



GREEN JOBS

*Analysing the Employment
Impact of Energy Efficiency Measures
in Bosnia and Herzegovina*

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Table of Contents

LIST OF FIGURES	4
LIST OF TABLES	4
ABBREVIATIONS	5
EXECUTIVE SUMMARY	7
INTRODUCTION AND METHODOLOGY	11
1. Analysis of the employment impact of EERE measures	13
1.1. Background	13
1.2. Types of buildings and types of implemented works	16
1.3. The value of investment in the implementation of EERE measures in buildings	17
1.4. Amount of labour created by implementation of EERE measures in 34 buildings	19
1.5. The employment impact of EERE measures by type of works	23
1.6. The employment impact of EERE measures by building	25
1.7. Employment potential and comparative indicators expressed via the investment value	28
1.8. Potential employment expressed via heated floor area	31
2. Potential for salaries and related taxes and contributions created by the implementation of EERE measures	32
2.1. Potential for salaries expressed via the investment value	32
2.2. Potential for salaries per heated floor area in buildings which are subject to improvements	36
3. Effects on employment and salaries under the National Energy Efficiency Action Plan of Bosnia and Herzegovina 2010-2018	37
3.1. Employment potential under the NEEAP	37
3.2. Potential for salaries and related taxes and contributions under the NEEAP	40
Conclusion	41

LIST OF FIGURES

Figure 1. Values of different types of works	18
Figure 2. Amount of labour required for the implementation of EERE measures, by type of works ·	21
Figure 3. Amount of labour required for the implementation of EERE measures, by skill level ·····	22
Figure 4. Share of the types of works in the implemented EERE measures	24
Figure 5. Number of hours worked by type of works per KM 1 investment in EERE measures ····	25
Figure 6. Direct employment potential by category of workers expressed as FTEs per KM 1 million investment	29
Figure 7. Direct employment potential by category of workers expressed as FTEs per 1,000 square metres of heated floor area	31
Figure 8. Structure and value of total investment in the implementation of EERE measures in respective buildings	32
Figure 9. Structure and value of total appropriations for workforce wage bill	33
Figure 10. Share in total salaries and related taxes and contributions by worker qualification ·····	34
Figure 11. Structure and value of taxes, fringe benefits and contributions for the work force involved in the implementation of EERE measures in respective buildings.....	34

LIST OF TABLES

Table 1. Buildings in which EERE measures have been implemented	16
Table 2. Type and value of works in buildings in which EERE measures have been implemented ··	17
Table 3. Amount of labour by type of works and category of workers	20
Table 4. Amount of labour by type of works presented as working hours and FTEs	23
Table 5. Ranking of buildings according to their contribution to job creation expressed as working hours and FTEs	26
Table 6. Ranking of buildings according to investment effectiveness expressed as the number of hours worked per KM 1 investment	27
Table 7. Labour potential for different levels of investment in EERE measures	28
Table 8. Comparative employment effects of energy efficiency activities	30
Table 9. Labour potential for energy performance improvements in buildings with various heated floor areas	31
Table 10. Total appropriations for workforce wage bill by category of workers	33
Table 11. Potential for net salaries, taxes and contributions for workers engaged in the implementation of measures per square metre of heated floor area	36

Table 12. Resources planned under the NEEAP for measures in buildings	38
Table 13. Resources planned under NEEAP for measures in buildings	38
Table 14. Total and annual spending for wage bill under the NEEAP	40
Table 15. Total appropriations for taxes and contributions levied on salaries under the NEEAP ...	40

ABBREVIATIONS

€ – Euro (currency)
BiH – Bosnia and Herzegovina
CA BiH 2010 – Classification of Activities of Bosnia and Herzegovina 2010
EERE – Energy Efficiency and Renewable Energy
FBiH – Federation of Bosnia and Herzegovina
FTE – Full-time Equivalent
KM – Convertible Mark (national currency)
KV – skilled worker/workforce
kWh – kilowatt-hour
m ² – square metre
NEEAP – National Energy Efficiency Action Plan of Bosnia and Herzegovina 2010-2018
NKV – unskilled worker/workforce
PKV – semi-skilled worker/workforce
PS – Primary School
SMEs – Small and Medium-sized Enterprises
UNDP – United Nations Development Programme
US – United States of America
VAT – Value Added Tax
VKV – highly skilled worker/workforce
VSS – worker with university education

EXECUTIVE SUMMARY

The term “green jobs” denotes employment opportunities in areas related to environmental protection. “Green jobs” are particularly suited to the construction sector as the usual structure of energy consumption is such that buildings consume the most energy, and as such are subject to energy performance improvements. Wasteful consumption of energy for heating, cooling and lighting is characteristic of almost all types of existing residential and public buildings in Bosnia and Herzegovina. According to the estimates of the Energy Sector Study in BiH, more than 75% of occupied buildings in the country have inadequate thermal insulation, with average energy use for space heating in excess of 200 kWh/m². Improving the energy performance of buildings and implementation of relevant measures delivers a range of benefits, job creation being one of the most important ones.

The purpose of this study is to analyse and present the effects of investment in energy efficiency and renewable energy (EERE) on direct employment in BiH. Direct employment means employment generated as a result of the increase in demand for goods and services directly related to the implementation of EERE measures.

BiH has a very low employment rate; hence, increasing employment rates and reducing unemployment should be the main political and national priorities, particularly among hard-to-employ population groups and in areas and regions characterised by sustained high unemployment.

For the purposes of assessing direct employment effects, the research team analysed data on the EERE measures applied in 34 buildings with a total heated floor area of 77,147 m², distributed across the country. In each of the buildings, all or some of the EERE measures were implemented, including preparatory works, masonry and insulation works, roofing and sheet-metal works, joinery works (PVC windows and doorways), façade works, house-painting and decorating works, installation of the lightning rod and electrical installations, plumbing works, and a significant number of mechanical works. The total value of funds spent for all buildings/projects was to the tune of KM 6,555,636, and the average investment per square metre of heated floor area was about KM 85.

Based on the applicable building standards defining the time required by type of works, all the aforementioned buildings required a total of 727,019 working hours. Based on 2,257 working hours per year, which is the typical number of hours worked by an individual in the construction industry in one year, according to the full-time equivalent, the number of jobs is 322, i.e. full-time employment for 322 individuals for one year. The 322 full-time equivalent (FTE) jobs are distributed as follows: one FTE job for unskilled workers, 117 FTE jobs for semi-skilled workers, 169 FTE jobs for skilled workers, 18 FTE jobs for highly skilled workers and 17 FTE jobs for workers with university education.

Looking at the type of works performed during the implementation of EERE measures in the aforementioned buildings/projects, as well as the contribution to employment, the highest amount of labour was produced by façade works with 178 FTEs, followed by preparatory works with 39 FTEs, joinery works with 31 FTEs, masonry and insulation works with 24 FTEs, etc. However, if we look at investment effectiveness, which is expressed as the number of working hours by type of works per KM 1 invested, the highest effectiveness is found in preparatory works with 0.57 hours per KM 1 invested, followed by façade works with 0.26 hours per KM 1 invested, and house-painting and decorating works with 0.21 hours per KM 1 invested. Preparatory works are found to be the most investment-effective because they are characterised by a large number of manual tasks and activities and workforce that is not too skilled and highly paid.

The key information used to compare investments and effects in different economic sectors is the number of FTE jobs per €1 million investment in EERE measures. According to calculations, €1 million spent in EERE measures generates 96 FTEs. Thus, it is possible to employ 96 individuals on a full-time basis for one year. This number is suitable for comparison with other countries and projects, whereas for the in-country purposes it is more suitable to express it in national currency, where KM 1 million spent in EERE measures creates the potential for 589 man-months or 49 new jobs, primarily in the construction sector. The structure of these 49 new jobs includes mostly skilled workers – about 26, followed by about 18 semi-skilled workers, about three highly skilled workers, about three workers with university education and 0.2 unskilled workers.


Further item of information that can be used for employment projections and planning is one that shows FTEs per square metre of heated floor area of a building that is subject to the implementation of EERE measures. According to calculations, 0.0042 FTEs are created per one square metre of heated floor area of a building subject to energy performance improvements.

During the implementation of EERE measures in the aforementioned buildings/projects, a total of 727,019 working hours, or 322 FTEs, were created. Based on the average monthly salaries paid to individual categories of workers in the construction industry, the total spending for the wage bill is calculated at KM 3,205,333. When this amount is compared to the total appropriations for implementing EERE measures in the aforementioned buildings/projects to the tune of KM 6,555,636, the share of the wage bill versus other project costs is 49% vs. 51%. The wage bill includes net salaries paid to workers and total taxes and contributions paid into the state budget, insurance schemes/funds, agencies and the like. Total annual net salaries amount to KM 1,891,247 and total taxes and contributions amount to KM 1,314,086. In terms of the taxes, fringe benefits and contributions for EERE works and measures implemented in the aforementioned buildings, the total amount of which is KM 1,314,086, the majority of funds were paid towards the pension and disability insurance scheme (51%), followed by the health insurance scheme (36%), and below 10% each towards income tax, the Employment Agency/Fund, water contribution fee and insurance against accidents and disasters, and the Fund for Professional Rehabilitation and Employment of Persons with Disabilities.

The main findings of this analysis demonstrate that KM 1 million investment in improving energy efficiency in buildings in BiH can:

- create net salaries for all categories of workers in the amount of KM 288,492, or 28.84% of the total investment,
- create taxes and contributions levied on the wage bill in the amount of KM 200,451, or 20.04% of total investment,
- cover the wage bill in the amount of KM 488,943, or 49% of the total investment, and other project costs (materials, equipment, tools, etc.) in the amount of KM 511,057, or 51%,
- of the total amount of KM 200,451 for taxes and contributions, create funds for:
 - the pension and disability insurance scheme in the amount of KM 101,231, or 10.1% of the total investment,
 - the health insurance scheme in the amount of KM 72,624, or 7.2% of the total investment,
 - the Employment Agency/Fund in the amount of KM 8,803, or 0.9% of the total investment,
 - budget revenues by way of the water contribution fee and insurance against accidents and disasters in the amount of KM 2,910, or 0.3% of the total investment,
 - budget revenues by way of the income tax in the amount of KM 12,682, or 1.27% of the total investment,
 - the Fund for Professional Rehabilitation and Employment of Persons with Disabilities in the amount of KM 2,202, or 0.22% of the total investment.
- plan salaries and related taxes and contributions by workforce category, as follows:
 - for unskilled workers, net salaries in the amount of KM 745 and taxes and contributions in the amount of KM 517, or a total of KM 1,262,
 - for semi-skilled workers, net salaries in the amount of KM 88,077 and taxes and contributions in the amount of KM 61,198, or a total of KM 149,275,
 - for skilled workers, net salaries in the amount of KM 152,883 and taxes and contributions in the amount of KM 106,227, or a total of KM 259,110,
 - for highly skilled workers, net salaries in the amount of KM 17,681 and taxes and contributions in the amount of KM 12,285, or a total of KM 29,966,
 - for workers with university education, net salaries in the amount of KM 29,106 and taxes and contributions in the amount of KM 20,224, or a total of KM 49,300.

Additionally, for each square metre of heated floor area of a building in which EERE measures are implemented, KM 41.5 is created in salaries and taxes for workers working on the building/project. This amount of KM 41.5 per square metre of heated floor area of a building in which EERE measures are implemented comprises KM 24.5 (59%) for net salaries and KM 17 (41%) for taxes and contributions.



One of the most important documents that the country is required to prepare as part of its commitments under the Energy Community Treaty is the energy efficiency action plan. Bosnia and Herzegovina prepared its first National Energy Efficiency Action Plan (NEEAP), focusing on the entire 2010-2018 period and establishing the overall objective for 2018. A significant portion of activities envisaged under the NEEAP concern the improvement of energy efficiency in buildings by improving the energy performance of buildings in almost all sectors. These planned construction measures can be used to determine the extent to which the implementation of EERE measures under the NEEAP would contribute to the creation of new employment opportunities or retention of existing jobs.

A total of €341 million (KM 667.485.662) was appropriated under the NEEAP for measures in buildings. This amount represents a basis and offers potential for creation of 32,865 FTE jobs, or, in other words, it can provide full-time employment to 32,865 individuals for one year. Given that the NEEAP covers a nine-year period (2010-2018), and if these jobs are linearly distributed, it would be possible to employ 3,652 individuals annually, primarily those in the construction profession.

The total employment potential of 32,865 FTE jobs under the NEEAP, i.e. the number of full-time workers for one year, is almost identical to the average number of 33,093 workers in the construction industry in BiH in 2015. So, if all the measures envisaged under the NEEAP were to be implemented within one year, all employees in the construction sector in BiH would be engaged in improving the energy performance of buildings. However, as the NEEAP covers a nine-year period, this means that annually employment would be created for 3,652 workers in the construction sector, i.e. an average of 11% of workers in the construction sector in BiH would be engaged in the implementation of EERE measures under the NEEAP. Under the NEEAP, the potential for creation of salaries and related taxes and contributions is KM 326 million, and this amount is made up of KM 192.5 million for net salaries and KM 133.8 million for taxes, fringe benefits and contributions.

INTRODUCTION AND METHODOLOGY

The term “green jobs” has been in use since the 1980s and denotes employment opportunities in areas related to environmental protection. Since energy efficiency and renewable energy represents a very important and highly relevant area of environmental protection, so employment opportunities generated under these aspects definitely fall into the category of “green jobs”. This term is gaining more traction in parallel with the development of dialogue occurring as a result of climate change, adaptation and mitigation measures, environmental pollution from the electricity generation sector, etc.

International estimates indicate that more than 2.3 million people worldwide are currently employed in the renewable energy sector only. The rapid development of the green sector is best illustrated by the fact that 4.2 million new “green” jobs are expected to be created in the US over the next 30 years. In our immediate neighbourhood, specifically in Croatia, it is estimated that by 2020 the use of biomass would result in the creation of 5,000 direct jobs and as many as 55,000 indirect jobs.¹

“Green jobs” are well-suited to dynamic labour markets and they include not only highly skilled workforce, but also, as will be seen in this analysis, a significant number of skilled and semi-skilled workforce.

“Green jobs” are particularly suited to the construction sector as most energy is typically consumed in buildings. Public, residential and commercial buildings are the most potent routes to energy and financial savings.

The aim of this study is to analyse and present the effects of investment in EERE measures on direct employment in BiH. Direct employment means employment generated as a result of the increase in demand for goods and services directly related to the implementation of EERE measures. The analysis is based on the EERE measures applied in 34 buildings with a total heated floor area of 77,147 m², distributed across the country. The measures in all of these buildings are part of a programme to increase energy efficiency in public institutions carried out by United Nations Development Programme (UNDP) in BiH. In each of the buildings, all or some of the EERE measures have been implemented, including preparatory works, masonry and insulation works, roofing and sheet-metal works, joinery works (PVC windows and doorways), façade works, house-painting and decorating works, lightning rod and electrical installations, mechanical works and plumbing works.

The authors had access to very precise data on the quantities of individual materials, raw materials, parts and equipment used, as well as the total costs for each of the 34 buildings. Additionally, they had access to data on heated floor area for each building. Based on the consumption of materials, raw materials, parts and equipment, authors consulted building standards for the deployment of workers of different profiles. Building standards define the time it takes one construction worker to do a particular task and define the type of work and the consumption of materials and time. Each position for each of the 34 buildings was standardised, i.e. each was assigned the number of working hours

¹ Očuvanje biodiverziteta u Bosni i Hercegovini kroz otvaranje „zelenih“ radnih mjesta u sektorima poljoprivrede i šumarstva [Preserving Biodiversity in Bosnia and Herzegovina through the Creation of “Green Jobs” in Agriculture and Forestry], Udruženje “GEA” – Centar za istraživanja i studije, Banja Luka, 2012, p. 6

per category of workers, separately for unskilled, semi-skilled, skilled, highly skilled workers and workers with university education. This formed a basis for assessing the impact of direct employment per amount of invested funds, per square metre of heated floor area, by category of workers, etc.

In addition, the effects of the EERE measures on employment were shown and ranked by type of work and by building. Also, secondary data collection helped determine the effects of EERE measures on employment in Europe and worldwide, which served as a basis for a comparative overview of effects in BiH (based on this study) and those demonstrated in studies conducted in numerous other countries.

The potential for creation of salaries and related taxes and contributions resulting from the implementation of EERE measures was calculated based on the official statistics on salaries in the construction sector by category of workers in BiH, and based on the workload levels. This provided the basis for determining the structure and values of salaries as well as all categories of taxes, fringe benefits and contributions. The analysis also looks at the potential for salaries per square metre of heated floor area of buildings subject to EERE improvements.

1. Analysis of the employment impact of EERE measures

Analysis of the employment impact of implementation of EERE measures will first describe the context within which the analysis was made. This will be followed by the overview of the types of buildings and the structures and values of works in the buildings, based on which conclusions were drawn about the employment impact. Also, the analysis will look at the amount of labour expended to implement EERE measures in the aforementioned buildings and the consequent employment effects shown by the amount invested and the heated floor area of the building. Finally, the buildings and the types of EERE works implemented were ranked according to the level of employment impact.

1.1. Background

The world, including Bosnia and Herzegovina, is facing two major energy-related challenges: lack of energy and energy insecurity, on the one hand, and environmental pollution and climate change resulting from excessive and wasteful energy consumption, on the other. Production, distribution and consumption of energy are activities that directly or indirectly affect all areas of human activity, as well as the social and economic progress of individual countries. Today, however, a large number of countries, particularly the developed ones, recognise that the current uncontrolled access to energy consumption is unsustainable. Sustainable use of energy should be given priority through the rational planning of consumption and implementation of energy efficiency measures in all segments of the country's energy system. The prices of energy and fuel will continue to grow for global and local reasons, which will result in an increase in the cost of living and doing business.

Wasteful consumption of energy for heating, cooling and lighting is characteristic of almost all types of existing residential and public buildings in Bosnia and Herzegovina. According to the estimates of the Energy Sector Study in BiH, more than 75% of occupied buildings in the country have inadequate thermal insulation, with average energy use for space heating in excess of 200 kWh/m². In the residential sector in Bosnia and Herzegovina space heating and hot water account for the majority of the total final energy consumption (60% and 11%, respectively), with electrical appliances and light fittings also being responsible for a sizeable share of energy consumption. In the public sector, too, heating accounts for the majority of energy consumption, followed by light fittings and office equipment.

Energy efficiency and renewable energy measures, including thermal insulation, replacement of old and worn-out joinery, roof insulation, the use of energy-efficient heating systems, solar energy and many others, bring about a number of benefits and salutary effects. Economic benefits produced by energy efficiency can be discussed at the individual (households and enterprises), sectoral,

national and international levels. Benefits experienced at a household and enterprise level include health and wellbeing, poverty alleviation (energy affordability and access) and increased disposable income. Sectoral-level benefits are those that do not affect the benefits for households, individual enterprises or entire economy in a significant way, but have important implications for particular sectors, such as the construction sector, transport sector, etc. Economy-wide benefits affect a variety of sectors and markets and are often the result of impacts occurring at other levels, and include: job creation, reduced energy-related public expenditures, energy security and macroeconomic effects. Job creation can be discussed on a sectoral basis with regards to jobs created by these sectors, but it is categorised as a national-level benefit because in times of crisis national economies are faced with unemployment problems across all sectors. Many of the benefits of energy efficiency at the international level extend beyond national borders and have an impact on all sectors that produce and use energy. Emphasis is placed on the benefits that concern: reduced greenhouse gas emissions, energy pricing, management of natural and energy resources, and meeting development goals. Of all the above benefits, this document will discuss job creation at the national as well as at the sectoral level.

BiH has a very low employment rate and economic activity rate of population. In this context, the situation on the labour market in BiH can be described using the following key indicators:

- total number of persons in employment in 2015 was 822,000 with an employment rate of 31.9%², with a slightly higher employment rate among men,
- total number of unemployed persons in 2015 was 315,000 with the unemployment rate of 27.7%³, with a slightly higher unemployment rate among women,
- activity rate⁴ in 2015 was 44.1%⁵, with a higher activity rate among men.

Employment rates are particularly low among young people with poor education, population above 55 years of age, and rural population. Looking at gender aspects, women are on average less likely to be employed than men and, when employed, tend to have lower wages.

In comparison with the neighbouring countries, Bosnia and Herzegovina has one of the highest unemployment rates. Hence, increasing employment rates and reducing unemployment should be the main political and national priorities, particularly among hard-to-employ population groups and in areas and regions characterised by sustained high unemployment. As shown by numerous studies in the region and Europe, investing in EERE measures has very positive effects on employment, not only in the construction sector and lateral procurement channels with relatively high labour intensity, but also because it helps generate energy savings that are used to boost economy through increased demand for goods and services.

In order for all of the above effects of EERE measures, notably employment, to occur, it is essential that all government structures in BiH and all international actors (agencies, directorates, embassies, etc.) have a clear picture of the employment potential offered by EERE measures. This potential further becomes the basis for the adoption of policies and programmes for the long-term implementation of EERE measures.

² Labour Force Survey 2015, the Agency for Statistics of Bosnia and Herzegovina, Sarajevo 2015, p. 30

³ Ibid.

⁴ Activity rate is calculated as the labour force divided by the working-age population then multiplied by 100. It shows the level of activity of the labour force in the labour market.

⁵ Op. cit. ad 1

The main purpose of this document is to demonstrate the direct employment effects of investing in EERE measures. Direct employment means employment generated as a result of the increase in demand for goods and services directly related to the implementation of EERE measures. In addition to direct employment, the literature mentions the categories of indirect and induced employment, which are not the focus of this document. Indirect employment occurs as a result of an increase in demand for goods and services produced by sectors that act as suppliers to those directly involved in the implementation of EERE measures, for example transport, catering and other supporting industries.

Induced employment is created when implemented EERE measures start to produce effects or savings. The owners of savings (households, private enterprises, public sector, etc.) experience increased revenues that are used to purchase goods and services in a variety of sectors, where an increase in demand creates increased employment across the sectors.

When considering the employment potential, the following implications should be borne in mind:

- Geographical distribution of employment effects, highlighting the fact that in the implementation of EERE measures retrofitting is usually conducted by local construction and other small and medium-sized enterprises (SMEs) that generate new employment. In addition, in BiH there is local production of joinery, which is one of the most useful energy efficiency measures.
- When implementing EERE measures, two levels of employment effects are created. The first level relates to the duration of employment in the course of the implementation of EERE measures, and the second one concerns employment that occurs after the measures have been implemented (mainly induced employment). In addition, it has already been pointed out that most buildings in BiH are in need of energy performance improvements, which creates an opportunity to generate long-term employment effects over as long as a few decades.
- In terms of the type of workers to implement EERE measures, there will be an increase in demand for skilled workers especially in the construction sector. In addition to architects and construction and mechanical engineers as leaders of the implementation of EERE measures, other highly skilled workers will be necessary (plumbers, fitters, electricians, house painters/decorators, etc.).

1.2. Types of buildings and types of implemented works

In order to assess the direct employment effects, the research team analysed data on EERE measures implemented in 34 buildings, as shown in Table 1 below. The total heated floor area in these buildings is 77,147 m².

No.	BUILDING	No.	BUILDING
1	"First Primary School", Široki Brijeg	18	Primary School "Bužim", Bužim
2	Primary School "Ante Bruno Bušić", Rakitino, Posušje	19	Kindergarten "Palčić", Teslić
3	Primary School "Ruder Bošković", Grude	20	Hospital "Sveti Apostol Luka", Doboј
4	Primary School "Ivana Brlić Mažuranić", Ljubuški	21	Municipality of Nevesinje
5	Health Centre, Velika Kladuša	22	"Home for the Elderly", Mostar
6	Kindergarten "Dunja", Zenica	23	Kindergarten "Radobolja", Mostar
7	Kindergarten "Zulejha Begeta", Konjic	24	Primary School "Fahrudin Fahro Baščelija", Goražde
8	Centre "Los Rosales", Mostar	25	Municipality of Novo Sarajevo
9	Cantonal Hospital, Goražde	26	Primary School "Borislav Stanković", Banja Luka
10	Home, Stolac	27	Kindergarten "Novi Travnik"
11	Kindergarten "Gorica", Trebinje	28	Primary School "Aleksa Šantić", Sarajevo
12	FC "Zvijezda", Gradačac	29	Primary School "Duboki potok", Srebrenik
13	"Croatian Hospital Dr. fra Mato Nikolić", Nova Bila OŠ "5. oktobar", Sanski Most	30	Primary School "Hasan Kikić", Olovo
14	"Second Primary School", Bosanska Krupa	31	Primary School "Lukavac Mjesto", Lukavac
15	Primary School "5 October", Sanski Most	32	Primary School "Dositej Obradović", Banja Luka
16	Secondary School, Ključ	33	"Kindergarten and Students' Dorm", Bosanska Krupa
17	Kindergarten "Hasnija Omanović", Cazin	34	Primary School "Rapatnica", Srebrenik

Table 1. Buildings in which EERE measures have been implemented

The measures implemented in the buildings above are part of a programme to increase energy efficiency in public institutions carried out by United Nations Development Programme (UNDP) in BiH as part of the "Green Economic Development" project. In each of the buildings, all or some of the EERE measures were implemented, including preparatory works, masonry and insulation works, roofing and sheet-metal works, joinery works (PVC windows and doorways), façade works, house-painting and decorating works, lightning rod and electrical installations, plumbing works, and a significant number of mechanical works.

According to the 2010 Classification of Activities of Bosnia and Herzegovina (CA BiH 2010), all implemented measures fall under category F (Construction), so the direct employment effects will

represent effects in the construction sector. In order to prepare and define the necessary EERE measures, energy audits were conducted for each building and accompanying energy audit reports were produced. The audits were performed by professionals with technical engineering and economic expertise. In addition to direct works on the implementation of EERE measures, supervision and control of implemented works were performed by technical engineering experts for each of the 34 buildings. In addition to the list of direct works, further analysis will include performance of energy audits and supervision and control of implemented works.

1.3. The value of investment in the implementation of EERE measures in buildings

Total funds spent for all buildings by type of works are shown in Table 2 below, and the values of different types of works are shown in Figure 1. The total amount of funds spent on EERE measures is KM 6,555,636, or an average of about KM 85 per square metre of heated floor area.

Description of works	Amount inclusive of VAT
1. Preparatory works	155,533
2. Masonry and insulation works	396,320
3. Roofing and sheet-metal works	519,281
4. Joinery works	2,078,023
5. Façade works	1,571,428
6. House-painting and decorating works	152,884
7. Lightning rod installation works	77,269
8. Carpentry works	193,147
9. Additional works	18,548
10. Work on electrical installations	6,198
11. Plumbing works	1,079
12. SUB-TOTAL CONSTRUCTION WORKS (1-11)	5,169,710
13. Mechanical works	1,166,089
14. Performance of energy audits	124,800
15. Supervision of the works	95,037
TOTAL ALL WORKS (12 + 13 + 14 + 15)	6,555,636
TOTAL AMOUNT INCLUSIVE OF VAT in EUR	3,351,843

Table 2. Type and value of works in buildings in which EERE measures have been implemented

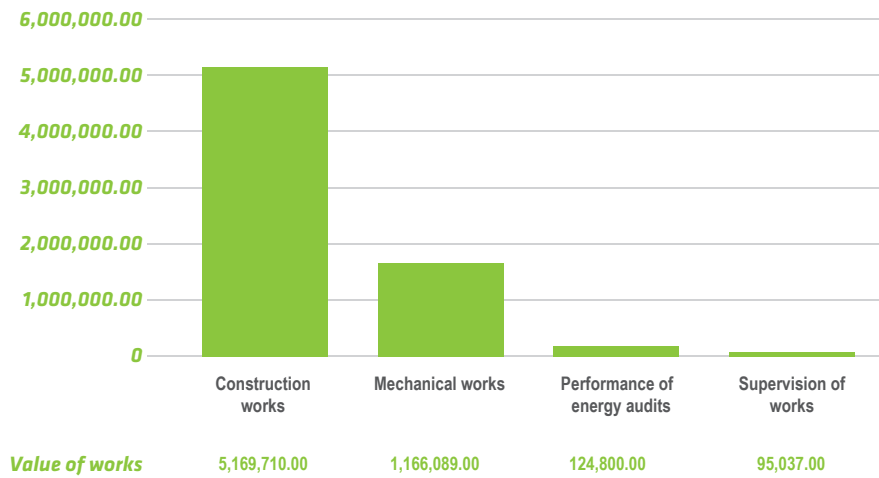


Figure 1. Values of different types of works

1.4. Amount of labour created by implementation of EERE measures in 34 buildings

For each of the 34 buildings there are very precise data on the quantities of materials, components, raw materials and equipment used, which served as a basis for assessing the direct employment impact. For these purposes, construction standards for deployment of workforce of different profiles were used. Construction standards define the time it takes a construction worker to do a specific task and apply only to the type of work and consumption of materials and time. For example, the plastering of walls made of PMC concrete and slag concrete 1:2:6 with lean cement mortar per square metre requires deployment of a semi-skilled worker for a period of 0,073 working hours.

After all works for the respective buildings have been standardised, the amount of labour was calculated as shown in Table 3 below. All buildings and all works defined under the construction standards require a total of 688,282 working hours. Construction standards do not include workers with university education and their labour, but they are present and need to be included. Based on previous experience, the amount of labour expended by workers with university education was estimated at 3% of the total number of working hours on the construction site, which is 20,648 hours, plus 92 working hours per completed energy audit or a total of 3,128 hours, and 440 hours of supervision per building/project or a total of 14.960 working hours. After including the working hours of workforce with university education, all buildings require the amount of labour totalling 727,019 working hours. In literature, a unit called full-time equivalent (FTE) is commonly used in demonstrating the employment potential. FTE shows the hours worked by one employee on a full-time basis over a period of one year.

DESCRIPTION OF WORKS	Working				TOTAL
	NKV (RI)	NKV (RII i RIII)	NKV (RIV-RVI)	VKV (RVII-RVIII)	
Preparatory works	25,52	32,286,08	34,217,48	19,667,87	86,196,95
Masonry and insulation works	-	22,334,61	29,139,26	649,07	52,122,94
Roofing and sheet-metal works	-	17,177,21	17,694,06	222,01	35,093,28
Joinery works	0,66	22,006,73	27,985,24	18,100,39	68,093,02
Façade works	-	150,768,19	239,670,04	-	390,438,23
House-painting & decorating works	-	12,493,02	17,988,17	-	30,481,18
Lightning rod installation works	-	-	5,431,70	-	5,431,70
Carpentry works	-	1,917,65	3,191,25	992,86	6,101,76
Additional works	-	376,41	290,34	15,34	682,09
Works on electrical installations	-	-	128,90	37,20	166,10
Plumbing works	-	11,82	24,60	2,60	39,02
Total hours per worker category for construction works	26,18	259,371,73	375,761,02	39,687,35	674,846,27
Total hours per worker category for mechanical works	2,327,95	4,573,82	5,416,23	1,117,90	13,435,90
Total hours per worker category for all works	2,354,12	263,945,54	381,177,25	40,805,25	688,282,17
FTEs* for unskilled, semi-skilled, skilled and highly skilled workers	1,04	116,94	168,89	18,08	304,95
Total work hours for workers with university education (for works at the construction site, performing energy audits and supervision of works)					38.736
FTEs* for workers with university education					17,16
Total work hours for all works and worker categories					727,019
FTEs*					322

* based on 2,257 working hours per year

Table 3. Amount of labour by type of works and category of workers

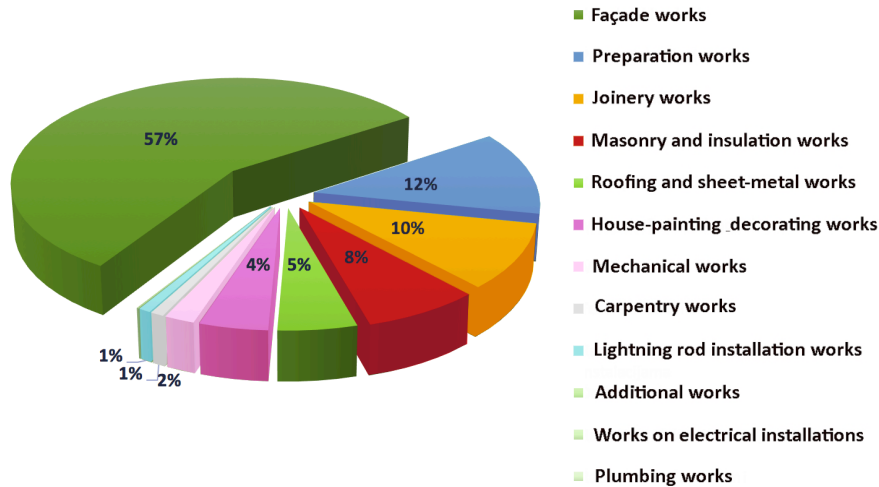


Figure 2. Amount of labour required for the implementation of EERE measures,

On an annual basis, an FTE is considered to be 2,080 hours, which is calculated as: 8 hours per day x 5 work days per week x 52 weeks per year = 2,080 hours per year. This FTE is based on the working week of 40 hours; however, as stated in the Labour Force Survey 2015, published by the Agency for Statistics of Bosnia and Herzegovina, the average number of usual working hours per week for the construction sector is 43.4, which gives an FTE of 2,257 hours (which will be used in subsequent calculations). Thus, for all respective buildings the amount of labour totalling 727,019 working hours (recalculated based on 2,257 hours per year) is equivalent to 322 FTEs, or 322 employed persons for a full year, or 3,871 man-months. These 322 FTE jobs are comprised of 1 FTE job for unskilled workers, 117 FTE jobs for semi-skilled workers, 169 FTE jobs for skilled workers, 18 FTE jobs for highly skilled workers and 17 FTE jobs for workers with university education.

According to collected data, a team to implement EERE measures needs to be composed of unskilled, semi-skilled, skilled and highly skilled workers, as well as workers with university education. On average, a team to implement EERE measures should consist mostly of skilled workers (approx. 52%), followed by semi-skilled workers (approx. 36%), skilled workers (approx. 6%) and workers with university education (approx. 6%) and, finally, a small number of unskilled workers (0.3%). This structure is shown in Figure 3 below.

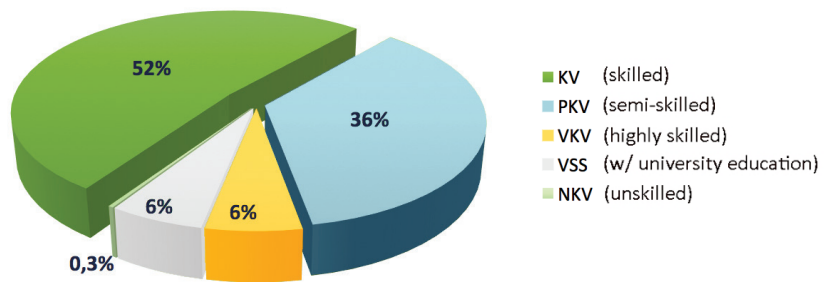


Figure 3. Amount of labour required for the implementation of EERE measures, by skill

1.5. The employment impact of EERE measures by type of works

In terms of the type of works performed during the implementation of EERE measures in respective buildings, as well as their contribution to employment, the highest amount of labour was produced by façade works with 178 FTEs, followed by preparatory works with 39 FTEs, joinery works with 31 FTEs, masonry and insulation works with 24 FTEs, etc. Table 4 below ranks the types of works by the number of total working hours and FTEs.

No.	BUILDING	Total working hours for all categories of workers	FTEs for all categories of workers
1	Façade Works	402,151	178
2	Preparatory works	88,783	39
3	Joinery works	70,136	31
4	Masonry and insulation works	53,687	24
5	Roofing and sheet-metal works	36,146	16
6	House-painting and decorating works	31,396	14
7	Supervision of works	15,840	7
8	Mechanical works	13,839	6
9	Carpentry works	6,285	3
10	Lightning rod installations works	5,595	2
11	Performance of energy audits	3,312	1,5
12	Additional works	703	0,31
13	Works on electrical installations	171	0,08
14	Plumbing works	40	0,02

Table 4. Amount of labour by type of works presented as working hours and FTEs

So, façade works hold the highest labour potential (over 55%), followed by preparatory works (12%), carpentry works (10%), etc., as shown in Figure 4 below. slici.

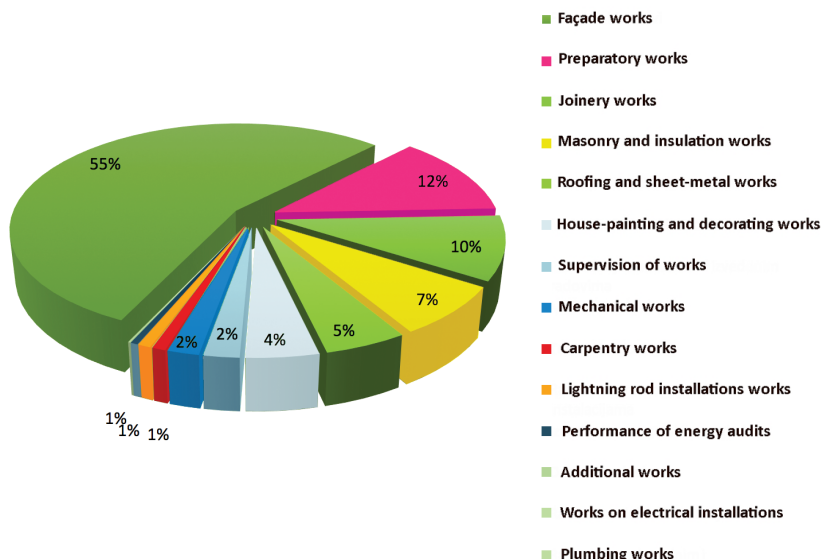


Figure 4. Share of the types of works in the implemented EERE measures

On the other hand, when it comes to investment effectiveness (expressed as the number of hours worked by type of works per KM 1 investment), best ranked are preparatory works with 0.57 hours worked per KM 1 investment, followed by façade works with 0.26 hours per KM 1 investment, and house-painting & decorating works with 0.21 hours per KM 1 investment. Preparatory works are best ranked because they are characterised by high levels of manual labour and workforce that is not too skilled and highly paid. Additionally, preparatory works do not consume a lot of material resources and thus require fewer financial resources. Façade works are ranked second because this type of works generates a large number of working hours. On the other hand, the effectiveness of mechanical works is low because they require substantial financial investment while generating relatively few working hours. These working hours relate only to the installation of mechanical equipment and fitting of installations. However, if the construction of boilers were to be taken into account (which is outside the purview of this analysis), the effectiveness of mechanical works would certainly be much higher. Figure 5 below shows investment effectiveness by type of works expressed as the number of hours worked per KM 1 investment.

Number of working hours by type of works per KM 1 of investment in EERE measures

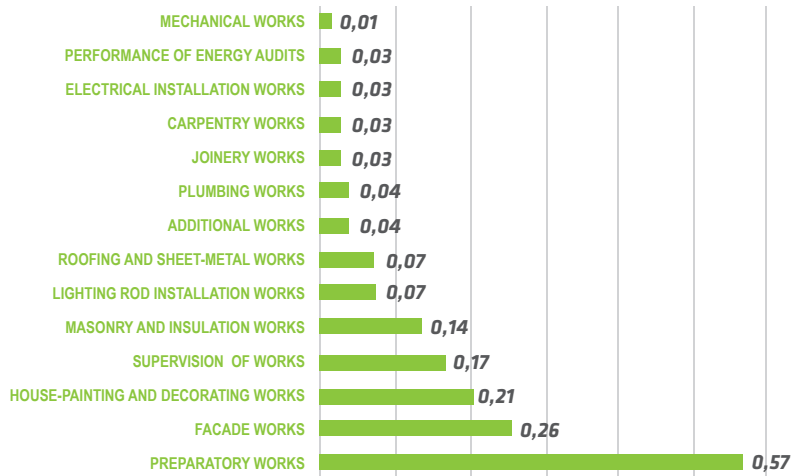


Figure 5. Number of hours worked by type of works per KM 1 investment in EERE

1.6. The employment impact of EERE measures by building

Looking at the employment impacts expressed as FTEs by building in which EERE measures were implemented, it becomes clear that the greatest amount of labour was achieved in “Hospital Doboj” with 21 FTEs, followed by “Primary School Srebrenik” with 17 FTEs, and “Primary School Lukavac Mjesto” and “Primary School Široki Brijeg” with 16 FTEs each. Table 5 below ranks the buildings according to their contribution to job creation.

On the other hand, when it comes to investment effectiveness (expressed as the number of hours worked per KM 1 investment per building/project), best ranked is “Kindergarten Cazin” with 0.194 hours worked per KM 1 investment, followed by “Primary School Srebrenik” with 0,193 hours worked per KM 1 investment, and “Primary School Sanski Most” with 0,19 hours worked per KM 1 investment. Construction measures with a slightly higher amount of labour per unit of investment dominate in all three top-ranked buildings/projects, and EERE measures mainly comprised: roof replacement and thermal insulation, thermal insulation of the façade, joinery replacement, installation of thermostatic valves on heating elements and replacement of light fittings. The buildings/projects in which mechanical works were the prevailing type of works have low investment effectiveness because they require substantial financial investment while generating relatively few working hours. These working hours relate only to the installation of mechanical equipment and fitting of installations. However, if the construction of boilers were to be taken into account (which is outside the purview of this analysis), the effectiveness of mechanical works would certainly be much higher. Table 6 below shows investment effectiveness by building/project expressed as the number of hours worked per KM 1 investment.

No.	BUILDING	Total working hours for all categories of workers	FTEs for all categories of workers
1.	Hospital "Sveti Apostol Luka", DobojoŠ „Rapatnica“,	46,616	21
2.	Primary School "Rapatnica", Srebrenik	38,163	17
3.	Primary School "Lukavac Mjesto", Lukavac	35,671	16
4.	"First Primary School", Široki Brijeg	35,586	16
5.	Primary School "5 October", Sanski Most	34,455	15
6.	Primary School "Fahrudin Fahro Baščelija", Goražde	34,437	15
7.	Secondary School, Ključ	33,641	15
8.	Primary School "Ruđer Bošković", Grude	31,691	14
9.	Primary School "Bužim", Bužim	28,892	13
10.	Primary School "Ivana Brlić Mažuranić", Ljubuški	27,409	12
11.	"Second Primary School", Bosanska Krupa	26,641	12
12.	Kindergarten "Dunja", Zenica	26,312	12
13.	Primary School "Duboki potok", Srebrenik	25,889	11
14.	Municipality of Novo Sarajevo	25,521	11
15.	"Home for the Elderly", Mostar	24,444	11
16.	Primary School "Ante Bruno Bušić", Rakitino, Posušje	23,776	11
17.	Kindergarten "Hasnija Omanović", Cazin	23,341	10
18.	Municipality of Nevesinje	22,343	10
19.	Primary School "Dositej Obradović", Banja Luka	21,427	9
20.	Primary School "Borislav Stanković", Banja Luka	20,890	9
21.	Kindergarten "Radobolja", Mostar	20,742	9
22.	Kindergarten "Novi Travnik"	20,024	9
23.	Kindergarten "Zulejha Begeta", Konjic	19,831	9
24.	Kindergarten "Palčić", Teslić	19,366	9
25.	Primary School "Hasan Kikić", Olovo	17,321	8
26.	Centre "Los Rosales", Mostar	15,027	7
27.	Health Centre, Velika Kladuša	10,407	5
28.	"Croatian Hospital Dr. fra Mato Nikolić", Nova Bila	6,176	3
29.	Home, Stolac	3,458	2
30.	Cantonal Hospital, Goražde	2,517	1
31.	Kindergarten "Gorica", Trebinje	1,488	1
32.	Primary School "Aleksa Šantić", Sarajevo	1,365	1
33.	FC "Zvijezda", Gradačac	1,280	1
34.	Kindergarten and Students' Dorm", Bosanska Krupa	872	0
TOTAL		727,019	322

Table 5. Ranking of buildings according to their contribution to job creation expressed as working hours and FTEs

No.	BUILDING	Total working hours for all categories of workers	Value of investment in KM	Number of working
1.	Kindergarten "Hasnija Omanović", Cazin	46,616	120,268	0,194
2.	Primary School "Rapatnica", Srebrenik	38,163	197,774	0,193
3.	Primary School "5 October", Sanski Most	35,671	181,103	0,190
4.	Primary School "Borislav Stanković", Banja Luka	35,586	114,988	0,182
5.	Kindergarten "Radobolja", Mostar	34,455	122,331	0,170
6.	Primary School "Lukavac Mjesto", Lukavac	34,437	210,707	0,169
7.	Secondary School, Ključ	33,641	211,041	0,159
8.	"Home for the Elderly", Mostar	31,691	164,016	0,149
9.	Municipality of Nevesinje	28,892	151,991	0,147
10.	Primary School "Hasan Kikić", Olovo	27,409	120,173	0,144
11.	Kindergarten "Zulejha Begeta", Konjic	26,641	145,081	0,137
12.	"Second Primary School", Bosanska Krupa	26,312	195,332	0,136
13.	Primary School "Fahrudin Fahro Baščelija", Gorazde	25,889	263,808	0,131
14.	Primary School "Bužim", Bužim	25,521	222,082	0,130
15.	Primary School "Ruđer Bošković", Grude	24,444	247,773	0,128
16.	Primary School "Dositej Obradović", Banja Luka	23,776	168,763	0,127
17.	"First Primary School", Široki Brijeg	23,341	282,515	0,126
18.	Primary School "Duboki potok", Srebrenik	22,343	214,811	0,121
19.	Kindergarten "Novi Travnik"	21,427	178,206	0,112
20.	Kindergarten "Dunja", Zenica	20,890	244,654	0,108
21.	Primary School "Ante Bruno Bušić", Rakitino, Posušje	20,742	229,940	0,103
22.	Hospital "Sveti Apostol Luka", Doboј	20,024	476,001	0,098
23.	Kindergarten "Palčić", Teslić	19,831	209,184	0,093
24.	Centre "Los Rosales", Mostar	19,366	171,105	0,088
25.	Municipality of Novo Sarajevo	17,321	305,767	0,083
26.	Health Centre, Velika Kladuša	15,027	139,960	0,074
27.	Primary School "Ivana Brlić Mažuranić", Ljubuški	10,407	422,219	0,065
28.	"Kindergarten and Students' Dorm", Bosanska Krupa	6,176	16,140	0,054
29.	Kindergarten "Gorica", Trebinje	3,458	42,611	0,035
30.	"Croatian Hospital Dr. fra Mato Nikolic", Nova Bila	2,517	200,073	0,031
31.	Primary School "Aleksa Šantić", Sarajevo	1,488	60,308	0,023
32.	FC "Zvijezda", Gradačac	1,365	70,040	0,018
33.	Home, Stolac	1,280	236,250	0,015
34.	Cantonal Hospital, Gorazde	872	218,622	0,012

Table 6. Ranking of buildings according to investment effectiveness expressed as the number of hours worked per KM 1 investment

1.7. Employment potential and comparative indicators expressed via the investment value

The key information used to compare the investments and effects in different economic sectors is the number of FTE jobs per €1 million investment in EERE measures. Given that the total investment in EERE measures for respective buildings is to the tune of € 3,351,843 and that that amount creates labour equivalent to 322 FTEs, the number of FTE jobs generated per €1 million is 96. According to calculations, €1 million spent in EERE measures generates 96 FTEs. Thus, with an investment of KM 1,955,830 it is possible to employ 96 individuals on a full-time basis for one year. Table 7 below shows the labour potential for different levels of investment in EERE measures.

<i>Investment in KM</i>	<i>Labour potential expressed as man-months</i>
1,955,830	1.152
1,000,000	589
100,000	59
10,000	5,9
5,000	3
1,000	0,6

Table 7. Labour potential for different levels of investment in EERE measures

Thus, an investment of KM 1 million in EERE measures creates the labour potential equivalent to 589 man-months or 49 new jobs (FTE) in the construction sector, given that all the implemented measures are classified as construction activities according to CA BiH 2010. This number of 49 FTEs applies to all categories and profiles of workers. It may also be interesting to analyse the direct employment potential by category of workers expressed as FTEs per KM 1 million invested in EERE measures. Figure 6 below shows that per KM 1 million investment in EERE measures employment is created for about 26 skilled workers, about 18 semi-skilled workers, about three highly skilled workers, about three workers with university education and 0.2 unskilled workers, on a full-time basis

**Direct employment potential by category of workers expressed as FTEs per
KM 1 million investment in EERE measures**

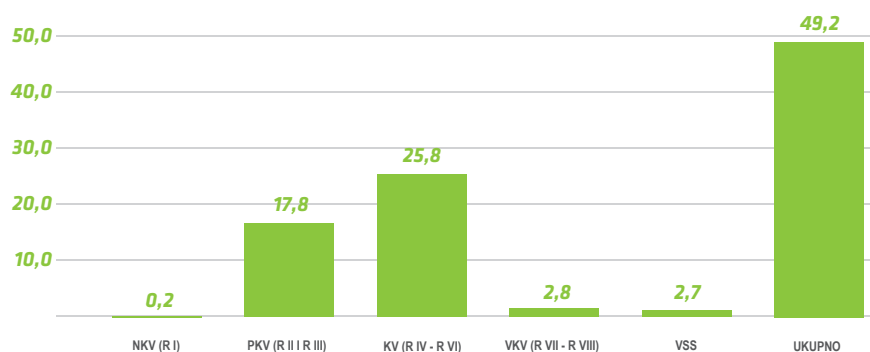


Figure 6. Direct employment potential by category of workers expressed as FTEs per KM 1 million investment

for one year. It is also interesting to compare the findings of this analysis with those of similar studies conducted in Europe and the world. Since employment is currently an important issue worldwide, numerous studies have been conducted into the employment impacts of EERE measures. All these studies have focused on topics related to EERE and climate change mitigation. What is common to all of them is that they show the number of jobs expressed as FTEs generated per €1 million investment in EERE measures. The findings of these studies are shown in Table 8 below.

There are marked differences between the findings of this analysis and those of the studies presented in Table 8. According to this analysis, the number of FTEs per €1 million investment is 96, while in the presented studies that number ranges from 4 to 82 FTEs per €1 million investment. Thus, the number of jobs in BiH is 17% higher than the findings of the study "SAVE: UK case study" conducted in the UK, which came up with the highest FTE per €1 million investment in measures EERE of all studies included in the comparison. The reasons for such a discrepancy can be manifold.

First of all, all of these studies and projects were carried out in highly developed countries where the level of automation and mechanisation of the production and construction processes in the construction industry is much higher than in developing countries such as Bosnia and Herzegovina. This fact significantly reduces the need for labour in the production or construction processes, and so the number of jobs per €1 million of investment is lower than in developing countries. Another aspect that substantially contributes to these discrepancies are the relatively outdated construction standards used for the purposes of this analysis, dating back to the 1980s. These standards implied more manual labour in construction works than needed with today's technology. Also, the standards could not take into account more recent materials and norms for their installation. All these aspects account for the fact that the number of FTEs per €1 million investment in BiH is higher in comparison with the findings of relevant studies.

Study/project	Reference	Year	Location	Intervention	FTEs/M€ invested
EU SAVE Programme	Wade et al, 2000	1995	European Union	Energy efficiency	26,60
SAVE: UK case study	EST, 2000	1996	United Kingdom	Energy efficiency in buildings	82,65
The size of the US Energy Efficiency Market	Erhardt-Martinez i Laitner, 2008	2004	USA	Energy efficiency	6,76
				Energy efficiency in residential buildings	10,08
Green Collar Jobs in the US and Colorado	Bezdek, 2009	2007	USA and Colorado	USA: Base scenario	10,97
				USA: Moderate scenario	11,21
				USA: Advanced scenario	10,97
				Col: Base scenario	13,55
				Col: Moderate scenario	13,96
Col: Advanced scenario	15,44				
Investing in Clean Energy	Pollin, Heintz i Garrett Peltier, 2009	2009	USA	Building retrofits Mass transit/ freight rail Smart grid	SAD
Danish Green Jobs	Juul, Hansen, Hansen i Ege, 2009	2009	Denmark	Energy renovation of poorly insulated housing	4,05
				Energy savings in buildings operated by local authorities	16,67
Rebuilding America	Hendricks, Goldstein, Detchon i Shickman, 2009	2009	USA	Building retrofits	17,44
National Association of Home Builders	Hendricks, Goldstein, Detchon i Shickman, 2009	2009	USA	Building retrofits	15,34
Center on Wisconsin Strategy	Sandquist, 2009	2007	Wisconsin, USA	Building retrofits	9,67
CECODHAS Offer to Fight Climate Change	CECODHAS, 2009	2009	Europe	Building retrofits	21,25

Table 8. Comparative employment effects of energy efficiency activities⁶

6 Ürge-Vorsatz, D., Arena, D., Herrero, S.T., Butcher, A., "Employment Impacts of a Large-Scale Deep Building Energy Retrofit Programme in Hungary", Center for Climate Change and Sustainable Energy Policy (3CSEP) of Central European University, Budapest, 2010, p. 100

1.8. Potential employment expressed via heated floor area

Further item of information that can be used for employment projections and planning is one that shows FTEs per square metre of heated floor area of buildings that are subject to energy performance improvements. Given that the total heated floor area in respective buildings is 77,147 m² and that energy performance improvements to the heated areas create 322 FTEs, the number of FTEs created per square metre is 0.0042. Table 9 below shows labour potential for energy performance improvements in buildings with various heated floor areas.

Heated floor area in square metres	Labour potential in man-months	Labour potential in FTEs
1	0,05	0,0042
10	0,50	0,04
100	5	0,42
1000	50	4,2
10000	501	42
77147	3871	322

Table 9. Labour potential for energy performance improvements in buildings with various heated floor areas

This number of 0.0042 FTEs per square metre applies to all categories and profiles of workers. It may also be interesting to analyse the direct employment potential by category of workers expressed as FTEs per square metre. Figure 7 below shows that per 1,000 square metres of heated floor area employment is created for about 2.2 skilled workers, 1.5 semi-skilled workers, 0.23 highly skilled workers, 0.22 workers with university education and 0.01 unskilled workers, on a full-time basis for one year.

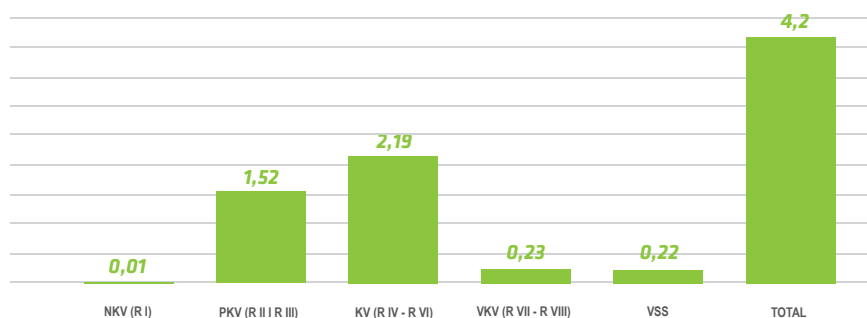


Figure 7. Direct employment potential by category of workers expressed as FTEs per 1,000 square metres of heated floor area

2. Potential for salaries and related taxes and contributions created by the implementation of EERE measures

Analysis of the effects of EERE measures on salaries and related taxes and contributions is shown via the investment value and the heated floor area.

2.1. Potential for salaries expressed via the investment value

During the implementation of EERE measures in the respective buildings/projects, a total of 727,019 working hours, or 322 FTEs, were created. Based on the average monthly salaries paid to individual categories of workers in the construction industry (according to CA BiH 2010), the total allocation for the wage bill is calculated at KM 3,205,333⁷. When this amount is compared to the total appropriations for implementing EERE measures in the respective buildings/projects to the tune of KM 6,555,636, the share of the wage bill versus other project costs is 49% vs. 51%. Figure 8 below shows the structure and value of total investment in the implementation of EERE measures in respective buildings.

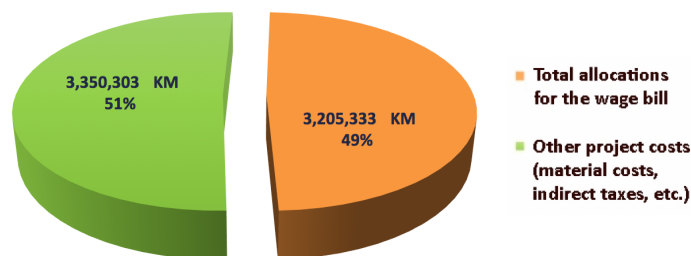


Figure 8. Structure and value of total investment in the implementation of EERE measures in respective buildings

⁷ Data on net salaries used for the calculation of total appropriations for the wage bill was taken from bulletin "Employment, Unemployment and Wages in the Federation of Bosnia and Herzegovina 2014", FBiH Office of Statistics, Sarajevo, 2015, p. 48

The official statistics and salary calculation methodology used in the Federation of Bosnia and Herzegovina was used to calculate total net salaries and contributions paid into the public budgets, insurance schemes/funds, agencies and the like. The amount of wage bill is KM 3,205,333, comprising net salaries paid to workers and total taxes and contributions paid into the public budgets, insurance schemes/funds and agencies. Figure 9 below shows the structure and value of total appropriations for wage bill for the workforce that implemented EERE measures in respective buildings.

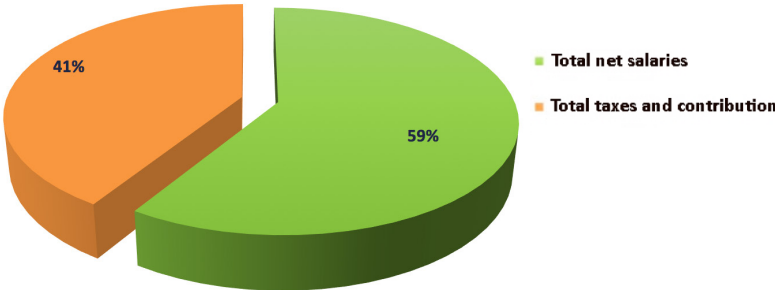


Figure 9. Structure and value of total appropriations for workforce wage bill

The total value of KM 3,205,333 for workforce wage bill comprises salaries, taxes, fringe benefits and contributions for all categories of workers, as shown in Table 10 below.

Values in KM					
Skill level	FTEs	Average monthly net salary in the construction industry in 2013	Total annual net salaries [1]	Total taxes and contributions for one year [2]	Total appropriations for workforce wage bill for one year [1] + [2]
NKV	1	399	4,994	3,279	8,273
PKV	117	420	589,404	389,189	978,594
KV	169	489	991,027	707,601	1,698,629
VKV	18	541	117,372	79,075	196,447
VSS	17	915	188,450	134,941	323,391
UKUPNO	322		1,891,247	1,314,086	3,205,333

Table 10. Total appropriations for workforce wage bill by category of workers

The largest share in the amount of salaries and related taxes and contributions, in the case of implementation of energy efficiency improvements in BiH, belongs to skilled and semi-skilled workers (over 84%) as the most numerous categories of workers, followed by workers with university education (10%), due to their somewhat higher salaries.

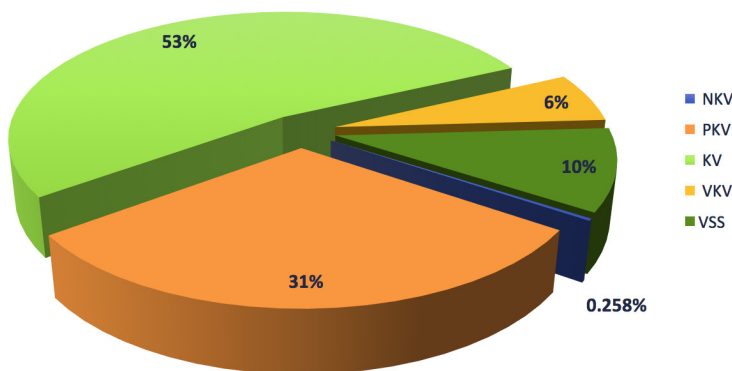


Figure 10. Share in total salaries and related taxes and contributions by skill level

In terms of taxes, fringe benefits and contributions in the total amount of KM 1,314,086 for EERE works and measures implemented in respective buildings, appropriations for pension and disability insurance schemes account for the majority of the amount (51%), followed by health insurance scheme (36%), and less than 10% each for income tax, the Employment Agency/Fund, water contribution fee and insurance against accidents and disasters, and the Fund for Professional Rehabilitation and Employment of Persons with Disabilities. The structure and value of taxes, fringe benefits and contributions for the workforce involved in the implementation of EERE measures in respective buildings is shown in Figure 11 below.

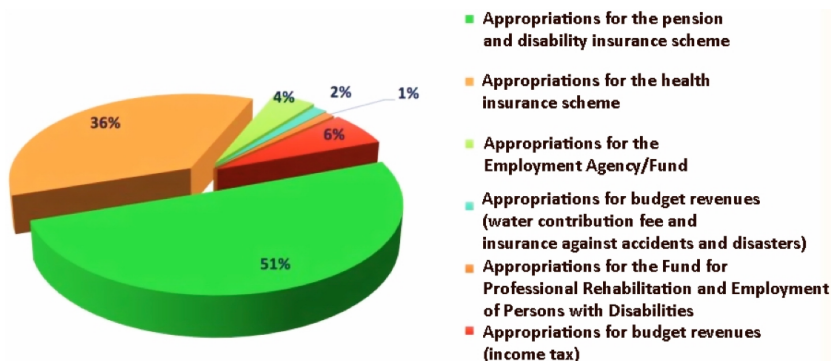


Figure 11. Structure and value of taxes, fringe benefits and contributions for the workforce involved in the implementation of EERE measures in respective buildings

Per KM 1 million investment in energy efficiency measures in buildings in BiH, it is possible to:

- create labour potential equivalent to 589 man-months or 49 new jobs (FTE) in the construction sector, for 26 skilled workers, 18 semi-skilled workers, three highly skilled workers, three workers with university education and 0.2 unskilled workers, on a full-time basis for one year,
- create net salaries for all categories of workers in the amount of KM 288,492, or 28.84% of the total investment,
- create taxes and contributions levied on the wage bill in the amount of KM 200,451, or 20.04% of the total investment,
- appropriate KM 488,943 or 49% of the total investment for the total cost of the wage bill and KM 511,057 or 51% for other project costs (materials, equipment, tools, etc.),
- of the total amount of KM 200,451 for taxes and contributions levied on the wage bill, create funds for:
 - the pension and disability insurance fund/scheme in the amount of KM 101,231, or 10.1% of the total investment,
 - the health insurance fund/scheme in the amount of KM 72,624, or 7.2% of the total investment,
 - the Employment Agency/Fund in the amount of KM 8,803, or 0.9% of the total investment,
 - budget revenues by way of the water contribution fee and insurance against accidents and disasters in the amount of KM 2,910, or 0.3% of the total investment,
 - budget revenues by way of income tax in the amount of KM 12,682, or 1.27% of the total investment,
 - the Fund for Professional Rehabilitation and Employment of Persons with Disabilities in the amount of KM 2,202, or 0.22% of the total investment.
- plan salaries and related taxes and contributions by workforce category, as follows:
 - for unskilled workers, net salaries in the amount of KM 745 and taxes and contributions in the amount of KM 517, or a total of KM 1,262,
 - for semi-skilled workers, net salaries in the amount of KM 88,077 and taxes and contributions in the amount of KM 61,198, or a total of KM 149,275,
 - for skilled workers, net salaries in the amount of KM 152,883 and taxes and contributions in the amount of KM 106,227, or a total of KM 259,110,
 - for highly skilled workers, net salaries in the amount of KM 17,681 and taxes and contributions in the amount of KM 12,285, or a total of KM 29,966,
 - for workers with university education, net salaries in the amount of KM 29,106 and taxes and contributions in the amount of KM 20,224, or a total of KM 49,300.

2.2. Potential for salaries per heated floor area in buildings which are subject to improvements

It is also important to show the potential for salaries per square metre of heated floor area in buildings which are subject to energy efficiency improvements. The total heated floor area in respective buildings is 77,147 m² with EERE measures creating labour equivalent to 322 FTEs, or creating appropriations for salaries, taxes and contributions to the tune of KM 3,205,333. For every square metre of heated floor area in buildings subject to energy performance improvements, KM 41.5 is created in salaries and taxes for workforce working on the building/project. This amount of 41.5 KM per square metre of heated floor area in buildings subject to energy performance improvements comprises KM 24.5 (59%) for net salaries and KM 17 (41%) for taxes and contributions. Table 11 below shows different heated floor areas in buildings and the potential for net salaries, taxes and contributions for workers involved in the implementation of measures.

Implementation of EERE measures per square metre of heated floor area	Total appropriations for wage bill in KM	Total net salaries in KM [1]	Total taxes and contributions in KM [2]
1	41,5	24,5	17
10	415	245	170
100	4,150	2,450	1,700
1000	41,500	24,500	17,000
5000	207,500	122,500	85,000

Table 11. Potential for net salaries, taxes and contributions for workers engaged in the implementation of measures

3. Effects on employment and salaries under the National Energy Efficiency Action Plan of Bosnia and Herzegovina 2010-2018

Analysis of the effects of the implementation of EERE measures envisaged under the National Energy Efficiency Action Plan (NEEAP) of Bosnia and Herzegovina for the period 2010-2018 is shown via the investment value, while also considering the impact on employment and salaries and related taxes and contributions.

3.1. Employment potential under the NEEAP

One of the most important documents that BiH is required to create as part of its commitments under the Energy Community Treaty is the energy efficiency action plan. Complying with the requirements of Directive 2006/32/EC of the European Parliament and of the Council on energy end-use efficiency and energy services (ESD), Bosnia and Herzegovina has prepared its first National Energy Efficiency Action Plan (NEEAP), focusing on the entire 2010-2018 period and establishing the overall objective for 2018. It envisages the implementation of activities to improve energy efficiency in four sectors, as follows:

- housing sector,
- commercial and public services sector,
- industry sector,
- transport sector.

A significant portion of activities to improve energy efficiency concerns buildings and energy performance improvements to buildings in almost all sectors, except the transport sector. These planned construction measures can be used to determine the extent to which the implementation of EERE measures under the NEEAP would contribute to the creation of new employment opportunities or retention of existing jobs.

This potential will be shown via the investment value, i.e. via the number of FTEs or jobs per KM 1 million investment. Under the NEEAP, financial resources are planned for the implementation of all measures, including construction measures. The total financial resources planned under the NEEAP

are to the tune of about €770.8 million⁸. Of that amount, €341 million is planned for measures in buildings, in accordance with the structure shown in Table 12 below.

Sector	Resources planned under the NEEAP for buildings in €	Resources planned under the NEEAP for buildings in KM
Housing sector	211,070,000 €	412,817,038 KM
Commercial and public sector	64,060,000 €	125,290,470 KM
Industry sector	66,150,000 €	129,378,155 KM
Total	341,280,000 €	667,485,662 KM

Table 12. Resources planned under the NEEAP for measures in buildings

For the purposes of this analysis, the authors will not consider the level of NEEAP's implementation or realisation, but will only look at the financial resources planned under the NEEAP for individual EERE measures.

As explained in section 1.7. (Employment potential and comparative indicators expressed via the investment value), the number of potential FTEs generated per €1 million investment is 96, i.e. employment is generated for about 96 individuals on a full-time basis for one year. Financial resources planned under the NEEAP for measures in buildings amount to €341 million (KM 667,485,662), offering potential for creation of 32,865 FTEs, or, in other words, it is possible to provide full-time employment to 32,865 individuals for one year. Given that the NEEAP covers a nine-year period (2010-2018), and if these jobs are linearly distributed, it would be possible to employ 3,652 individuals annually, primarily those in the construction profession. Table 13 below shows the employment potential offered under the NEEAP by category of workers. As has already been pointed out in the preliminary conclusions, the greatest employment potential is created for skilled and semi-skilled workers, nearly 90% of total employment.

Sector	Resources planned under the NEEAP for buildings in €	Resources planned under the NEEAP for buildings in KM
NKV	137	15
PKV	11,877	1,320
KV	17,201	1,911
VKV	1,843	205
VSS	1,809	201
Ukupno	32,865	3,652

Table 13. Resources planned under NEEAP for measures in buildings

⁸ National Energy Efficiency Action Plan of Bosnia and Herzegovina 2010-2018 – Final Draft, Working Group for Energy Efficiency in the EnC Secretariat "EETF", 2012

The total employment potential of 32,865 FTE jobs under the NEEAP, i.e. the number of full-time workers for one year, is almost identical to the average number of 33,093⁹ workers in the construction industry in BiH in 2015. So, if all the measures envisaged under the NEEAP were to be implemented within one year, all employees in the construction sector in BiH would be engaged in improving the energy performance of buildings. However, as the NEEAP covers a nine-year period, offering the annual employment potential for 3,652 workers in the construction sector, this means that, on average, 11% of workers in the construction sector in BiH would be engaged in the implementation of EERE measures under the NEEAP. Of that number, 15 would be unskilled workers, 1,320 semi-skilled workers, 1,911 skilled workers, 205 highly skilled workers and 201 workers with university education.

⁹ Press release "Employees by Type of Activity in January 2016", Agency for Statistics of Bosnia and Herzegovina, Sarajevo 2016, p. 4

3.2. Potential for salaries and related taxes and contributions under the NEEAP

The wage bill, which encompasses net salaries and taxes, fringe benefits and contributions, in the implementation of EERE measures accounts for 48.89% of the total cost of investment. Based on the financial resources planned under the NEEAP for measures in buildings to the tune of €341 million (KM 667.5 million), the potential for creation of salaries and related taxes and contributions is KM 326 million. This amount is made up of KM 192.5 million in net salaries and KM 133.8 million in taxes, fringe benefits and contributions. Table 14 below shows the total and annual spending for wage bill under the NEEAP.

Values in KM		
Type of appropriations	Total appropriations for wage bill under the NEEAP	Annual appropriations for wage bill under the NEEAP
Net salaries	192,564,274	21,396,030
Taxes and contributions	133,798,169	14,866,463
Total	326,362,442	36,262,494

Table 14. Total and annual spending for wage bill under the NEEAP

Additionally, the amount of KM 133 million, which would be appropriated for taxes and contributions levied on salaries, would comprise appropriations towards public budgets and off-budget funds, as shown in Table 15 below.

Type of appropriations for taxes and contributions levied on salaries	Amount in KM
Appropriations for the pension and disability insurance scheme	67,570,009
Appropriations for the health insurance scheme	48,475,280
Appropriations for the Employment Fund/Agency	5,875,653
Appropriations for budget revenues (water contribution fee and insurance against accidents and disasters)	1,942,265
Appropriations for the Fund for Professional Rehabilitation and Employment of Persons with Disabilities	1,470,056
Appropriations for budget revenues (income tax)	8,464,906
Total appropriations for taxes and contributions levied on salaries	133,798,169

Table 15. Total appropriations for taxes and contributions levied on salaries under the NEEAP

4. Conclusion

As shown by numerous studies in the region and Europe, investing in EERE measures has very positive effects on employment, not only in the construction sector and lateral procurement channels with relatively high labour intensity, but also because it helps generate energy savings that are used to boost economy through increased demand for goods and services.

In order for all of the above effects of EERE measures, particularly employment, to occur, it is essential that all government structures in BiH and all international actors (agencies, directorates, embassies, etc.) have a clear picture of the employment potential offered by EERE measures. This potential further becomes the basis for the adoption of policies and programmes for the long-term implementation of EERE measures.

The main findings of this analysis demonstrate that KM 1 million investment in improving energy efficiency in buildings in BiH can:

- create labour potential equivalent to 589 man-months or 49 new jobs, primarily in the construction sector, for about 26 skilled workers, 18 semi-skilled workers, three highly skilled workers, three workers with university education and 0.2 unskilled workers,
- create net salaries for all categories of workers in the amount of KM 288,492, or 28.84% of the total investment,
- create taxes and contributions levied on the wage bill in the amount of KM 200,451, or 20.04% of the total investment,
- appropriate KM 488,943, or 49% of the total investment, for the total cost of the wage bill and KM 511,057, or 51%, for other project costs (materials, equipment, tools, etc.),
- of the total amount of KM 200,451 for taxes and contributions levied on the wage bill, create funds for:
 - the pension and disability insurance fund/scheme in the amount of KM 101,231, or 10.1% of the total investment,
 - the health insurance fund/scheme in the amount of KM 72,624, or 7.2% of the total investment,
 - budget revenues by way of the water contribution fee and insurance against accidents and disasters in the amount of KM 2,910, or 0.3% of the total investment,
 - budget revenues by way of income tax in the amount of KM 12,682, or 1.27% of the total investment,
 - the Fund for Professional Rehabilitation and Employment of Persons with Disabilities in the amount of KM 2,202, or 0.22% of the total investment.

■ plan salaries and related taxes and contributions by workforce category, as follows:

- for unskilled workers, net salaries in the amount of KM 745 and taxes and contributions in the amount of KM 517, or a total of KM 1,262,
- for semi-skilled workers, net salaries in the amount of KM 88,077 and taxes and contributions in the amount of KM 61,198, or a total of KM 149,275,
- for skilled workers, net salaries in the amount of KM 152,883 and taxes and contributions in the amount of KM 106,227, or a total of KM 259,110,
- for highly skilled workers, net salaries in the amount of KM 17,681 and taxes and contributions in the amount of KM 12,285, or a total of KM 29,966,
- for workers with university education, net salaries in the amount of KM 29,106 and taxes and contributions in the amount of KM 20,224, or a total of KM 49,300.

Further item of information that can be used for employment projections and planning is one that shows FTEs per square metre of heated floor area of buildings that are subject to energy performance improvements. According to calculations, 0.0042 FTEs are created per one square metre of heated floor area of a building subject to energy performance improvements.

Additionally, for every square metre of heated floor area in buildings subject to energy performance improvements, KM 41.5 is created in salaries and taxes for workers working on the building/project. This amount of 41.5 KM per square metre of heated floor area in buildings subject to energy performance improvements comprises KM 24.5 (59%) for net salaries and KM 17 (41%) for taxes and contributions.

Finally, if all the measures envisaged under the 2010-2018 National Energy Efficiency Action Plan (NEEAP) of Bosnia and Herzegovina were to be implemented, this would create potential employment for 32,865 individuals on a full-time basis for one year. However, as the NEEAP covers a nine-year period, the annual employment potential would be for 3,652 workers, primarily in the construction sector. Given the total number of employees in the construction sector in BiH, the implementation of NEEAP would employ an average of 11% of workers in the construction sector in BiH in the implementation of EERE measures. Of that number, 15 would be unskilled workers, 1,320 semi-skilled workers, 1,911 skilled workers, 205 highly skilled workers and 201 workers with university education. Under the NEEAP, the potential for creation of salaries and related taxes and contributions is KM 326 million, and this amount comprises KM 192.5 million in net salaries and KM 133.8 million in taxes, fringe benefits and contributions.



