

# Long-Term View on Construction 2035

7 Big Steps

2021

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For the future of  
Estonia

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# 1. INTRODUCTION

The Centre for Applied Social Sciences (CASS) of Tartu University has highlighted in the study “Analysis of Productivity, Added Value and Economic Impact of the Construction Sector” commissioned by the MEAC prior to this work<sup>1</sup> (hereinafter referred to as the *Construction Productivity Survey*) the important role of the construction sector in the socio-economic development of society: through construction activities, companies create wealth, which accounts for about 6% of GDP and, together with the real estate sector, 16% of GDP. **The construction sector creates new jobs, supports the sustainable development of the economy and provides an opportunity to address regional, social, climate, cultural heritage and energy challenges<sup>2</sup>**, which is why the sector plays an important role in the government policy-making.

In the course of general economic growth, the Estonian construction sector has grown rapidly in recent years - the construction volume of approximately 3.2 billion euros in 2018 exceeded the level of the most active construction year so far, 2007, for the first time. In 2019, the construction volumes were even higher, but according to preliminary information, in 2020 they fell again to the level of 2018.<sup>3</sup>

At the same time, the construction sector is facing various **problems and challenges** that ultimately reduce the international competitiveness of the construction sector, for example:

- low productivity (productivity of the Estonian construction sector is twice lower than the EU average);
- reduced growth of added value;
- lack of innovation;
- non-transparent and fragmented processes;
- cyclicity;
- pro-cyclicality of public sector construction investments (increase in investment volumes in the economic growth phase and decrease in the volume in the economic downturn phase);
- lack of consideration of energy consumption in buildings and CO<sub>2</sub> emissions in the sector;
- fragmentation of the construction sector (mostly small companies);
- lack of cooperation in the sector;
- shortage of skilled workforce and, on the other hand, valuing of skilled workforce - i.e. how much the sector itself values (incl. in terms of wages) trained/skilled specialists compared to an employee without professional skills;
- low export potential;
- etc

Today's project-based approach in the construction sector leads to the fragmentation of the value chain and lacks to provide a lifecycle-wide view of a building, focusing primarily on meeting contractual obligations rather than involving a balanced comprehensive spatial solution, additional financial benefits or innovation.<sup>4</sup> At the same time, shifting the focus to the construction value chain as a whole is one of the most important ways to make the sector more efficient from a broader perspective and, on the other hand, to reduce the total cost of building life.

The aforementioned challenges are largely due to the external environment and third parties (such as the public sector as a policy-maker and contracting authority), while bottleneck situations create new challenges in the built environment (e.g. lack of a comprehensive vision for high-quality, environmentally friendly and healthy living environment). **The principles of high-quality spatial planning** developed in 2019<sup>5</sup> have not been implemented in practice. Consequently, specific steps need to be taken to understand, evaluate and make decisions based on common values and principles.

<sup>1</sup> [https://www.mkm.ee/sites/default/files/ehitussektori\\_tootlikkuse\\_lisandvaartuse\\_ja\\_majandusmoju\\_analuus.pdf](https://www.mkm.ee/sites/default/files/ehitussektori_tootlikkuse_lisandvaartuse_ja_majandusmoju_analuus.pdf)

<sup>2</sup> <https://www.weforum.org/projects/future-of-construction>

<sup>3</sup> Source: Statistics Estonia

<sup>4</sup> Vrijhoef, R., Koskela, L. A Critical Review of Construction as a Project-based Industry: Identifying Paths Towards a Project-independent Approach to Construction. <http://www.irbnet.de/daten/iconda/CIB6804.pdf>

<sup>5</sup> The principles of high-quality spatial planning are timeliness and relevance, expediency, adaptability, economy and efficiency, climate and environmental friendliness, safety and health, accessibility, social cohesion, diversity, distinctiveness and perception of place, heritage friendliness and aesthetics: [https://www.kul.ee/sites/kulminn/files/lisa\\_3\\_-\\_kvaliteetne\\_ruum\\_aluspohimotted.pdf](https://www.kul.ee/sites/kulminn/files/lisa_3_-_kvaliteetne_ruum_aluspohimotted.pdf)

The analysis and suggestions made by the expert group on spatial development have not yet been implemented in full<sup>6</sup>. In order for the further development of the construction sector in Estonia to be uninterrupted and competitive and for the built environment to support the needs and interests of the population, **it is important to create a common understanding of the vision between various parties, aimed at achieving cross-cutting goals.**

**Long-Term View on Construction 2035** is focusing on the identification of<sup>7</sup> main causes to ensure the best development of the construction sector, shaping a high-quality built environment and wording the objectives for the development of this field of activity. This forms the basis for public agreement, cooperation and change in the legal environment between the public and private sectors (including relevant stakeholders). The document can serve as an input in designing a strategic development document on the living environment. Long-Term View on Construction 2035 involves **seven major steps**. The starting point is how to create a better living environment while ensuring a more efficient construction industry. In order to achieve a more extensive effect on society, the first step is to determine the role of the public sector as the pioneer, which, on the one hand, provides a basis for structural changes, while on the other hand ensures the cooperation of different parties. The task of the state as the policy-maker and a major contracting entity is to create a suitable environment for the implementation of changes in the sector, which can be achieved only through long-term and purposeful action. In fact, the strategic development of the construction sector causes a significant effect on the whole society, as construction, which is a horizontal economic sector, serves as a basis for the development of all other sectors.

The construction sector cannot be viewed as a separate industry. First of all, it is difficult to define the clear borders of the construction sector, as the value chain of the construction industry is very wide and not limited to companies specializing in the construction. For example, minerals, waste, logistics, real estate, industry and many other fields are largely dependent on or contribute to construction, but companies specialized in these activities are not classified as construction companies. Secondly, the construction industry has similar features as other industries, which means that the problems and possible solutions that promote economic success and quality are not necessarily unique in here. However, there can be no doubt that for many people, businesses, countries and other potential owners, a building is usually one of the biggest investments. The result of construction will shape our living environment and society for decades, hundreds or even thousands, often exceeding the lifespan of the original owner. Due to the low recurrence, many owners cannot consider themselves proficient in making construction investment decisions, due to which the best solutions may never be implemented. It is therefore likely, and explained in this document, that there are many untapped opportunities for more skilful management of construction investments. The great development potential of the processes in the construction sector will lead to a significantly more efficient economy and a higher quality living environment. The problems and solutions presented in this document can also serve as an example for solving similar problems in other economic sectors.

The preparation of the document “A Long-Term View on Construction 2035” was organized and the corresponding study was commissioned by the Ministry of Economic Affairs and Communications within the framework of the program “**Strengthening of Sectoral Research and Development**” (abbreviated RITA, code 2014-2020.4.02.16-0025). The project was funded to the extent of 60% by RITA Activity 2 from the European Regional Development Fund and by 40% from the budget of the Ministry of Economic Affairs and Communications. The author of the cover image of the document is Rasmus Jurkatam.

The Government of the Republic approved the document at the Cabinet meeting on April 27, 2021, and the “Agreement for Taking Seven Big Steps in the Construction Sector” was signed by the Minister of Economic Affairs and Infrastructure and representatives of local governments, professional associations and universities in Tallinn on June 9, 2021

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<sup>6</sup> [https://www.kul.ee/sites/kulminn/files/ruumiloome\\_lopparuanne\\_.pdf](https://www.kul.ee/sites/kulminn/files/ruumiloome_lopparuanne_.pdf)

<sup>7</sup> In this document, construction includes all activities in the traditional sense of construction and other activities directly related to construction. The broader definition of the construction sector, i.e., the value chain of the whole sector, is discussed. In addition to general contracting and subcontracting companies, the construction sector also includes companies producing and supplying construction inputs (planners, surveyors, architects, civil engineers, designers, manufacturers of construction materials, etc.) and parties involved in the sale and use of construction as an end-product (repairers, managers, maintenance, brokers, interior designers, etc.).

## 2. CURRENT SITUATION IN THE ESTONIAN CONSTRUCTION SECTOR

### 2.1. STRENGTHS OF THE CONSTRUCTION SECTOR

In addition to addressing the challenges in the construction sector, it is equally important to recognize the positive achievements of the sector and to further develop these strengths. On the whole, people's **satisfaction with the condition of housing has increased**, which is expected to be due to the **improvement of construction quality**, but also to the established **construction standards**<sup>8</sup>. On average, the satisfaction of the Estonian population with the housing has improved by 10% in ten years<sup>9</sup>.

The **capacity to conduct electronic procurements** deserves to be highlighted - the public procurement process is open and it is managed through a comprehensive e-procurement platform. Public procurements are transparent, competition is guaranteed, procedures are fast and complaints are resolved quickly. The introduction of the electronic procurement system will lead to a reduction in administrative costs. In addition to the lowest price criterion, the Public Procurement Act allows for and even favours the setting of qualitative, environmental or social evaluation criteria, which help ensure the selection of a tender with the best price-quality ratio.<sup>10</sup> The Road Administration (from 2021 the Transport Administration) and State Real Estate Ltd., which are state contracting authorities, have carried out several successful procurements that take into account quality criteria, and the construction sector assesses the competencies of these agencies. However, there is still much room for improvement in the implementation of value and collaboration based procurement in international comparison.

**The productivity of the construction sector has grown rapidly** in recent years: from 2015 to 2018, the productivity of the Estonian construction sector has grown by 35% (see Section 2.2.7), which is a significant improvement, however, still below the European average. Added value has increased mainly in the industry of special construction works, as well as in architectural and engineering activities, the export potential of which is the largest in case of fluctuations in market demand.<sup>11</sup> The successful export of timber construction, in which we are by far the first in Europe, deserves to be highlighted.

The strengths of the Estonian construction sector include the implementation of smart house solutions, solutions for building wooden houses, as well as coverage with professional standards in the industry (OSKA study). The state, in co-operation with the construction sector, has made **digitalisation in the industry** a priority (e-construction vision, development of the digital twin, developments of the building register and planning procedural environment, etc.) and has made strong progress in this regard. Professional associations and clusters function well.

PIMA raport<sup>12</sup> highlights sustainable investment as Estonia's strength, which has helped Estonia reduce gaps in both access to and quality of public infrastructure. In particular, progress has been made in the field of roads and electricity. The public sector has a **strong and well-functioning investment management framework**, which is a pre-condition for effective investment management.

### 2.2. DEVELOPMENT PROBLEMS

When describing the Estonian construction sector, it is important to point out the problems in the construction sector today. The following list with reasons and explanations has been prepared as a result of analyses of the construction sector, strategies and other documents (a detailed overview of the documents is provided in the list of references) and has been complemented with input from experts in the field through interviews and workshops.

The main problems are:

1. Lack of a long-term view on living environment,
2. Lack of a long-term and counter-cyclical construction investment plan,

<sup>8</sup> Estonia's long-term strategy "Estonia 2035" <https://www.riigikantselei.ee/et/Eesti2035>

<sup>9</sup> Estonian Statistics "Sustainable Development Indicators" 2018

<sup>10</sup> <https://www.riigiteataja.ee/akt/101072017001>

<sup>11</sup> <https://oska.kutsekoda.ee/wp-content/uploads/2018/02/OSKA-Ehitus-terviktekst.pdf>

<sup>12</sup> [https://www.rahandusministeerium.ee/sites/default/files/Riigieelarve\\_majandus/estonia-pima-final-report.pdf](https://www.rahandusministeerium.ee/sites/default/files/Riigieelarve_majandus/estonia-pima-final-report.pdf)

3. Lack of smart contracting entity principles and their implementation,
4. Environmental sustainability and efficiency problems,
5. Slowdown in export growth,
6. Lack of openness to innovation,
7. Low productivity,
8. Bad reputation of the construction sector.

### 2.2.1. LACK OF A LONG-TERM VIEW ON LIVING ENVIRONMENT

Given that the spatial development and construction are influenced by many different interests and goals of the private sector and the state, the goals and tasks of the parties regarding construction are divided between several different organizations, including government agencies and their subordinate agencies. This makes it difficult to manage the development and innovation in the construction sector.

**The Department of Construction and Housing of the Ministry of Economic Affairs and Communications** has a leading role here, but the following departments also have their important roles: Energy, EU and International Cooperation, Information Technology, Economic Development, Business And Consumption Environment, Mineral Resources, Transport Development and Investment, Road and Railway Resources, and External Resources. Under the governance of the MEAC, the Consumer Protection and Technical Surveillance Authority, the KredEx Foundation and the Transport Administration also contribute to the coordination of the construction sector.

In performing its tasks, the MEAC co-operates closely with the **Ministry of Finance**, as well as State Real Estate Ltd. and Statistics Estonia operating under the governance of the Ministry of Finance. **The Ministry of Justice** also plays an important role, as does the **Ministry of Social Affairs** together with the Health Board. **The Ministry of the Interior** and the Rescue Board are also important co-operation partners. In the construction industry, environmental issues receive more and more attention, with the **Ministry of the Environment** and the Environmental Board and the Land Board under the governance of the Ministry of the Environment playing a key role. The Ministry of Culture is responsible for architectural policy and cultural heritage policy, the Heritage Protection Act is implemented by the National Heritage Board. The role of the Ministry of Education and Research in the organization of the education system is no less important, including the Estonian Qualifications Authority, which coordinates the qualification system in the construction industry.

In addition to ministries and agencies in their area of government, local government units play an important role in making spatial planning decisions. Decisions related to the spatial plans also provide information on the development trends of the built environment in Estonia, which is the basis for shaping national construction and housing policy. In addition to the above, there is constant cooperation with professional associations and other umbrella organizations in the field, such as the Estonian Association of Construction Entrepreneurs, the Estonian Association of Architectural and Consulting Engineering Companies, the Association of Estonian Cities and Municipalities, the Union of Estonian Architects, the Estonian Homeowners Association, the Estonian Woodhouse Association, the Digital Construction Cluster and many others.

**The fragmentation of the industry** has created a situation where different agencies have prepared different studies, analyses, development plans and strategies for parts of the living environment, but nobody has come up with a comprehensive strategy with an action plan and a vision for the living environment. The various sectoral development plans are also not clearly linked, and it is primarily a question of clarity and adherence to the agreements reached in the action plans drawn up to implement the strategies. For example, the construction sector has a direct link to the Estonian Strategy for Research, Development, Innovation and Entrepreneurship (TAIE)<sup>13</sup>, the Energy Economy Development Plan (ENMAK) and the Transport and Mobility Development Plan. However, the construction sector as such has not been addressed in the strategic documents as a whole<sup>14</sup> and thus there is no one responsible for efficiency and quality problems to address these bottlenecks.

**"Estonia 2035"** will play the role of such an umbrella strategy<sup>15</sup>, the aim of which is to develop and support the well-being of our people so that in twenty years Estonia will be the best place to live and work, and which should provide a unified direction to policy-makers and decision-makers in various industries and to the use of the state budget or European money. In the preparation process, **one of the five priorities of the Estonian state**

<sup>13</sup> Among the focus areas of TAIE, construction is primarily related to digital solutions in every area of life, valuing local resources and smart and sustainable energy solutions.

<sup>14</sup> The links with national strategic planning are explained in more detail in Section 2.3.1

<sup>15</sup> <https://www.riigikantselei.ee/et/Eesti2035>

**is to create a safe and high-quality living environment that takes these needs into account**, as well as to create a space and infrastructure that meets the needs of society through comprehensive and high-quality planning and renewal of space, taking into account the needs of society, population change, health and environmental protection. This provides direction, but the change would require a more specific action plan on how to achieve the objectives. It has not been created so far. In the field of spatial planning, an important umbrella document is the **National Spatial Plan "Estonia 2030+"**<sup>16</sup> with its action plan, but today this document is not linked to the activity-based budgeting system and public investment planning. The task of the National Spatial Plan is to define the principles and trends of the country's spatial development. It provides guidelines for more detailed planning to address spatial development issues at the local level. Together with the guidelines for promoting the creation and maintenance of a comprehensive and high-quality environment for the development of spatial development principles and trends, it is an effective tool for implementing the long-term principles of high-quality spatial planning and the long-term vision of improving the living environment. In this way, they find a direct output in the next level of spatial planning and are the basis for construction activities. Based on a review submitted to the government in 2020<sup>17</sup> the government has instructed the Ministry of Finance<sup>18</sup> to prepare for a New National Spatial Plan. According to the review, a valid national plan was prepared in 2011-2012 both by involving sectoral expertise and by actively cooperating with stakeholders across Estonia. Over the last ten years, a number of issues have both emerged and become more specific, being strongly related to land use management. The probability that in the next five years the review of the national plan would still include a number of new implemented spatial planning objectives is not high, because for the most part the plan has been implemented, for example, in the context of infrastructure construction, or has reached the final phase. Also, the new issues that have arisen (new objectives for climate and environmental goals, basic principles of high-quality spatial planning, planning to adapt to reduction, challenges in the field of housing, promoting biodiversity in changing land use situations,<sup>19</sup> etc.) can no longer be resolved through amendments to the action plan but essentially through the preparation of a new plan and its action plan. Thus, in the coming years, it is necessary to start the process of updating Estonia's central spatial planning development document, which, according to the Planning Act, takes place partly through the preparation of a New National Spatial Plan, but is probably not enough for major changes.

At the same time, there is no common understanding of **what we mean by a high-quality living environment** and what should serve as a basis for planning the investments in the living environment. Laws that affect space do not set out the **objectives of spatial development**, but are limited to the regulation of procedures and narrow sectoral objectives.<sup>20</sup> As a result of the spatial development work group initiated by the Government of the Republic in 2019, **the principles of high-quality spatial planning were formulated**<sup>21</sup>, which is a step forward in describing the values of the living environment.

Thirdly, the lack of a common long-term vision and agreements in the industry leads to a situation that does not consider **a comprehensive approach to the life cycle of buildings and areas**, the concept and approach of which are not always understood in the same way by the parties. Decisions are often made on a project- and phase-basis and needs-based cooperation across the life cycle does not work because activities are limited in terms of time, funds and due to the legal framework. If the emphasis is on making each individual process as cost-effective and efficient as possible, the perspective of long-term benefits won't be addressed. Insufficient work at the design stage and the consequent change in decisions in the following stages usually reduces the final quality of the building, prolongs the completion time, is not optimal in the use phase and, in the end, proves to be more costly. In case of the comprehensive life cycle view, the focus is broader than the specific characteristics or processes of individual buildings, covering the functionality of buildings as integral components of a high-quality living environment. This focus will reveal the opportunities that provide long-term savings, are health sustainable,

<sup>16</sup> <https://www.rahandusministeerium.ee/et/ruumiline-planeerimine/uleriigiline-planeering>

<sup>17</sup> [https://www.rahandusministeerium.ee/sites/default/files/Ruumiline\\_planeerimine/yrp\\_ylevaade\\_2020.pdf](https://www.rahandusministeerium.ee/sites/default/files/Ruumiline_planeerimine/yrp_ylevaade_2020.pdf)

<sup>18</sup> <https://dhs.riigikantselei.ee/avalikteave.nsf/documents/NT00212172?open>

<sup>19</sup> The construction sector depends on nature and its benefits, thus, preserving and promoting biodiversity is important in terms of the sustainable life cycle of the built environment. See also [EU Biodiversity Strategy for 2030](#).

<sup>20</sup> [https://www.kul.ee/sites/kulminn/files/ruumiloome\\_lopparuanne\\_.pdf](https://www.kul.ee/sites/kulminn/files/ruumiloome_lopparuanne_.pdf)

<sup>21</sup> [https://www.kul.ee/sites/kulminn/files/lisa\\_3\\_-\\_kvaliteetne\\_ruum\\_aluspohimotted.pdf](https://www.kul.ee/sites/kulminn/files/lisa_3_-_kvaliteetne_ruum_aluspohimotted.pdf)

usable and accessible to all groups in society,<sup>22</sup> and reduce emissions to the natural environment through efficiency and longevity.

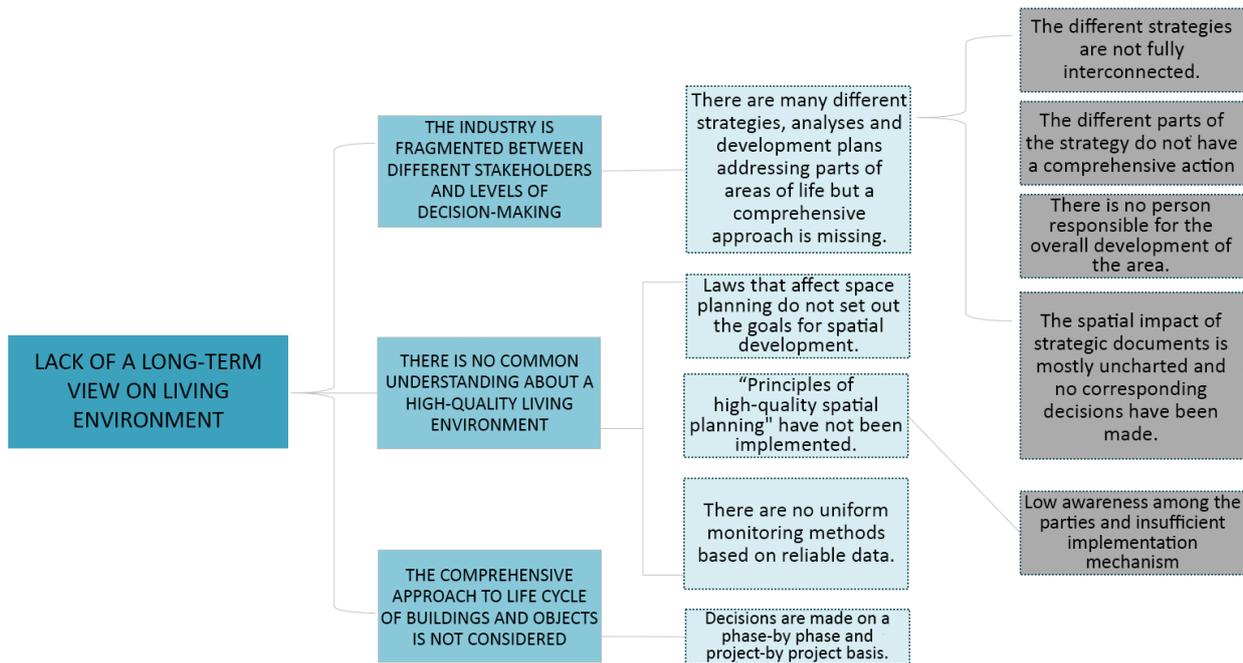


Figure 1. Reasons for the lack of a long-term view on the living environment

### 2.2.2. LACK OF A LONG-TERM AND COUNTER-CYCLICAL INVESTMENT PLAN

So far, one of the problems with the functioning of the Estonian construction and real estate market has been **the pro-cyclical or cycle-enhancing capital investments of the public sector**, which has led to overheating, i.e. an even stronger upturn and a sharper downturn than it would have been without public intervention. The volume of the state budget depends on the current state of the economy, the forecast of economic growth or decline, and the assessment of the economic cycle. In the recession phase, the state collects less taxes, which means that the state has to find budget savings for such a forecast. One of the measures used is the postponement of investments, which in turn reduces government orders and the downturn in the construction sector deepens. In the cycle of economic growth, the state increases investments in the construction sector which leads to an additional leverage effect - prices rise, quality decreases, there is a shortage of workforce. To capture the right direction of the economic cycle, i.e. **the accuracy of forecasting and taking it into account**, is of critical importance. It is important to notice when the direction of the cycle changes and to react to it cautiously and counter-cyclically, thus softening sharp rises and falls.

Certainly, the lack of a long-term investment plan is related to the lack of a comprehensive long-term view on the living environment (see Section 3.2.1 for more details). Public **investments are made in individual projects**, there is no direct link between planning and investment decisions. Contracting authorities do have long-term procurement plans, but this is rather an exception, this practice is not harmonized and is not widespread in the country. In the case of construction, the area of use of the object has been considered rather than the creation of a complete living environment. This means that planning is not based on society as a whole, the conditions of a shrinking population and other regional developments are not always taken into account. Due to the shortness of the period covered by the contracts, the companies do not have sufficient security. The state budget strategy is prepared for four years, in the worst case, investments are added within the framework of the annual budget process, which means that there is no long-term investment planning at the national level. **Political (individual) decisions** may not support the best solutions

<sup>22</sup> The overall term "inclusive design" is used, see the guide "Planning and creating an all-inclusive living environment": [https://www.astangu.ee/sites/default/files/media/koiki\\_kaasava\\_elukeskkonna\\_kavandamine\\_loomine.pdf](https://www.astangu.ee/sites/default/files/media/koiki_kaasava_elukeskkonna_kavandamine_loomine.pdf)

that would actually be needed to develop a complete living environment, and that would promote the construction sector.

The International Monetary Fund (IMF) public sector investment analysis (PIMA)<sup>23</sup> published in June 2019, points out that the Estonian state manages its investments well financially, but the long-term planning, selection, evaluation and monitoring of investments need to be improved. There is also no central overview of public sector investments, i.e. their adherence to the time and funding schedule during the development process. The lack of a long-term vision hinders the development of the country's competitiveness.

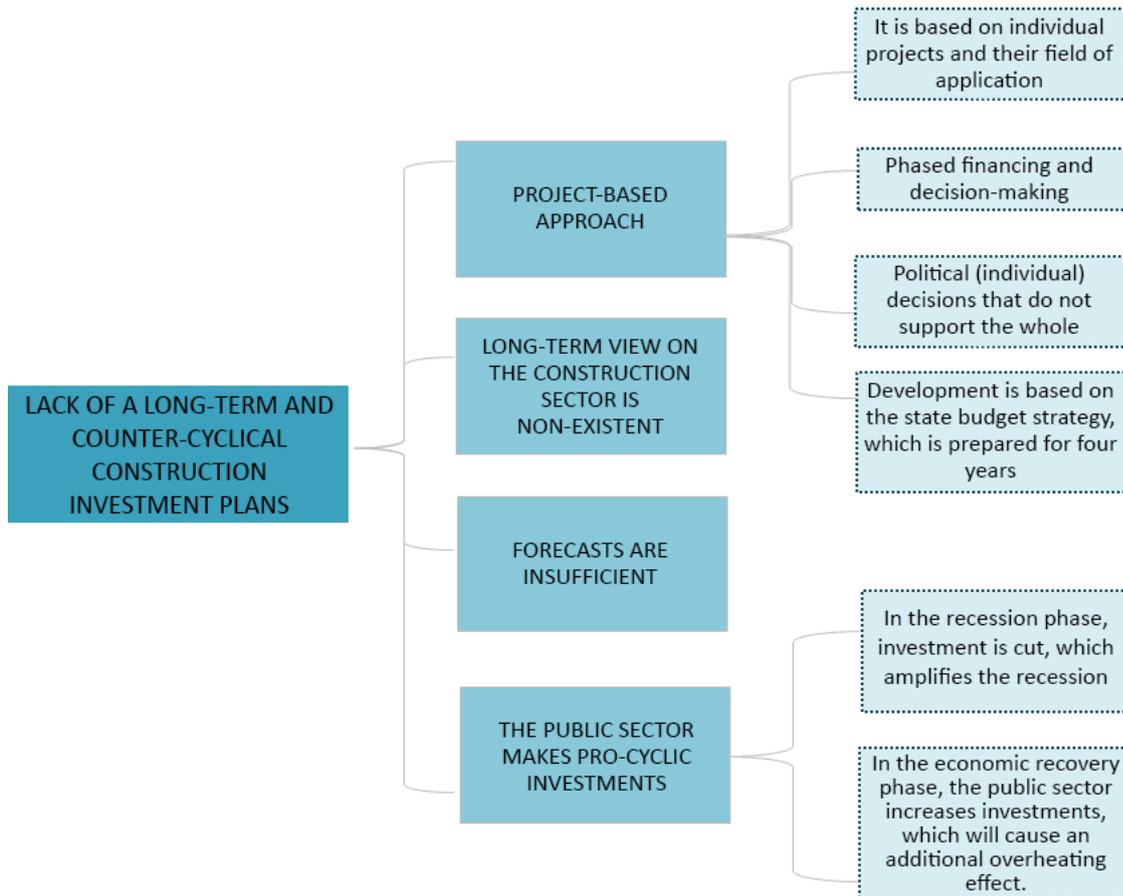


Figure 2. Lack of a long-term construction investment plan

### 2.2.3. LACK OF SMART CONTRACTING ENTITY PRINCIPLES AND THEIR IMPLEMENTATION

The principle of a smart contracting entity means the application of sufficient competence and knowledge when ordering, the ability to anticipate the whole picture and to map and manage the risks that come with construction. A high-quality building or facility starts with competent planning and terms of reference, thorough research and an appropriate design. A smart contracting entity uses value-based, collaborative and innovative procurements. While in the IT field we have learned to buy services on the basis of value, then in construction the only criterion is the lowest price, which does not correspond to the meaning and requirements of the law. This is a bad practice, which in turn hampers innovation and the development of high-quality solutions. Skimping and haste in the early stages of construction will inevitably lead to time-consuming disputes and large additional costs. A shorter than needed planning period (i.e. pre-design work, including planning, pre-works, analyses) for construction projects, which is cumulatively carried over to later stages, both construction and exploitation stages, has a significant impact on the added value and productivity of the companies operating there. There are also unreasonable deadlines for submitting tenders and completing construction, without considering all the processes thoroughly enough, there is no time to find innovative solutions, deadlines are not met (see also the problems of company management described in Section 2.2.7).

<sup>23</sup><https://www.rahandusministeerium.ee/et/avaliku-sektori-investeeringute-planeerimise-ja-labivimise-tohustamine>

There is also quite a lot of delegation and multi-layered and lowest cost outsourcing that scatter responsibilities. **This will result in a situation where no one is responsible for the whole.** Co-operation procurement models (such as alliance procurement) have not yet been introduced in Estonia.

Often, the state and the public sector do not act as leaders and role models for smart contracting. Model practices have been partially developed in competence centres, including RKAS (for public sector real estate) and the Transport Administration (for infrastructure). Wider use of their competence in supporting local governments, for example, could also be considered, as the quality of procurement outside the centres is rather low according to the sector. On the one hand, this is due to the lack of a long-perspective and long-term investment plan described above. **A project-based approach and individual policy decisions at making investments** may not support the best solutions that would actually be needed to develop a comprehensive living environment and would result in a public sector leading the way in smart contracting. In addition, **specialists with spatial planning education** have been employed enough at the state level to fulfil the goal of improving the living environment and to ensure competent decision-making in terms of spatial development.<sup>24</sup>

In the construction sector, the contracting authorities are both private and public sector organizations. The problem of a smart contracting entity is exacerbated by the **inadequate number of trained professionals**. Specialists with certain higher education are needed by both the public and private sectors, in the case of other specialists too many people enter the sector every year. On the one hand, the lack of specialists is exacerbated by the **small number of construction students in higher education** and the high drop-out rate, i.e. there are not enough graduates who would come to work in the field of construction. The reasons for this can be found in the fact that construction specialties cannot compete with more popular professions (e.g. IT). On the other hand, schooling depends on the cycles of the field - during the economic downturn, there is time to go to school and study, during the economic upswing, students are already hired from the school bench and so their education path is interrupted.

More cooperation between architects and engineers is needed to create a unified value system and set goals. In all specialties dealing with space, including engineering, more strategic planning and urban planning, the connections between construction and planning, and the effects on society, the environment, etc. need to be introduced. Unfortunately, very often there is a lot of misunderstanding and the quality of cooperation suffers.

The Green Paper on Spatial Planning<sup>25</sup>, too, addresses the need for training, by highlighting the following:

- to promote planner education (level training, in-service training) in order to ensure the growth of competent planning officials and planning consultants and the competence of existing ones;
- continuous training and promotion activities for planners, decision-makers, participants in planning and the general public.

Knowledge of the basic principles of high-quality spatial planning (including inclusive design) should be promoted in construction-related disciplines (not only in architectural and planning education, but also, for example, in civil engineering study). A common understanding of the goals for creating a living environment makes it possible to alleviate the conflicts of different interests in creating a built environment.

In addition to the small number of students in higher education and high drop-out rate, the seminars and discussions conducted during the analysis also highlighted as a problem that the **training offered in the specialties is not practical enough or up-to-date**. The reasons for this are that not enough entrepreneurs are involved in curriculum development (although they are involved in the preparation of qualification requirements or professional standard), internships are not always mandatory or good internships are difficult to find and companies do not cooperate enough with educational institutions on RDI from which educational institutions could also learn and pass on the knowledge. **The weakness of the construction sector is the lack of project managers with management knowledge**. Universities should pay more attention to teaching leadership and collaboration skills when designing construction specialty curricula. The shortage of trained professionals in the public sector would be improved if relevant professional experience in the public sector were taken into account in maintaining a professional level in the construction sector. At the moment, a public sector employee who wants to maintain a professional level must also work in the private sector.

<sup>24</sup> [https://www.kul.ee/sites/kulminn/files/ruumiloome\\_lopparuanne\\_.pdf](https://www.kul.ee/sites/kulminn/files/ruumiloome_lopparuanne_.pdf)

<sup>25</sup> <https://planeerimine.ee/static/sites/2/ruumilise-planeerimise-roheline-raamat.pdf>

Experience gained in the public sector should be taken into account in a number of specialties, such as architects, landscape architects, planners, civil engineers and engineers, in order to maintain a professional level. There are professional standards at the level of skilled workers, but there are (almost) no workers with a professional certificate. The construction business model, where a project management company hires subcontractors to carry out construction work, does not favour the certification of professional qualifications:

- the main contractor or the project management company does not want to have additional requirements (for example, that all construction workers must have proven professional skills) which prevent them from freely choosing and changing subcontractors;
- the general contractor, who has the resources to train, is not interested in training skilled workers because it does not employ the workers itself;
- a subcontractor, who often has to make ends meet without an opportunity for development, cannot afford training because it does not have the resources (money, time) and is afraid about employees leaving.

**To ensure substantive quality, skilled construction workers (evidenced by a professional certificate) are needed.**

According to the participants in the analysis discussions, the number of **in-service trainings** also does not correspond to the actual demand and need of the market. At the same time, due to high turnover and tight work schedules, company managers may lack motivation to train employees. The training simply is not cost-effective. Businesses are small and lack the necessary resources.

In the case of a shortage of skilled workforce, the current practice of companies in valuing people should be observed. To what extent does the sector itself value (incl. in terms of remuneration) a trained/skilled specialist compared to an employee without professional skills? In a sense, it is a vicious circle - companies could raise wages, but this means that the prices of services and products must be increased, and the customer must be prepared for that.

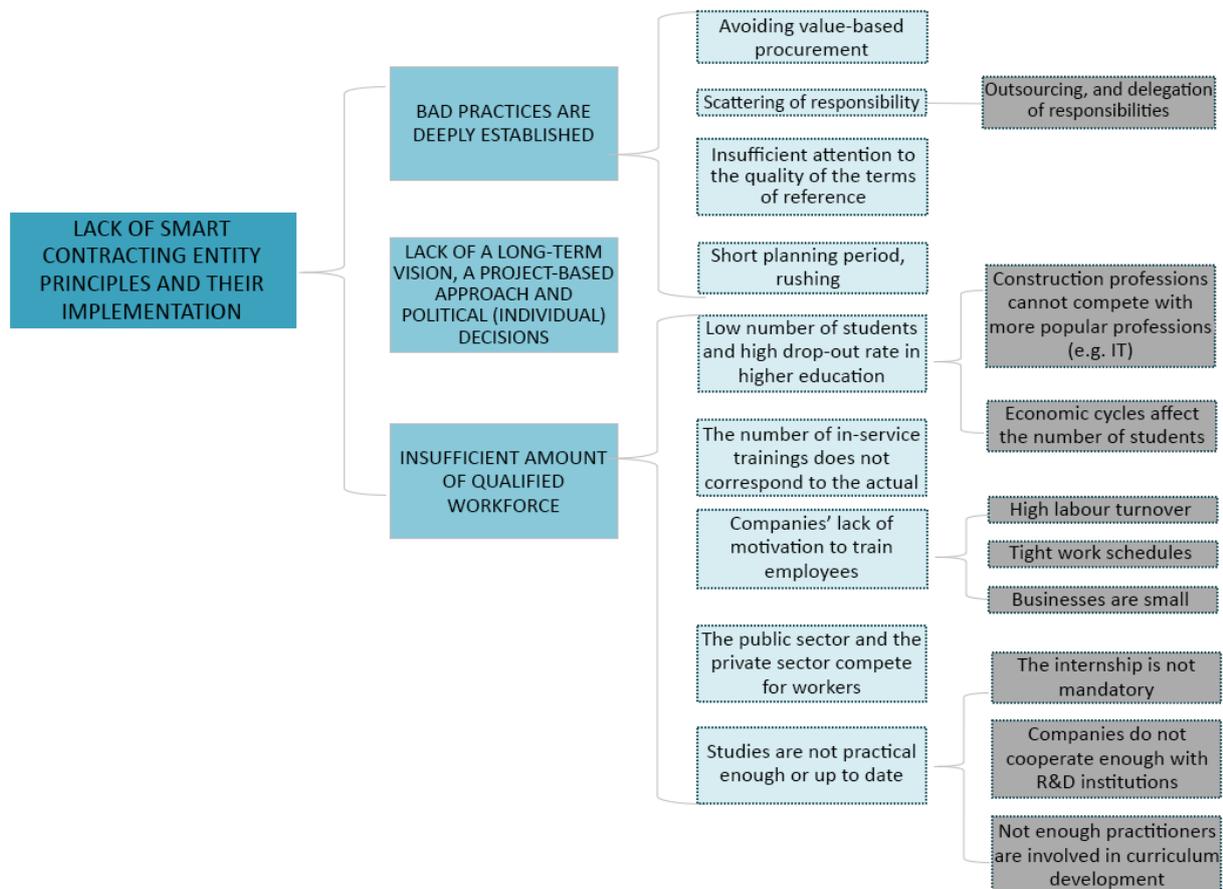


Figure 3. Reasons for the lack of smart contracting principles and their implementation

## 2.2.4. ENVIRONMENTAL AND HEALTH SUSTAINABILITY PROBLEMS

The application of the principles of environmental sustainability must be viewed **throughout the construction life cycle** instead of by individual stages. This means that these principles must be recognized in all activities in the construction industry - in the preparation of terms of reference, planning, design, construction, exploitation as well as demolition/renovation and handling of construction materials and products. The Estonian construction industry is fragmented, it includes very different fields of activity - architects, builders, consultants and engineers, specialized subcontractors. This means that informed and responsible decisions must be made at all stages and by all parties. However, the later the decision is made, the less impact it can have, or the more costly and environmentally harmful it will be. The cheapest and most environmentally friendly way is to make the right decisions during the stage of drafting the terms of reference.

Environmental sustainability is not only a concern of the contracting authority but also of the tenderer, who should achieve savings in the production process or in the provision of the service. Increasing attention, for example, to reducing CO<sub>2</sub> emissions in production is becoming increasingly important if one is to compete in both domestic and foreign markets<sup>26</sup>. As 50% of natural resources is directed into construction, the limited and fragmented view on the principles of the circular economy in the construction sector makes global resource efficiency virtually impossible.

In the European Union, buildings consume on average 40% of all final energy consumption, in Estonia this figure is 50%. Old buildings are energy intensive and no energy efficiency and indoor climate requirements were in place at the time of construction. Many of these buildings have not been renovated or brought into line with current requirements. One can say that addressing the reduction of energy use in the existing housing stock is not systematic and planned, **there are no overviews of objects in need of reconstruction and renovation**, which hinders the planning of further activities in these areas. This is partly due to the fact that such **data is not aggregated, information systems are not compatible with each other**.

Modern construction activities are moving from open construction sites to factories. It also has a positive impact on environmental sustainability, by helping address these problems more effectively. In Estonia, this is currently manifested in a strong cluster of wooden house construction, but in terms of increased productivity in the construction sector, it is important that **off-site manufacturing** expand more actively to other construction areas as well.

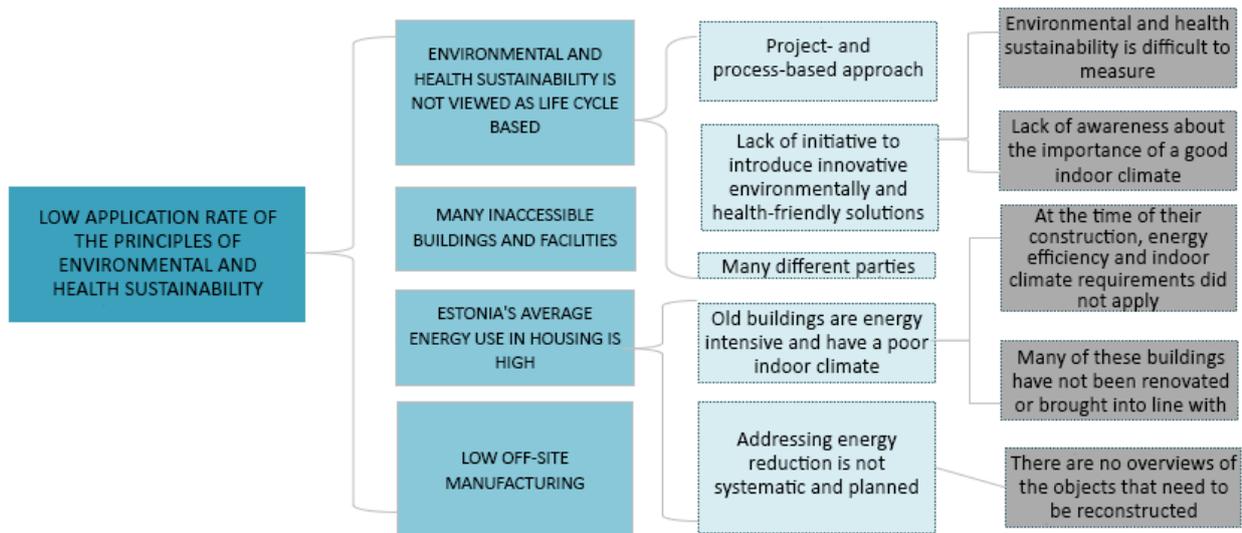


Figure 4. Causes of environmental and health sustainability problems

In addition, it is important to keep in mind that in terms of societal benefits and overall costs, it is often more economical to intensify the settlements and refurbish old valuable houses in the core area of the city (even if they cannot meet the highest energy efficiency standards) instead of building efficient new buildings far from

<sup>26</sup> See also Communication from the European Commission: Stepping up Europe's 2030 climate ambition: Investing in a climate-neutral future for the benefit of our people: <https://ec.europa.eu/transparency/regdoc/rep/1/2020/ET/COM-2020-562-F1-ET-MAIN-PART-1.PDF>

Reducing car use is a very important factor in terms of the environment and also in terms of health sustainability.

Health sustainability as a basic principle of a high-quality living environment sets the basic preconditions for the design of a building. The built environment has a significant impact on human health, productivity and wider well-being. In 2017, a research summary analysis "The 9 Foundations of a Healthy Building" was published, according to which these foundations include ventilation, noise, lighting, air quality, thermal health, moisture, dust and pests, drinking water quality, and safety and security (overall term *indoor climate*). No doubt, health sustainability also results from the implementation of inclusive design and accessible solutions. Objects that are accessible to as many people as possible ensure the long-term sustainability of the living environment, as such living environment won't need to be materially adapted to the changed needs of people in the future. The problems are usually due to insufficient preparation for construction, design or planning and the execution of work. Considering and including all these factors requires a lot of expertise and therefore, the health aspect should be fully taken into account when improving processes.

### 2.2.5. SLOWDOWN IN EXPORT GROWTH

Empirical studies have found that companies that export and have an international or global reach are more productive, and among exporting companies, in turn, the companies export high value-added products and services are more productive.<sup>27</sup> One of the most important obstacles to the growth of broad-based exports in the Estonian construction sector is the size of a company. **Estonian construction businesses are rather small**, it is more difficult for them to find both financial and human resources to enter foreign markets. Small businesses have a narrow network of contacts abroad and little international experience. Small companies also have small production volumes, which makes it difficult to compete in large markets. Although small businesses may be successful in providing specific services due to their flexibility, such success will not lead to a wider export capacity in the sector.

In addition, the operation in foreign markets is hindered by **local bureaucracy, different business cultures and practices, access to information** on the market, employment contracts, working conditions, legislation and tax system of destination country, and qualification requirements for employees. There is a hidden protectionist policy (e.g. foreign companies win the contracts that local companies are less interested in).

Challenges of export development include **certification** (documentation required for the CE mark, which needs product development and research, which, however, is not sufficient) **and energy efficiency and CO<sub>2</sub> emissions requirements**. For example, without an environmental declaration or a corresponding test or calculation, it will not be possible for Estonian manufacturers of construction materials to sell their products on the European Union market in the coming years. The following factors can also be considered as barriers to exports: low automation of production, low use of digital solutions, high cost of acquiring modern production technology and high cost of raw materials, all of which lead to **higher product costs** and thus make competition more difficult.

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<sup>27</sup>[https://www.riigikogu.ee/wp-content/uploads/2017/09/Uuringuaruanne\\_Tootlikkus\\_ja\\_investeeringud\\_30052018.pdf](https://www.riigikogu.ee/wp-content/uploads/2017/09/Uuringuaruanne_Tootlikkus_ja_investeeringud_30052018.pdf)

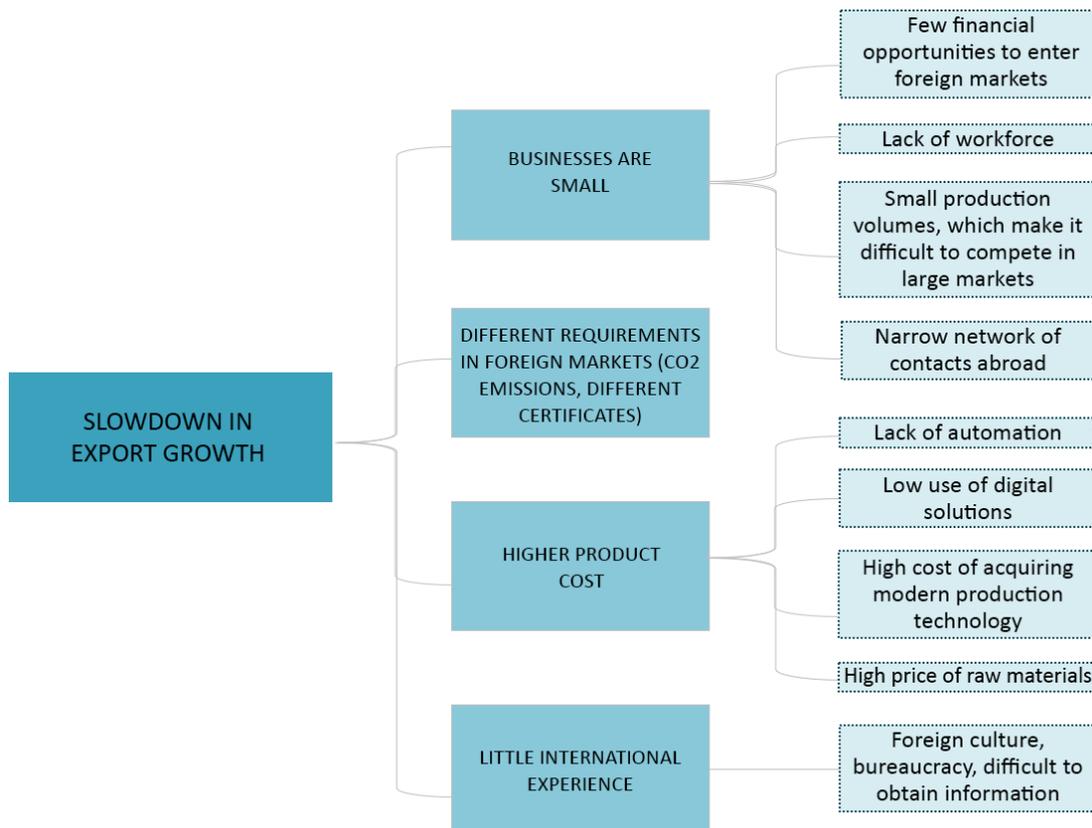


Figure 5. Reasons for the slowdown in export growth

## 2.2.6. LACK OF OPENNESS TO INNOVATION

Innovation is hampered by both **the development of the living environment and the instability of the sector**. As the project-based approach prevails, there is **no long-term planning to offset this instability**. The existence of a long-term plan and an investment plan, as well as long-term contracts, linked to an existing spatial planning system, would give entrepreneurs confidence, which would increase their willingness to invest in innovation. At the same time, public investment is made in individual projects, so companies are reluctant to make consistent investments in R&D and innovation due to the short duration of the contracts. Due to low recurrence, the profitability of innovation is lower and takes more time than it would be for large and recurrent projects. **Low levels of innovation are likely to lead to lower quality investments**, including an unsustainable built environment that is not guided by the principles of high-quality spatial planning.

In a highly competitive environment, companies do not have the resources for innovation in the normal course of business and in the so-called "survival process". It is, in a sense, a dead end, because a lack of innovation is not conducive to development and this, in turn, is not profitable. Companies lack **substantial cooperation supporting innovation** between the various parties involved in construction (client, architect, engineer, builder, manager, end-user), which is a precondition for optimizing the life cycle costs of a building. **Estonian construction businesses are rather small** and operate primarily in the domestic market. Small companies have low readiness and opportunities (including both financial and human resources) for innovative investments, and low export capacity. There are often too many levels of contracting, which makes then implementation of innovation cumbersome. The cooperation with other areas to adopt technical solutions or extract ideas is also insufficient.

Similarly, the **cooperation with universities and other research and development centres is low**. The subject of knowledge transfer is one of the main tasks of Enterprise Estonia, however, the corresponding measures have not always been attractive enough for companies or have not been found. The companies have not set a goal of involving researchers from universities and other research and development institutions in applied research projects in the field of construction.

One of the obstacles to the development of innovation is the **lack of laboratories**<sup>28</sup> (e.g. for the determination of hazardous substances) and the non-compliance of laboratories with the requirements of construction practice. The problem can be divided into three parts: on the one hand, the required laboratory does not exist at all or the existing laboratory does not meet the requirements of practice (e.g. the laboratory is too small to take certain objects for measurement and testing) or the market is too small to set up a laboratory and therefore, it is not profitable. In the latter case, the state could consider support measures to provide companies with better access to foreign laboratories where testing is costly.

Behind the lack of innovation, we can see **traditional contracting methods** that focus on solving individual problems rather than achieving an excellent end goal, incl. the lean constructio<sup>29</sup> principles and alliance procurement<sup>30</sup> implementation is not encouraged. Due to traditions, habits and lack of information, the design philosophy of the building as a whole based on the building information model (BIM) is not sufficiently implemented.<sup>31</sup>

The share of **value- and cooperation-based procurement** in public procurements is low compared to other countries.<sup>32</sup> Long-term benefits and good results are usually not considered as main criteria - successful tenders are usually determined only by the lowest price. According to the sector, one of the main reasons for focusing mainly on the price component is the aspect of contesting procurements, i.e. if the lower price criterion dominates, the risk of contestation is significantly lower. At the same time, it also happens in the private sector that they focus primarily on the price component, so the problem is not solely public sector based. Focusing on the price component can justify companies' **lack of interest** in knowledge-based construction and development, as innovative solutions may be more expensive in the design and construction phase than conventional traditional solutions, while being more cost-effective in the overall lifecycle of a building. For this reason, the public sector in particular should set an example by prioritizing cooperation and quality criteria alongside the lowest price, in order to maximize the potential benefits throughout the life cycle of the building.

<sup>28</sup> [https://www.mkm.ee/sites/default/files/ehitussektori\\_tootlikkuse\\_lisandvaartuse\\_ja\\_majandusmoju\\_analuus\\_uuendatud.pdf](https://www.mkm.ee/sites/default/files/ehitussektori_tootlikkuse_lisandvaartuse_ja_majandusmoju_analuus_uuendatud.pdf)

<sup>29</sup> philosophy of construction management with the aim of efficient use of resources and reduction of waste ( <https://www.rkas.ee/sites/default/files/public-uploaded-files/iuhendid/IPD%20iuhendmaterial.pdf> )

<sup>30</sup> project management organization, in which case the contract is based on a single agreement uniting the main partners, which ensures the involvement of the parties to the project as early as possible and joint liability for risks (<https://www.rkas.ee/sites/default/files/public-uploaded-files/iuhendid/IPD%20iuhendmaterjal.pdf> )

<sup>31</sup> According to the standard EVS 932:2017 /Three-dimensional digital presentation of the physical and functional properties of a building or its part, which may also include information about the manufacturer, cost, etc. of the building elements. " <https://www.evs.ee/tooted/evs-932t-2017>

<sup>32</sup> [https://ec.europa.eu/internal\\_market/scoreboard/performance\\_per\\_policy\\_area/public\\_procurement/index.en.htm](https://ec.europa.eu/internal_market/scoreboard/performance_per_policy_area/public_procurement/index.en.htm)

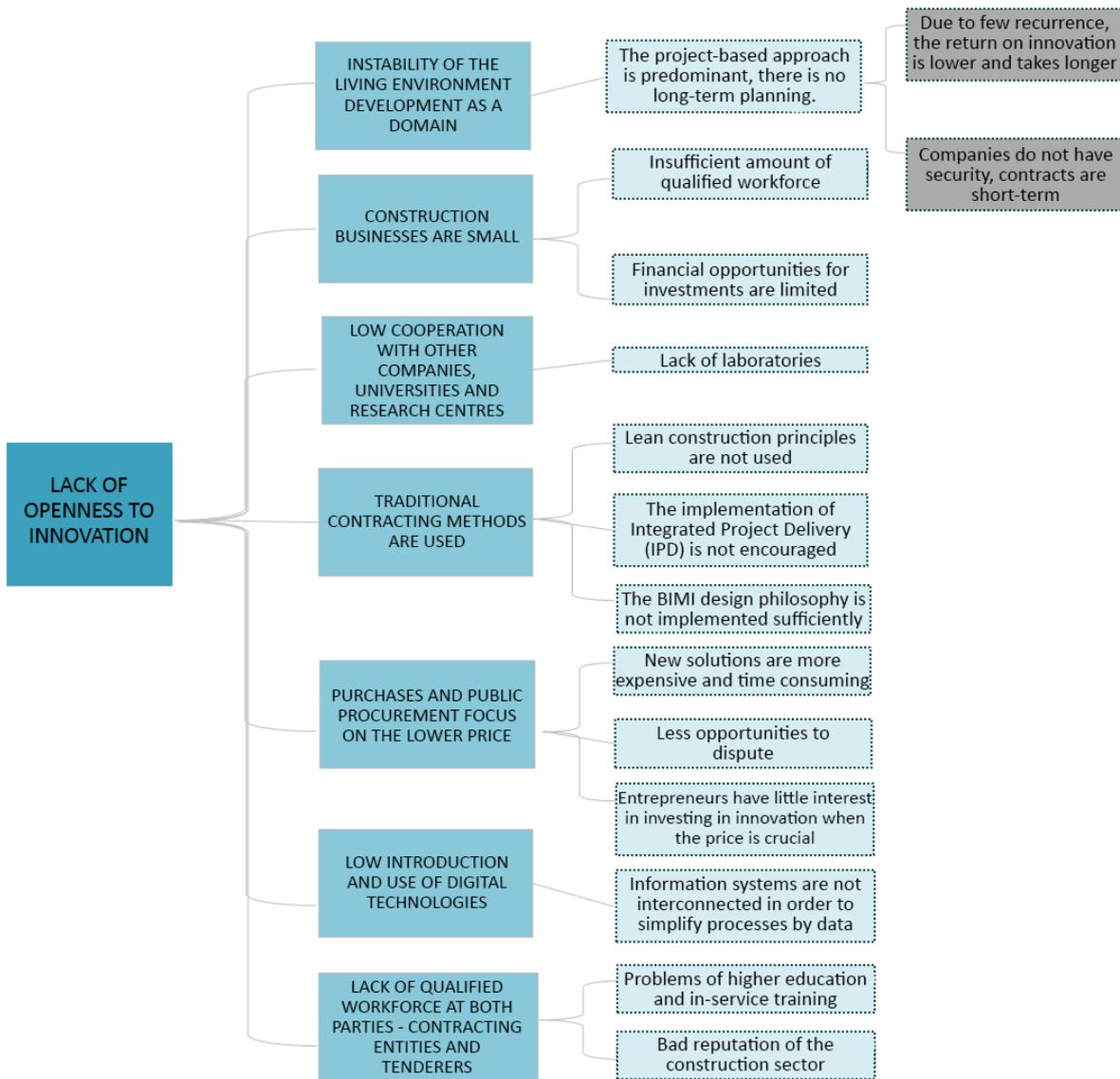


Figure 6. Reasons for low innovation

An indispensable precondition for the value-added development of the construction sector is the **provision of very good, interoperable and interconnected databases based on open data**. In this case, machine learning and algorithms can come to the rescue and help design, build and maintain a better built environment for all of us. At the same time, we can **notice rather low introduction of digital technological innovations** in Estonia in order to make the construction process smoother, minimize construction errors, reduce costs and increase environmental and health sustainability.<sup>33</sup>

**The lack of qualified workforce** can also be mentioned as a reason for low innovation. The knowledge and skills of employees often do not allow the introduction of innovative methods, technologies and concepts. The training of specialists is insufficient to develop and/or implement innovation and to manage innovation. The problems of skilled workforce are due to the issues of training described above, professional higher education, but also the reputation of the sector.

<sup>33</sup>[https://www.mkm.ee/sites/default/files/ehitussektori\\_tootlikkuse\\_lisandvaartuse\\_ja\\_majandusmoju\\_analuis\\_uuendatud.pdf](https://www.mkm.ee/sites/default/files/ehitussektori_tootlikkuse_lisandvaartuse_ja_majandusmoju_analuis_uuendatud.pdf)

## 2.2.7. LOW PRODUCTIVITY

Low productivity in the construction sector inhibits GDP growth, thereby endangering the success of other economic sectors and, in the end, decreasing the international competitiveness of the construction sector. With a high-quality service, the construction sector enables to create benefits in all other sectors of the economy and society as a whole, by creating in their workplaces and homes conditions that help increase labour productivity and thus promote economic growth and the well-being of the society. **The productivity of the Estonian construction sector is twice lower than the EU average.** The productivity of the Estonian construction sector has experienced strong growth, but remains below the EU average - in 2014, the productivity of the Estonian construction sector was 25,900 euros per employee,<sup>34</sup> while the EU average was 50,200 euros per employee<sup>35</sup>. By 2017, the productivity of the Estonian construction sector per employee had increased to 29,500 euros<sup>36</sup>, but still estimated to be twice lower than the EU average.

It should be noted that in the context of this document, productivity and labour productivity are considered unambiguous. Values are calculated as the quotient of value added and the number of employees, where value added consists of operating profit, labour costs and depreciation. In the construction sector, most of the value added is included in labour costs. Thus, the comparison of the data has to take into account that the level of productivity is largely determined by the level of wages, but also by the resources invested in fixed assets (such as new machinery and equipment) and profitability. Certainly, these factors depend on the general standard of living in the region, and artificial changes can cause structural problems. For example, in the context of sharply rising construction volumes, wages of simple workforce in the construction sector may rise disproportionately high, which may reduce the competitiveness of other sectors in the labour market. However, in this paper we assume that the **increase in productivity can primarily take place as a result of more efficient work of each person.** The construction sector must reduce its dependence on unskilled workforce and create high-paid, knowledge-based jobs instead. For example, almost half of jobs in the construction sector can be automated<sup>37</sup>. The increase in productivity due to the increase in added value may be due to higher construction and preparation costs, but by achieving long-term financial and quality benefits for the owner, user and society of the building. Therefore, in the case of public procurement in particular, the question of whether to order more or better buildings for taxpayers' money should be looked into more deeply. It is often not necessary to favour one over the other, but to reach a compromise between the life cycle costs and value in use. The focus on long-term benefits could also serve as a model for private owners.

The low productivity is caused by the **lack of openness of the construction sector to innovation**, including to technological innovation, and to the introduction of various modern digital solutions and thus to the development of modern working methods and work organization. The investment in the development that creates added value, and the application of innovative technologies are limited. The problems and reasons for low innovation are analysed in Section 2.2.6.

Productivity is also hampered by **inefficient work organization**. The development of companies' work culture and process management is often organized based on wasteful business models, using inefficient traditional hiring methods and contract forms. Planning, procurement and design processes are often too short, while on-site construction tends to go overdue, which reduces productivity. Often, the so-called preliminary work (feasibility studies, construction studies, identification of various conditions, etc.) is left to be carried out in the work execution phase, which inevitably results in time pressure on the performance and quality of the work. All the more so if in the course of carrying out the work, significant limitations or conditions become apparent which significantly affect the entire process and which could have been identified already during the preliminary work. Thus, a critical bottleneck is the poor quality of design and construction procurement preparation (see also problems related to smart contracting in Section 2.2.3), which leads to insufficiently planned construction designs, overdue deadlines and poor cooperation between the parties. In the sector as a whole, attention needs to be paid to the various social and behavioural problems of employees, which can

<sup>34</sup> European Construction Sector Observatory. Country Profile Estonia. March 2018.

<sup>35</sup> European Construction Sector Observatory. Country Profile Romania. June 2018.

<sup>36</sup> European Construction Sector Observatory. Country Profile Estonia. September 2019.

<sup>37</sup> Research of the Development Monitoring Center of the Riigikogu "Do companies' investments reach productivity?" Section 4.2: [https://www.riigikogu.ee/wpcms/wp-content/uploads/2017/09/Uuringuaruanne\\_Tootlikkus\\_ja\\_investeeringud\\_30052018.pdf](https://www.riigikogu.ee/wpcms/wp-content/uploads/2017/09/Uuringuaruanne_Tootlikkus_ja_investeeringud_30052018.pdf)

have a negative impact on quality and productive working time (e.g. a study<sup>38</sup> found that on-site smoking breaks can reduce productivity by up to 15.2% during an 8-hour shift. This is greater than, for example, the loss of productivity due to sick leave). It should also be noted that **off-site manufacturing is not widespread enough in the industry**, however, inefficient construction on the site is predominant.

The low productivity is also caused by the problems mentioned in other chapters, such as the lack of a long-term view on the living environment, the lack of a long-term and counter-cyclical investment plan, the uneven distribution of investments over the years, and the slowdown in export growth. The lack of a stable, long-term and well-developed investment plan does not encourage development, export growth or investment in innovation, which is a prerequisite for increased productivity.

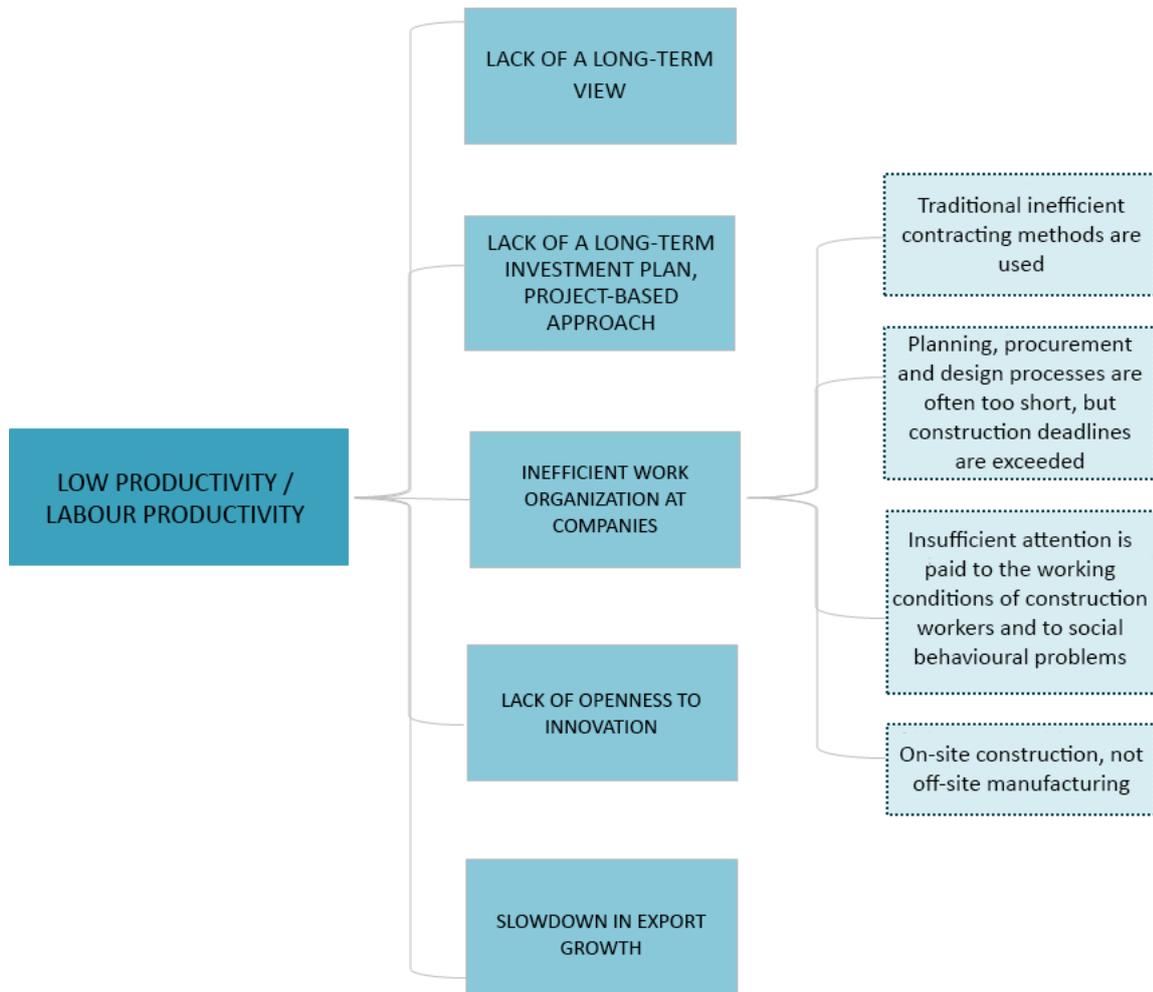


Figure 7. Causes of low labour productivity

### 2.2.8. BAD REPUTATION OF THE CONSTRUCTION SECTOR.

**Working in the construction sector is not valued enough in society. Cooperation throughout the life cycle of a construction** is not going well, there is omission, accusation and disrespect, and a lack of involvement, all of which affect the achievement of a high-quality result and thus, the reputation of the construction sector. The principles and rules of cooperation in the construction value chain are usually set by the client, so insufficiently thought out or even faulty primary conditions affect all subsequent processes. Insufficient preparation also creates a negative public perceptions on the building, which could have been of better quality by using the same resources.

The reputation of the sector has certainly been damaged by **corruption cases, the issue of envelope salaries and the use of dishonest practices**. More broadly, there are only few issues in the construction sector that are covered in the media as positive examples.

<sup>38</sup> <https://www.emerald.com/insight/content/doi/10.1108/09699981211277540/full/html>

Rather, they talk about non-compliance with deadlines, construction defects, accidents at work, non-payment to subcontractors, bankruptcies, visiting workers ("kalevipojad"), problems with foreign workforce, etc.

**Many young people do not have personal practical contact with the construction industry** and therefore the involvement of young people in the sector is low. The construction sector is wide, including architects, engineers, project managers, skilled workers, etc. Young people are not aware of all these roles. Physical work is not attractive and popular as a profession and cannot compete with, for example, IT or environmental protection. Negative media coverage of the construction sector further reinforces this attitude.

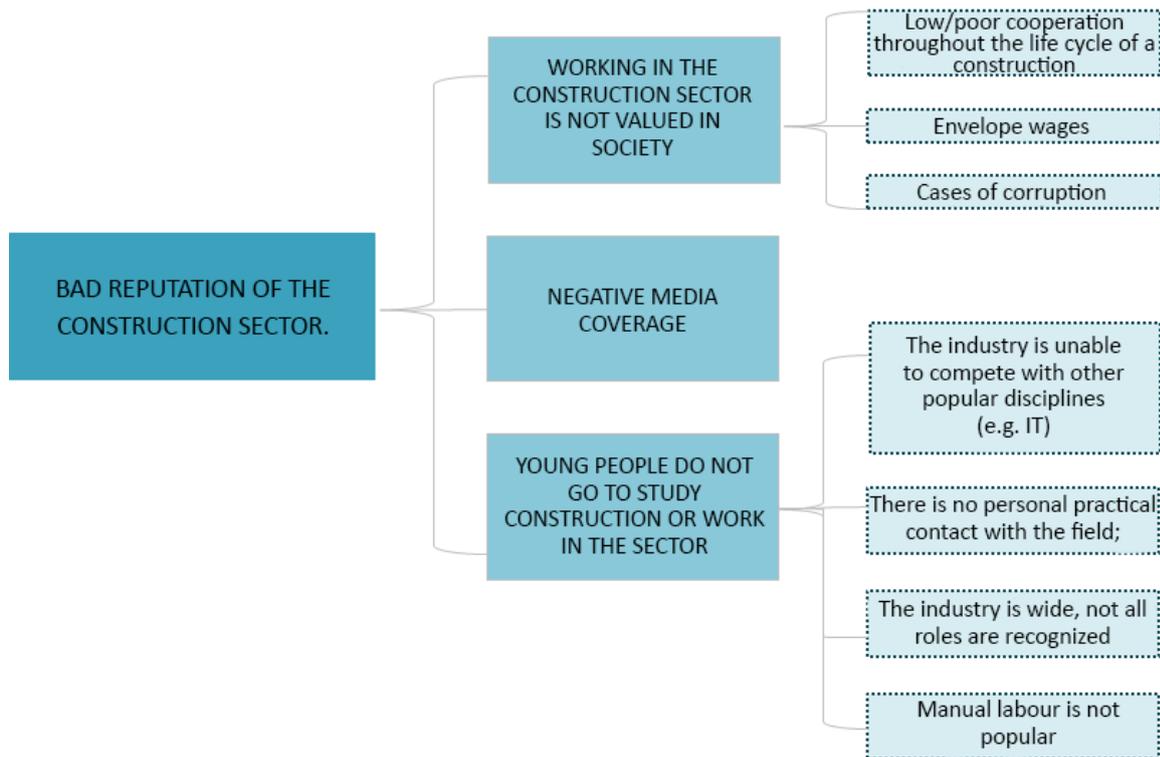


Figure 8. Reasons for the poor reputation of the construction sector

### 2.2.9. SUMMARY OF PROBLEMS AND CHALLENGES

As a result of consolidating the problems and creating connections, two main problems emerge:

- 1) Insufficient basis for the creation of high-quality living environment;
- 2) Low productivity in the construction sector.

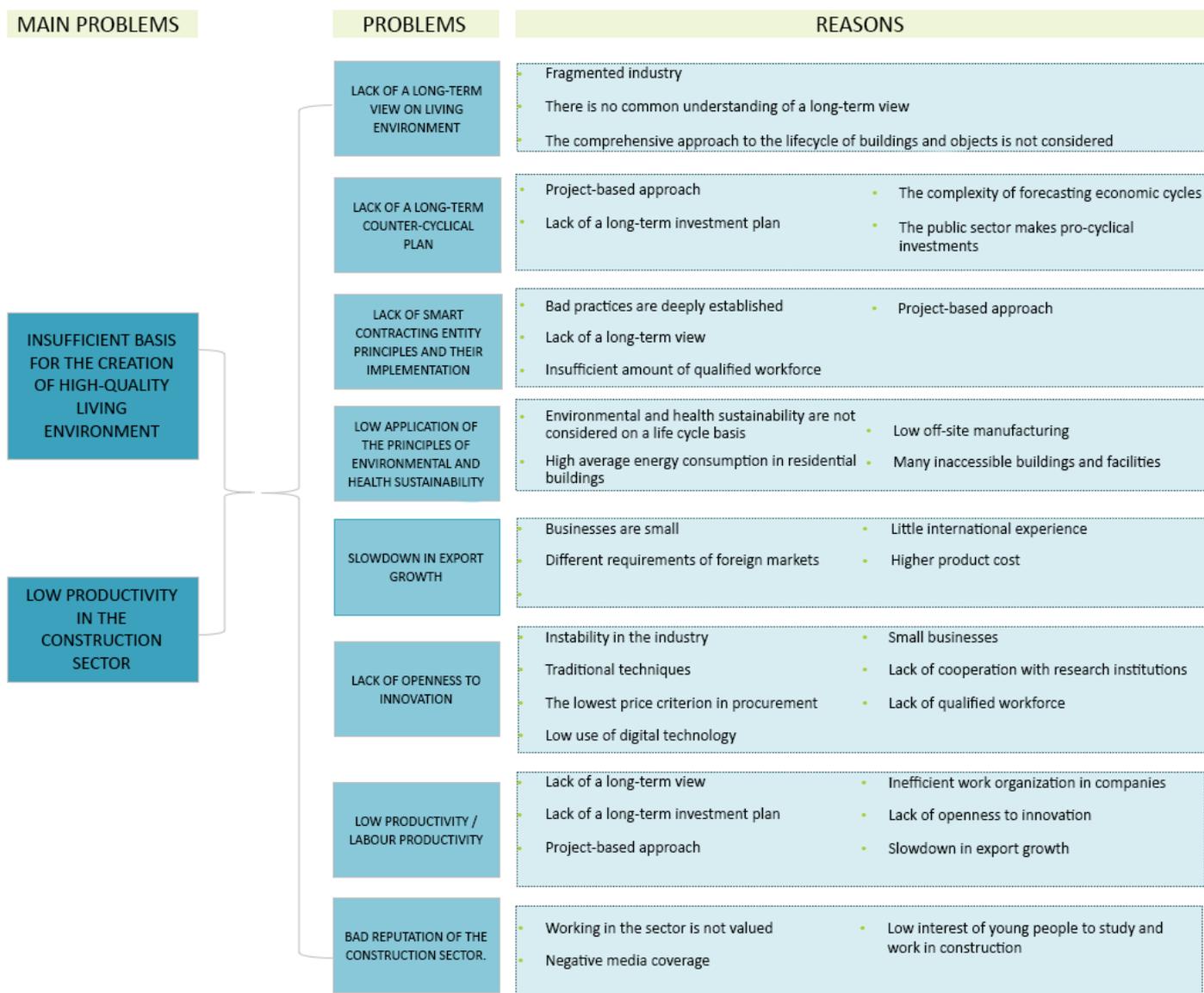


Figure 9. The main problems

Põhiprobleemid toovad välja nii era- kui ka avaliku sektori põhilised kitsaskohad ning sellest tulenevalt keskse väljakutse – kvaliteetse elukeskkonna loomise ja toimimise põhimõtted vajavad väljatöötamist, selgitamist ja kooskõlla viimist, et kujundada parim elukeskkond lõppkasutajatele.

## 2.3. FACTORS AFFECTING THE DEVELOPMENT

In addition to the described strengths, the problems identified and the root issues that cause them, attention must also be paid to the wider context. It is necessary to understand local as well as international factors and trends affecting the construction industry.

### 2.3.1. LINKS TO NATIONAL STRATEGIC PLANNING

Several public sector organizations, including ministries, agencies and local governments, are responsible for the development of the living environment as a field. The fragmentation of the industry has created a situation where different agencies have prepared different studies, analyses, development plans and strategies for parts of the living environment, but nobody has come up with a comprehensive strategy with an action plan and a vision for the living environment. The various sectoral development plans are not clearly linked and do not contain spatial planning decisions.

The "Estonia 2035"<sup>39</sup> strategy will play the role of such a so-called umbrella strategy, according to which one of the five priorities in Estonia is "Estonia has a safe and high-quality living environment that takes everyone's needs into account" and the necessary change is "We plan and renovate the space comprehensively and with high quality while considering the needs of society, population changes, health and environmental protection". In 2019, a working group of ministries developed the principles of high-quality spatial planning<sup>40</sup> and their implementation plan<sup>41</sup>.

High-quality living environment and public space have also become a central topics thanks to the **Estonian Human Development Report 2019/2020 "Spatial Choices of Urban Society"**<sup>42</sup>. The Estonian Human Development Report (EIA) is a biennial report that summarizes the data and descriptions of the socio-economic development of the Republic of Estonia provided by the most renowned researchers in Estonia. The Estonian Human Development Report is a knowledge-based reflection of Estonia's reality and development choices, which can be used by decision-makers in politics, economics and other fields. The 2020 report addresses the links between public space and democracy, discussing these issues in the context of a borderless and multinational world, and sets out 5 key messages as main findings:

- 1) **Estonia has advanced to 29th position in the world in terms of human development (2020) , but has since stalled.** The well-being of the Estonian population has improved remarkably compared to other countries in the world. Domestically, social inequality between regions is deepening.
- 2) **Estonia's metropolisation is reflected in the continued growth of the Greater Tallinn urban area, where people, economic activity and services are concentrating, while the rest of Estonia is shrinking.** For Estonia as a whole, metropolisation creates an imbalance in terms of statehood, governance, the economy, and the quality of life, space and the environment. It is time to require urban policy-making, time to create a national framework and targeted measures based on actual urban areas, rather than administrative city boundaries.
- 3) **Estonians' multilocality connects Tallinn with counties and cities with villages.** People's expanding daily activity spaces and the recent administrative reform have led to a dilution of spatial identity. A lifestyle and infrastructure based on car use allows people to operate simultaneously in the city and the countryside. Living in more than one place, due to labour migration, country homes, networks of families and friends, study and leisure, requires more flexible spatial planning and administrative arrangements.
- 4) **Public debate results in a better living environment and greater consensus.** The development of deliberative skills is in the national interest. More effective transparent and feedback-based modes of public participation are needed to promote participatory democracy. Digital platforms a media space based on analytical argumentation, a competent civil service and reliable experts all contribute to this, ensuring the exchange of knowledge and building mutual trust between the state and its citizens
- 5) **Built heritage and natural areas as part of Estonian culture strengthen people's relationship with the environment and their sense of belonging.** A diverse living environment requires the protection of built heritage based on the principles of sustainable development, combined with an investment plan that ensures the preservation, utilization and management of buildings of national importance. Estonians' environmental awareness is undergoing rapid and sharp changes, which explains the social confrontation over the use of natural areas in recent years. More targeted planning of natural areas and better management of visits to nature helps to improve the health of urban population and maintain their contact with nature.

The **Estonian Human Development Report** is an analysis that can be used as a basis for decision-makers in politics, economics and other fields. **Estonia's 2035 strategy** will be implemented primarily through national development plans and programs. Achieving Estonia's strategic goals also requires the contribution from local governments and public, non-governmental and private sector organizations, as well as the knowledge of the Estonian people in making everyday choices. Strategic planning is structured along five levels of management: performance areas, programs, measures, program activities and services<sup>43</sup>:

<sup>39</sup> <https://www.riigikantselei.ee/et/Eesti2035>

<sup>40</sup> [https://www.kul.ee/sites/kulminn/files/lisa\\_3\\_-\\_kvaliteetne\\_ruum\\_aluspohimotted.pdf](https://www.kul.ee/sites/kulminn/files/lisa_3_-_kvaliteetne_ruum_aluspohimotted.pdf)

<sup>41</sup> [https://www.kul.ee/sites/kulminn/files/lisa\\_4\\_-\\_kvaliteetne\\_ruum\\_aluspohim\\_elluviimine.pdf](https://www.kul.ee/sites/kulminn/files/lisa_4_-_kvaliteetne_ruum_aluspohim_elluviimine.pdf)

<sup>42</sup> <https://inimareng.ee/sissejuhatus.html>

<sup>43</sup> <https://www.rahandusministeerium.ee/et/riigieelarve-ja-majandus/tegevuspohine-riigieelarve>

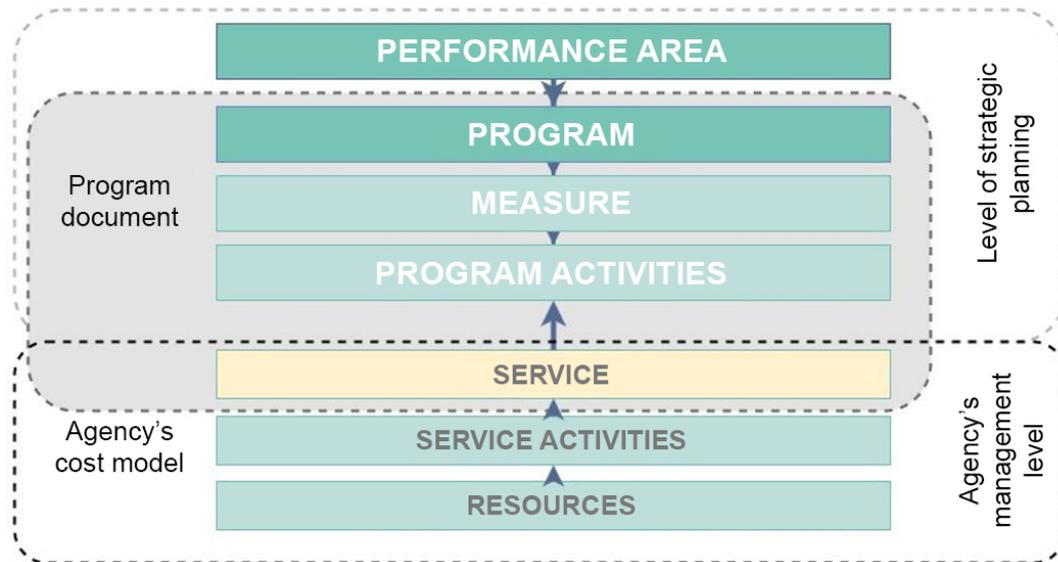


Figure 10. Levels of the strategic planning structure of the Estonian state (Source: Ministry of Finance)

If we look at the location of the living environment as an area in the framework of national strategic planning based on Figure 10, then construction is part of the R&D and business performance area. Part of this performance area is covered by the "Development Plan for Research and Development, Innovation and Entrepreneurship (TAIE)", while construction is not presented as a separate topic in this development document. In addition to the construction sector, the living environment also consists of **state property and administrative policy and spatial planning**, which is part of the performance area of the state government, but no separate development plan has been created there either. In the area of spatial planning, an important umbrella document is the **National Spatial Plan Estonia 2030+**<sup>44</sup> together with its action plan. The national plan is not currently a national strategic development document, as it is not related to budget decisions. **Spatial development and architectural policy** are certainly an important part of the living environment, being related to the performance area of culture and reflected in the "Estonian Architectural Policy".<sup>45</sup> framework document, which, however, is not a development plan. There are also no clear links with the state budget. The links with the development plan for transport and mobility, the development plan for the energy economy, climate policy, the proposed development document for the circular economy, etc. are important. Construction activities are affected by the requirements set out in various sectoral legislation, such as the protection of various valuable areas, heritage protection, etc.

**In summary, the topics that are important parts of the living environment are not covered by the country's strategic development documents, they are located in different performance areas, which is why the creation of a corresponding horizontal strategic development document is reasonable and necessary. As today, there is no separate performance area for the living environment, the organization of performance areas and the creation of a performance area for the living environment should be considered. The goals set in the "Estonia 2035" strategy and the conclusions from the Estonian Human Development Report lend additional weight to this need. The corresponding strategic development document should cover construction, building heritage, state property, administrative policy as well as spatial and architectural policy and be clearly linked to the state budget. The final decision to create a unified performance area will require a broader agreement on the social, natural and cultural environment affected, both in urban and rural areas.**

This analysis of the long-term view on construction, e-construction vision, construction sector productivity study, long-term strategy for building renovation, basic principles of a high-quality spatial planning, Green Paper on spatial planning, Estonian Human Development Report 2019/2020 and other analysis documents prepared on the initiative of the MEAC and other ministries and interest groups, as well as the agreements made with stakeholders, form a good input for the preparation of the aforementioned strategic development document.

<sup>44</sup> <https://www.rahandusministeerium.ee/et/ruumiline-planeerimine/uleriigiline-planeering>

<sup>45</sup> [https://www.kul.ee/sites/kulminn/files/content-editors/eesti\\_arhitektuuripoliitika.pdf](https://www.kul.ee/sites/kulminn/files/content-editors/eesti_arhitektuuripoliitika.pdf)

### 2.3.2. LINKS BETWEEN CONTRACTING AND ECONOMIC CYCLICALITY

Each process starts with the needs and wishes of a contracting authority. When these needs and wishes are thoroughly thought out, the contractor will be better able to offer a suitable product / service to the customer. Good preparation ensures a smoother, faster and less resource-intensive construction process, and more careful and thorough preparation leads to lower costs related to the real estate environment throughout the life cycle of the real estate project. In order to facilitate smart contracting, it is necessary to create a legal environment that supports it, the state can set an example and lead by acting as a smart contracting entity and by creating long-term favourable market conditions for private companies to operate. At the same time, the private sector has an equally important role to play in implementing smart contracting principles and practices. In order to increase and spread competencies, it is necessary to create networks that will help with advice and strength in contracting and implementing developments. Both public and private procurement must be comprehensive, not phased, support the cost-optimal, energy-efficient and contracting authority's / owner's values and functionality of the building's life cycle.

The Productivity Survey of the Construction Sector<sup>46</sup> points out that when approaching construction defects on a life cycle basis, it is possible that some apparent construction defects may in fact originate from a pre-construction phase, and such defects often have a tendency to accumulate. If the error occurs already at the beginning of the building life cycle, i.e. in the planning phase (e.g. from surveying, site selection or planning decision), the further the error is carried on in the life cycle, the more costly and time consuming it becomes to repair, ultimately reducing the value of the property as a whole in different phases of the life cycle. In conclusion, errors that occur at the beginning of the life cycle can be carried forward cumulatively until the end of the use phase of the building. These errors need to be rectified by the building owner where possible, and the building users or society at large often have to put up with the negative consequences for the entire life cycle of the building.

The construction sector is a sensitive area for economic cycles, characterized by demand volatility. In a scenario of rapid economic growth and strong credit growth in the private sector, there will be temporarily strong demand for construction services. As demand grows, the construction sector is forced to hire new employees, which in turn exerts strong wage pressures and leads to higher prices for construction services. Higher price levels have a strong impact on the competitiveness of the construction sector, leading to a decline in the volume of construction services over time and a decrease in employment.<sup>47</sup> **The biggest challenge for the construction sector is to stabilize demand, which can be achieved through counter-cyclical public sector investment, where investment would increase during the downturn and decrease during the upswing.**

The Estonian Institute of Economic Research has mapped the main factors limiting building activity, which already since 2019, have been **workforce shortages and insufficient demand** (Figure 11).

**Factors limiting building activity (% of businesses), 2003-2020**

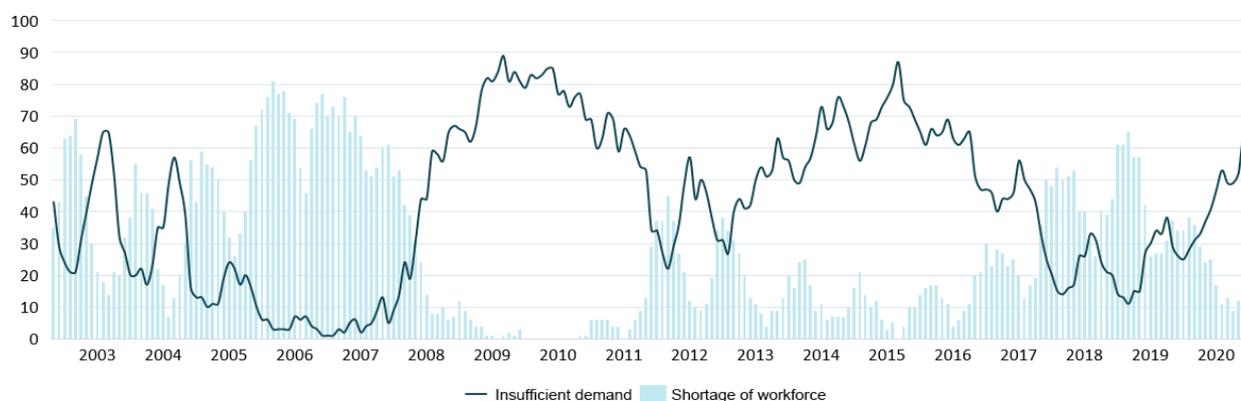


Figure 11. Factors limiting building activity (Source: Estonian Institute of Economic Research, 2020)

<sup>46</sup> [https://www.mkm.ee/sites/default/files/ehitussektori\\_tootliikuse\\_lisandvaartuse\\_ja\\_majandusmoju\\_analuus.pdf](https://www.mkm.ee/sites/default/files/ehitussektori_tootliikuse_lisandvaartuse_ja_majandusmoju_analuus.pdf)

<sup>47</sup> Eesti Pank, 2017. <https://www.eestipank.ee/en/node/51690>

The above factors should be constantly monitored at the national level. In case of insufficient demand, the economy is in a downturn and the employment rate is falling. In order to restore demand, counter-cyclical investments should be started, which would increase the employment rate and demand in the construction sector. The main limiting factor in the growth phase of the economy is workforce shortages, and pro-cyclical investments contributes to wage pressures and rapid price increase. Public support must ensure a balance not only with the economy but also with the social sphere - investments must be directed to areas where the problems are more severe, such as the rural areas, segregated areas, etc., as the economic downturn exacerbates the problems there most rapidly. In a downturn, a quality requirement must be added to public support, i.e. the crisis should not lower the quality.

IMF economic analyst Alexander Klemm (2014) has analysed the impact of Latin American public investment on the economy, where fiscal policy played a major role, which has increased economic instability due to pro-cyclical investment due to the overheating of the construction sector. A similar pro-cyclical fiscal policy also exists in Estonia, which is why the demand in the Estonian construction sector is volatile - **public sector investments are 100-300 million euros higher in the economic upswing** (the example of 2007-2010), so there is a risk of overheating in the construction sector. In the period 2007-2010, Estonian construction volumes decreased by 51.9% or approximately 1.8 billion euros (in 2007, the construction volumes were 3.4 billion, in 2010, 1.67 billion euros; Figure 12<sup>48</sup>).

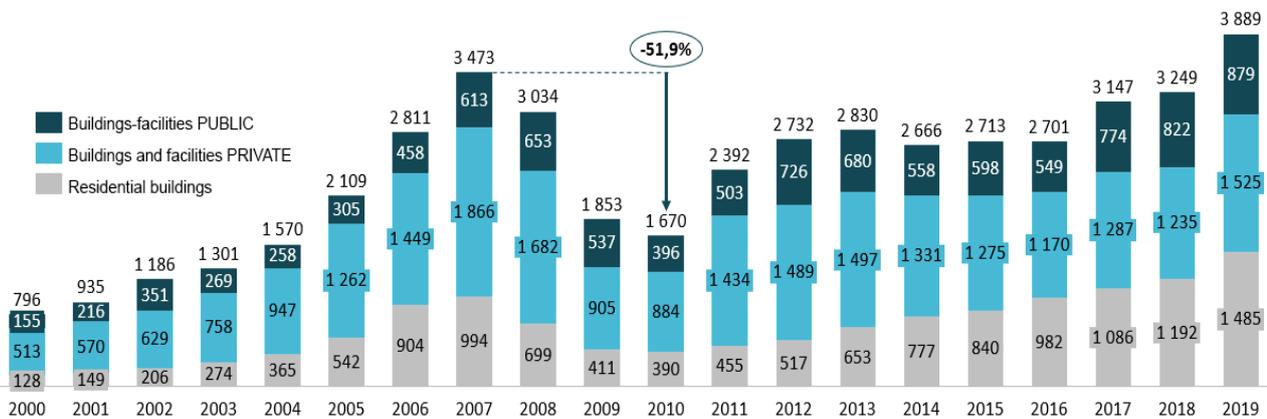


Figure 12. Construction volumes of sectors at current prices, million € 2000-2019 (Source: Ministry of Finance)

The effect of the decrease in construction volumes can also be seen in the figure of factors limiting building activity (Figure 11), where 90% of the businesses operating in the construction sector found in 2009-2010 that insufficient demand is a major factor limiting the activity. To help the construction sector in times of crisis, demand should be boosted and the public sector should make counter-cyclical investments. Increasing demand during a recession does not have to mean directly building new buildings. Germany used counter-cyclical infrastructure investments during the crisis of 2008-2011 by investing 15.7 billion euros (0.63% of GDP) in energy efficiency in schools to strengthen the economy. As a result of the booster program, each investment of 25,000 euros created one job per year, which makes 628,000 jobs<sup>49</sup>. The renovation of existing buildings (for example, school buildings) could also be carried out in Estonia during the economic downturn. The possibilities for reconstruction should be looked into first, and if this is not feasible, the construction of a new building should be considered.

When looking at the decrease in the volume of Estonian construction investments in 2008-2010 (Figure 12) during the economic crisis (length and depth of the recession phase) the potential counter-cyclical investment can be estimated at 0.7-1.1 billion euros per year. It is not possible to predict economic recessions, their duration and depth, but it is possible to learn from the experience of previous periods and other countries.

<sup>48</sup> These are volumes in Estonia. It is not differentiated whether the construction work was carried out by domestic or foreign contractors. There is no double counting with different levels of employment. The amounts are given with VAT. Total investments are considered. Subcontracting chains are not double counted. The starting point is public investment in the state budget view, plus the private sector and households.

<sup>49</sup> <http://www.martin-watzinger.com/uploads/4/9/4/1/49415675/buchheim-watzinger-2017-employment-effects-of-countercyclical-investments.pdf>

Thus, the public sector must be prepared to contribute up to **1-1.5 billion euros** a year to the construction sector during the economic downturn.

In the case of counter-cyclical investments, investments in the economic downturn are made to move demand *towards equilibrium*, i.e. stability, where demand in the construction sector is at an executable level and there is no overheating (Figure 13).

### Business cyclicity of the construction sector and counter-cyclical public sector investments

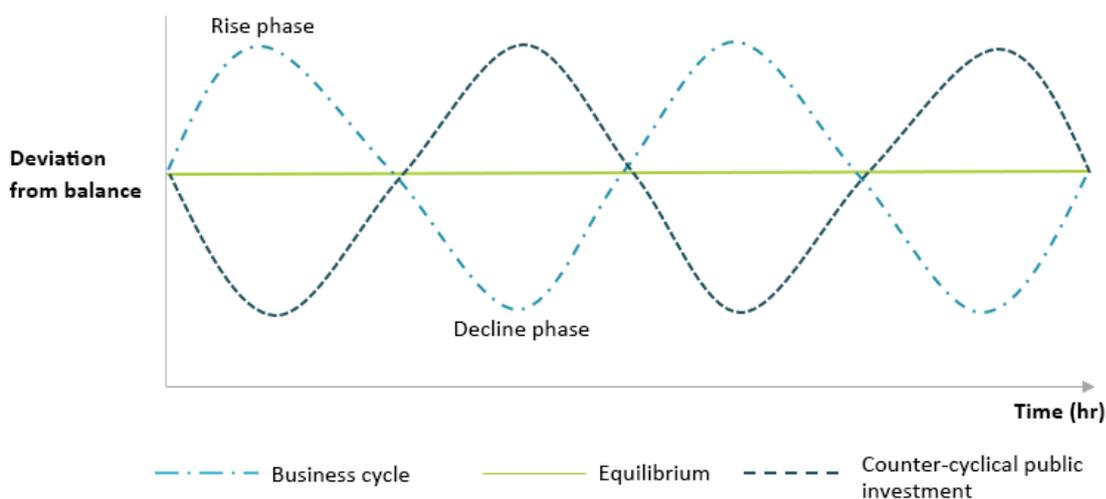


Figure 13. Cyclical nature of construction (Source: Civitta)

In addition to reducing volatility in the construction sector, counter-cyclical investments (compared to pro-cyclical ones) have a stronger impact on economic growth. Auerbach et al. (2012) proved that investments made in the economic downturn have a stronger effect on GDP growth than investments made in the upswing phase of the economic cycle. By increasing public sector investment by 1% in the downturn phase of the economic cycle, GDP will grow by 3.4%, compared to 2.3%, if the investment were made in an upward phase, i.e. pro-cyclically.

Buchheim et al. (2017) found that there are three challenges for counter-cyclical investments:

- 1) **Areas more affected by the recession need more investment;**
- 2) The impact of stimulus investment programs is difficult to assess, as counter-cyclical investments affect the economy as a whole;
- 3) The implementation time of public investments is often long.

The aforementioned challenges can be solved by proactive planning and preparation of projects that can be launched at the right time in the downturn phase. **In a situation of weak demand, counter-cyclical investments are economically reasonable, as there is no price pressure in the sector due to high demand.**

**The main challenge for the construction sector is the lack of stability, which is why a long-term investment plan should be drawn up and counter-cyclical investments should be made, especially in areas severely affected by the recession, to alleviate fluctuations in the added value of the economy and create the stability needed for development.**

### 2.3.3. TECHNOLOGICAL CHANGES IN THE CONSTRUCTION SECTOR

Through building activities, businesses in the field create wealth for the economy (measured in GDP) and the living environment. The construction sector helps create benefits in all other areas of the economy and in society as a whole through the provision of high-quality services. With the help of buildings, conditions are created in working and living places that enable to increase the labour productivity and thereby indirectly

promote the growth of economic growth and the well-being of society. The productivity of the Estonian construction sector is twice lower than the EU average.

Well-thought-out digitalisation and automation of building activities is important for increasing productivity growth. **Digitalisation helps make construction costs more transparent and predictable, and better available data avoids errors in the construction process.**<sup>50</sup> This is a precondition for the construction of energy-efficient buildings with high-tech solutions, where it is important to ensure the designed low energy consumption in the operation of the building, but also to avoid wasting materials and resources in the construction of buildings.

The global economy is on the brink of change driven by the digital revolution, and according to the European Commission's digital development strategy, the fourth industrial revolution, Industry 4.0, is currently taking place, which will require a revolutionary change in the adoption of digital solutions in the coming years.<sup>51</sup> Industry 4.0 is also clearly affecting the construction sector, and the technological leap forward is changing the existing business models, leading to a paradigm shift throughout the value chain.<sup>52</sup>

Industry 4.0 requires digitalisation, i.e. the introduction of technologies based on interconnected devices, data analytics and artificial intelligence, which will enable further automation of processes<sup>53</sup> (Figure 14).

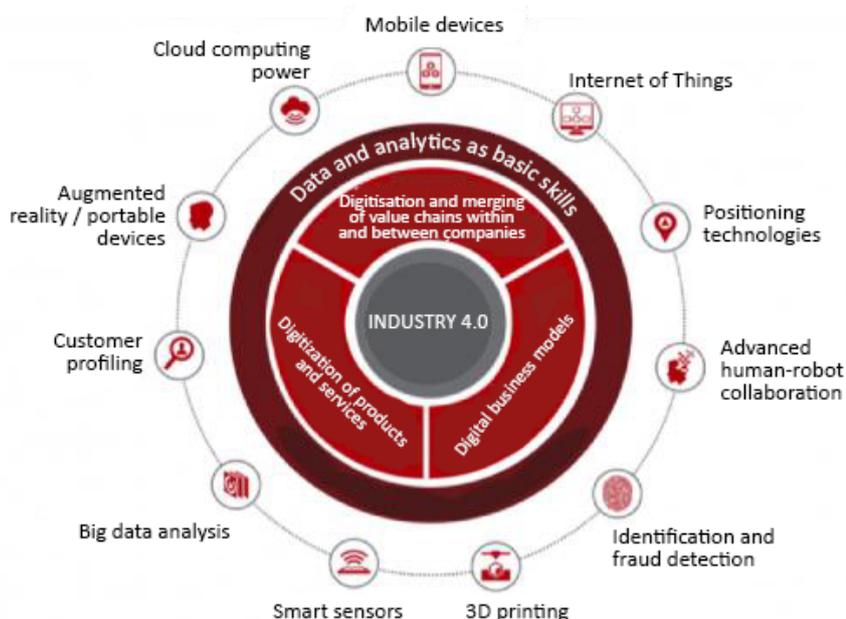


Figure 14. Industry 4.0 framework and the digital solutions that contribute to it (Source: PwC 2016; RAKE, Ehitussektori tootlikkuse ja lisandväärtuse majandusmõju analüüs)

Such Industry 4.0 digital solutions include mobile and cloud-based project management applications that help improve team communication and synchronize sensors, portable devices, and other related machines. According to McKinsey (2020)<sup>54</sup> "The next normal in construction", the use of digital tools can significantly improve work on the construction site.

<sup>50</sup> [https://www.mkm.ee/sites/default/files/ehitussektori\\_tootlikkuse\\_lisandvaartuse\\_ja\\_majandusmoju\\_analuus\\_uuendatud.pdf](https://www.mkm.ee/sites/default/files/ehitussektori_tootlikkuse_lisandvaartuse_ja_majandusmoju_analuus_uuendatud.pdf)

<sup>51</sup> Accelerating the digital transformation of European industry and enterprises, European Commission, 2016

<sup>52</sup> Ehitussektori tootlikkuse, lisandväärtuse ja majandusmõju analüüs, Ministry of Economic Affairs and Communications, 2018

<sup>53</sup> Industry 4.0: national and regional comparative advantages in key enabling technologies, Ciffolilli, A., Muscio, A., 2018

<sup>54</sup> The next normal in construction - How disruption is reshaping the world's largest ecosystem, McKinsey (2020)

Today's processes (Figure 15) are project-based - special order solutions are developed for the customer every time, where construction projects are prepared again from the first step and there are few repetitions. Value chains are divided horizontally and vertically, and it is necessary to involve several parties at each stage of the activity. Construction is carried out by general contractors on the site in unfavourable conditions, a large part of the workers are temporary and work manually. The availability of digital tools covering the entire life cycle of construction is limited, and construction projects are often underfunded (low-cost solutions).

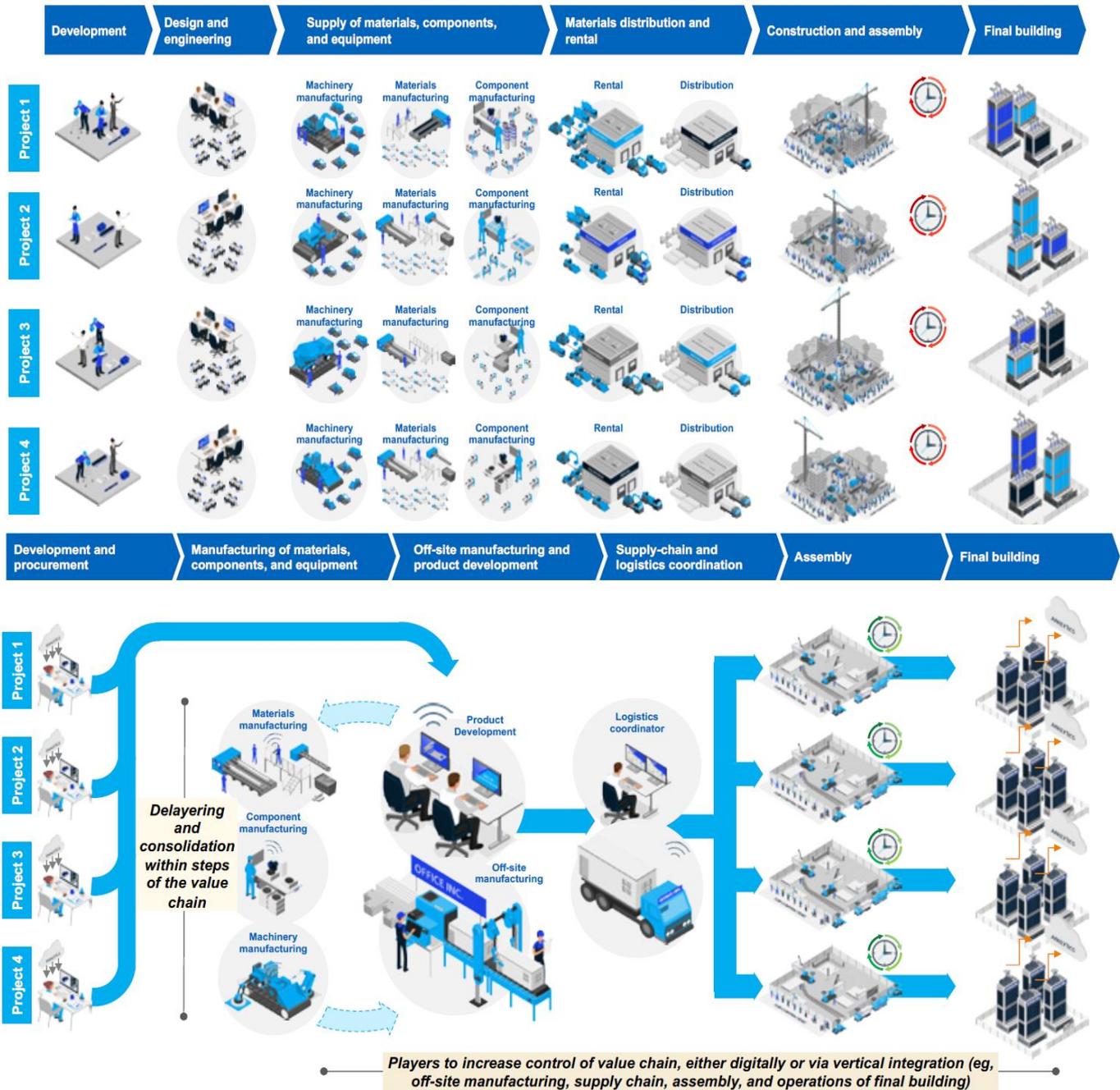


Figure 15 (top) and 16 (bottom). Today's and future construction processes (McKinsey, 2020)

The report points out that future construction ecosystems should be radically different. The future construction processes should be more standardized, consolidated and integrated (Figure 16). Construction processes are mainly based on off-site manufacturing. Building designers have the opportunity to select components from the respective digital catalogues. Harmonized processes, the principle of mass customization and digital tools make it possible to create a unique, valuable living environment that is tailored to a specific situation. The construction value chain has been consolidated, allowing for better internationalization. Differentiation takes place in digital environments. On the site, the builders focus on assembling the products and implementing the virtually designed buildings with the highest possible quality

and at the same time efficiently. Designers (incl. developers, architects, planners, engineers, etc.) regularly analyse consumer preferences and apply the relevant information for future projects.

Table 1. Development of industrial revolutions (source: MEAC, 2018; EAIT, 2019)

Industry	Time	Description
1.0	1780	Water and steam powered machines became the main means of production, i.e. mechanization took place.
2.0	1870	Introduction of electrical technology enabled even higher manufacture volumes and more sophisticated machines.
3.0	1970	Introduction of computers in manufacture, storage of information, beginning of the information age
4.0	Today	Digitalisation or the creation of "smart factories", interconnected devices or the Internet of Things (IoT), the application of artificial intelligence in manufacture.
5.0	The future	Human-machine interaction, where the human intellect works in harmonious cooperation with machines and computers with cognitive abilities, which provides the basis for creating mass-customized products.

At a time when industries are moving towards digitalisation, the construction sector is lagging behind other economic sectors. According to the McKinsey (2020)<sup>55</sup> report, this is due to cyclical demand, which is why the construction sector makes small investments compared to other industries. At the same time, customer expectations are growing - smart, energy-efficient, user-friendly, accessible buildings with low maintenance costs are today's normal. Unfortunately, it is difficult to meet such expectations with traditional methods and at the same time earn a profit, which is already small (the average operating profit margin of companies participating in the construction sector is less than 5%). According to a study by the European Commission, companies that have implemented technological solutions are clearly more productive and significantly more economical, so the construction sector needs to take radical steps towards digitalisation to prepare the construction sector for Industry 4.0 or even 5.0 by 2035, to replace today's 3.0.

According to DESI 2020, the digitalisation of companies, and the more general integration of digital technology is still one of the major challenges in the Estonian economy. In the construction sector, digitalisation would mean the introduction of new construction methods such as laser scanning, building information modelling (BIM) and the introduction of digital master data to increase productivity, ensure safety and quality, and improve project management.<sup>56</sup>

Construction projects are becoming increasingly complex and construction businesses' investment in research and development is less than in other sectors of the economy<sup>57</sup>, although they strongly contribute to economic development, which indicates the need for digital solutions. The main reason for the low level of investment in R&D is the fragmentation of the construction sector, i.e. the sector is made up of many small and medium-sized businesses that do not have the financial capacity to invest in research and development. Therefore, the public sector needs to provide support and assistance to the businesses in the construction value chain, for example by investing in R&D, setting up centres of excellence (such as the Smart City Centre of Excellence in 2020 with Horizon funding) and in the introduction of new business models and the management of change. The state is already doing some of this, for example within the framework of the Applied Research Program of Enterprise Estonia.

<sup>55</sup> The next normal in construction - How disruption is reshaping the world's largest ecosystem, McKinsey (2020)

<sup>56</sup> Industry 4.0 for the Construction Industry—How Ready Is the Industry?, Maskuriy et Al. 2019

<sup>57</sup> Oesterreich, T.D.; Teuteberg, F. Understanding the implications of digitisation and automation in the context of Industry 4.0: A triangulation approach and elements of a research agenda for the construction industry.

**In order to maintain competitiveness in the construction sector and ensure sustainable economic growth, the public sector should contribute to the development of the construction sector through the modernization of the sector and the introduction of innovative solutions. This will lay the foundations for the future and increase the readiness of the entire construction sector to catch up with the industry, at least to the level of Industry 4.0. At the same time, the human factor must not be forgotten - innovations and developments are invented and implemented by people, and their competence is crucial here. This means that the entry of talented people into the construction sector can also have a significant impact on the long-term effect of the construction sector in innovation, which should undoubtedly be taken into account when shaping the long-term development of the construction sector value chain.**

Identifying main problems and links will help describe the desired situation in the long term, i.e. until 2035, and to set priorities for choosing appropriate measures.<sup>58</sup> The emphasis here is on co-operation - the chosen measures will only work if the parties are equally willing to contribute to the achievement of the long-term vision. The following chapters describe the vision for the construction sector by 2035, seven main goals for moving towards the vision, and 38 activities for achieving the goals.

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<sup>58</sup> The analysis focused on an even longer time perspective, until 2050, but as most of the chosen goals and measures can be achieved in a shorter period of time, the deadline was changed. However, in part, objectives and measures, such as counter-cyclical, a high-quality living environment development plan and a focus on the circular economy, have a significantly longer impact.

### 3. THE VISION FOR THE ESTONIAN CONSTRUCTION SECTOR BY 2035

Based on existing documents in the industry, the current situation analysed, our current strengths and (basic) problems, the links between strategic planning, demand and economic cyclicity and technological breakthroughs, we have formulated a vision for 2035 that describes the construction sector in 15 years:

The built environment in Estonia is user-centered and **serves the general goal of creating a high-quality living environment**. Our developments are **well-thought-out from the point of view of all users, they are functional and follow the principles of high-quality spatial planning**.

Construction decisions are made on a long-term basis, based on data and economically, by creating a balance between ecological and economic aspects throughout the life cycle of the building. The creation of a space involves dialogue with the local community and stakeholders and takes into account their interests and needs.

**The public sector is a leader and an example** in terms of both smart contracting and fostering innovation. We contribute to the development and implementation of the latest technologies and materials, and digital solutions and standards ensure that construction takes place in cooperation between the contracting entity and the executor, with equal responsibility for high-quality results. Long-term national level planning of construction ensures counter-cyclical management.

Building activity is fast and of high quality and organized as a **transparent process**. The construction industry uses **smart and pioneering solutions**, and to find such solutions, the parties cooperate with each other and research institutions. At the same time, the construction sector respects the **historical and cultural context** and uses it as an important resource and tool. The construction sector is a valued industry in society, we employ **specialists in the field**, and the construction sector is **an attractive specialty to study**.

As a result, **the productivity** of the Estonian construction sector meets the best level in Europe, our construction products and services are internationally **highly competitive** and support economic growth in Estonia in the best possible way.

In other words, the description of the vision is a **model of the Estonian construction sector**, i.e. the construction process is planned and organised, the sustainability and competitiveness of the sector is ensured and international cooperation is promoted. The development of the entire e-state and digital changes in the construction sector play an important role here. The model of the Estonian construction sector is a **development agreement made in cooperation with the public and private sector (relevant stakeholders), the achievement and promotion of which are equally the duty and responsibility of all the parties involved**.

## 4. OBJECTIVES AND ACTIVITIES

In order to achieve the vision and solve the main problems described above, 7 goals and 38 activities have been set. Objectives and measures help set goals and provide solutions to achieve the long-term view on the construction sector described as a social agreement.

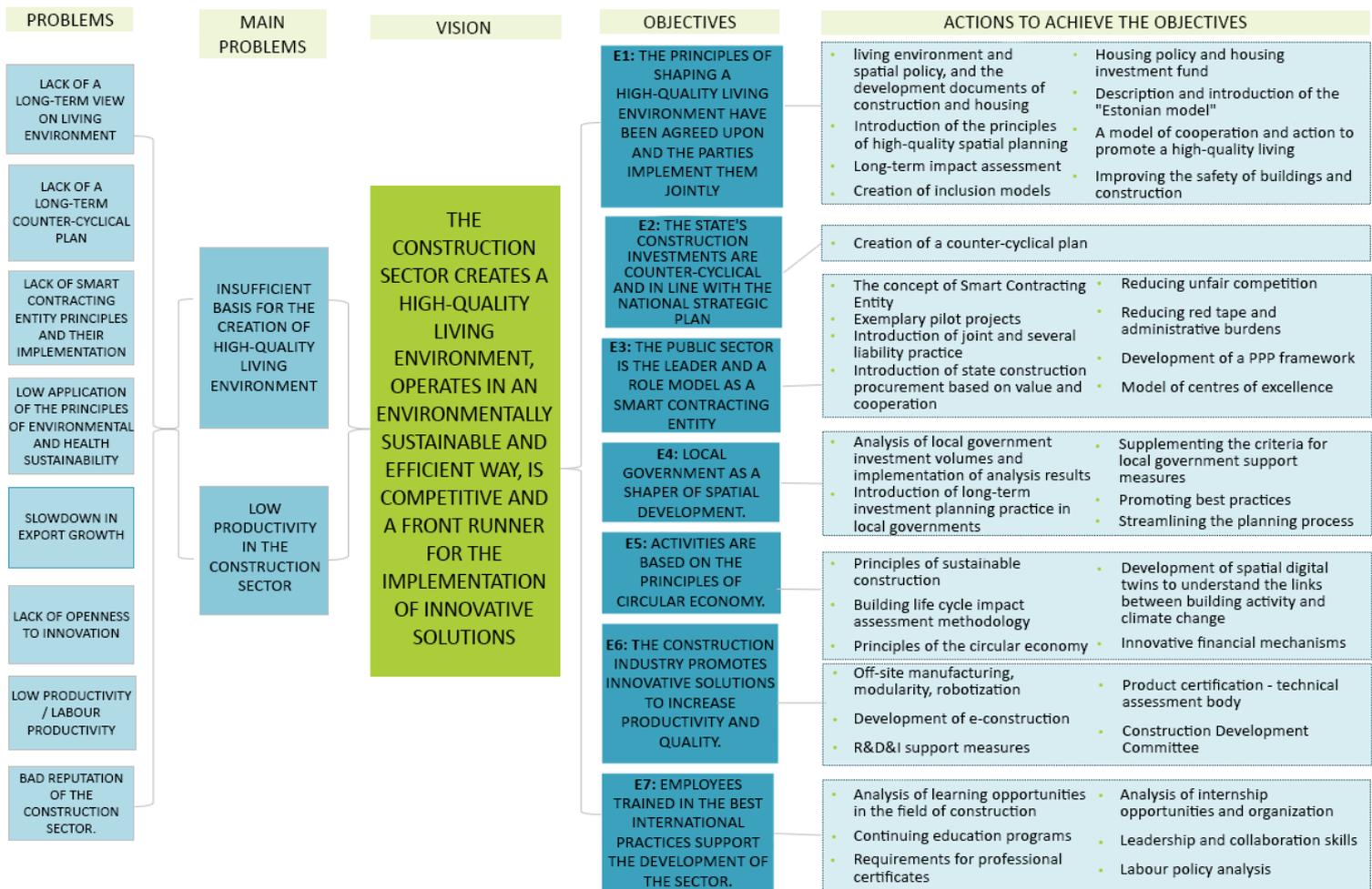


Figure 17. Long-term objectives and measures for construction

A summary table of systematisation of activities and impact assessment is presented in Annex 3 to the document, which describes the output of the measure, the estimated time perspective for the implementation of the measure, coherence in solving problems, cost and potential impact on GDP.

The impact and result indicators of the objectives are presented in [Chapter 6](#). The proposals for indicators have been presented with a view to using them in the relevant sectoral strategic development documents.

## OBJECTIVE 1: THE PRINCIPLES OF SHAPING A HIGH-QUALITY LIVING ENVIRONMENT HAVE BEEN AGREED UPON AND THE PARTIES IMPLEMENT THEM JOINTLY

National strategic long-term view on the development of the living environment has been prepared. The vision set out in the relevant strategic development documents includes objectives and activities that are agreed upon by public authorities, local governments, professional associations, private companies, educational and research institutions, the third sector and communities at large. The plan helps the parties analyse and plan their strategies, activities and market. The public sector is expanding its purpose and opportunities for synergies, the private sector is aware of the long-term plan, its role in it, and helps achieve the goals. The principles of high-quality spatial planning<sup>59</sup> will be introduced and the public space is designed primarily according to the needs of the consumer (end user). Creation of a high-quality living environment goes through competencies that can be provided by a smart contracting entity and strong businesses. The needs of regions with both declining and growing populations are taken into account and the results of the Government Office's spatial development expert group and accessibility task force and the Estonian Human Development Report 2019/2020 are used as a basis.

**Activity 1.1: Preparation of the living environment and spatial policy as well as construction and housing development documents.** Preparation of a New National Spatial Plan, focusing on the improvement of the living environment and the topic of high-quality living environment. Preparation of a development document guiding activities in the field of construction and housing in accordance with the sectoral activities mentioned in the document “Long-term view on construction 2035” and in accordance with the global goal of sustainable development “Sustainable cities and settlements”.

- Output 1: New National Spatial Plan.
- Leader<sup>60</sup>: MF.
- Involved parties<sup>61</sup>: MEAC, ME, MC, LGs.
- Output 2: Development document in the field of construction and housing.
- Leader: MKM.
- Involved parties: MF, ME, MC, LGs.

**Activity 1.2: More detailed description and application of the principles of high-quality spatial planning.** The public sector, as the contracting entity, is able to apply the agreed principles, and the private sector, as the tenderer, is guided by them in its work. When making investment decisions (for example, SBS), the necessity of the object and compliance with the principles of high-quality spatial planning are substantiated<sup>62</sup>

- Output: description of implementation options; modification of the principles of the SBS proposals and inclusion of the criteria for the principles of high-quality spatial planning in the statement of grounds; making proposals for the inclusion of principles in master plans; analysis of local governments' investment volumes, on the basis of which sectoral ministries can make additional SBS applications, if necessary.
- Leader: MF.
- Involved parties: MEAC, MC, SRELtd, LGs.

**Activity 1.3: Development and implementation of housing policy as one of the activities of the respective development document (Activity 1.1). Establishment of residential investment fund services at KredEx.** Housing policy will be developed, principles will be agreed on how the state can encourage private investors in areas of market failure to build residential and rental premises; the connections with counter-cyclical investment and consideration of population trends nationwide and at the local government level when making spatial decisions are described; activities are based on the specifics of inclusive design.

<sup>59</sup> [https://www.kul.ee/sites/kulminn/files/lisa\\_3\\_-\\_kvaliteetne\\_ruum\\_aluspohimotted.pdf](https://www.kul.ee/sites/kulminn/files/lisa_3_-_kvaliteetne_ruum_aluspohimotted.pdf)

<sup>60</sup> For the purposes of this document, a leader is a party that manages the implementation of activities on the basis of an operational program based on the input of those involved.

<sup>61</sup> An involved party, for the purposes of this document, is a party whose participation in the implementation of the activity is required and whose views must be taken into account.

<sup>62</sup> [https://www.kul.ee/sites/kulminn/files/lisa\\_3\\_-\\_kvaliteetne\\_ruum\\_aluspohimotted.pdf](https://www.kul.ee/sites/kulminn/files/lisa_3_-_kvaliteetne_ruum_aluspohimotted.pdf)

- Output: development and description of housing policy; establishment of a housing investment fund at KredEx, finding financing and directing finances to the fund.
- Leader: MEAC.
- Involved parties: GO, MF, LGs.

**Activity 1.4: Introduction of long-term impact assessments into spatial planning decisions.** Socio-economic analyses (CBAs) are part of the spatial plans and spatial planning decision-making process.

- Output: Preparation of the guidelines for analysis (in which cases specific analysis are required).
- Leader: MEAC
- Involved parties: MF, MC, SRELtd.

**Activity 1.5: Development of a cooperation and action model for the promotion of high-quality living environment.** Describing clear roles and responsibilities; if necessary, the creation of a new agency, the restructuring of existing structures or the aggregation of responsibilities. Expansion of counselling and training activities of LGs in areas related to the improvement of the living environment.

- Output: Development of a cooperation and action model.
- Leader: MF
- Involved parties: GO, MEAC, ME, MC, LGs.

**Activity 1.6: Creation of inclusion models.** The aim is to strengthen the inclusion processes, introduce new and modern inclusion methodologies, ensure their better implementation and thus better dialogue between communities, the state and private companies. In the activities at the local government level, inclusion is the responsibility of the local government, but the state can assist in the development and management of unified inclusion technologies.

- Output: updating the guidelines for inclusion, submitting proposals and additions to the Open Government Partnership Action Plan; IT solutions compatible with the e-construction platform and private sector applications for organizing inclusion.
- Leader: MEAC.
- Involved parties: MF, private, LGs.

**Activity 1.7: Improving the safety of buildings and construction.** Launching public consultations on improving the safety of buildings; disclosure, analysis and statistics of the most common construction defects; launching the construction defects information bank; promotion of author's supervision services; promoting motivational leadership practices; wider implementation of the principles of health sustainability and safety.

- Output: Construction defects information bank; construction defect analysis system; management training; indoor climate requirements.
- Leader: Private.
- Involved parties: MEAC, ME, LGs.

**Activity 1.8: Description and introduction of the "Estonian construction sector model".** Description of the "Estonian construction sector model" prepared on the basis of supporting documents (long-term view on construction, vision of e-construction, sectoral strategic development documents to be prepared), preparation and implementation of its communication plan and marketing strategy for foreign markets, including the development of the system of key indicators for monitoring the development of the construction sector, defining Construction 4.0 and 5.0, describing development leaps and linking them to the construction counter-cyclical plan and the corresponding strategic development document.

- Output: Description of the Estonian construction sector model; marketing and communication plan.
- Leader: MEAC.
- Involved parties: Private.

## OBJECTIVE 2: THE STATE'S CONSTRUCTION INVESTMENTS ARE COUNTER-CYCLICAL AND IN LINE WITH THE NATIONAL STRATEGIC PLAN

The state has prepared a long-term (for 10 years minimum) counter-cyclical investment plan(s) through various levels (ministries, local governments, agencies), and forecasts and monitors fluctuations in economic cycles. The state makes informed investment decisions in order to support economic development to the maximum. Additional quality requirements must be applied to state aid, i.e. the crisis should not reduce quality. Studies have shown that by increasing public investment by 1% during the downturn in the economic cycle will lead to an increase in GDP of about 3.4%, compared to a 2.3% increase in GDP, if the investment is made in the upswing phase of the economic cycle.<sup>63</sup> Preparation and adherence to the investment plan ensures needs-based planning and construction.

**Activity 2.1: Preparation of a counter-cyclical plan** and its continuous / annual update. When preparing the plan, objective indicators for the implementation / suspension of the investment are developed. MEAC and MF also make the plan available to LGs, which can make better spatial planning decisions based on economic cycles.

- Output : long-term fiscal projections; long-term counter-cyclical construction investment plan.
- Leader: MEAC.
- Involved parties: MF, LGs.

## OBJECTIVE 3: THE PUBLIC SECTOR IS THE LEADER AND A ROLE MODEL AS A SMART CONTRACTING ENTITY

As a smart contracting entity, the public sector supports the achievement of long-term goals of construction in the conditions of both economic growth and crisis. When choosing solutions, cost-effectiveness is preferred in the life cycle view, which includes exemplary solutions that follow the principles of energy efficiency, CO<sub>2</sub> economy, accessibility and other solutions that follow the principles of high-quality spatial planning. Construction decisions and processes made by the public sector are transparent, the working teams are competent and work together towards a clearly defined goal. The public sector sets an example through practice, its procurement and the organization and execution of construction, thereby shaping the culture of the whole sector. The objects to be built are planned and designed in such a way that they integrate into the living environment as a whole and support the high-quality spatial development. The earliest possible inclusion of the parties and forms of cooperation between the state and the private sector will be encouraged in order to find solutions that offer the greatest added value during the period of use of the building, i.e. the life cycle of the building. The principles of joint and several liability will be implemented and value and cooperative based procurement will be encouraged, with the public sector setting an example. Each public authority shall involve a sectoral centre of excellence in building activities in order to obtain the best advice for making wise decisions.

**Activity 3.1: Preparation of the smart contracting entity concept**, which describes, among other things: 1) good practice in construction planning, including what to take into account in planning, which preliminary analyses and assessments need to be performed (ordered) before starting the design phase; 2) good practice in contracting works, i.e. instructions on how to carry out procurements, what is the process of performing works, what documents must be prepared, what criteria should be followed when contracting works (e.g. greater emphasis on functionality and long-term value creation for users, total cost calculation methodology, etc.) and how to involve centres of excellence; 3) references to relevant instructions and standards and their relations with legislation; 4) a national model for the completion of the building for the organizational side (how to plan, how to organize procurements, etc.)

- Output: the concept of a smart contracting entity (guidance material).
- Leader: Private.
- Involved parties: MEAC, MF, MC, SRELtd, ME, LGs.

<sup>63</sup>[https://www.mkm.ee/sites/default/files/ehitussektori\\_tootlikkuse\\_lisandvaartuse\\_ja\\_majandusmoju\\_analuu\\_uuendatud.pdf](https://www.mkm.ee/sites/default/files/ehitussektori_tootlikkuse_lisandvaartuse_ja_majandusmoju_analuu_uuendatud.pdf)

**Activity 3.2: Setting an example by the public sector, including the implementation of demonstration and pilot projects.**

Introduction of innovative and optimized solutions, best practices: sample projects, pilot projects, digital tools, alliance procurement, preference for environmentally friendly materials, products and technologies in procurement, introduction of machine learning solutions, introduction of energy-saving behaviour in shaping the built environment, promotion of wood and other environmentally friendly materials, renovation of building monuments, flood mitigation solutions, best practice in accessibility, introduction of zero waste principles, promotion and introduction of circular economy, etc.

- Output: sample and pilot projects; input to the sectoral development document and the smart contracting concept.
- Leader: MEAC.
- Involved parties: MF, MC, SRELtd, LGS.

**Activity 3.3: Establishing the joint and several liability at the choice of the counterparty and before the counterparty. Implementation of the public procurement standard for construction works and, if necessary, specification of the criteria for the performance of construction processes;**

whereas, the implementation of the standard must ensure that construction carried out on the basis of construction designs takes into account the life cycle of the building and is based on the principles of high-quality spatial planning; the pre-construction design phase must be of sufficient length, and appropriate investment must be made in preparation; the optimal completion time of the building is taken into account; the construction commences according to the work project, based on professional owner and author's supervision. More detailed determination of the responsibilities of the contracting entity and other parties in the construction process, planning, design, construction and management of buildings.

- Output: Preparation of a procurement guide and linking it to the smart contracting entity concept; updating the public procurement standard; training and information activities on the implementation of the standard; reviewing the principles of liability insurance, amending legislation, if necessary.
- Leader: Private.
- Involved parties: MF, MEAC, SRELtd, LGS.

**Activity 3.4: Introduction of state's value- and cooperation-based construction procurement practice,**

including description of quality indicators, development of a pricing model that takes into account environmental impacts, accessibility and use costs, and calculation of the total cost of the object in planning. Development of bonus systems in accordance with the Public Procurement Act, and introduction of incentives in procurement so that the state can support the initiation and implementation of new solutions. Organization of architectural contests as a quality assurance measure. In the public sector, centres of excellence, where best practice and knowledge are concentrated and whose role is to lead the procurement process, help organize and conduct procurement. To form a working group to define the preconditions for organizing value- and cooperation-based construction procurements and to develop model evaluation criteria in accordance with the Public Procurement Act. In each area (design, construction, maintenance, etc.) there are standard criteria for value-based procurement, the basis for their evaluation, and guidelines for their use in public procurement.

- Output: putting together a working group; analysis, including the analysis and, if necessary, amendment of the Public Procurement Act; procurement guidelines, inclusion of centres of excellence.
- Leader: MF.
- Involved parties: MEAC, MC, SRELtd, Private, LGS.

**Activity 3.5: Reducing unfair competition.** Review, analysis and, where necessary, development of a guide to public procurement practices in order to reduce the sector's perceived unfair competition and introduce best procurement practices (e.g. by excluding tenderers who do not comply with general principles and good practice). Implementation of the analysis results, incl. conducting trainings (e.g.to introduce and implement the public procurement standard).

- Output: Analysis of public procurement practice and implementation of analysis results; preparation of procurement guidelines; organization of trainings.
- Leader: MF.
- Involved parties: MEAC, SRELtd, Private, LGs.

**Activity 3.6: Reduction of bureaucracy and administrative burdens**, including adaptation of legislation. Analysis to determine whether the requirements of the Commercial Register, REA, BR, Heritage Protection Act and other legislation, requirements and procedural acts are relevant and necessary. In addition, the size of the minimum structure of a construction company or the key indicators for the proper fulfilment of legal obligations and liability should be analysed.

- Output: legal analysis and implementation of its results.
- Leader: MEAC.
- Involved parties: MJ, MC, ME, Private, LGs.

**Activity 3.7: Development of a model for centres of excellence.** Mapping the roles of current institutions (e.g. SRELtd, Transport Administration, KredEx, etc.) and other cooperation platforms and joint organizations. Analysis of the preconditions for the performance of the tasks by the centre of excellence and their interrelationships (training, decision-making rights, cooperation agreements, funding, etc.).

- Output: analysis and proposals for supplementing the documents that serve as basis for operation to competent authorities; conducting an analysis of the fulfilment of the role of the centre of excellence.
- Leader: MEAC.
- Involved parties: MC, MF, SRELtd, ETA, LGs, Private.

**Activity 3.8: Development of the PPP framework**, including the development of efficiency and calculation principles of PPP as a business model in public investment decisions.

- Output: Introduction of PPP feasibility analysis practice and development of implementation methodology for major public sector investments, including guidelines for the implementation of the PPP process.
- Leader: RAM.

#### OBJECTIVE 4: LOCAL GOVERNMENT ACTS AS A SHAPER OF SPATIAL DEVELOPMENT.

Local governments are aware of their responsibility and important role in initiating construction processes and guide spatial development, by designing the built environment and making informed spatial planning decisions, taking into account trends that affect changes in the number and composition of the population. The principles of high-quality spatial planning are applied<sup>64</sup> and the public space is developed primarily based on the needs of the consumer (end user).

**Activity 4.1: Analysis of the volumes of local government investments and implementation of the results of the analysis.** The state can support the investments by local governments through various sources of financing, such as general revenue base, investment subsidies from the state budget and structural funds. It is wise to keep all these in mind when supporting local governments. The need to support local government investments depends on many factors: the economic cycle, the situation of the income base and the investment capacity that depends on it, the debt burden and the availability of loan products, the state of assets, demographic trends, etc. Increasing investment support is important for the development of a good living environment and, where appropriate and if respective capacity is available, in the interests of balanced regional development, opportunities should be found to provide additional support to local governments.

<sup>64</sup> [https://www.kul.ee/sites/kulminn/files/lisa\\_3\\_-\\_kvaliteetne\\_ruum\\_aluspohimotted.pdf](https://www.kul.ee/sites/kulminn/files/lisa_3_-_kvaliteetne_ruum_aluspohimotted.pdf)

- Output: Analysis of the volumes of local government investments, on the basis of which sectoral ministries can make additional applications of SBS;
- Leader: MF
- Involved: all sectoral ministries, LGs.

**Activity 4.2: Introduction of long-term investment planning (approximately 10 years in perspective) practice in local governments.** Local governments should base their investment planning on countercyclicality. This means a reserve of construction investments that can be used if additional financial resources are available, for example in times of crisis. It is important to increase the local government's capacity as a smart investment planner, in terms of spatial planning competence and local development planning (property condition, demographics, needs, financial opportunities, consideration of existing values in site selection) and as a smart contracting entity. The solution is to prepare guidelines, carry out and supervise various training programs, share good practices, and, if necessary, change regulations.

- Output: Preparation of a guide for smart investment planning for local governments, training programs, changing regulations, if necessary.
- Leader: MEAC.
- Involved parties: MF, LGs.

**Activity 4.3: Supplementing the criteria for the use of support measures for local governments based on the** investment, master design and local government development plan. In other words, support is allocated to investments that comply with the local government's general design and development plan and take into account long-term planned investments, including the specifics of both economic growth and decline. The precondition for the master design and development plan to be the basis for investment decisions it is adequate to take long-term population projections into account in these documents.

- Output: Guidelines to all ministries for developing support measures. Supplementing the Operational Program for Structural Assistance for the period 2021-2027 with a corresponding requirement.
- Leader: MF.
- Involved parties: MEAC, LGs.

**Activity 4.4: Promoting best practices.** Local governments cooperate, including with local governments in other countries, by exchanging experiences in the development of a high-quality space. Spatial planning competence and the promotion of best practices are growing. In addition, it is planned to organize network meetings with local government construction specialists on the initiative of the MEAC, where, for example, current topics will be introduced and information on planned changes will be exchanged. Preconditions will also be created for the formation of a budget negotiation working group with representatives of AECM, which is part of the annual budget and budget strategy negotiation process of the Government Committee and representatives of AECM pursuant to the State Budget Act. In the sectoral working group, AECM and the central government (ministry) can submit proposals for changes and expectations of the parties on which an agreement will be reached.

- Output: Mapping the needs of LGs; creation and launching of cooperation networks and working groups.
- Leaders: LGs / AECM, MF, MEAC.
- Involved parties: MC.

**Activity 4.5: Enhancement of the processes for the preparation and implementation of spatial plans.** The aim of enhancement is to improve the quality of spatial planning, including through the implementation of digital tools. Decisions are made based on the principles of high-quality spatial planning and the principles set out in Chapter 2 of the Planning Act. The existence of relevant and up-to-date spatial plans and regular substantive review of the plans will be ensured. A nationwide digital database of spatial plans will be created, which will contain as many valid spatial plans as possible, together with the restrictions specified in the plans, providing a clear basis for carrying out construction activities.

The aim is to create a nationwide planning process environment that is compatible and interoperable with databases and services in the construction sector and other areas of spatial development. Through the respective interface, the planning data is reflected on the e-construction platform and in the digital twin of the built environment.

- Output: Compilation/updating of instructional materials in the field of spatial planning and construction; as a result of the ex-post evaluation of the Planning Act and the Building Code, if necessary, updating the Planning Act and the Building Code; creation of a national digital database of spatial plans, and in case there is corresponding funding, a procedural environment; display of spatial planning data on the e-construction platform and in the digital twin of the built environment.
- Leader: MF.
- Involved parties: MEAC, MC, ME, LGs.

## OBJECTIVE 5: ACTIVITIES ARE BASED ON THE PRINCIPLES OF CIRCULAR ECONOMY.

The building life cycle has been taken into account in the planning, design and construction of each object. The construction process and the built object are nature and energy efficient and sustainable. Buildings are reusable or usable for a new purpose and flexible, meaning that they can be dismantled or relocated as well as rebuilt, and their functionality can change over time. Buildings and living environments are designed in such a way that they can be adapted to the needs later on. Housing fund management is cost effective. Alongside new construction, more and more emphasis is placed on renovation.

**Activity 5.1: Introducing the principles of sustainable construction.** Supplementing and expanding the respective curricula (architecture, urban planning, landscape architecture, engineering studies, real estate development, etc.); conducting information campaigns, including those based on success stories, to promote shared values and best practices. It is important to establish a central information channel (similar to eehitus.ee) and to improve communication between agencies (ministries, boards, universities, institutions) (in the form of a round table, task force, etc.) at the level of policy makers, with the aim of creating better synergies, harmonizing instruments, measures, etc. The preparation of a vision document for sustainable construction (as a separate document, e.g., based on the "Principles of high-quality spatial planning", or as part of a corresponding development document) is crucial. In the field of resource valorisation, the growth niche is resource efficiency in construction and buildings and the valorisation of environmentally friendly materials.

- Output: communication plan: convening of a task force on sustainable construction; a vision document for sustainable construction (this should include the implementation of the principles of the circular economy, sustainable use of water and other natural resources, as well as new innovative solutions for climate change mitigation and construction of buildings that take into account changing climate conditions and needs to adapt to climate change); proposals from the sector to supplement curricula; the organization of level and in-service training necessary for the introduction of the basic principles of high-quality spatial planning.
- Leader: MEAC.
- Involved parties: MF, MC, MER, ME, Private, LGs.

**Activity 5.2: Introduction of circular economy principles,** i.e., mapping of the re-use of buildings and typical construction materials in construction and demolition waste, assessment and harmonization of waste recyclability through pilot projects; establishment of national waste recovery rules and practices; encouraging the re-use of valuable buildings, including information campaigns based on success stories to promote opportunities and best practices and to raise awareness at all levels. Piloting of a construction and demolition waste recycling plant should be considered. Cooperation with other sectors should be achieved to get the best results for the recovery of construction and demolition waste, including for material recycling. Looking for opportunities to use or reuse additional local raw materials.

In addition, the regulation on the length of building life cycle must be reviewed and, if necessary, amended (requirements of the construction design, etc.).

- Output: mapping of construction waste content and assessment of their recyclability; pilot projects (material recovery; recycling plant); national rules and practices for construction and demolition waste; encouraging the re-use of valuable buildings; estimating the life cycle of a building and changing regulations; implementation of digital and automated solutions to facilitate reuse, recycling and recovery; identifying new applications for the circular economy through sectoral research.
- Leader: MEAC.
- Involved parties: ME, MC, educational institutions related to the industry.

### **Activity 5.3: Development of spatial digital twins in such a way that they contribute to a better understanding of the links between construction activities and the achievement of climate goals.**

Digitalisation of climate impact monitoring of buildings, i.e., interfacing into the digital twin, by enabling better monitoring of the state of the built environment and better policy decisions, including the creation of an environment for energy efficiency assessments of utility systems based on BR; automatically generated energy audits and markers based on energy consumption; mapping of empty buildings; digital tools for building owners, etc.

- Output: IT solutions and private sector applications on the e-construction platform.
- Leader: MEAC.
- Involved parties: ME, Private, educational institutions related to the industry.

### **Activity 5.4: Development and implementation of a building life cycle impact assessment methodology.**

It is necessary to develop and implement a greenhouse gas budget methodology (incl. materials database, methodology and piloting), national regulation of the building life cycle "Greenhouse gas budget" (similar to minimum energy efficiency requirements), to supplement the construction documentation of spatial plans with the principles of environmental protection, sustainability and circular economy, incl. to introduce regulations on the climate impact of buildings (when reconstructing buildings, but also when planning new areas and buildings, the climatic conditions of the next 50-100 years must be taken into account). Develop and implement bonus schemes in accordance with the Public Procurement Act to promote sustainable construction (e.g., incentives for work well done, additional floors, etc. for a small footprint). Develop a methodology for calculating the overall impact of new public buildings and introduce it in decision-making processes to calculate the cost of maintaining / demolishing of an existing building and the cost of building, moving, transporting, etc. a new building.

- Output: Greenhouse gas budget methodology and national regulations on the climate impact of buildings; updating the planning guide; methodology for calculating the total impact.
- Leader: MEAC.
- Involved parties: ME, educational institutions related to the industry.

**Activity 5.5: Development and implementation of innovative financial mechanisms.** Analyse the possibilities, advantages and disadvantages of aggregation of the emissions trading system of the construction sector. Possibilities for the introduction of the "Energy performance contract" method need to be developed. In addition, CO<sub>2</sub>-based reconstruction support measures for commercial real estate need to be developed.

- Output: study on the emissions gas trading system; proposal for a support measure.
- Leader: MEAC.
- Involved parties: ME.

## OBJECTIVE 6: THE CONSTRUCTION INDUSTRY PROMOTES INNOVATIVE SOLUTIONS TO INCREASE PRODUCTIVITY AND QUALITY.

Strong private companies, well-functioning cooperation networks and associations have developed. The output of construction work is recognized, of high quality and innovative. The building life cycle has been taken into account in the planning, design and construction of each object. Planning and building activities are based on construction-related data that is available to everyone. Automated solutions are used in construction processes, the most common are off-site manufacture and the use of BIM models. Better access to information makes construction processes and the whole sector more transparent. Thanks to the data-based decision-making process, the quality of the decisions has improved. The state promotes innovative solutions (digitization and availability of data, procurements supporting innovation). Contracting and construction of buildings is a transparent process. The share of the grey economy is non-existent. Innovative architectural practice promotes the application of new technologies for built environment and construction processes.

Exports of higher value-added products / services (digital and automation solutions, data exchange) are important. Exporting the Estonian model - sharing their experience and knowledge in construction management (i.e., strategic, long-term, counter-cyclical planning, smart contracting, value-based procurement, efficient construction process management, data-driven approach and digitization in decision-making and implementation, use of smart user-friendly solutions, solutions that fully comply with the principles of high-quality spatial planning, etc.) to other countries and stakeholders.

**Activity 6.1: Promoting the implementation of off-site manufacture, modularity, robotics, automation possibilities under the leadership of the centres of excellence.** The implementation of activities also contributes to the reduction of human resources in the construction industry, which, taking into account the population trends both in Estonia and in Europe, may prove necessary.

- Output: conducting pilot projects, increasing the share of applications.
- Leader: Private.
- Involved parties: MEAC, SRELtd.

**Activity 6.2: Development of e-construction**, including digitization of construction data, standardization and making data available (realization of the e-construction vision), provision of digital sandboxes; open e-databases with virtual prototypes; bringing e-government processes into the sector in order to increase user-friendliness, speed of procedures and efficient operation of the sector; creation of an inclusion platform and BIM model platforms; to make the use of BIM in the design of new buildings mandatory in the public sector, incl. to create a capacity in BR to process building and use permits on the basis of a BIM model.

- Output: Preparation of IT analyses, creation of IT solutions, development of digital construction environments, preparation of standards, making the introduction of BIM mandatory in the public sector and facilitating the introduction.
- Leader: MEAC.
- Involved parties: MF, SRELtd, Private.

**Activity 6.3: Development of R&D support measures**, in order to encourage private businesses to cooperate with universities; setting up incubators and testing laboratories or providing access for businesses to test and develop innovative solutions. Increasing of the private sector funding for training, including payment for in-service training by the company, payment of scholarships in vocational and higher education institutions, organization of student competitions and commissioning of student work by the private sector, etc.

- Output: Preparation of proposals for the Operational Programmes of the Structural Funds for the period 2021-2027; development and implementation of financing measures (incl. SF); developing models for engaging private funding; proposals to stabilize sectoral research funding, taking into account project-based practices.

- Leader: MEAC.
- Involved parties: MF, MER, MC, Private.

**Activities 6.4. Convening of the Construction Development Committee.** Establishment of a permanent voluntary development group across the construction sector (clients, developers, planners, architects, engineers, builders, manufacturers of building materials and elements, managers) in the form of the Construction Sector Development Committee (to map the various forms of cooperation in the country, e.g. the Transit Commission, the Open Government Development Committee, the BIM Working Group of Public Contracting Authorities, etc. and to develop a suitable form of cooperation based on best practices).

- Output: convening of the Construction Development Committee.
- Leader: MEAC
- Involved parties: MF, MC, ME, SRELtd, Private (incl. EACE, EAACEC, UEA, etc.), LGs (AECM).

**Activity 6.5: Ensuring the certification of products (incl. reused, secondary raw materials from waste), i.e., establishing a technical assessment body or assigning its function to an existing body.**

Carrying out an analysis to identify more specific needs and alternative business models (who and how provides the service). For services that, based on the analysis, are not cost-effective, setting up a support measure for the use of a certification service elsewhere in the country should be considered.

- Output: analysis and decision-making (establishing of an agency or extension of the functions of an existing agency, increase of contracts, award of a function, provision of resources, creation of a support measure).
- Leader: MEAC.
- Involved parties: Private.

## OBJECTIVE 7: EMPLOYEES TRAINED IN THE BEST INTERNATIONAL PRACTICES SUPPORT THE DEVELOPMENT OF THE SECTOR.

In conjunction with the fulfilment of the objectives of the education development plan, contribution is made to the development of the sectoral education system and school network and the increase of the level of education. In particular, efforts will be made to increase the share of people with vocational education that meets the expectations of the labour market, and to the optimal school network. A constantly evolving in-service training system is crucial. The image of the construction sector is positive, and the occupancy of curricula is high, which is one of the preconditions for ensuring the availability of necessary specialists. In the field of construction, there are enough specialists with education in spatial planning, who follow the principles of high-quality spatial planning, and the construction sector is an attractive employer for specialists. The construction sector is developing new functional solutions in cooperation with Estonian and international research institutions, and the public sector is supporting their implementation. Representatives of different specialties in the construction industry share goals and a value system.

**Activity 7.1: Analysis of learning opportunities in the construction industry and implementation of the results of the analysis.** The analysis of the educational institutions providing education in the field of construction must assess the optimal structure of the school network and the possibilities for specialization necessary for the digital and green revolution. The development of vocational and higher education in the field of construction must be assessed both to cover the needs of today's construction sector and to consider future trends (for example, climate policy, aging population, technological development). Curricula and teaching principles need to be reviewed in order to increase the quality of studies and the acquisition of prescribed learning outcomes, *inter alia* to ensure the growth of competent planning specialists.

- Output: convening a round table on education in the field of construction; performing analyses and implementing changes as a result; improving the quality of education.
- Leader: MER.
- Involved parties: MEAC, educational institutions related to the industry, MC, MF, Private.

**Activities 7.2. Modernization of management and cooperation skills.** Replacing demand-based management practices with motivation-based ones, which is a precondition for the spread of a quality, efficiency and innovation-oriented mindset in the sector. Professional standards and curricula emphasize leadership and collaboration competencies and are based on modern management methodologies and tools (incl. negotiation skills, virtual team management, recruitment, change management, stakeholder involvement, communication, coaching, etc.).

- Output: professional standards and curricula supplemented with leadership and cooperation competencies.
- Leader: Private.
- Involved parties: MER, educational institutions related to the industry.

**Activity 7.3: Establishment of the requirement for a professional certificate (or similar certificate) for construction workers working on construction sites.** Analyse the factors that favour the acquisition of qualifications and businesses' contribution to the training of their employees.

- Output: analysis; identifying and implementing further steps according to the results of the analysis.
- Leader: Private.

**Activity 7.4: Development and provision of in-service training programs** (e.g., project management, planning education). Carrying out an analysis of the needs for which there is no supply on the market today, the best practices, and the needs of Estonia for organizing in-service training (for the establishment of in-service training centres). Today, MER offers in-service training in the construction sector according to the OSKA reports. The best solution must be found to integrate the principles of high-quality spatial planning into in-service training.

- Output: program development; financing the implementation of programs; carrying out the analysis and applying its results.
- Leader: Educational institutions related to the industry.
- Involved parties: MER, MEAC, MC, Private.

**Activity 7.5: Analysis of national labour policy, including migrant labour policy,** that takes into account the labour market needs and developments. Analyse the need, purpose, implementation methods, control mechanisms, etc. of the worker's card. If the analysis supports the need, then the introduction of a worker's card requirement in the construction sector, which may also include the obligation to register short-term employees in the Employee Register. Transfer of certificates of competence of other countries to the Estonian system.

- Output: analysis; identifying and implementing further steps according to the results of the analysis.
- Leader: MEAC.
- Involved parties: MF, MI, MSA, MER.

**Activity 7.6: Increasing the supply of internship opportunities, analysing the possibilities of motivating it and implementing possible proposals,** for example, introducing an exemption from social tax for internship centres (as a tax refund) or a significant benefit from the salaries paid to interns..

- Output: increased supply of internships, analysis (incl. tax analysis); identifying and implementing further steps according to the results of the analysis.
- Leader: Private.
- Involved parties: MER, educational institutions related to the industry, MF, MSA.

## 5. PRELIMINARY IMPACT ASSESSMENT OF THE ACTIVITIES

An indicative impact assessment was prepared to assess the relevance of the objectives and activities set out in the document. The expected costs or required investments have been estimated to the best of our knowledge during the "Long-term view on construction 2035" analysis in cooperation with the contractor's and contracting entity's steering team. The following expenses are not presented as a commitment to apply for the respective funds in the processes of preparation of the state budget or planning of foreign funds. Similarly, the parties do not make any binding commitments when signing the "Agreement on the seven big steps in construction".

The measures outlined for the development of the Estonian construction sector are different in terms of cost, time, income and their impact. Some measures have a direct impact on Estonia's economic growth, while some contribute to the growth of the well-being of the Estonian people, which is difficult to quantify. By combining objectives that are closely related in terms of impact, and by setting hypotheses, we have assessed the impact of the measures on the Estonian economy.

The impact assessments are based on the studies of the impacts of similar measures, research and the best knowledge, the results of which have been adjusted according to the size of the Estonian construction sector or other indicators, respectively. For example, if McKinsey and Ellen MacArthur estimate the impact of the circular economy on the world economy at 1.5 trillion euros, and considering that the share of activities directly related to the Estonian construction sector is about 10% of the Estonian economy (6% in the strict sense) and Estonia's GDP forms 0.04% of world GDP, then with such a methodology we have derived the effect of achieving the target. The resulting effect is then divided between the measures, for which it is assumed that the productivity of each measure is relatively the same and that the productivity of the measure depends on the investment (costs).

Sources used to assess the impact of the measures:

- World Economic Forum. „Shaping the Future of Construction: A Breakthrough in Mindset and Technology" (2016)
- McKinsey. "The Circular Economy: Moving from theory to practice" (2016)
- Ellen MacArthur Foundation „Within Growth: A Circular Economy Vision for a Competitive Europe" (2016)
- Wang, S., Ofori, G. „Total factor productivity growth accounting in the construction industry of Singapore" (2003)
- WEF "Shaping the Future of Construction A Breakthrough in Mindset and Technology" (2016)
- Auerbach, A., Gorodnichenko, Y. "Measuring the output responses to fiscal policy." (2012)
- Statistics Estonia (2020)
- World Bank (2020)

### OBJECTIVE 1: THE PRINCIPLES OF SHAPING A HIGH-QUALITY LIVING ENVIRONMENT HAVE BEEN AGREED UPON AND THE PARTIES IMPLEMENT THEM JOINTLY

According to the report of the European Environment Agency<sup>65</sup>, successful urban planning and housing have an impact on reducing emigration, in other words, it is a pull factor. Similarly, Massey (2005)<sup>66</sup> has mapped cultural ties between cities and peripheral areas as one of the pull factors. In Munich, where stakeholders were involved in urban planning, a development plan was established and cooperation was provided at regional level in shaping the living environment, the population has grown by an average of 0.7% between 1990 and 2016<sup>67</sup>. Carlino et al. (2019)<sup>68</sup> identified a link between urban beauty and population growth - population growth in "beautiful cities" is on average 10% higher and attracts highly educated people. Therefore, it is important to contribute to the creation of a high-quality living environment, as the living environment has an impact on reducing emigration.

<sup>65</sup> Urban sprawl in Europe - The ignored challenge (2006)

<sup>66</sup> Worlds in Motion: Understanding International Migration at the End of the Millennium (2005)

<sup>67</sup> Urban sprawl in Europe - The ignored challenge (2006) & Bavarian Regional Authority for Statistics and Data Handling

<sup>68</sup> Beautiful city: Leisure amenities and urban growth (2019)

According to 2019, Estonia's GDP per capita is 21,219 euros and the number of emigrants is 12,801.<sup>69</sup> Although the reasons for emigration among Estonian have been partially mapped, the exact impact of successful urban planning on emigration has not been assessed. Therefore, the assessment is based on the average impact or 5% in the studies by Munich (2006) and Carlino et al. Therefore, we find that if successful urban planning and housing **reduce emigration by 5%, the GDP growth would increase by 0.05 percentage points, or about 13 million euros.**<sup>70</sup> If emigration were to decrease by 1%, the impact on GDP would be around 3 million euros. Indirect benefits such as better long-term planning and the quality of decisions and increased tourism should also be taken into account.

## **OBJECTIVE 2: THE STATE'S CONSTRUCTION INVESTMENTS ARE COUNTER-CYCLICAL AND IN LINE WITH THE NATIONAL STRATEGIC PLAN**

The preparation of a counter-cyclical plan helps ensure the stability of the construction sector. As the construction sector is strongly affected by economic cyclicity, and pro-cyclical investments include the risk to exacerbate overheating and therefore, instability, public investment should be balancing or counter-cyclical. This will ensure stable productivity and employment. The impact of counter-cyclical investments on GDP is stronger than that of pro-cyclical investments - Auerbach et al. (2012) proved that investments made in the economic downturn have a stronger effect on GDP growth than investments made in the upswing phase of the economic cycle. **By increasing Estonian public sector investment by 1% in the downturn phase of the economic cycle, GDP will grow by 3.4%, compared to 2.3% of GDP growth, if the investment were made in the upswing or pro-cyclical phase.** As counter-cyclical investments are made in recession time and their impact largely depends on the timing, length and depth of the downturn, the exact cost of counter-cyclical investments is difficult to estimate, but it is estimated at between 100 to 260 million euros.

## **OBJECTIVE 3: BEING A SMART CONTRACTING ENTITY, THE PUBLIC SECTOR ACTS AS A LEADER AND SETS AN EXAMPLE** **OBJECTIVE 4: LOCAL GOVERNMENT ACTS AS A SHAPER OF SPATIAL DEVELOPMENT**

According to a study by the World Economic Forum (2016), optimization of construction and planning processes enables to reduce project completion time by 20% and therefore, reduce the company's operating costs by up to 16%.<sup>71</sup> However, this requires the implementation of innovative and optimized solutions where the public sector can set an example as a smart contracting entity - such as implementing BIM principles and best practices, sample projects, pilot projects, value and cooperation based procurement, alliance procurement, preference for off-site manufactured components in procurement and machine learning solutions. According to the World Economic Forum (2016), the impact of optimizing planning processes on the global construction sector will bring about 0.4 trillion euros savings in operating cost over 10 years, which in the Estonian context would mean about 15 million euros in savings per year.<sup>72</sup>

However, the public sector must also set an example by improving procurement processes by ensuring transparency and anti-corruption measures. According to the World Economic Forum (2016), the impact of corruption in public procurement in the construction sector is 0.2% of the construction sector productivity, i.e. in the Estonian context, an estimated 5 million euros.<sup>73</sup> **Therefore, applying the estimates presented in the studies in the Estonian context - optimizing construction, planning and procurement processes and making them more transparent, reducing bureaucracy and administrative burden, the impact of the measures is estimated at 20.76 million euros, which would contribute 0.08% to Estonia's GDP growth.**

<sup>69</sup> Statistics Estonia (2020)

<sup>70</sup> Calculation procedure: GDP per capita 21 219\* number of emigrants 12 801\* reduction of emigration 5%

<sup>71</sup> Shaping the Future of Construction (2016)

<sup>72</sup> Calculation procedure: 0.4 trillion (operating cost savings) / World GDP (68 trillion) \* Estonian GDP (26 billion) / 10 (years)

<sup>73</sup> Identifying and Reducing Corruption in Public Procurement in the EU (2013)

<sup>74</sup> Calculation procedure: Size of the Estonian construction sector (2.6 billion) \* 0.2%

## OBJECTIVE 5: "CIRCULAR ECONOMY PRINCIPLES SERVE AS A BASIS" AND OBJECTIVE 6 "THE CONSTRUCTION INDUSTRY PROMOTES INNOVATIVE SOLUTIONS TO INCREASE PRODUCTIVITY AND QUALITY"

World Economic Forum (2016) report, McKinsey study<sup>75</sup> and the Ellen MacArthur Foundation's study have identified two future trends in the construction industry:

- implementation of the principles of the circular economy and thus a more economical and efficient construction sector;
- deployment of the technology of the future - digitization, modularity, 3D printing and robotisation.

It is therefore reasonable to combine Objectives 5 and 6, as the studies look at both the concept of the circular economy and future technologies together as a single trend. According to McKinsey, ARUP<sup>76</sup> as well as the study by the Ellen MacArthur Foundation<sup>77</sup>, application of the principles of circular economy could increase the productivity of the world economy by around 1.5 trillion euros, with an impact on the construction sector of around 150 billion euros. At the same time, research finds that the implementation of the principles of circular economy requires the introduction of digital solutions, modularity, robotics and off-site manufacturing. **In the Estonian context, this would mean an increase of 57 million euros in GDP, or 0.22% of GDP<sup>78</sup>.**

## OBJECTIVE 7 "EMPLOYEES TRAINED IN THE BEST INTERNATIONAL PRACTICES SUPPORT THE DEVELOPMENT OF THE SECTOR"

According to Zhi et al. (2003)<sup>79</sup>, qualified workers have a strong impact on productivity in the construction sector. The authors found that when increasing the number of qualified workers by 1%, the productivity of the construction sector will increase by 0.111%, which is why education has a clear impact on increasing the productivity of the construction sector. Assuming that the goal is to raise the qualification of 10% of existing workers through in-service training programs and the introduction of professional certificate requirements, **the productivity of the Estonian construction sector would increase by 26 million euros, which would contribute to GDP growth by 0.1%<sup>80</sup>.**

**By combining the activities of all objectives, it is possible to increase the contribution of the construction sector to the GDP of the Estonian economy by 1.59 percentage points, i.e., by approximately 405 million euros in value added. Whereas, the cost of implementing all activities is estimated at 60 million euros. In addition, hidden synergies should be taken into account, as the development of the construction sector towards education, R&D, productivity and a better living environment can also contribute to the development of other industries, the impact of which has not been assessed here.**

See Annex 3 for the overview of the costs and benefits of the activities.

<sup>75</sup> The Circular Economy: Moving from theory to practice (2016)

<sup>76</sup> The Circular Economy in the Built Environment (2016)

<sup>77</sup> Achieving 'growth within' (2017)

<sup>78</sup> Calculation procedure: 150 billion (impact of the circular economy) \* 0.04% (Estonia's share of world GDP)

<sup>79</sup> Total factor productivity growth accounting in the construction industry of Singapore (2003)

<sup>80</sup> Calculation procedure: 0.111% (productivity growth) \* 2.6 billion (share of the Estonian construction sector in GDP) \* 10

## 6. PROPOSED INDICATORS

Impact and result indicators should be set primarily at the level of the strategic development document, which formulates the general objective, sub-objectives and indicators describing their level of achievement. Indicators will also be added to the activities of the program designed to achieve the objectives set in the development document.

Table 2 provides an overview and initial recommendations for potential indicators to be used to measure the achievement of the sector's development goals. The exact list and levels of indicators are defined in the strategic development document of the industry or in the national plan.

Table 2. Indicators

INDICATOR	LINK TO THE OBJECTIVE	LEVELS (basic level, 2030, 2040, 2050)
Satisfaction with the living environment (satisfied or rather satisfied)	E1, E2, E4	Basic level: 84.54% (2020); regional differences (difference between the highest and lowest decile LGs) - 29 percentage points. Target: > 85%; regional differences (difference between the highest and lowest decile LGs) - ≤29 percentage points.
The length of the processing of spatial planning documents	E2, E4	NA
Speed of processing building permits, average number of days needed	E2, E4	30
Speed of processing of permits, average number of days needed	E2, E4	10+
Amount of CO <sub>2</sub> emissions from construction activities, thousand tons per year	E1, E3	155,2 <sup>81</sup>
Estonia's place in the global sustainable development goals index (EE2035 indicator)	E3, E5	12 (2019)
Share of improved environmental indicators among sustainable development indicators (EE2035)	E3, E5	The baseline is the state in 2020
Circular material use rate (EE2035)	E3, E5, E6	8.7% (2018)
Share of reconstructed buildings from buildings in need of renovation (energy efficiency class C) by counties	E3	Nationwide 25% (2030), 60% (2040), 100% (2050)
The share of new buildings with nearly zero energy, % of the volume of new buildings	E3	-
Share of renewable energy in total final energy consumption (EE2035)	E3	>30% (2018); >42% (2035)
Energy consumption of residential and non-residential buildings (EE2035)	E3	16,1 TWh; 14 TWh (2035)
Share of procurements that favour the lowest price criterion	E4	In public procurement in general 84% in Estonia, 54% in Finland; Target: 50% in construction procurement (2030)
Share of alliance procurement	E4	-
Share of rented premises in the total housing stock (excluding accommodation, airbnb, etc.)	E1	NA

<sup>81</sup> [http://pub.stat.ee/px-web.2001/Dialog/varval.asp?ma=KK31&ti=%D5HUHEITMETE+ARVEPIDAMINE&path=../Database/Keskond/01Keskonna\\_arvepidamine/08Ehu\\_emissioonide\\_arvepidamine/&lang=2](http://pub.stat.ee/px-web.2001/Dialog/varval.asp?ma=KK31&ti=%D5HUHEITMETE+ARVEPIDAMINE&path=../Database/Keskond/01Keskonna_arvepidamine/08Ehu_emissioonide_arvepidamine/&lang=2) (productivity survey of the construction sector)

Volume of public and private investments	E5	-
Change in the volume of real estate investments compared to the economic situation	E7	
Unemployment rate in the construction sector	E6	
Number of skilled workers	E7	
Share of building permits applied for on the basis of BIM	E6	NA
R&D expenditure of businesses in the construction sector per sales revenue, %	E6	0.016% <sup>82</sup>
R&D expenditure in the private sector (EE2035)	E6	0.61% of GDP
Number of patents created by Estonian construction businesses, average per year	E6	NA
Share of off-site manufacturing	E6	NA
Square meters of residential buildings per workforce	E6	
Productivity / labour productivity 1. architecture and design 2. construction manufacture 3. construction	E6	1. 25 219 (2018. a) 2. 27 157 (2018. a) 3. 29 500 (2017.a)
Share of labour costs in the construction sector in value added	E6	
Assessment of labour shortage by construction businesses (indicator: KI construction barometer data)	E6	69 <sup>83</sup> %
Share of employees with professional certificates	E7	
Number of people entering the labour market who have completed higher education in the construction specialty	E7	
Number of people entering the labour market who have completed vocational training in the construction specialty	E7	
Number and drop-out of vocational students in the construction specialty	E7	
Number of researchers and engineers in the private sector per 1000 population (EE2035)	E6, E7	1.33 (2018); 4.53 (2035)
Share of intangible investments, %	E6	22.9% <sup>84</sup>
The share of the grey economy	E6	25%
Business confidence indicator	E6	
Total export volume, million euros per year 1. architecture and design 2. construction manufacture 3. construction	E6	NA
Share of exports, % of sales revenue	E6	NA <sup>85</sup>
Share of unused buildings		
Accessibility index		
Share of building monuments in a good and satisfactory condition	E1, E4, E5	63.9% (2019)
Share of building monuments in use	E1, E4, E5	74.7% (2019)

<sup>82</sup> Statistics Estonia, data from 2016

<sup>83</sup> Statistics Estonia, data from 2016; productivity survey of the construction sector

<sup>84</sup> EIB Investment Survey, 2017; productivity survey of the construction sector

<sup>85</sup> Can be further calculated from Tax and Customs Board's VAT declaration data (construction sector productivity survey)

## 7. ABSTRACT

The construction sector plays a key role in the socio-economic development of society: companies generate wealth with construction activities that, combined with the real estate sector, account for approximately 16% of GDP. **The construction sector shapes the environment we live in, creates new jobs and supports the sustainable development of the economy. Regional, social, climate, cultural heritage and energy-related challenges could be addressed through this sector**, giving it an important place in the state's policy-making. **The principles of high-quality spatial planning**<sup>86</sup> that were developed in 2019 have not taken root in practice, which means that specific steps must be taken for us to understand, appreciate and adopt decisions based on these values and principles. The analysis and suggestions made by the expert group on spatial development have not yet been implemented in full<sup>87</sup>. In order for the further development of the construction sector to be consistent and competitive in Estonia and the built environment to support the health, needs and interests of the population, **it is important to build a common understanding between the different parties of the vision that aims towards the achievement of cross-sectorial objectives.**

**Long-Term View on Construction 2035** is focusing on the identification of main causes to ensure the best development of the construction sector, shaping a high-quality built environment and wording the objectives for the development of this field of activity. This serves as a basis for the agreements and cooperation between the state and private sector, changing the model of action, and it could be one of the inputs into the preparation of a strategic development document (e.g. sectorial development plan).

In recent years, the Estonian construction sector has contributed significantly to general economic growth. However, there exist several **problems and challenges** that in interaction reduce the international competitiveness of the construction sector, such as lack of a long-term view on the living environment, a non-existent long-term and counter-cyclical construction investment plan, smart commissioning principles and implementation thereof, as well as environmental sustainability and healthiness problems, a slowdown of export growth, a lack of openness to innovation, a low level of labour productivity and the bad reputation of the construction sector. All the listed problems stem from two main problems:

- 1) Insufficient basis for the creation of high-quality living environment;
- 2) Low productivity in the construction sector.

In addition, external factors influencing the construction sector must be taken into account. Subjects that are important for the creation of the living environment are not currently covered by development plans and they belong to different results areas. In the interests of having a holistic approach to the development of the living environment, a reorganisation of the results areas and creation of the living environment results area should be considered. This approach is further supported by the targets set by the 'Estonia 2035' strategy and conclusions made in the Estonian 2019/2020 Human Development Report. In order to resolve the challenge of the instability of construction investments, a long-term investments plan should be developed and counter-cyclical investments should be made with the aim of alleviating fluctuations in added value and ensuring more broad-based economic stability. In the interests of the competitiveness of the construction sector and sustainability of the economy, the public sector should show its innovative initiative through its different roles (planner, client, financier, etc.). This would enable the construction sector to catch up with other sectors (for example, industry sector) by bringing the sphere of construction to the level of 4.0 or even 5.0. As a rule, people come up with innovations and developments and proceed to implement them, and their competence in this area is extremely

<sup>86</sup> [https://www.kul.ee/sites/kulminn/files/lisa\\_3\\_-\\_kvaliteetne\\_ruum\\_aluspohimotted.pdf](https://www.kul.ee/sites/kulminn/files/lisa_3_-_kvaliteetne_ruum_aluspohimotted.pdf)

<sup>87</sup> [https://www.kul.ee/sites/kulminn/files/ruumiloom\\_opparuanne.pdf](https://www.kul.ee/sites/kulminn/files/ruumiloom_opparuanne.pdf)

important. The entry of competent and vigorous people into the sector ensures a long-term development effect across the entire value chain of the construction sector in Estonia.

Based on the analysed present situation, our current strengths and (main) problems, links between strategic planning, the cyclical nature of demand and the economy, and technological breakthroughs, we have worded the vision for 2035 to describe the construction sector in 15 years:

The built environment in Estonia is user-centred and **serves the general purpose of creating a high-quality living environment**. From **the user perspective**, our developments are **well thought-out, functional** and follow **the basic principles of high-quality space**.

Construction decisions are made with a long perspective in mind and are based on data and sustainability principles, thereby creating a balance between ecological and economic aspects throughout the full life cycle of a building. When shaping spatial use, discussions are held with the relevant local community and stakeholders, and their interests and needs are taken into account.

**The public sector is the leader and a role model** in facilitating smart commissioning and innovation. We assist in the development and introduction of the newest technologies, materials and digital solutions, and standards ensure that the construction process is completed in cooperation with the client and the contractor where both parties are equally responsible for the high-quality result. The long-term planning of construction by the state ensures counter-cyclical management.

Construction activity is quick and of high quality, and it is organised as a **transparent process**. In the sphere of construction, **smart and pioneering solutions are implemented**, and to find such solutions, the parties cooperate with each other and research institutions. At the same time, the construction sector respects the **historical and cultural context** and uses it as an important resource and tool. The construction sector is a valued field of activity in society, we employ **professionals** and the field of construction is an **attractive speciality to study**.

All of the above contribute to bringing the Estonian construction sector **productivity** to the best level in Europe. Our construction products and services are internationally **highly competitive** and support economic growth in Estonia in the best possible way.

In other words, the vision description is a **model of the Estonian construction sector**, i.e. the method and culture describing how a high-quality living environment is created, the construction process is planned and organised, the sustainability and competitiveness of the sector is ensured and international cooperation is promoted. The entire e-governance development and the potential of digitalisation of many other supplementary processes play an important role here. The model of the Estonian construction sector is **a development agreement made in cooperation with the public and private sector (relevant stakeholders), the achievement and promotion of which are equally the duty and responsibility of all the parties involved**.

In order to achieve the vision and resolve the root problems described above, **seven large steps and 38 activities** have been planned. By combining the activities of all objectives, it is possible to increase the contribution of the construction sector to Estonian GDP by 1.59 percentage points or **approximately 405 million euros in a year as added value**. At the same time, the **estimated total costs** of the implementation of all these activities is **60 million euros**. In addition, indiscernible synergies must be taken into account, as the development of the construction sector contributes to better education, research and development, the improvement of profitability and the shaping of a better living environment. These impact on the development of other sectors, the effect of which has not been estimated here.

As an objective, Long-Term View on Construction 2035 sets seven large steps that help us to move forward towards shaping a high-quality living environment. In order to achieve a more extensive effect on society, the first step is to determine the role of the public sector as the pioneer, which, on the one hand, provides a basis for structural changes, while on the other hand ensures the cooperation of

different parties. The task of the state as the policy-maker and a major construction client is to create a suitable environment for the implementation of changes in the sector, which can be achieved only through long-term and purposeful action. In fact, the strategic development of the construction sector causes a significant effect on the whole of society, as construction, which is a horizontal economic sector, serves as a basis for the development of all other sectors.

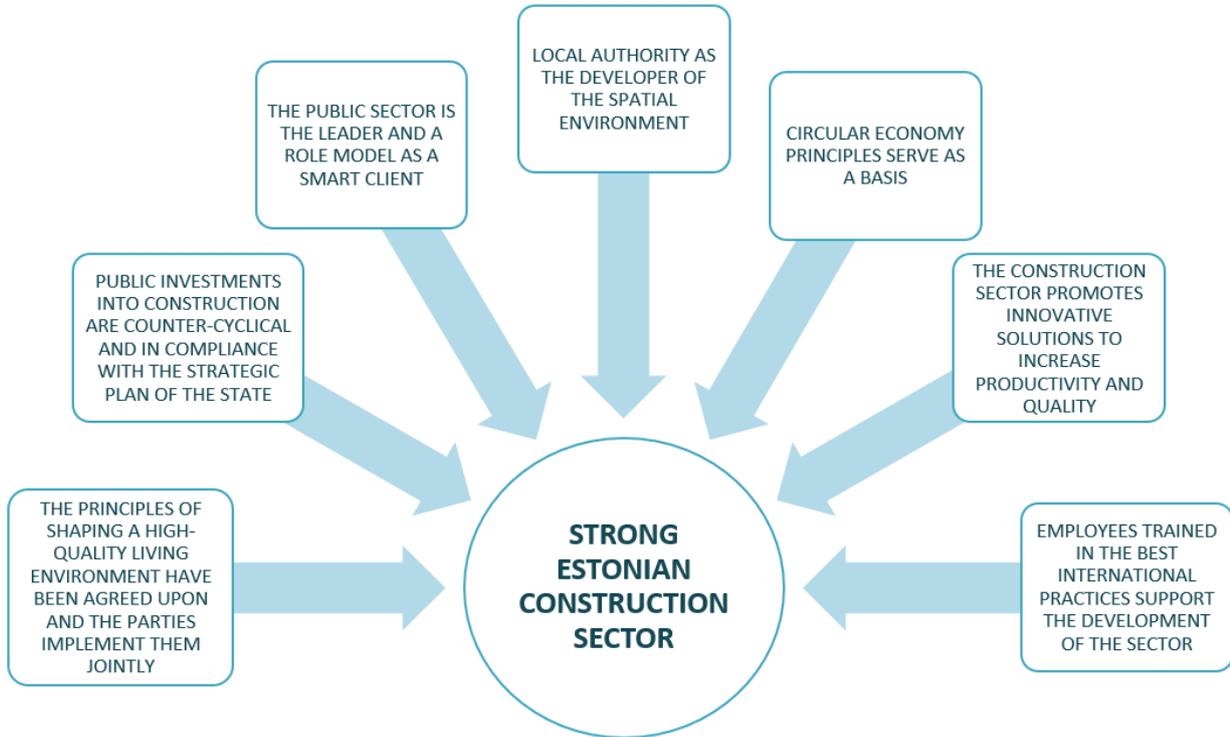


Figure: Seven large steps of the construction sector

# ANNEX 1. DEFINITIONS AND ABBREVIATIONS

**AECM** - Association of Estonian Cities and Municipalities

**Alliance Procurement or Integrated Project Implementation (IPI)** - the owner or contracting entity and the service providers work as a single integrated team under one contract, where the business interests of all parties are primarily related to the end result of the project. All parties are involved in the project as early as possible and are jointly and severally liable for the risks. The term Alliance Procurement is used throughout this document.

**BIM** - Building Information Modelling, which is based on a process-oriented way of thinking about the application of information technology in the design of buildings. Software that follows the idea of model design supports the entire life cycle of a building, from the idea to the demolition. The software supports the stages of spatial planning, architectural design, structural calculations, special parts design, construction, supervision, operation, management. These disciplines are interconnected through work processes and partly overlap. Modelling requires a smooth exchange of information between the parties.<sup>88</sup>

**BR** - Building Register

**Building life cycle** - a view of a building, from its design to the end of exploitation. The life cycle is characterized by different periods such as planning, design, construction, operation and maintenance of the property, major reconstruction or demolition, if necessary<sup>89</sup>

**CASS** - Center for Applied Social Sciences

**Construction industry** - according to the narrow definition of the construction sector, the sector consists mainly of general and subcontracting enterprises (NACE code F). In the context of this analysis, it is based on a broader definition of the construction sector (construction industry), i.e. the entire construction sector value chain, i.e. in addition to general and subcontracting companies, the construction sector also includes companies producing and supplying construction inputs (planners, surveyors, architects, civil engineers, designers, manufacturers of construction materials, etc.) and parties involved in the sale and use of construction as a final product (repairers, managers, maintenance, appraisers, brokers, interior designers, etc.).<sup>90</sup>

**EAACEC** - Estonian Association of Architectural and Consulting Engineering Companies

**EACE** - Estonian Association of Construction Entrepreneurs

**EBIT** - Earnings before interest and taxes

**EREMA** - Estonian Real Estate Maintenance Association

**ETA** - Estonian Transport Administration

**EU** - European Union

**GDP** - Gross domestic product

**GO** - Government Office

**IMF** - International Monetary Fund

**IT** - Information Technology

**LG** - Local government

**IoT** - Internet of Things

**MC** - Ministry of Culture

<sup>88</sup> [https://www.mkm.ee/sites/default/files/ehitussektori\\_tootlikkuse\\_lisandvaartuse\\_ja\\_majandusmoju\\_analuus.pdf](https://www.mkm.ee/sites/default/files/ehitussektori_tootlikkuse_lisandvaartuse_ja_majandusmoju_analuus.pdf)

<sup>89</sup> <https://www.ehitusuudised.ee/uudised/2016/09/09/mis-on-ehitise-elukaar>

<sup>90</sup> [https://www.mkm.ee/sites/default/files/ehitussektori\\_tootlikkuse\\_lisandvaartuse\\_ja\\_majandusmoju\\_analuus.pdf](https://www.mkm.ee/sites/default/files/ehitussektori_tootlikkuse_lisandvaartuse_ja_majandusmoju_analuus.pdf)

**ME** - Ministry of the Environment

**MEAC** - Ministry of Economic Affairs and Communications

**MER** - Ministry of Education and Research

**MF** - Ministry of Finance

**MI** - Ministry of the Interior

**OECD** - Organization for Economic Cooperation and Development

**OIB** - Österreichische Institut für Bautechnik

**PIMA** - International Monetary Fund Public Investment Assessment

**PPP** - Public-private partnership

**Productivity** - or labour productivity (within the framework of this analysis, the terms productivity and labour productivity are considered unambiguous). The amount of work that the workforce is able to do over a period of time. Calculated: value added divided by the number of employees. Value added = Operating profit + Labor costs + Depreciation.

**R&D** - Research and Development

**REA** - Register of Economic Activities

**SBS** - State Budget Strategy

**SF** - Structural Funds

**SME** - A small and medium-sized enterprise

**SRELtd** - State Real Estate Ltd.

**UEA** - Union of Estonian Architects

## ANNEX 2. METHODOLOGY AND LIST OF PARTICIPANTS

Based on the objectives of the project, the analysis part of the paper was carried out in four stages.

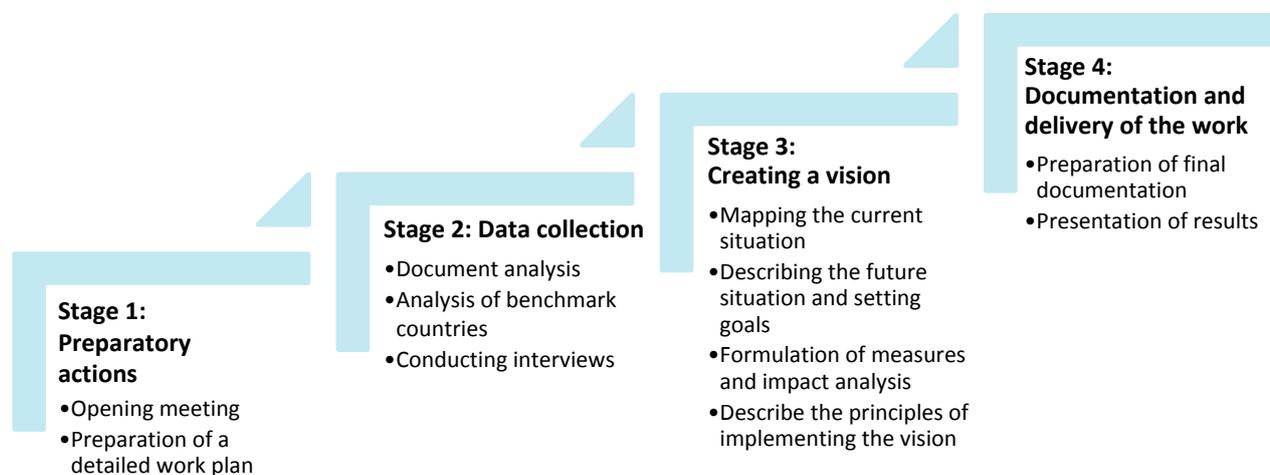


Figure 19. Stages of work implementation

The data collection stage included:

- **a document analysis** describing the strengths and key challenges of the industry
- **an analysis of benchmark countries**, the main aim of which was to collect the best practices that could be implemented in Estonia, but also to assess the market potential of the Estonian construction sector;
- **interviews and workshops** aimed at validating and supplementing the information gathered during the document analysis, and finding possible measures to improve the situation in the Estonian construction sector.

In the vision creation stage, the collected **information** was analysed both by the project team of the executer and together with experts at workshops. As a result of the analysis, the **current situation of the construction sector, the desired future situation, the objectives** describing the future situation and the measures the implementation of which ensures the achievement of the desired future situation were described. In order to map the validation of problems, vision, goals and measures, five workshops and 11 steering group meetings were held, which were supplemented with 20 interviews.

Table 3. Steering group of the Long-Term View on Construction project

NAME	ORGANIZATION
Jüri Rass	Ministry of Economic Affairs and Communications
Ivo Jaanisoo	Ministry of Economic Affairs and Communications
Jaan Saar	Ministry of Economic Affairs and Communications
Ivan Sergejev	Ministry of Economic Affairs and Communications
Katri-Liis Ennok	Ministry of Finance
Veronika Iisjan	Ministry of Finance
Janno Veskimets	Ministry of Finance
Madis Aben	Ministry of Finance
Veronika Valk-Siska	Ministry of Culture

Raivo Rand	Rand ja Tuulberg AS, Estonian Association of Construction Entrepreneurs
Indrek Allmann	Architectural firm PLUSS, Union of Estonian Architects
Gerd Müller	Nordecon AS, Estonian Association of Construction Entrepreneurs
Tiit Kerem	Estonian Association of Architectural and Consulting Engineering Companies
Jan Trei	Association of Estonian Cities and Municipalities
Eha Võrk	Tallinn City Government, Association of Estonian Cities and Municipalities

Table 4. Participated in workshops, interviews

NAME	ORGANIZATION
Sulev Senkel	Brainteam OÜ
Hele-Mai Metsal	Digital construction cluster
Miina Karafin	Digital construction cluster
Tiit Hion	Digital construction cluster
Katrin Koov	Union of Estonian Architects
Indrek Peterson	Estonian Association of Construction Entrepreneurs
Riho Oras	Estonian Association of Civil Engineers
Kalle Karron	Estonian Association of Architectural and Consulting Engineering Companies
Toomas Vainola	Association of Construction Material Producers of Estonia
Miguel Ortega	Estonian Real Estate Maintenance Association
Tõnis Rüütel	Association of Estonian Real Estate Firms
Maris Mändel	Estonian Academy of Arts
Renee Puusepp	Estonian Academy of Arts
Kalle Toomet	Association of Estonian Cities and Municipalities
Andry Krass	Estonian Homeowners Association
Tuulikki Laesson	Estonian Homeowners Association
Ülle Kadak	Estonian Association of Planners
Endrik Mänd	expert
Mario Sõrm	expert in public procurement
Kadi Metsmaa	Esplan OÜ
Erki Tamm	Ministry of Education and Research
Ivi Lillepuu	Ministry of Education and Research
Pille Metspalu	Hendrikson & Ko OÜ
Oivo Manninen	Innopolis Insenerid OÜ
Alo Nõmmik	Kaamos Ehitus OÜ
Priit Uustulnd	Kaamos Ehitus OÜ
Indrek Moorats	Kapitel AS

Getlyn Denks	Ministry of the Environment
Küllli Kell	Ministry of the Environment
Merike Rannu	KOKO Arhitektid OÜ
Tambet Tiits	Land Board
Mait Kriipsalu	University of Life Sciences
Mihkel Kiviste	University of Life Sciences
Raiko Puustusmaa	Ministry of Economic Affairs and Communications
Taavi Jakobson	Ministry of Economic Affairs and Communications
Liisi Pajuste	Ministry of Economic Affairs and Communications
Ivo Volkov	Merko Ehitus Eesti AS
Marek Hergauk	Merko Ehitus Eesti AS
Veljo Viitmann	Merko Ehitus Eesti AS
Siim Raie	National Heritage Board
Rainer Aavik	Pärnu City Government
Tiit Oidjärv	Ministry of Finance
Raul Vibo	Ramboll Finland OY
Mihkel Mäger	State Real Estate Ltd.
Margus Keerutaja	Sovek AS
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Oliver Eglit	Tallinn City Government
Raido Puust	Tallinn University of Technology.
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Ene Kolbre	Tallinn University of Technology.
Tõnis Arjus	Tartu City Government
Uku Varblane	University of Tartu
Sven Pertens	Trev-2 Grupp AS
Tarmo Pohlak	US Real Estate OÜ
Lauri Tuulberg	Welement AS
Olavi Ottas	HOCO OÜ
Alari Arro	Arro & Agasild Inseneribüroo OÜ

## ANNEX 3. IMPACT ASSESSMENT

Table 5. Assessing the impacts of costs and benefits

Link to the problem	Objective	Cost (EUR million)	Source of cost	Potential time spent	% share of required investment	GDP growth, %	GDP growth in € (€ million)
<b>Objective 1</b>							
<b>P1, P3, P7</b>	living environment and spatial policy, and the development documents of construction and housing	0.40€	Labour costs	Short	6%	0.005%	0.76€
<b>P1, P3, P7</b>	Creation of inclusion models	0.12€	Labour costs	Short	2%	0.002%	0.23€
<b>P1, P3, P7</b>	Development of a cooperation and action model for the promotion of high-quality living environment.	0.31€	Labour costs	Short	4%	0.004%	0.59€
<b>P1, P3, P7</b>	Guidelines for long-term impact assessment	0.13€	Labour costs	Short	2%	0.002%	0.23€
<b>P1, P3, P7</b>	Improving the safety of buildings and construction	0.50€	Investment	Medium	7%	0.007%	0.95€
<b>P1, P3, P7</b>	Development of housing policy; Establishment of residential investment fund services at KredEx	5.28€	Investment	Medium	74%	0.070%	10€
<b>P1, P3, P7</b>	Description and introduction of the "Estonian construction sector model".	0.31€	Labour costs	Medium	4%	0.004%	0.59€
<b>Objective 2</b>							
<b>P4</b>	Creation of a counter-cyclical plan	0€	Labour costs	Long	100%	1.10%	287€
<b>Objective 3</b>							
<b>P1, P2, P3, P7</b>	Creating the concept of smart contracting entity	0.10€	Labour costs	Medium	1%	0.001%	0.27€
<b>P1, P2, P3, P7</b>	Setting an example of the public sector, including the implementation of sample and pilot projects	2.10€	Investment	Long	28%	0.022%	5.74€

<b>P1, P2, P3, P7</b>	Establishing the joint and several liability at the choice of the counterparty and before the counterparty. Implementation of the public procurement standard for construction works and, if necessary, specification of the criteria for carrying out construction processes	0.70€	Labour costs	Medium	9%	0.007%	1.91€
<b>P1, P2, P3, P7</b>	Introduction of the state's value- and cooperation-based construction procurement practice	0.70€	Labour costs	Medium	9%	0.007%	1.91€
<b>P1, P2, P3, P7</b>	Reducing unfair competition	0.77€	Labour costs	Medium	10%	0.008%	2.10€
<b>P1, P2, P3, P7</b>	Reducing red tape and administrative burdens	0.77€	Labour costs	Medium	10%	0.008%	2.10€
<b>P1, P2, P3, P7</b>	Development of a PPP framework	0.70€	Labour costs	Short	9%	0.008%	2.00€
<b>P1, P2, P3, P7</b>	Development of a model for centres of excellence	0.77€	Labour costs	Medium	10%	0.008%	2.10€
<b>Objective 4</b>							
<b>P1, P2, P3, P7</b>	Analysis of the volumes of local government investments and implementation of the results	0.40€	Investment	Medium	5%	0.004%	1.08€
<b>P1, P2, P3, P7</b>	Promoting best practices	0.07€	Labour costs	Short	1%	0.001%	0.18€
<b>P1, P2, P3, P7</b>	Long-term investment planning practice in local governments	0.07€	Labour costs	Short	1%	0.001%	0.18€
<b>P1, P2, P3, P7</b>	Enhancement of the processes for the preparation and implementation of spatial plans.	0.33€	Labour costs	Short	4%	0.003%	0.90€
<b>P1, P2, P3, P7</b>	Supplementing the criteria for local government support measures	0.13€	Labour costs	Short	2%	0.001%	0.36€
<b>Objective 5</b>							
<b>P3, P5, P6</b>	Introducing the principles of sustainable construction	0.19€	Labour costs	Short	0.6%	0.001%	0.33€

<b>P3, P5, P6</b>	Development and implementation of the building life cycle impact assessment methodology	0.19€	Labour costs	Short	0.6%	0.001%	0.33€
<b>P3, P5, P6</b>	Development and implementation of innovative financial mechanisms	0.39€	Labour costs	Short	1.1%	0.002%	0.65€
<b>P3, P5, P6</b>	Introduction of circular economy principles	0.58€	Labour costs	Short	1.7%	0.004%	0.98€
<b>P3, P5, P6</b>	Development of spatial digital twins	0.40€	Investment	Medium	1.2%	0.003%	0.67€
<b>Objective 6</b>							
<b>P3, P5, P6</b>	Development of R&D support measures	1.95€	Investment	Medium	5.7%	0.012%	3.26€
<b>P3, P5, P6</b>	Ensuring the certification of products, i.e., establishing a technical assessment body or assigning its function to an existing body.	0.58€	Labour costs	Short	1.7%	0,004%	0.98€
<b>P3, P5, P6</b>	Development of e-construction	9.74€	Investment	Medium	28.4%	0.062%	16.29€
<b>P3, P5, P6</b>	Convening of the Construction Development Committee	0.12€	Labour costs	Short	0.4%	0.001%	0.2€
<b>P3, P5, P6</b>	Promoting the implementation of off-site manufacture, modularity, robotics, automation possibilities under the leadership of the centres of excellence.	20.10€	Investment	Long	58.7%	0.129%	33.61€
<b>Objective 7</b>							
<b>P6, P7</b>	Analysis of learning opportunities in the field of construction and implementation of the results of the analysis	0.05€	Labour costs	Medium	0%	0.000%	0.12€
<b>P6, P7</b>	Analysis of national labour policy, including migrant labour policy	0.52€	Labour costs	Medium	5%	0.005%	1.25€
<b>P6, P7</b>	Establishing the requirement for a professional certificate (or similar certificate) for construction workers working on construction sites	4.65€	Investment	Medium	43%	0.043%	11.12€

<b>P6, P7</b>	Increasing the supply of internship opportunities, analysis on how to motivate it, and the implementation of possible proposals	0.05€	Labour costs	Medium	0%	0.000%	0.12€
<b>P6, P7</b>	Modernization of management and cooperation skills	0.50€	Investment	Medium	5%	0.005%	1.20€
<b>P6, P7</b>	Development and provision of in-service training programs	5.12€	Investment	Medium	47%	0.047%	12.25€
<b>Impact of objectives</b>		Cost (EUR million)				GDP growth, %	GDP growth in € (€ million)
		<b>59.79€</b>				<b>1.59</b>	<b>404.54€</b>

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# ANNEX 5. OVERVIEW OF THE CONSTRUCTION SECTOR IN BENCHMARK COUNTRIES

## INTRODUCTION

The construction sector survey was conducted in four foreign countries - the United Kingdom, Finland, Denmark and Austria. The indicators of the countries were compared with the indicators of the Estonian construction sector. The following items were compared:

- business environment;
  - access to capital for construction businesses;
  - the impact of regulations on the sector;
  - labour market in the construction sector;
- the development of a cross-sectoral vision or strategy (if any);
- the most outstanding success stories in the construction industry;
- export trends.

## PRODUCTIVITY

The comparison of the construction sector productivity in the target countries shows the change in the productivity of the three sub-sectors in 2010-2017. The United Kingdom and Finland have made the most significant progress during this time, with the productivity growing in all sub-sectors; the development of the UK's narrow construction sector, which is now significantly higher than others, is particularly impressive. Growth rates in Denmark and Austria are more modest; the productivity of Danish architectural and design services even declined in the period 2010-2017, however, marginally. Estonia's relative growth has been strong, but the numbers are about two and a half times lower when compared one by one to the target countries. It is important to bear in mind that these are absolute numbers that do not take into account the general economic situation of the target countries.

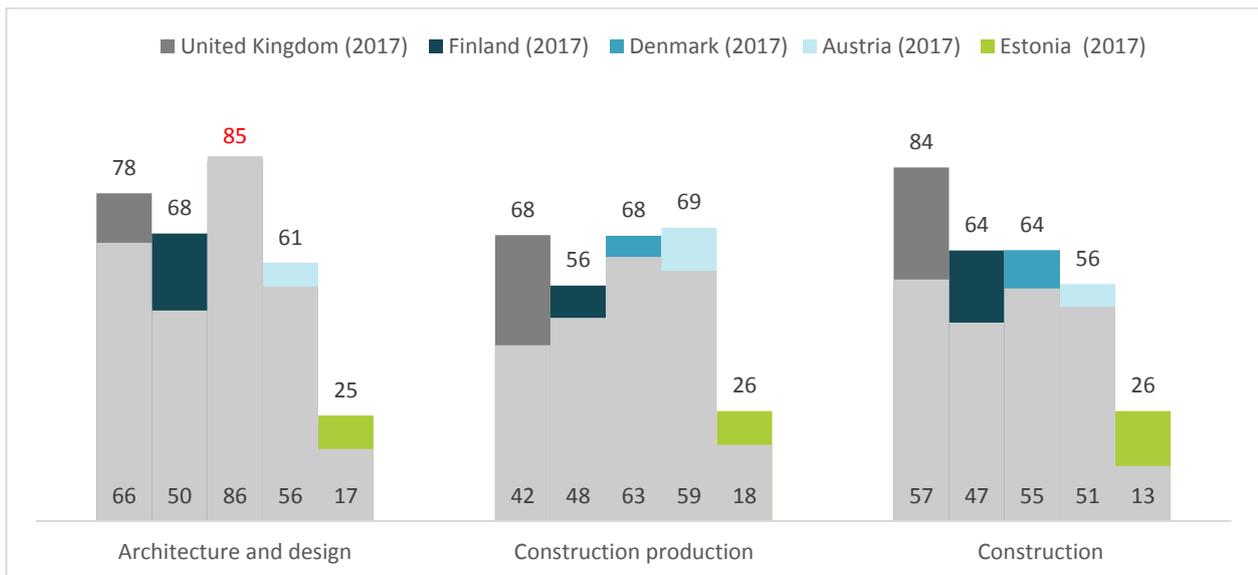


Figure 20. Productivity change in the construction sector in 2010-2017 ('000€ per employee)<sup>91</sup> (Source: European Construction Sector Observatory, 2019)

<sup>91</sup> ECSO's country reports do not specify their methodology or calculation procedure, so the exact meaning of these data remains unclear.

A better overview of the current development of the construction sector can be found by looking at Eurostat periodic data. Eurostat's measurable construction volume index<sup>92</sup> and the volume of work done in hours<sup>93</sup> can be used to show the relative change in productivity of the construction sector in each country from year to year. By measuring the sector's input in hours worked, it is possible to exclude differences between countries in labour costs - one hour spent working in Estonia is as long as in the UK (whereas, for one euro you get significantly "more" workforce in Estonia than in the UK).

Based on NACE Rev. 2 typology<sup>94</sup>, these data (NACE Section F) include:

- building construction (residential, industrial and public buildings);
  - including new developments, repair and renovation, installation of prefabricated buildings and erection of temporary buildings;
  - including construction development (pooling of financial and other resources);
- civil engineering (roads-streets, bridges, tunnels, railways, airports, ports, tracks, outdoor stadiums);
  - including new developments, repair and renovation, installation of prefabricated buildings and erection of temporary buildings;
- other specific construction activities;
  - including demolition work; electrical, plumbing and similar work; finishing work.

However, the data do not include:

- architectural and design activities;
- construction project management.

2015 is the baseline year and characterizes the so-called zero level, and the level of other years is characterized by a percentage change compared to the baseline year. It is important to point out that:

- these are not absolute indicators, which means that the zero levels of different countries are different (in 2015, the productivity in the UK as well as in Finland-Denmark-Austria was definitely much higher than in Estonia);
- each year's indicator characterizes the change in relation to the baseline year and not to the previous year - this means that the percentage change does not accumulate from year to year.

Table 6. Relative change in productivity in the construction sectors of benchmark countries

	2010	2011	2012	2013	2014	2015	2016	2017	2018
United Kingdom	-3%	1%	-6%	-7%	-3%	0%	0%	3%	2%
Finland	-12%	-7%	-8%	-10%	-6%	0%	-1%	-1%	-3%
Denmark	-5%	-3%	-2%	-2%	-1%	0%	2%	2%	3%
Austria	-2%	-2%	0%	1%	0%	0%	2%	6%	8%
Estonia	-13%	8%	11%	12%	12%	0%	8%	24%	35%

Source: Eurostat, authors' calculations.

It can be seen that Estonia has made the greatest development; Finland has also made considerable progress, but only until 2015, after which the situation has stalled and even deteriorated slightly. In the

<sup>92</sup> Production in construction (sts\_copr\_a), calendar adjusted data, volume index of production, 2015=100

<sup>93</sup> Labour input in construction (sts\_colb\_a), calendar adjusted data, volume of work done (hours worked), 2015=100

<sup>94</sup> <https://ec.europa.eu/eurostat/documents/3859598/5902521/KS-RA-07-015-EN.PDF/dd5443f5-b886-40e4-920d-9df03590ff91?version=1.0>

UK and Denmark, productivity has modestly grown in the long run, whereas in Denmark the growth has been much steadier than in the United Kingdom, where very large fluctuations can be seen from year to year. If we look at the period 2015-2018, we can see that in addition to Estonia, Austria has also made good progress with remarkable stable growth in productivity since 2010.

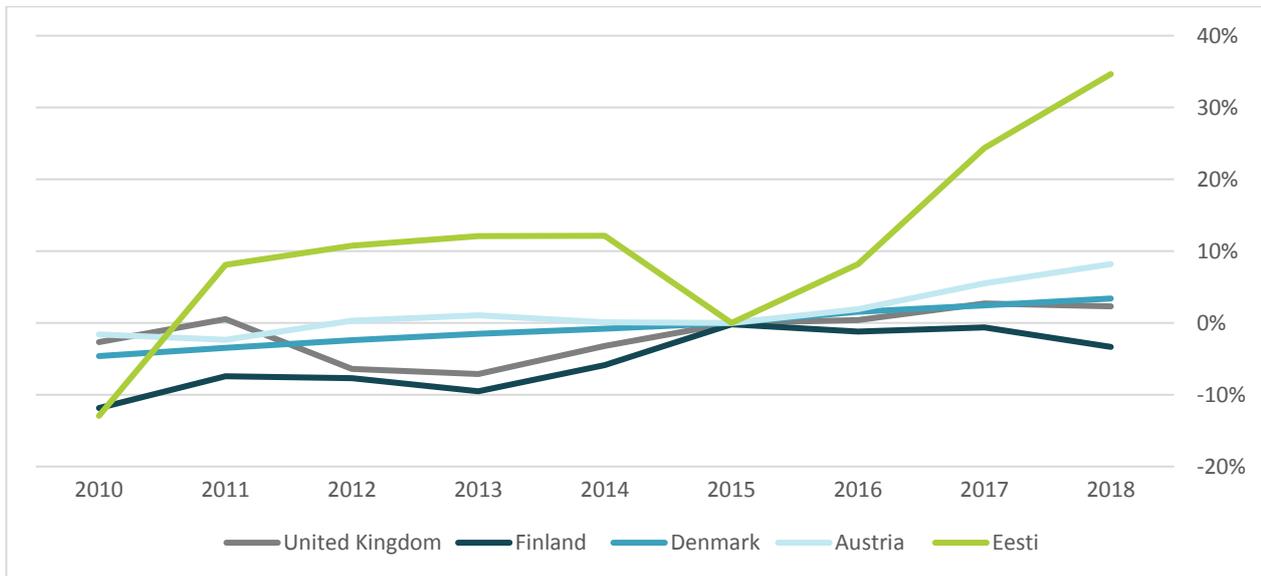


Figure 21. Relative change in productivity in the construction sectors of target countries (Source: Eurostat, authors' calculations)

## REGULATORY ENVIRONMENT

A very general idea of the regulations applicable to building activities can be obtained by comparing how many administrative procedures are needed to build a warehouse there<sup>95</sup> and how long their processing last. Austria immediately stands out here, where the respective administrative activities take as much as 222 days. Finland's figures are contradictory - the number of procedures required is as high as 17, but it does not take long to process them, only 65 days. For comparison, the OECD average for high-income countries is 12.5 procedures and 154.6 days for processing<sup>96</sup>.

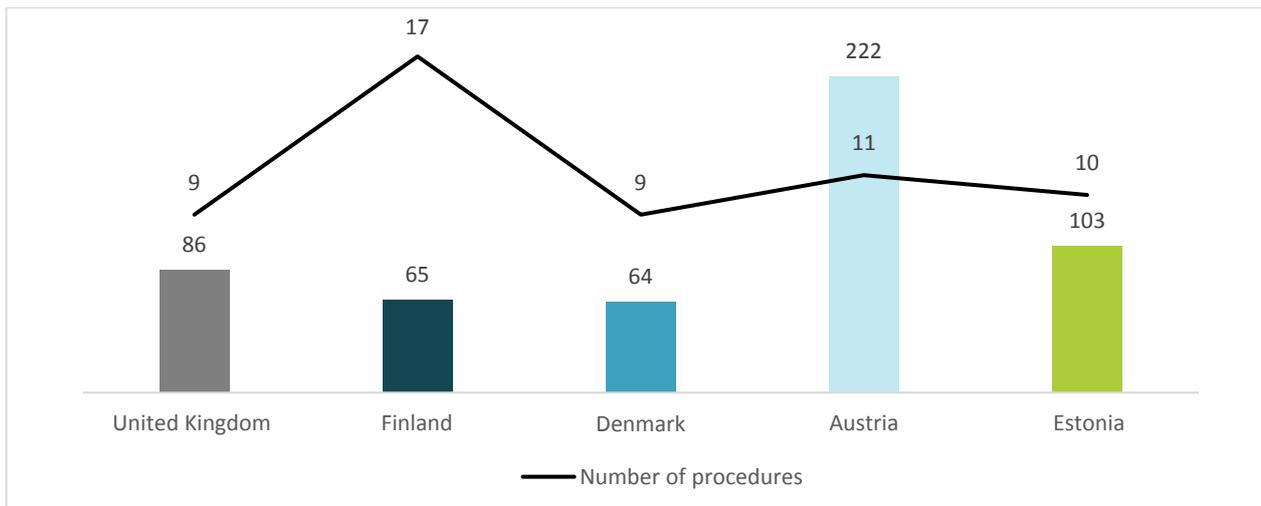


Figure 22. Number of administrative procedures and their duration in days required for the construction of a warehouse (Source: European Construction Sector Observatory, 2020)

<sup>95</sup> A two-storey building for storage activities with an area of 1300 m<sup>2</sup>; it is assumed that the plot belongs to the contracting entity and technical construction design has been completed. <https://www.doingbusiness.org/en/data/exploretopics/dealing-with-construction-permits>

<sup>96</sup> <https://openknowledge.worldbank.org/handle/10986/29089>

## EXPORT CAPACITY

The export capacity of the construction sector in the target countries is characterized by the following export indicators, which can be viewed separately in the context of services and construction products. When comparing the export and import volumes of construction products, it can be seen that all countries are net exporters, but Denmark's export capacity is compared to others about ten times higher. When comparing the exports of construction services with the exports of construction products, it appears that the United Kingdom, Finland and Denmark are oriented on the exports of services, while Austria, on the contrary, has focused on the exports of products.

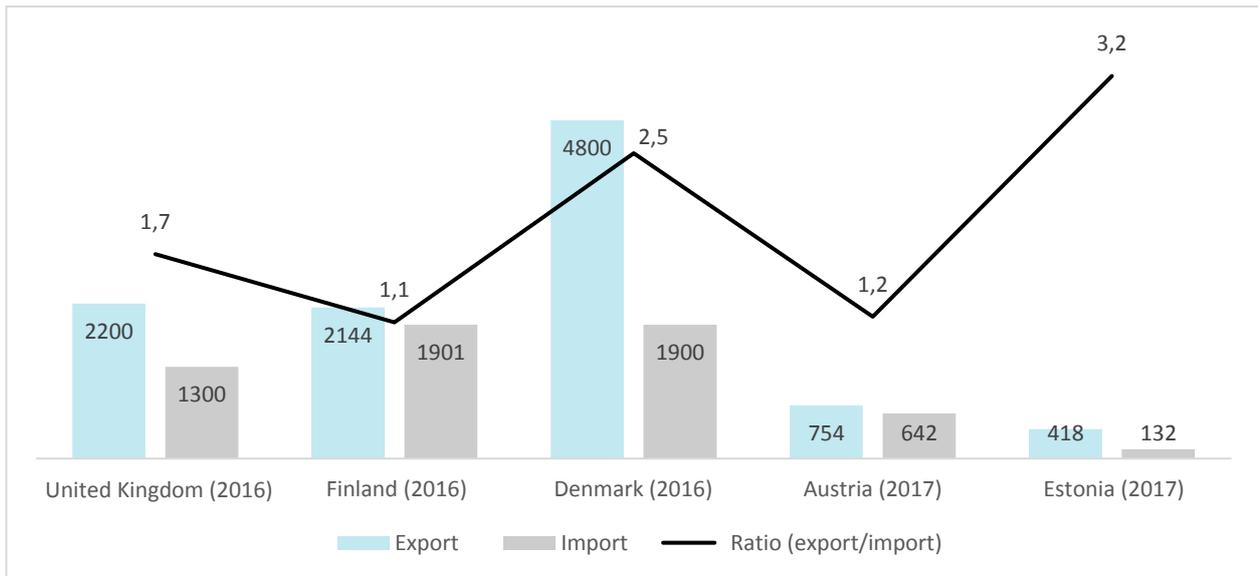


Figure 23. Exports and imports of services in the construction sector (M €) (Source: European Construction Sector Observatory, 2019)

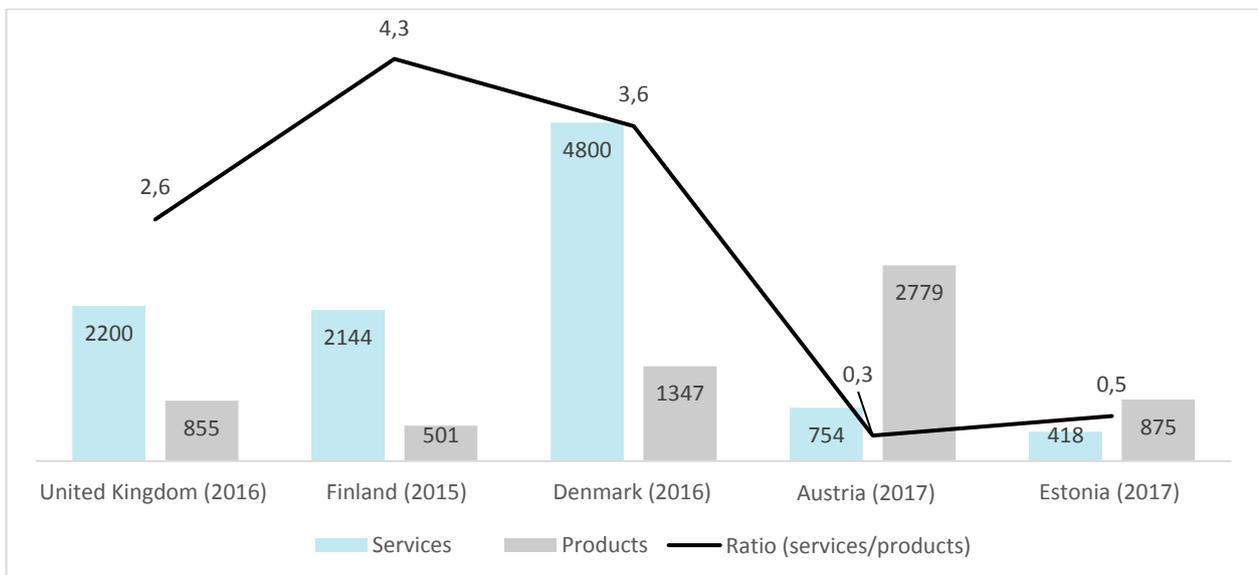


Figure 24. The exports of construction services compared to the exports of construction products (M €) (Source: European Construction Sector Observatory, 2019)

## UNITED KINGDOM

### BUSINESS ENVIRONMENT

Small and medium-sized construction businesses in the UK have had difficulties in obtaining loans because credit institutions see them as high-risk customers<sup>97</sup>. The Government has taken a number of initiatives to alleviate the financing problems of construction businesses.

Various financing measures (*Enterprise Finance Guarantee scheme*<sup>98</sup>, *Funding for lending scheme* and its follow-up *Term Funding scheme*<sup>99</sup>, etc.) allowed commercial banks to easily provide loans to SMEs in the period of 2012-2019. For loans granted under these measures, commercial banks often received money from the central bank and did not have to guarantee it with a deposit. The schemes served their purpose because it was really easy for SMEs to borrow, but in the context of the economic uncertainties brought by Brexit, there are concerns that loans were granted too easily, and the banks have been overly optimistic about borrowers' risk levels.<sup>100</sup>

*The Supply Finance scheme* initiative aimed to alleviate the liquidity difficulties caused by very long maturities, which became the norm in the sector after the financial crisis and hampered the day-to-day business of SMEs. Under the initiative, the government temporarily instructed banks to pay for bills between construction companies in such a way that the actual payer of the bill would compensate the bank in the future - in essence, the factoring service was offered at almost non-existent interest. In practice, however, large companies began to take advantage of this opportunity, extending their payment deadlines as much as possible and, by default, referring all their customers to banks if they wanted to pay for their bills; particularly noteworthy is the case of the recently bankrupt Carillion, who, among other things, harassed the UK government with this scheme;<sup>101</sup>

*Project Bank Accounts* also aims to alleviate the cash flow of SMEs as subcontractors. The current payment practice means that the client pays for the construction project to the main contractor, who pays the first level subcontractors, who in turn pay the second level subcontractors, etc., etc. However, the above-mentioned payment deadlines mean that the lower the level of the subcontractor, the longer they have to wait for their money, while already being more dependent on day-to-day cash flows (SMEs have significantly more limited access to financing options than larger companies). In the case of a project bank account, the client transfers the entire project sum to the account managed by the bank and the bank pays all parties directly in accordance with the agreements. In this way, an unfair "financial hierarchy" is eliminated and cash-sensitive subcontractors receive their money much faster. The partial implementation of project bank accounts has been successful, and the UK Parliament is discussing about making them mandatory for all public construction procurements.<sup>102</sup>

The construction sector in the UK is haunted by labour shortages and the future prospects do not look good due to poor image of the construction sector as a career opportunity amongst young people. Current (vocational) education programs have been criticized for offering mostly education with very limited prospects, which is too job-specific. Both the public and private sectors have set up a number of different programs<sup>103</sup> to attract young people to pursue a career in construction, while providing them with a proper education and career prospects<sup>104</sup>.

<sup>97</sup> Country profile England, European Construction Sector Observatory, 2019.

<sup>98</sup> <https://www.uktech.news/news/value-of-loans-offered-by-sme-lending-scheme-drops-20190311>

<sup>99</sup> <https://blogs.deloitte.co.uk/financialservices/2019/02/the-end-of-the-term-funding-scheme.html>

<sup>100</sup> <https://www.euromoney.com/article/b1g4hr8p2k41s/alternative-remedies-scheme-boosts-supply-of-sme-lending-at-the-wrong-moment>

<sup>101</sup> <https://www.forbes.com/sites/civcnation/2020/02/04/overcoming-the-challenges-of-getting-through-college/#132954136e26>

<sup>102</sup> <https://www.building.co.uk/focus/explainer-how-do-project-bank-accounts-work/5099705.article>

<sup>103</sup> <http://www.construction-for-youth.eu/en/initiatives.aspx?country=gb>

<sup>104</sup> <https://www.citb.co.uk/>

## VISION

The UK has been monitoring and steering the development of its construction sector for decades<sup>105,106</sup> and it is therefore no wonder that they have a clear and defined vision for construction also today. In 2013, the UK government published a vision statement, *Construction 2025*<sup>107</sup>, which aimed to develop a vision of where the construction sector will be in the future and what are the numerical targets at the most general level. One of the decisive motives for starting the activity was that the government as a customer in the construction sector was dissatisfied - they believed that more added value should have been created for the same money. The construction sector was also seen as an area with great potential for reducing emissions.

*Construction 2025* was a very ambitious, but rather superficial statement. Besides the objectives and vision, no in-depth analysis was carried out, and they have not been discussed with the parties in the sector. However, it laid the foundation for the future - it provided the basis for the next stage, which was already realized as a serious vision document *Construction Sector Deal*<sup>108</sup>. The Construction Sector Deal was developed by the Department for Business, Energy & Industrial Strategy, and in addition, the Construction Leadership Council, established before the initial vision for Construction 2025, was involved in promoting the construction sector.

The Construction Sector Deal was significantly more elaborated, and the representatives of the construction sector were also involved through the Construction Leadership Council. In retrospect, however, it appeared that the representatives of the private sector were heavily skewed towards large companies and that the concerns and interests of SMEs did not receive enough attention, leaving the value chain as a whole uninterpreted. At the initiative of large companies, a lot of attention was paid to productivity and workforce; at the same time, SMEs were struggling with the situation where the invoices submitted by them as subcontractors were not paid on time. In addition to the under-representation of SMEs, there was pressure from politicians to develop the vision, who wanted to show results as soon as possible.

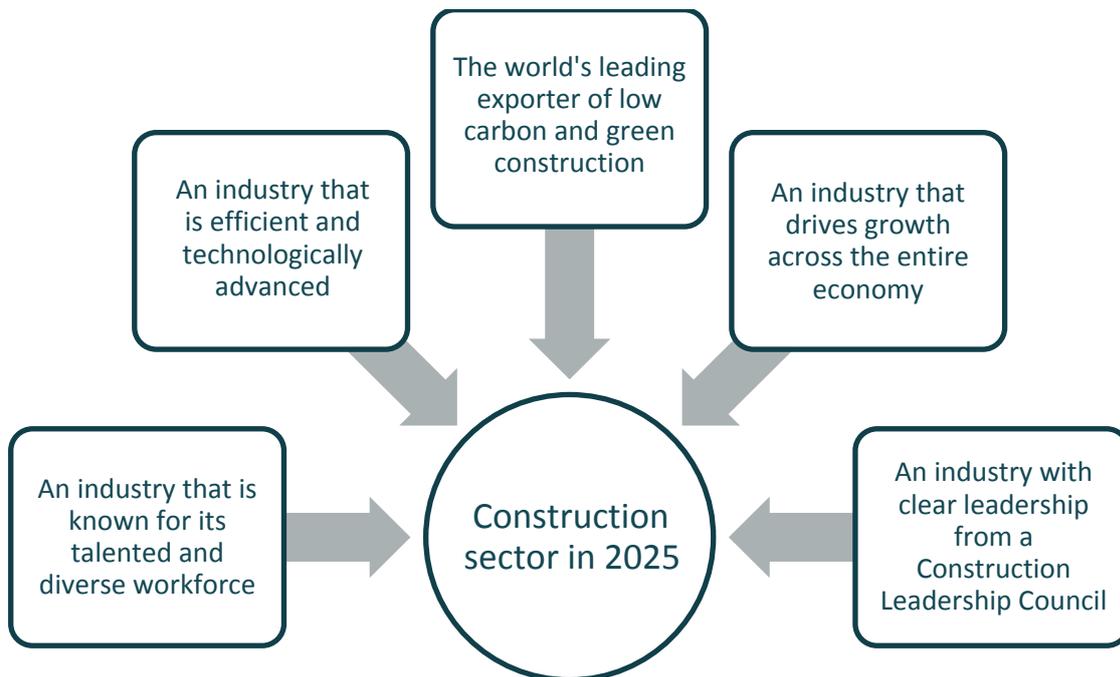


Figure 25. Construction 2025 vision for the UK construction sector.

<sup>105</sup> [https://www.desiRningbuildings.co.uk/wiki/Simon\\_Report](https://www.desiRningbuildings.co.uk/wiki/Simon_Report)

<sup>106</sup> [https://en.wikipedia.org/wiki/Egan\\_Report](https://en.wikipedia.org/wiki/Egan_Report)

<sup>107</sup> [https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment\\_data/file/210099/bis-13-955-construction-2025-industrial-strategy.pdf](https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/210099/bis-13-955-construction-2025-industrial-strategy.pdf)

<sup>108</sup> <https://www.gov.uk/government/publications/construction-sector-deal/construction-sector-deal>

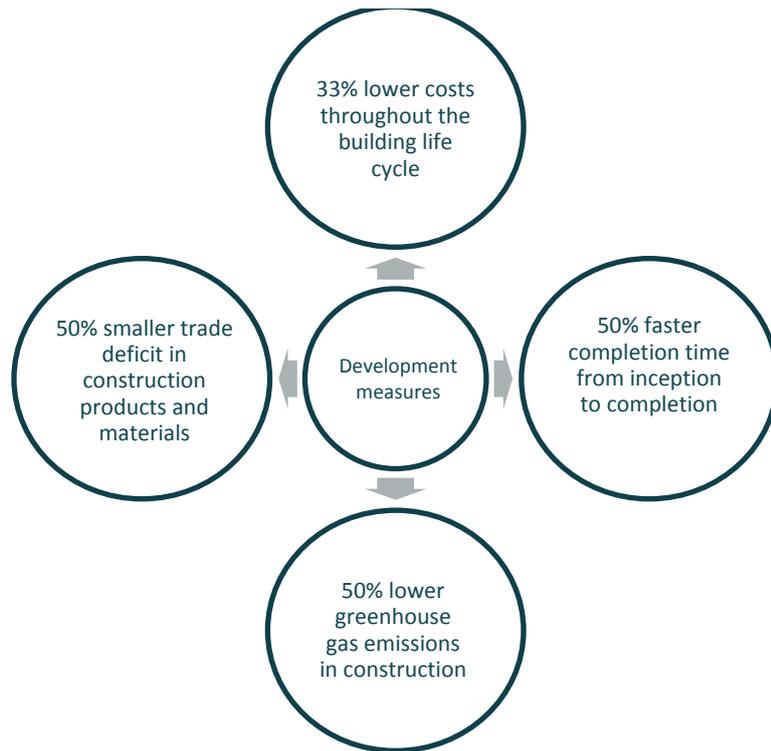


Figure 26. Growth targets of the UK construction sector for 2013-2025.

## MEASURES

In developing the vision, three strategic measures were identified to transform the sector and achieve the desired productivity growth. The implementation of digital solutions and the introduction of off-site manufacture were seen as the two most important measures. The widespread introduction of these two measures will also create the preconditions for the third measure: strategic resource planning throughout the life cycle of a building.

Table 7. Development measures for the development of the UK construction sector.

#	MEASURE	IMPACT ON THE SECTOR DEVELOPMENT
1.	Implementation of digital solutions (BIM, etc.)	The implementation of BIM models makes it possible to plan the implementation of future construction operations in advance (until demolition and re-use). Very different parties are responsible for the different stages of a building life cycle, and BIM models help everyone to follow a single plan - cooperation and communication between different parties converge and efficiency increases.
2.	Introduction of off-site manufacture	By moving part of the construction off-site and using more prefabricated elements, it is possible to increase efficiency, because the off-site work is much smoother, and in this way the building is completed in two places in parallel. In addition, it reduces costs, waste and pollution, and facilitates quality control.
3.	Resource planning across the building life cycle	Instead of focusing separately on construction, the efficiency and resource cost of a building should be considered for the whole life of a building. Such planning helps optimize energy consumption, as well as save other resources needed to maintain the building. Strongly dependent on the implementation of Measure 1, which sets out a common technical methodology (BIM) for all parties.

The implementation of the vision and the introduction of measures was carried out through three financial funds. The government allocated £170 million for research and development to help introduce digital solutions and implement off-site manufacture. There were three types of grants:

- £70 million was allocated to the consortium of universities and research institutes;

- the aim was to carry out applied research;
- 2-3 applicants;
- £30 million for organizations developing positive energy buildings (buildings that produce and store more energy than they consume);
  - 2-3 applicants;
- £60 million for smaller businesses and organizations to carry out their R&D and demonstration projects;
  - many applicants and projects of smaller volume (e.g., with a budget of £500,000);
  - application conditions are much more open than for the first two types;
  - the money was allocated in many phases over several years.

The application process worked on the principle that applicants are competing with each other and the projects are evaluated by the executors of the vision - the Department for Business, Energy & Industrial Strategy, Construction Leadership Council, as well as external experts. The grants awarded and the impact of these projects will be evaluated by an impartial consultancy firm - at the time of writing this analysis, the framework for its implementation is still in progress.

### PRIVATE AND PUBLIC CONTRIBUTIONS

In addition to achieving these numerical targets, attention was paid to the various contributions that the private and public sectors should make to the overall development and well-being of the construction sector. It is important to note that, despite the distinction between the private and public sectors, constant communication and cooperation between businesses and the state is crucial for almost all initiatives. The following is a generalized excerpt of the key initiatives identified.

Table 8. Private and public contributions to the development of the UK construction sector.

PRIVATE CONTRIBUTIONS TO THE SECTOR DEVELOPMENT	PUBLIC CONTRIBUTIONS TO THE SECTOR DEVELOPMENT
<b>INNOVATION</b>	
Investment in research and development	Creation of financial measures and investment funds to support the introduction of innovative technologies by innovative companies
Introduction of BIM models in the preparation of tenders	Introduction of BIM models and other digital solutions in public procurement
Multilateral implementation of new technological solutions through various consortia and programs	
<b>WORKFORCE</b>	
Providing an input to the reform of the professional qualifications system and the development of training programs	Reform of the vocational qualification system and renewal of curricula and training programs
Attracting and retaining workforce in the sector through standardization of internships, promotion of career opportunities, and gender and ethnic diversification of the workforce, and inclusion of the partially incapacitated	Establishing standards of practice
Linking career opportunities to construction-related curricula	
<b>BUSINESS ENVIRONMENT</b>	

PRIVATE CONTRIBUTIONS TO THE SECTOR DEVELOPMENT	PUBLIC CONTRIBUTIONS TO THE SECTOR DEVELOPMENT
Development and introduction of new standardized procurement methods that consider the whole life cycle of a building	Development and introduction of new standardized procurement methods in public procurement
Development of a strategy for foreign markets	Promoting export opportunities and supporting exports; Promoting "domestic" solutions to partner countries
Development of methodology for measuring the efficiency of construction projects	Development of methodology for measuring the efficiency of construction projects
Formation of consortia, which would include all the know-how needed to carry out large projects	Simplifying legal and procedural procedures for the award of contracts

In addition, there is a common understanding between the public and private sectors that if the government expects a broad-based transformation in the construction sector, the public sector should do its utmost to create the most stable economic environment possible. The debate revolves around whether the public sector could draw up a single plan for procurement over the next 5-10 years.

## EXPORTS

Improvement in exports by 50% is one of the four objectives. This is due to the fact that the UK has a very strong construction sector despite numerous concerns and intense competition in the internal market. In order not to hamper the growth potential of construction businesses, the state has decided to strategically support the exports of construction<sup>109,110</sup>.

The potential for exports is seen in innovative smart measures that would help beat local suppliers in foreign markets and provide higher added value. The fact that British construction exports are already moving towards higher value-added products is also supported by statistics: low value-added items - such as building materials - have high import rate<sup>111</sup>, while in the domain of high-technology construction equipment<sup>112</sup>, there are many net exporters. According to one analysis, the largest export potential is to large countries such as the USA, India and China<sup>113</sup>, however, according to another, to fast-growing markets in Asia, the Middle East and Latin America<sup>114</sup> targeting countries such as Brazil, South Africa and Vietnam<sup>115</sup>. Regardless of the target country, the use of innovative technologies must first be introduced on the domestic market before we can talk about larger exports.

Table 9. Exports and imports of construction materials and components in the UK, August 2019<sup>113</sup>.

UNITED KINGDOM EXPORT MARKETS	VOLUME (M £)	UNITED KINGDOM IMPORT MARKETS	VOLUME (M £)
Ireland	1183	China	2831
Germany	800	Germany	2577
USA	642	Italy	1052
France	613	Spain	909

<sup>109</sup> <https://www.ukconstructionmedia.co.uk/features/government-support-uk-construction-export/>

<sup>110</sup> <https://www.building.co.uk/news/government-in-talks-to-export-smart-construction-know-how/5102004.article>

<sup>111</sup> <https://www.parliament.uk/documents/commons-committees/Exiting-the-European-Union/17-19/Sectoral%20Analyses/8-Sectoral-Analyses-Construction-and-Related-Engineering-Report.pdf>

<sup>112</sup> <https://www.thecea.org.uk/market-info/uk-imports-exports-construction-equipment-q2-2019/>

<sup>113</sup> <https://www.consultancy.uk/news/18372/uk-must-establish-construction-as-jewel-of-post-brexite-exporting>

<sup>114</sup> <https://www.macegroup.com/perspectives/191119-uk-election-a-manifesto-for-construction-and-the-built-environment>

<sup>115</sup> <https://www.building.co.uk/news/government-unveils-more-details-about-exporting-construction-know-how/5102102.article>

UNITED KINGDOM EXPORT MARKETS	VOLUME (M £)	UNITED KINGDOM IMPORT MARKETS	VOLUME (M £)
The Netherlands	598	The Netherlands	907

Table 10. Export and import of construction equipment in the UK, 2018<sup>114</sup>.

UNITED KINGDOM EXPORT MARKETS	VOLUME (M £)	UNITED KINGDOM IMPORT MARKETS	VOLUME (M £)
USA	913	Japan	338
Germany	266	Germany	334
France	211	The Netherlands	146
Ireland	196	South Korea	81

## FINLAND

Finland saw a major construction boom until 2018, when the volume of investments in housing construction, which had grown for years, subsided, and now the first signs of a decline in the construction sector can be seen. At the same time, the construction of commercial premises showed modest growth compared to housing construction, however, this growth is similarly slowing down. In contrast, public investment in civil engineering (both buildings and infrastructure) is rising moderately, probably due to good tax revenues in the context of vibrant economic activity in recent years. In the long run, however, the need for housing is high: a few years ago, it was estimated that by 2040 there would be a nationwide need for 760,000 new homes.<sup>116</sup>

### BUSINESS ENVIRONMENT

The number of workers in the construction sector has grown a lot and is soon reaching a limit - there is a large shortage of 130 project managers and other coordinating specialists, and labour shortage is seen as the biggest bottleneck in the sector's growth. The average age of professionals in the construction sector is high, and currently there are half as many retiring professionals each year as the young people who study and who could replace them. Possible solution includes<sup>117</sup>:

- reforming the relevant curricula;
- providing more flexible education;
- adult (re)learning;
- the inclusion of women in the male-dominated workforce.

*Rakennusteollisuus RT*<sup>118</sup> strives on a daily basis to improve the image of the construction sector among young potential workers. One solution is the versatile use of numerous technological solutions on the construction site - drones, cameras, sensors, etc. This would help make object management somewhat similar to playing a video game and would probably be quite appealing to young people. However, the use of such techniques is conceivable only in the roles of site managers and civil engineers - it is much more difficult to create novelty for simple skilled workers and motivate them to learn.

The government has stimulated housing construction with MAL agreements signed between the state and larger local governments (Helsinki, Tampere, Turku, Oulu), and which include state's investment projects in

<sup>116</sup> <https://www.hs.fi/kaupunki/art-2000002881984.html>

<sup>117</sup> [https://iulkaisut.valtioneuvosto.fi/bitstream/handle/10024/161357/VM\\_14\\_2019\\_Rakentaminen%202019\\_2020.pdf?sequence=1&isAllowed=y](https://iulkaisut.valtioneuvosto.fi/bitstream/handle/10024/161357/VM_14_2019_Rakentaminen%202019_2020.pdf?sequence=1&isAllowed=y)

<sup>118</sup> <https://www.rakennusteollisuus.fi/Rakennusteollisuus-RT/>

land use development, accommodation and transport. Such large-scale planning helps implement the principles of smart and sustainable urban planning, as whole districts are seen as functioning unities. As a result of the MAL agreements concluded in 2016-2019, tens of thousands of homes have been built in Helsinki and thousands in other cities for both sale and rent, the vast majority of which are apartments.<sup>119</sup>

MAL agreements are an example of wider state support for housing development, which is the responsibility of the *Asumisen rahoitus- ja kehittämiskeskus* (ARA) under the Ministry of the Environment, which is responsible for housing policy and wants to provide comfortable housing for all through various support and loan measures.<sup>120</sup> ARA's activities are seen as a good opportunity to stimulate the construction sector during the economic downturn<sup>119</sup> and to introduce the principles of smart and sustainable construction through the respective requirements. More than half of all rental apartments in Finland have been built with ARA grants<sup>121</sup>.

Though ARA's housing policy helps compensate for economic cycles to some extent, the resulting cash flows may remain small and reach the economy too late through a reactive approach. As an alternative, long-term (10-15 years) advance planning of road works and other infrastructure projects has been proposed, which would give the sector some certainty in drawing up its long-term strategy and help it survive recessions more easily. Respective debate and the drafting of laws have been going on for years, and Parliament should soon pass the law.

## VISION

Unlike in the United Kingdom, the private sector stands out in the search for innovative solutions in Finland. The Visio 2030 consortium consists of Aalto University and, at the time of writing this report, consists of 19 construction companies and is open to new entrants.<sup>122</sup> The leader of Vision 2030 is Olli Seppänen, a professor in the Department of Civil Engineering at Aalto University, who worked long before his academic career as an entrepreneur, developing software for various construction companies - most of the time in California, USA. The consortium was convened when the Finnish construction industry lost its leading position in digital innovation: while Finland was a leader in the early 2000s (the world's first 4D-5D BIM models, for example) then by 2015 – when Professor Seppänen returned to Finland – he acknowledged that Finland was three or four years behind in the industry development. After extensive communication work, in the course of which Professor Seppänen visited 40 companies, a consortium was formed with 11 companies - all interested Finnish construction companies are still welcome to join.

The consortium generates innovation through research and development funded by the consortium's membership fees. Membership has two stages:

- lower level with an annual membership fee of €10,000;
  - these members take part in all discussions but do not have the right to vote in the final decision-making process;
  - 12 members at the time of writing this report;
- higher level with an annual membership fee of €25,000;
  - they have the right to vote in the final decision-making process;
  - 7 members at the time of writing this paper.

Each year, two or three research topics are selected from around 10 proposals, to focus on – all members of the consortium can make proposals, but the final decision is made by the representatives of the senior members with the right to vote. Each research topic will be covered by a research group consisting of 2-4 people from each member of the consortium, the group is led and coordinated by the head researcher from Aalto University (often Professor Seppänen himself). As the areas of activity of the

<sup>119</sup> <https://www.ym.fi/download/noname/%7BFA5CB9B2-7C21-4018-B7DD-51CAA7193FC9%7D/138171>

<sup>120</sup> [https://www.ara.fi/en-US/About\\_ARA](https://www.ara.fi/en-US/About_ARA)

<sup>121</sup> <https://www.abecip.org.br/admin/assets/uploads/anexos/pekka-averio-finlandia.pdf>

<sup>122</sup> <https://www.aalto.fi/fi/building-2030>

consortium member companies are very different, diverse and extensive expertise is also ensured.

Research groups also include students working for member companies, who can write academic research papers and/or theses based on the work done. This provides a situation where companies have a pragmatic interest in enabling students to engage in their academic work with commitment, while giving students the opportunity to learn about the expectations the private sector have for their skills and knowledge. This results in a fertile environment for the cooperation between the private sector and universities.

The goal of the Visio 2030 consortium is that the new methods developed in the course of their work reach all parties in the sector and transform the sector as a whole. Through the general contractors belonging to the consortium, the solutions developed in the working groups also reach the agreements signed by the general contractors and thus also the real estate developers and owners, who can then demand new solutions from other construction companies as well. The property owners' association has welcomed the process in this form.

Thus, Visio 2030 is not a vision document in the classical sense, but a constantly evolving process, where the direction is adjusted on an ongoing basis, according to the experience of the consortium members operating in the construction sector. Vision 2030 includes five core principles:

- reliability;
- user orientation;
- sustainable development;
- productivity;
- inspiration.

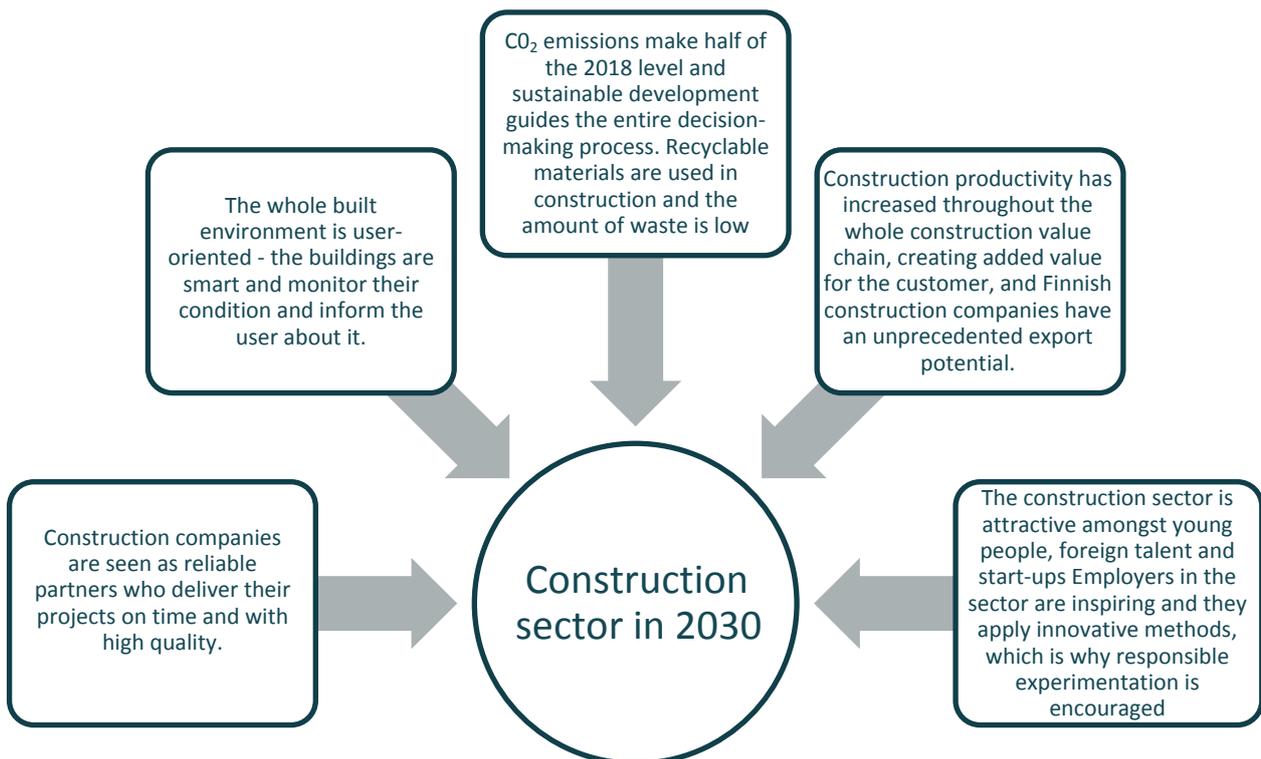


Figure 27. Visio 2030 key principles for<sup>122</sup>

At the time of writing this paper, seven different studies have been published under Visio 2030<sup>123</sup>, which focus on

- the assessment of pre-production potential in construction projects;
- real-time monitoring of the location of tools and the like on the construction site;

<sup>123</sup> <https://www.aalto.fi/fi/building-2030/loppuraportti>

- improving trust and communication between the various parties to a construction project;
- the potential impact of synchronizing new logistics solutions and projects.

## INNOVATION

Over the recent years, the Finnish construction sector has not stood out with any big achievement in any particular area - ground-breaking digital innovation took place in the early 2000s. After the 2008-2009 economic crisis, many start-ups were forced to close down or move to a more fertile economic environment, which led to a situation where all local sources of innovation had disappeared.

However, the efforts of the Visio 2030 consortium have produced the first results: one working group explored ways to reduce the duration of construction projects.<sup>124</sup> The study applied Takt time planning to two real construction projects, and although the goal was to halve the planned construction time, in practice 30% time savings were achieved. After that, the Takt time planning has been introduced in other construction projects and it is planned that another 50 projects will follow the principles discussed in the study.

A recent successful pilot project on the digital twin of the Kalasatama district<sup>125</sup> has, however, contributed to the ambition to apply the same thing across Finland<sup>126</sup>, so it is worth keeping an eye on these developments as well.

The public sector, too, has attempted to introduce innovative solutions. More precisely, within the framework of the Helsinki Road Improvement Project, they realized that choosing the cheapest tender in public procurement did not produce the desired cooperation and results. In the alliance project of the Finnish Transport Agency, innovative techniques and measures were implemented to ensure that procurement led to productive cooperation<sup>127</sup>. Among other things, tenders were no longer evaluated on the basis of a single tender document, but instead the core team potentially executing the tender was invited for an interview to discuss the nature and prospects of the project. This approach ruled out the possibility where tenderers submit a well-written document but their actual capacity does not correspond to it; in addition, it gave an opportunity to actually discuss the vision with potential contractors and listen to their ideas.

## EXPORTS

Exports of services in the Finnish construction sector increased by 32% between 2013 and 2016 reaching the total volume of 2.144 billion euros. The high share of extra-EU trade in total exports is remarkable (~70%)<sup>128</sup>. Exports of construction products totalled 501 million euros in 2015<sup>128</sup>. Like the United Kingdom, Finland sees the potential for the future in the implementation of construction lifecycle planning and the development and implementation of corresponding digital solutions<sup>127</sup>.

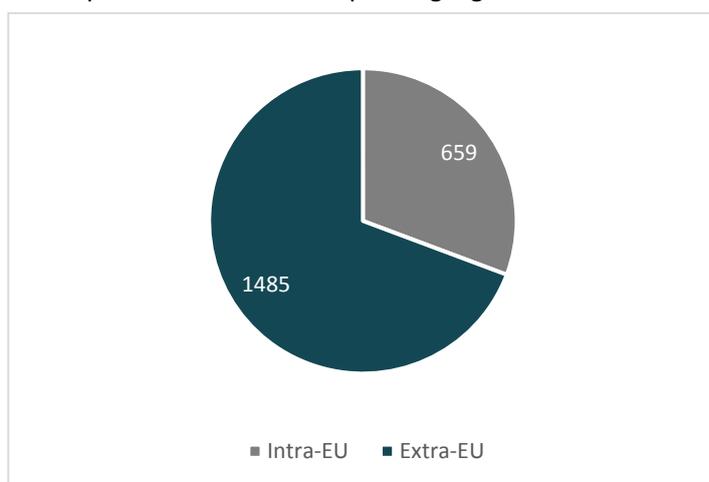


Figure 28. Exports of services in the Finnish construction sector, 2016 (M €)<sup>129</sup>.

<sup>124</sup> [https://www.aalto.fi/sites/g/files/flghsv161/files/2019-02/building\\_2030\\_tahti\\_suunnittelussa\\_ja\\_tuotannossa\\_loppuraportti\\_22.1.201.pdf](https://www.aalto.fi/sites/g/files/flghsv161/files/2019-02/building_2030_tahti_suunnittelussa_ja_tuotannossa_loppuraportti_22.1.201.pdf)

<sup>125</sup> <http://www.kiradigi.fi/kokeiluhankkeet/kokeiluhankkeet/kalasataman-digitaaliset-kaksoset.html>

<sup>126</sup> <http://leaninpublicsector.org/wp-content/uploads/2019/06/Pekka-Petajamieini-2016-LIPS-Alliancing-in-the-Finish-Transport-Agency.pdf>

<sup>127</sup> <https://kirafoorumi.fi/suomi-tahtaa-kiinteisto-ja-rakentamisan-digitalisaation-paalupaikalle/>

<sup>128</sup> Country profile Finland, European Construction Sector Observatory, 2019.

Table 11. Most exported construction products in Finland in 2015<sup>128</sup>.

#	PRODUCT GROUP	EXPORT VOLUME (M €)	SHARE FROM THE TOTAL EXPORTS OF CONSTRUCTION PRODUCTS
1.	Processed wooden products <sup>129</sup>	155	31%
2.	Prefabricated wooden buildings	66	13%
3.	Windows, doors and their frames	45	9%
4.	Other structures <sup>130</sup>	44	9%
5.	Prefabricated metal buildings	43	9%

## DENMARK

Similarly to Finland, the construction sector in Denmark has grown strongly in recent years, and this is mostly because of the high demand for housing. The construction of schools, health care facilities and other public buildings has also been high in recent years, which is again likely to be due to good tax revenues.

### BUSINESS ENVIRONMENT

In 2016, Danish construction companies acknowledged that they had difficulties with obtaining loans from banks after the last financial crisis<sup>131</sup>. This has been due to the bank's more conservative approach in granting loans, whereas, construction companies are being considered higher risk than companies in other industries. As an alternative way of raising capital, construction businesses have been offered to issue bonds, but in reality this option is only available to the largest companies.

In addition to securing capital, Danish construction companies have also been plagued by cyclical economic volatility. In Denmark, municipalities have a high degree of autonomy and are large customers for the construction sector with their procurement. As a result, the Ministry of Finance sets limits on how much local governments can spend on construction procurement in a given budget period. These prescribed limits are an attempt to force local governments to contract more during the recession and less during the boom, to compensate for general economic constraints.

In terms of speed of issuing construction permits and licenses Denmark has a leading position in the world, which is thanks to policy initiatives to reduce administrative costs. These initiatives were largely implemented through the 2016 amendments to the Building Code (Byggeloven), which provided for simplified procedures and shorter permitted processing times.<sup>132</sup> Among other things:

- the process of issuing building permits was simplified;
- fire safety requirements were simplified;
- the procedural burden on local governments was alleviated by assigning the task of verification of technical requirements for certain types of buildings to certified private companies.

Against the background of labour shortages in construction, tax incentives for home repairs have been suspended to reduce pressure<sup>133</sup> - it could decrease private demand and thus mitigate labour shortages on

<sup>129</sup> Builders' joinery and carpentry of wood, etc.

<sup>130</sup> Other structures (group 251123)

<sup>131</sup> [https://www.licitationen.dk/article/view/282908/byggeriet\\_sidder\\_stadig\\_i\\_kreditklemmen](https://www.licitationen.dk/article/view/282908/byggeriet_sidder_stadig_i_kreditklemmen)

<sup>132</sup> <https://uk.fm.dk/publications/2016/denmarks-national-reform-programme-2016>

<sup>133</sup> [https://www.nationalbanken.dk/en/publications/Documents/2017/03/Analysis\\_Outlook%20for%20the%20Danish%20Economy\\_March%202017.pdf](https://www.nationalbanken.dk/en/publications/Documents/2017/03/Analysis_Outlook%20for%20the%20Danish%20Economy_March%202017.pdf)

a large scale. In the long run, however, labour concerns are serious, as the number of young professionals entering the sector is lower than the number of professionals retiring, and young people are discouraged by the volatile cyclical nature of the sector. Vocational education in Denmark requires internships, but construction companies themselves have not been able to create internship opportunities for young people - a number of programs have been set up to support the creation of internships and the recruitment of young people.<sup>134</sup> Several programs and initiatives have been developed over the years to bring construction education closer to young people<sup>135</sup>, which includes various study materials introducing construction works, mobile applications and site visits.

The productivity commission (Produktivitetskommissionen) as well as the European Commission noted on the low productivity of the Danish construction sector<sup>136</sup>. The main reasons were considered to be the fragmentation of the sector and labour shortages. The fragmentation of the sector manifests in the lack of cooperation between the parties responsible for the various stages of the building life cycle.

## VISION

In 2014, the government published a strategy document "Towards the stronger construction sector in Denmark" ("*Vejen til et styrket byggeri i Danmark*") which stated that the construction sector productivity needed to be improved<sup>137</sup>. This was largely due to the above-mentioned productivity committee report, but there were other possible factors:

- tollal kimbutas ehitussektorit madal konkurentsitase;
- this resulted in the high cost of construction from the contracting entity's point of view;
- a collective understanding of the need to develop the construction sector towards sustainability;
  - particularly from the perspective of the natural environment;
  - but also the overall optimization of construction processes through the introduction of life cycle costs principles.

The Danish Transport, Accommodation and Construction Agency started drafting the vision with the guidance from the government. The agency had the competence to formulate the vision - lawyers, (construction) engineers, the so-called generalists. External stakeholders and parties were involved on an ongoing basis, either through bilateral meetings or working groups. As the implementation of the vision was in the interests of all parties, there were no problems once the government changed. While the minister responsible for the construction sector was formally responsible for the vision and its implementation, the agency was still responsible for day-to-day work.

The Denmark's Strategy identified five issues that should be addressed.

<sup>134</sup> <https://indberet.virk.dk/arbejdsgivernes-uddannelsesbidrag/praktikplads-aub>

<sup>135</sup> <http://www.construction-for-youth.eu/en/initiatives.aspx?country=dk>

<sup>136</sup> Country profile Denmark, European Construction Sector Observatory, 2019.

<sup>137</sup> <https://www.trafikstyrelsen.dk/da/Byggeri/Lister/Publikationsliste?relevance=Byggeriets-parter&theme=AB-systemet&type=Strategi>

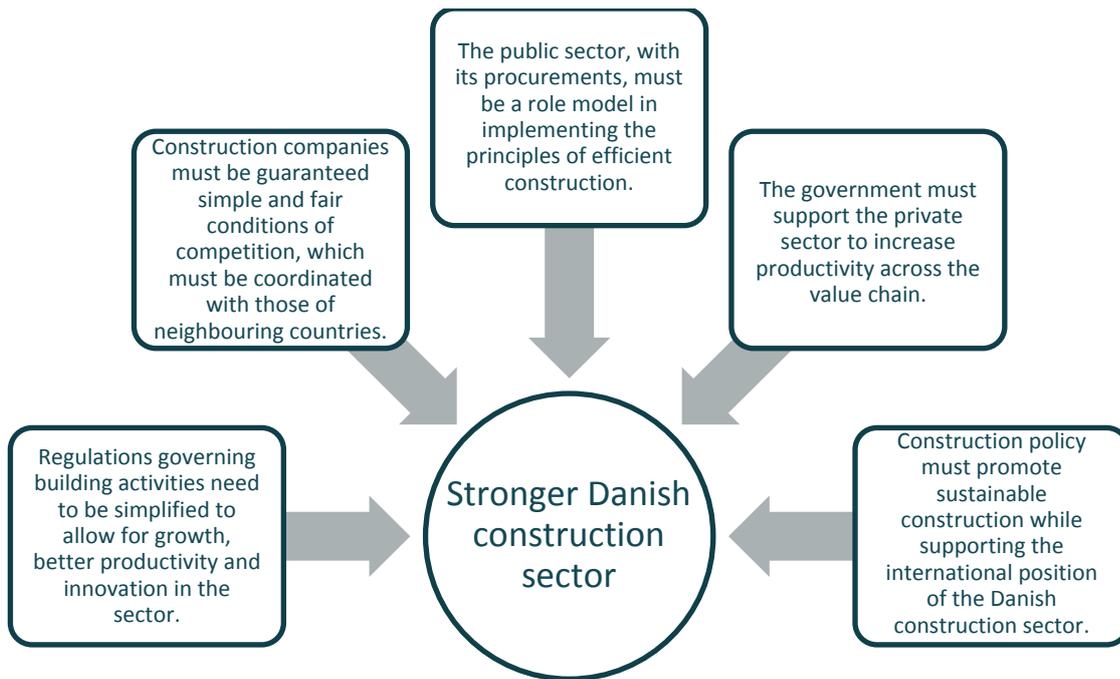


Figure 29. Five development issues in the strategy "Towards a stronger construction sector in Denmark"<sup>139</sup>

Within these five topics, 34 initiatives were set up - some of which were about implementing changes; some about further analysis and assessment of possible need for action. As the initiatives were of a different nature and it could take a long time for several of them to have an effect, no common principles were set for their ex-post validation.

As an example, the updated construction requirements were assessed ex post in the framework of the respective initiative - how the stricter construction requirements were adopted and whether they served the purpose. Contacts were made with both general contractors and other parties, and an advisory expert group was set up. Among other things, international practices were mapped with the aim of harmonizing Danish requirements with those in force elsewhere, with the intention that this would encourage Danish construction companies to export to foreign markets and, conversely, attract foreign companies to participate in the Danish market. In particular, the need to simplify fire prevention requirements and indoor climate rules was identified.

In addition to the simplification of regulations governing building activities (the said building requirements, but also the procedural processes mentioned in the introduction), progress has also been made in applying sustainable construction and introducing digital measures, for which considerable efforts are being made.

## INNOVATION

Denmark has proven to be a pioneer in eco-innovation and sustainable construction - this is particularly evident in the introduction of energy-efficient construction. The pursuit of energy-efficient buildings consists of:

- the construction of new buildings according to the latest requirements and standards;
- renovation of older buildings in order to make the most of their potential.

Denmark has decided that the most productive way to introduce sustainable and energy-efficient construction is to set national energy parameters.<sup>138</sup> Compared to self-regulation and/or information campaigns in the construction sector, legal regulation ensure that the principles are implemented immediately, unambiguously and, most importantly, for a long-term. Thus, construction companies have an obligation to achieve energy-efficient results, but it is up to them to choose the best and most cost-effective methods to achieve these results.

<sup>138</sup> [https://ens.dk/sites/ens.dk/files/Globalcooperation/tool\\_ee\\_byg\\_web.pdf](https://ens.dk/sites/ens.dk/files/Globalcooperation/tool_ee_byg_web.pdf)

The implementation of various specific requirements is based on the so-called the principle of least cost, which means that requirements are only imposed if the resulting savings outweigh their costs over a period of time (the period should be approximately comparable to the expected life cycle of the building or component under consideration). This principle also applies to energy efficiency regulation as a whole.

The Danish energy performance requirements for new buildings were introduced in parallel and in several stages: initially the minimum requirement "Building Regulation 2010" and two standards applied to which the future minimum requirements were to apply - "Building Class 2015" and "Building Class 2020". These standards could be applied for on a voluntary basis in parallel with the current minimum requirement. In 2016, "Building Regulation 2015" (based on the previous voluntary standard "Building Class 2015") was introduced as a new minimum requirement and "Building Class 2020" remained the only "premium standard".<sup>139</sup> In 2018, a new minimum requirement "Building Regulation 2018" was introduced, which was a further development of the previous requirement and in parallel with this the voluntary standard "Building Class 2020" can still be applied for.<sup>140</sup> This gradual introduction gave the construction sector the opportunity to adapt to the new requirements and plan its future activities in good time.

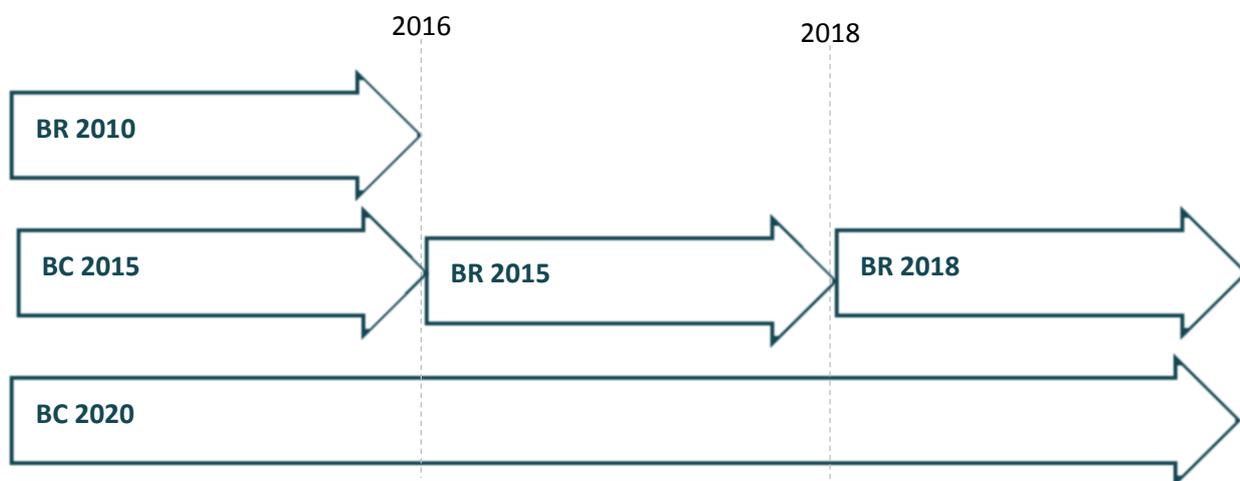


Figure 30. Gradual implementation of Danish energy efficiency requirements.

The guideline for developing the requirements came from the government, which set targets for the construction sector. Based on the set goals, the Danish Energy Agency had already developed specific requirements that experts believed would be achievable and in line with real situation. As the issuing of building permits is the responsibility of local governments in Denmark, it is also their job to ensure that energy efficiency requirements are met. Each completed building must pass an audit by an independent and certified auditor, and the results must be submitted to the local government. In addition, the local government must inspect at least 5% of all new buildings, and all sites applying for voluntary "future standards" must be inspected.

Proactive communication work of the government has been important in introducing the requirements. Press releases and workshops have been carried out proactively for the relevant private sector representatives and the relevant officials have been trained so that they can provide expert advice on the implementation of the requirements. In addition, the public sector's function as a role model has been emphasized by ordering demo buildings that are innovative but with a realistic concept that construction companies would be able to reproduce in the private sector.

The energy performance of existing buildings is characterized by the Danish equivalent of the energy label<sup>141</sup>. The existence of an energy label is a legal precondition for signing a sales or lease agreement. During the renovation, it is pointed out that the work done would also improve the indoor climate of the buildings and thus the living conditions of the people - this will bring each building one step closer to energy-efficient buildings and give people the opportunity to benefit from it. Renovation of existing buildings must also be based on the applicable minimum requirements (currently "Building Regulation 2018"), which sets out individual requirements for the various components of a building.

<sup>139</sup> <http://epbd-ca.eu/wp-content/uploads/2018/08/CA-EPBD-IV-Denmark-2018.pdf>

<sup>140</sup> [https://www.byggeriogenergi.dk/media/2202/danishbuildingregulations\\_2018\\_energy-requirements.pdf](https://www.byggeriogenergi.dk/media/2202/danishbuildingregulations_2018_energy-requirements.pdf)

<sup>141</sup> [https://stateofgreen.com/en/uploads/2018/07/SoG\\_WhitePaper\\_Renovation\\_210x297\\_V10\\_WEB.pdf](https://stateofgreen.com/en/uploads/2018/07/SoG_WhitePaper_Renovation_210x297_V10_WEB.pdf)

Another high-impact measure to introduce energy efficiency in the construction sector is high-rate energy taxes, which account for half or more of the price of different energy resources for the end-user, in which case the consumers should use the most energy-efficient solutions. Gradually, energy tax rates have been harmonized for private and industrial consumers. In addition to taxes and requirements, informing the public at a substantive level has played a very important role in promoting energy-efficient construction.<sup>142</sup> Renovation instructions for the most common types of private houses have been published<sup>143</sup>, the effect of the requirements on different repair works is explained one by one<sup>144</sup> and standard solutions have been prepared that could serve as a basis for the planning of repairs<sup>145</sup>.

In Denmark, hard efforts have been made to introduce various digital solutions and thus increase the sector's productivity. In 2006, a strategy for the introduction of digital measures was adopted, which stipulated that BIM models would be required for public procurement exceeding a certain amount. Now, many major general contractors, as well as architects and engineers, use BIM models in their daily work. However, with the introduction of BIM models, the information flow between the parties responsible for the various stages of the construction life cycle has not yet improved, and the transparency of processes in general has not improved. As a result, a new strategy was adopted in 2019, which will focus on those factors that would help to enhance cooperation between the various parties in the implementation of the BIM (contractual requirements, etc.).<sup>146</sup>

## EXPORTS

In 2016, the Danish construction sector exported services for 4.8 billion euros, three quarters of which were exported to EU member states<sup>136</sup>. Imports, on the other hand, amounted to almost 1.9 billion euros, making the Danish construction sector an exceptionally strong net exporter. Various construction products were exported in the amount of 1,347 billion euros, and the most exported items are various masts, which show the role of wind turbines in the Danish construction sector's exports.

The strategy document "Towards a stronger construction sector in Denmark" highlighted the need to support the construction sector's exports with a focus on energy-efficient materials and construction services<sup>136</sup>. Under this initiative, a partnership agreement was signed with the Chinese government to promote Danish energy-efficient construction know-how in the Chinese market. In 2017, the Danish Ministry of Foreign Affairs launched a new program (*Urban Solutions*), which introduces Danish know-how on the international stage.<sup>147</sup> The Danish Trade Council (*Dansk Erhverv*), construction companies, town planners and investors are all involved in the program.

However, these initiatives are of a rather specific nature; there is no comprehensive state strategy to support the exports of construction companies. However, complex national requirements for the energy efficiency of new buildings have inadvertently forced construction companies to come up with new smart solutions. However, the same solutions have already been exported, helped by the harmonization of

<sup>142</sup> [https://ec.europa.eu/energy/sites/ener/files/dk\\_building\\_renov\\_2017\\_bilag\\_b\\_neeap\\_en.pdf](https://ec.europa.eu/energy/sites/ener/files/dk_building_renov_2017_bilag_b_neeap_en.pdf)

<sup>143</sup> <https://spareenergi.dk/forbruger/vaerktoejer/bygningsguiden>

<sup>144</sup> <http://krav.byggeriogenergi.dk/tag-loft>

<sup>145</sup> <https://www.byggeriogenergi.dk/energiloesninger/>

<sup>146</sup> The Danish Ministry of Transport, Building, and Housing, 'Strategy for digital construction', 2019.

<sup>147</sup> <https://thetradecouncil.dk/services/eksport/globale-sektorteams/danske-loesninger-til-udvikling-af-verdens-storbyer>

other construction requirements in Denmark with those in foreign markets, where possible.

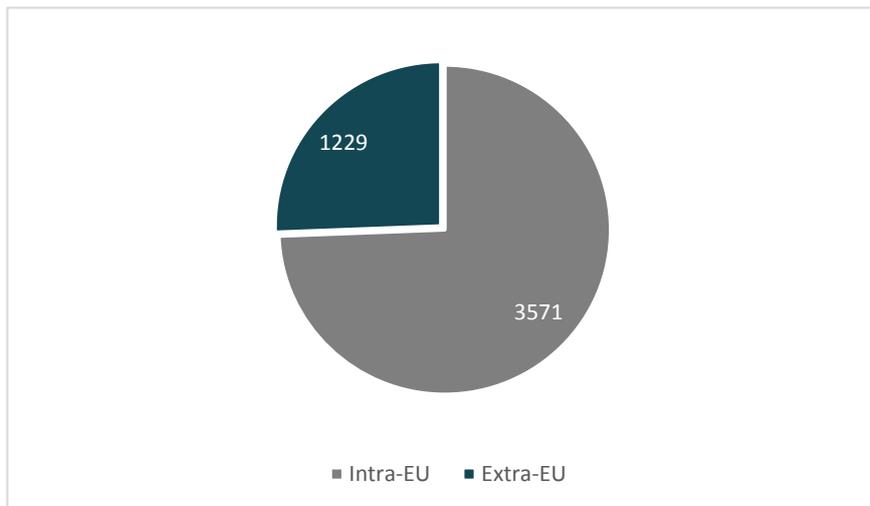


Figure 31. Exports of Danish construction services, 2016 (M €)<sup>136</sup>.

Table 12. The most exported Danish construction products in 2016<sup>133</sup>.

#	PRODUCT GROUP	EXPORT VOLUME (M €)	SHARE FROM THE TOTAL EXPORTS OF CONSTRUCTION PRODUCTS
1.	Masts and truss masts, made of iron or steel	333	25%
2.	Windows, doors and their frames	226	17%
3.	Other structures <sup>130</sup>	178	13%
4.	Different cements <sup>148</sup>	118	9%
5.	Processed wood products <sup>129</sup>	76	6%

## AUSTRIA

In Austria, too, growing demand for housing has contributed to the growth of the construction sector as a whole in recent years<sup>149</sup>. What makes the Austrian real estate market unique is that only 48% of households own their own homes and as many as 24% of all residential buildings are so-called social housing buildings. The social dimension of housing policy is very strong in Austria, but as it is divided between three administrative levels (national, provincial and local), the various support measures for low- and middle-income households are somewhat fragmented. However, a resource-intensive housing policy can be used as an instrument to compensate for the cyclical nature of the economy.

### BUSINESS ENVIRONMENT

SMEs in the Austrian construction sector are relatively highly leveraged and therefore most credit institutions see them as having a high credit risk and are therefore reluctant to lend them more money. However, loan interest rates are currently low, so companies with an exemplary capital structure should be able to get a loan.

<sup>148</sup> Portland cement, aluminous cement, etc.

<sup>149</sup> Country profile Austria, European Construction Sector Observatory, 2019.

The Austrian construction sector suffers from labour shortages, just like in other benchmark countries. There is a shortage of skilled and highly qualified workers. Among other things, the poor reputation of the construction sector, which scares away young people, is also a concern. The future prospects look more promising due to the fact that vocational education is very strong in Austria. Almost 90% of vocational school graduates work and there are several programs in the construction sector<sup>150</sup>, which bring students and companies together and provide them with grants to encourage them to recruit trainees. One should mention the *Baulehre* 2020 initiative with the curriculum that provides for the widespread acquisition of digital skills to prepare young people for future solutions and improve the image of the sector.<sup>151</sup>

## VISION

Austria is a federal state, and this reflects in the construction sector in the fact that, at the federal level, the construction sector is not under the governance of any ministry. Construction is regulated at federal level and coordinated by the *Österreichische Institut für Bautechnik* (OIB)<sup>152</sup>. However, the OIB focuses on more common issues, such as the standardization of various requirements and market monitoring. Therefore, Austria does not seem to have a common vision and strategy for the development of the construction sector.

## INNOVATION IN THE CONSTRUCTION SECTOR

The Austrian construction sector stands out in two areas where it is leading the way:

- construction waste management and recovery;
- ecological construction and passive buildings.

In Austria, the management of construction and demolition waste is regulated at national level, supported by guidelines developed by the sector itself. The national program (*Abfallvermeidungsprogramm*) is updated every five years to set new targets - the 2020 target was to recycle 70% of all construction waste. In 2016, 84% of waste was sent to recycling and 55% of waste was actually recycled. The so-called building passport principle will certainly have a role here in the future, which would aggregate all data related to the building and thus facilitate the flow of information between different parties (designers, contractors, public registers and officials, administrative service providers ...). As the passport should contain, among other things, information on the materials used, this would allow the re-use of the materials to be planned in advance.

The development and construction of passive houses is being supported also by the 14-year program *Haus der Zukunft*.<sup>153</sup> In 1999–2013, two-stage grants were offered for the development of new technologies to support:

- construction of energy efficient buildings (€ 30 million);
- "plus energy buildings"<sup>154</sup> development (€ 51 million).

Due to the long duration of the program and the variety of activities involved, it is difficult to assess its specific impact, but as of 2011, 25% of all new buildings in Austria were passive buildings.<sup>155</sup> The fact that in 2013 the world's first high-rise passive building was completed in Vienna is also a sign of progress in the construction industry in Austria.<sup>156</sup>

## EXPORTS

In 2017, the Austrian construction sector exported services for 754 million euros 2017<sup>Error! No bookmark defined.</sup>. Despite stable growth, the volume is rather modest compared to the other benchmark countries covered by the analysis, with exports to extra-EU countries being almost non-existent. In contrast

<sup>150</sup> <https://www.baudeinezukunft.at/de/home/>

<sup>151</sup> <https://news.wko.at/news/salzburg/baulehre-wird-digital-und-zukunftsfit.html>

<sup>152</sup> <https://www.oib.or.at/de/ueber-uns>

<sup>153</sup> [https://nachhaltigkeit.big.at/sites/default/files/files/160704%20Evaluierungsbericht%20Haus%20der%20Zukunft\\_final.pdf](https://nachhaltigkeit.big.at/sites/default/files/files/160704%20Evaluierungsbericht%20Haus%20der%20Zukunft_final.pdf)

<sup>154</sup> Buildings that produce more energy than they consume throughout their life-cycle.

<sup>155</sup> [https://ec.europa.eu/environment/ecoap/sites/ecoap\\_stayconnected/files/field/field-country-files/austria\\_eio\\_country\\_profile\\_2016-2017\\_1.pdf](https://ec.europa.eu/environment/ecoap/sites/ecoap_stayconnected/files/field/field-country-files/austria_eio_country_profile_2016-2017_1.pdf)

<sup>156</sup> [https://passivehouse-international.org/upload/2017\\_01\\_25\\_Pressemitteilung\\_Tagung\\_Wien\\_Programm\\_EN.pdf](https://passivehouse-international.org/upload/2017_01_25_Pressemitteilung_Tagung_Wien_Programm_EN.pdf)

to the services exports, the exports of various construction products were by far the highest amounting nearly €2.8 billion. It follows that manufacturing is the most capable area in the Austrian construction sector.

In the field of passive buildings mentioned above, Austria is also proving itself internationally: Buildings built as part of pilot projects by Austrian architectural and design firms can be found in the United Arab Emirates, China, and the *Zero Carbon Resorts* strategy was developed in collaboration with the Philippines to offer resorts around the world the opportunity to build highly efficient and energy-efficient accommodation.<sup>157</sup>

The export ambitions of Austrian construction companies have received support from both the more general go-international support scheme<sup>158</sup> as well as tec4market scheme specifically targeted at technology companies and companies developing innovative construction technologies.<sup>159</sup>

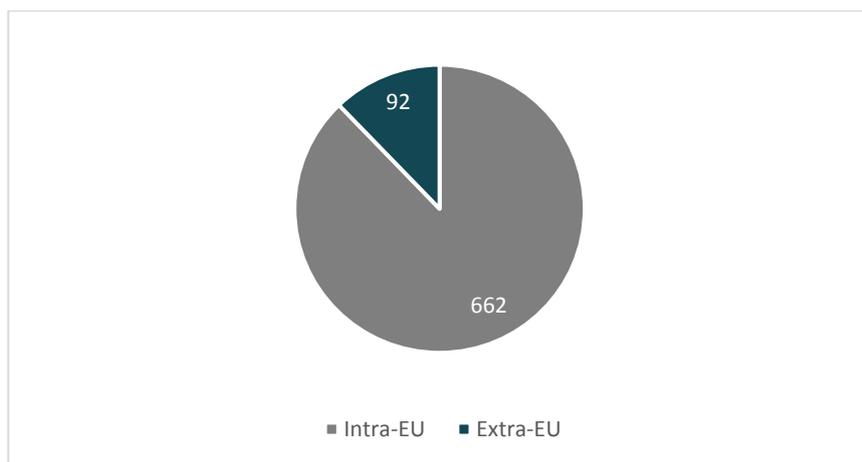


Figure 32. Exports of Austrian construction services, 2017 (M €)

Table 13. Most exported construction products in Austria in 2017

#	PRODUCT GROUP	EXPORT VOLUME (M €)	SHARE FROM THE TOTAL EXPORTS OF CONSTRUCTION PRODUCTS
1.	Processed wood products <sup>129</sup>	783	28%
2.	Other structures <sup>130</sup>	770	28%
3.	Assembled parquet panels	222	8%
4.	Windows, doors and their frames	139	5%
5.	Concrete formwork	135	5%

<sup>157</sup> [https://nachhaltigwirtschaften.at/resources/nw\\_pdf/eia/eia\\_171\\_en.pdf](https://nachhaltigwirtschaften.at/resources/nw_pdf/eia/eia_171_en.pdf)

<sup>158</sup> <https://www.go-international.at/>

<sup>159</sup> <https://nachhaltigwirtschaften.at/de/hdz/ausschreibungen/aws-tec4market.php>

## SUMMARY

The following is an overview of the strengths and weaknesses of all benchmark countries under the four topics:

- the existence of a cross-sectoral vision or strategy;
- business environment;
- the most outstanding success stories in the construction industry;
- export trends.

This is followed by brief descriptions of common features between the countries, their causes and accompanying measures.

Table 14. Strengths and weaknesses of the construction sectors in all benchmark countries.

COUNTRY	STRENGTH / WEAKNESS	MEASURES TO BE TAKEN
<b>VISION / STRATEGY</b>		
United Kingdom	The government made an ambitious statement <i>Construction 2025</i> , and a comprehensive vision document <i>Construction Sector Deal</i> , was prepared on the basis of this.	<ul style="list-style-type: none"> <li>• Numerical targets were set for the development of the sector</li> <li>• Inclusion of the parties through the Construction Leadership Council</li> <li>• Establishment of financial support measures for the implementation of R&amp;D</li> </ul>
Finland	The <i>Visio 2030</i> consortium was created.	<ul style="list-style-type: none"> <li>• Aalto University and Private Sector Consortium<sup>122</sup></li> <li>• Research on the potential of innovative solutions to modernize the construction sector<sup>123</sup></li> </ul>
Denmark	In 2014, " <i>Vejen til et styrket byggeri i Danmark</i> " ("Towards a stronger construction sector in Denmark") was published.	<ul style="list-style-type: none"> <li>• 34 different initiatives were planned<sup>137</sup></li> <li>• Reforms to reduce red tape and administrative burdens<sup>132</sup></li> <li>• Introducing the principles of <i>energy efficient construction</i></li> </ul>
Austria	There is no cross-sectoral vision.	-
<b>BUSINESS ENVIRONMENT</b>		
United Kingdom	The construction sector SMEs' difficulties in obtaining loans	<ul style="list-style-type: none"> <li>• <i>The Funding for Lending Scheme</i><sup>160</sup></li> <li>• <i>The Supply Chain Finance Scheme</i><sup>161</sup></li> <li>• <i>Project Bank Accounts</i><sup>162</sup></li> <li>• <i>Home Building Fund</i><sup>163</sup></li> </ul>
	Labor shortages - poor reputation of the construction sector amongst young people.	<ul style="list-style-type: none"> <li>• Promoting professional education<sup>103</sup></li> </ul>

<sup>160</sup> <https://obr.uk/box/the-funding-for-lending-scheme/>

<sup>161</sup> <https://www.gov.uk/government/news/prime-minister-announces-supply-chain-finance-scheme>

<sup>162</sup> <https://www.building.co.uk/focus/explainer-how-do-project-bank-accounts-work/5099705.article>

<sup>163</sup> <https://homebuildingfund.campaign.gov.uk/>

COUNTRY	STRENGTH / WEAKNESS	MEASURES TO BE TAKEN
	Vocational education and training are outdated and need to be modernized	<ul style="list-style-type: none"> <li>• <i>Construction Industry Training board (CITB)</i><sup>104</sup></li> </ul>
Finland	Growing labour shortages - there are no young people entering the sector to replace retired workers.	<ul style="list-style-type: none"> <li>• Updating of work methods of site managers and civil engineers through the introduction of innovative technologies on sites - drones, cameras, sensors</li> </ul>
	National housing policy and advance planning of infrastructure procurement guarantees a certain amount of procurement even when the economy cools down	<ul style="list-style-type: none"> <li>• MAL agreements<sup>119</sup></li> <li>• New laws obliging the public sector to plan road construction and other infrastructure procurements 10-15 years in advance</li> </ul>
Denmark	Construction companies have been having difficulties obtaining loans since the last financial crisis.	-
	Permits issue and other bureaucracy associated with construction activities one of the most efficient in the world.	<ul style="list-style-type: none"> <li>• Comprehensive National Reform Programs, including reduction of bureaucracy and administrative burdens<sup>132</sup></li> <li>• Simplification of the building permit process</li> <li>• Simplification of construction requirements in the field of fire safety</li> </ul>
	Growing labour shortages - there are no young people entering the sector to replace retired workers.	<ul style="list-style-type: none"> <li>• Suspension of tax benefits for home repairs</li> <li>• Promoting professional education<sup>135</sup></li> </ul>
	Construction companies are not able to offer internships to vocational students, although the curriculum requires it.	<ul style="list-style-type: none"> <li>• The government supports construction companies in recruiting trainees<sup>134</sup></li> </ul>
Austria	High leverage is common among construction companies which makes it difficult to obtain loans.	-
	Shortage of labour - there is a shortage of skilled and highly qualified workers.	-
	Strong professional (vocational) education and several internship programs will hopefully mitigate labour shortages in the future.	<ul style="list-style-type: none"> <li>• Strong internship programs to attract young people to the construction industry</li> <li>• <i>Baulehre 2020</i> program</li> </ul>
<b>INNOVATION OR SUCCESS STORIES IN THE CONSTRUCTION SECTOR</b>		
United Kingdom	The state set a very clear vision for developing the construction sector and supporting exports.	<ul style="list-style-type: none"> <li>• Inclusion of the parties through the Construction Leadership Council</li> <li>• Establishment of financial support measures for the implementation of R&amp;D</li> <li>• Exports support schemes<sup>109,110</sup></li> </ul>

COUNTRY	STRENGTH / WEAKNESS	MEASURES TO BE TAKEN
Finland	The private sector has started to introduce innovation in the construction sector on its own initiative	<ul style="list-style-type: none"> <li>• <i>Visio 2030</i> Consortium <sup>2</sup></li> <li>• MR forum <sup>64</sup></li> </ul>
	Reducing the duration of construction projects in pilot projects	<ul style="list-style-type: none"> <li>• <i>Visio 2030</i> working group and their implementation of the Tact planning methodology</li> </ul>
	There are ambitions to create a nationwide digital twin and at the same time acquire know-how that can be exported in the future.	<ul style="list-style-type: none"> <li>• Kalasatama digital twin pilot project<sup>125</sup></li> </ul>
Denmark	The introduction of strict energy efficiency requirements is well thought out and has been successful.	<ul style="list-style-type: none"> <li>• A well-thought-out strategy for implementing requirements</li> <li>• Various repair instructions for implementing energy-efficient construction</li> </ul>
	Continued efforts to implement and use digital solutions wisely.	<ul style="list-style-type: none"> <li>• Adoption of an updated follow-up strategy in 2019</li> </ul>
Austria	The share of recyclable construction and demolition waste is very high in Austria.	<ul style="list-style-type: none"> <li>• <i>Abfallvermeidungsprogramm</i> - national waste management program<sup>165</sup></li> <li>• The concept of a building passport<sup>166</sup></li> </ul>
	The construction of ecological passive houses includes considerable know-how, and their share of passive houses is very high.	<ul style="list-style-type: none"> <li>• <i>Haus der Zukunft</i> program</li> </ul>
<b>EXPORTS IN THE CONSTRUCTION SECTOR</b>		
United Kingdom	It seems that the state has made serious effort to strategically support the exports of the construction sector.	<ul style="list-style-type: none"> <li>• Corresponding exports support schemes<sup>109,110</sup></li> </ul>
Finland	There are no prominent export initiatives.	
Denmark	Large-scale exports of construction services, with an emphasis on energy-efficient construction.	<ul style="list-style-type: none"> <li>• Harmonization of Danish construction requirements with those of other countries</li> <li>• Cooperation agreements with the Chinese authorities<sup>137</sup></li> <li>• <i>Urban Solutions</i> export support scheme</li> </ul>
Austria	The know-how of passive houses is demonstrated through various pilot projects around the world.	<ul style="list-style-type: none"> <li>• <i>Zero Carbon Resorts</i> strategy</li> <li>• tec4market funding scheme for the export of innovative pilot projects</li> </ul>

<sup>164</sup> ..

<sup>165</sup> ..

<sup>166</sup> ..

## COMMON THREADS

The above table shows that there are sectoral problems that are common to all target countries analysed.

It turns out that three out of four countries have developed vision documents and/or strategies for their construction sector prospects and development opportunities. While in Finland it was drafted by private companies in cooperation with Aalto University, in Denmark and the United Kingdom the respective initiative came from the government. The United Kingdom shows particularly determined action, where appropriate support measures for research and development have been set up to implement the vision and foster innovation.

Another positive trend that emerges is the support schemes the target countries use to support the export of know-how in the construction sector. The UK's support measures appear to be more general than those of Denmark and Austria. The latter focus on specific subjects. Denmark emphasizes energy-efficient construction and Austria commits to the construction of passive buildings. However, on the basis of various sources, it can be stated that all three see potential in Asian market, with a focus on China.

The first negative trend is the difficulty amongst construction companies (especially SMEs) to raise (loan)capital – this concern has been observed in the United Kingdom, Denmark and Austria. These difficulties are mainly due to the financial crisis of 2008 and the subsequent changes in bank lending conditions. In a very short period of time, companies had to adapt to a situation where only companies with a very solid capital structure and low financial leverage could receive loans. However, operating in the construction sector often requires significant (initial) investments, which the owners of SMEs are not able to engage on their own; in a situation where loans were no longer granted, many had to close down after the financial crisis. It seems that in Denmark and Austria, no active measures were taken for this end, instead they rather let market forces to do their job - as the economic situation improved, the prospects for raising loan capital also improved. In the UK, on the other hand, a number of innovative solutions have been used to improve the financial situation of construction companies, with great potential seen in *Project Bank Accounts* measure. In Finland, it is possible to revive the construction markets through a large-scale housing policy - the state only needs to time housing procurement in such a way that construction companies benefit from it during the economic downturn - at a time when private sector contracts are declining.

Another problem that haunts the construction sectors in all countries is chronic (sometimes worsening) labour shortages. The average age in the construction sectors has increased and not enough young people enter the sector to replace retired workers. The reputation of the construction sector is poor amongst young people for two reasons. Firstly, the sector is very volatile due to economic cycles, especially in Denmark. The poor image is also exacerbated by the fact that in many professions all career prospects are very limited and there is little room for development. Another major concern - observed in the UK and Denmark - is the quality of education. In the United Kingdom, training is essentially outdated, and in Denmark, students have difficulty finding internships in a situation where the curriculum requires them to complete an internship. In both cases, the government has taken some steps to improve the situation: In the United Kingdom, the Construction Industry Training Board has been set up to reform curricula, and the Danish state is supporting construction companies in setting up traineeships and programs. Austria's prospects are the best against the backdrop of labour shortages. Austria has strong vocational training system and over the years they have focused on giving young people the opportunity to put themselves to the test in the construction sector through various internship programs.