Energy efficiency regulations in Estonia

E. Seinre, H. Voll

Abstract: Since July 1st, 2009 it is compulsory for a new or major renovation building project to meet the requirements set by Estonian Government decree nr. 258 „The Minimum Requirements for Energy Efficiency". This article reports on analysis of evaluation carried out in Tallinn University of Technology how the implementation has taken effect. As the results show there are severe problems with application of this decree, concerning the decree itself, as well as the shortage of knowledge and know-how amongst people applying it. Due to difficulties of establishment of the decree an alternative building evaluating schemes that could be implemented in Estonia are introduced, with their possible merits and drawbacks stated.

Keywords: BREEAM, Building legislation, Building simulations, Energy efficiency regulations, Estonia, LEED.

1. Introduction

The following is an evaluation on the situation of construction market in Estonia. Main proportions of this article are based on the survey carried out during several months in Tallinn University of Technology (TUT) [1]. This work was requested and financed by Estonian Heating and Ventilation Association (EKVÜ) and by private partner Kliimakonsult OÜ. The project was carried through by lecturers from TUT, PhD and MSc students. Also a helping hand from private partners and State Technical Supervision Authority has to be mentioned.

Being a member of European Union (EU) Estonia has to adopt to legislation put forward in higher rankings in EU. Among those is the aim to decrease energy consumption of member countries [2]. Estonia has set a target to decrease energy consumption by 9% in the next following 9 years to come, compared with the average energy consumption during the years 2000 to 2005. As building sector energy consumption is above 40% of overall energy consumption, of which around 63% is dedicated to apartment and public buildings, there lies a great potential to decrease energy consumption.

Estonia is not alone in this matter. For instance, Croatia has similar development directions for more sustainable future [3]. Although Croatia is not yet member of EU they thrive to more energy efficient future as well. As stated in referenced article there is large energy-saving potential in residential and service sector, with first denoting bit short from 1/3 of overall energy consumption in the state according to statistics from 2006. Both together had a 39% share of overall energy consumption in Croatia in 2006. By renovating buildings with proper measures authors of the article expect 10-30% energy consumption decrease in residential sector, whereas they expect up to 15% decrease in heating energy consumption by better insulation.

What is different from the situation in Estonia, is that based on this article Croatia is behind in level of energy efficiency development compared to Estonia, with status early in 2008. Problems in Croatia lie in the first steps of making energy-efficiency a priority.

Steps have to be taken to firstly increase inhabitants awareness of benefits of energy efficient buildings, also the enforcement of legislation is taking its first steps. Furthermore, the financial support from the government is expected in larger extent and in proper directions. Though government is offering already support the investigation showed, that money was initially allocated to wrong incentives and was not used in full extent.

For Croatia it is, at the moment, a matter of removing hindering barriers to energy efficient solutions. Only after that may they come across to problems arising with implementation of legislation in energy-efficient construction market, like study [1] for Estonian construction market came across.

A study in Italy [4] that evaluated energy performance on buildings is also well connected to current article. It evaluated real measured energy consumption of buildings and compared it with simulation results. Two kinds of simulation were considered: 1) dynamic and 2) static simulations.

Dynamic simulations are what are expected/preferred by decree nr. 258 in Estonia also, as only single family houses can use simplified method to prove accordance with „The Minimum Requirements of Energy Efficiency".

Static simulations are using averaged input data (monthly or seasonal), as opposed to much more detailed (hourly) input values of dynamic simulation. Also other parameters like occupancy, electrical equipment etc. are included in more simple way. All this constitutes the accuracy difference berween dynamic and static calculations, with prior being more precise.

Eventually a conclusion could be made, that while dynamic simulations give reasonable accuracy in comparison with measured data, static simulations need some improvement to be even closely correlated with real energy consumption.

Due to great potential and also to thrive to more sustainable future, by building more energy efficient buildings, a new legislation law was accepted in Estonia in 2009. This means that starting from 1st of July, 2009 all new buildings and major renovations must comply with Estonian government decree nr. 258 „The Minimum Requirements for Energy Efficiency" [5].

Shortly said this decree nr. 258 sets requirements to 2 main parameters:

1. Energy-Efficiency Value, which characterises building specific overall energy usage
2. Summer operative temperature, which characterises indoor climate during summer months

Those 2 requirements are supplemented by usual requirements to building envelope, building service systems and energy supply.

The Energy-Efficiency Value (EEV) includes whole building overall energy use, including energy necessary to guarantee acceptable indoor climate, hot domestic water and miscellaneous equipment.

The calculation of overall energy consumption is based on net energy need for HVAC systems, lighting and other equipment not covered by previous terms. The heat loss of (heating/electrical) energy production and in transmission is considered.

Overall energy use gives a good reference value to evaluate building energy use and environmental impact. The implementation of „The Minimum Requirements for Energy Efficiency" and comparison of buildings energy efficiency assumes that overall annual energy use is given per m^2. As building energy consumption is dependent on internal loads and usage profiles, the overall energy use is calculated according to standard profiles. This allows an energy efficiency comparison of same type of buildings on objective basis. Government decree nr. 258 has standard profiles for most common building types. Having certain standard profiles to use, will determine most input values in a energy usage calculation. The values that are not determined with decree nr. 258 are acquired from project documentation.

Setting energy-efficiency value as a target is based on Building Energy Efficiency directive [6] which emphasizes the importance of primary energy use and CO2 emissions, the economic efficiency and good indoor climate.

Decree nr 258 has different maximum allowable energy-efficiency values for several types of buildings. These also differ depending whether it is a new construction or renovation under consideration, allowing renovations to have somewhat higher values.

For new constructions, maximum allowable Energy Efficiency Values per year to meet with decree nr. 258 requirements are as follows:

1) 180 kWh/m^2 for small residential buildings (including semi-detached and terraced houses)
2) 150 kWh/m^2 for apartment buildings
3) 220 kWh/m^2 for office and administrative buildings
4) 300 kWh/m^2 for commercial buildings, hotels, other accommodation and catering facilities, trading and service facilities
5) 300 kWh/m^2 for public and recreational buildings
6) 300 kWh/m^2 for educational buildings and research facilities (excluding dormitories, libraries and clinics)
7) 400 kWh/m^2 for healthcare facilities
8) 800 kWh/m^2 for natatoriums

For major renovation buildings the allowable EEV limits are somewhat higher compared with new constructions as stated in previous paragraph. The values vary from 50 to 200 kWh/m^2 larger allowable EEV depending on building type. As investigation [1] dealt with new buildings the values concerning major renovation are not dealt with further detail.

Another important section in decree nr. 258 states the weighting factors for different energy carriers. These are as fallows:

1) 0,75 for fuels based on renewable raw materials (wood and wood-based fuels, other bio fuels, excl. peat and peat briquettes)
2) 0,9 for district heating
3) 1,0 for liquid fuels (heating oils and liquefied gas)
4) 1,0 for natural gas
5) 1,0 for solid fossil fuels (e.g. coal)
6) 1,0 for peat and peat briquettes
7) 1,5 for electricity

Above values give a clear overview which fuel types are preferred. As weighting factors are multiplied with consumed energy amount, the lower the weighting factor the better Energy Efficiency Value it is possible to obtain. Thus, for example using wood-based boiler as an energy source is twice as effective compared to electricity use.

What does not show from weighting are the efficiencies of different solutions. This means that in reality the difference between these 2 energy carriers is not so large as electrically operated systems tend to have higher efficiency ratios compared with others.

The second point in „The Minimum Requirements for

Energy Efficiency“ sets limits to operative temperature. This means that it is allowed to have up to 100 or 150 degree-hours(°C·h) over cooling set-point temperature during summer months (from June to August) depending on building type. Residential buildings are allowed to have up to 150 (°C·h) per year when indoor operative temperature exceeds cooling set-point limit. All other buildings must meet the 100 (°C·h) limit. To evaluate the meeting of this requirement it is assumed that a computer simulation is carried out for a sample room. Dwellings are allowed to be checked with simplified way by using specific graphs.

Authors of this article think that there are further parameters that should be considered when evaluating indoor climate that are as important to give definite evaluation over indoor quality. That is why, in later part of this article alternative building grading programs are considered.

2. Problem Description

According to decree nr. 258 it is necessary for new and major renovation construction to prove that energy consumption requirements are met. To do that, means to have knowledge of methodology and the ability to use calculation programs. Concluding from first results on applying the decree in correct manner shows that there is a high probability to obtain incorrect final values by designers. Main reason behind that is low user experience with simulation software, but also incorrect input values, unclear calculations and wrong assumptions of the complicated methodology. At the same time local authorities do not have knowledge capacity to check the results. This has induced a situation where building permit is given to a project that according to energy label is acceptable, but in reality consumes considerably more energy. Altogether, there is a threat that the decree is not fulfilling its purpose – to prevent constructing houses that consume excessive amount of energy.

Current article is focused on the evaluation of how decree nr. 258 is taking effect and introducing main concern points.

2.1 Current Situation

In co-operation with State Technical Supervision Authority altogether 13 non-residential buildings were selected. Due to difficult economic state in 2009 these where practically also the only building projects that had received building permits from 1st of July - 1st of December in 2009. Enquiry showed that only 3 project`s energy consumption calculations where done with suitable simulation software. Furthermore, 1 project calculation out of the 3 was not done according to decree, using project based input values and not standard profiles according to the decree, where applicable. Thus, energy calculation check analysis was carried out only for 2 projects as shown in Fig 1.

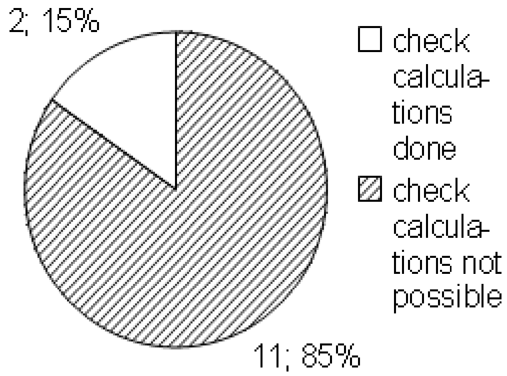

Figure 1. Projects qualifying for check calculations

As Fig. 1 shows this constitutes only 15% of all building permit allowances that were justified considering proper use of decree nr. 258 „The Minimum Requirements for Energy Efficiency“. Main reason to reject other projects for check calculation was the usage of wrong simulation software for non-residential projects (5 cases), but there was also forgery of signature (1 case) and a case with no actual calculation done.

The reason behind using inappropriate simulation program was the user friendliness of the program BV2 with its easy-to-understand Estonian manual, good examples and quick response from developers in the case of questions. As this is only simulation software publicised and promoted by Ministry of Economic Affairs and Communication who is coordinating the building`s energy efficiency acts it is understandable. Also it is the only available simulation software without any fee. Furthermore, users probably did not turn a lot of attention to the fact, that BV2 is not suitable for buildings other than residential buildings as this is the closest designers get to simulation software. This was still far better solution than to hand-calculate the energy performance. Thus this minor deviation was just overlooked. At the same time, the appropriate simulation programs where considered very sophisticated and difficult to understand with their foreign (English) language manual, not to mention the expense.

2.2 Check of Energy Calculation Results

2 project calculations that qualified for calculation check analysis where simulated by MSc and PhD students. The check calculations where carried out with IDA-ICE and/or BSim simulation software. Both

softwares do comply with IEA BESTEST methodology [7],[8]. One of the projects was a retail centre in Narva, second was an office building in Tallinn.

1. Retail Centre in Narva

Building year:2009

Heated floor area: 12 733 m^2

Net floor area: 13 287 m^2

Building model from IDA-ICE simulation software can be seen on Fig.2.

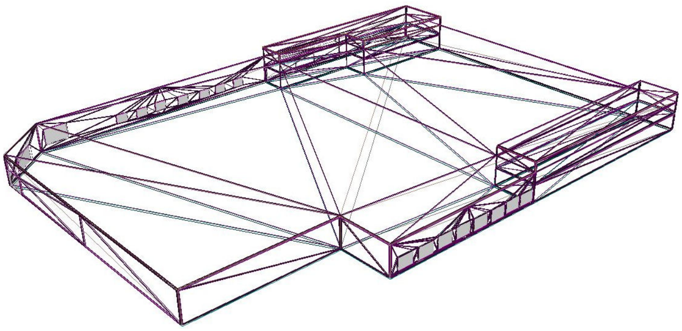

Figure 2. 3-D simulation model of Narva retail centre

Results.

Simulation and project results for Narva retail centre are presented in Table 1.

Tabel 1. Results for Narva retail centre

	Project Values [kWh/(y*m2)]	Check Calculations [kWh/(y*m2)]
Energy Efficiency Value	291	247
Energy for Heating	42,7	79,2
Ventilation Electricity consumption	8,5	46,2
Consumer Electricity	89,1	69,7
Energy for Cooling	69,8	3,7

Energy Efficiency Value: In design documents a value of 291 obtained compared to 247 kWh/(m^2 x yr) in check calculations. This constitutes about 15% difference. Both of these Energy Efficiency Values falling in allowable limit of 300 kWh/(m^2 x yr) for commercial buildings.

Looking at building service systems and their energy consumption shows even larger discrepancy. For instance, heating energy consumption is 42,7 in design documents while it is 79,2 kWh/(m^2 x yr) in check calculations showing about 47% difference. At the same time ventilation equipment electrical energy consumption is about 5 times larger in check calculations, while other electrical equipment energy consumption is over 20% less in the same calculations.

Concerning cooling, the difference is immense, with 69,8 in design documents and 3,7 kWh/(m^2 x yr) in control calculations, constituting close to 20 times difference!

Evaluation of the results.

There are several possible considerations that constitute to results difference.

- different calculation software
- difference in EEV is probably caused by special equipment used in retail centre about which there were missing input values for check calculation.
- Special equipment probably constitutes 20% difference in equipment electrical energy consumption as well.
- the reason for large difference in ventilation electrical energy consumption could lie behind SFP (specific fan power) value as design calculation software does not allow to input this value. To check which results match more with reality by using simplified calculation with the same air flow rate and simple usage profile gives a result of 43,7 kWh/(m^2 x yr) being close to check calculation result.
- with more precise evaluation of results the main concern is associated with refrigeration equipment used in retail centres and how to consider these in energy calculations. That is not regulated in decree nr 258.

2. Office building in Tallinn

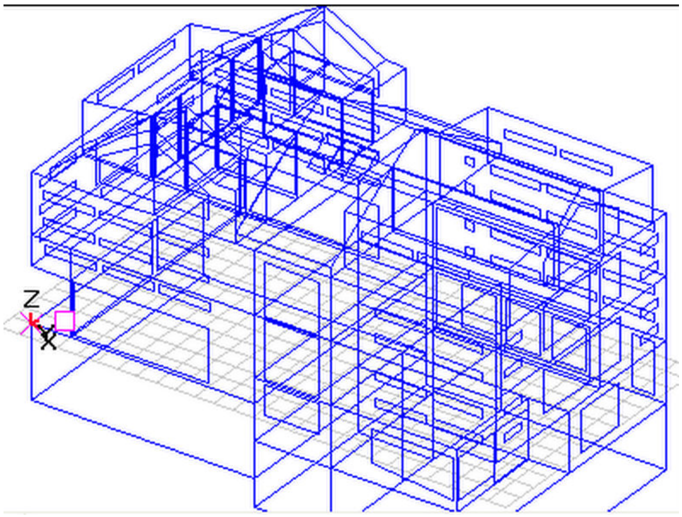

Figure 3. Office building model from BSim

Building year: 2009

Heated floor area: 964,4 m^2

Net floor area: 1 094,2 m^2

Building wire-framed model from BSim simulation program can be seen on Fig. 3.

Results.

Office building results for actual project and for check calculation are presented in Table 2.

Table 1. Results for Office building

	Project Values [kWh/(y*m2)]	Check Calculations [kWh/(y*m2)]
Energy Efficiency Value	168,5	146,6
Energy for Heating	39,1	47,8
Ventilation Electricity consumption	14,9	14,7
Consumer Electricity	52,1	49,4
Energy for Cooling	7,9	4,2

EEV is 168,5 compared to 146,6 kWh/(m^2 x yr) in design calculations and in check calculations respectively. This constitutes around 13% difference. Both of these Energy Efficiency Values are in allowable limit of 220 kWh/(m^2 x yr) for office buildings. Heating energy consumption is around 18% lower for design calculation compared with check calculations, with values of 39,1 and 47,8 kWh/(m^2 x yr) respectively. Ventilation electrical energy consumption is almost the same for both cases, with 14,9 kWh/(m^2 x yr) for design case and 14,7 kWh/(m^2 x yr) for check calculation. Furthermore, equipment energy consumption is matching well also, with 52,1 in design case compared to 49,4 kWh/(m^2 x yr) in check calculation. Those two parameters show good match. But there is a larger cap between cooling energy demand, around 2 times, with 7,8 kWh/(m^2 x yr) in design case and 4,2 kWh/(m^2 x yr) in check calculation.

Evaluation of results.

As there are occasional mismatches among the results, there are few possible considerations that constitute to these differences:

- different calculation software
- mismatch of floor areas
- It is unclear which part of building is considered unheated.
- During check calculation there arouse a doubt about input values of internal heat gain and usage profiles of lighting, people and equipment in design calculations. Check calculations used profiles according to decree nr 258, which are not matching with design case.
- Difficult to understand such high cooling energy need in design calculations
- There is also a large, 3,5 times difference, in ventilation air heating demand. The reason behind it is the supply air temperature difference being +21 °C in design case while in check calculations it is +18 °C. It is also partly due to heat recovery temperature efficiency value difference, being 0,8 for control calculation according to decree, while it is 0,76 in design calculation (probably based on project documents).

2.3 Summary of Energy Calculation Results Check

The investigation showed that there are severe deficiencies in application of Estonian governments decree nr. 258 „The Minimum Requirements for Energy Efficiency“ and set targets are not met. Only 2 project energy calculations out of 13 where done in accordance with decree nr. 258. Investigation also showed that most calculations where incomplete, done with inappropriate calculation software or just missing. Reasoning behind application difficulties lie behind sophisticated level of the decree, but also problems concerning appropriate simulation software usage. There have not been institution(s) to educate enough specialists in acceptable simulation software. Furthermore, acceptable software is available in foreign language, expects high level of knowledge in the field of building energy consumption and large work experience. Often the calculation process is not easily assessable and this makes energy calculation result checks complicated.

To conclude, although the purpose of decree nr. 258 is noble, it is at the moment ahead of it`s time, as implementation is not going the way it is supposed. There is shortage of (experienced) experts able to carry out calculations with appropriate simulation software.

3. Future Alternatives

As the situation with current Estonian government decree nr. 258 „The Minimum Requirements for Energy Efficiency“ is not good there is room for improvement. Implementation of the decree has been made compulsory, but at the same time it seems Estonia is just not ready for that. All this is clearly visible by looking at implementation since decree was made a law last July. There is only few projects granted building permit and most of them are based on wrong values due to the inappropriate use of the decree. To resolve this problem, there should be more supporting education in how to implement the decree and further guidance for the users.

There is movement towards that, as besides TUT there is another research centre in Tartu University also working towards brighter future by educating students and doing research work considering energy efficiency in buildings and concentrating especially on passive buildings.

Second alternative to evaluate building projects could be the usage of more thorough building rating system.

The latter would consider much more parameters than just annual specific energy use and indoor climate conditions based on operative temperature during summer months.
The shortcomings of only 2 parameter use is that these might not give correct overview of actual conditions in a building. As discussed in [9] which analyzed conditions in Estonian residential and school buildings the indoor climate can be very low in renovated buildings. The main reason is that usually renovation in Estonia means better insulation on a building envelope and also air-tightening by replacing windows. This, on the other hand, constitutes lower ventilation rates, as old buildings were designed using natural ventilation. Thus, if using for instance CO_2 levels as an evaluation tool, it can be seen that allowable limits can be exceeded in 2-3 times, as measurements in [9] show.
Similar study [10] which also investigated indoor climate quality in apartment buildings with natural stack ventilation showed some occasional high levels in CO_2 concentrations and relative humidity levels depending mostly on the fact whether windows had been changed or not.
From these examples it should be clear that EEV and summer operative temperatures are not enough. Using only those 2 values a building could be considered suitable according to decree nr. 258, but if a broader view is taken, some shortcomings could be noticed. Although it must be noted, that decree nr. 258 sets also ventilation airflow rates for mechanical ventilation for different room types, thus by proper use of the decree there should not be problems, considering indoor air quality using CO_2 as reference value at least for mechanically ventilated buildings. Naturally ventilated buildings, on the other hand, are different matter.
Another study [11] analyzed indoor climate in small detached houses in Estonia, which showed good results concerning CO_2 levels and relative humidity. Major difference from buildings in [9] is that here mechanical ventilation was used. The study reported on 2 buildings, one of which with balanced mechanical ventilation and other with mechanical exhaust ventilation. Measurements taken from buildings showed good indoor air quality, with CO_2 levels and relative humidity values falling into allowable limits.
What can be concluded from comparison of these 3 studies is that while it might be enough to evaluate a building by using only EEV and summer operative temperature for mechanically ventilated buildings, it surely needs to consider further parameters in naturally ventilated buildings.
What furthermore supports the idea of using more thorough evaluating scheme, is the fact that current regulative decree has not been enforced in full extent, meaning it is not fulfilling it`s purpose and it is not used in a right manner. Thus, there is room to implement a new grading system which is more complete to evaluate proposed building projects to guarantee better building designs.
There are few established grading systems available in the world, which this new building project evaluation system should follow. The two most complete ones are LEED in US and BREEAM in UK, but there are more.
The first one is LEED (Leadership in Energy and Environmental Design) Green Building Rating System developed by U.S. Green Building Council (USGBC) [12]. Latest edition is from 2009. BREEAM (Building Research Establishment`s Environmental Rating System) [13] is developed by BRE in UK current last edition is published in 2008.
Both of these rating systems are acknowledged all over the world. Both of them are consistently being improved by respective institutions. Thus, besides setting standards now, they will be in the forefront in the future as well.
Furthermore, as there can be several building project types (e.g. residential, retail, school, office etc. buildings) there are different grading schemes for specific project type. BREEAM, for instance, has editions covering Courts, Education, Industrial, Healthcare, Offices, Retail, Prisons, Multi-residential projects. There are several options for LEED as well, consisting of New Constructions or Major Renovations of Commercial and School buildings, Homes, Retail, Core&Shell and Commercial Interiors. There is a small difference between division by both organisations in their respective evaluation schemes, but the idea stays the same – to use appropriate grading systems for specific building project types. Though there are several grading schemes, the most urgent ones for Estonia are Office and Multi-residential by BREEAM or the edition for New Constructions and Major Renovations of Commercial buildings by LEED.
These two grading systems are well composed covering matters in a wide range. They are not only about energy consumption and indoor temperature, but rather cover much broader range. Like life, it is a matter of many factors to describe reality and not just few seemingly most important ones to give exact and complete picture of a building. For instance in LEED there are 5 main evaluation topics plus additional 2 topics, latter consisting of Innovation in Design and Regional Priority. Regional Priority is applicable only in the territory of US. Main topics are Sustainable Sites, Water Efficiency, Energy & Atmosphere, Materials & Resources, Indoor Environmental Quality. All of these main topics consist of several sub-themes making up an extensive scale to evaluate building projects. Each main topic has 1 to 3 requirements which a project has to pass to receive recognition from USGBC.
Sustainable Sites evaluates the suitability of proposed building site for construction. The matters considered are the current situation of site, accessibility by public transport, bio-diversity, management of stormwater,

heat effect on surroundings.

In Water Efficiency water use reduction and conservations are considered.

Energy & Atmosphere deals with energy consumption, optimizes it, considers mechanical systems and refrigerants, evaluates and measures operation.

Materials & Resources turns attention to recycling, re-using and lowering waste generation by proper management of materials and resources.

Indoor Environmental Quality deals with indoor air quality, ventilation rates, low-emitting materials and finishes, controllability, lighting levels and views. Also measurements and verification of systems work is considered.

BREEAM is almost the same, at least the topics covered are in large part the same.

From the short introduction to LEED evaluation scheme, it should be clearly visible even just by the numbers of topics in it that decree nr. 258 with it`s 2 main characteristics to evaluate a building project is too limited.

As BREEAM and LEED grading schemes are aiming not just to pass a project by meeting minimum requirements, but rather offering a possibility to rank a building according to solution quality, there are threshold levels to pass according to those standards. Taking LEED, for instance, it is possible to have 110 point maximum (in US), including points from innovation and regional priority. But it is also enough to pass if a project achieves over 40 points. 40 point level is just passing according to LEED, but there are further levels at over 50, 60 and 80 points threshold. Developed project, having higher level certification from USGBC, is of course attracting more attention. Client can compare project only based on the certificate allocated, making it easy for client and the developer alike. Having world known grading scheme acknowledging your effort, is what each developer in the future will want and need to make their projects marketable.

The thing that should be considered is the volume of LEED and BREEAM. As these are considering a lot of parameters when evaluating a building project, it may turn out that it is too comprehensive and difficult to follow. There would surely be shortage of expertised personnel in the field at current situation in Estonia. To overcome that problem, both BRE and USGBC are offering education for training people to use their schemes in correct manner. Both these grading schemes have certified personnel who are accredited to offer consultation and conduct evaluation of proposed building projects, after taking a course and passing an exam. Thus, the possibility to become recognised assessor is available to all.

This means that even though there would be shortage of qualified personnel in the first years after establishing BREEAM or LEED, it can change in the future.

To overcome the problem of too many points under consideration for evaluating a project, there could be made some modifications.

It might be reasonable to take LEED, BREAAM or a combination of both or even more building rating schemes as a basic reference to compose custom Estonian building grading scale. It bares of course some threats, main of which would be that it would not surely be bearing the approved certification stamp from USGBC or BRE. At the same time, it can still be the best solution. This would mean more elaborate evaluation compared to current decree, but staying in reasonable extents.

Another thing is that someone has to make a choice of what to include to the modified Estonian grading scale and what to leave out. This should be rather done by an institution, e.g. Tallinn University of Technology, or if BRE and USGBC would be interested, in co-operation with them. It is hard to expect interest from US and UK standard organisation to help working out standards for Estonia, thus the latter idea could be crossed out. BRE and USGBC would rather just see their standards directly taken over in Estonia as it is recognised all over the world as this would seem most reasonable choice to all, at least from their point of view.

TUT, on the other hand, could be very suitable institution to work out appropriate scheme for Estonia. They have a well-known high level reputation in Estonia, and should have capacity also. As TUT is currently looking for further improvements of current decree nr. 258 considering building sustainability and energy efficiency as a PhD thesis, the work towards more suitable solution for building rating in Estonia is in progress.

Besides working out most suitable solution for evaluating buildings we aim to become the organisation educating future assessors and becoming a consulting organisation considering buildings not just in Estonia but at least in Baltic countries. All this should help to overcome problems aroused from application of decree nr. 258 till now.

4. Conclusion

Based on evaluation on projects granted a building permit in 2009, since the decree nr. 258 was made compulsory, it can be concluded that the law is not fulfilling its purpose and has not established itself yet. Thus, there is still room for improvement of current decree or event to replace it with some more complete evaluation schemes, like LEED.

To become more acquainted with BREEAM and LEED our next objectives are to evaluate some future building projects in Tallinn, and see where would these fit in BREEAM and LEED grading schemes. These will show the current level of our standards necessary to pass for building permit. If the scores will be low, it will definitely show shortcomings in our regulations. The probable reasons behind those can be two kinds:

1) the points considered in BREEAM and LEED are not considered in Estonian regulations, thus can not be evaluated.
2) the parameter thresholds might be too low compared to levels in UK and US.

Based on the future evaluations it will be clear whether the best solution is to take LEED or BREEAM directly in use, to modify these to fit with Estonian situation or to make extensive additions to current decree nr. 258. All this will be future work in next 2-3 years to come ended by a PhD thesis and defence on the final results and solutions.

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