterproofing applying vapour permeable membrane on roofing and installing new battens and support rafters
	- insulating attic ridge vent
Dwelling with - brick inner leaf - brick outer leaf - wooden floors	- widening and insulating existing foundation on the outside, laying a gravel bed
	- replacing existing wooden floor with PS combination floor connecting onto inside foundation
	- replacing brick outer cavity wall by wooden frame element with facade cladding
	- door insulation, with optional vestibule
	- providing drainage and ensuring air tightness for windows and doors
	- triple glazed windows

[25] See the construction reference details for the passive house as elaborated by the SBR, the Dutch knowledge platform for construction and real estate.

	- window blinds
	- replacing roofing and building scissor trusses/insulated roof elements
	- retrofitting of insulation on existing roofing
	- attic floor insulation using resilient planks
	- covering / sealing tops of walls
	- insulating attic ridge vent

In Chapter 3, we already pointed out that the implementation of measures to achieve zero-energy dwellings/buildings is technically more complex for existing buildings than for new housing. In addition, communication with clients/inhabitants and sound provision of information on solutions applied and on their efficiency are very important. Key issues are: certainty as to energy/sustainability performance of measures and impact on utilities expenses, home comfort and a healthy indoor climate.

In order to meet the high standards set for renovation projects, unconventional solutions may prove necessary. Renovation work draws on the ability of professionals to come up with solutions for (unexpected) problems, more so than new housing projects. In both cases, to meet the pre-set energy performance targets, full commitment is needed on the part of both workers and supervisors. This applies across the board, from the person in charge of preparatory demolition to the person responsible for the finishing work.

Installation technology concepts applicable in zero-energy buildings
Energy performance of buildings is greatly influenced by their orientation, compactness, size, building materials as well as the attention paid to detail and quality during construction. The choice and application of installations also have an important impact on a building's energy consumption.
When determining installations, construction aspects need to be taken into account. The opposite also holds true. An integral approach to construction and installation aspects lead to better results.
For each basic requirement, the table below indicates installation systems which contribute to the quality of the building and which limit its energy consumption.

Applying installations in energy-neutral dwellings/buildings				
Basis requirement	**Aspect**	**Fulfilling the requirement**	**Systems**	
Light	daylight	on demand	regulation daylight entrance	
	artificial light		LED lighting	
Air	air quality	ventilation on-demand	natural ventilation	Soil vent pipes
	Humidity		mechanical ventilation	Heat recovery
			hybrid ventilation	Opening/closing of windows/vents
				balanced ventilation
				central/local ventilation
Comfort	heat / cold	demand-driven systems	Heat and cold storage	Concrete core activation (CCA)
			Thermal storage	PCM's
			Low temperature systems	Floor and wall heating
				Climate ceilings
			Solar heating	Solar cooling

				Solar boiler
				Solar light activated blinds
			Evaporative cooling	
Water	Rinsing water		Solar heating	Solar boiler
	Drinking water			Heat recovery system for shower
				Pump optimisation
				Water pipe insulation
Energy	To heat spaces	Demand-driven	Wind	
	For electrical equipment		PV	
			Boiler	
			Biomass	
			Heat pumps	Water-water and air-water
			Cogeneration (CHP)	
			Residual heat	

Adapting working procedures in construction and avoiding costs of failure
In addition to well thought out concepts, the construction of energy neutral buildings also requires adapting working procedures. In the new working procedures, quality must be leading. Quality norms and methods to ascertain compliance need to play a key role. This also applies to the construction drawings (2D-3D) and the instructions supplied by manufacturers/ importers. Builders and installers will not risk being held responsible by clients, contractors, suppliers or the government for the consequences of non-conformity to standards, instructions or (detailed) drawings.

In the coming years, actual detection of deviations during construction or upon completion will become more likely. This is due mainly to improved methods and techniques for an objective assessment of construction and installation quality.[26]
In addition, the mandatory energy label for new buildings (housing and utility construction) will become effective as of 1 January 2012. In order to determine the type of label given, a practical test for the energy performance certificate (EPC) is done upon completion. To avoid repair costs and assure compliance with protocols for the new housing label, ongoing measurements and quality checks are expected to become part of the construction process and to take place all along. As a result, construction professionals at middle management level will increasingly have to deal with control moments and will regularly have to provide photographic material and video footage, to prove that correct working methods and implementation procedures have been followed.

To realise energy neutral, high quality buildings, working procedures explicitly focus on:
- Providing information and instruction to professionals on the required quality, also addressing past mistakes and pitfalls
- Regular coordination during construction process between workers and professionals with different specialities re. planning, starting conditions, use of equipment and other matters;

[26] In this context, we point out the **NEN** 2686 and **NEN**-EN 13829 for air tightness values and the advent of building thermography, which allows precise determination of heat leaks in buildings as a result of thermal bridges, non-existent or wet insulation, leaks and unintended cracks and holes. Building thermography is commonly used in building inspections and is combined with pressure testing in the building.

- Communication in case of deviation from instructions, design drawings and construction specifications to ensure that the information is included in the project file (information model)
- Evaluation and documentation of experiences and sharing of knowledge and information.

In general, more time is being spent on consultations and assessment of construction projects prior to actual works (building, renovation, installation) as well as evaluation upon completion.

In order to participate in these new integrated working procedures, professionals and middle management officers must have certain skills and competencies. They need these to perform their jobs but also in their roles as ambassadors of energy efficient buildings / dwellings and as team players.

Required skills /soft skills		**role**			
skill	aspect	performer	leader	ambassador	Team player
communication	listening	x	x	x	x
	speaking/explaining		x	x	x
	Involving others in achieving goals	x	x	x	x
	creating enthusiasm		x	x	x
	instructing		x	x	
	Controlling and confronting		x		
reading interpretation	Reading and understanding technical instructions and texts	x	x	x	x
	Reading construction drawings (2D and 3D)	x	x		x
cooperation	With colleagues on site	x	x		x
	With designers		x	x	x
	with clients				
documentation	Taking and sending photographs	x	x		
	Keeping written records and sharing files		x		x
conducting meetings	Taking part in planning and evaluation meetings,	x	x		x
	conducting planning and evaluation meetings		x		x
taking responsibility	for quality of work	x	x		x
	for reporting deviations/problems	x	x		x

Another process factor which influences the realisation of (or aspiration to realise) zero-energy buildings is the shift of activities from the construction site to prefabrication or manufacturing workplaces. Although prefab is only slowly inching its way along, it is expected that the aspirations to achieve zero-energy buildings will give prefab construction an extra push.[27]

[27] Prefab environments are subject to more standardised control mechanisms, which include climate manufacturing conditions. This means that the quality of prefab parts and installations is generally higher and more consistent than that of parts or installations produced or assembled on the construction site.[27]

7.4 Existing occupations and exercise of professions

Which existing occupations are most affected by increasing sustainability of the built environment in terms of professional exercise? After a brief sketch of the occupations concerned, this question is answered in sections 5 and 6.

Occupations concerned
In chapter 5, Figure 6 shows the construction and installation occupations which relate to the targets set by BuildUpSkillsNL. Of the occupations listed at various intermediate vocational levels, the following ones are most relevant for BuildUpSkillsNL.[28]

Installation
- Mechanic and service engineer for electrical installation (solar power, sustainable lighting, regulation/home automation, power quality and monitoring)
- Mechanic and service engineer for mechanical engineering installations (heat pump, power generation, low temperature systems, ventilation systems, monitoring and solar power, thermal)
- Mechanic and service engineer specialised in air conditioning (ventilation systems, monitoring, high temperature cooling systems and solar power, refrigeration)
- Roofer (solar power and wind energy)
- Technical illustrator for installations (all installations)
- Installations works planner (all installations)

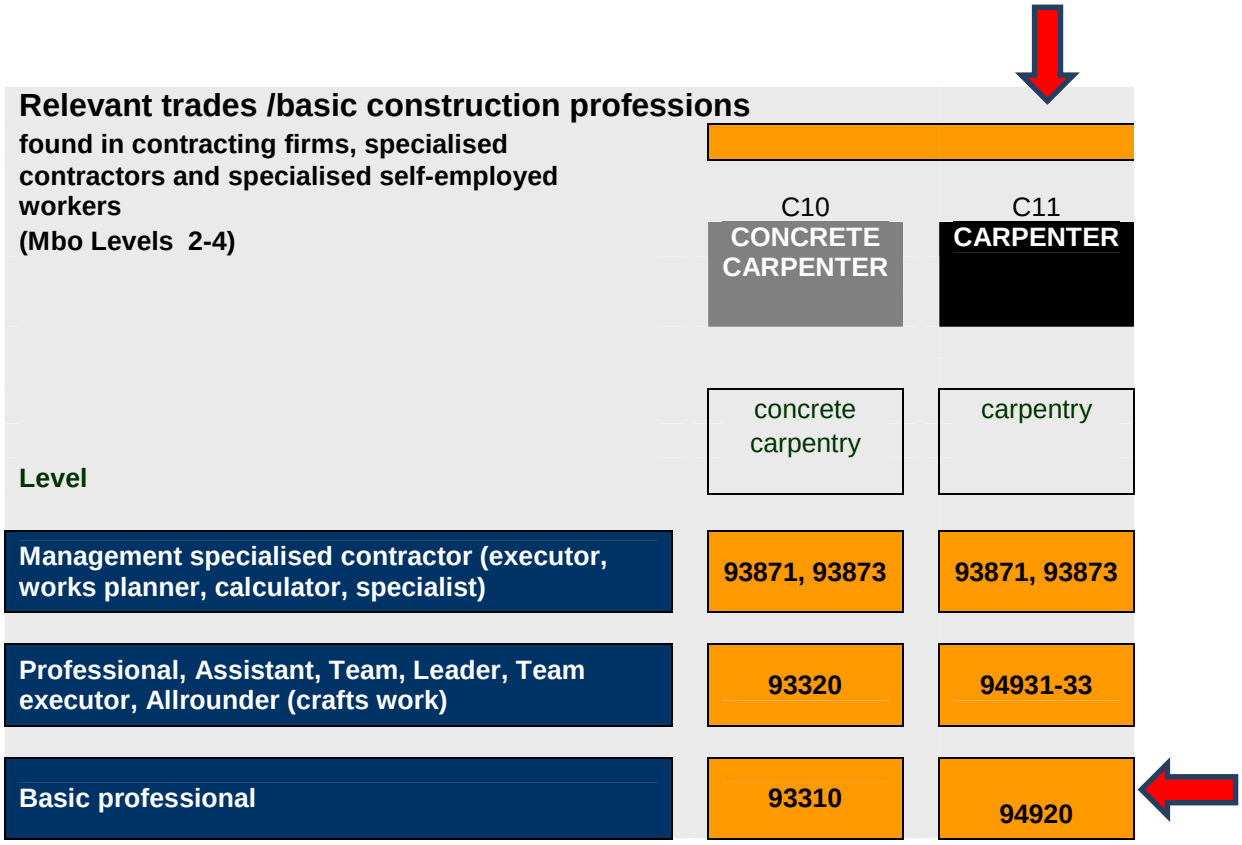
Construction
- Joiner (floor, facade, roof, frames, windows and doors, fitting, joinery products)
- Mason (insulation, protective insulation and installing damp proof courses to protect construction against humidity, joinery products for roof/walls, cutting openings in roofs, connections to foundation beams)
- Roofer (roof insulation, protection of insulation and construction, cutting openings in roofs and insulating them)
- Glazier (placing glass in windows, doors and frames)
- Plasterer (exterior facade insulation, inside facade insulation)
- Ceiling and wall installer (insulation of inner leaf)
- Works planner (preparation of construction parts and joinery products)
- Construction executor (supervision of construction parts and joinery products)

Note on the selection of occupations
An English version of the selection work chart is included in the appendix ('Work Chart Construction and Installation ENG.xls').

To determine the status quo of the Dutch construction and installation industry for BuildUpSkillsNL, we started by listing the different occupations in those sectors. A list of professions was drawn up which correspond to professional competency profiles and qualification files. The list features both mainstream professional titles as used in the competency profiles, and alternative names for those professions, also mentioned in the professional competency profiles. In terms of the qualification files, names of professions have been used as they figure in the titles of those files as well as names of professions used to describe job options after completion of education differentiation).

As there are many synonyms and, in addition, a number of homonyms to denote certain professions, this inventory initially takes into account only those professions which appear in the titles of the qualification files and the professional competency profiles. Furthermore, for practical purposes, professions have been concentrated per area of expertise and per level. For BuildUpSkillsNL, this has resulted in practical overview, whereby all occupations found in a single matrix cell are backed by a database containing names of professions:

[28] For each occupation, activities are specified which are required of that profession in realising zero-energy buildings.



For example, C11 – level 2 (carpenter, basic specialist) covers the following professions:
- New construction carpenter
- Finishing carpenter
- Timber frame carpenter
- Restoration carpenter
- Workshop carpenter
- Maintenance Carpenter

The complete overview shows only construction and installation professions or groups of professions which are directly related to meeting the target of realising zero-energy buildings. For many professions, such as joiners and roofers for example, this relationship is crystal clear. For other professions which have been named, further explanation is needed. A scaffold builder, for instance, when fixing his scaffolding, must be aware of the building's thermal shell and careful to leave it intact or repair it if necessary. The areas of expertise which have been coloured black have the closest links to BuildUpSkillsNL. These are the areas requiring most effort in order to achieve the desired level for the workers in these professions.

The overview presents professions which cover a number of occupations in a separate table. These are professions which embrace more than one area of expertise.

7.5 Specialisations and post-initial training

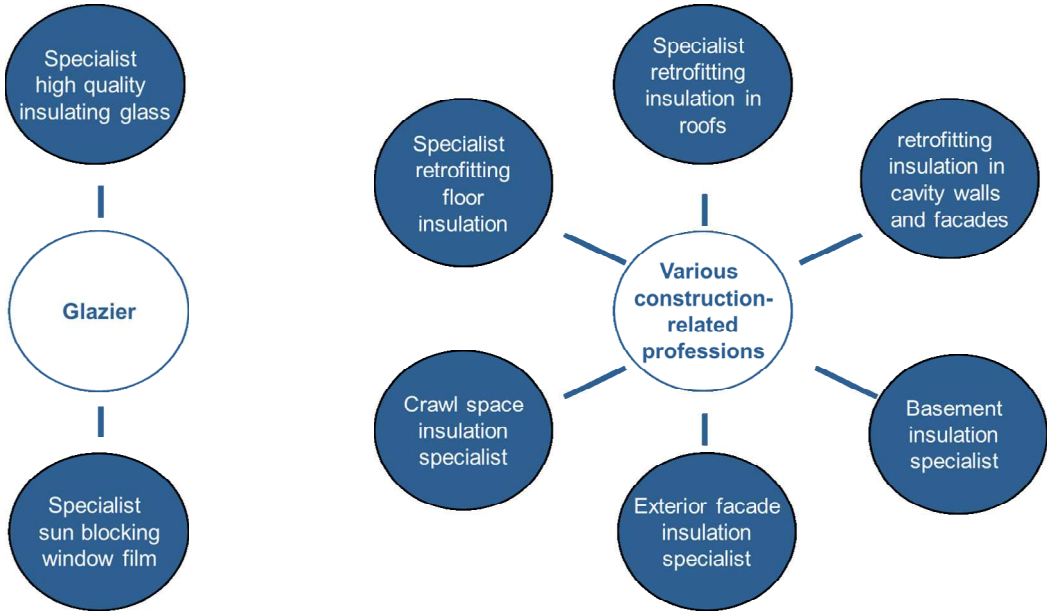
To get an idea of existing professional specialisations and new professions emerging as a result of the ambition to realise zero-energy buildings, the following three steps were taken:

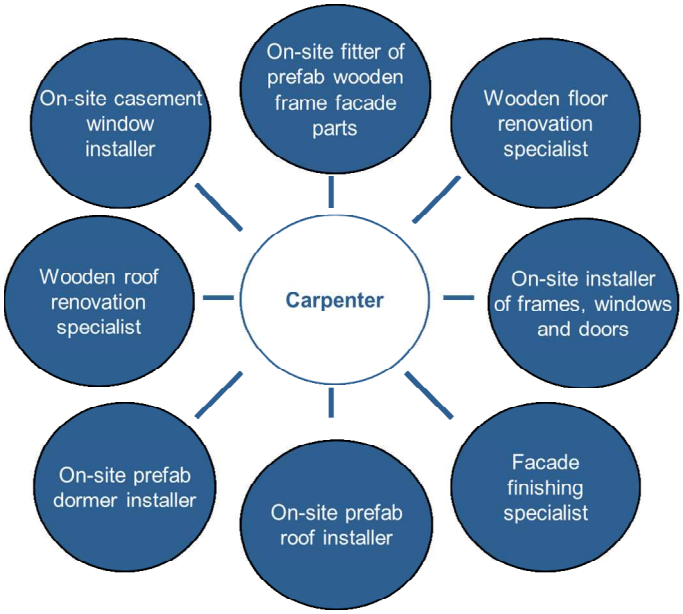
1. An inventory was made of available post-initial training and education which is directly related to the zero-energy buildings target. To understand the gap, relevant courses which prepare for specialised, new occupations (but which have not yet been assimilated in initial education) have been clustered into "specialisations."
2. Based on construction and technical installation concepts for zero-energy buildings, we identified specialisations which are necessary for the successful implementation of these

concepts, following specific and detailed procedures, and for the correct use of materials, systems and working methods.

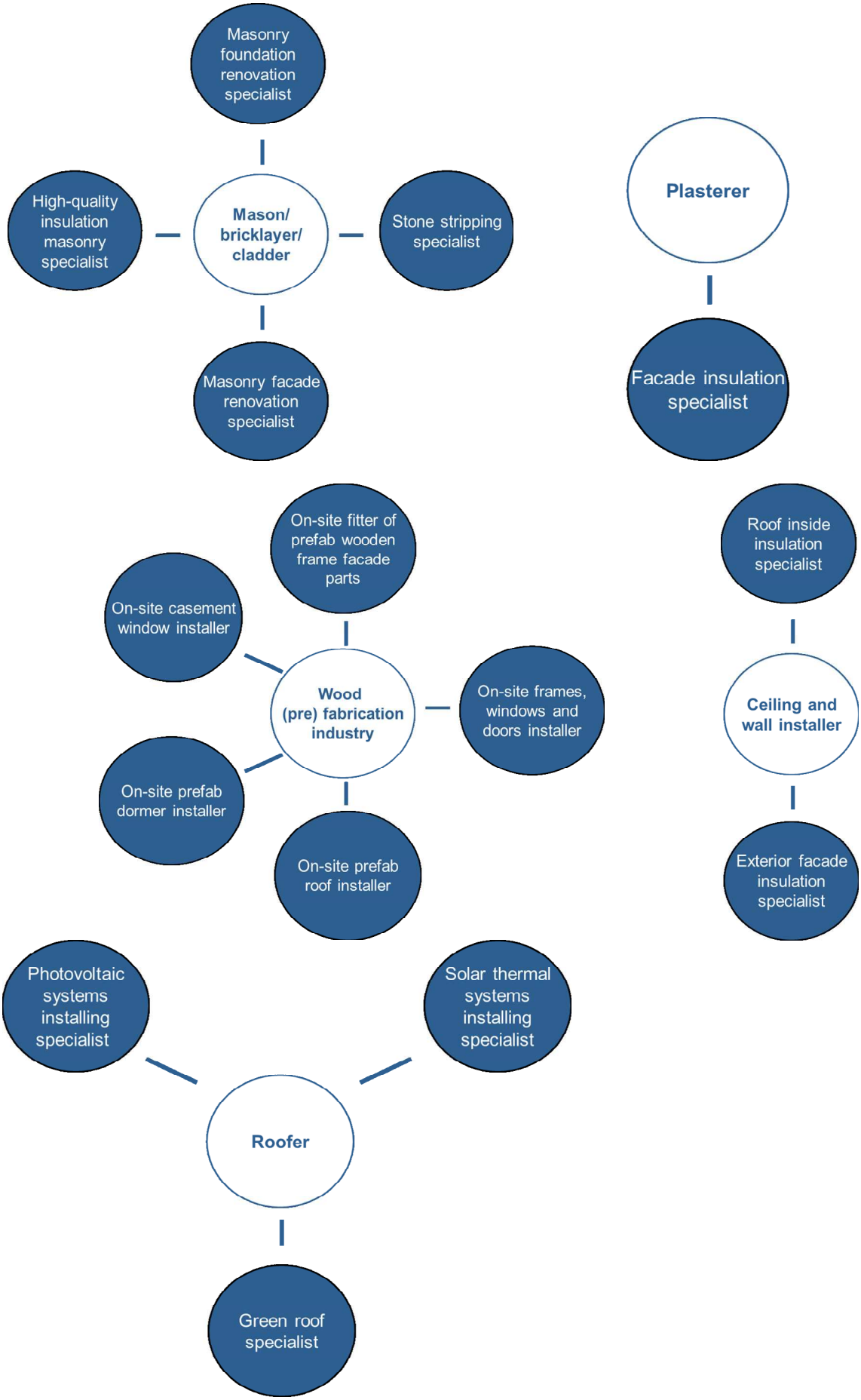
3. We looked at outreach of specialisations in practice, and how they are portrayed in commercials along highways and on the Internet.

The identified specialisations were then linked to basic professions in the professional qualification structure. This was done because over 40% of workers entering the construction sector are school dropouts.[29] Also, the target group description for post-initial training refers to the basic professions. Results are depicted in the blue circle diagrams below. The most relevant specialisations for operating in the fields of construction and technical installation are indicated further on:

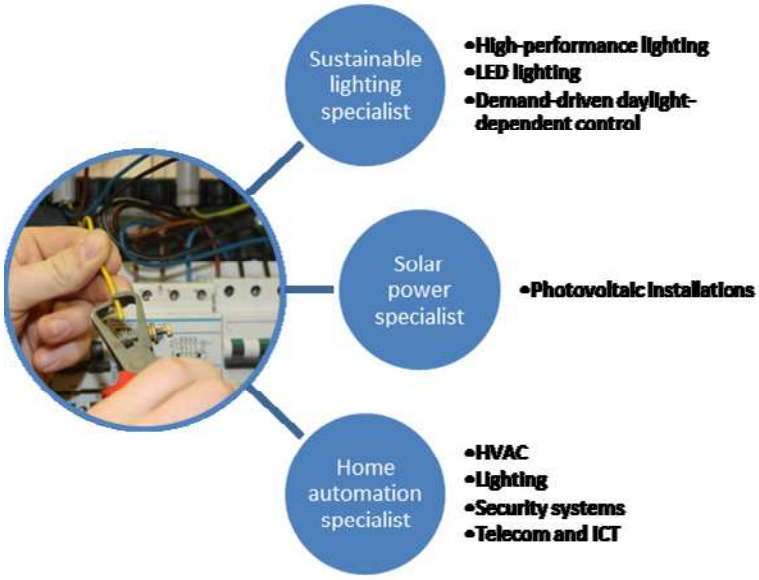




[29] Approximately 5% of the total working population enters the construction sector (Fluctuations in the Dutch Labour Market 1999-2008)

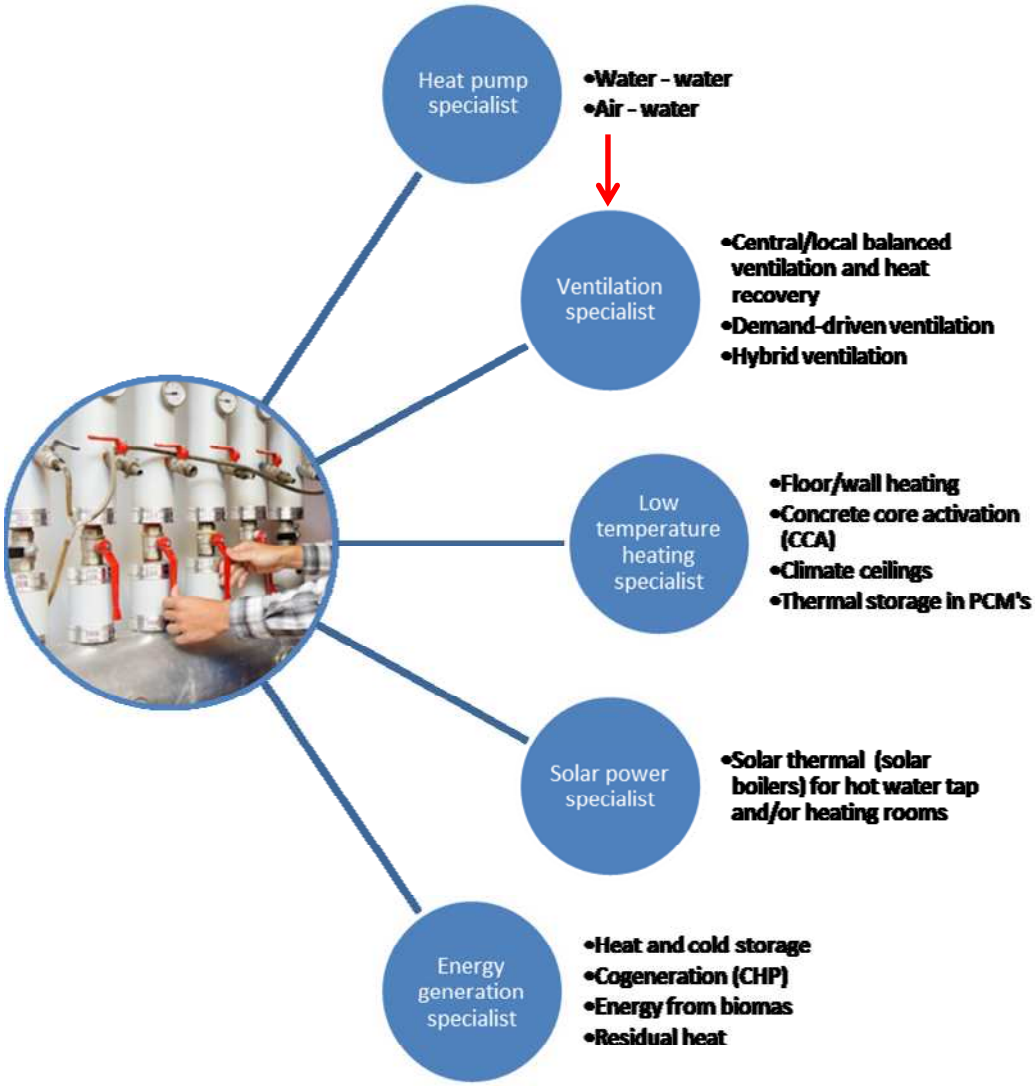

Masonry foundation renovation specialist
High-quality insulation masonry specialist
Mason/ bricklayer/ cladder
Stone stripping specialist
Masonry facade renovation specialist
Plasterer
Facade insulation specialist
On-site fitter of prefab wooden frame facade parts
On-site casement window installer
Wood (pre) fabrication industry
On-site frames, windows and doors installer
On-site prefab dormer installer
On-site prefab roof installer
Roof inside insulation specialist
Ceiling and wall installer
Exterior facade insulation specialist
Photovoltaic systems installing specialist
Solar thermal systems installing specialist
Roofer
Green roof specialist

I10: Electrical installations mechanic

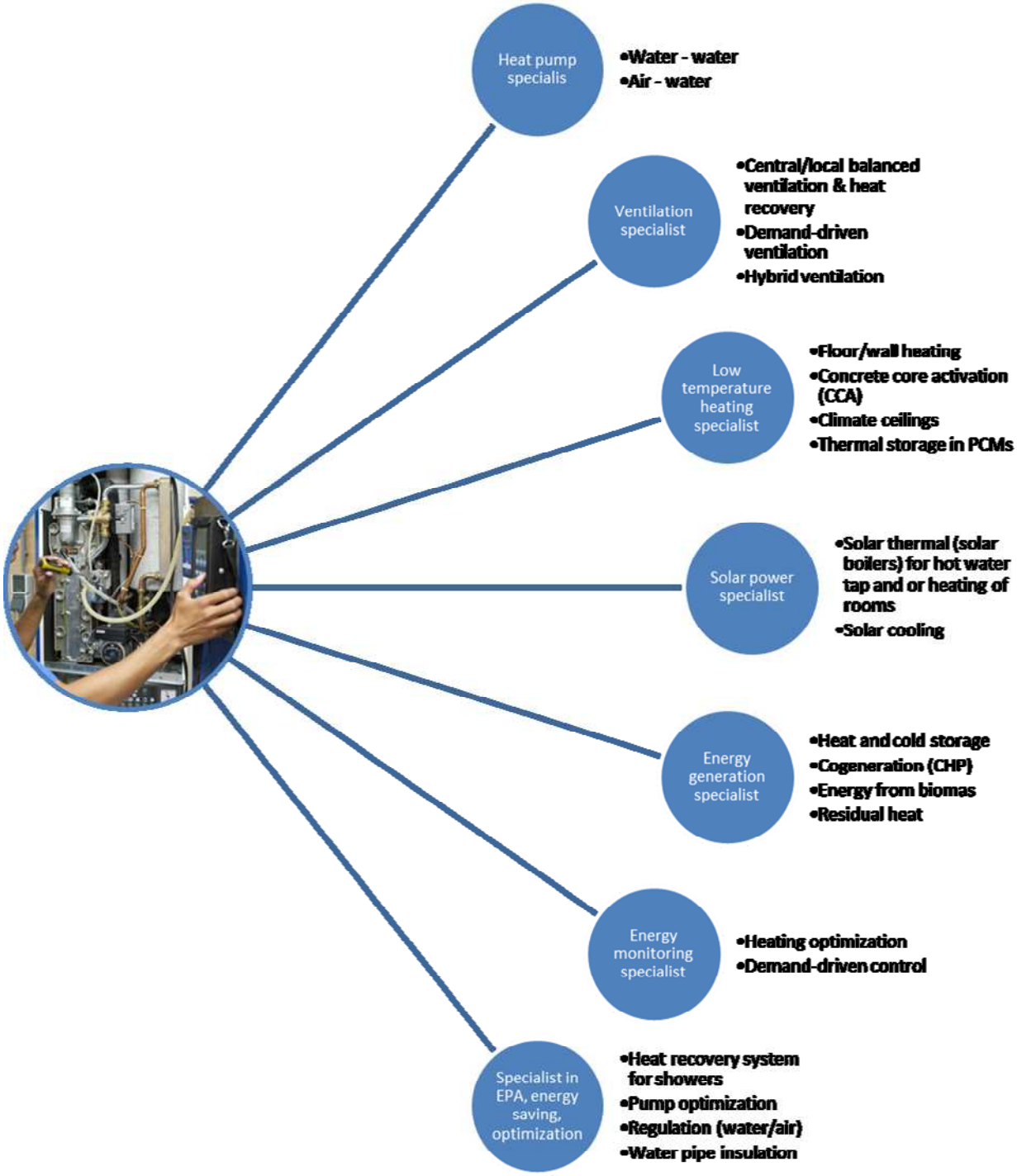


I11: Service engineer for electrical installations

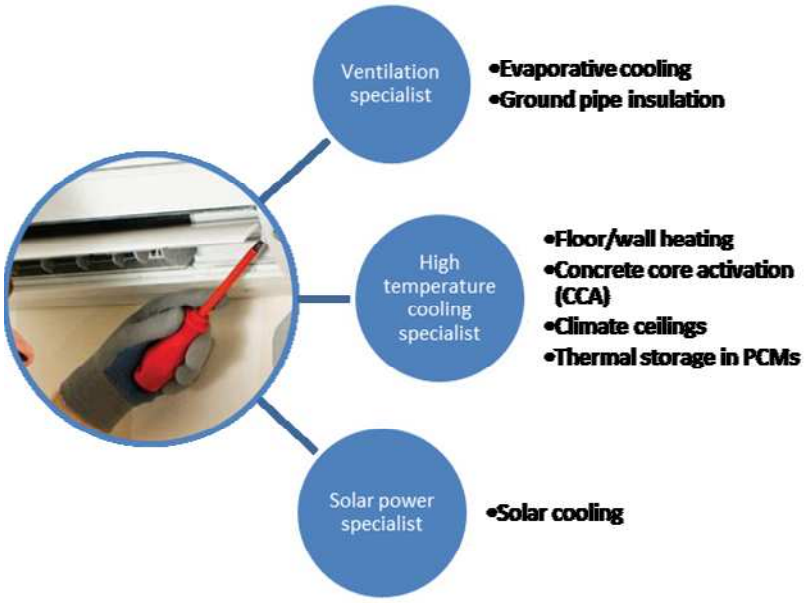
I12: Mechanical engineering installations specialist



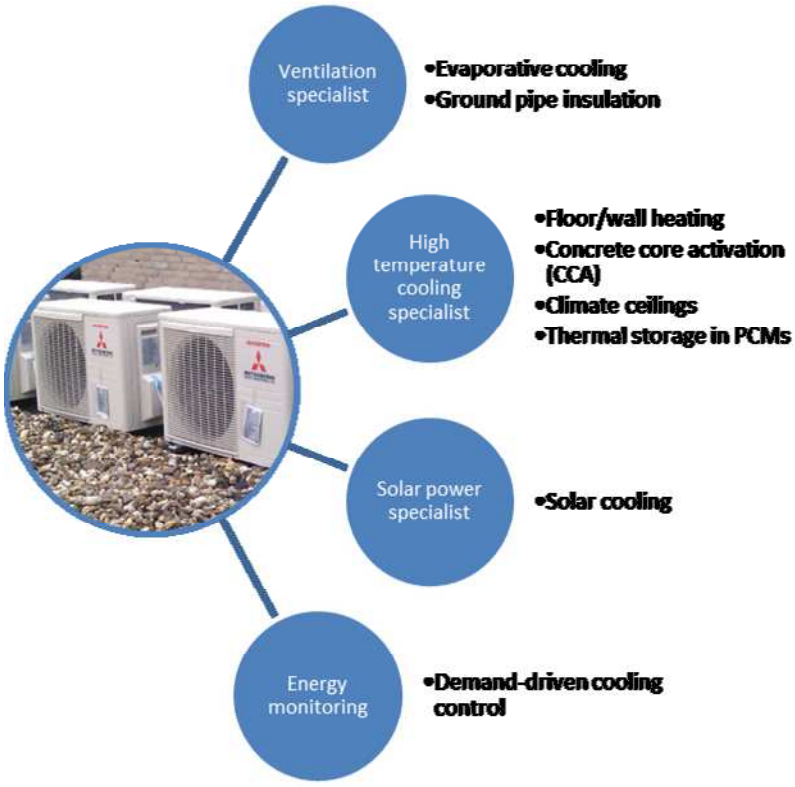
I13: Service engineer for mechanical installations



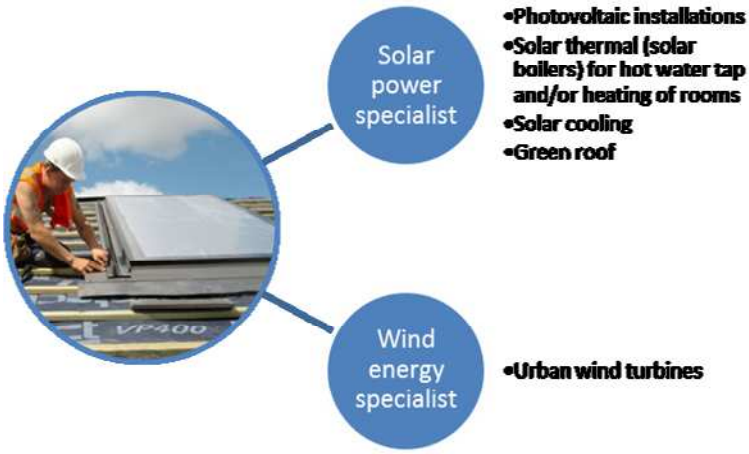
I16: Cooling installations mechanic



I17: Service mechanic for cooling installations



I18: Roof mechanic



Potentially missing professions
A number of specialisations are not easily linked to an existing professional competency profile. This is true in particular of specialisations in the fields of insulation and prefab elements.

Insulation specialist
In the list of construction professions derived from professional competency profiles, the profession of insulation specialist or retrofitter of insulation does not appear. The specialisations in this field however, are numerous. In Belgium, by way of contrast, a professional competency profile was recently developed for insulation specialist for basic foundations, walls and roofs. This profile focuses on retrofitting of insulations in a dwelling or building and corresponds to tasks performed by insulation retrofitters working for Dutch companies which are members of VENIN, the Dutch association of firms specialized in the application of insulation materials in (already built) buildings.

Installing insulation in both new housing and renovated buildings often happens incorrectly. A construction special entirely dedicated to the insulation of dwellings [30] recently published detailed illustrations of practical situations in which mistakes are commonly made. The proneness to mistakes in this area justifies recognition of the profession of insulation specialist, in particular with a view to meeting the 2020 targets. Currently in practice, it is not always clear who is responsible for the correct installation of insulation material.
In a recent large-scale renovation project[31], wooden ground floors were replaced by PS combination flooring. Tasks such as digging out the crawl space, smoothing off the foundation masonry, insulating the walls, covering the ground, installing pipes and insulated floor elements were performed by various professionals including masons, carpenters, ground workers, construction cleaners and mechanics. The quality of work and the insulation performance achieved in this renovation project depended strongly on the supervision and the constructive insight of the executor. Because insulation performance is becoming increasingly important, fully trained professionals responsible for the correct installation/application of insulation and sealing materials should be present on every construction site.

Fitter and installer of prefab parts in construction
The list of professions derived from professional competency profiles does not include the profession of fitter and installer of prefab parts. Because manufacture of (components for) roofs, floors and facades is shifting to factories and a lot can go wrong in the surrounding construction, it seems advisable that professionals should be trained and made responsible for the monitoring of correct fitting and installation of prefab parts in new housing and renovation projects. Training could include specialisations for stone-like and wooden prefab elements.

30

The Construction Special on Insulation is a special publication on thermal insulation materials in the construction sector. This edition was sent to readers of a number of Dutch professional publications like “Aannemer” (Contractor), “Bouwwereld” (The world of construction) and “Technisch gebouwbeheer” (Technical building maintenance). Publisher Eisma, Bouwmedia June 2012

31 Source VBI

7.6 Initial professional trainings

The professional competency profiles which form the basis of initial vocational training at intermediate level (for construction and installation) go back 8 to 12 years on average and have not kept up with recent developments in their respective fields. To ensure that due attention is paid during such trainings to knowledge and skills which are relevant for the realisation of energy efficient and sustainable buildings, professional competency profiles (BCPs) must be updated. Concepts like sustainable building, heat loss, energy (consumption), CO2 reduction, insulation and other topics related to sustainable building need to be integrated into the professional competency profiles.

It is important to understand that a professional competency profile is not just theoretical paperwork. It documents the activities carried out by an experienced professional. It describes tasks as they are presently performed, not in the future. If activities are named which do not (yet) occur or which hardly take place in practice, they are not mentioned in the BCP. Aspects related to energy efficiency are still not yet part of a carpenter's daily practice (hence it will not be mentioned in the updated BCP).

Another related point is training and refreshment courses for trainers in intermediate vocational education. Vocational learning institutes are faced with the heavy task of having to replace many of their retiring employees by new trainers in construction and installation technology.[32] The ageing population is one of the greatest concerns of professional construction education. Teachers and practical trainers are intermediate vocational level are in a position to assure the topicality of initial professional training. Their duty is to train students who will be able to put their knowledge and skills to use in realising zero-energy housing. A fresh pool of knowledgeable educators to train people for the construction and installation sectors in the coming years is an important precondition for the realisation of the targets set by BuildUpSkillsNL.

7.7 Monitoring needs

Within BuildUpSkillsNL in workpackage 3 we are working in consultation with market players for agreements on monitoring. Part of these agreements will be keeping the status quo analysis up-to-date and the development of training records. From the up to date analysis mismatches in skill development can be identified and prevented. Also, in this way it becomes possible to respond to new technological and process innovations that implicate specific demands on the knowledge and skills of the blue collar workers. In addition, the results of training and retraining around the appointed new specializations and professions will be clarified.

7.8 Summary and follow-up

The following table summarizes this chapter. It identifies new emerging skills and numbers of building workers to be trained in each sub-sector/profession to each skill level to achieve the 2020 energy targets, based on NACE (Statistical Classification of Economic Activities in the European Community) and ISCO (International Standard Classification of Occupations) classification.

[32] See Fluctuations in the Dutch Labour Market, 1999-2008 (Statistics Netherlands) POPULATION PYRAMID IN THE EDUCATION SECTOR

surplus(+)
in balance (=),
shortage (quantity, quality) therefore need for more, different and more up to date (-)

Basic profession	NACE	ISCO	Specialisms and skills	Training	Accreditation	Qualifications	Estimated shortage of qualifying trainings and trainers
Construction (C)							
C11 - Carpenter	F41.2.0 - Construction of residential and non-residential buildings	7119 - Building frame and related trades workers not classified elsewhere	On-site installer of casement windows	Available	Yes	94920	=
		9113 - Building construction labourers	On-site installer of prefab wooden frame facade elements	Available	Yes	94920	=
			Wooden floor renovation specialist	Available	Yes	94920	-
			Renovation specialist for wooden roof constructions	Available	Yes	94920	=
			On-site prefab dormer installer	Available	Yes	94920	=
			On-site prefab roof installer	Available	Yes	94920	-
			Specialist façade panelling	Available	Yes	94920	=
			On-site installer of frames, windows and doors	Available	Yes	94920	-
C12 - Bricklayer	F41.2.0 - Construction of residential and non-residential buildings	7119 - Building frame and related trades workers not elsewhere classified	Masonry foundation renovation specialist	Available	Yes	93901	=
			Stone stripping specialist	Available	Yes	93901	=
			Masonry facade renovation specialist	Available	Yes	93901	=
			High quality insulation masonry specialist	Available	Yes	93901	=
C13 - Mason	F41.2.0 - Construction of residential and non-residential buildings	9113 - Building construction labourers	Masonry facade renovation specialist	Available	Yes	93951	=
C14 - Roofer	F43.9.1 - Roofing activities	7121 - Roofers	Photovoltaic systems installing specialist	Available	No	93841/93846/93845	-
			Solar thermal systems installation specialist	Available	No	93841/93846/93845	-
			Green roof specialist	Not available	N.A.	Not available	-
C15 - Glazier	F43.3.4 - Painting and glazing	7125 - Glaziers	Specialist high quality insulating glass	Not available	N.A.	Not available	-
			Specialist sun blocking window film	Not available	N.A.	Not available	-
C16 - Plasterer	F43.3.1 - Plastering	7123 - Plasterers	-	Not available	N.A.	93600	-
Wood (pre)fabrication industry	F41.2.0 - Construction of residential and non-residential buildings	7115	On-site casement window installer	Available	Yes	94920	-
		?	On-site fitter of prefab wooden frame facade parts	Available	Yes	94920	-
		?	On-site prefab dormer installer	Available	Yes	94920	-
		?	On-site prefab roof installer	Available	Yes	93841/93846/93845	-

		7115	On-site installer of frames, windows and doors	Available	Yes	94920	-
Other construction related professions	F41.2.0 - Construction of residential and non-residential buildings	7124 - Insulation workers	Specialist retrofitting insulation in floors	Available	Yes	94920	-
		7124 - Insulation workers	Specialist retrofitting insulation in roofs	Available	Yes	94920	-
		7124 - Insulation workers	Crawl space retrofitting insulation specialist	Available	Yes	94920	-
		7124 - Insulation workers	Specialist in retrofitting insulation in cavity walls and facades	Available	Yes	94920	-
		7124 - Insulation workers	Exterior facade insulation specialist	Available	Yes	94920	-
		7124 - Insulation workers	Basement insulation specialist	Available	Yes	94920	-

Installation technology (I)							
I10 - Monteur E-installatie	F43.2.1 - Electrical installation	7411 - Building and related electricians	Sustainable lighting specialist	Not available	N.A.	Not available	-
			Solar power specialist	Available	No	94271	-
			Home automation specialist	Not available	No	Not available	-
I11 - Service engineer for electrical installations	F43.2.1 - Electrical installation	7411 - Building and related electricians	Sustainable lighting specialist	Not available	N.A.	Not available	-
	M71.2.0 - Technical testing and analysis		Solar power specialist	Available	No	94321	-
			Home automation specialist	Not available	No	Not available	-
			Power quality specialist	Not available	No	Not available	-
			Energy monitoring specialist	Not available	No	Not available	-
I12 - Mechanical engineering installations specialist	F43.2.2 - Plumbing, heat and air conditioning installation	7126 - Plumbers and pipe fitters	Heat pump specialist	Available	No	Not available	=
			Ventilation specialist	Available	No	94283	=
			Specialist LTV	Available	No	94283	=
			Solar power specialist	Available	No	94283	=
			Specialist in energy generation	Not available	No	Not available	-
I13 - Service mechanic W-installatie	F43.2.2 - Plumbing, heat and air-conditioning installation	7126 - Plumbers and pipe fitters	Heat pump specialist	Available	No	Not available	=
	M71.2.0 - Technical testing and analysis		Ventilation specialist	Available	No	94323	=
			Specialist LTV	Available	No	94323	=
			Solar power specialist	Available	No	94323	=
			Energy generation specialist	Not available	No	Not available	-
			Energy monitoring specialist	Not available	No	Not available	-

			EPA specialist, Energy savings/optimization	Available	No	94323	=
I16 - Cooling installations mechanic	F43.2.2 - Plumbing, heat and air-conditioning installation	7127 - Air conditioning and refrigeration mechanics	Ventilation specialist	Available	No	94273	=
			High temperature cooling specialist	Not available	No	Not available	-
			Solar power specialist	Available	No	94273	=
I17 - Service mechanic for cooling installations	F43.2.2 - Plumbing, heat and air-conditioning installation	7127 - Air conditioning and refrigeration mechanics	Ventilation specialist	Available	No	94332	=
	M71.2.0 - Technical testing and analysis		High temperature cooling specialist	Not available	No	Not available	-
			Solar power specialist	Available	No	94332	=
			Energy monitoring specialist	Not available	No	Not available	-
I18 - Roof mechanic	F43.9.1 - Roofing activities	7121 - Roofers	Solar power specialist	Available	No	93841/93846/93845	=
			Wind energy specialist	Not available	No	Not available	-

This table indicates which basic professions currently exist and which specialisations are needed to meet the 2020 targets. For these specialised professions to come into existence, training is required. The table shows whether trainings are available and whether this will continue to be the case to a sufficient degree in the future. For instance, it appears that in the future, special training in solar power, preparing service mechanics for electrical installation work, will be available, but it will not be sufficient. The reason is that the technology for converting solar energy into electricity is developing fast (new development include transparent window frames equipped with solar panels). The last column indicates the estimated shortages of trainings. A "+" stands for a surplus. A "-" stands for a shortage and a "=" means supply meets demand. Due to increasing use of renewable energy, the shortages are expected to grow, as shown in the table above. This means the gap between available and required expert work force is likely to widen.

In 2012, as part of the implementation of the RES-directive, accreditation has been introduced for refresher courses in RES techniques in the installation sector.

Follow-up

In the first activities in work package 3 of BuildUpSkillsNL, the analysis presented in this chapter is further elaborated. This is done through a dynamic survey with a timeline which indicates per profession which competencies are needed with regard to sustainability targets for construction, renovation and installation towards 2020.

In line with Cedefop (2012), we intend to differentiate between

(a) any change in the level of skill required
(b) any change in the type of skill required
(c) whether the skill is required within an existing occupation or a new occupation
(d) whether the job is required within a new industry or within an existing industry.

8. Barriers

This chapter outlines the main barriers to meeting the 2020 energy efficiency targets in relation to construction practice (section 8.1), construction education (section 8.2) and the built environment in general (section 8.3). Besides the economic crisis, construction practice today is mainly affected by traditionally poor cooperation between the many different disciplines and specialties which enter into play. In addition to the persisting gap between work and education, and of course the major impact of the current economic slump, one of the barriers in terms of Build Up Skills is the absence of sustainability (competencies) in various curriculum descriptions. From a more general perspective, the image and culture of the construction industry need to be improved, and this would help address various related negative aspects of the built environment.

8.1 Barriers in the construction industry

8.1.1 Lack of clarity as to who takes the lead

Ambitions for the construction industry by 2020 have been outlined in general terms by the Dutch Construction and Infrastructure Federation [Bouwend Nederland], for example in its report entitled "The construction industry in 2020." How these ambitions are to be achieved is left to the market. In the construction industry, responsibility for applying energy saving measures tends to be easily deflected to clients or to the government.

Clients on the other hand prove to have strong hesitations in inquiring about energy saving measures / sustainability. It appears from the 2012 Monitoring Study on Knowledge on Sustainability in Construction that the client is seen as the main barrier to the application of sustainable systems. Corporations also often point to the contractor B&U as an obstructive factor. In the construction world, it seems people are insufficiently capable of communicating on this matter and take a wait-and-see approach. This is understandable to a certain degree, as the financial crisis has dealt the construction sector a considerable blow, and banks are increasingly difficult about extending loans for projects and or financing businesses, housing corporations or developers.

In the short term, the economic crisis is the largest impediment, as small and middle-seized enterprises focus mainly on surviving, whereas sustainability aspects in construction are not automatically as part of their survival. The economic potential of sustainability is not recognized as self-evident on a large scale. In many cases, clients are led by price rather than aspects related to energy or sustainability. This seems to be paralleled by a lack of support at policy level, which is due mainly to uncertainty as to funding, issuing of warranties, construction licensing, excessive bureaucracy and unrealistic demands set by incentive schemes.

8.1.2 Lack of cooperation between disciplines

The key to real energy savings ultimately lies in consumer behaviour and actual performance of technical solutions, which in reality are often found less effective than expected based on laboratory tests. Hence, it is difficult to establish an earning model. Whereas available technologies are generally considered to be sufficient, they often represent only partial products or solutions and an overall concept is missing. This is further reflected in substantial fragmentation of activities, making it difficult for the client to get the full picture.

What is often missing is the ability of individual workers involved in a construction project to see themselves as part of a larger plan. Also lacking is an awareness of how various disciplines are interrelated: which part or activity of a different discipline is important for one's own performance? It is a question of awareness and attitude, especially with regard to other professions.
Professionals in different trades need to become more sensitive to each others' contributions and stakes. Often however, tradesmen are judged on metres and speed, which in fact form the wrong incentives. They are not judged on their contribution to the entire process. Meanwhile, little or no information is available on the knowledge or skills levels of these professionals.

A plasterer, for example, will not be rated on how he performs in the construction team or chain. What counts are merely his plastering skills. Communication skills are not required. So, what is important is the way construction workers are assessed and rewarded. Professional skills and abilities of course remain the basis, but even during training, cooperation and communication receive too little attention.

In general, one could say that in spite of progress made in the past few years, the situation in the construction industry is still that of a “prisoner’s dilemma,” in which parties operate separately, do not trust one another and look only to serve their own interests. More communication, a change of culture and better cooperation are the basic elements requiring urgent attention. Real cooperation only takes place on a very small scale. Knowledge needs to be shared in order to be put to maximum advantage. Many companies however, pertinently refuse to do so for fear of competition. The lack of cooperation means that knowledge or skills which are not found within a company, are often brought in by hiring external parties.

The general characteristics of the construction industry are partly the reasons for its flaws, such as the great variety of specialties, (reflected in the high number of sector organisations) turning communication and coordination into obstacles by definition. Further barriers are the focus on new construction rather than on existing buildings, and a passive stance: real action only takes place if the law requires it.

Due to the lack of cooperation between different disciplines, overarching professions hardly exist. There is a high degree of specialisation and a strong tendency to put professions in pigeonholes. Meanwhile, activities which reach beyond the scope of any single discipline are not encouraged, not to say discouraged.

One of the barriers to meeting sustainability targets is the fact that “blue collar” activities are seen as separate from the long chain of activities in a construction project. Costs of failure for example, are regarded entirely in terms of “excellent performance” and are not seen in relation to preliminary activities or to the potential contribution of blue collar performance. Clear feedback on knowledge and competencies would be a good start. Evaluation of existing approaches and decision making processes could serve as input to develop new ways of working.

Another obstacle is the predominantly linear way of thinking: (1) tightening performance requirements will give rise to technological innovations which (2) will increase demand for qualified staff (in order to apply the technologies), which (3) will lead to a need for new trainings and later (4) will even create new professions. This kind of reasoning is actually more suitable as a rational explanation of events, rather than to initiate desired change. Technological innovations in the modern-day construction sector come mainly from the supply industry, after which leaders in the business pick up on them. As long as enough people continue doing their jobs in traditional ways, the innovative potential of the construction industry will remain weak, even for forerunners.

8.1.3 Insufficient investment in expertise

Partly due to the economic crisis, construction companies are less inclined to hire or hang on to permanent staff. More and more, they are becoming a sort of “temp agencies” hiring temporary staff and freelancers on a large scale. Because permanent teams have disappeared, there is no staff to send on trainings or courses and so self-employed workers must gain their expertise on their own. A self-employed worker must decide whether to invest in new knowledge or to continue looking for work projects which draws on the knowledge he already has.

For self-employed workers, opting for a course or training implies a double investment: besides the cost of the training, there is the time involved in following the training as opposed to work, which means no income during that time. The training also needs to fit in with regular ongoing activities. This is an (additional) argument in favour of an “on the job” approach.
If the market does not demand sustainable measures, it is not worth it for construction companies or self-employed workers to invest in expertise.

8.1.4 Inadequate knowledge of the capacities of migrant workers

Language barriers are not seen as the most important obstacle to meeting the 2020 targets. Illiteracy on the other hand, is a risk for many construction workers. In the building sector, the last few years show a growing tendency to work with migrant workers, especially via outsourcing and temp agencies and through small businesses set up by (self-employed) migrant workers (Economic Institute for the Construction Industry [EIB] 2009a). It is not clear how the level of expertise of migrant workers is evolving in comparison to that of Dutch construction workers.

	Total	Of which						
Sector	Self-employed	Poland	Czech Republic	Slovakia	Hungary	Rumania	Bulgaria	Total CEE
General civil /utility construction	6,203	391	93	12	7	29	90	622
Handyman businesses	25,432	3,470	184	93	39	132	486	4,404
Plasterers	3,183	125	5	5	1	7	63	206
Joiners	12,352	155	34	7	10	3	36	245
Painters/glass fitters	7,663	241	22	15	2	8	42	330
Other	26,251	283	18	2	68	25	195	591
Construction industry	**81,084**	**4,665**	**356**	**134**	**127**	**204**	**912**	**6,398**

Table 8.1: Number of self-employed workers and number of businesses set up by people from Central or Eastern Europe (CEE), 1 January 2008 (EIB 2009a)

8.2 Barriers in initial and post-initial training

8.2.1 The gap between training and work

Intermediate vocational training and education prepares students for the exercise of a profession or for further education. In order to warrant a smooth transition to the job market, schools offering intermediate vocational training and education have an extensive outreach to regional corporate employers, municipalities and social organisations. Through these channels, latest developments are communicated, the goal being to translate new insights into the curriculum. 20% of training time is especially reserved to that end. Hence, trainings are considerably informal en diverse. Regional Training Centres absorb and assimilate new developments to different degrees and with varying speed. In that sense, the lengthy development period of qualification files– two years on average – during which new developments are formalised, may be seen as an obstacle in the transfer from training to work. The qualification files form the basis for curricula which are subsequently developed for initial education. Hence, schools are unable to play into current demands and market developments in a timely way.

Initial training is currently used to teach knowledge, skills and competencies which are necessary for daily work on an “average” construction site. Initial trainings pick up on new technologies and methods first, followed by post-initial trainings, if there is sufficient acceptance.

Another obstacle is that trainers are not always sufficiently trained for the newest techniques and so after a while, their knowledge becomes outdated.

Construction and installation are two entirely separate worlds. For an adequate response to extensive energy savings, a more integrated training is required involving both construction and installation. This implies cooperation between construction and installation workers. Roofers, for instance, need to should to work together with installers who are working inside of a building.

8.2.2 Sustainability: not an educational topic

It is unclear so far to what extent skills in relation to energy savings and sustainability form a part of new curricula. In the qualification files, no link has been made as yet between sustainable energy and professional or job competencies. The extent to which sustainability competencies are developed depends on the way in which regional intermediate vocational training institutes (MBO) or individual trainers assimilate this issue in their lessons.

The qualification structure is currently being reviewed. The number of qualifications will be reduced by introducing a domain structure which is expected to enhance coherence and make room for the development of sustainability competencies. It is not yet known how this will happen, nor what the impact will be. Clearly however, construction must begin to explore new ways. This means that teachers to, will need additional training.

8.2.3 Shrinking numbers of students

The Regional Training Centres have pointed out that in times of slump, the number of participants in full-time courses (BOL) increase and that the number of part-timers (BBL) is more likely to shrink. This applies in particular to the lower levels of education. At the moment however, the sector faces a sharp drop in number of students, both full-time (BOL) and part-time (BBL). Another problem is the large percentage of school drop-outs: around 25% within 4 years. Moreover, current teaching staff is also rapidly leaving the labour market, due to retirement.

Thanks to Education and Development Funding supplied by the sector, education contributes importantly to performance in the construction industry. This contribution has now come under severe pressure due to a combination of developments: strong specialisation/fragmentation, increasing fixation on efficiency measures, and waning commitment or involvement of companies in programming and carrying out research and education. Meanwhile, the construction industry in the Netherlands still counts almost 11,000 recognized learning businesses, which represent 50% of all businesses employing staff.

An increasingly flexible job market means that employers invest less in trainings and refresher courses for their employees. More and more, the employee is made responsible for acquiring new skills and competencies.

8.2.4 Complex and disparate supply of post-initial trainings

Post-initial schooling supply in the Netherlands is rather complex and disparate. For the construction industry, the catalogue of the Training Fund [Scholingsfonds] provides a list of available courses. In order to feature in the catalogue, training institutes must meet a number of quality criteria. In addition, the offer of training and courses, in particular those addressing new topics, depends largely on regional and private initiatives, often jointly developed by suppliers and large businesses. This can lead to overlapping subjects, or to a lack of trainings.

When a need arises for a certain course or training, it is not always clear whether it exists or is being developed. Especially for emerging technologies (such as green facades, sustainable lighting, and phase change materials) the number of courses currently available is limited. For technologies which have already been introduced on the market, the supply is larger. The quality of what is on offer is very diverse and a standardised accreditation system is lacking. These circumstances make it difficult for workers to acquire sustainability competencies.

8.3 Other obstructions

Besides barriers related to expertise and training, other obstructions have been identified which bear on home owners / inhabitants and on the built environment:

- Home owners or tenants are not always inclined to have energy saving systems installed as this almost always entails a (substantial) investment up-front, whereas the payback period may take many years. In the present economic situation, this can form such a high barrier that the measure is postponed.
- Energy saving measures already taken can put the break on additional measures. When (recent) adjustments have been made, such as replacement of double window panes by High efficiency panes, this can be a reason not to incur additional costs for say, roof or facade insulation.
- For terraced houses or apartment buildings with an n association of property owners, it may be necessary to obtain agreement from several tenants in order to implement energy saving measures. It may be the case that dwellers differ on the perceived necessity of such measures. This can frustrate the process of decision making and may mean that the measures are not taken.
- Construction characteristics of buildings or of the direct surroundings can make energy saving measures difficult or impossible. Examples are lack of space to install roof insulation, monumental status of a building or qualification as a protected urban scene impeding insulation of the outer walls etc.
- The quality delivered in the construction chain regularly fails to meet client demands or wishes. This is not good for the reputation of the industry. Often, in the building sector, constructors do not bother to check the quality of their work. It is essential that management is geared towards quality, especially in relation to sustainable technologies. At intermediate vocational training level (MBO), students are not taught to put the client first.

9. Conclusions

The preceding chapters show that the Dutch construction industry faces a considerable number of barriers and concerns, both general and specific in nature, in relation to achieving the 2020 energy efficiency targets. The conclusions below focus on the next steps in elaborating the national roadmap, based on the scope of BuildUpSkillsNL.

Most importantly, constructing zero-energy buildings requires changing the working procedures. In the new working procedures, quality is leading. Quality norms and methods to ascertain compliance will play a key role. Better information will have to be made available to (potential) clients on the combined options offered by different construction disciplines, enabling them to make the right choices more quickly. Based on past experience, it is probably not advisable for the construction sector to attempt to change the client. In training situations, on the other hand, better client orientation and more attention to dealing with the client are mandatory. One of the ways to achieve this is by developing a proactive attitude.

A first prerequisite for a positive impact on construction quality is a sense of urgency which needs to permeate all levels and all disciplines involved in the construction process, in particular among professionals and construction managers involved in actual implementation of construction projects. In order to meet pre-set energy targets, full commitment is needed on the part of workers and supervisors, and this goes for both renovated and new buildings.

In general, more time is needed for consultations and assessment of construction projects prior to actual works (building, renovation, installation) as well as evaluation upon completion. The focus is on actual performance of technical solutions and self-assessment. Information availability (i.e. exchange) on expertise and skills levels of professionals needs to be improved and exchange of this information must be promoted. This will also help to monitor persisting high costs of failure in the construction industry and shed light on the causes: (lacking) professional ability or other (business) factors. In addition, communication with clients and/or users and information on solutions applied and their efficiency are of utmost importance.

The different disciplines need to consider themselves as part of the larger picture of the construction project. Taking this coherent approach, individual actors need to know which elements or activities delivered by others with different specialties are important for their own work. Professionals must start to see the importance of each others' contributions and needs. Knowledge sharing is most effectively achieved through knowledge development, as it then becomes a necessary condition rather than an optional activity. Because feedback on knowledge and competencies from the blue collar workforce is crucial for the improvement of construction activities, a learning-on-the-job approach seems to be the most logical. This will also help improve exchanges between the construction and the installation worlds (and possibly even lead to their integration).

Due to the current lack of cooperation between different disciplines, overarching professions hardly exist. There is a high degree of specialisation, and professions are still mostly pigeonholed, while activities or trainings which cover more than one discipline are not stimulated, or even discouraged. The main issue with the blue collar trainings is that the qualification files form the basis of the curricula developed for initial education. This means that education is unable to tune in quickly to current needs and developments in the market. The question is whether anything can or should be done about this, or whether it should be tackled only or mainly by post-initial education. The (single) way out of this dead-end seems to be a stronger focus on teachers, greater expertise and more freedom. Existing and active recognized learning companies, in combination with the increasing group of highly qualified self-employed workers, have great and valuable potential for the construction industry.

The qualification structure is already under review. The number of qualifications is being reduced by introducing a domain structure which will bring more coherence and more room to develop sustainability competencies. It has not yet been established in which way this will happen, nor what the impact will be. Other ways of building are clearly necessary. This means that trainers too, will have to be retrained. Their job is to equip students with the knowledge and skills needed to realise zero-energy buildings. The intermediate vocational training schools face the difficult task of recruiting many

new construction trainers and teachers of installation technology as the old ones retire. The aging population is one of the main concerns for professional construction training.

To encourage intermediate vocational training schools to give due attention to knowledge and skills relevant for the realisation of energy efficient and sustainable buildings, it may be necessary to review the professional competency profiles. Energy saving is still not a part of daily practice. Hence this aspect is currently not taken into account in the professional competency profiles. Although concepts such as sustainable building, heat loss, energy (consumption), CO2 reduction, insulation and other concepts related to sustainable construction hardly enter into play in practice, they will have to be assimilated into the professional competency profiles. During initial training, emphasis is required on quality of completed work and context-sensitive use of materials rather than production speed and use of separate materials. As well as “soft skills”, the focus should be on integral preparation, evaluation and cooperation (ambassadorship).

In an increasingly flexible labour market, in which employers tend to invest less in training/retraining of their employees, responsibility for acquiring new skills and competencies rests increasingly on the shoulders of employees. This development, which essentially delays the achievement of the 2020 targets, can on the other hand accelerate the development of specialisations and new professions, such as insulation specialists and installers or builders of prefab buildings parts or components. It may also indirectly affect existing professions, combined with the long-expected shift of activities from the construction site to prefabrication or manufacturing workplaces, another process factor which influences the realisation of (or aspiration to realise) zero-energy buildings. Although current trends do not show it yet, this shift is expected to get an additional push as prefab parts and installations stand for higher and more consistent quality than parts or installations which are produced or assembled on site.

The combination of factors named above underline how important it is that priority it given to elaborating an adequate roadmap.

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BACK COVER

BUILD UP Skills

The EU Sustainable Building Workforce Initiative in the field of energy efficiency and renewable energy

BUILD UP Skills is a strategic initiative under the Intelligent Energy Europe (IEE) programme to boost continuing or further education and training of craftsmen and other on-site construction workers and systems installers in the building sector. The final aim is to increase the number of qualified workers across Europe to deliver renovations offering a high energy performance as well as new, nearly zero-energy buildings. The initiative addresses skills in relation to energy efficiency and renewable energy in all types of buildings.

BUILD UP Skills has two phases:

I. First, the objective is to set up national qualification platforms and roadmaps to successfully train the building workforce in order to meet the targets for 2020 and beyond.

II. Based on these roadmaps, the second step is to facilitate the introduction of new and/or the upgrading of existing qualification and training schemes.

Throughout the whole duration of the initiative, regular exchange activities are organised at EU level to underline the European dimension of this important initiative and to foster the learning among countries.

The BUILD UP Skills Initiative contributes to the objectives of two flagship initiatives of the Commission's 'Europe 2020' strategy — 'Resource-efficient Europe' and 'An Agenda for new skills and jobs'. It is part of the Commission's Energy Efficiency Action Plan 2011. It will also enhance interactions with the existing structures and funding instruments like the European Social Fund (ESF) and the Lifelong Learning Programme and will be based on the European Qualification Framework (EQF) and its learning outcome approach.