



Republic of Macedonia  
Municipality Mavrovo – Rostushe



*“Lighting of two road sections on the  
regional road R-409”*

World Bank

Municipal Services Improvement Project

## **EXECUTIVE SUMMARY**

The Project focuses on providing street lighting of two road sections on the regional road R-409 in the Municipality Mavrovo-Rostushe. The first section is located between Rostushe bridge and the locality called ‘Zad Chuka’, while the other road section is located between Zirovnica bridge and dairy “Boletin” located in the industrial area of the Municipality Mavrovo-Rostushe.

The main purpose of the proposed technical solution is to improve living conditions and electricity savings by introducing LED technology which provides better photometric results and reduces electricity costs in the long run.

The least-cost analysis showed that the LED solution can be considered the most cost-efficient alternative when compared to the other options available (CFL, Sodium and Mercury lights) over the projected time horizon. This conclusion results from the fact that the maintenance and electricity costs are significantly higher for the alternatives (CFL, Sodium and Mercury) than the maintenance and electricity costs for the LED option during the projected time horizon.

In addition, the least cost analysis showed that the LED luminaries provide the lowest negative influence on the environment and on the health of the citizens.

If implemented, the Project would contribute towards accomplishment of the strategic goals in the area of infrastructure of the Municipality Mavrovo-Rostushe. The municipal administration recognizes the improvement of the street lighting as its highest strategic priority in the area of improvement of the municipal infrastructure. The Mayor and the municipal administration strive to achieve full coverage of a transport, communal (utility) and electricity infrastructure throughout the municipal territory.

Taking into account that the Project is located on two sections on the main regional road R-409 that crosses the Municipality, it can be inferred that the Project will undoubtedly contribute towards improvement of the quality of life and well-being of all of the citizens of the Municipality Mavrovo-Rostushe.

The improvement of the electricity infrastructure can improve accessibility to tourist attractions and ensure better access to the tourism service points within the Municipality. This is also important considering that 85.4% of the territory of the Municipality Mavrovo-Rostushe is part of the largest national park of the Republic of Macedonia, i.e. the “National park of Mavrovo”, whereas the Municipality’s location on the mountains of Bistra and Korab (the highest in the Republic of Macedonia) and the Lake Mavrovo have helped it grow into a leading year-round tourist centre. Taking into account that tourism is recognized as a labour intensive sector, the Project is expected to lead towards increasing the tourist potential in the Municipality of Mavrovo-Rostushe, which is of a particular importance in tackling the extremely high rate of unemployment.

In addition, one of the sub-projects is located in the industrial area of the Municipality Mavrovo-Rostushe. Thus, the Project is expected to lead towards increasing the attractiveness of the area for potential investors, therefore enhancing the commercial activities in this part of the Municipality, which will also lead towards increasing the

economic development and decline in the extremely high level of unemployment recognized as the bitterest and galling problems in the Municipality Mavrovo-Rostushe.

What is the most important, the Project would ensure better access to what the Municipality offers, thus contributing towards increasing the number of tourists and commercial activities in the industrial area of the Municipality Mavrovo-Rostushe and ultimately towards higher economic development and tackling the extremely high rate of unemployment recognized as one of the bitter and galling problems in this municipality.

Furthermore, it is very difficult to relate the benefits of Projects of this kind with the economic development and poverty levels in a certain Municipality in a short-term. However, taking into consideration that increasing the quality of the infrastructure is linked with decreasing poverty and unemployment, the Project will definitely have a wide positive impact on the economic growth and the poverty level, not only in a short term but also in the longer term perspective.

## 1. PROJECT DESCRIPTION

### General Information on the Municipality Mavrovo-Rostushe

The Municipality Mavrovo-Rostushe is one of nine constituent municipalities of the Polog planning region of the Republic of Macedonia. The Municipality is situated on the north-western part of the Republic of Macedonia, between 41°41" latitude and 20°41" and 9°18" longitude (Picture 1), spreading on an area of 856km<sup>2</sup> on an average altitude of around 1,159m.

**Picture 1.** Municipality Mavrovo - Rostushe



*Source: State Statistical Office*

**Picture 2.** Polog planning region with its eleven constituent municipalities



*\*Note: 1. Mavrovo - Rostushe, 2. Gostivar, 3.Tetovo, 4.Tearce, 5.Bogovinje, 6.Brvenica, 7.Vrapciste, 8.Zelino and 9.Jegunovce.*

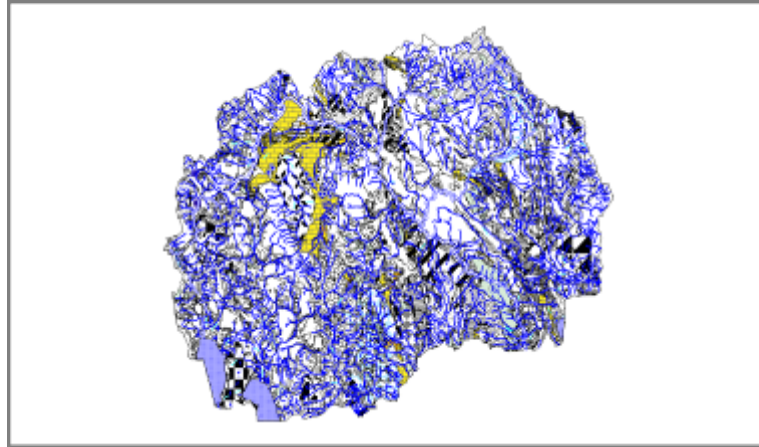
*Source: Centre for development of the Polog planning region*

The border line with the Republic of Albania is on the western part of the Municipality Mavrovo - Rostushe, the borderline with the Municipality Gostivar is on the northern part, with the Municipality Debar is on the south-western part, the borderline with the Municipality Drugovo is on the south-eastern part, while the borderline with the

Municipality Zajas is on the eastern part. The municipality is considered rural comprising 42 local communities (rural villages): Adzievci, Belicica, Bibaj, Bituse, Bogdevo, Boletin, Cerovo, Duf, Galicnik, Grekaj, Jance, Kicinica, Krakornica, Lazaropole, Leunovo, Mavrovi Anovi, Mavrovo, Nicpur, Nikiforovo, Nistrovo, Niviste, Novo Selo, Orkjushe, Prisojnica, Ribnica, Rosoki, Rostushe (where the municipal seat is found), Selce, Sence, Skudrinje, Sretkovo, Susica, Tanuse, Trebiste, Tresonce, Velebrdo, Viduse, Volkovija, Vrben, Vrbjani, Zirovnica and Zuznje.

It is worth mentioning that around 85.4% of the territory of the Municipality Mavrovo-Rostushe is part of the largest national park of the Republic of Macedonia, i.e. the national park of Mavrovo (spreading on an area of 722 km<sup>2</sup>). The Municipality's location on the mountains of Bistra and Korab (the highest in the Republic of Macedonia) and the Lake Mavrovo have helped it grow into a leading year-round tourist centre. In addition, the Municipality Mavrovo-Rostushe is considered the most popular ski-center in the Republic of Macedonia.

**Picture 3.** Hydro-geological map of the Republic of Macedonia 1:200.000



Source: Civil Engineering Institute – “Macedonia”, Geotechnical department, Skopje 2010

The average annual minimum temperature is -7°C, while the average annual maximum temperature is 21°C, which classifies the area as relatively cold. The area of the Municipality Mavrovo-Rostushe is considered highly mountainous with lowland terrain only along the river beds of the ‘Radika’ and ‘Mala reka’. Thus, the area is characterised by long and snowy winters and short and relatively fresh summers. The number of rainy days per year is 146 on average. In addition, the average quantity of rainfalls is 85mm, which are unevenly distributed throughout the year. The months that are classified as the rainiest are November, December, January, February and March with an average of 51% of the average annual amount, while July and August are considered the least rainy months with an average of around 10% of the average annual amount of rainfalls. The snowfalls happen from October to May. Annually, there are around 120 days on average under snow.

## Demographic profile of the Municipality Mavrovo-Rostushe

According to the revised 2005 Census, the total number of inhabitants is 8,618 with a natural growth rate of 2.3% for the year of 2011. The total number of households is 1,969, while the average number of households' members is 4.4. Additionally, the total number of dwellings is 4,842. There are 186km of local roads, 4 post offices and 7 primary health protection centres. Additionally, there is one high school and 4 primary schools where 636 children at the age of 6-14 attend. As regards economy, there are 158 active enterprises according to the latest State Statistical Office data. The rate of unemployment is extremely high and stands at 61.6%, while the activity rate is 27.9%. The women activity rate is 22.1%. The main macroeconomic indicators of the Municipality Mavrovo-Rostushe are provided in Table 1.

**Table 1.** Main macroeconomic indicators of the Municipality Mavrovo-Rostushe\*

| Demography   | Municipality Mavrovo-Rostushe | Polog planning region | Republic of Macedonia |
|--|-------------------------------|-----------------------|-----------------------|
| Total Population   | 8,618                         | 310,853               | 2,022,547             |
| Rate of natural increase (per mil)   | 2.3%                          | 3.7%                  | 1.6%                  |
| Total number of households   | 1,969                         | 69,091                | 506,203               |
| Average number of households members   | 4.4                           | 4.4                   | 3.6                   |
| Total number of dwellings  | 4,842                         | 78,544                | 697,529               |
| Percentage of dwellings that are connected to the public water supply system   | 78.9                          | n.a                   | 85.5                  |
| Percentage of dwellings are connected to the sewerage system                   | 54.9                          | n.a                   | 59.8                  |
| Percentage of dwellings that are connected to the central heating              | 0.3                           | n.a                   | 8                     |
| <b>Infrastructure</b>  |                               |                       |                       |
| Local roads(km)  | 186                           | 1,351                 | 9,300                 |
| Number of locations in primary health protection                               | 7                             | n.a                   | n.a                   |
| Number of Post offices   | 4                             | n.a                   | n.a                   |
| <b>Education</b>   |                               |                       |                       |
| Regular primary schools in school year 2010/2011                               | 4                             | 145                   | 990                   |
| Children at age 6-14 that attend school  | 636                           | 32,517                | 204,439               |
| Population literacy at age 10 and more   | 6,967                         | 245,088               | 1,693,044             |
| <b>Economy</b>   |                               |                       |                       |
| Number of business subjects – active (as of 31.12.2011)                        | 158                           | 7,100                 | 75,497                |
| GDP per capita (US\$)**  | n.a.                          | 1,980                 | 4,328                 |
| Fixed capital investment (Denar million)**                                     | n.a.                          | 6,518                 | 82,966                |
| <b>Employment</b>  |                               |                       |                       |
| Employment rate (Percentage of employed in working-age population – age 15-64) | 38.3                          | 30.0                  | 38.9                  |
| Activity rate  | 27.9                          | 43.9                  | 56.8                  |
| Unemployment rate (percentage of unemployed from the labour force)             | 61.6                          | 31.8                  | 31.4                  |

Source: State Statistical Office, Revised Census Data 2005, Municipality Mavrovo-Rostushe

\*Note: last available data

\*\* Note: the data is for the Polog planning region which constitute of the 9 municipalities Mavrovo - Rostushe, Gostivar, Tetovo, Tearce, Bogovinje, Brvenica, Vrapciste, Zelino and Jegunovce.

The following table represents the age distribution in the total population. The analysis of data shows that the age groups are mainly distributed in the age 10 - 49.

**Table 2.** Age repartition

| Repartition   | Municipality<br>Mavrovo-Rostushe |            | Polog planning<br>region |            | Republic of Macedonia |            |
|---------------|----------------------------------|------------|--------------------------|------------|-----------------------|------------|
|               | Number                           | Percent    | Number                   | Percent    | Number                | Percent    |
| 0 - 4         | 595                              | 6.9        | 21,647                   | 7.1        | 122,757               | 6.1        |
| 5 - 9         | 794                              | 9.2        | 27,397                   | 9.0        | 143,184               | 7.1        |
| 10 - 14       | 905                              | 10.5       | 30,165                   | 9.9        | 160,339               | 7.9        |
| 15 - 19       | 853                              | 9.9        | 28,455                   | 9.4        | 165,422               | 8.2        |
| 20 - 24       | 721                              | 8.4        | 26,001                   | 8.5        | 161,945               | 8.0        |
| 25 - 29       | 663                              | 7.7        | 24,490                   | 8.1        | 153,461               | 7.6        |
| 30 - 34       | 627                              | 7.3        | 24,262                   | 8.0        | 148,281               | 7.3        |
| 35 - 39       | 639                              | 7.4        | 23,793                   | 7.8        | 149,837               | 7.4        |
| 40 - 44       | 664                              | 7.7        | 21,167                   | 7.0        | 146,902               | 7.3        |
| 45 - 49       | 487                              | 5.7        | 17,250                   | 5.7        | 142,688               | 7.1        |
| 50 - 54       | 316                              | 3.7        | 13,954                   | 4.6        | 127,760               | 6.3        |
| 55 - 59       | 276                              | 3.2        | 10,945                   | 3.6        | 95,234                | 4.7        |
| 60 - 64       | 294                              | 3.4        | 10,608                   | 3.5        | 89,822                | 4.4        |
| 65 - 69       | 308                              | 3.6        | 9,574                    | 3.1        | 84,443                | 4.2        |
| 70 - 74       | 237                              | 2.8        | 7,215                    | 2.4        | 61,969                | 3.1        |
| 75 - 79       | 151                              | 1.8        | 4,065                    | 1.3        | 40,384                | 2.0        |
| 80 - 84       | 57                               | 0.7        | 1,842                    | 0.6        | 18,975                | 0.9        |
| Above 85      | 21                               | 0.2        | 931                      | 0.3        | 7,941                 | 0.4        |
| Age unknown   | 10                               | 0.1        | 364                      | 0.1        | 1,203                 | 0.1        |
| <b>Total:</b> | <b>8,618</b>                     | <b>100</b> | <b>304,125</b>           | <b>100</b> | <b>2,022,547</b>      | <b>100</b> |

Source: State Statistical Office, Revised Census Data 2005

The following table represents the gender repartition in the total population. As it can be seen, 49.8% of the total population in the Municipality are male, while 50.1% are female, which means that there is nearly equal representation of male and female in the total population.

**Table 3.** Gender repartition

|               | Municipality<br>Mavrovo-Rostushe |        | Polog planning<br>region |         | Republic of<br>Macedonia |           |
|---------------|----------------------------------|--------|--------------------------|---------|--------------------------|-----------|
|               | Male                             | Female | Male                     | Female  | Male                     | Female    |
| <b>Number</b> | 4,295                            | 4,323  | 152,707                  | 151,418 | 1,015,377                | 1,007,170 |
| <b>%</b>      | 49.8                             | 50.1   | 50.2                     | 49.8    | 50.2                     | 49.8      |

Source: State Statistical Office, Revised Census Data 2005

Table 4 represents the urban repartition in the total population. The data infer that the Municipality is mostly rural, i.e. around 78.8% of the total population is settled in the rural area.

**Table 4.** Urban repartition

| Repartition  | Municipality<br>Mavrovo-Rostushe |            | Republic of<br>Macedonia |            |
|--------------|----------------------------------|------------|--------------------------|------------|
|              | Number                           | Percent    | Number                   | Percent    |
| Urban        | 1,827                            | 21.2       | 1,169,032                | 57.8       |
| Rural        | 6,791                            | 78.8       | 853,515                  | 42.2       |
| <b>Total</b> | <b>8,618</b>                     | <b>100</b> | <b>2,022,547</b>         | <b>100</b> |

Source: State Statistical Office and Municipality Mavrovo-Rostushe

In relation to the ethnic affiliation of the citizens, the prevailing population in the Municipality Mavrovo-Rostushe are Macedonians, representing 50.5% of the total population, followed by the Turkish community, representing 31.1% of the municipality's total population (Table 5). It is important to note that each of the ethnicities speaks its own language in the informal communication. The officially used language in this Municipality however, is the Macedonian with its Cyrillic alphabet.

**Table 5.** Population repartition

| Repartition  | Municipality Mavrovo-Rostushe |            | Polog planning region |            | Republic of Macedonia |            |
|--------------|-------------------------------|------------|-----------------------|------------|-----------------------|------------|
|              | Number                        | Percent    | Number                | Percent    | Number                | Percent    |
| Macedonians  | 4,349                         | 50.5       | 56,079                | 18.4       | 1,297,981             | 64         |
| Serbs        | 6                             | 0.1        | 977                   | 0.3        | 35,939                | 2          |
| Roma         | 10                            | 0.1        | 4,717                 | 1.6        | 53,879                | 3          |
| Vlachs       | 0                             | 0.0        | 30                    | 0.01       | 9,695                 | 0          |
| Turks        | 2,680                         | 31.1       | 17,394                | 5.7        | 77,959                | 4          |
| Bosniacs     | 31                            | 0.4        | 251                   | 0.1        | 17,018                | 1          |
| Albanians    | 1,483                         | 17.2       | 222,679               | 73.2       | 509,083               | 25         |
| Others       | 59                            | 0.7        | 1,998                 | 0.7        | 20,993                | 1          |
| <b>Total</b> | <b>8,618</b>                  | <b>100</b> | <b>304,125</b>        | <b>100</b> | <b>2,022,547</b>      | <b>100</b> |

Source: State Statistical Office, Revised Census Data 2005

According to the data available, the number of live births in the Municipality Mavrovo-Rostushe is fluctuating around 88 on average over the last 5 years (Table 6).

**Table 6.** Live births number in Mavrovo-Rostushe

| Total births                  |        | 2007   | 2008   | 2009   | 2010   | 2011   |
|-------------------------------|--------|--------|--------|--------|--------|--------|
| Municipality Mavrovo-Rostushe | Male   | 52     | 36     | 37     | 54     | 39     |
|                               | Female | 46     | 45     | 46     | 44     | 43     |
|                               | Total  | 98     | 81     | 83     | 98     | 82     |
| Polog planning region         | Male   | 1,923  | 1,759  | 1,877  | 1,937  | 1,870  |
|                               | Female | 1,700  | 1,667  | 1,657  | 1,741  | 1,729  |
|                               | Total  | 3,623  | 3,426  | 3,534  | 3,678  | 3,599  |
| Republic of Macedonia         | Male   | 11,772 | 11,826 | 12,340 | 12,631 | 11,752 |
|                               | Female | 10,916 | 11,119 | 11,344 | 11,665 | 11,018 |
|                               | Total  | 22,688 | 22,945 | 23,684 | 24,296 | 22,770 |

Source: State Statistical Office

## Economic profile of the Municipality Mavrovo-Rostushe

According to the Central registry data, the number of newly registered enterprises is fluctuating around 20 on average over the last 6 years (Table 7).



**Table 7.** Newly registered enterprises (2006 – Q1 2012)

| Year              | Newly registered enterprises<br>in the Municipality Mavrovo-Rostushe |
|-------------------|--|
| 2006              | 15   |
| 2007              | 17   |
| 2008              | 21   |
| 2009              | 25   |
| 2010              | 32   |
| 2011              | 20   |
| end of Q1 of 2012 | 9  |

Source: Central Registry of the Republic of Macedonia

Additionally, according to the SSO data, private enterprises are operating mainly in wholesale and retail trade, repair of vehicles, motorcycles and personal and household goods (43), followed by manufacturing (27), accommodation and food service activities (21), transport storage and communication (15), construction (11), agriculture, forestry and fishing (10) and human health and social work activities (10).

**Table 8.** Active business subjects by sectors (as of 31.12.2011)\*

| Active business subjects by sectors                                  | number     | in %       |
|--|------------|------------|
| Agriculture, forestry and fishing                                    | 10         | 6.3        |
| Activities related to real estate                                    | 1          | 0.6        |
| Manufacturing  | 27         | 17.1       |
| Water supply, sewerage, waste management and remediation activities  | 2          | 1.3        |
| Construction   | 11         | 7.0        |
| Wholesale and retail trade, repair of motor vehicles and motorcycles | 43         | 27.2       |
| Transportation and storage   | 15         | 9.5        |
| Accommodation and food service activities                            | 21         | 13.3       |
| Information and communication  | 2          | 1.3        |
| Professional, scientific and technical activities                    | 2          | 1.3        |
| Administrative and support service activities                        | 3          | 1.9        |
| Public administration and defence                                    | 1          | 0.6        |
| Education  | 4          | 2.5        |
| Human health and social work activities                              | 10         | 6.3        |
| Arts, entertainment and recreation                                   | 3          | 1.9        |
| Other service activities   | 3          | 1.9        |
| <b>Total</b>   | <b>158</b> | <b>100</b> |

Source: State Statistical Office \*Note: last available data

When analysing the labour market, the available data show that 1,698 of the municipal population is considered economically active, of which 652 are employed (83.6% male, 16.4% female), while 1,046 are unemployed. From the total number of the unemployed persons 74.3% are male, while 25.7% are female.

**Table 9.** Activity rates

|  |         | Economically active |          |            | Economically inactive | Total            |
|--|---------|---------------------|----------|------------|-----------------------|------------------|
|  |         | All                 | Employed | Unemployed |                       |                  |
| <b>Municipality Mavrovo - Rostushe</b> | Number  | 1,698               | 652      | 1,046      | 4,373                 | <b>6,071</b>     |
|  | Percent | 27.9                | 38.4     | 61.6       | 72.1                  | <b>100</b>       |
| <b>Polog planning region</b>           | Number  | 70,954              | 35,543   | 35,411     | 145,959               | <b>216,913</b>   |
|  | Percent | 32.8                | 50.1     | 49.9       | 67.2                  | <b>100</b>       |
| <b>Republic of Macedonia</b>           | Number  | 743,676             | 460,544  | 283,132    | 833,325               | <b>1,577,001</b> |
|  | Percent | 47                  | 62       | 38         | 53                    | <b>100</b>       |

Source: State Statistical Office, Revised Census Data 2005

Finally, 4,373 persons are considered economically inactive, where 35.4% are male, while 64.6% are female.

### General description of the Project

The general objective of the Project is to improve the level of lighting in the Municipality Mavrovo-Rostushe, while at the same time achieving cost efficiency for lighting and maintenance. In that respect, the Project assumes improvement and upgrade of local road lighting in two directions:

- Increase in the number of light units in the Municipality;
- Placement of energy efficient LED lamps.

As elaborated in Technical design (Chapter 4), the first sub-project is located at the section between Rostushe bridge on the regional road R-409 and locality called 'Zad chuka', where a sport facility complex is envisaged to be constructed. Therefore, the assumption is that the implementation of this Project will lead towards increasing the outdoor activities, which will ultimately lead towards increasing the living conditions in the Municipality Mavrovo-Rostushe.

The second sub-project is located at the section between Zirovnica bridge on the regional road R-409 and dairy "Boletin" which is located in the industrial area of the Municipality Mavrovo-Rostushe. Therefore, the assumption is that the implementation of this Project will lead towards increasing the attractiveness of the area for potential investors, thus enhancing the commercial activities in this part of the Municipality, which will ultimately lead towards increasing the economic development and decline in the extremely high level of unemployment.

Taking into account that the Project is located on two sub-sections of the regional road R-409, it can be inferred that all citizens can be considered beneficiaries of the Project since R-409 is the main regional road that crosses the Municipality Mavrovo-Rostushe. However, the direct beneficiaries of the implementation of this Project are the local communities of Zirovnica and Rostushe whereby, according to the data available, 3,750 inhabitants live, which is 43.5% of the total population of the Municipality Mavrovo-Rostushe. It is worth mentioning that the local community of Zirovnica is considered the largest community in the Municipality, while the local community of Rostushe is the seat of the Municipality Mavrovo-Rostushe. The local communities of Vrbjani, Vidushe, Velebrdo, Trebiste and Bistushe gravitate around the local communities of Zirovnica

and Rostushe, implying that the inhabitants of these local communities can be considered indirect beneficiaries of the Project. In total, 6,850 inhabitants of the Municipality Mavrovo-Rostushe will have direct or indirect benefit of the realization of this Project which is 79.4% of the total number of inhabitants in the Municipality of Mavrovo-Rostushe. In addition, tourists, passengers and drivers can also be considered beneficiaries of the Project since R-409 is the main regional road that connects the Municipality Mavrovo-Rostushe with the Municipality Debar and the border crossing “Blato” with the Republic of Albania. It is expected that with the Project implementation the number of car accidents will fall. Finally, Municipality Mavrovo-Rostushe borders with the Republic of Albania and there are potential illegal crossings of the border by emigrants, whose final destination is EU.

As a result of the project implementation it is expected to have lighting according to the European and world standards. The proposal to install LED lights is due to the long life (the newest generation of bulbs has a life expectancy of 50,000 working hours, where if we assume that the lights would be used for 10 hours per day, this should be nearly 14 years) and the lower costs of maintenance than the usually used in the country (mercury or sodium bulbs). In the long run, the Project would result in electricity savings as well as in better lighting in the Municipality as a result of the long life of the LED bulbs and their quality.

Besides financial results the Project main goal is improvement in well-being of the population by increased safety on the road.

### **Strategic Interest of the Municipality Mavrovo-Rostushe to implement the Project**

If implemented, the Project would contribute towards accomplishment of the strategic goals in the area of infrastructure of the Municipality Mavrovo-Rostushe. The municipal administration recognizes the improvement of the street lighting as its highest strategic priority in the area of improvement of the municipal infrastructure. The Mayor and the municipal administration strive to achieve full coverage of a transport, communal (utility) and electricity infrastructure throughout the municipal territory.

Taking into account that the Project is located on two sections on the main regional road R-409 that crosses the Municipality, it can be inferred that the Project will undoubtedly contribute towards improvement of the quality of life and well-being of all citizens of the Municipality Mavrovo-Rostushe. The Project is part of the Annual communal utilities programme which is adopted by the Municipal Council, adding additional relevance to the Project.

The improvement of the electricity infrastructure can improve accessibility to tourist attractions and ensure better access to the tourism service points within the Municipality. This is also important when considering that 85.4% of the territory of the Municipality Mavrovo-Rostushe is part of the largest national park of the Republic of Macedonia, i.e. the National park of Mavrovo, whereas the Municipality's location on the mountains of Bistra and Korab (the highest in the Republic of Macedonia) and the Lake Mavrovo have helped it to grow into a leading year-round tourist centre. Taking into account that tourism is recognized as a labour intensive sector, the Project is

expected to lead towards increasing the tourist potential in the Municipality of Mavrovo- Rostushe, which is of a particular importance in tackling the extremely high rate of unemployment.

In addition, one of the sub-projects is located in the industrial area of the Municipality Mavrovo-Rostushe. Thus, the Project is expected to lead towards increasing the attractiveness of the area for potential investors, therefore enhancing the commercial activities in this part of the Municipality, which will also lead towards increasing the economic development and decline in the extremely high level of unemployment recognized as the bitter and galling problems in Municipality Mavrovo-Rostushe.

### **Knowledge and Experience of the Municipality Mavrovo-Rostushe to implement the Project**

The knowledge and experience needed for successful implementation of the Project are related to Project management, technical knowledge and execution of procurement practices. The Municipality Mavrovo-Rostushe, the competent authority in this Project, has participated in a wide variety of large construction or other type of projects with different investors, whereby the Municipality allocated the land and provided the investors with technical services, and gained in return new businesses on its territory or improved housing facilities, schooling facilities, wastewater networks and treatment. The Municipality has implemented several projects for improving municipal services supported by UNDP, USAID and others. It can be inferred that the Municipality is able to contribute with the necessary experience to large construction projects such as the lighting of two road sections on the regional road R-409, envisaged to be financed from the World Bank MSIP funds to the Government of the Republic of Macedonia.

### **Concluding remarks**

The Project is in-line with the strategic priorities of the Municipality Mavrovo-Rostushe and it will contribute towards achieving the vision of the municipal administration for providing full coverage of transport, communal and electricity network throughout the municipal territory. The Project is part of the Annual communal utilities programme which is adopted by the Municipal Council, adding additional relevance to the Project.

The relevance of the Project results from the fact that the Project is located on two sections on the main regional road R-409 that crosses the Municipality, which is why it is expected that the Project will undoubtedly contribute towards improvement of the quality of life and well-being of all of the citizens of the Municipality Mavrovo-Rostushe. The proposed technical solution is in-line with the existing standards and regulations for this kind of projects. The knowledge and experience needed for successful implementation of the Project are related to Project management, technical knowledge and execution of procurement practices. Municipality Mavrovo-Rostushe has implemented various similar projects in the past, some of which in collaboration with international institutions, which implies that the Municipality is able to implement large construction projects such as the lighting of two road sections on the regional road R-409.

## **2 SOCIAL IMPACT**

### **Methodology**

The methodological approach was based upon the methodological concept of World Bank summarized as Five Entry Points, One Result. This concept requires exploration of five components - social diversity and gender, institutions, rules and behaviour, stakeholders, participation and social risk. The Assessment anticipated field research to get available information on interests and attitudes of stakeholders. Unfortunately, the time and resources constraint, did not admit application of all instruments for data collection such as survey, meetings with focus groups, thus the research is reduced to relevant secondary data from the Municipality Mavrovo-Rostushe and face-to-face interviews with three officials (the Mayor, the President of the Council and an Associate for Urban and Communal Utilities), who presented their opinions about the role and influence of various stakeholders in the process of decision making relevant to the Project, as well as the level of information, capacities and readiness of the citizens to support the Project.

Taking into account their delegation and duties, the interviewees proved to be useful interpreters of the opinions of the citizens since being their representatives and having frequent meetings with them, they are very familiar with the needs, attitudes and opinions of the local population.

Nevertheless, the weakness of this approach lies in its indirectness. More precisely, the indirect way of getting information on this issue, plus possibility of subjective approach among some of the interviewees decreases the level of accuracy of the public opinion in this respect. However, the answers from the interviews are very indicative and give a very good insight in the local processes relevant to the Project.

### **Social diversity and gender**

Like in the other Municipalities in the country, in the Municipality Mavrovo-Rostushe, citizens are organized into various social groups based on their status prescribed at birth (ethnicity, gender, language, etc.). From the demographic data presented in Chapter 1, the following can be seen:

- The age groups are mainly distributed in the age of 10–49. The data show that this is the case both on the Polog Planning Region's level and on a country level as well;
- The live births are fluctuating around 88 on average over the last five years;
- There is nearly equal representation of male and female in the total population in the Municipality. The data show that this is the case both on the Polog Planning Region's level and on a country level as well;
- Most of the population lives in the rural area of the Municipality (78.8% of the total population in the Municipality is located in a rural area);
- The prevailing nationality in the Municipality Mavrovo-Rostushe is the Macedonian, representing 50.5%, followed by the Turkish population which constitute 31.1% of the total population;

- Each of the ethnicities in the Municipality speaks its own languages in the informal communication. The officially used language in the Municipality is Macedonian with its Cyrillic alphabet;
- 78.9% of the households are connected to the public water supply system, opposite to 85.5% on a country's level;
- 54.9% of the households live in dwellings connected to the public sewerage system, opposite to 59.8% on a country's level;
- 0.3% of the households live in dwellings which have central heating, opposite to 8% on a country's level;
- There are 158 active business subjects in the Municipality, opposite to 75,497 in the country;
- The activity rate in the Municipality is 27.9%, opposite to 32.8 in the Region and 47% in the country;
- The unemployment rate in the Municipality is extremely high of 61.6%, opposite of 31.8% in the region and 31.4% in the country.

Asked about the number of beneficiaries of the projects, the interviewees expressed their opinion that all citizens in the Municipality will be beneficiaries of the Project, since R-409 is the main regional road that crosses the Municipality Mavrovo-Rostushe.

All three officials stated that tourists, visitors in the national park of Mavrovo, passengers and drivers can also be considered beneficiaries of the Project since R-409 is the main regional road that connects the Municipality Mavrovo-Rostushe with the Municipality Debar and the border crossing "Blato" with the Republic of Albania. In addition, R-409 is the main regional road that connects the neighbour municipalities of Mavrovo-Rostushe (Municipalities Gostivar, Drugovo and Zajjas), with the Municipality Debar and the border crossing of Blato. This implies that the implementation of the Project will have a wider regional impact, adding further to its significance.

It is expected that with the Project implementation the number of car accidents will fall. Finally, Municipality Mavrovo-Rostushe borders with the Republic of Albania and there are potential illegal crossings of the border by emigrants, whose final destination is EU.

### **Institutions, rules and behaviour**

According to the interviewees' opinions the selected contractor must provide guarantees for the realization of the Project. The Municipal Council might request information from the Mayor in reference to the Project's realization at any time. In addition, based on experience with other projects and the overall existing lighting installation in the Municipality Mavrovo-Rostushe, the municipal administration has the capacity to maintain the lighting installation after the implementation of the Project. In addition, the Municipality has an administration, which has experience to monitor the progress of the Project.

## **Stakeholders**

There are several important stakeholders of the Project. The interviewees fully agree that the most influential participants in the process of decision making at the municipal level are the Mayor and the Municipal Council. In addition, potentially influential stakeholder in Mavrovo-Rostushe is the business sector. The nongovernmental organizations (NGOs hereinafter) are influential to some extent, but not as much as the former. Citizens, as an organized group of stakeholders, articulate their opinions directly to the Council and the Mayor, through the local communities and they are not very influential stakeholder in the municipal decision making, although their opinion is always taken into consideration.

The interviewees stated that the Project is unanimously supported by the Councillors representing different political parties in the municipal Council, which means that a political consensus is achieved on this issue and that the Councillors are considering this Project a top priority of the Municipality Mavrovo-Rostushe. In respect to the citizens, the opinion of most interviewees is that all of the citizens support or will support the Project, because it is in the general interest of municipal community.

Influential stakeholders are the Mayor and the Councillors representing different political parties. As implied earlier, this Project has been unanimously supported by the Councillors adding additional weight to its relevance.

The NGOs have some influence, but since this Project will promote improvement of the quality of life in the Municipality Mavrovo-Rostushe, the NGOs are expected to be in favour of the Project.

The citizens in the local communities of Zirovnica, Velebrdo, Rostushe, Trebishte, Bitushe, Vrbjani and Vidushe have frequently submitted their complaints about the current situation with the lighting, which again implies that the citizens are fully in favour of the Project. As elaborated earlier, since this Project is expected to influence the overall living standard in the Municipality, it is expected that the citizens will support the Project.

Furthermore, since R-409 is the main regional road that connects the Municipality Mavrovo-Rostushe and its neighbour municipalities (Municipalities of Gostivar, Drugovo and Zajas) with the Municipality Debar and the border crossing "Blato" with the Republic of Albania, implies that the implementation of the Project will have a wider support in the region adding to its significance.

## **Participation**

It is decided that the loan will be repaid from the municipal Budget in the following years. The answers of the interviewees were unanimous that there is no need for any kind of voluntary participation or financial contribution of the citizens.

## **Social risks**

High social risks for carrying out the Project cannot be perceived. In the Municipality Mavrovo-Rostushe, the Municipal Council consists of 11 Councillors from 4 political

parties. Out of the total number of Councillors, 6 support the Mayor, 4 are in opposition while 1 is independent. In spite of their political orientation, the Councillors cannot endanger the realization of the Project because it is a part of the adopted Annual Program for Communal services of the Municipality Mavrovo-Rostushe, which has been also adopted by the Council. As elaborated earlier, in spite of their political background the Councillors have already unanimously expressed their support for the Project and for raising a loan for its implementation recognizing that its realization will undoubtedly lead towards improvement of the quality of live in the Municipality Mavrovo-Rostushe.

Interviewees presented a wide range of priorities in many fields that are within the local government competencies. They identified: increasing the employment rate, the construction or reconstruction of communal facilities, construction of water supply and sewage network, increasing the local economic development, use of renewable energy sources, improvement of social aid and social protection to vulnerable groups, promotion of education and agriculture, etc. Without exception, all of the interviewees said that one of the highest priorities is improvement of lighting network throughout the Municipality Mavrovo-Rostushe, emphasizing the necessity of the implementation of the Project that is subject to this Appraisal in particular.

Additionally, it was discussed in detail whether the citizens are fully informed of the construction activities related to providing lighting of two road sections on the regional road R-409 in the Municipality Mavrovo-Rostushe and the ensuing financial repercussions on the municipal budget. The interviewees believe that the citizens are fully informed in detail about the Project. Their arguments are based on frequent complaints by the citizens of the local communities of Zirovnica, Velebrdo, Rostushe, Trebishte, Bitushe, Vrbjani and Vidushe about the current situation with the lighting on the R-409.

One very important question that was discussed is related to potential *“feeling of inequality among the citizens and possibility they could endanger the realization of the Project in order to get some personal or group benefits?”* The interviewees stated that it might happen that the realization of this Project causes a slight discontent among the population in other communities (20% of the total population), simply because they will not be direct beneficiaries of the Project. However, taking into account that the citizens highlighted the improvement of the lighting network to contribute mostly to the improvement of the quality of life in the Municipality in general, they should be in favour of the Project. It is also important to state that the Municipality has the intention to improve the lighting network in all of the settlements. It solves the problems that were persistent for many years. Those who will be not covered by this Project can expect that will be provided with such public service subsequently. With the implementation of this strategically important Project, the Municipality is sending a strong signal that plans to solve this issue on the whole municipal area. The interviewees unanimously expressed their opinion that any special technical or economic obstacles and difficulties in the maintenance of the Project could not be expected. They referred to both the implementation phase and the operations and maintenance phase.

According to the answers of the interviewees special obstacles and difficulties cannot be anticipated or expected. The procedure for realization of the projects after reception of the loan is legally stipulated. The contractor will be selected at a tender, and the system



after its construction will be maintained as it has been done before by external firm - in addition, the economic effects will be positive since the Project has to lead towards energy efficiency.

Since the two sub-sections of the R-409 that are subject to this Appraisal are set on municipal (state) property, no expropriation issue is expected to be raised.

### **Other considerations**

The implementation of the Project that is subject to this Appraisal is expected to improve the overall community living in the Municipality Mavrovo-Rostushe.

It is worth mentioning that the Municipality Mavrovo-Rostushe is considered one of the leading year-round tourist centre in the north-western part of the Republic of Macedonia with a high potential of rural and alternative (eco) tourism. This is mostly due to its location on the mountains of Bistra and Korab (the highest in the Republic of Macedonia) and the Lake Mavrovo which is considered one of the top tourist destinations in the country. Taking into account the significance of tourism for the economic development of the Municipality as well as the decline in the extremely high level of unemployment, the development of the rural tourism is considered one of the strategic pillars for local economic development of the Municipality Mavrovo-Rostushe. To that end, the municipal administration considers the improvement of the lighting for access to the Municipality and to what it can offer, as of an utmost priority which would contribute towards increasing the number of tourists. Taking this into account, the Project would ensure better access to what the Municipality offers, thus contributing towards increasing the number of tourists and ultimately towards higher economic development and tackling the extremely high rate of unemployment.

In addition, the assumption is that the implementation of this Project will lead towards increasing the attractiveness of the industrial zone of Municipality Mavrovo-Rostushe for potential investors since the construction of lighting between Zirovnica bridge on the regional road R-409 and dairy “Boletin” will improve the access to it. It is expected that this will enhance commercial activities in this part of the Municipality, which will ultimately lead towards increasing the economic development and decline in the extremely high level of unemployment.

### **Resettlement issues**

This Project is not a subject to resettlement issues.

### **Concluding remarks**

The Project is expected to be socially successful for the following reasons:

- the Project is relevant because it is useful for the improvement of the community living in the Municipality Mavrovo-Rostushe;
- the Project is of a highest municipal priority for the public administration and for citizens;

- the stakeholders are very motivated by the realization of the Project;
- the Project does not bear very high financial burden in comparison to the Budget and the population is not placed into a position to contribute financially, so there is no cause for conflict on this point;
- the Project will ensure better access to the touristic attractions of the Municipality, thus contributing towards increasing the number of tourists and ultimately towards higher economic development and tackling the extremely high rate of unemployment;
- the Project will increase the attractiveness of the industrial area of Municipality Mavrovo-Rostushe for potential investors since the construction of lighting between Zirovnica bridge on the regional road R-409 and dairy “Boletin” will improve the access to it. It is expected that this will enhance commercial activities in this part of the Municipality, which will ultimately lead towards increasing the economic development and decline in the extremely high level of unemployment;
- the Project is not a subject to resettlement issues;
- no expropriation issue is expected to be raised during the implementation of the Project.

### **3 TECHNICAL SOLUTION**

#### **Description**

The Project is focused on providing lighting of two road sections on the regional road R-409 in the Municipality Mavrovo-Rostushe. The first section is located between Rostushe bridge and the locality called 'Zad Chuka', while the other road section is located between Zirovnica bridge and dairy "Boletin" which is located in the industrial area of the Municipality Mavrovo-Rostushe.

In order to improve living conditions and electricity savings, the Municipality Mavrovo-Rostushe prepared a Technical design for providing lighting for the above mentioned road sections. When making the proposal and finding the optimal lighting solution, the following principles were considered:

- new investment on two road sections on R-409, currently without public light;
- proposal of rational solution that satisfies the needs of lighting-technical criteria that prevail to a given traffic category;
- with minimum number of bulbs to satisfy the needs of the level of brightness;
- by choosing appropriate type of bulbs, the maintenance of installation of the lights to be particularly reduced in the long run;
- the new solution will use the new electric installation; and
- to provide energy efficient solution.

The municipality studied different technical solutions in terms of technology (mercury, sodium, compact fluorescent, LED). After deep considerations and evaluation of municipal credit capacity it was concluded that more expensive technology could be applied despite its higher price. LED technology provides better photometric results, and it is considered the most energy efficient solution in the long run. Benefits from using the LED as the source of the light are:

- the key strength of LED lights is reduced power consumption, i.e. LED promote energy-efficiency;
- LED way fixtures have a life rating of more than five times that of traditional mercury lamps significantly reducing costs and allowing the municipality to better utilize maintenance resources;
- visibility for vehicular and pedestrian traffic will be considerably improved through the use of LED product technology that lay the light into the desired target zone for superior uniformity and control; and
- high efficiency in terms of energy costs in the long run.

Based on available data of the power and the number of installed bulbs estimation of energy and economic impact that would be achieved with the reconstruction can be made. The average life of the mercury bulbs is about 1,200 hours, sodium bulbs is about 8,000 hours, CFL is around 10,000 hours whereas the average life of the LED bulbs is around 50,000 hours.

### 3.1. Analysis and calculation

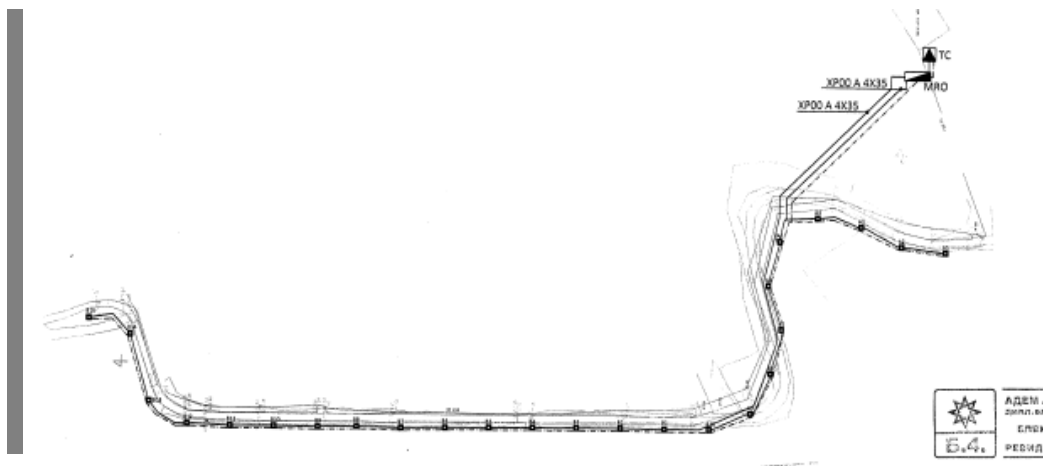
The technical design provides detailed calculation of the required installed power, the photometric characteristics of the lights, the voltage drop and also the light intensity. Additionally, the technical design provides detailed elaboration of the electrical grounding of the designed poles, electro-installation material, test of the functionality of the performed activities and detailed attest documentation for the necessary equipment, installations and other material.

The conducted analyses and calculations resulted in selection of LED technology lights which provide far greater working life of the bulbs, significantly lower electricity consumption, i.e. high energy efficiency.

#### 3.1.1.1. Road section lighting between Rostushe bridge and the locality called 'Zad Chuka'

On this road section on R-409, construction of lighting is envisaged on the left side of the road in the length of  $L = 1,100\text{m}$  (Picture 4). Power supply to the lighting has been planned to be provided from the substation located next to the planned sport complex. The use of the electricity provided is envisaged to be measured through a distributing cabinet (MPO) and power supply is with cable XP00A 4x50. The technical solution envisages construction of two sections of which Section 1 is envisaged to be powered by an underground cable XP00A 4x35 with a length of 1,000m, while and section 2 with an underground cable XP00A 4x35 with a length of 400m. Alongside these two lighting sections, FeZn earth tape is envisaged to be placed. Over the power cable, plastic protectors will be set, while at a certain depth in the trench a warning tape will be set. According to the photometric calculations, placement of 25 steel light poles with a height of 9m is envisaged on a distance of approximately 35m. The poles will be screwed to steel plates with anchors set on concrete foundations with dimensions 110/110/110cm. Luminaries with LEDs 60W are envisaged to be placed on the light poles.

**Picture 4.** Technical solution for providing road section lighting between Rostushe bridge and the locality called 'Zad chuka'

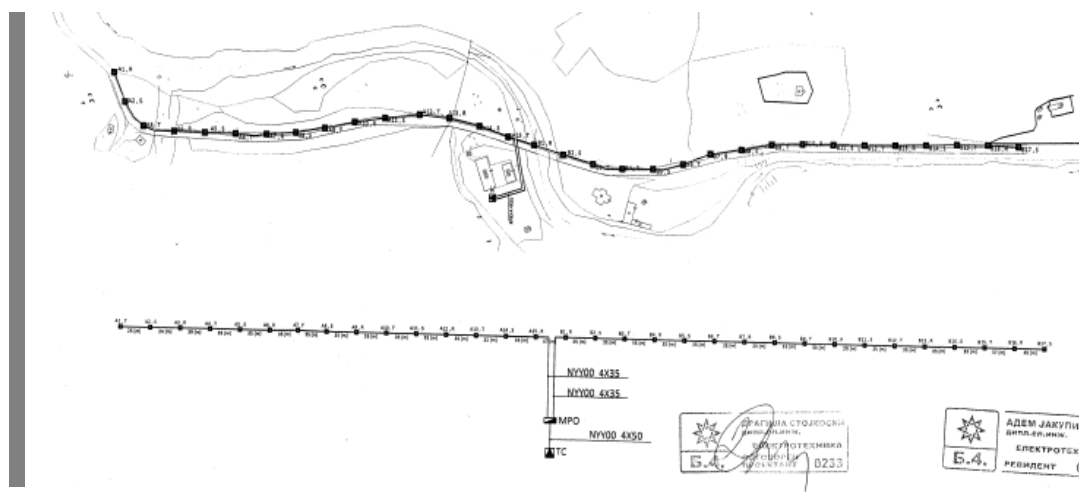


Source: Project's technical documentation

### 3.1.1.2. Road section lighting between Zirovnica bridge and dairy “Boletin”

On this road section on R-409, construction of lighting is envisaged on the right side of the road in the length of  $L = 1,350\text{m}$  (Picture 5). Power supply to the lighting has been planned to be provided from the substation located on a distance of 100m from R-409, next to the former factory of MZT. The usage of the electricity provided is envisaged to be measured through a distributing cabinet (MPO) and power supply cable NYY00 4x50. The technical solution envisages construction of two sections of which section 1 is envisaged to be powered by an underground cable NYY00 4x35 with a length of 750m, while section 2 with an underground cable NYY00 4x35 with a length of 820m. Alongside these two lighting sections, FeZn earth tape is envisaged to be placed. Over the power cable, plastic protectors will be set, while at a certain depth in the trench a warning track will be set. According to the photometric calculations, placement of 32 steel poles with a height of 9m is envisaged on a distance of 35m. The poles will be screwed to steel plates with anchors set on concrete foundations with dimensions of 110/110/110cm. Luminaries with LEDs 60W are envisaged to be placed on the light poles.

**Picture 5.** Technical solution for providing road section lighting between Zirovnica bridge and dairy Boletin



Source: Project's technical documentation

## Concluding remarks

These sections of the regional road R-409 are located near the two largest local communities in the Municipality Mavrovo-Rostushe, i.e. the local communities of Rostushe (the seat of the Municipality) and Zirovnica (the largest community) with high traffic rate especially from the local population of these local communities and the population of other local communities which gravitate around Zirovnica and Rostushe. The realization of this Project will contribute towards better visibility on the road, greater traffic safety, improving the working conditions of existing commercial, sporting and tourist facilities in the area, as well as the opportunity to construct new facilities.

#### 4. ENVIRONMENTAL IMPACT

The Project aims to provide lighting of two road sections on the regional road R-409 in the Municipality Mavrovo-Rostushe. The first section is located between Zirovnica bridge and dairy “Boletin” located in the industrial area of the Municipality Mavrovo – Rostushe (Figure 1, blue line) while the other road section is located between Rostushe bridge and the locality called ‘Zad Chuka’ (Figure 1, green line).



**Figure 1 Location of the road sections between Zirovnica bridge – Dairy Boletin (blue line) and Rostushe bridge – Zad Cuka (green line)**

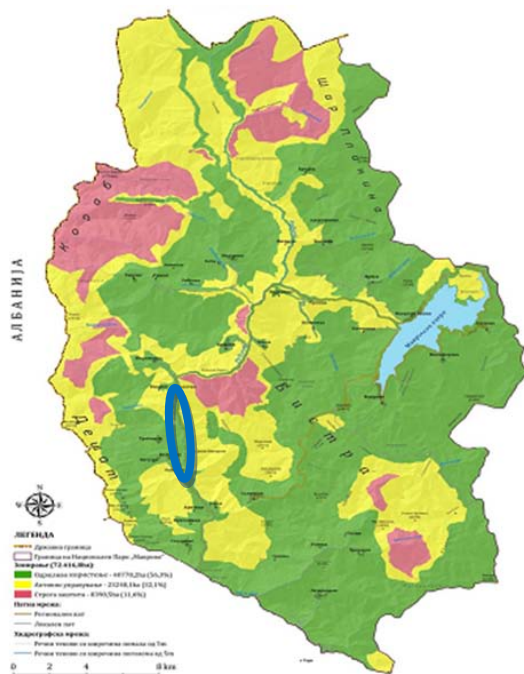
The Project is in-line with the strategic priorities of the Municipality Mavrovo - Rostushe and it will contribute towards achieving the vision of the municipality for providing full coverage of transport, communal and electricity network throughout the municipal territory. The selection of LED technology lights will provide far greater working life of the bulbs, significantly lower electricity consumption, i.e. high energy efficiency thus will contribute to protection of the environment and sustainable development.

The sub-project for the first road section between Zirovnica bridge and dairy “Boletin” from the regional road R-409, assume construction of lighting on the right side of the road in the length of  $L = 1,350\text{m}$ . Power supply to the lighting has been provided from the substation located next to the former factory of MZT on a distance of 100m from R-409. The technical solution envisages construction of two sections of which section 1 is envisaged to be powered by an underground cable with a length of 750m, while section 2 with an underground cable with a length of 820m. According to the main project 32 steel poles will be placed with a height of 9m on a distance of 35m.

The sub-project for the second road section from the regional road R-409, between Rostushe bridge and the locality called “Zad Chuka”, assume construction of lighting on the left side of the road in the length of  $L = 1,100\text{m}$ . Power supply to the lighting would be provided from the substation located next to the planned sport complex. The technical solution envisages construction of two sections of which Section 1 is envisaged to be powered by an underground cable with a length of  $1,000\text{m}$ , while section 2 with an underground cable with a length of  $400\text{m}$ . According to the main project, placement of 25 steel light poles with a height of  $9\text{m}$  is envisaged on a distance of approximately  $35\text{m}$ .

Alongside these lighting sections for the two sub-projects, FeZn earth tape is envisaged to be placed for electricity grounding. Over the power cable, plastic protectors will be set, while at a certain depth in the trench a warning track will be set. The poles will be screwed to steel plates with anchors set on concrete foundations with dimensions of  $110/110/110\text{cm}$ . Luminaries with LEDs  $60\text{W}$  are envisaged to be placed on the light poles.

The two roads - sections are located in the western part of Republic of Macedonia within the borders of the National Park “Mavrovo”(Figure 2). Due to the high diversity of habitat types, species diversity including 115 endemic species – (58 local/national endemic and 57 Balkan endemic species), plenty of vegetation communities (41), flora and fauna diversity and hydrology, unique geomorphology, forestry (25 forest ecosystems), the protected area was classified with status of protection Category II (National Park). The proclamation of National Park “Mavrovo” was done in 1949 and it was re-proclaimed in 1952 when the area was extended to  $72,204\text{ ha}$ .



**Figure 2 Protection Zones within the National Park “Mavrovo” and project area marked in blue**

According the Law on nature protection (Official Gazette No. 67/04, 14/06, 84/07, 35/10, 47/11, 148/11, 59/12 and 13/13) and the Management Plan for the National Park

“Mavrovo “prepared for the period 2012-2021 there are three protection zones (protection regime) refer to the activities allowed: a) Zone with strict protection – 8,390 ha, b) Zone with active management – 23,248 ha and c) Zone with sustainable use – 40,778 ha. These three zones are presented within the Figure 2 where the red colour indicates the zone with strict protection, the green is a zone for sustainable use and the yellow is a zone with active management.

The location of the two road sections on the regional road R-409 that should be lightened belongs to the protection zone for sustainable use that is a part of the National Park with no high value of protection, where there are infrastructural objects (including roads), settlements, agricultural land and buildings. The location of the two road sections could be found within the green zone of protection on Figure 1.

The only adverse environmental impacts of the Project are expected during the construction of lighting of two road sections on the regional road R-409, due to the following activities: a) marking the route for lighting (fundamentals of the pillars) b) excavation of channels for installation of power cable and excavation of fundamentals; c) establishment of concrete fundamentals and binding the pillars with anchors; d) setting power cable; e) installation of the lighting protection and grounding; f) installation of measured lightning distributing cabin with complete equipment; g) establishment of light armature (LED – light of 60W).

The Main Projects documentation proposes 438m<sup>3</sup> ground/soil to be dug for the road section Rostushe bridge - locality called “Zad Chuka” and 598m<sup>3</sup> ground/soil to be dug for the road section Zirovnica bridge - dairy “Boletin”, and after the finalization of works the exceed of ground/soil will be disposed on the municipal landfill. The coordination needs to be established with CSE “Mavrovo” from Municipality Mavrovo - Rostushe, responsible for waste management.

Taking into account that road sections are already in operation more than 40 years and both sections are with small length and they are located within the protection zone of sustainable use, the all potential environmental impacts are expected to be small, with low intensity, local significance and on short-term basis - during the setup of lighting period only. The good construction and installation practice could cover almost all mitigation measures proposed mainly to overcome the OH&S risks for workers and community risks that could appear as a result of frequent traffic on this road in some periods of the year.

The project activities will be limited on the side along the two sections from the regional road R409. All project activities during implementation of street lighting will be initiated by setting up signs in order to maintain safe traffic on regional road.

Before initiating the activities a contract needs to be signed with the Public Communal Enterprise “Mavrovo” in order to take over the produced waste from the site. Contracts should be signed with other authorized companies in order to handle with other waste streams (packaging waste, the waste code 17 04 11 “cables without dangerous substances, waste code 17 04 – Metals, 17 04 05 “iron and steel”, concrete, pipes and other devices). The disposal of any type of waste is not permitted in the vicinity of the road sections where the Project activities will take place due to their surroundings (National Park “Mavrovo”).



During the project activities special attention should be paid to the possible pollution of the river Radika (II class of water quality) passing almost parallel with the roads – sections on R 409. The determination of the water quality status of the main surface watercourses is prescribed by the Law on Water Official Gazette no. 87/08, 6/09, 161/09, 83/10, 51/11 and Decree on classification of waterways, lakes, accumulations and ground waters (Official Gazette No.18/99, 71/99). According several indicators: organoleptic indicators, pH-acidity, dissolved oxygen, mineralization, eutrophication, hazardous substances, etc. surface waters are classified into five classes (Class I is the best quality water, Class V is the worst one). The distance of the river stream to the road is in the range 10-80m, so, special attention should be paid to the protection of water of river Radika from improper waste management during project construction lifetime.

Taking into consideration the fact that the both sub-projects are located within the borders of National Park “Mavrovo” and according the Law on noise protection (Official Gazette No. 79/07, 124/10, 47/11) the National Parks belong to the area with first degree of noise protection and the max. allowed noise level should be 40dB for night and 50dB for day and evening. The project activities are not envisaged during the evenings and nights.

The measures that should apply to protect, avoid and mitigate the adverse impacts of the lighting of both roads sections are provided within the following Environmental Mitigation Plan. The main responsibility for implementation of the mitigation measures lay to the Sub-contractor and Supervisor (nominated by the Municipality) on daily basis. Some of these measures should be applied by the municipality staff (announcement of the traffic regime, recording the waste quantities) and CSE “Mavrovo” dealing with waste management.

The kick off meeting should be organized among all involved parties together with the representatives from the Public Institution “National Park Mavrovo” (main responsibility for management with the National Park) in order to discuss the planned activities and possible additional mitigation measures that need to be follow by the Sub-Contractor.

The Monitoring Plan presents the frequency of monitoring and main responsibilities among all involved during the Project implementation.

**Table 1. Environmental Mitigation Plan**

| Project activity  | Potential impact   | Impact scale   | Proposed mitigation measures   | Responsibility  |
|---|--|--|--|---|
| Marking out the route for construction and installation of lighting for two road sections on the regional road R-409 in the Municipality Mavrovo-Rostushe: (“Rostushe bridge” - locality called “Zad Chuka” and “Zirovnica bridge” - dairy “Boletin”) | <p>Possible adverse social and health impacts to the pedestrians and traffic as well as for the workers due to:</p> <ul style="list-style-type: none"> <li>- Unsafe start of construction works</li> <li>- Injury passing near by the open trench and manholes</li> <li>- Not compliance with health and safety at work procedure</li> </ul> | <p>Local/within the two road sections on the regional road R-409</p> <p>short term/minor</p> | <ul style="list-style-type: none"> <li>• Application of good practice for marking out the construction site for all project activities</li> <li>• Adequate warning tapes and signage need to be provided</li> <li>• Forbidden of entrance of unemployed persons within the fence</li> <li>• Public and occupational health and safety measures should be applied (life jackets, use of proper protective clothing and equipment by employees)</li> <li>• Health protection- first aid kits and medical service on sites</li> <li>• Application of good practice for handling the electricity cables, lights, appliances under voltage (power disconnection during the work to avoid risk of fatal electric shock)</li> </ul> | <ul style="list-style-type: none"> <li>• Contractor –Bidder</li> <li>• Supervisor</li> <li>• Municipality Inspector</li> </ul>  |
| Very limited adverse environmental impacts could be expected due to effects on several environmental elements:  |  |  |  |   |
| Construction and installation of lighting for two road sections on the regional road R-409 in the Municipality Mavrovo-Rostushe (“Rostushe bridge” - locality called “Zad Chuka” and “Zirovnica bridge” - dairy “Boletin”)                            | <b>a) Landscape and visual environment</b>   | <b>Local / short term /moderate</b>  | <ul style="list-style-type: none"> <li>• Good construction practices have to be implemented – including fencing and protection of construction sites according to national legislation on construction</li> <li>• Minimization of the construction area as much as possible along the road (carefully planning and design of the project activity)</li> <li>• Fully clean-up of the sites immediately after accomplishment of the last activity</li> <li>• Collection of the generated waste on daily basis, selection of waste, transportation and final disposal on appropriate landfill (according the type of waste)</li> </ul>  | <ul style="list-style-type: none"> <li>• Contractor –Bidder</li> <li>• Supervisor</li> <li>• Municipality Inspector</li> <li>• Traffic Engineer at the Local self-government</li> </ul> |
|   | <b>b) Air quality</b><br>The construction activities will initiate gases emissions of dust-suspended particulates (PM <sub>10</sub> , PM <sub>2.5</sub> ), emissions from the vehicles and construction machinery  | <b>Local/ short term/major</b>   | <ul style="list-style-type: none"> <li>• The mitigation measures to minimize dust generation during construction will included: <ul style="list-style-type: none"> <li>➢ Construction sites, transportation and materials handling sites should be water-sprayed on dry and windy days, especially due to location in the protection zone for sustainable use as a part of the National</li> </ul> </li> </ul>   | <ul style="list-style-type: none"> <li>• Contractor –Bidder</li> <li>• Supervisor</li> <li>• Municipality Inspector</li> </ul>  |

| Project activity | Potential impact  | Impact scale                          | Proposed mitigation measures   | Responsibility   |
|------------------|---|---------------------------------------|--|--|
|                  | <p>(CO<sub>2</sub>, NO<sub>x</sub>, PAH, SO<sub>2</sub>).</p> <p>The airborne dust will be caused by excavation, vehicle movement and materials handling, particularly around the construction sites.</p> <p>The construction and installation activities may cause traffic congestion.</p> |                                       | <p>Park Mavrovo</p> <ul style="list-style-type: none"> <li>➤ Vehicles and construction machinery will be required to be properly maintained and to comply with relevant emission standards</li> <li>➤ Construction materials and complete equipment for lighting should be stored in appropriate places covered to minimize dust;</li> <li>➤ Vehicle loads likely to emit dust need to be covered</li> <li>➤ Conduction of regular maintenance of the vehicles and construction machinery in order to reduce the leakages of motor oils, emissions and dispersion of pollution</li> <li>➤ Usage of protective masks for the workers if the dust appears</li> <li>➤ Restriction of the vehicle speed within the project activities sites</li> <li>➤ Information to the public about the construction work should be announced through the local radio/TV station for carefully low speed driving near the projects road sections</li> </ul> |  |
|                  | <p><b>c) Noise and vibration</b></p> <p>All project activities, procurement and transport of the equipment for lighting of project sections will cause noise and vibration due to the machinery and vehicles used for transport.</p>  | <p><b>Local/ short term/minor</b></p> | <ul style="list-style-type: none"> <li>• The main mitigation measures related to reduction of noise level and vibration are: <ul style="list-style-type: none"> <li>➤ The equipment should be fitted with appropriate noise muffling devices that will reduce sound level</li> <li>➤ As the project is located within the borders of National Park “Mavrovo” the level of noise should not exceed more than 50 dB during the day and evening and below 40 dB during the night</li> <li>➤ The construction works should be not permitted during the nights, the operations on site shall be restricted to the hours 7.00 - 19.00</li> <li>➤ The vehicles that are excessive shall not be operated until corrective measures have been taken</li> </ul> </li> </ul>  | <ul style="list-style-type: none"> <li>• Contractor –Bidder</li> <li>• Supervisor</li> <li>• Municipality Inspector</li> </ul> |
|                  | <p><b>d) Waste management</b></p>   | <p><b>Local/ short term/minor</b></p> | <p>The good waste management practice should be</p>  | <ul style="list-style-type: none"> <li>• Contractor –Bidder</li> </ul>   |

| Project activity | Potential impact   | Impact scale | Proposed mitigation measures   | Responsibility   |
|------------------|--|--------------|--|--|
|                  | <p>Possible adverse environmental impact and health effects could occur as a result of the following:</p> <ul style="list-style-type: none"> <li>- generation of the different waste streams</li> <li>- inappropriate waste management with those different type of waste</li> </ul> |              | <p>applied through the preparation of Waste Management Plan including:</p> <ul style="list-style-type: none"> <li>➤ Identification of the different waste types that could be generated at the sites (due to the materials used – soil, sand, broken pipes, broken concrete, asphalt, packaging waste, cables, etc.)</li> <li>➤ Classification of waste according the national List of Waste (Official Gazette no.100/05)</li> <li>➤ The main waste would be classified under the Waste Chapter 17 “Construction and demolition wastes (including excavated soil from sites)” with the waste code 17 01 – waste from concrete, 17 05 04 – Excavated soil, 17 09 04 – Mixed waste from construction site, 17 04 11 - cables without dangerous substances, 17 04 -metals, 17 04 05 - iron and steel</li> <li>➤ Small amount of solid municipal waste could be found (food, beverages), as well as packaging waste (paper, bottles, glass, etc.</li> <li>➤ Fulfilment of the Annual Report for non-hazardous waste management by the Mayor of Mavrovo - Rostushe and reporting to the Ministry of Environment and Physical Planning</li> <li>➤ The contract with the company for waste collection and transportation should be signed for collection and transport of waste to the municipal landfill or the landfill for inert waste</li> <li>➤ The construction waste should be re-used once again if it is possible and promptly removed from the sites</li> <li>➤ The materials should be covered during the transportation to avoid waste dispersion</li> <li>➤ The first selection should be performed by types of waste</li> <li>➤ Possible hazardous waste (motor oils, vehicle fuels) should be collected separately and authorized collector and transporter</li> </ul> | <ul style="list-style-type: none"> <li>• Supervisor</li> <li>• Local self-government administration</li> </ul> |

| Project activity   | Potential impact  | Impact scale                    | Proposed mitigation measures   | Responsibility  |
|--|---|---------------------------------|--|---|
|  |   |                                 | should be sub-contracted to transport and finally dispose the hazardous waste  |   |
|  | <p><b>e) Water management</b><br/>Possible water pollution can occur due to improper waste management and loss of upper soil layer due to erosion as a result of construction activities</p>  | <b>Local/ short term/minor</b>  | <ul style="list-style-type: none"> <li>➤ Implement of good construction practice on the site in order to escape placing of any wet concrete in or close to watercourse (river Radika is passing along the regional road R 409) and should be controlled to minimize the risk of leakage into the watercourse</li> <li>➤ Minimize storage of substances harmful to waters (e.g. fuels for construction machinery) on the construction site. Organize proper handling and storage.</li> <li>➤ The road should be kept clean and tidy to prevent the build-up of oil and dirt that may be washed into a watercourse or drain during heavy rainfall</li> </ul>   | <ul style="list-style-type: none"> <li>• Contractor –Bidder</li> <li>• Supervisor</li> <li>• Municipality Inspector</li> </ul>                                |
|  | <p><b>f) Biodiversity</b></p>   | <b>Local/ short term/ minor</b> | <ul style="list-style-type: none"> <li>➤ Planning the project activities to avoid the breeding seasons in living organisms;</li> <li>➤ Limit the speed on the road for the vehicles to avoid collision with the animals.</li> <li>➤ It is not allowed workers to catch animals, destroying habitats, collect eggs from turtles, birds etc.</li> </ul>  | <ul style="list-style-type: none"> <li>• Contractor –Bidder</li> <li>• Supervisor</li> <li>• Municipality Inspector</li> </ul>                                |
| <b>Operational phase</b>   | <ul style="list-style-type: none"> <li>• <b>No environmental risks are expected</b></li> </ul>  |                                 |  |   |
| Replacement of the luminaries with LEDs during the operation of lighting | <p>Adverse environmental impact as a result of the following:</p> <ul style="list-style-type: none"> <li>- Generation of the packaging waste from the new luminaries with LEDs</li> <li>- Generation of waste if any LEDs breaks during the installation</li> </ul> | <b>Local short-term impacts</b> | <ul style="list-style-type: none"> <li>• Identification of the generated waste during the placement of new luminaries with LEDs <ul style="list-style-type: none"> <li>➤ Classification of the packaging waste of new items according the national List of Waste (Official Gazette no.100/05)</li> <li>➤ The packaging waste has been classified under the Waste Chapter 15 “Waste packaging; absorbents, wiping cloths, filter materials” with the waste code 15 01 07 – Glass packaging and 15 01 01 – Paper and cardboard packaging</li> <li>➤ The waste has been identified as a non-hazardous waste that could be recycled</li> </ul> </li> <li>• Separation of the packaging waste from other waste at the site</li> <li>• The placement activities should be finished when</li> </ul> | <ul style="list-style-type: none"> <li>• Municipality staff and the Company subcontracted by the Municipality to maintenance the road and lighting</li> </ul> |

| Project activity  | Potential impact  | Impact scale            | Proposed mitigation measures  | Responsibility   |
|---|---|-------------------------|---|--|
|   |   |                         | all waste is collected - no waste left on location site   |  |
| Regular operation and maintenance of the luminaries with LEDs | <ul style="list-style-type: none"> <li>Possible adverse environmental and health risk due to the broken luminaries with LEDs</li> </ul> | <b>Local short-term</b> | ➤ Perform the periodically checkups and necessary steps need to be taken for safety usage of luminaries with LEDs | <ul style="list-style-type: none"> <li>Municipal staff and the Company subcontracted by the Municipality to maintenance the road and lighting</li> </ul> |

**Table 2.** Monitoring Plan

| What parameter is to be monitored?   | Where is the parameter to be monitored?   | How is the parameter to be monitored?               | When is the parameter to be monitored (frequency of measurement)?  | Why is the parameter to be monitored?  | Cost         |            | Responsibility  |  |
|--|---|---|--|--|--------------|------------|---|--|
|  |   |   |  |  | Construction | Operations | Construction and installation of the lighting of two road sections on the regional road R-409 | Operations of the new luminaries with LEDs |
| <b>Project stage: Start up of the works for lighting of two road sections on the regional road R-409 (marking out the route and construction site)</b> |   |   |  |  |              |            |   |  |
| The safety protection measures applied for the workers (power disconnection, protection personnel clothing)  | On the construction site  | Visual checks                                       | At the beginning of the construction work (first day)<br>Every working day during the project activities | To prevent health and safety risks – mechanical injuries                                   |              |            | Contractor - Bidder /Supervisor<br>Inspector at the Municipality of Mavrovo Rostushe          |  |
| The occupational measures applied for the workers  | On the construction site  | Visual check  | Before start of the project activities and each of working day   | To avoid occupational injuries   |              |            | Contractor - Bidder /Supervisor<br>Inspector at the Municipality of Mavrovo Rostushe          |  |
| Separated hazardous and non-hazardous waste  | On the sites / at two road sections on the regional road R-409 in the Municipality Mavrovo - Rostushe | Visual monitoring and reporting                     | During the installation activities   | To avoid disposal of hazardous waste on municipal landfill                                 |              |            | Contractor - Bidder / Supervisor  |  |
| Fulfilled Annual Report for transportation and disposal of waste   | Local self-government administration  | Review of documentation – Identification waste List | After the accomplishment the task of collection, transportation of waste on daily/monthly basis          | To improve the waste management and hazardous waste management on local and national level |              |            | Mayor of Municipality of Mavrovo Rostushe/CSE “Mavrovo“                                       |  |

| What parameter is to be monitored?   | Where is the parameter to be monitored? | How is the parameter to be monitored?   | When is the parameter to be monitored (frequency of measurement)?                                    | Why is the parameter to be monitored?   | Cost         |            | Responsibility   |   |
|--|---|---|--|---|--------------|------------|--|---|
|  |   |   |  |   | Construction | Operations | Construction and installation of the lighting of two road sections on the regional road R-409                          | Operations of the new luminaries with LEDs        |
|  |   |   |  | To be in compliance with national legal requirements  |              |            |  |   |
| Exposure of loud noise from mechanization and electric tools                                     | On the site                             | Review the noise level technical specifications of the used vehicles and mechanization tools –for their use outside | Before the beginning of the work (first day)   | To protect the workers against exposure to loud noise taking into account the technical specifications of tools and time duration of the work outside           |              |            | Municipality staff/Inspectors  |   |
| Noise level  | On the site                             | Monitoring of the noise levels dB (A) with appropriate monitoring devices   | On regularly basis during the work, through site visits, in accordance with the national legislation | To monitor if the noise level is above/or below the acceptance noise level for that type of area – National Park Mavrovo (50 dB (A) during the day and evening) |              |            | Company authorized to performed noise levels measurements sub-contracted by the Contractor – Bidder/Municipality staff |   |
| Safety traffic through the site where road lighting is positioned                                | At the spot                             | Visual monitoring   | During the working activities  | To ensure the coordinated traffic flow through two road sections on the regional road R-409 in the Municipality Mavrovo-Rostushe                                |              |            | Contractor – Bidder/ Traffic Engineer at Municipality of Mavrovo-Rostushe  |   |
| <b>Project stage: Regular operation and maintenance of regional road R 409 lighting</b>          |   |   |  |   |              |            |  |   |
| Regular operation and maintenance of road R 409 lighting (all parts of the luminaries with LEDs) | At the sites                            | Visual monitoring and check up  | On every six months (winter/summer period)   | To mitigate the adverse environmental and health impacts and to obtain better lighting of the lamps   |              |            |  | Municipal staff and outsourced electrical company |