Assessing the impact of green economy investments in Montenegro:

a sectoral study focused on energy (transport and buildings) and tourism

Summary Report
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Key messages

- **The main results of the simulation analysis indicate that the Green Economy interventions analysed could effectively reduce energy consumption and associated GHG emissions, also reducing energy expenditure in all sectors analysed, while creating employment.**

- **Green Economy interventions offer a positive return on investment.** It is estimated that total avoided costs will surpass total investments by 2017 (indicating an economy-wide 5 year payback time) in the GE12 (12% energy efficiency improvement by 2020) scenario and 2019 in the GE20 (12% energy efficiency improvement by 2020) scenario. The green investments will generate a net savings of 4.16 million euros per year on average during 2012 – 2020 in the GE12 case, and 3.7 million euros per year in the GE20 simulation.
    - The total investment required for 2012-2020 in the GE scenarios reaches about 66.2 million euros (or 7.35 million euros per year on average) in the GE12 scenario and about 140 million euros (or 15.5 million euros per year on average) in the GE20 scenario.
    - Avoided energy costs reach a total of 13.9 million euros for buildings in 2020 (60.5 million euros in total) and 9 million euros for transport in 2020 (43.2 million euros in total) in the GE12 scenario. In the G20 case, avoided costs reach 23.2 million euros for buildings in 2020 (101.3 million euros in total) and 13.2 million euros for transport in 2020 (67.7 million euros in total).

- **Green Economy interventions effectively reduce energy consumption and emissions.**
    - Energy consumption decline relative to BAU by 8.6%-12.5% (transport) and 11.8%-19.2% (buildings) by 2020 in the GE12 and GE20 scenarios respectively.
    - Transport emissions decline to 600,000 – 570,000 tonnes of CO_2e in 2020 (9% - 14% below BAU) in the GE12 and GE20 scenarios, respectively. Power emissions for the residential and services sectors decline by up to 190,000 – 300,000 tonnes of CO_2e in total by 2020 (or 16% - 26% relative to BAU) in the GE12 and GE20 scenarios, respectively.

- **The Green Economy investment simulated reduces energy costs, but more efforts are needed to offset the projected increase in energy prices.** Total energy costs are estimated to be 15% - 26% lower than BAU by 2020 in the GE12 and GE20 scenarios, but still higher than 2006 and 2010. This indicates that, under the assumptions used, incentives and other support measures (a "social protection floor") would be needed particularly for low income groups.

- **Green Economy investments increase employment.** The green economy investments simulated are projected to generate 370 - 730 full time direct jobs by 2020 in the GE12 and GE20 scenarios, respectively, in the buildings and transport sectors. The direct tourism employment would be the same, but indirect employment creation could reach up to 16,000 jobs in sectors involved in tourism's supply chain.

- **Depending on the policies chosen, and the investments targeted, the effectiveness of Green Economy interventions in reducing energy consumption and emissions and in creating jobs varies considerably.**

Introduction[1]

This project was developed by UNDP and UNEP in partnership with the Government of Montenegro to assess the impacts of greening its economy through increase in energy efficiency of the building and transport sectors and promoting domestic supply chains in the tourism sector.

This study is a sectoral pilot project carried out to highlight the potential impact of transitioning to a green economy in the sectors mentioned above. It aims at providing information on (1) the amount of investment required to achieve selected sectoral goals, and (2) the potential impact of investments on energy savings, domestic job creation and income, and greenhouse gas emission reductions. This is a technical analysis that does not aim to address policy and funding options to support the transition to a greener economy. It estimates investment requirements to reach stated goals and the potential consequences of reaching such goals.

The analysis comprises the creation of sectoral simulation models. Three scenarios were simulated to compare a Business as Usual (BAU) and two Green Economy (GE12 and GE20) outlooks. The BAU scenario assumes that current trends would continue until 2020. GE scenarios simulate additional investments and interventions that increase energy efficiency in transport and buildings (particularly emphasizing electricity consumption in buildings), and increase the reliance on domestic supply chains in the tourism sector.

The study does not simulate specific policy interventions, but reviews a range of options that could be employed to create investment opportunities, or leverage public expenditure, focusing on three main intervention areas: capital investment, regulations (e.g., mandates) and incentives (e.g., subsidies). Emphasis is put on the synergies created across policy options, to eliminate weaknesses and make use of the collective strengths of the intervention strategy.

The study was commissioned by UNDP and UNEP, following guidance from the Government of Montenegro. The UNDP team collected national data and supported communication with national stakeholders.

[1] All real (constant) monetary values presented in this report use 2000 as the base year.

Scenarios

Three main scenarios have been simulated and analyzed.

- A *Business as Usual (BAU)* case that incorporates historical and present trends, as well as policies and interventions currently active and enforced[2].
- Two *Green Economy (GE)* scenarios, simulating additional interventions that:
    - Reduce energy consumption and energy intensity in the transport, buildings (with an emphasis on improving the energy efficiency of electricity consumption) and tourism sectors;
    - Evaluate the impacts of increased domestic supply chains in the tourism sector.

The two green economy scenarios differ only in the target for energy efficiency, more ambitious in the GE20 scenario than in the GE12 case.

- Scenario GE12: 12% improvement by 2020 (extending the target of 9% by 2018 set in the *Energy Efficiency Action Plan).*
- Scenario GE20: 20% improvement by 2020 (proportionally increasing the effort of G_12, by 66% -or the difference between a 12% and a 20% energy efficiency improvement).

The sectoral allocation of energy efficiency improvement follows the *Energy Efficiency Action Plan*:

- Buildings: 92% (households: 45%; services: 37%). Interventions emphasize electricity consumption (representing about 65% of energy consumption in buildings, with the remainder being primarily biomass). This is due to the lack of data on potential fuel switching (biomass to electricity), and the economic cost of biomass consumption.
- Transport: 8%.

Assumptions

Macroeconomic drivers include (1) energy prices (assumed to grow following the trend of the last 10 years), (2) population (assumed to grow at 0.2% per year, also following the historical trend); (3) real GDP (assumed to grow at 3% per year, the base scenario of the Montenegro Pre-Accession Economic Programme).

Buildings

In the buildings sector specific interventions are not simulated separately, but possible interventions to improve energy efficiency could include improved thermal insulation of residential buildings and increased share of heat pumps (UNFCCC Communication).

[2] The already defined energy efficiency target improvement of 9% by 2018, is excluded by the BAU scenario and instead assessed in the GE scenario. This is because the target is not mandated (i.e., enforced) and because it refers to an intervention that can be considered leading to a greener economy.

Employment creation in the buildings sector is calculated using an energy efficiency employment multiplier. This multiplier is 0.59 jobs per GWh of energy consumption avoided (based on a study from Wei et al. (2010), adjusted for national average labor intensity).

The energy efficiency intervention cost, calculated using a carbon abatement cost of $50/ton (based on IEA estimations) represents only the cost of intervention. In other words, the avoided energy consumption resulting from the investment is not included in this estimate, which only accounts for the cost of intervention (e.g., better building insulation).

Transport

The interventions simulated in the transport sector include higher road vehicle efficiency for conventional thermal engines, introduction of engines that can accommodate the use of biofuels and electricity and alternative fuel technologies, and the implementation of transit oriented development plans that would support the expansion of public transport.

More specifically, in order to reach the goal of energy efficiency improvement, the analysis includes:

- Gradual transition to low carbon vehicles -up to 4% of the stock by 2020-
- Expansion of the public transport network with hybrid buses (euro 1 M per year)
- Urban development factor: 5% (assumed, based on possible trends of urbanization and transit oriented development plans)

The additional cost of low carbon vehicles is assumed to be 4,129 Eur/vehicle (based on IEA, 2011). This value represents the additional cost of purchasing a low carbon vehicle (e.g., hybrid, electric or efficient thermal engine) relative to a vehicle with a conventional thermal engine.

The average fuel efficiency of low carbon vehicles is assumed to be 3 Kg of oil equivalent per 100 km (based on IEA, 2011). This assumption considers the current average efficiency of hybrid engines, averaging 3 kg of oil equivalent/100 km (or 3.6 liters/100 km). The Toyota Prius currently consumes 4.7 liters/100 km with a hybrid 1,800 cc engine.

Finally, regarding the investment in public transport, the average cost of hybrid buses is assumed to be in the range of 112,500 (used) - 450,000 (new) Eur/bus, based on expert opinion.

Tourism

Interventions in the tourism sector, on top of energy efficiency investments (already included in the buildings sector) include the expansion of the domestic supply chain. Options to create the enabling environment for increased investment include overcoming barriers in the areas of (1) private-sector orientation; (2) destination planning and development; (3) fiscal and government investment policies; (4) finance and investment; (5) local investment generation. Unfortunately, the cost of such interventions could not be estimated at this stage. On the other hand, scenarios are simulated to evaluate the potential benefits of such interventions, in case the target stated is reached.

The main assumptions utilized to simulate the impact of increasing the reliance of the tourism sector on the domestic supply chain include the following:

- Employees employed per room: 0.6 employees/room (based on WTTC-MONSTAT)
- Indirect employment, or employment in sectors that support (and depend on) the tourism sector. Employment per Eur of sectoral GDP: 0.0253 (based on WTTC-MONSTAT)
- Domestic supply chain multiplier, or Eur of value added generated in domestic supply chain for each Eur of value added created in the tourism sector: *0.33 (BAU scenario) - 0.7 (GE scenario)*. This value is based on the Howarth Hotel Industry Survey.
- Imported goods from indirect spending multiplier, or Eur of value added generated by importing goods for each Eur of value added created in the tourism sector: *0.45 (BAU scenario) – 0.1 (GE scenario)*. This value is based on the Howarth Hotel Industry Survey.

Methodology for the estimation of the investment requirement

The energy efficiency investment in the buildings sector is estimated by (1) calculating GHG emissions reduction by meeting the energy efficiency target; and (2) multiplying the GHG emission reduction amount by the emission reduction cost per Ton ($50/ton, estimated by the IEA as the global average cost for the building sector) to obtain the investment value.

In the transport sector, in the absence of a specific energy efficiency plan, and with a very broad range of possible interventions and related costs, an emission abatement value could not be utilized. As a consequence, selected interventions (and their specific costs) were simulated, to calculate the investment needed to reach the efficiency target stated.

In the tourism sector, the cost of intervention to increase the reliance on the domestic supply chain could not be estimated. As a consequence, the simulations should be considered as "What if" scenarios, with interventions aimed at reducing the import of goods in favor of domestic (and more local) production. Specifically, the goal is to transition from approximately a 70% import ratio to about 30% by 2020.

Summary of Results

The main results of the analysis indicate that the Green Economy interventions analysed would effectively reduce energy consumption and associated GHG emissions (which are projected to slightly decline over time), also reducing energy expenditure in all sectors, while creating employment. These main impacts have several ramifications across sectors, which would vary in strength and relevance depending on the policies and mechanisms utilized to reach the goals projected in this study.

Table 1 introduces the main changes in the GE scenario relative to BAU, with emphasis on the impacts generated by green economy interventions.

Table 1: Qualitative comparison of selected sectoral indicators, GE vs. BAU scenario.

VARIABLE NAME	GE vs. BAU	INTERPRETATION
BUILDINGS		
Total residential and services power demand	↓	With energy efficiency investments in buildings (residential and services sectors) energy demand is projected to decline by about 12% below BAU by 2020 in the GE12 case. This reduction of demand is projected to reduce energy costs and increase employment (required to implement energy efficiency investments). Investments are projected to be paid back in the short term, with a negative cost over the lifetime of the interventions.
Residential total energy demand	↓	
Residential power demand	↓	
Residential others demand	↓	
Services energy demand	↓	
Services power demand	↓	
Services others demand	↓	
Green Economy energy efficiency employment	↑	
TRANSPORT		
Total transport average fuel efficiency	↑	Green Economy investments in the transport sector are implemented to improve energy efficiency of private and public vehicles, expand the public transport network and reduce unnecessary use of private vehicles. Coupled with spatial planning, which would increase impact and effectiveness; these investments reduce energy consumption and costs, as well as emissions and transport-related accidents. Costs are expected to be medium/high, and policies need to be carefully designed to reduce the burden (of both action and inaction) on households.
Total km driven (public and private)	↓	
Total km driven passenger vehicles	↓	
Total km driven public transport	↑	
Total transport energy consumption	↓	
Total passenger vehicle energy consumption	↓	
Total public transport energy consumption	↓	
Total transport emissions CO2e	↓	
Total transport-related accidents	↓	
TOURISM		
Tourism GDP	↑	Tourism Green Economy investments are aimed at lowering energy consumption and costs, as well as at strengthening the supply chain by stimulating the development of domestic production. While cost estimates for the development of a local supply chain could not be calculated, potential direct, indirect and induced GDP impacts were estimated, indicating that about 150 million Eur could be generated when replacing a portion of imports with the domestic supply chain. This estimation provides a basis for the evaluation of intervention options (e.g., potentially setting a limit for intervention costs), which could include more effort in marketing the tourism sector as sustainable and bringing value to local communities.
Total contribution of tourism to GDP	↑	
Direct contribution of tourism to GDP	↑	
Total tourism revenues	↔	
Total tourism costs (purchases by tourism providers)	↓	
Indirect contribution of tourism to GDP	↑	
Capital investment	↔	
Domestic supply chain	↑	
Government collective spending	↔	
Imported goods from indirect spending	↓	
Induced impacts	↑	
Total tourism employment (direct and indirect)	↑	
↑: Increase ↓: Decrease ↔: No Obvious Change		

More detailed results are presented for (1) investments and avoided costs, (2) energy consumption and emissions, (3) employment and cross sectoral impacts.

Investment and avoided costs

The total investment required for 2012-2020 in the GE scenarios:

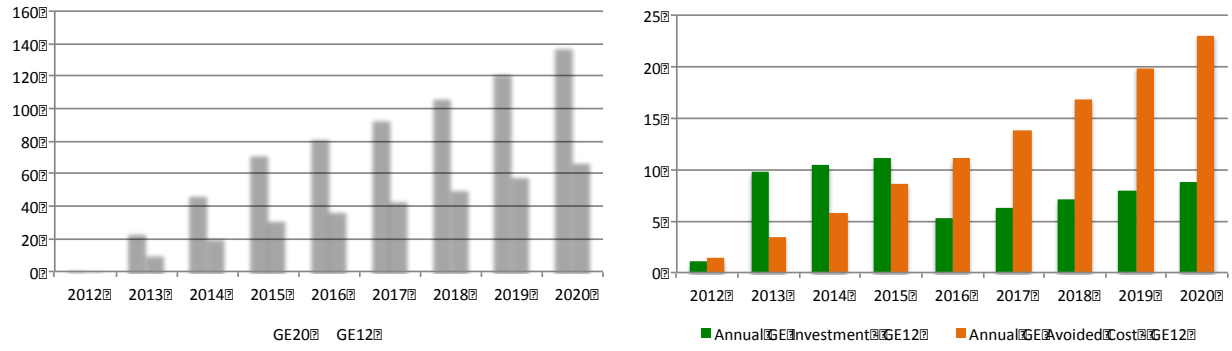
- GE12: Reaches about 66.2 million euros (or 7.35 million euros per year on average).
  - 32 million euros are allocated to the buildings sector in total, or 3.5 million euros per year (including energy efficiency improvements to be achieved in the tourism sector).
  - 34.2 million euros to the transport sector, or 3.8 million euros per year on average.
- GE20: Reaches about 140 million euros (or 15.5 million euros per year on average).
  - 57 million euros are allocated to the buildings sector in total, or 6.3 million euros per year (including energy efficiency improvements to be achieved in the tourism sector).
  - 82 million euros to the transport sector, or 9.1 million euros per year on average.

Avoided energy costs reach a total of:

- G12: 13.9 million euros for buildings in 2020, 60.5 million euros in total. 9 million euros for transport in 2020, 43.2 million euros in total.
- G20: 23.2 million euros for buildings in 2020, 101.3 million euros in total. 13.2 million euros for transport in 2020, 67.7 million euros in total.

Worth noting, the timeframe of analysis does not allow us to calculate the avoided cost over the lifetime of the investment (e.g., a vehicle would normally be used for 14 years, while our analysis calculates avoided costs for 8 years).

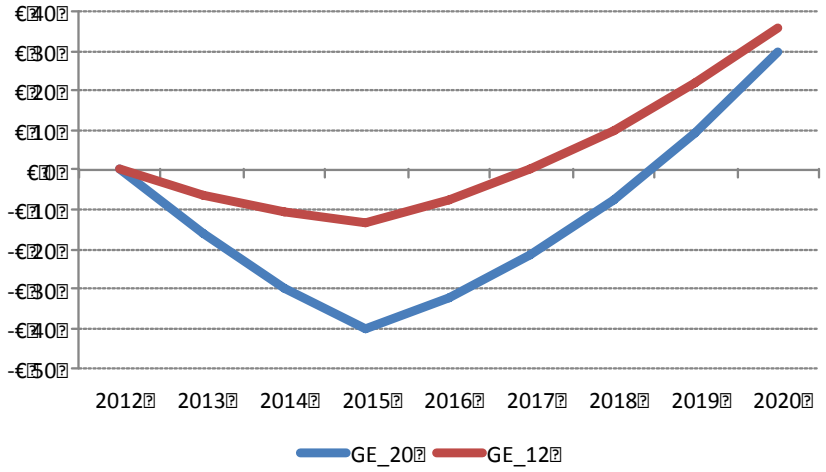
Figure 1 and 2: Total cumulative investment (million euros, left) GE12 and GE20 scenarios; annual investment compared to avoided energy costs in the GE12 scenario (million euros, right).



It is estimated that total avoided costs will surpass total investments by 2017 (5 year payback time) in the GE12 scenario and 2019 in the GE20 scenario. The green investments will generate a net saving of 4.16 million euros per year on average during 2012 – 2020 in the GE12 case, and 3.7 million euros per year in the GE20 simulation.

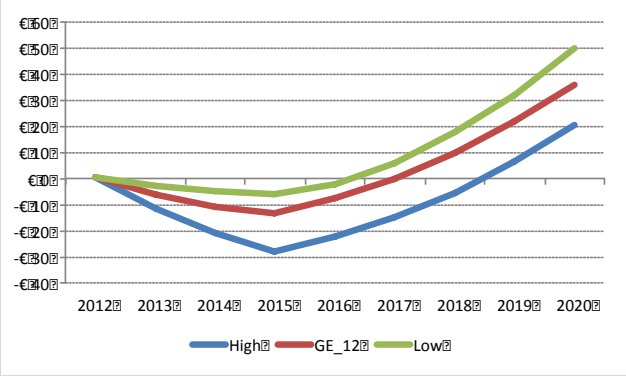
In addition, 2.66 – 5.25 million euros of income from direct employment would be created in the transport and buildings sectors in the year 2020 alone, for the GE12 and GE20 scenarios respectively, increasing the overall benefit of GE investments. Income from interventions in the tourism sector are not considered in this calculation as the investment to improve the domestic supply chain could not be estimated.

Figure 3: Chart comparing total investment and avoided costs (cumulative). The break even point is reached in 2017 and 2019. The red and blue lines (million euros) are calculated as the difference between avoided cost and investment.



Box 1: The cost of intervention could be very different depending on which specific intervention -and policy- is chosen.

Based on our analysis, the variability in results could be considerable, both for the investment and avoided costs. A more detailed (but still integrated) analysis should be carried out to support policy formulation once more concrete longer term plans are available.



Energy consumption and emissions

It is estimated that energy consumption will decline relative to BAU by 8.6% - 12.5% (transport) and 11.8% - 19.2% (buildings) by 2020 in the GE12 and GE20 scenarios respectively. The absolute reduction (energy saving) reaches about 52 ktoe by 2020 relative to BAU in the GE12 scenario and 74 ktoe in the GE20 case.

It is also estimated that transport emissions will decline to 600,000 – 570,000 tonnes of CO_2e in 2020 (9% - 14% below BAU) in the GE12 and GE20 scenarios respectively. Or below 3 tonnes of CO_2e generated on average per vehicle per year (1.9 and 2.7 in the GE cases).

Power emissions for the residential and services sectors decline by up to 190,000 – 300,000 tonnes of CO_2e in total by 2020 (or 16% - 26% relative to BAU) in the GE12 and GE20 scenarios.

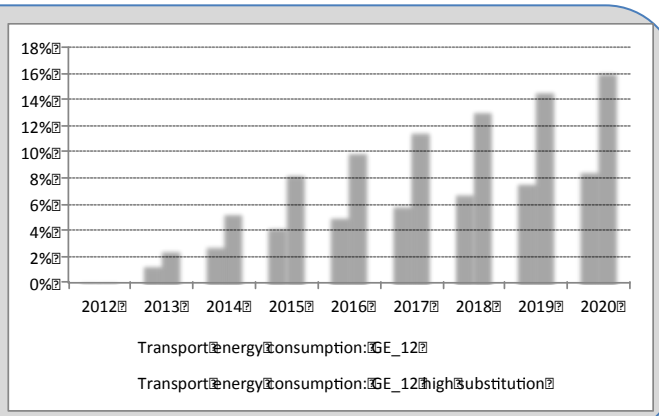
Total energy costs, calculated as energy consumption times market price, are estimated to be 15% - 26% lower than BAU by 2020 in the GE12 and GE20 scenarios. On the other hand, in both simulations, energy costs are projected to be higher than 2006 and 2010 values.

This indicates that, under the assumptions used, investments in energy efficiency to reach the stated targets would mitigate the expected increase in prices, but not completely offset it. In

this respect, support measures would likely be needed for low income groups, to reduce the impact of increasing energy costs on disposable income.

Box 2: Depending on the effectiveness of public transport interventions, the impact on energy consumption could change considerably.

The chart on the right compares the GE scenario with an alternative case, 20x more effective, assuming that public transport targets very frequented areas (e.g., north-south, east-west in Podgorica).



Employment and cross sectoral impacts

The green economy investments simulated are projected to generate 370 - 730 full time direct jobs by 2020 in the GE12 and GE20 scenarios in the buildings and transport sectors. 170 – 410 direct jobs would be created in the transport sectors (using the assumption that 5 jobs would be created per million euros invested) and 200 – 320 from energy efficiency. The direct tourism employment would be the same, as interventions are aimed at increasing energy efficiency (with the employment potential being considered in the energy sector) and at stimulating economic activity in the supply chain.

The potential indirect employment creation in the tourism sector is projected to be considerable. Using statistics on direct and indirect tourism employment for Montenegro from the World Travel and Tourism Council (WTTC), the potential employment creation reaches 16,000 jobs in the Green Economy scenarios. These jobs would be created in the sectors being part of the supply chain of the tourism sector (such as agriculture and food production, construction, logistics, etc.), but specific estimates could not be carried out due to the lack of sub-sectoral data.

Box 3: The creation of employment varies considerably depending on the type of investment and policy chosen.

Several studies indicate that the potential job creation from investments in public transport infrastructure (such as railroads and tram/metro systems) is considerably higher than interventions targeting passenger cars.

Assuming that the same investment amount simulated in the GE scenarios would be allocated to the expansion of the rail network, employment creation would grow up to 6,600 jobs by 2020 (or about 80 jobs per million euros invested).

From an economic perspective, the jobs created could potentially generate up to 2.66 – 5.25 million euros of income in 2020 in the two GE scenarios. Close to 120 million euros of income could be created in the tourism sector (indirect -supply chain- employment), if interventions to stimulate the domestic supply chain are successful.

The tourism sector is particularly relevant for ripple effects to other sectors of the economy. With investments in energy efficiency, energy costs are projected to decrease, although their

impact is limited due to the considerably proportionally higher costs of capital, labor and materials (especially if calculated on a per room basis). Of more economic relevance, concerning the indirect contribution of tourism to the economy, is the potential to make use of local supply chains. It is estimated that currently about 35 euro cents per each euro of GDP in the tourism sector reach the domestic supply chain in form of local GDP. It is estimated that for every EURO of GDP generated by the tourism sector, 35 EUR cents are spent on the domestic supply chain, while 45 EUR cents are spent on imported goods. If the amount spent on imported goods could be reduced to 15 cents per EUR of GDP as it was in 2006 and 2007, and the reliance of domestic supply chain could be expanded proportionally, the indirect contribution of tourism to GDP could grow by over 150 million euros in 2020, or close to 67 million euros per year on average between 2012 and 2020. While the costs of this intervention could not be estimated at this stage, it is relevant to evaluate the potential benefits to provide a basis for policy design and evaluation. With additional detail, also on the characteristics of the local supply chain options in different regions of the country, inputs could be disaggregated further (e.g., food and construction materials) to better evaluate the potential for local development and impact, especially in relation to quality and reliability of supply.

Limitations

Despite the fact that most results are presented without a range of confidence, it has to be noted that all tables include the median result of the simulations and that uncertainty has to be considered, for two main reasons:

- Data availability and quality is uneven across the variables and sectors analysed. Further, certain indicators were calculated using existing literature that may use assumptions that may not apply to the specific socio-economic and environmental context of Montenegro (e.g., transport and energy efficiency employment).
- Most of the results projected assume the correct and effective implementation of investments and/or regulatory measures up to 2020. Since the future development of the sectors analysed depends on the specific policies and interventions implemented, projections may change considerably if a different mix of interventions is simulated. Identifying the best intervention options is beyond the scope of this study, as a consequence it is wise to utilize a range of results (only median values are presented in this report), rather than rely on a single point estimation.

Further, this study has the following characteristics:

- A sectoral analysis does not fully capture synergies (opportunities) and side effects (challenges) at the macroeconomic level.
- An aggregated geographical analysis, with no geographical disaggregation, misses on the creation of several insights for effective policy formulation.

Possible next steps to inform decision making on the impacts of selected interventions include the creation of an integrated macro model that would make it possible to fully estimate the

direct, indirect and induced impacts of policies across a larger number of sectors. In addition, more detailed sectoral studies could be developed, to run and test the effectiveness of potential regional and local pilot projects. In this respect, data collection efforts should be prioritized, as a more detailed analysis would require more data, while a more cross-sectoral study would inform and support data collection efforts by identifying priority areas and potential consistency issues.

Conclusions

The study provides an estimation of sectoral and cross-sectoral impacts of GE investments. From an economy-wide perspective, benefits are projected to outweigh costs, especially for energy efficiency interventions in buildings.

More detailed (but still integrated) studies would be needed to evaluate the specific impacts of interventions (investments and policies) on regions, population and income segments. Generally there are four main ways to influence future trends in order to reach stated goals: (1) voluntary behavioral change, (2) capital investment, (3) public targets mandated by law, and (4) incentives (such as tax reductions and subsidies).

The interventions analyzed in this study would therefore require policy packages that include mandates/targets (e.g., fuel efficiency standards for passenger vehicles), incentives for supporting the transition (e.g., tax rebates for the purchase of energy efficient appliances) and capital investments for process improvements (e.g., investments in renewable energy, such as solar water heaters or green procurement and the retrofit of public buildings).

The choice of policy and instruments will impact not only the probability to reach stated goals and targets, but also the total costs of interventions and how these costs are going to be allocated across the different actors in the economy. Similarly, policies will determine how benefits will be accrued. The goal is to find a strategy to balance funding responsibilities, sharing benefits with all actors of society and the economy, while providing a social protection floor to low income and disadvantaged families.

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