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Срок реализации:
27.10.2016-26.10.2021 гг.

United Nations Development Programme
Country: Belarus

PROJECT DOCUMENT

Project Title:	Belarus: Supporting Green Urban Development in Small and Medium-Sized Cities in Belarus
UNDAF Focus area:	Focus area 3: Environmental sustainability is increased.
Expected UNDAF Outcome:	Outcome 3.1 "National capacity to mitigate and adapt to climate change enhanced"
Executing Entity:	Ministry of Natural Resources and Environmental Protection of Belarus (MoNREP)
Implementing Entity:	UNDP

Brief Description

The objective of the Project is the growth of development of green urban development plans and pilot green urban development initiatives related to energy efficiency and sustainable transport in small and medium cities in Belarus. This objective will be achieved through 4 components: i) Development and adoption of green urban development plans; ii) Development of pilots on sustainable urban transport in Novopolotsk and Polotsk; iii) Development of pilots on energy efficiency in Novogrudok; and iv) Replication mechanisms for green urban development in Belarus. The Project will be implemented over a 5-year period and is expected to generate lifetime direct GHG emission reductions of 77.8 ktonnes of CO_2 equivalent through improved urban transport efficiencies in the cities of Polotsk and Novopolotsk and 13.3 ktonnes of CO_2 equivalent through energy efficiency pilots in Novogrudok municipality. Indirect emission reductions (top-down and bottom-up) will range from 25.2 to 231 ktonnes of CO_2 equivalent.

Programme Period:	2011 - 2015
Atlas Award ID:	00081828
Project ID:	00090983
PIMS #	4981
Start date:	12 October 2015
End Date	11 October 2020
Management Arrangements	NIM
PAC Meeting Date	4 December 2014

Total resources required	$ 15,526,420
Total allocated resources:	$ 15,526,420
Project Budget:	
GEF	$ 3,091,000
Parallel co-financing	
○ UNDP ongoing project	$ 3,000,000
○ MoNREP	$ 150,000
○ MoAC (IRUP)	$ 300,000
○ Municipalities	$ 8,495,000
○ EU Project in Polotsk	$ 377,420
○ NGO BTU	$ 113,000

Ministry of Natural Resources and Environmental Protection of the Republic of Belarus:
Mr. Andrei M. Kovkhuto
Minister

Date/Month/Year

UNDP:
Ms. Ekaterina Paniklova
Deputy Resident Representative

30 OCT 2015

Date/Month/Year

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ACRONYMS

Acronym	Meaning
APR	Annual project review
AWP	Annual work plan
BAU	Business-as-usual
BTOR	Back-to-office report
BTU	Belarusian Transport Union
CC	Climate change
CCM	Climate change mitigation
CDM	Clean Development Mechanism
CHP	Combined heat and power
CoM	Covenant of Mayors
CO	Country office
CP	Country Programme
CPAP	Country Programme Action Plan
CPD	UNDP Country Programme Document
DEE	Department of Energy Efficiency of the State Committee for Standardization
EE	Energy efficiency
EIAs	Environmental Impact Assessments
EMIS	Energy management information system
EOP	End of Project
EU	European Union
FY	Fiscal year
GDP	Gross Domestic Product
GEF	Global Environment Facility
GHG	Greenhouse Gases
GIZ	German International Assistance
GJ	Gigajoules
GUD	Green urban development
GUDP	Green urban development plan
HACT	Harmonized Approach to Cash Transfers to Implementing Partners
IE	Implementing entity
IRUP	Belarusian Institute for Regional and Urban Planning
kgoe	Kilogram oil equivalent
ktonnes	Kilotonnes
kWh	Kilowatt hours
LED	Light emitting diode
LULUCF	Land use, land-use change and forestry
M&E	Monitoring and evaluation
MDG	Millennium Development Goals
MJ	Megajoules
MoAC	Ministry of Architecture and Construction
MoE	Ministry of Economy

Acronym	Meaning
MoF	Ministry of Finance
MoNREP	Ministry of Natural Resources and Environmental Protection
MoT	Ministry of Transport
MPa	Megapascal (a unit of pressure)
Mt	Million tonnes
mtoe	Million tonnes of oil equivalent
MWh	Megawatt-hour
NGUDP	National Green Urban Development Plan
NIM	UNDP's National Implementation Modality
NPD	National Project Director
PB	Project Board
PIR	Project Implementation Report
PMU	Project Management Unit
PPG	Project preparation grant
ProDoc	UNDP Project Document
QPR	Quarterly progress report
R&D	Research and Development
RCU	UNDP Regional Coordination Unit
RES	Renewable energy sources
RTA	Regional Technical Advisor
SBAA	Standard Basic Assistance Agreement
SEAP	Sustainable Energy Action Plan
SME	Small-to-medium enterprise
TA	Technical assistance
TJ	Tera joules
TOE	Tons of oil equivalent
ToR	Terms of Reference
UNDAF	United Nations Development Assistance Framework
UNDP	United Nations Development Programme
UNECE	United Nations Economic Commission for Europe
UNFCCC	United Nations Framework Convention on Climate Change
WB	World Bank

Currency Equivalents[1]

Currency Unit	=	Belarusian Ruble, BYR
1 USD	=	BYR 9,724

[1] www.oanda.com (exchange rate effective March 1, 2014)

SITUATION ANALYSIS

Context and Global Significance

1. The Republic of Belarus is a landlocked country in Eastern Europe bordered by Russia, Ukraine, Poland, Lithuania, and Latvia with a population of 9.5 million. The capital city is Minsk and other major cities include Brest, Grodno, Gomel, Mogilev, and Vitebsk. Over forty percent of the 207,600 square kilometers of the country is covered in forests. The strongest economic sectors are service industries and manufacturing. The majority of the population lives in cities and the country is highly urbanized. The Government of Belarus is an Annex I Party to the UNFCCC since the year 2000 and is a Party to the Kyoto Protocol since 2005. The Government of Belarus also signed up to the Copenhagen Accord (2009) and pledged to reduce GHG emissions to 10% below 1990 levels by the year 2020[2]. The Government of Belarus also supports the negotiation and agreement of a successor instrument to the Kyoto Protocol.

2. With the Belarusian economy steadily growing annually at an average rate of 7.3% from 1996 to 2006, energy consumption of the country has also grown steadily from 19,077 ktoe in 1996 to 20,360 ktoe in 2006, and peaking at 22,995 ktoe in 2012[3]. This represents an average increase of energy consumption of 0.7% during the 1996-2006 period, and 1.1% during the 1996 to 2012 period. Real GDP growth averaged 3.8% during the 2009-2012 period[4]. Electricity consumption during this period, however, only grew an average of 2.4%[5].

3. Economic growth is determined by a combination of factors: the targeted and socially oriented economic policy of the state, favourable market conditions in the Russian Federation and EU countries for the export of Belarusian goods and an increase in labour productivity. The energy sector, including the fuel, petrochemical and electricity subsectors, has played a key role in the recovery and growth of Belarus' economy.

4. Belarus is a typical transit country. Due to the geographical location of Belarus, its energy infrastructure is important for the energy security of Europe. Belarus is located between Western Europe, the Russian Federation and other post-Soviet countries and has developed an infrastructure for the transportation of oil, oil products, natural gas and the transmission of electricity. These factors determine the key principle of the state energy policy: providing for energy security through changes in the fuel and energy mix with the rational use of energy resources, maximising local fuels and renewable energy sources (RES) use and introducing energy efficient and clean technologies in all sectors of the economy. Energy saving and energy efficiency were made the priorities of the state energy policy.

5. From 1990-1995, GHG emissions sharply decreased by 40.4% due to a significant deterioration in economic development rates. From 1995-2000, a 4.4% reduction in emissions was caused by changes in the fuel and energy mix (an increase in natural gas

[2] This was subsequently amended in the Doha Amendment to the Protocol, wherein Belarus has pledged to cut its GHG emissions by 12% below 1990 level during 2013-2020. (http://unfccc.int/files/kyoto_protocol/application/pdf/kp_doha_amendment_english.pdf)
[3] IEA Energy Statistics
[4] http://trade.ec.europa.eu/doclib/docs/2006/september/tradoc_111480.pdf
[5] From the Statistical Yearbook of the Republic of Belarus 2013, pg 303, and available on http://belstat.gov.by/homep/en/publications/year/2013/about.php

share and reduction in consumption of heating oil and coal) and GDP structure (an increase in the share of the services sector and other sectors not related to GHG emissions), as well as energy saving efforts. The period of 2000-2010 is characterized by activities focused at improving the efficiency of fuel and energy use and the introduction of renewable energy sources into the fuel and energy mix, which stabilized GHG emissions against an insignificant increase in the gross consumption of fuel and energy and considerable GDP growth.

6. In 2009, when the world economy experienced a very severe recession, Belarus' economy stayed afloat. In spite of the worsening conditions for the energy supply during the financial crisis and the contraction of the demand on external markets, the country managed to avoid a sharp deterioration in the living standards of the population, shutdowns and an increase in unemployment due to a shift in the consumption focus in the domestic market. The economic policy during the crisis focused on boosting of internal demand, changes in the added value structure in economy sectors, significant growth of this indicator in the construction sector and intensive development of housing construction..

7. In 2011, Belarus faced new challenges that threatened sustainable development of the national economy. These challenges coupled with existing factors that were having a destabilizing effect (with regards to inefficient sectoral structure of production and heavy reliance on imports) resulted in currency market instability, the devaluation of the Belarusian Ruble and high inflation. However, the economic growth was 5.3% in 2011 which had the impact of increasing export volumes to a maximum mainly due to supplies of Belarusian goods (mainly oil products) to EU countries.

8. According to the chapter "Ecological Effect" of the National Energy Saving Programme for 2011–2015, the combustion of fossil fuels is responsible for over 65% of the total GHG emissions and about 95% of CO_2 emissions in Belarus. This rationalizes the Programme's measures aimed at improving energy efficiency in energy production and consumption and reducing energy losses. These measures should help Belarus to comply with GHG emissions targets of the Kyoto Protocol, and provide the basis for Belarusian activities on reducing the unit consumption of hydrocarbon fuel. According to the Biennial Report of Belarus submitted to UNFCCC in December 2013, the net GHG emissions in CO_{2eq} in Belarus in 2011 (excluding land use, land-use change and forestry (LULUCF)) was 87.3 Mt, 37.3% lower compared to the 1990 base year emissions[6].

9. The energy sector is responsible for the majority of GHG emissions. In 1990, GHG emissions in the sector totaled 102.24 Mt in CO_2 equivalent, or 74% of the total emissions. In 2010, GHG emissions in the energy sector totaled 56.44 Mt in CO_{2eq} (63%), including in electric power with 31.77 Mt in CO_{2eq} (36%), industry and construction with 8.14 Mt in CO_{2eq} (9%), transport with 5.28 Mt in CO_{2eq} (6%), agriculture with 22.58 Mt in CO_{2eq} (25%) and wastes with 6.18 Mt in CO_{2eq} (7%).

10. Currently, the major consumer of energy is the residential sector, with a share exceeding 32%. The increase in final energy consumption by the residential sector is mainly due to active housing construction supported by the encouraging state policy. In addition, more efforts are being made to implement the thermal modernisation of existing housing and to construct new energy efficient buildings. Heat dominates with respect to energy

[6] http://unfccc.int/national_reports/biennial_reports_and_iar/submitted_biennial_reports/items/7550.php

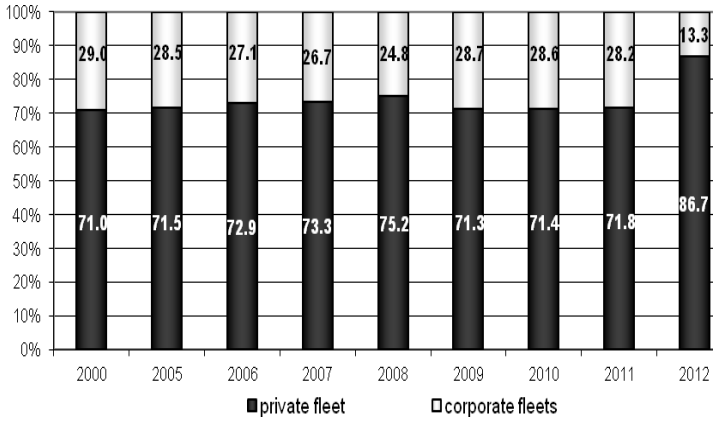
consumption due to the high level of development of district heating in the country. Most of this consumption occurs within urban areas of Belarus under the governance of municipalities. With the emphasis on the National Energy Savings Programme, there are a number of municipalities making strong initiatives to reduce their energy consumption. This includes a number of municipalities in Belarus including Polotsk and Novogrudok, who are signatories to the Covenant of Mayors and being proposed for GEF support as potential green cities[7]. Fuel consumption by sector is provided on Table 1.

Table 1: Total Fuel Consumption in Belarus by Sectors (Mtoe)[8]

Sector	1990	1995	2000	2005	2006	2007	2008	2009
Residential	5.124	4.965	5.379	5.928	6.261	5.973	5.970	5.914
Industry	9.564	4.537	4.921	5.119	5.200	5.299	5.479	4.744
Commercial and public services	4.478	2.675	1.913	2.017	1.988	1.848	1.705	2.077
Transport	3.661	2.076	1.953	1.996	2.212	2.295	2.533	2.538
Agriculture/forestry	2.221	1.265	1.070	1.015	1.085	1.120	1.227	1.098
Non-energy use	9.320	2.762	3.011	3.222	3.989	3.723	3.052	3.031
Other	253	70	40	16	23	35	54	0
Total	34.621	18.350	18.287	19.311	20.758	20.293	20.020	19.406

11. According to the Ministry of Transport (MoT), the number of motor vehicles in Belarus grew 65% between 2002 and 2012, with the share of private cars sharply increasing from 2011 to 2012 from 72% to 87% of total stock (as shown in Figure 1). The growth of vehicle fleet in Belarus and associated increases in fuel consumption have led to increases in pollutant emissions from mobile sources, which currently accounts for 72% of the total volume of pollutant emissions in Belarus. Figure 2 shows that 2012 stationary sources account for 433,000 tons of pollutant emissions, compared with 956,000 tons for mobile sources. Mobile sources of emissions are based on the consumption of diesel and gasoline as primary fuels as shown on Figure 3.

Figure 1: Breakdown of pollutant emissions from mobile sources



[7] The output of green urban development is a green city as further explained in Para 14
[8] IEA 2011

Figure 2: Breakdown of pollutant emissions from stationary and mobile sources

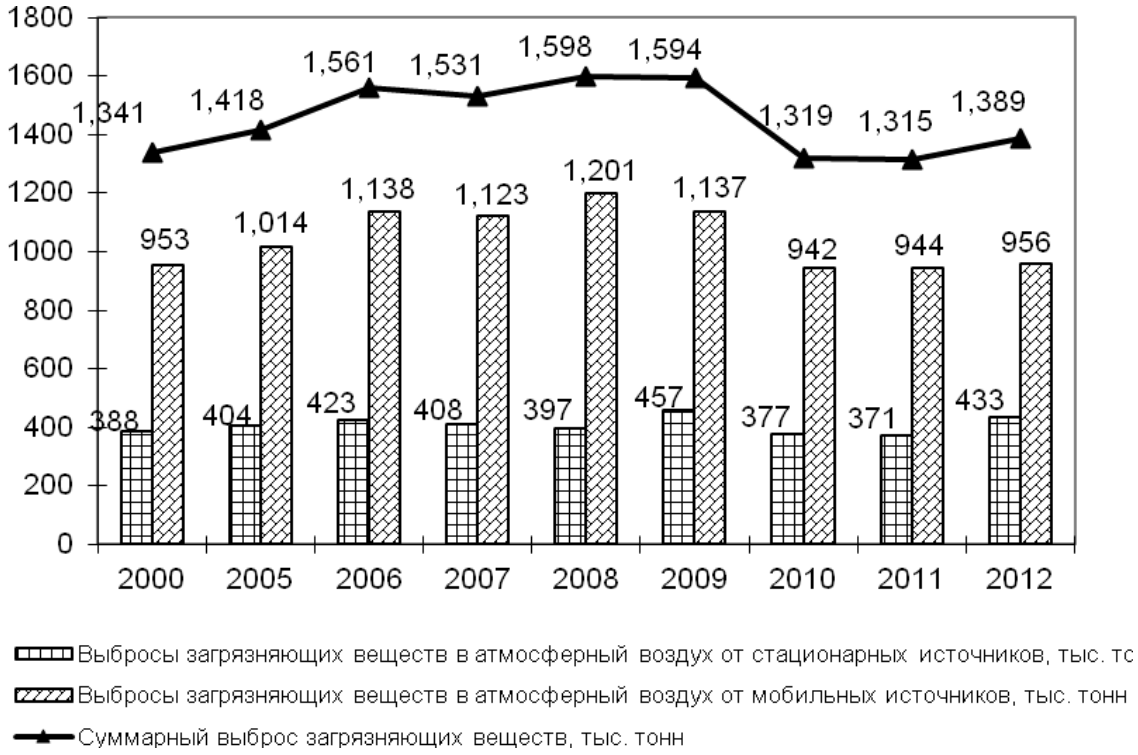
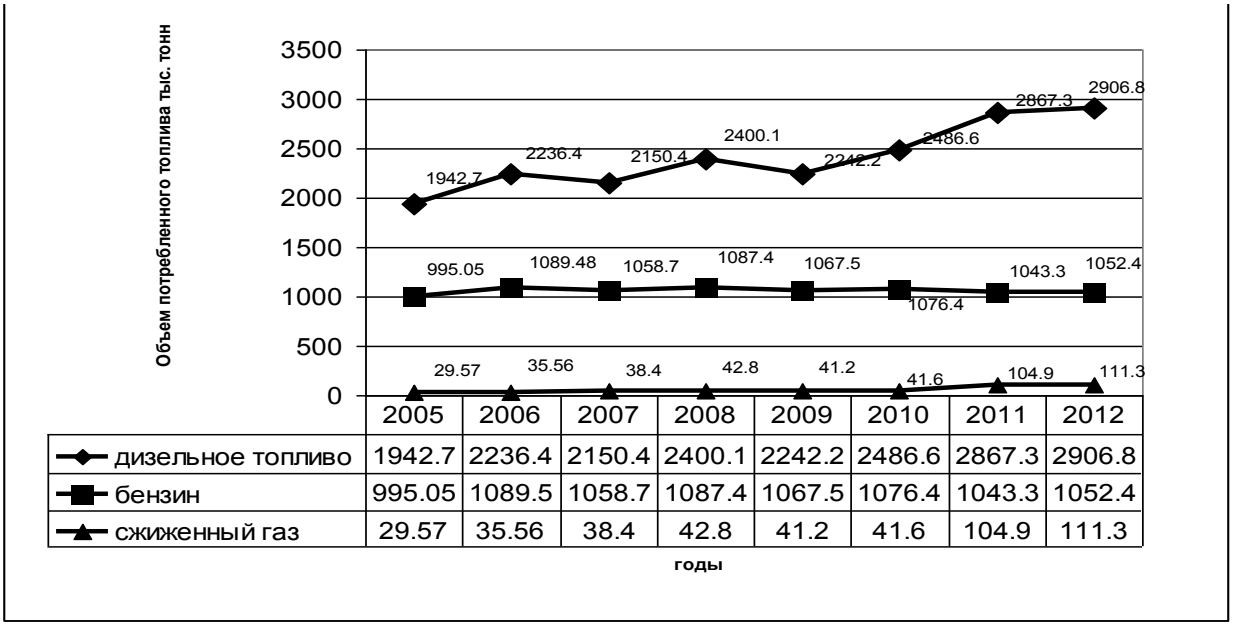


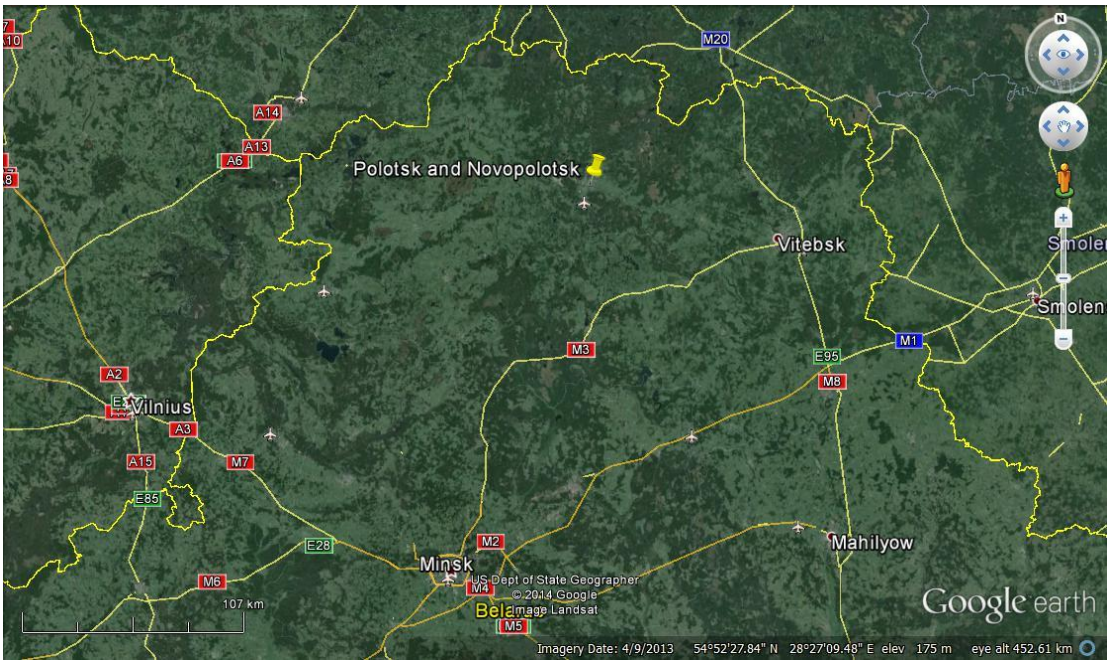
Figure 3: Breakdown of Belarus vehicle consumption of diesel, gasoline, CNG (ktonnes)



	2005	2006	2007	2008	2009	2010	2011	2012
дизельное топливо	1942.7	2236.4	2150.4	2400.1	2242.2	2486.6	2867.3	2906.8
бензин	995.05	1089.5	1058.7	1087.4	1067.5	1076.4	1043.3	1052.4
сжиженный газ	29.57	35.56	38.4	42.8	41.2	41.6	104.9	111.3

12. Both Polotsk and Novopolotsk (located north of Minsk as shown on Figure 4) face the problem of inefficient and suboptimal urban transport, which negatively affects their quality of life. This is related to the increase in the use of private cars for urban transport. With the growth of cars outstripping the growth of urban road space, the energy intensity of urban transport for the citizens of these cities will be increasing for the foreseeable future. This is recognized by the respective municipalities as an environmental threat with commitments made by the mayors to creating conditions for sustainable mobility within their cities.

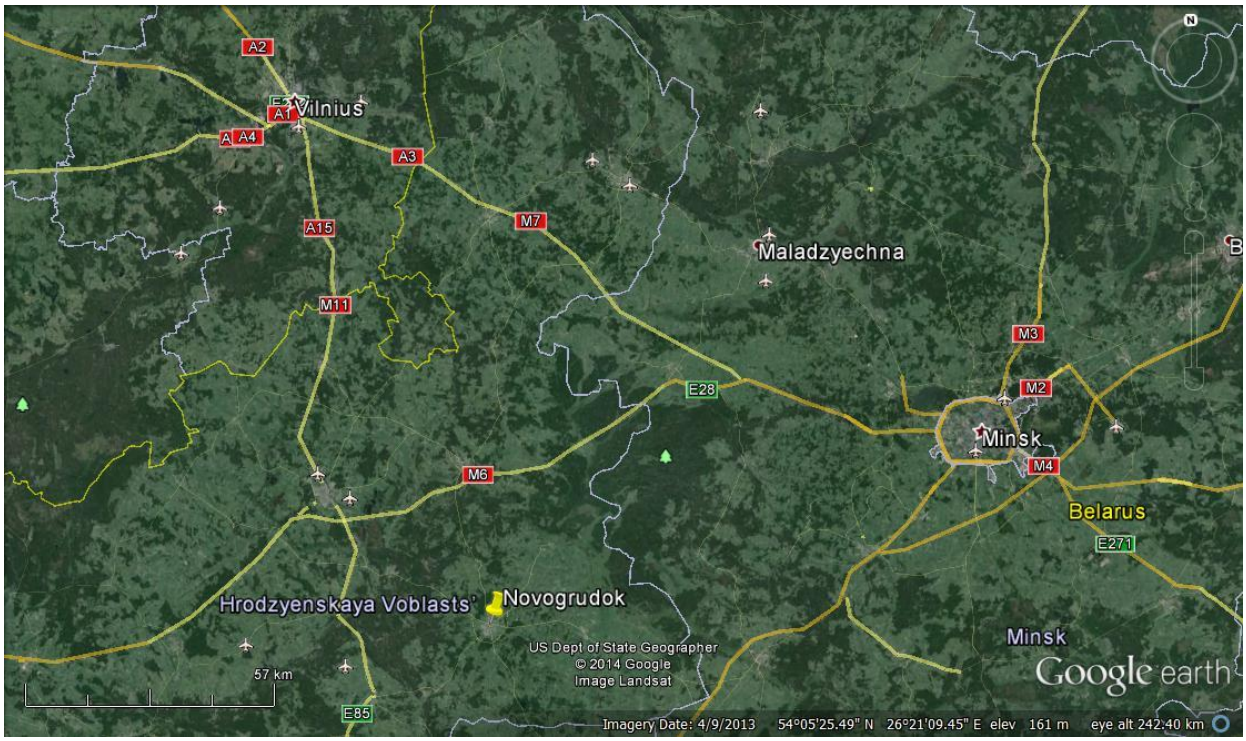
Figure 4: Location of Polotsk and Novopolotsk



13. For Novogrudok (located west southwest of Minsk as shown on Figure 5), city officials have made the reduction of GHG emissions a top priority. Around 13% of the city's annual budget of USD 27.35 million goes to pay for energy resources to meet the needs of the population and industry. The promotion of renewable sources of energy and energy efficiency is high on the municipality's agenda.

14. With a number of ongoing efforts to reduce GHG emissions and improve urban living conditions, this GEF Project aims to introduce in Belarus the concept of green urban development and support for planning and developing green cities. The concept of a green city development encompasses the holistic consideration of environmental impacts of new investments in city infrastructure and is dedicated to the minimization of required inputs of energy, water, and food and waste, output of heat, and air pollution. As such, a functional green city should sustainably meet the needs of several generations, and lead to significant reductions in GHG emissions. The current challenge for Belarus is being able to design and implement a comprehensive set of sustainable actions towards green city status by saving energy, reducing GHG emissions, as well as other measures that are beneficial to the economies and environments of these cities. In Belarus, there are no cities which currently meet this definition of a green city. There are only cities which aspire to this status but who are impeded in realizing this goal by a lack of knowledge, experience and planning capacity related to green urban development.

Figure 5: Location of Novogrudok



Barriers and Root Causes

15. The process of spatial and urban planning in Belarus is well entrenched with three levels of government from a national level to regional levels (oblasts or a number of districts within an oblast) to a local level (spanning a whole district or a part of a district or settlement). This process and the methodologies for planning, however, do not fully reflect the best international practices that address holistic approaches to planning. The root cause of the absence of green urban development in Belarus is the lack of focus on GHG mitigation in the current planning urban practices in Belarus and using sustainable mobility as one of the mitigation options. Moreover, there is a paucity of examples in Belarus on implementing the concept of linking green urban development to GHG emissions reduction. City planners generally plan urban development consistent with old practices with no link towards green urban planning and its principles of sustainability. In particular, the three cities involved on this Project have made expressions of their interest to strengthen their ties to green urban development planning as a strategy to assist them with low emissions development. To accelerate this process towards green urban development, Polotsk and Novogrudok have signed up to the EU Covenant of Mayors, while Novopolotsk is close to signing in the near future.

16. In Novogrudok, natural gas accounts for 42% of the final energy consumption of Novogrudok based on 2011 data. Under the business-as-usual (BAU) scenario, the city of Novogrudok, as part of its priority to reduce GHG emissions, is likely to develop small-scale renewable generation through the installation of solar water heaters at some of its schools and day-care facilities. However, a root cause to Novogrudok's inability to "green" their public lighting systems is their lack of knowledge and access to modern energy management information systems that can facilitate the maximization of operational costs

savings to operate the system[9]. Modern energy efficient LED lights and intelligent control systems are less costly to operate over their service life compared with conventional lighting systems. Under a BAU scenario, Novogrudok's existing street and public buildings lighting systems will continue to operate with old and inefficient technologies without modern intelligent control systems.

17. Amongst other issues related to energy consumption, the major "greening" issue for both Polotsk and Novopolotsk is the increasing use of private motorised transport in the form of cars, with a primary reason for the low efficiency of public transport. As the population has become relatively more affluent and as a result of changes to import tax on foreign vehicles, the number of cars in both cities has increased rapidly to around 340 private cars per 1,000 persons as of 2014,, a level approaching that of Western Europe. Whilst both of the cities are generously laid out and well planned with wide streets, there are a number of key areas where this increasing use of the private car is causing infrastructure level problems of congestion, delays and parking demand. Both cities differ in structure and organization of public transport; lack of administrative integration is also negatively impacting on the transport situation.

18. Both Polotsk and Novopolotsk have expressed a policy commitment to sustainable transport and have embarked on developing sustainable urban mobility plans, which, among others, aim to improve the cycling network and facilities There is recognition of the need to plan for the future growth in private car ownership and use, whilst ensuring that public transport remains a viable alternative contributing to sustainable transport behaviour. The cities recognize, however, that they require exposure to best international practices for implementing these plans.

Barrier Analysis

19. The barriers to green city development in Belarus can be characterized as follows:
    - Limited number of examples in Belarus of best international practices on setting national standards and regulations for green city development;
    - Limited local government experience to resolve certain aspects of green city development in a holistic manner that will attract financing of green development initiatives. This would include inefficient coordination between various government agencies at the national level and local municipal governments;
    - Lack of public awareness to support and increase demand for green initiatives being promoted by local government. This would include insufficient recognition of the public to the threats associated with uncontrolled growth in the use of private cars.

20. For the MoNREP and the Ministry of Architecture and Construction (MoAC), the development of "green cities" in Belarus is relatively new. As such, there are no examples of comprehensive green urban development in Belarus from which standards and regulations can be set. Without such examples that employ best international practices, these ministries have not yet fully adopted green urban development standards and regulations in an effective and efficient manner.

[9] This would include the cost of energy for operating the lighting systems, and the costs of replacing cheaper lights that do not have a long service life

21. Since energy is consumed across a wide spectrum of sectors (such as transport, residential, commercial and industrial) in urban areas, government agencies involved in planning need to improve their coordination with regards to energy consumption and GHG emissions across this wide sectoral spectrum. Current approaches by government urban planning agencies to reduce GHG emissions and reduce energy consumption are generally sector-focused that is inconsistent with green city development and its holistic approaches. Examples of the lack of holistic approaches for the cities involved with this Project are provided in the following paragraphs.

22. While Polotsk was the first Belarusian city to sign the Covenant of Mayors (CoM) and complete a Sustainable Energy Action Plan (SEAP) in late 2012, the city has implemented a number of energy efficiency initiatives including the installation of LED street lights along central city street (F.Skoriny ave.) and proposing a number of measures including solar water heating, and improved energy efficiencies for the central boilerhouse and heat network. While transport is a top priority for Polotsk in the SEAP, a barrier to reducing GHG emissions from the transport sector is the municipality's capacity to undertake initiatives for greening its transport sector. Under a "business as usual" (BAU) scenario, Polotsk is likely to focus on the energy efficiency measures that can be undertaken for municipal assets. Measures in the transport sector, which is problematic for the city due to increased traffic congestion from increased private car usage, will likely be constrained due to the financial barriers. Reducing congestion and the attendant GHG emissions will require interventions with a number of agencies including those responsible for public works (for infrastructure), the bus company (for improvements in bus service and fuel efficiency of vehicles), the road police (for traffic flows) and agencies responsible for public campaigns (to inform the public of required changes in travel behaviour, improved service provision and general public benefits of the changes).

23. While Novopolotsk is in the process of signing onto the Covenant of Mayors, they are planning to explore efficiencies in the distributed heat network and through the use of solar hot water heating in public buildings. With transportation accounting for 15% of the city's CO_2 emissions (excluding the large hydrocarbon process industries that dominate the local economy)[10], the city's transport demands are manifested mainly by the location of the city's major employers located to the west and southwest of the city residential area by a distance of 3 to 4.5 km. The city has already taken steps to influence travel behaviour and show a keen interest in being a sustainable transport exemplar (that includes promoting non-motorized transport (NMT) such as cycling and walking). However, a barrier to maximizing transport sector GHG emission reductions is insufficient capacity in Novopolotsk municipality for implementing best international practices for greening its urban transport. Under a BAU scenario, Novopolotsk will continue development of energy efficiency in the industrial sector to meet emerging and current policy; this will, by nature, not include sustainable transport measures.

24. Notwithstanding the close proximity of Polotsk and Novopolotsk, there are no coordinating bodies that would work toward integrating functional development of both cities. No results are possible to be achieved in the area of mobility without join coordination mechanisms. Both cities have separate budgets and management structures; they have developed their own comprehensive transport schemes. However, there has been an insufficient level of integration of these transport schemes between the two cities that does not take advantage of the opportunity to share resources and knowledge and work together to tackle regional

[10] Personal communication with the Mayor's Office in Novopolotsk

issues of demand for public transport, congestion from increased private car use and urban mobility, and the need for new infrastructure. Their plans, which do not strongly integrate the findings of the surrounding areas, likely do not adequately address regional transport issues between the two cities and beyond. As such, recommended interventions of their transport schemes may not result in the realization of reducing transport-related GHG emissions of the two cities to its full potential.

25. Novogrudok has made a commitment to reduce the cost of providing energy services and reducing GHG emissions. To this end, a number of initiatives to accomplish these objectives have been completed or are in progress. This includes small-scale renewable generation through the installation of solar water heaters at some of its schools and day-care facilities. In addition, the city would like to replace its old and inefficient street and public buildings lighting systems that currently consist of older technologies that are cheaper and more abundant. While there is some awareness amongst municipal personnel on modern energy efficient lighting fixtures and intelligent control systems, there are barriers to fully realizing the GHG potential for these modern fixtures and systems:
    - Current public sector procurement rules primarily consider lowest cost, and not the life-cycle cost of a green technology. As such, the procurement process for lighting equipment does not generally allow for the purchase of higher cost LEDs despite their lower energy consumption and life-cycle costs. As a consequence, the LED technologies with lower life-cycle costs for application in Novogrudok do not have widespread deployment in Belarus as compared to more advanced foreign markets. Moreover, the SMART sensors and energy management systems for lighting control that are available on the Belarusian market are cheaper to be cost competitive but do not always have the specifications that meet the best international standards;
    - With regards to street lighting, there are a number of design issues including the fact that Novogrudok is often foggy, making photocell switching problematic and the use of time switches unreliable. The current regime of street lighting is not considered sustainable in the long term in the interests of further carbon and cost reduction, as well as public safety and equality considerations. As such, the modernization of public lighting fixtures and systems is not likely to get introduced under a BAU scenario[11];
    - There likely is insufficient local capacity and resources in Novogrudok municipality for the preparation of the business case required for the procurement of costlier equipment that has long term cost reductions from energy savings. The removal of this capacity barrier would open several opportunities for the procurement of energy saving technologies for Novogrudok and other cities in Belarus including the municipal laundry; and
    - The preparation of promotional materials and demonstrations to assist other cites to adopt the green approaches taken by Novogrudok (as well as Polotsk and Novopolotsk) will likely be insufficiently effective. The removal of this barrier could be done with outside consultancy support, training for officials, and assistance in implementing demonstrations and preparing promotional materials on green urban development.

[11] Replacement of mercury lights with sodium ones in street lighting is mandated Council of Ministers regulation #248 dated February 22, 2010, and has been partially done by the municipality.

Stakeholder Analysis

26. Spatial planning and urban development in Belarus are regulated by the Law "on architecture, urban development and construction" that defines the authority of various governmental entities, including:
    - The President of the Republic of Belarus who has the authority over approval of:
        - the Fundamental Objectives the State Urban Development Policy of Belarus;
        - the National Comprehensive Territorial Plan of Belarus;
        - schemes integrated territorial organization of oblasts (regions);
        - master plans of the city of Minsk and regional centers.
    - The Council of Ministers of Belarus with the mandate to:
        - initiate development of the National Comprehensive Territorial Plan of Belarus, submission for Presidential approval and implementation of its key provisions;
        - submit the master plans of the city of Minsk and the regional centers for presidential approval;
        - approve master plans of oblast-level subordination cities (with the exception of oblast centers), as well as scheme and projects of development of social, industrial, transport and engineering infrastructure of national importance;

27. Stakeholders expected to be involved with green cities development on this Project includes:
    - Ministry of Natural Resources and Environment (MoNRE) with the mandate to oversee natural resource use, planning and conservation, and to serve as the Executing Entity for this Project;
    - Ministry of Architecture and Construction (MoAC) with the mandate for oversight of settlement planning and built environment planning, and acts as the contracting agency for all general urban projects funded from the state budget;
    - The Belarusian Institute for Regional and Urban Planning (IRUP) is a subordinate agency of MoAC responsible for:
        - urban development documents (i.e. feasibility studies for spatial development and investment analysis, national master plan, master and detailed plans of settlements) and research in urban sustainable development; and
        - research in the areas of urban development, urban planning, housing development[12]; and
        - monitoring implementation of national programs in the area of urban development[13].
    - Ministry of Economy (MoE) with the mandate for implementation of state policy, regulation and administration of analysis and forecast of social and economic development as well as coordination of government entities and other subordinate organizations in the area of social and economic development;
    - The Department of Energy Efficiency (DEE) as a subordinate to the State Committee for Standardization with responsibility for the development and implementation of state policy on energy efficiency and renewable energy sources;

[12] In 2013, IRUP designed principles of a new approach to urban development and drafted recommendations for necessary regulatory changes. IRUP is also a participant in various international projects (e.g. IRA.URBAN project to set up a network of urban development research centers) and cooperates with UN-Habitat on establishment of a regional training center for preparation for the Habitat III conference

[13] IRUP cooperates with UNECE on preparation of national reviews of the housing sector and research in urban development

- Ministry of Transport (MoT) with the mandate for implementation of the road and transport policy that aims to satisfy the demand for transport services from institutional and residential sectors while minimizing environmental impacts;
- The Municipalities of Polotsk, Novopolotsk and Novogrudok or respective regional and local governments (at times, referred to as regional or district executive committees) who are responsible for:
  - the identification and initiation and development of urban projects;
  - preparing comprehensive development schemes and master plans for cities and towns under their administration; and
  - approval of master city plans and detailed plans of urban development;
- Private sector stakeholders who will provide the necessary and specialized services to implement detailed plans for urban development; and
- Civil social service organizations who operate in the area of sustainable development and urban (regional) mobility (including, transport, environmental NGOs, cycling associations, etc.).

Table 11 provides a listing of the stakeholders and their roles on this Project.

Baseline Analysis

Policies and Directives

28. Green city development is a new approach for Belarus. As such, its adoption in the Belarusian Government falls under urban development and housing sector development that is regulated by a number of technical, regulatory and legal acts, laws, government resolutions, technical codes of common practice, building regulations and codes, health regulations as well as guidance and recommended design practices.

29. The Fundamental Objectives the State Urban Development Policy of Belarus 2011-2015 (approved by Decree of the President № 385 dated August 30, 2011) provide the key guidelines of urban development policy in Belarus. The urban development policy defines objectives, tasks and methods of successful development of settlement systems urban and rural settlements, social, industrial, engineering-transport infrastructure, protection and sustainable development of historical and cultural values, and establishment of secure, effective and aesthetically appropriate activity of the Belarusian citizens. The policy defines 5 key objectives related to spatial planning, settlement planning, establishment of integrated living environment, development of transport infrastructure and improvement architectural image:
    - *Objective 1:* Improvement of territorial organization of Belarus to ensure successful development of regions and settlements through utilization of their potential, international, national and regional best-practices in urban development;
    - *Objective 2:* Improvement of spatial organization of urban and rural settlements based on new urban planning principles:
      - A safe settlement that provides social and environmental safety;
      - A comfortable settlement that provides functional, esthetic and information comfort;
      - An effective settlement that provides sufficient spatial arrangements and is energy efficient;
    - *Objective 3:* Comprehensive shaping of the living environment that meets the needs of residents for housing, social services within walking distance;

- *Objective 4:* Improvement of the system of regional and urban transportation services to reduce daily commute times and to enhance accessibility of various services;
- *Objective 5:* Creation of a modern architectural image for the country by using the achievements from other countries and adopting best international practices for urban development.

30. Key aspects of urban development planning in Belarus are defined by the Law "on architecture, urban development and construction" (2005). The Law establishes the relations between the state, population, business entities within the activities of urban planning, implementation of urban development and construction. The Law specifies civil rights for favorable living environment, guaranteed by Constitution, including:
    - environmental protection and security arrangements within the territories;
    - conservation of real material, historical-cultural values and protection of natural reserves and sites;
    - creation and development of the system of engineering infrastructure and site improvements;
    - development of transport infrastructure;
    - allocation of recreational and health sites;
    - creation of the environment for physically disadvantaged people.

    The Law also identifies the state administrative bodies that have roles in the urban planning and development process including territorial zoning, urban planning and development of sites, authorization of documents for design and construction, urban development and construction, and state monitoring and inspections of urban development and construction activities.

31. The following regulatory acts are also applicable to urban development:
    - Presidential Decree №72 dated 07.02.2006, "Governmental control of functions in allocation and construction of residential houses, engineering, transport and social infrastructure";
    - Law of the Republic of Belarus of 11.11.1999, №322-2, "State minimal social standards".
    - Technical code of common practice 45-3.01-116-2008, "Urban development, settlements, and standards of planning and construction";
    - Technical code of common practice 45-3.01-117-2008 (02250), "Urban development. Areas of private housing construction. Standards of planning and construction";
    - Technical code of common practice 45-3.01-118-2008 "Urban development. Comprehensive Territorial Plan of the Region (Oblast, District, Group of Districts). Standards of planning and construction" Clause 4.1[14] and Clause 6.19[15].
    - Technical code of common practice 45-2.02-242-2011 (02250) "Fire prevention, fire protection within communities and business entities area, and building regulation standards";

[14] The Comprehensive Territorial Plan (CTP) of the region should be developed as part of general urban planning and must cover the following issues: Strategy of territorial development of a design object; and coordination of prospective national and local responsibilities, decisions and interests regarding territorial development of a design object. Development of a City Master Plan is a subsequent stage after implementation of a CTP.

[15] Under this Clause, a CTS for an oblast or region consists of the transport infrastructure development scheme, which illustrates development (construction, reconstruction, phasing out, retirement) of various regional transport infrastructure components as part of the whole system of transportation facilities linked to the transport system of a higher territorial level including suggestions on the connection of different modes of transport (i.e. vehicular, railway, water, air).

- Technical code of common practice 45-3.03-227-2010 “Streets in settlements"; “Principles of area development and upkeep within cities and communities”;
- Technical code of common practice 45-3.02-69-2007 (02250), “Area development, urban greening, and standards of design and implementation";
- Technical code of common practice (02250) “Garage-parking and car parking areas, and design specifications”.
- Sanitary regulations and standards “Hygienic requirements for community area management”;
- Technical code of common practice 45-2.04-154-2009 “Noise control, construction design standards”.

32. Urban development in Belarus is further regulated by several national and international programs and strategies including:
    - *Urban development Charter of the CIS* that identifies guidelines, objectives and milestones of sustainable development and infrastructure development in the CIS, and was adopted in Minsk in 1999;
    - *The National Strategy of Sustainable Socio-Economic Development of Belarus until 2020* that was adopted by the National Commission on Sustainable Development of the Republic of Belarus (6.5.2004) and the Council of Ministers of Belarus (22.06.2004);
    - *The Program of Socio-Economic Development of Belarus 2011-2015* that was adopted by the Decree of the President of Belarus №136 dated 11.04.2011;
    - *The Framework State Housing Policy of Belarus until 2016* that was adopted by Resolution of the Council of Ministers of the Republic of Belarus 05.04.2013 № 267;
    - *The Framework National Security of Belarus* that was adopted by Resolution of the President of the Republic of Belarus by 9.11.2010г. № 575;
    - *Habitat Agenda* that was adopted at the UN conference on communities at Habitat II, Istanbul, June 3-14, 1996;
    - *UNECE Strategy for a Sustainable Quality of Life in Human Settlements in the 21st Century* adopted in December 2001;
    - *Declaration on Cities and Other Human Settlements in the New Millennium* that was adopted by Resolution S-25/2 by special session of the United Nations General Assembly on June,9, 2001.

33. Green cities development in Belarus is consistent with the goals of Belarusian energy policy consisting of:
    - *The Concept of Energy Security of the Republic of Belarus, Directive No. 3* (approved by Decree of the President dated 17 September 2007, No. 433). The objective of this policy is to ensure a sustainable energy supply for consumers through improving the energy security of the country, maximising the efficient use of fuel and energy resources, reducing the dependence on energy resources and maximizing the benefits of geopolitical position of Belarus as a transit country for energy trade between Russia and the European Union;
    - *The Strategy for Energy Potential Development for 2011–2015* (approved by Resolution of the Council of Ministers dated 9 August 2010 No. 1180). The objective of the Strategy, amongst other indicators, is to achieve a 50% reduction in the energy intensity of GDP by 2015 and 60% by 2020 from the 2005 levels. The Strategy also provides:
        - guidance on the need to develop and adopt new laws to conserve electricity and energy[16];

[16] This includes Law on Energy Saving, Law on Electricity, the Law on State Regulation of Tariffs for Electricity and

- fulfilment of Strategy objectives of state targeted energy programmes through regulation by over 30 legislative instruments, which regulate public relations in the area of energy saving including international treaties of Belarus related to the implementation of the energy saving policy in the country;
- priority to the establishment of a system of technical norms and standards to be harmonized with European and international standards[17]. A new draft Law on Energy Saving is being developed;

- *The National Energy Saving Programme for 2011-2015* which has a goal of 29-32% reduction in the energy intensity of GDP from the 2010 level by 2015. The Programme includes a range of priority actions aimed at:
  - increasing efficiency of conventional energy generation sources;
  - development of renewable sources of energy;
  - reducing losses during energy transportation;
  - increasing energy efficiency in industry, construction, agricultural and budgetary sectors;
  - reducing energy consumption in the utilities sector;
  - introducing economic incentives for energy efficiency among producers and consumers of energy;
  - improving transport energy efficiency by setting up automated control systems for public urban transport to optimize capacity utilization

34. There are linkages to energy saving measures and objectives under the Ministry of Natural Resources and Environmental Protection (MoNREP) under the "Strategy for limiting transport impact on air until 2020" that primarily involves transport emissions of various pollutants (i.e. CO, NO_x, SO_x, CO_2). The 2020-Strategy has been based on the need to balance the economic and social benefits of transport with its negative impacts on the environment, while observing Belarus' international obligations and social-economic development priorities. The objective of the 2020-Strategy is to improve air quality that ensures environmentally safe living conditions through higher energy efficiency and environmental safety of the transportation system. The objectives of the 2020-Strategy are as follows:
    - Improvement and implementation of a legal mechanism for regulation of pollutant emissions from mobile sources;
    - Effective state management in the area of mobile emissions;
    - Scientific and technical support;
    - Improvement of the system of responsibility and incentives for cutting down on pollutant emissions from mobile sources;
    - Enhancing the system of norms for emissions from mobile sources;
    - Introduction of innovative technologies for monitoring of air quality near roads and major hubs.

35. The 2020-Strategy was based on sustainable development principles whereby the transportation needs should not contradict environmental priorities and compromise the interests of future generations. The expected outcomes of the 2020-Strategy are:
    - Reduction of share of mobile emissions in total emissions of pollutants from 72% to 65% by 2020;

Heat, and the Law on Heat Supply.

[17] This would include standards and regulations for improvements in the energy efficiency of buildings, heat generation equipment, energy management and energy audits in organisations.

- Capping of mobile emissions at 900,000 tons/year by 2020, with passenger vehicle emissions declining by at least 1% annually;
- Growth of the share of environmentally-sustainable public transport and electric transport in urban areas with over 100,000 of residents to 50% by 2020; and
- Renovation of the vehicle fleet and raising the share of higher-emission class vehicles (euro4 and higher) to 50% by 2020[18].

36. Belarus has a "Law on Protection of the Environment" that has undergone a number of amendments, the latest ones dating to January 2013. This Law sets legal basis for protection of the environment, use of natural resources, conservation and restoration of biodiversity, natural resources, and aims to safeguard the constitutional rights of Belarusian citizens for life and healthy environment:
    - Article 22 of the Law provides guidelines for setting standards of acceptable emissions and discharges for stationary and mobile sources based on the limits of permissible anthropogenic load on the environment, environmental quality standards and technological standards. Technological standards for stationary and mobile sources are set based on the best available technologies to meet the requirement for the protection of the environment, taking into account economic and social factors;
    - Article 44 lists environmental requirements for mobile emission sources. The article requires that measures are implemented to reduce the toxicity of smoke exhaust gases, purify or neutralize emissions and discharges of pollutants into the environment, transition to less toxic fuels and other measures aimed at preventing and reducing the harmful impact on the environment by mobile emission sources. Production and/or operation of mobile sources with pollutant emissions or harmful impacts exceeding the set limits is prohibited. .

37. Belarus also has a "*Law on Protection of the Atmospheric Air"* that contains a number of provisions relevant to urban development:
    - Article 22 sets requirements for air protection during elaboration of comprehensive land use plans, city master plans and detailed urban development plans. Specifically, the article mandates that "city master plans and detailed urban development plans should include provisions for measures to reduce and/or prevent emissions of pollutants, including:
        - Information on the quality of atmospheric air and forecast of potential changes related to construction of planned urban infrastructure;
        - Measures to optimize location of the existing and planned facilities that can have the greatest impact on the air quality including potential traffic congestion areas;
        - Other measures to ensure compliance with the legislation on air protection including mandatory requirements for related technical codes and standards;
    - Article 28 sets requirements for air protection during emission of pollutants by mobile sources. The emissions of pollutants from mobile sources are not allowed to exceed the limits set in line with set technical standards and codes. Emissions of pollutants by mobile sources are subject to verification by legal entities and individual entrepreneurs engaged in production, operation, maintenance and repair of mobile emission sources,

[18] These outcomes could be achieved through a sectoral programme to replace rolling stock and improvement of fuel consumption monitoring systems; approved operating standards for fuel consumption for all vehicles; measures to optimize traffic and public transport routes; introduction of online dispatch control systems for various transport networks including public transport; large scale and fuel consumption standards for specific traffic routes; and improved measures to monitor emission reduction of polluting substances (CO, black carbon, hydrocarbons, SO_x, NO_x and GHGs).

using instruments to measure actual content of pollutants is in compliance with the standards.

Polotsk

38. Polotsk is the oldest city in Belarus (dating back to 862), and is a major tourist attraction located in northern Belarus in Vitebsk oblast with a population of over 83,000 people and an area of 42 km^2. Polotsk became the first Belarusian city to develop a Sustainable Energy Action Plan (SEAP) that was completed in 2012. Baseline energy consumption for Polotsk as presented in the SEAP used 2010 data, and did not include data from the industrial sector. Table 2 presents the baseline energy consumption of Polotsk from 2014 that *does* includes energy consumption of its industrial sector. The energy balance for Polotsk is dominated by natural gas that accounts for more than 30% of total final energy consumption in Polotsk. On this basis, GHG emissions of Polotsk are estimated at 385,000 tons CO_2 per year. Sectoral consumption is summarized on Table 3 and is dominated by the industrial sector and residential and municipal buildings while transport (private, commercial, municipal and public) accounts for a 5% share of GHG emissions.

39. As part of the SEAP, Polotsk has undertaken a voluntary commitment to reduce its emissions by at least 20% by 2020 against the baseline of 2010. The bulk of energy and CO_2 savings is expected to come from a set of measures in the buildings and facilities sector: installation of high efficiency pumps in municipal boiler houses, upgrade of the central heating networks, switch to woodchips in heating boilers, renovation of buildings envelope, installation of solar water heaters in sports facilities and municipal public buildings. Installation of EE lighting systems has already been initiated with 75 LED lighting fixtures installed along the central avenue of the city.

Table 2: Energy Sources in 2014 for Polotsk City

Source	Consumption (MWh)	Share (%)
Thermal energy	685,949	33.7
Natural gas	641,477	31.5
Electricity	464,549	22.8
Petroleum	97,914	4.8
Biomass	97,788	4.8
Other	46,614	2.3
Total:	**2,034,291**	**100**

Table 3: Sectoral Energy Use in 2014 for Polotsk City

Sector	Consumption (MWh)	Share of Total Consumption (%)
Industry	1,040,048	51.1
Municipal buildings	481,162	23.7
Residential buildings	415,167	20.4
Municipal and public transport	97,914	4.8
Totals:	**2,034,291**	**100**

40. The increasing energy consumption of the transport sector of Polotsk City, however, is a top priority for Polotsk municipality. While the City's SEAP does address some of the issues with urban mobility in Polotsk, it only mentions the development of a "sustainable urban mobility plan" with no concrete actions other than implementation of the plan and the development of a bicycle system for the City. Based on the strong interest of Polotsk City to collaborate with UNDP and GEF in the area of sustainable transport, this Project is in part being developed to assist Polotsk in reversing the trend of declining use of public transport.

41. Overall, Polotsk reports that the trend in recent years has been the increased use of the private car as the means of transport of choice. This has led to a number of outcomes including:
    - A decreased number of registered public transport buses as shown in Table 4, and the quadrupling of the number of cars in Polotsk over the past 4 years[19];
    - Decreased viability of both public and private sector public transport operations;
    - Increase in the number of road vehicles is more rapid than the growth of road space in Polotsk leading to congestion along main corridors and intersections, that is made worse by infrastructure constraints such as level railway crossings and bridge connections;
    - Increased journey times and less reliability of bus services exacerbating problems in travel behaviour;
    - The average daily walking distance of Polotsk residents has decreased leading to concerns over a drop in the physical and mental well-being of its residents;
    - The lack of car parking facilities at key destinations;
    - Increased car usage has led to perceptions over road safety and potentially making cycling a less attractive mode of transport;
    - An increase in road accidents based on 2013 data from Polotsk City;
    - Air quality is deteriorating, amongst other factors, with increased emissions of CO, NO_x, some of it attributed to local transport; and
    - Increased congestion leading to higher fuel consumption and increased GHG emissions.

Table 4: Trends in the number of public transport vehicles in Polotsk[20]

Number of registered public transport vehicles	2009	2010	2011	2012	2013
Number of Buses (gasoline)	8	7	7	5	4
Number of Buses (diesel)	164	164	143	138	117

42. Actions in progress under the SEAP for the transport sector of Polotsk includes the updating of the Polotsk City Master Plan[21], initial preparation of a sustainable urban mobility plan (SUMP) with an overarching objective to reduce the usage of private cars within the City[22],

[19] The City of Polotsk reports that the number of cars has increased in four times over the past 4 years as of January 2014. As of January 2014, there were 21,301 cars, 3,090 trucks and 737 buses registered in Polotsk.
[20] Polotsk City reports that public transport subsidies were in the order of USD 1.3 million in 2013
[21] The original City Master Plan was developed by IRUP in 2004 with the planning timeframe being 2010 for Phase I and the end target date of 2020. The City Master plan does address the issue of tram extension from Novopolotsk into Polotsk, and if necessary, the Master Plan can be revised to accommodate certain changes of the tram extension.
[22] Preparation of the SUMP is being financed under the EU project "From Energy Efficiency to Urban Mobility: Introducing Participatory Approach to Development of a Sustainable Mobility Plan in Polotsk". Details are provided on http://eu-belarus.net/en/news/56

and the completion of a 10-year *Comprehensive Transport Scheme* for Polotsk that lays out investments required for Polotsk City to reduce traffic congestion. Based on the analysis of the current transport planning practice, it is reasonable to assume, however, that the Transport Scheme is not going to fully address measures required to encourage modal shifts from private motor vehicles to lower carbon intensive means of urban transport. The proposed SUMP for Polotsk City, however, will recommend such measures including:

- creation of integrated park-and-ride facilities with public transport and a bicycle network;
- improving traffic flows through key corridors and intersections through synchronized signalling and improved roadway designs;
- reconfiguration of public transport routes to minimize overlaps and improve journey times;
- conversion of public transport vehicles to cleaner alternative fuels;
- incentives for the operation of environmentally friendly vehicles;
- the building of over 10 km of bike lanes that are integrated with other modes of public transport; and
- enforcing a traffic-free area to minimize environmental impacts**.**

The Polotsk SEAP estimates these sustainable transport measures would save more than 17,777 MWh/yr or reduce CO_2 emissions by 4,717 tonnes annually (based on diesel savings).

43. The construction of cycling lanes is provided as a proposed action under SEAP transport sector. The City is committed to developing over 10 km of segregated bicycle lanes along roadsides, road shoulders and through park lands. The City aims to reduce GHG emissions by encouraging modal switches from private cars to bicycles and walking. In addition, the City had also considered implementing a bikeway between Polotsk and Novopolotsk. However, this was not placed on the SEAP due to the administrative complexity to implement this bikeway.

44. To ensure the sustainability of improved and increased number of bicycle lanes, the SEAP also identifies the completion of an urban cycling master plan. The plan will ensure the bicycle network is integrated with public transport facilities, notably bus stops where public bicycles would be made available or buses where bicycle racks could be placed to allow cyclists to travel with their bicycles on a bus.

Novopolotsk

45. Founded in 1958, Novopolotsk has grown from being Polotsk's satellite town to the largest petrochemical industrial center in Belarus with the total population of 106,000 people over an area of 55 km^2. Novopolotsk is located less than 10 km from Polotsk. As can be seen in Table 6, energy consumption in Novopolotsk comes mainly from the industrial sector that is largely centred around Naftan JCS, the largest refinery in Belarus that provides close to 64% of the Vitebsk Oblast gross regional product. While the share of transport energy consumption in Novopolotsk is small, it is relatively the same consumption as the transport sector in Polotsk. Moreover, there are similar growth trends in the use of private cars in both cities, in large part due to the growing economic importance of the two cities to the Belarusian economy.

Table 5: Energy Sources in 2014 for Novopolotsk City

Source	Consumption (MWh)	Share (%)
Natural gas	4,428,904	36.0
Petroleum	1,749,769	14.2
Electricity	3,394,577	27.6
Biomass	26,048	0.2
Other	2,708,571	22.0
Total:	**12,307,869**	100

Table 6: Sectoral Energy Use in 2014 for Novopolotsk City

Sector	Consumption (MWh)	Share (%)
Industry	11,407,596	92.7
Residential buildings	616,311	5.0
Municipal buildings	134,826	1.2
Transport	149,136	1.1

46. On the basis of the above energy data, the city of Novopolotsk has a GHG footprint roughly estimated at 3.71 million tonnes CO_2 per year, which is significant, but also largely dominated by petrochemicals processing at the Naftan refinery. The city of Novopolotsk has announced its intention to develop a SEAP. The petrochemical industrial sector in Novopolotsk has received and will continue to receive top-priority attention from the Central Government in the reduction of its energy intensity. As such, the planned SEAP for Novopolotsk will not include the emissions from it petrochemical industries at Naftan. In addition, Novopolotsk will also continue reducing its GHG footprint through the distribution of renewable energy generation through installation of solar water heaters in sports facilities and public buildings.

47. With the exclusion of the petrochemical industry from any proposed SEAPs by Novopolotsk, the City's footprint is reduced to estimated 170,000 tons CO_2 per year, with transport accounting for a share of 16%. While the key priorities for the development of Novopolotsk in 2012-2015 included further growth in industrial production and exports and facilitation of small and medium business development, improving urban transport through a comprehensive planning approach (to maximize public transport benefits and GHG reductions) was not a development priority in 2012.

48. As of 2013, urban transport had emerged as a priority issue for Novopolotsk. With the increasing affluence of the city, the ownership of cars in Novopolotsk is approaching 340 cars per 1,000 inhabitants, close to the EU average of 375 cars per 1,000 inhabitants[23]. Moreover, the City has also experienced a decrease in the share of passengers on public transport, similar to what has been observed in Polotsk. Table 7 illustrates the decrease in the number of registered buses from 2009 to 2013 in Novopolotsk. The increased use of private cars as a primary choice of transport within Novopolotsk are similar to the trend in Polotsk described in Para 41. Novopolotsk reports that private car occupancies are in the order of 1.2 passengers per car.

[23] Personal communication with Mayor of Novopolotsk

Table 7: Trends in the number of public transport vehicles in Novopolotsk

Number of registered public transport vehicles	2009	2010	2011	2012	2013
Number of Buses (gasoline)	3	2	1	1	1
Number of Buses (diesel)	199	204	180	151	147

49. Travel patterns of Novopolotsk can be characterized as follows:
    - Travel patterns are dominated by trips to and from the Naftan refinery;
    - An estimated 15,000 private cars go to and from Novopolotsk to the refinery mostly during peak hours and causing traffic congestion along the major routes;
    - Travel between Polotsk and Novopolotsk reaches around 35,000 vehicles per day. A significant number of these vehicles originate in Polotsk and travel through Novopolotsk on the way to the refinery;
    - A tram line serves the refinery area with employers providing shuttle transport to and from the tram stops to the work areas;
    - The 38 trams in operation in Novopolotsk are full during rush hours causing a modal shift towards private cars. The city only receives on average one additional tram each year;
    - Remainder of city is well serviced by bus routes but with share of passengers decreasing to private vehicles;
    - Parking in the residential areas available albeit in an unorganized manner;
    - There is a fragmented cycling network that requires upgrading to encourage cycling as a means of urban transport; and
    - Permitted parking is also available in the refinery areas.

50. For the greater urban area of Novopolotsk, the City's urban planning process includes the following:
    - The completion of a City Master Plan in 2012 by IRUP[24];
    - The completion of a CoSUM by the Belarus Transport Union (BTU) and ongoing preparations for a SUMP that has the following objectives for reducing the carbon intensity of urban travel:
        - a 3.5 km tram extension from its current terminus at Vulica Kamsamolskaja to a point along Vulica Maladzioznaja towards the southern areas of Novopolotsk. A conceptual and feasibility study on the 3.5 km tram extension is being prepared[25];
        - a further extension of this tram line across the Daugava River to the western side of the Airport area of Polotsk;
        - a parking strategy to improve traffic flows in selected areas of the City;
        - a cycling master plan that addresses the priorities of the Mayor's office for its development and integration with public transport facilities[26]; and
        - improvements in public transit services;

    - Ongoing preparations for a Comprehensive Transport Scheme that, similarly to the Polotsk Transport Scheme, is not going to adequately address measures required to

[24] The planning timeframe of the City Master Plan was 2020 for Phase I and an end target date of 2030

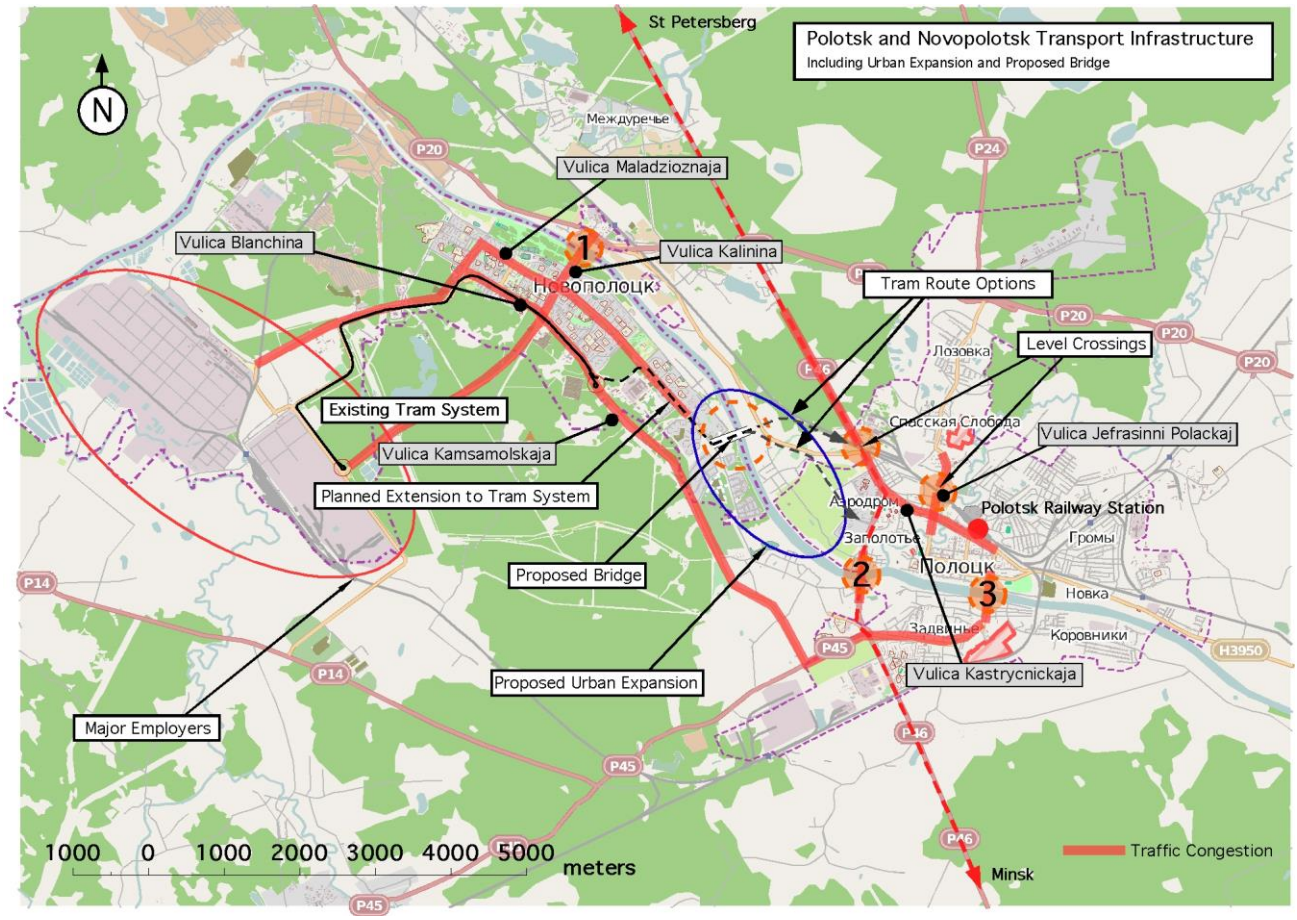
[25] The mayor's office reports that the budget for the USD 3.0 million extension is already allocated for 2016. To date, USD 100,000 has been invested in its feasibility design with another USD 200,000 required to complete detailed design.

[26] The mayor's office reports that there is an approved City master plan after which a transport scheme will be developed which may include a cycling scheme as an annex.

encourage modal shifts from private motor vehicles to lower carbon intensive means of urban transport.

Figure 6 is a map illustrating the current and proposed (in cities' master plans) transport infrastructure of both Polotsk and Novopolotsk.

Figure 6: Current and Proposed Transport Infrastructure of Polotsk and Novopolotsk



51. With these initiatives of Novopolotsk currently underway, the municipal government in Novopolotsk has expressed an interest in working with UNDP and GEF to demonstrate best international practices for the development of a green urban transport system, and to maximize GHG reductions from the urban transport sector. This would include a system promoting and integrating all low carbon intensity modes of transport from public transit to bicycling and walking.

Novogrudok

52. Novogrudok is a typical middle-sized Belarusian town located western Belarus in Grodno Oblast with a population of around 30,000 people spread over an area of 13.75 km^2. The population of surrounding villages under the Novogrudok administration is estimated at 17,000. As Novogrudok town is significantly smaller city than both Novopolotsk and Polotsk,

it does not experience problems with urban mobility. In contrast, the priority of the Novogrudok administration is on energy efficiency and development of renewable sources of energy to reduce GHG emissions.

53. The economy of Novogrudok is made up of a mixture of agriculture, light industry, food processing, tourism, manufacturing and assembly. There are around ten major industrial employers with some 6,000 people employed in these activities. With 13% of the city's annual budget of USD 27.35 million is allocated to energy resources, the town's energy balance is dominated by natural gas that accounts for 58% of total final energy consumption in Novogrudok (2013 data) as can be seen in Table 8. Table 9 shows energy consumption in Novogrudok is dominated by the residential and industrial sectors.

54. On the basis of the energy balances depicted in Tables 8 and 9, Novogrudok's GHG footprint in 2013 is estimated to be around 165,000 tons of CO_2 per year, or around *134,000 tons CO_2* if industry-related emissions are left out. On January 25, 2013, Novogrudok has subsequently developed a Sustainable Energy Action Plan (SEAP) towards achieving a 20% reduction in carbon emissions before 2020[27] which can be found in Annex V. Prior to its development of the SEAP, Novogrudok has been implementing a number of carbon reduction initiatives since 2011 including:
    - A 1.5 MW wind power plant which started operation in 2011 in Grabniki village. Total electricity generated from the plant was 9,994 thousand kWh up to early 2014. This plant provided 7% of the total electricity consumption for the Novogrudok region;
    - Two reciprocating CHP units owned by Novogrudok Utility Company with total electrical capacity 4 MW that started operation in June 2012;
    - The installation of energy efficient lighting fixtures (in 2013 Novogrudok utility company replaced 40 old light fixtures of RKU-250 type with new ones ZhKU-150, 62 RKU-250 fixtures with ZhKU-100; 230 energy efficient luminaires installed at educational institutions in vil. Ladeniki, Benin, Vselluyb; 157 energy efficient luminaires installed in the central hospital);
    - The installation of energy efficient windows to improve thermal performance in municipal buildings (a total of 459 sq.m, of energy efficient windows installed in kindergarten #10 and #8, gymnasium #1, schools #5 and #1);
    - The installation of energy efficient heating and electrical equipment (Novogrudok utility company has installed 9 modern individual heating substations in buildings on Sovetskaya, Komsomolskaya, Mitskevicha, Volchetskogo street; 2 variable-frequency drives installed at local boiler house in village Lyubcha; lower-capacity 90 kW equipment installed at educational facilities to replace old 100 kW units); and
    - Conversion of equipment in heating plant to use biomass as its primary fuel (two biomass boilers installed at the central boiler house of Novogrudok utility company; an additional 1MW biomass boiler installed at a boiler house in village Negnevichi).

[27] The development of the Novogrudok SEAP for 2011-2020 was developed in the framework of the EU project "DACO" (Grant-contract № EuropeAid/131258/C/ACT/Multi, approved by Decree of the Council of Ministers on August 23, 2013 № 742)

Table 8: Energy Sources in 2013 for Novogrudok City

Source	Consumption (MWh)	Share (%)
Natural gas	334,729	57.9
Diesel	104,612	18.1
Electricity	63,129	10.9
Biodiesel	23,731	4.1
Gasoline	22,819	1.4
Wood biomass	8,357	0.6
Coal/peat	3,585	0.6
Other	16,855	2.9
Total:	**577,817**	**100**

Table 9: Sectoral Energy Use in 2013 for Novogrudok City

Sector	Consumption (MWh)	Share (%)
Industry	293,078	50.7
Other	107,887	18.7
Residential buildings	95,540	16.5
Transport	81,312	14.1

55. For the residential sector in Novogrudok, the following improvements in energy efficiency were implemented:
    - Replacement of old heating pipes with preliminary insulated pipes;
    - Installation of energy efficient boilers;
    - Installation of variable-speed drives and frequency controllers in heating plants;
    - Replacement of pumps; and
    - Installation of heating automation systems.

56. Implementation of these energy efficiency measures in Novogrudok district has led to an estimated savings of 12.7 ktce in 2011-2013, and a reduction in consumption of energy resources by 9.15%.

57. Future carbon reduction initiatives for Novogrudok include:
    - Improvements to the energy efficiency of residential buildings through improved insulation and multiple glazing;
    - Replacement of inefficient incandescent lighting in common areas of residential buildings;
    - The switching of vehicles to run on natural gas and biofuels;
    - A 2.0-2.5 MW wind power plant that has been constructed in Grabniki village;
    - A 9 to 12 MW wind park to be constructed in Grabniki village by 2018 by the Grodnoenergu regional power company;
    - A 15-18 MW wind power plant that is to be proposed in a feasibility study;
    - A number of 1 to 3 MW roof-mounted and stand-alone photovoltaic power plants to be proposed in a feasibility study;
    - A biogas plant using agricultural waste to be proposed in a feasibility study;
    - A municipal waste processing plant and wastewater sludge processing to be proposed in

a feasibility study;
- A 4 MW biomass CHP Power Plant as well as a biogas power plant using municipal solid waste and wastewater sludge to be developed with European Commission support under the project "Development of Renewable Energy in Novogrudok Region - Roadmap for Environmentally Clean Territory";
- Replacement of 21.32 km of heat supply pipelines with the installation of primary insulated pipes is scheduled for 2014-2020;
- The installation of solar heating panels in municipal buildings;
- The installation of heat recovery systems;
- The replacement of pumps in heating plants; and
- The installation of wood chip biomass boilers.

58. Novogrudok has also undertaken some measures to reduce the cost and carbon emissions of street lighting. This is in response to the Decree of the Council of Ministers of the Republic of Belarus #248 dated 22.02.2010, requiring that a 100% of lighting fixtures for street and industrial lighting must meet national energy efficiency standards by the end of 2012[28]. The total number of sodium-discharge lamps in street lighting fixtures that meet the national energy efficiency standards, has been increased to 755. In addition, Novogrudok municipality also wants to reduce its cost of street-lighting, estimated to be USD 20,000 per month in the city and USD 7,500 in the district villages.

59. To date, Novogrudok has made some efforts to reduce these costs through:
    - Reduction in the number of hours when street lights are operational;
    - Powering of alternate street lighting columns and dimming of certain street lights; and
    - Greater vigilance and monitoring of lights that are manually controlled.

60. The ability to generate electricity savings from street lighting has been hampered by Novogrudok's typically foggy weather making automated switching of these lights with photocells problematic. In reducing the operations of some of the street lights, municipal officials also need to consider pedestrian and vehicle safety issues. As such, the current regime of street lighting is not considered sustainable in the long term in the context of cost and carbon reduction.

61. Novogrudok municipality has installed over 100 traffic signal devices and pedestrian crossing signals with LED lights, reducing energy consumption. The municipality has the desire to extend this installation program to street lights. They have identified the need to replace over 811 energy inefficient mercury discharge lamps that are being used for street lighting, with LED lighting. There are, however, a number of local issues, constraints and opportunities preventing the municipality from converting all outdoor public lights to LEDs:
    - The procurement of new high-quality LED lighting has, and continues to be, problematic as the municipality under public procurement rules can only buy new lighting primarily from Belarusian suppliers from the "lowest cost" provider as determined from a suppliers tender;
    - Locally produced LED fixtures often use low-quality imported LEDs with attendant reliability and quality control issues;
    - There are also quality issues with some of the locally manufactured street lights involving premature failure and the lack of guaranteed service life of these lights;

[28] The standard sets the minimal efficiency of street lighting at 70% (for IP23 protected fixtures) and 60% (for IP23+ protected fixtures), measured as the ratio of light output of the fixture to the light output of the lamp in the fixture.

- The municipality's need for resources and knowledge to prepare a viable business case for LED procurement as a viable replacement of sodium discharge lamps through the comparison of their respective service lives and energy costs;
- The municipality also has plans to replace outdoor lighting in public areas with LEDs such as hospitals, schools, utility buildings, educational and healthcare facilities and other municipal assets; and
- Opportunities for off-grid LED public lighting are possible through various sites around Novogrudok including the use of solar PV panels for outdoor lighting of areas including tourist attractions such as the area around the Novogrudok castle.

62. Overall these issues were not considered insurmountable and the solutions discussed included:
    - The opportunity to apply an Energy Management Information System to the street lighting asset;
    - The opportunity to explore "green" procurement routes; and
    - The development of technical solutions in partnership with local universities and colleges.

63. Novogrudok is also implementing a program to replace all incandescent lighting in the common areas of public and residential buildings with energy efficient lighting devices. Most of the lights in these common areas are manually switched on. Moreover, these bulbs are easily stolen and are often left on permanently. The aforementioned Decree #248 mandates the installation and usage of automatic switching in common areas for all residential assets by 2012. Recent pilots by the municipality have shown that the LED replacements with acoustic sensors work well in terms of reducing the electricity bill, though there is room for improvement in the monitoring of the proper installation of the LEDs and sensors. These LED replacements have provided cost and carbon reductions, and improved security and safety in these areas.

64. Another significant GHG reduction opportunity for Novogrudok is the modernization of the local municipal laundry. The energy supply for the laundry comes from electricity and natural gas used for producing steam from a boiler house. The steam is transferred over an 800 m distance through stretches of pipe, some of which is uninsulated pipes at a pressure of up to 6 Bar. There are heat losses as well as health and safety concerns over the route of the pipes through a children's play area. In addition, the cooling of the excess steam at the laundry is causing additional energy losses, the condensing plant is beginning to fail, one of the municipality's boilers is dedicated for steam supply to the laundry, and the laundry equipment is outdated and inefficient. Modernization of the equipment could result in energy savings of more than 85%, substantial reductions in energy costs and a modest GHG emission reduction. Notwithstanding, productivity at the laundry remains high and the facility is an important employer and provider of services to Novogrudok municipality.

STRATEGY

Project Rationale and Policy Conformity

65. This Project is consistent with the GEF Climate Change mitigation focal area and specifically "CCM:2 – Promote Market Transformation for Energy-Efficiency in Building and Industrial Sectors" by promoting investment, technologies and policies for energy-efficient street and

public buildings lighting in pilot city of Novogrudok (Component 3) and with "CCM:4 – Promote energy-efficient low carbon transport and urban systems" by promoting investment, technologies and policies for sustainable transport in the pilot cities of Novopolotsk and Polotsk. The Project focuses on green urban development planning and pilot green urban development projects related to energy efficiency and sustainable transport in small and medium cities in Belarus, and replication with the development of green urban development plans to a minimum of 10 cities. The project aims to remove barriers to support further investment in green urban development by cities in Belarus, with a particular emphasis on energy-efficiency in street and public buildings lighting and sustainable transport initiatives. These activities are consistent with the GEF climate change mitigation focal area with their emphasis on reducing greenhouse gas emission reductions, in particular from transport and lighting sectors.

66. The 2011-15 UNDAF for Belarus[29] includes Agency Outcome 3.1. National capacity to mitigate and adapt to climate change enhanced. Under this Outcome, actions to reduce greenhouse gases through energy-efficiency and sustainable transport are both included. The proposed project is fully in line with the UNDP Country Programme Document (CPD) for Belarus for 2011-2016 which states that "UNDP will assist Belarus with further developing the country's capacity to mitigate and adapt to climate change. UNDP will provide the Government with capacity building support to help meet the country's obligations under the environmental conventions ratified by Belarus." The CPD 2011-2016 among its outputs includes Output 3.1.2. "National legal and institutional frameworks for the use of renewable energy sources, particularly wind energy, strengthened." Outcome 3 of the CPD is for enhancing environmental sustainability and has a budget of USD 3.5 million. UNDP also has experience with implementing two GEF energy-efficiency projects, one focused on the EE in the state sector which finished in early 2012 and another one on EE in residential buildings which started in December 2012.

Country Ownership: Country Eligibility

67. The GoB ratified the UN Framework Convention on Climate Change on 11 May 2000.

Country Drivenness

68. The 5th National Communications of the Republic of Belarus to the UNFCCC identifies both energy-efficiency and transport as two priority areas with large potential for reduction of greenhouse gases in the domestic economy in the Republic of Belarus. The State Climate Change Mitigation Program (2013-2020) has emphasized energy-efficiency and transport as key priority areas for additional action. Finally, in the transport sector the Program of Development of Automotive Sector of Republic of Belarus (2011-2015)[30] and the "Strategy for limiting transport impact on air until 2020"[31], both recognize the importance of sustainable transport policies and initiatives as a tool to mitigate and reduce greenhouse gases in

[29] http://undp.by/f/file/UNDAF%20Belarus%20English_text.pdf

[30] This program aims to meet the demand for freight and passenger transportation by road vehicles, and enhance the quality of transportation services and competitiveness of Belarusian transportation companies in international markets. Along with increases in passenger and freight transportation, the program is expected to yield 1-2% annual reduction in tailpipe emissions (pollutants) from road vehicles.

[31] See Para 37 for details

Belarus. This Project is fully consistent with the all national strategies and plans of the Republic of Belarus.

69. The environmental policy of Belarus has the intent on providing environmental safe conditions for its citizens, and protecting and allowing rational uses of natural resources that will be sustained for future generations. These are stated under the environmental laws of Belarus, which include the “Law on Protection of Environment (1992, as revised in 2002)” and the “National Strategy of Sustainable Social and Economic Development for the Period until 2020”, “Law on Atmospheric Protection (2008)”, “Law on Protection of the Ozone Layer (2014)”, "Law on Renewable Sources of Energy" (2010), and “Law on Treatment of Wastes (2007)”. These policies and laws demonstrate the drivenness of the Government of Belarus to pursue the strengthening of existing urban development policies of the Belarus (as detailed in Paras 28 to 38) to be consistent with green urban development.

70. The Government of Belarus is also committed to implementing environmental policy through:
    - improving environmental legislation;
    - establishing a system of financing environmental measures;
    - empowering of state regulatory bodies, and related organizations in environmental monitoring and enforcement; training and ecological education of the population;
    - international co-operation and active use of international experience for addressing environmental challenges;
    - setting of State targeted strategies, programmes and action plans on the protection, restoration and rational use of certain components of the environment and natural ecosystems, the most relevant of which are the “National Programme of Climate Change Mitigation for 2008–2012”, and “the Strategy of Reducing GHG Emission and Improving GHG Absorption by Sinks in Republic of Belarus for 2007–2012”.

Design Principles and Strategic Considerations

71. This Project is designed to assist Belarus in the initiation of green urban development by approaching its development through the use of best international practices and holistically addressing urban problems namely in the areas of sustainable transport for Polotsk and Novopolotsk, and energy efficiency in Novogrudok. These cities were chosen based on their commitment to integrated green urban development as expressed through their participation in the EU Covenant of Mayors, their willingness to provide co-financing and support for Project activities, and due to the fact that none of the cities are significantly large enough to warrant a much larger project[32]. The increased likelihood of success for demonstrations in smaller sized cities will also increase the replication potential of the demonstrations, a key objective of this Project. The positive demonstration experiences generated from the Project will be able to inform the details and modalities of any proposed green urban plans for Belarus as well as associated policies, standards and regulations to implement such a plan.

72. With the concept of green urban development being tied to GHG emissions being new to Belarus, Project resources will be channeled into efforts to streamline the fragmented

[32] The Project will not focus on larger cities in Belarus such as the capital city Minsk, due to the limited Project budget and the decreased likelihood of successful outcomes for larger cities in Belarus.

manner in which urban planning is now practiced in Belarus. In particular, the Project will support green cities development through:

- approaching green urban development priorities in a holistic manner utilizing best international practices;
- fully evaluating the social and environmental impacts of any green initiatives;
- ensuring that green initiatives undertaken are sustainable;
- taking lessons learned from implementing green urban development to improve the design and implementation of subsequent green city initiatives; and
- working within the existing centralized framework for urban planning in Belarus that will develop green urban development plans (GUDPs) and best practice guides for their development and replication throughout all Belarusian municipalities. This is illustrated on Figure 7.

Figure 7: Framework for Formulating Green Urban Development Plans

73. To enhance the replication of green urban development plans and implementation beyond the three cities of this Project, the Project will facilitate:
    - The definition of criteria for green urban development and a green city for Belarus;
    - Analysis of existing legal and regulatory system against the criteria of green urban development;
    - Identification of key strategic directions of the national urban development policy in Belarus, to reflect green urban development priorities;

- Incorporation of green urban development plans into a model residential area (as determined by MoAC) that meets the principles and norms of green urban development to promote new approaches to spatial planning in Belarus;
- Introduction of eco-standards in urban development;
- Setup of institutional mechanisms to promote green urban development throughout Belarus; and
- Support efforts of other municipalities in Belarus to become green cities through new institutional mechanisms.

74. Specific reasons for the selection of mitigation actions in the transport and street lighting are as follows:
    - Stakeholder consultations in both Novopolotsk and Polotsk revealed that the transport sector is under represented in urban planning. Moreover, both cities have issues with transportation and neither has developed an integrated sustainable transportation plan. In addition, GHG emissions in transport for these cities are rising;
    - The implementation of sustainable urban transport measures proposed under this Project are not affected by the provisions of the City Master Plan, and can be implemented under the current regulations in force. This could include traffic management measures (such as dedicated bus lanes for public transport and traffic light synchronization) as well as investment in bicycle network and infrastructure, improvement of public transport services; and
    - Novogrudok city authorities have identified a range of possible activities as part of their SEAP such as energy-efficient street and public buildings lighting where potential sources of funding could be utilized for undertaking new activities and making new investment to enable cost savings and achieve GHG emission reductions. Energy-efficient lighting offers the benefit of being highly visible and therefore it should help to catalyze new and additional sustainable urban development interventions in the city of Novogrudok in the area of energy-efficiency.

75. Specific strategic considerations on this Project include:
    - *For the Polotsk-Novopolotsk region, an integrated analysis of the urban traffic congestion issues*. The current work to date by each city on their urban transport issues is not fully integrated. The congestion issues of these cities are to a large extent, related to travel between the two cities as well as inter-city travel between Polotsk-Novopolotsk, Minsk, Latvia and Russia. A priority of the Project will be to provide an integrated analysis of both cities;
    - *For the Polotsk-Novopolotsk region, planning measures to reduce carbon intensity of urban movements*. Efforts will need to focus on increasing the share of public transit passengers and non-motorized modes of transport such as cycling and walking. These measures are strongly supported by the mayors of each city;
    - *For Novogrudok, increase access to energy efficient technologies and systems that are not readily available in Belarus*: The Project will assist Novogrudok in the acceleration of energy efficient technology for application within its municipal assets. This will include the conversion of their lighting systems for streets and public buildings to LEDs, installation of smart systems to switch on these lighting systems, and technical assistance to the municipality in preparing feasibility studies to identify solutions to improve the energy efficiency of the municipality's public laundry facility.

Project Objective, Outcomes and Outputs

76. The objective of this Project is the growth of development of green urban development plans and pilot green urban development initiatives related to energy efficiency and sustainable transport in small and medium cities in Belarus.

77. **Component 1: Development and adoption of green urban development plans**. To support the intentions of the Republic of Belarus to transform its urban areas into "green cities", specific activities or plans for green urban development (GUD) will need to be integrated with the existing legal and regulatory framework to develop low carbon climate resilient cities in Belarus through the Institute of Regional of Urban Planning (IRUP) under the Ministry of Architecture and Construction (MoAC) with contributions from other state and non-governmental organizations having expert capacity and experience in the area. Once developed, IRUP will have the format of GUD plans that will be able to address a wide range of urban issues (such as energy-efficiency, renewable energy, and sustainable transport[33]); identify funding modalities and sources from state and municipal budgets as well as corporate and philanthropic sources; and assist with the development of GUD plans for the cities of Novopolotsk, Polotsk, and Novogrudok. However, with no precedence of "green urban development" in Belarus, the demonstration activities under Outcomes 2 and 3 will provide a basis for GUD plans in the context of sustainable transport (as planned for Novopolotsk and Polotsk), and public sector energy efficiency activities (as planned for Novogrudok). The key outputs of this component will be a comprehensive "best practice guide" for urban planning with green elements developed and adopted in Belarus and three city-specific green urban plans developed and adopted for Novopolotsk, Polotsk, and Novogrudok. Outcomes 2 and 3 will also inform amendments required for existing policies and regulations in the area of energy efficiency for municipal assets (such as public lighting) and urban transport development that will be proposed as additional policy instruments to achieve a green outcome. *The expected outcome from the outputs and activities under this component is the successful development and adoption of GUD plans* and the replication of the greening of several Belarusian cities to international standards. This will provide MoAC with the integration of GUD plans with existing urban plans and associated national urban development standards and plans. This outcome will be achieved through:

- *Output 1.1: Proposed enhancements of national policies and regulations for energy efficiency of municipal assets and urban transportation.* This will be achieved through the development and agreement with the MoAC and IRUP on the various GUD criteria that need to be focused upon (using EU-GUD criteria developed), and a "'gap analysis" consisting of a review of the current frameworks to identify areas of conflict and opportunity. Successful examples using best international practices of improving energy efficiency of municipal assets (such as street lighting and municipal laundries) and urban mobility through low carbon modes of transport will be developed in the activities of Outcomes 2 and 3. These examples will be used to identify areas of conflict and opportunity and to propose enhancements to existing standards and regulations and attendant amendments required to address green city development. *GEF assistance will be required for the delivery of this output that will include*:

[33] Green elements of a GUDP could include, amongst other elements, sustainable transport plans, sustainable energy plan, sustainable water consumption plan, plans for green infrastructure and a programme for increased use of green building materials. The sustainable transport inputs into a GUDP would be in the form of a Sustainable Urban Mobility Plan (SUMP).

- Proposals for enhancement and revision of national standards, norms and codes (i.e. legal, regulatory and technical codes) of common practice[34] based on results from the demonstration projects in Components 2 and 3 including:
  - ⇒ Code 45-3.03-227-2010: Streets in settlements - construction design norms;
  - ⇒ Code 45-3.01-116-2008: Urban development - settlements – planning and construction norms;
  - ⇒ Code 45-3.01-117-2008: Urban development. Allotment residential construction – planning and construction norms; and
  - ⇒ Code 45-3.02-69-2007: Site improvement. Greening - planning and construction norms;
- review of existing national standards and policies on street lighting and residential lighting in Belarus, and its appropriateness for LED devices in comparison with LED installation experiences in Novogrudok and other jurisdictions;
- provide revised recommendations for changes standards and policy for street lighting, lighting in public areas, and residential lighting against existing legislation that will include standards for lighting fixtures, illuminance of certain areas and energy performance of LED lighting fixtures and other lighting technologies as deemed appropriate, monitoring methodologies for energy usage in street lighting and other municipal energy consuming activities, and monitoring protocols for GHG reductions from these activities;
- provide revised recommendations for changes in standards and policy for municipal laundries against existing legislation that will include standards for performance of washers and driers and types of energy sources to be used for laundry activities;
- review existing policy, standards and regulations regarding the development of sustainable urban transport and its appropriateness for ongoing sustainable transport initiatives being undertaken in Novopolotsk and Polotsk;
- provision of recommendations to integrate sustainable transport measures into existing national standards for Belarusian cities including:
  - ⇒ policies for improving the utility of public transport services that includes service frequency, ease of transfers between different modes of transport and bus routes, coverage of public transit network that cover major city destinations, and sustainable financing of public transit from state budgets and private entities;
  - ⇒ standards for sustainable transport measures including road dimensions vehicles, standards for public transport stops and transfer hubs, bicycle access and availability, and energy performance standards for buses and other public transit rolling stock;
  - ⇒ regulations governing the monitoring of GHG reductions from sustainable transport measures;

- *Output 1.2: Green Urban Development Plans for Cities of Polotsk, Novopolotsk and Novogrudok:* The work carried out under output 1.1 and the existing regional "master plans" for these cities will be used as a basis for developing their GUD plans. In close collaboration with IRUP[35], *GEF assistance will be required for these cities in developing their own GUD plans including*:
  - the available social and economic forecast to be used for defining growth of these cities and their district;

[34] Examples of regulatory codes includes night-time noise levels in certain urban areas that would restrict the types of roads to be constructed, and classification of buildings based on energy consumed per square meter. These regulatory codes can be amended to encourage green development

[35] IRUP has the Master Plans for all cities in Belarus

- determination of the optimal system of settlement distribution and land use;
- determination of the required regional system of public transport and infrastructure;
- coordination with local government urban development plans and objectives of the national strategies and programs as outlined on Para 32;
- estimating projections of energy requirements using low carbon technologies to meet the requirements of a green city plan and providing revisions of these estimates based on feedback from stakeholder consultations during the development of the plan;
- preparation of the three GUD plans[36].

- *Output 1.3: Green urban development activities that are integrated into existing legal and regulatory framework.* To assist the Government of Belarus in enhancing energy efficiency of the national economy, green urban development activities and plans need to be integrated with the existing legal and regulatory framework into a format of a guidebook that contains "emerging GUDPs" and "best practices guide and case studies" (see Figure 7). This guidebook will also define GUD strategies and implementation, and identify funding and financial mechanisms for sustainability. The Project with its support for energy efficiency and sustainable transport initiatives will be able to inform the existing national legal and regulatory framework to "green" existing policies, the associated regulatory framework and a proposed national plan for GUD. To achieve this, *GEF assistance will be required to enable integration of GUD with the existing legal and regulatory framework including*:
  - Defining criteria for "emerging" GUDPs for Belarusian municipalities;
  - Identification of key strategic directions of national urban development plans and policy in Belarus with respect to sustainable urban transport and energy efficiency for public assets[37];
  - Provision of designs for a model residential area that meets the principles and norms of green urban development that will promote new approaches to spatial planning in Belarus and abroad; and
  - Introduction of eco-standards in sustainable urban transport development and energy efficient lighting for municipal assets.

- *Output 1.4: National Workshops on development of GUDPs for other cities.* A total of 8 national workshops will disseminate knowledge products from Outputs 1.1, 1.2 and 1.3 to other municipalities which will provide a forum for knowledge transfer and feedback from participating municipalities. The feedback will be used to refine the policies, standards, regulations and knowledge products from Outputs 1.1, 1.2 and 1.3. *GEF assistance will be required for the technical assistance to prepare and conduct these workshops with MoNREP and MoAC as well soliciting workshop feedback and preparing workshop proceedings;*

[36] The framework for a GUD plan would be formulated by the Project using examples from foreign cities that have GUD plans. These GUD plans would include, amongst other planned measures, actions to ensure energy is sustainably consumed in the building sector, urban transport is organized to minimize fossil fuel usage, and water usage in the city is consumed in a sustainable manner.

[37] Examples of key strategic directions for energy efficiency includes improvement of existing buildings to modern energy efficiency standards, installation of EE technologies in existing buildings, construction of EE buildings, and EE measures for street lighting and traffic signals. These can be derived from SEAPs from specific cities in Belarus. Examples for sustainable transport may include development of walking and cycling facilities (including trails, lanes, parking and road crossings), development of public rapid transit schemes, investments into bus and tram infrastructure, and affecting behavioural changes in travel choices through raised awareness and marketing. These can be derived from city-specific SUMPs.

- *Output 1.5 MRV framework for GUD in Belarus. GEF assistance is required for the technical assistance to setup the MRV programme that measures GHG reductions from the pilot components, specifically Components 2 and 3.* This will include:
  - GHG reductions from modal shifts to less carbon intensive modes of urban transport as well as energy efficiencies realized from improved traffic flow of public buses and trams from synchronized lighting and the removal of parked cars from public transit corridors as part of Outputs 2.1-2.6. Technical assistance will be provided to design and conduct the surveys necessary to find: a) the number of passengers who have switched from private car trips to public transit, cycling or walking; b) the average distances avoided by private car; and c) the size of the survey or the number of respondents necessary for a reasonable confidence level of the survey that will account for the seasonal variations of public transit usage. Guidelines for such a survey can be found in approved CDM Methodology AM0031[38]; and
  - GHG reductions from the investments made in Outputs 3.1, 3.2 and 3.3. Technical assistance will be provided to design and conduct the monitoring and review of the performance and reliability of the new lighting systems in pilot areas and additional areas. This will focus primarily on baseline energy consumption, the energy consumption of the new lighting and laundry equipment installed and the resulting GHG emission reductions.

78. **Component 2: Development of pilots on SUT in Novopolotsk and Polotsk**. *The expected outcome from the outputs and activities under this component is the completion of successful pilots in SUT in Novopolotsk and Polotsk* that can be replicated or strengthened in the twin cities and other municipalities of Belarus to reduce carbon intensity of urban journeys. This outcome will be achieved through:

- *Output 2.1: Integrated Sustainable Urban Mobility Plan (ISUMP) for Polotsk and Novopolotsk***.** This output addresses an obstacle to reduced carbon intensity of urban travel between and within these cities. While both cities have a statutory duty to plan for growth, joint planning of their transport systems needs to be strengthened due to the interrelationship of the cities with respect to common locations for employment and shared urban transport needs. This plan will form the basis for subsequent investments by the cities, some of which will be supported by GEF, and serve as the underpinning strategy to inform regional decision making at a strategic level. *Integral to this output will be a traffic model of the two cities* that will form the baseline for understanding regional travel behaviour and to test infrastructure level interventions. The integrated traffic model and ISUMP offer the best opportunity to maximise the investment in both the feasibility and delivery of a solution that meets present needs in the most efficient way whilst also addressing future transport needs of both cities. By considering the needs of both cities jointly, the opportunities and challenges can be met in a resilient and responsive way with predictable results. *To deliver this output, GEF assistance is required for the following activities*:
  - Define the objectives of the ISUMP that will:

[38] Specifically, Section 6.3 (pg 50-51 or Para 128-134) provide details of the required survey: http://cdm.unfccc.int/filestorage/e/h/P3RA2GQMBV490J75IWYXSFLUZ1KECO.pdf/EB70_repan14_AM0031_ver05.0.0.pdf?t=OUV8bjh6Z25nfDD5GxJggW5iJ617hQyFmZCk. While this provides a high degree of detail and rigor for obtaining carbon credits, reference to this methodology is only intended to provide a framework and guidance on how the survey should be setup.

a) respond to the issues and priorities raised in the City Master Plans and Comprehensive Transport Plans of the two cities;
b) enhance the attractiveness the agglomeration of the two cities through improved efficiency of its mobility network;
c) change the mobility conditions of Polotsk and Novopolotsk to reinforce the attractiveness of the cities for new businesses and citizens and minimize pollution;
d) ensure the continuity and connection of transport networks; and
e) provides citizens with conditions to adopt a lifestyle that, to a larger extent, incorporates sustainable mobility;

- Conduct traffic surveys that would include traffic counts, end-to-end journey analysis, destination mapping, trip generation and modal split for all forms of transport in Polotsk and Novopolotsk in an agreed methodology and format that can be used as baseline data. Given that this is a large task, GEF-supported data collection should be restricted to sites where GEF investments will be made, restricted to data required by a traffic model and a demonstration of the required data collection activities (to be defined during the Project) that need to be continued after the EOP. This will likely include a comprehensive survey of locations in the highway network where congestion is currently a problem including peak hours, and where there are high volumes of passengers using public transit. Data collection activities for other sites and corridors will be co-financed from the respective municipalities;
- Setup of an appropriate traffic model[39] that, among others, has a built-in module for GHG emissions estimation. The setup will include the procurement[40], commissioning and necessary training in the use of a computer traffic model to inform the development of the ISUMP and emerging infrastructure level interventions. Outputs from the traffic model will model simulations of traffic movement within and between the Cities and enable urban planners to optimize traffic flows and minimize journey times within the two cities. Model outputs of optimized traffic flows will be provided as inputs into the development of the ISUMP;
- A comprehensive assessment of future growth and employment and urban mobility needs;
- Integrated planning for public transport routes, feeders, facilities and corridors with the aim to increase ridership and modal switches from private cars through improved delivery public transit services, decreased journey time, and NMT travels modes such as cycling. The key role in ensuring intercity public transport service will be played by Bus Depot #6 from Novopolotsk that currently services the Polotsk-Novopolotsk public transit route. Electric transport (tram) will be a key priority for inner-city public transit promotion in Novopolotsk. This should include transport to and from the Naftan Refineries and tram stops as well as any new bus stops and cycling corridors if proposed[41];

[39] An example of such a model could be Aimsun Microsimulation (www.aimsun.com)
[40] Licensing rights for the modelling software to be procured as part of the project will be agreed with the relevant stakeholders in line with the relevant UNDP procedures
[41] An interesting concept for Polotsk and Novopolotsk to consider would be to provide reduced transit fares or free use of public transit for using park-and-ride lots and switching modes of transport to public transit. Due to the high volumes of cars going to the Naftan refinery every day, such a service could be considered for employees of the refineries which can be tied to GHG reductions of the two cities and the provision of additional state budget for the operation of such a system. The buses and trams would have signalling priority as well as dedicated corridors allowing efficient passage through a corridor and minimizing journey times. Examples of reduced fares or free public transport to congested areas include Nysa, Poland (http://www.eltis.org/index.php?id=13&lang1=en&study_id=4052)

- Development of the ISUMP through broad participation of all local stakeholders including general public, and NGOs to formulate plans that will influence travel behaviour and smarter choices, including partnerships with public transport providers and a comprehensive walking and cycling plan;
- Integration of the ISUMP with the revised versions of the City's Master Plans and Comprehensive Transport Plans. This will ensure consistency of the ISUMP with their SEAPs and approaches to sustainability measures for buildings, energy generation and land use;
- An action plan of the setting of necessary steps, performance targets, phasing and delivery of the investment over a 5-year period and beyond in a 15-year timeframe;
- A detailed business case identifying the level of investment required, the payback period, funding sources and procurement criteria for key infrastructure projects that will feed into detailed feasibility studies proposed under Outputs 2.2 and 2.3;
- An analysis of the potential of sustainable transport to stimulate the tourism sector and policies required to facilitate;
- Estimates of GHG reductions that will be achieved with proposed actions of the ISUMP;
- A comprehensive maintenance plan for the sustained operation of the public transit network including maintenance of vehicles in good operational condition as well as maintenance of tram tracks and the roads along which public transit operates; and
- Formation of a joint coordinating mechanism to accelerate agreement of the ISUMP between Polotsk and Novopolotsk;
- Study tours for key stakeholders, including government bodies and municipal officials from Polotsk and Novopolotsk to selected foreign cities where SUT measures have been successfully adopted and reduced transport-related GHG emissions. Such a study tour would assist towards Belarusian legislative harmonization of EU legislation for sustainable transport;

All these activities will be conducted using best international practices to test interventions and formulate joint strategies in consideration of all modes of transport. This will inform spatial and infrastructure plans and the softer measures required to influence travel behaviour. All the proposed activities will receive all necessary approvals in line with the existing legislation. Table 10 provides an overview of the transport planning process of the two cities and proposed Project activities that will improve quality and integration of transport plans of Polotsk and Novopolotsk.

- *Output 2.2: A detailed feasibility study for the integration and extension of the Cycle Network for Polotsk and Novopolotsk.* This study complete with an action plan and business case for investment will form the basis for subsequent GEF investment, contributing towards the extension and integration of the current cycle network and facilities in Polotsk and Novopolotsk, improving access, amenity and the visibility of this mode of transport. The impacts of this feasibility study will be ensure that cycling infrastructure investments maximize benefits in terms of connectivity; the network has logical points where cyclists can join and leave safely and connect destinations in a meaningful way; and a programme of activities is conducted to raise the visibility and awareness of cycling as a mainstream mode of urban transport. Cycling network design principles from the European Cycling Federation will be used as guidance for this output[42]. *GEF support is required for the technical assistance using best international*

and Portland, Oregon, USA.

[42] http://www.eurovelo.org/wp-content/uploads/2011/08/Guidance-on-the-Route-Development-Process.pdf

practices to the municipal governments to prepare the feasibility study, action plan and business case for an integrated cycle network for Novopolotsk and Polotsk that will include:

Table 10: Overview of ongoing and proposed transport plans for Polotsk and Novopolotsk

Planning Step	Polotsk	Novopolotsk
"National and Regional Master Plans"	Completed[43]	
City Master Plan	Completed in 2004. Currently under revision	Completed and approved adopted 2012
Concept on Sustainable Urban Mobility[44]		Completed by BTU
	Integrated concept to be developed by UNDP-GEF Project	
Traffic Survey[45] and Modelling[46]	To be completed by UNDP-GEF Project	
ISUMP[47]	To be prepared by EU Project[48]	Work started by BTU
	Integrated SUMP to be developed by UNDP-GEF Project	
Comprehensive Transport Scheme	To be revised following master plan revision and approval, revisions to be proposed by UNDP-GEF	Available, revisions to be proposed UNDP-GEF
Action Plan	UNDP-GEF	

- An audit of the existing cycle network and the identification of new routes and destinations that can be connected;
- Consideration of options to provide the necessary infrastructure to include on-road, off-road and shared space solutions;
- An awareness raising field study of international best practice for key stakeholders;
- Design of a comprehensive network that includes suitable bicycle parking, integration with other modes of transport and facilities (such as cycle rentals and repair shops);
- A programme of events (to be determined by the Cities and the Project) to promote the use of the network and cycling in general. This might include the production of network maps, events that increase the visibility of cycling and training in cycling proficiency and safety;
- An examination of procurement routes, including "green procurement" of equipment and technology identifying suppliers and supporting of equipment and technology such as identifying appropriate local sources for the procurement of rental bicycles;
- Required behavioural changes to increase the use of cycling;
- A detailed business case, identifying the level of investment required, for the proposed infrastructure[49];

[43] The regional master plan considers Polotsk and Novopolotsk as twin cities for the purposes of development
[44] New transport planning step introduced by EU and integrated through the UNDP-GEF Project
[45] Traffic and passenger surveys are currently done under the preparation of the Comprehensive Transport Scheme
[46] New transport modelling step to be introduced by the UNDP-GEF Project
[47] Ibid 43. ToRs for SUMP come from the Mayor's office
[48] EU project "From Energy Efficiency to Urban Mobility: Introducing Participatory Approach to Development of a Sustainable Mobility Plan in Polotsk"
[49] This may include the possibility of private building developers funding a portion of the cycle network as a means to increase the attractiveness of their buildings. This aspect of financing a cycling network should be adopted by IRUP in its development of national GUD criteria

- Proposals to ensure that access for disabled people can be secured alongside improvements to the network including dropped kerbs, resurfacing and appropriate signage where the existing built environment permits to do so.

- *Output 2.3: Detailed design plans to address strategic transport needs*. This activity provides an opportunity to capture the benefits of the ISUMP that meets the needs of both Polotsk and Novopolotsk, thus avoiding design work currently being done that does not holistically address traffic congestion challenges and carbon intense modes of transport resulting from travel behaviour. A key input into these holistically prepared detailed design plans is the information generated by the detailed traffic model developed in Output 2.1. *GEF assistance will be required for the technical assistance of up to four feasibility detailed design plans that may include:*
  - Synchronisation of signals along key corridors such as the Vulica Kastrycnickaja and Bahdanovicha in Polotsk and the Vulica Maladzioznaja in Novopolotsk;
  - Detailed design plans[50] of improvements of congested junction at the Airport residential area of Polotsk with Vulica Bahdonovica and Vulica Kastrycnickaja. This may include road widening schemes, improved signalling based on traffic volumes, strategically located park-and-ride lots and accommodation for dedicated lanes for buses that will reduce bus journey times, improve public transit services and discourage private car usage;
  - The creation of strategically located bus priority lanes and junctions, and the integration with feeder marshrutka routes and the bicycle network. The integration of these different modes of transport should facilitate easy transfers between walking, cycling (possibly through the use of rental bicycles), buses, mashrutkas and trams. One possible bus corridor that could be improved is Bus Route #5 that goes between bus stations in Polotsk and Novopolotsk covering a distance of around 18 km. Journey times of the route could be reduced and ridership increased through bus priority lanes, improved connections to other public transit routes (i.e. bus or mashrutka routes or cycling routes), and improved conditions of bus stops;
  - Improvements in public transit services including the provision of improved real-time information, and improvements in the condition of bus and tram stops. These studies would also gauge the impact of these investments with regards to improving public confidence in public transit services in Polotsk and Novopolotsk to the extent that it competes with the private car as an urban transport mode.

  The Project will ensure best international practices for the completion of the feasibility studies that will include consideration of all constraints and underground services diversions; and safe crossing points for pedestrians, access for disabled people and safeguards to residential amenity in terms of noise. More precise details of these

[50] In contrast to the master plan, a detailed design plan is developed for a part of a city or rural settlement for residential, industrial, recreational, landscape and other functional areas. A detailed design plan is developed for the territory where major investment is expected or planned (e.g. new housing development areas) or where local governments are interested in exercising tight control over development of e.g. downtown areas of historic buildings. Building on the approved master plan, the detailed plan further defines and clarifies functional and spatial planning organization of the territory, and sets streets and roads; borders and size of land plots; urban development protocols; planned urban development options; planned options for protection and use of historic and cultural heritage; environmental protection measures; and implementation phases. The detailed design plan is generally compiled through a one-stage process and consists of a narrative section with a set of drawings done to the scale of 1:500; 1:1000; 1:2000.

studies will be known after the completion of the ISUMP. However, these studies will be completed using best international practices on holistic analysis and further strengthen investment plans that will have the impact of influencing travel behaviour towards lower carbon intensive modes of transport.

- *Output 2.4: Investment in the cycling network.* This output consists of direct investments into improvements to the cycle network, which build on the conclusions of the detailed feasibility study completed under Output 2.2, to include LED lighting, cycle parking, signage, dropped kerbs, on and off-road provision and facilities in buses for cycles. *GEF investments for this output will be considered for*:
  - Installation of energy efficient (e.g. LED) lighting of the existing cycle network. Based on the recommendations of the feasibility study, this will support supply and installation of efficient lighting columns where lighting levels are poor or in dark areas that prevent connections to other parts of the network. With the length of the existing network not known, the extent of this investment has been estimated;
  - Provision of cycle parking at key nodes, points of arrival and interchanges. This would include the supply and fitting of simple bicycle hoops (for locking), cycle shelters, and safe (signal controlled) crossing points for cyclists;
  - Creation of cycle paths in the existing public realm and pavements including improved signage, lines, dropped kerbs and tactile paving;
  - Creation of off-road leisure routes that are green infrastructure corridors along the River Daugava and other water bodies. This can be considered in the context of the wider ecology of the area, adding to the amenity and value of the green infrastructure asset; and
  - Installation of bicycle racks on a number of buses to improve facilities for cyclists on buses;
  - Awareness raising measures for cycling that affect behavioral changes in the choices of urban transport modes.

  Details of the planned GEF investment and the co-financing investment for the Polotsk and Novopolotsk cycling network can be found in Annex VI on Table VI-9.

- *Output 2.5: Investment in improved public transit services.* This output consists of direct investments into reducing wait times for passengers at bus or tram stops and improving the safety and comfort of bus and tram stops, which build on the recommendations of the detailed feasibility study completed under Output 2.3. These investments are designed to improve the public's confidence of improved public transit services, and encourage modal shifts from private cars to public transit. *GEF investments for this output will be considered for*:
  - providing "real time" information for passengers on electronic display boards at bus, mashrutka and tram stops and via SMS and mobile apps that track the route and predict the arrival and departure times of services;
  - provision of improved seating, lighting shelter, level access and passenger information at bus and tram stops**.** This investment could be made with the local bus and tram operators and corporate sponsors for advertising space that would add quality and value to existing investment plans. Improvements will be made so that public transit services are accessible for all citizens including disabled and senior citizens;
  - setup of park-and-ride facilities strategically located at the terminus of the bus and tram routes or at key bus and tram stops; and
  - awareness raising programs of improved transit for the two cities.

Details of the GEF investment and the co-financing investment for improved public transit services for Polotsk and Novopolotsk can be found in Annex VI on Table VI-11.

- *Output 2.6: Investment in bus priority lanes and traffic light synchronization.* This output consists of direct investments into synchronization of lighting along selected corridors and creating a bus priority lane to reduce bus journey times through congested traffic corridors which build on the recommendations of the detailed feasibility study completed under Output 2.3. Similar to Output 2.5, these investments are designed to improve the public's confidence that public transit services are competitive with private car usage, and encourage modal shifts from private cars to public transit. *GEF investments for this output will be considered for*:
  - The installation, commissioning and deployment of up to 6 adaptive control systems for synchronized traffic signals. The location of the systems has been tentatively proposed along the Bus Route No. 5 that originates at Vulica Kastrycnickaja in Polotsk and goes along the Vulica Maladzioznaja corridor in Novopolotsk, and then to the bus station;
  - The creation of up to 12 km of dedicated bus lanes along a selected public transit route(s) (e.g. the Bus Route No. 5) that will allow for an increase in the average speed of the bus[51];
  - Implementation of parking strategies to remove parked cars along the public transit corridor, if necessary.

Details of the planned GEF investment and the co-financing investment for bus lane priority and traffic light synchronization for Polotsk and Novopolotsk can be found in Annex VI on Table VI-13.

79. **Component 3: Development of pilots on energy efficiency in Novogrudok**. This component responds to the municipality's priorities that energy efficiency is at the core of its green urban development. Activities in this component include a focus on replacement of inefficient outdoor lighting systems with LED technologies, and support for improving the energy efficiency of the municipal laundry. Both of these pilots will provide experience that will strengthen future efforts for integrated green urban development and replication of EE street lighting and laundries in at least 3 other cities that will receive Project support for feasibility study and business plan preparation that would lead to actual investment. *The expected outcome from the outputs and activities under this component is the completion of successful energy-efficiency pilots in Novogrudok*, one for EE street lighting and the other for EE equipment for the municipal laundry. This outcome will be achieved through:

- *Output 3.1: Detailed feasibility studies on energy efficiency in Novogrudok and other cities in Belarus.* This will include feasibility studies complete with business and action plans with holistic approaches for:
  - *Installation of LED street lighting in Novogrudok that are allied to advanced control and management systems*. This would involve an analysis and mapping of the target illuminance levels, colour temperature and needs across the city of Novogrudok taking into consideration amenity, road and personal safely and characteristics of the streets, and areas around public municipal buildings, hospitals and schools. Requirements for control gear and energy management information systems to

[51] The bus schedule for Route No. 5 indicates an average speed of the buses anywhere between 20 and 24 kph.

operate the street lighting efficiently would also be provided taking into consideration improved traffic management. This approach will result in greater costs and carbon savings, providing more certainty over investment decisions and improved ability to monitor performance[52]. Table 11 provides a summary of the street lighting system in Novogrudok. In addition to these lights, there are other street lights in the rural areas of Novogrudok that could be linked to an advanced control and management system;

- *Installation of LEDs for common areas managed by the municipality.* This feasibility study will form the basis for subsequent GEF investment in lighting the common areas of municipal buildings in Novogrudok including communal areas of residential buildings where electricity consumption for indoor and outdoor lighting for these common areas is significant but also essential for safety and security around these buildings[53]. The study will provide an analysis of the needs, locations, target illuminance levels and condition of the wiring within municipal building assets of Novogrudok. In addition, a listing of required control gear and energy management information systems will be provided to reduce lighting management efforts and costs. Findings from this study will be transferrable to a variety of other building types and may benefit public procurement personnel from other municipalities;

Table 11: Street Lighting Inventory for Novogrudok

Lighting Fixture Code	Number of street lighting fixtures	Types of lamps used in street lighting fixtures	Lamp type	Power rating of lamp (watt)	Total power rating of lighting fixture (kW)
ZHKU-70	35	DNaT-70	Sodium discharge lamp	70	2.5
ZHKU-100	128	DNaT-100	Sodium discharge lamp	100	12.8
ZHKU-150	487	DNaT-150	Sodium discharge lamp	150	73.1
ZHTU-70	18	DNaT-70	Sodium discharge lamp	70	1.3
ZHTU-150	87	DNaT-150	Sodium discharge lamp	150	13.1
RKU-125	93	DRL-125	Mercury discharge lamp	125	11.6
RKU-250	718	DRL-250	Mercury discharge lamp	250	179.5

- *Refurbishment and modernization of the municipal laundry*. This feasibility study will provide an audit of the existing boiler plant and equipment in the laundry and equipment fitness; changes in effectiveness and heat load of the boiler house (if the laundry is to be disconnected), changes in the cost of energy produced by the boiler house, a consideration of options for centralised or decentralised heat sources; a suggested investment programme that prioritises the most pressing issues in the short, medium and long term; design of a comprehensive mechanical and electrical system tailored to maximise energy efficiency; and a strategy for the recovery and re-use of waste heat;

[52] This study will also consider the public realm around municipal buildings, street lighting traffic signals, advanced control and monitoring systems, and target illuminance levels across the city that includes tourism assets. The impact of this study would be an holistic solution for Novogrudok lighting needs that will take advantage of opportunities to share the purchase and operational costs with other municipal partners

[53] For indoor applications, this would include the lobby communal areas, hallways and stairwells in hospitals and municipal buildings. The study would also address issues related to LED fixtures and control gear sourcing and procurement and the capacity of the supply chain to provide quality LED products.

- *Replication plans for the installation of LED street lighting in other Belarusian cities.* Once the investment on LED street lighting has been completed in Novogrudok, the Project will support similar initiatives for other Belarusian cities that come forward for assistance to design their LED street lighting program.

GEF assistance is required for the preparation of these feasibility studies that will provide:

- An examination of procurement modalities including "green procurement" of equipment and technology, identifying suppliers and supporting innovation in the local supply chain;
- An action plan setting out the necessary steps, performance targets, phasing and delivery of the investment over a 5-year period. This will include the establishment of selection criteria during the Project to prioritize the installation of LED lights and EE equipment to be installed;
- A detailed business case identifying the level of investment required, the payback period, funding sources and procurement criteria;
- An analysis of the GHG reductions that will be achieved with proposed interventions; and
- A comprehensive maintenance plan and manual for local management of the systems.

- *Output 3.2: Investment in LEDs for lighting streets and public areas (indoor and outdoor), control gear and Energy Management Information Systems (EMIS).* This output consists of direct investments into LED lighting improvements in pilot areas with Novogrudok, allied to the adoption of EMIS and new control gear. *GEF investments for this output will consist of*:
  - Procurement of suitable control gear, LED lighting devices, systems and software that will include appropriate training and technology for relevant municipal staff. The specific equipment to be procured includes 404 units of control gear and 404 - 90W LED light heads to replace mercury discharge lamps;
  - Procurement and commissioning of a City-wide EMIS that will include training for municipal staff operating the system;
  - The installation of 404 LED street lights with control gear linked with the EMIS in pilot areas; and
  - The installation of additional LED street lighting that can be operated with the control gear setup in pilot areas, and monitored with the EMIS.

  This proposed outdoor lighting pilot investment will provide energy savings of 596 MWh/year or an annual operational cost savings of USD 90,000 with a payback period of 11 years (in comparison with 15 years without the GEF Project[54]). Details of the GEF investment and the proposed co-financing investment for LED street lighting for Novogrudok can be found in Annex VII on Table VII-3[55]. Implementation of this investment will follow the plans provided by the LED street lighting feasibility study under Output 3.1.

[54] This is based on an electricity price of USD 0.151/kWh and a cost of LED street lighting, EMIS and control gear of USD 1.321 million of which USD 986,700 is the proposed investment of Novogrudok municipality.

[55] This could consist of an investment programme for the remaining lamps throughout Novogrudok, equating to 1207 columns. Priority investment should be made in the remaining mercury discharge lamps in the early years of the project as these are the least efficient. Alternatively, a programme of investment could be made for remaining outdoor lamps in public areas in Novogrudok and in the rural areas under the jurisdiction of Novogrudok for which a baseline survey would be needed and conducted by Novogrudok.

- *Output 3.3: Investment in energy efficient equipment, plant and machinery for municipal laundry. GEF investments for this output will consist of 30% of the total cost of:*
  - Procurement of EE equipment to replace the current machinery with stand-alone modern equipment with integral heating systems. The specific details of the investment will depend to a large extent on the findings of the feasibility study of Output 3.1[56]. The new EE equipment will be sourced from a vendor who will train municipal laundry staff on the operation and maintenance of the equipment; and
  - Installation of the EE equipment for laundry including re-wiring and provision of appropriate room arrangements within the laundry building for the new equipment.

  This proposed laundry pilot investment will provide energy savings of over 85% with a payback period of less than 17 months[57]. Details of the GEF investment and the co-financing investment for the Novogrudok municipal laundry can be found in Annex VII on Table VII-7. The Project will cover the entire cost of monitoring and review of the performance and reliability of the new EE equipment, notably the energy consumption and GHG emissions.

80. **Component 4: Replication mechanisms for green urban development in Belarus**. Activities of this component will focus on replication and dissemination of the green urban development approach demonstrated in Polotsk, Novopolotsk and Novogrudok, and developed through national policies, regulations, codes and standards from the outputs in Component 1. This will be achieved through support to at least 5 other cities for strengthened participation and technical assistance in developing green urban development plans and preparing SEAPs which will assist IRUP in preparing GUDPs. It is envisaged that through initial support from the Project on facilitating the set-up for an institutional mechanism for promoting green urban development, green urban development in Belarus will be sustained beyond the EOP. *The expected outcome from the outputs and activities under this component is the growth in green city development in Belarus.* This outcome will be achieved through:

    - *Output 4.1: A completed SEAP for Novopolotsk*. With Novopolotsk close to signing with the Covenant of Mayors, the City will need to prepare a SEAP as a part of its obligations. *GEF resources will be required to assist the municipality in the preparation of the SEAP.* This would include determination of the baseline energy consumed by the municipality, identification and prioritization of opportunities for energy savings, and indicative costs of energy and carbon reduction opportunities*;*

    - *Output 4.2: Updated SEAPs for Polotsk and Novogrudok*. With SEAPs prepared for these cities in 2012, *GEF resources will be required to update their SEAPs towards the EOP.* With the completion of pilot projects in Components 2 and 3, green development priorities will change for these cities, necessitating changes to their SEAPs*;*

[56] The investment could involve the replacement of the old equipment with 6 industrial washing machines similar to the Electrolux W4400H, and 4 industrial sized driers similar to the Dryer Electrolux T 4650 (specific models of laundry equipment are given only for the purpose of energy savings estimate). Details of their energy consumption are provided in Annex II.

[57] This is based on a total investment of the laundry modernization of USD 255,000 (GEF investment of USD 117,000 + Novogrudok co-financing investment of USD 138,000) that would be paid back against a savings of USD 182,112 (from a savings in natural gas of USD 201,096 equivalent to 684,000 m3/yr at USD 0.294/m3 less 125,720 MWh of electricity consumed by new equipment at USD 0.151/kWh). More energy details on Table II-10

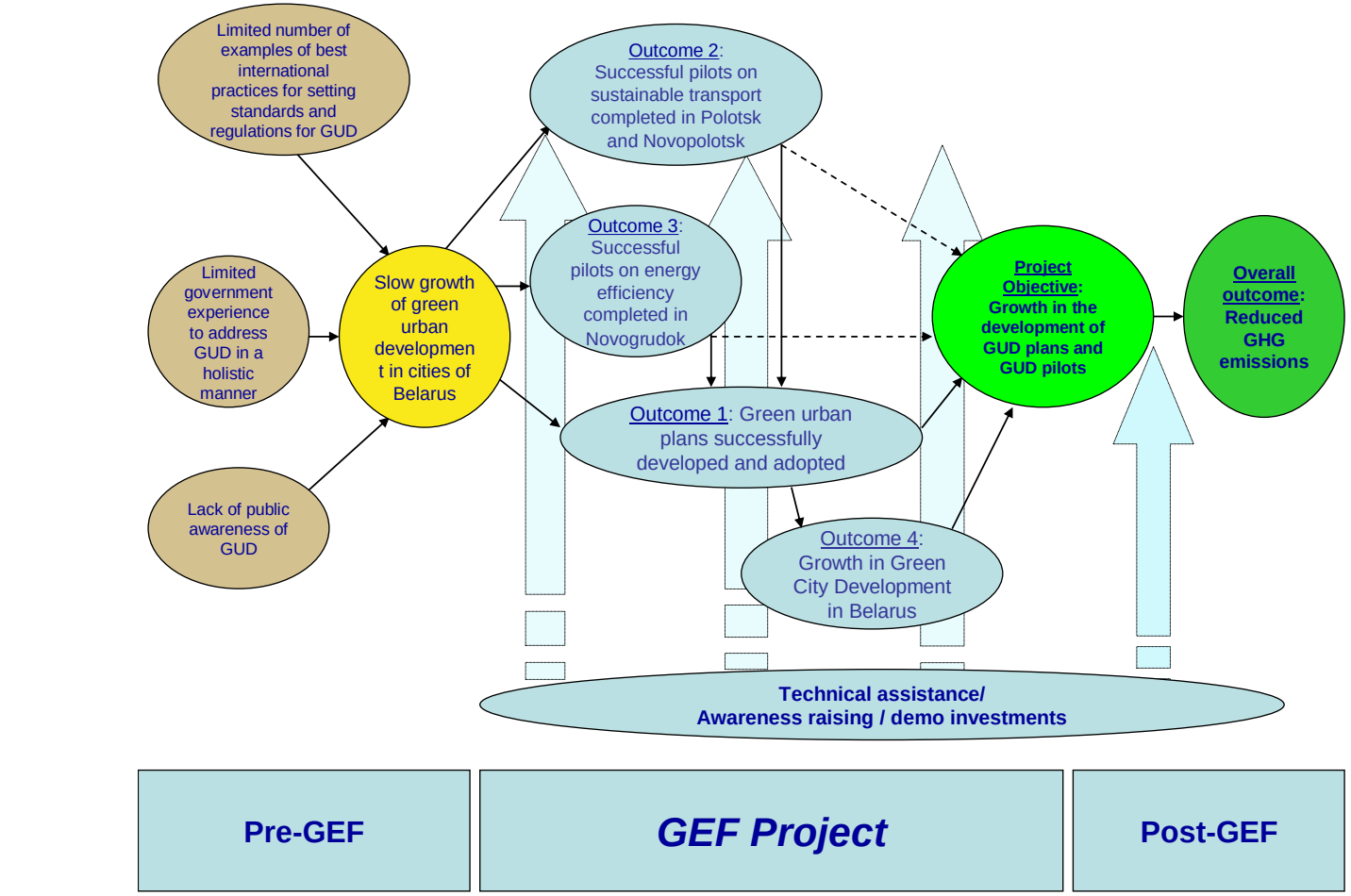
- *Output 4.3: Mechanism for promoting low carbon growth in Belarusian cities*. This output will seek to recommend an institutional mechanism for coordinating green urban development activities in Belarus. *GEF support is required for the necessary TA to build the institutional capacity of the key government agencies to promote low carbon growth through stronger linkages with Local Agenda 21 and the EU Covenant of Mayors.* This may include the setup of a dedicated Project website that can evolve into a government-supported national green urban development website, and local promotion activities of green urban development activities*;*

- *Output 4.4: Completed or updated SEAPs or green urban development plans for another 10 municipalities in Belarus*. With an anticipated increased interest in green urban development by Year 4 and Year 5, there will likely be additional cities signing onto the CoM or wanting to reduce their carbon footprint. *GEF support is required for the necessary TA to assist these cities and a designated government agency (from Output 4.3) in the preparation or updating of their SEAPs or green urban development plans.* The outcome of this assistance will be central, regional and municipal government authorities who are able to prepare or update SEAPs and GUDPs for their respective jurisdictions*.*

81. In each of the three cities, analysis of municipal plans and strategies clearly shows that without GEF assistance, a high priority to green urban development planning and projects would be unlikely to take place over the next five years. Another one of the few initiatives in Belarus related to developing a green economy and green urban development planning is the EU's Green Economy project for Belarus, due to start in late-2014, of which UNDP will manage approximately USD 6.0 million. While this Project does not have any specific focus on the cities of Novopolotsk, Polotsk, and Novogrudok, it is intended to have involvement with a wider range of environmental issues such as water, waste, ecotourism, and green energy. This Project will work closely with the Green Economy project of the EU to ensure that GUD issues and climate change mitigation issues are better integrated.

82. Figure 7 is a flowchart of how the Project will be implemented. Figure 8 is an indicative implementation schedule of how the Project will be implemented.

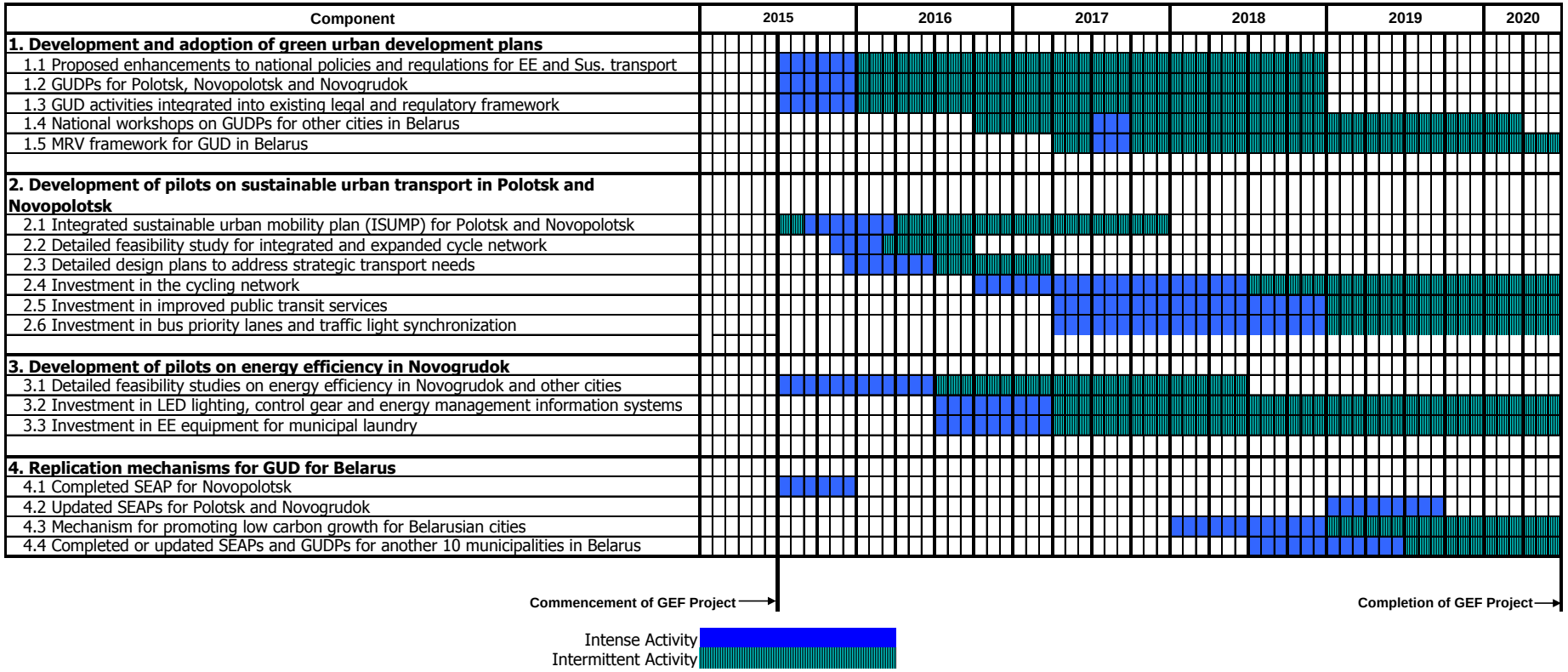
Figure 7: Project Flowchart



Legend:

- Barriers
- Baseline activities
- GEF activities
- Project objectives and outcomes

Figure 8: Indicative Implementation Project Schedule



Key Indicators, Risks and Assumptions

Indicators

83. The most direct impact of the proposed Project as it relates to core GEF objectives is the reduction in CO_2 emissions from demonstration projects in Outcomes 2 and 3 to demonstrate a shift away from the carbon intensive urban activities. To a minor extent, there will be indirect impacts resulting from the engagement of other cities in green urban development. Key impact indicators to gauge the success of the Project and improve sustainability of green urban development in Belarus includes:

- Number of enhanced national policies and regulations for public lighting and sustainable urban transport by EOP (Component 1);
- Number of pilot GUDPs completed by EOP (Component 1);
- Kilometers of private car travel displaced from modal switches from private cars to public transport (buses and trams) by EOP (Component 2);
- Minutes of bus journey time reduced along Route No. 5 (Component 2);
- Number of persons using improved public transport services during Year 5 (Component 2);
- MJ of energy savings from LED installations for street lighting pilot and public areas using new control gear and the EMIS by EOP (Component 3);
- MJ of energy savings from EE measures on municipal laundry by EOP (Component 3);
- Number of completed or updated SEAPs and/or GUDPs by EOP (Component 4);
- Number government officers dedicated to promotion of urban low carbon growth by EOP (Component 4); and
- Number of hits on national website for promoting GUD by EOP.

84. The successful implementation of the proposed Project will also contribute towards:

- Lifetime direct cumulative CO_{2eq} emission reductions of 91.116 ktonnes CO_2;
- Indirect emission reductions ranging from 25.16 ktonnes CO_{2eq} (bottom-up) and 231 ktonnes CO_{2eq} (top-down) between 2021 and 2030, the period of 10 years after the completion of the Project.

85. GHG emission reductions are based on:
- Passenger modal switches from private cars to public transit and cycling demonstrated during the Project period, after the EOP and from replicated improvements to public transit services in other cities in Belarus after the EOP (from investments in Component 2)[58];
- Reduced electricity consumption from street lighting in Novogrudok and other municipalities that replicate the Novogrudok demonstration (from investments in Component 3);

[58] There will be GHG reductions from improved traffic flow efficiency for buses and trams along corridors where dedicated bus lanes and synchronized lighting have been piloted during the Project period (Output 2.6). Without knowing the specific improvements, it is difficult to calculate the fuel savings which are not included in the cumulative GHG savings. These GHG reductions can be calculated during the Project when the specific corridors and improvements are known from the ISUTP and functional plans for improvements

- Reduced energy consumption resulting from EE measures undertaken for the municipal laundry in Novogrudok and other EE measures replicated after the EOP (from investments in Component 3).

A summary of GHG reductions from Project interventions is shown on Table 12.

Table 12: Summary of GHG Emission Reductions from Project Interventions

Intervention Description	Detail	GHG Reductions (Tonne CO_{2eq})[59]			
		Direct[60]	Direct Post-Project[61]	Indirect Bottom-up[62]	Indirect Top-Down[63]
Sustainable transport measures	Modal switches to public transport along Route No. 5 where services have improved including "real-time" bus information, improved bus stops and reduced journey times.	77,786	0	9.944	135,864
	Improved fuel efficiencies for buses along Route No.5 where dedicated bus lanes and synchronized (or priority) signaling have been piloted.	0[64]	0	0	0
	Modal switches from private cars to bicycles based on improved access to safe cycling network provided by Project investment	0	0	0	0
Energy efficiency measures demonstrated at Novogrudok	LED street lighting in Novogrudok	3,140	0	5,023	73,584
	EE measures undertaken at municipal laundry in Novogrudok	10,190	0	10,191	21,577
Totals:		***91,116***	***0***	***25,158***	***231,025***

86. Without GEF support to cover the incremental cost associated with the removal of barriers to green urban development, green urban development under a BAU scenario is unlikely to take hold and gather momentum in Belarus. The problem that this Project seeks to address is ensuring that urban development in Belarus is taking place in an environmentally sustainable manner (in particular in the cities of Novopolotsk/Polotsk/and Novogrudok) and that barriers are being removed to promote greater application of energy-efficient technologies in urban environment and sustainable transport. In particular, the Project will

[59] Grid emission factor for Belarus assumed to be 0.48 tonnes CO_{2e}/MWh.
[60] This is the cumulative emissions reduction during the lifetime of the investments.
[61] This includes cumulative emission reductions for the first 10 years after the EOP.
[62] Assumed replication factor or 2 due to lack of funds to implement similar demo projects.
[63] Assumed causality factor of 20% due to anticipated shortage of funds.
[64] Cannot yet be determined due to need for determining baseline information of fuel efficiencies of buses along this route and the design of new corridor with dedicated bus lane and bus priority signalling.

focus on the transport sector in Novopolotsk and Polotsk where GHG emissions are rising. Stakeholder consultations in both Novopolotsk and Polotsk revealed there is a need for external expertise to resolve their urban transport issues into an integrated and sustainable transportation plan. For Novogrudok, city authorities revealed that their priorities lie with energy-efficient street and public buildings lighting where they see the best potential for undertaking new activities and making new investments to enable cost savings and achieve GHG emission reductions. The investment into energy-efficient lighting offers the benefit of being highly visible and serves as a catalyst for new and additional sustainable urban development interventions and energy-efficiency applications in the city of Novogrudok and other municipalities of Belarus.

Risks

87. Risks identified in the implementation of the Project includes:

- Lack of willingness of various stakeholders to provide information and data. With a heavy emphasis on monitoring, verification, and reporting of greenhouse gas emissions (both direct and indirect), a key national expert to be given the task of monitoring and reporting of GHG emission reductions, and obtaining information relevant to GHG emission estimates. As such, the risk of stakeholders unwilling to share information can be mitigated;
- Lack of financing for demonstration projects and replication projects. One of the major capital projects to be financed that would result in significant GHG reductions is the Daugava River crossing which will provide more capacity for traffic volumes and public transit to and from Polotsk and Novopolotsk. The capital cost of the bridge is in the order of USD 100 million;
- Technical risks related to government officer capacity to address green urban development and planning issues related to green cities;
- The recent drop in oil prices reduces stakeholder urgency of green city development. The Project will facilitate implementation of a replication mechanism, which will play a strong role in raising awareness and disseminating information about integrated urban development and sustainable green cities, and the associated fiscal benefits to municipalities. The drivenness of the Government should sustain the development of green urban development beyond the EOP.

Risks and countermeasures to identified risks are analyzed in detail in Annex I.

Assumptions

88. The main assumptions for this Project are the:

- Continued central government officers access to external network of green urban development groups and initiatives (such as CoM and Local Agenda 21);
- Agreement for a joint transport coordinating body between Polotsk and Novopolotsk;
- Agreement by Government to change procurement regulations to simplify purchase of more expensive items if the life cycle costs of these items is less costly.

Cost Effectiveness

89. The Government of Belarus has expressed its resolve in its 5th National Communications to the UNFCCC that identifies both energy-efficiency and transport as two priority areas with large potential for reduction of greenhouse gases in the country. The State Climate Change Mitigation Program (2013-2020) has emphasized energy-efficiency and transport as key priority areas for additional action. Finally, in the transport sector the Program of Development of Automotive Sector of Republic of Belarus (2011-2015)[65] and the "Strategy for limiting transport impact on air until 2020", both recognize the importance of sustainable transport policies and initiatives as a tool to mitigate and reduce greenhouse gases in Belarus.

90. Through the activities of the GUD Project for Belarus, incremental support will remove the aforementioned barriers (Paras 15-18), and catalyze the development of green urban development in small to medium-sized cities in Belarus that will improve urban mobility and reduce their energy consumption. On a national scale, the GUD Project will provide Belarus's first demonstrations of sustainable urban transport development and municipal energy efficiency that can be replicated in other municipalities in Belarus. The demonstration will catalyze interest and increase confidence of the three demonstration cities and other Belarusian municipalities in implementing GUD projects. This should facilitate the leveraging of capital finances to implement GUD projects in a number of Belarusian municipalities.

91. In each of the three demonstration cities, analysis of municipal plans and strategies clearly shows that without GEF assistance, a high priority to green urban development planning and projects would be unlikely to take place over the next five years. Another one of the few initiatives in Belarus related to developing a green economy and green urban development planning is the EU's Green Economy project for Belarus, due to start in late-2014, of which UNDP will manage approximately USD 6.0 million. While this Project does not have any specific focus on the cities of Novopolotsk, Polotsk, and Novogrudok, it is intended to have involvement with a wider range of environmental issues such as water, waste, ecotourism, and green energy. This Project will work closely with the Green Economy project of the EU to ensure that GUD issues and climate change mitigation issues are better integrated.

92. The GHG reductions expected from this Project are 0.347 million tonnes CO_{2eq} cumulative to 2030, 10 years after Project completion. Cost of emission reductions resulting from this Project are USD 8.91 per tonne of CO_2 reduced. GHG emission reductions generated by this Project are based on:
    - Passenger modal switches from private cars to public transit and cycling demonstrated during the Project period, after the EOP and from replicated improvements to public transit services in other cities in Belarus after the EOP (from investments in Component 2);
    - Reduced electricity consumption from street lighting in Novogrudok and other municipalities that replicate the Novogrudok demonstration (from investments in Component 3);

[65] This program aims to meet the demand for freight and passenger transportation by road vehicles, and enhance the quality of transportation services and competitiveness of Belarusian transportation companies in international markets. Along with increases in passenger and freight transportation, the program is expected to yield 1-2% annual reduction in tailpipe emissions (pollutants) from road vehicles.

- Reduced energy consumption resulting from EE measures undertaken for municipal laundry in Novogrudok and other EE measures replicated after the EOP (from investments in Component 3).

Sustainability, Replicability and Impacts

Sustainability

93. An integrated approach combining energy-efficiency measures and sustainable transport measures towards reducing greenhouse gas emissions in a cost-effective manner which manifests itself in the development of green urban development plans. This is consistent with and complementary to the integration of energy efficiency and sustainable transport standards (that are consistent with green urban development) with existing Belarusian regulations and standards for urban development. In Belarus, the urban population is estimated as 73% of the total population of 9.5 million and this percentage is increasing. The opportunities for significantly reducing GHG emissions from green urban development in Belarus are therefore significant. The sustainability of this project is inherent in its design:
    - The integration of new energy efficiency and sustainable transport standards with existing standards and regulations for urban planning will provide the overall framework for green urban planning and identify funding modalities for green development activities across the municipalities of Belarus;
    - With two cities with commitments under the EU Covenant of Mayors (Polotsk and Novogrudok with Novopolotsk due to join soon) and the respective Sustainable Energy Action Plans, the Project will support demonstrations for GHG reductions in these municipalities. These demonstrations will generate tangible GHG reductions and provide lessons to be learnt in their implementation;
    - These demonstration projects will strengthen and inform the GUD at a national level and provide a basis for regulations and standards for future replication demonstration projects;
    - The Project will support an institutional mechanism whereby the promotion of green urban development and a linkage to CoM and SEAP will be promoted. ;
    - The Project will also strengthen institutional capacity for the monitoring of urban GHG emissions to ensure that the GHG reduction activities undertaken on demonstration projects and replication projects are sustained or even improved over the long term.

    Through these Project actions, the likelihood of sustained interest in green urban development promoted by this Project is increased.

Replicability

94. To encourage replication of the energy efficient investments in street lighting and other EE measures, the Project will provide technical assistance to municipalities wishing to develop similar energy efficient measures. Another important aspect of the Project to ensure replication of GUD measures will be the “green” upgrading of national regulations and standards and the identification of specific sources of financing for green urban development. The Project will facilitate strengthened linkages to these financing sources, both external and internal.

Impacts

95. The positive social and environmental impacts of this Project are numerous including:

- Improved urban air quality resulting from a reduction of private car usage for urban trips, and reduced journey times within urban areas and increased use of non-motorized vehicles modes of transport;
- Reduced operational costs of delivery of municipal services from energy efficiencies implemented and replicated during the Project that will have the impact of improving municipal services;
- Development of infrastructure that will minimize energy consumption and environmental impacts over the long term, and maximize opportunities to provide the highest quality of life to its residents;
- Sustainable mobility generates equal accessibility options for all city residents, including for marginalized groups and people with disabilities.

PROJECT RESULTS FRAMEWORK

Primary applicable Key Environment and Sustainable Development Key Result Area (same as that on the cover page, circle one): 1. Mainstreaming environment and energy OR 2. Catalyzing environmental finance OR 3. Promote climate change adaptation OR 4. Expanding access to environmental and energy services for the poor.
Applicable GEF Strategic Objective and Program: GEF-5 CCM Strategic Program 2: Promote Market Transformation for Energy Efficiency in Industry and the Building Sector; and GEF-5 CCM Strategic Program 4: Promote Energy Efficient, Low-Carbon Transport and Urban Systems
Applicable GEF Expected Outcomes: For Program 2: a) Appropriate policy, legal and regulatory frameworks adopted and enforced; b) Sustainable financing and delivery mechanisms established and operational; and c) GHG emissions avoided, and **for Program 4**: a) Sustainable transport and urban policy and regulatory frameworks adopted and implemented; b) Increased investment in less-GHG intensive transport and urban systems; c) GHG emissions avoided.
Applicable GEF Outcome Indicators: For Program 2: a) Extent to which EE policies and regulations are adopted and enforced; b) Volume of investment mobilized; c) Tonnes of CO_2 equivalent avoided, and **for Program 4**: a) Number of cities adopting sustainable transport and urban policies and regulations; b) Volume of investment mobilized; c) Tonnes of CO_2equivalent avoided

Outcomes	Indicator	Baseline	Targets End of Project (EOP)	Source of verification	Risks and Assumptions
Project Objective: [66] The growth of development of green urban development plans and pilot green urban development initiatives related to energy efficiency and sustainable transport in small and medium cities in Belarus	▪ Cumulative lifetime project CO_2 emission reductions resulting from pilot projects and technical assistance by EOP, ktonnes CO_2.	▪ 0	▪ 91.1 [67]	▪ Project final report as well as annual surveys of energy consumption & GHG reduction estimates from Project investments	▪ The recent drop in oil prices does not reduce stakeholder urgency of green city development.
	▪ Cumulative direct energy savings (TJ) from Project investments in sustainable transport and energy efficiency measures by EOP	▪ 0	▪ 112.2 [68]	▪ APRs and PIRs	
	▪ % of persons in green cities who are either aware of or have benefitted from green initiatives from the Project at EOP.	▪ 0	▪ 50 [69]		

[66] *Objective (Atlas output) monitored quarterly ERBM and annually in APR/PIR*

[67] This is the direct emission reductions from investments made during the course of the 5-year Project, and extrapoloated over the lifetime of these investments.

[68] 19.6 TJ from Component 2 investments, 6.4 TJ from Output 3.2 investment, and 86.2 TJ from Output 3.3 investment

[69] This should include persons who are aware of or have used sustainable transport in Polotsk or Novopolotsk, and are aware of or have benefitted from EE initiatives in Novogrudok. The EOP target of 50% will be measured as a survey near the EOP date with the impact of measuring the human impact of the Project

Outcomes	Indicator	Baseline	Targets End of Project (EOP)	Source of verification	Risks and Assumptions
Outcome 1:[70] Green urban development plans successfully developed and adopted	• Number of enhanced national policies and regulations in the area of public lighting and urban transportation that have been reviewed and approved by EOP • Number of officially approved green urban development plans in Project cities by EOP	• 0 • 0	• 4[71] • 3[72]	• Official documentation on policies and regulations • Reports on workshop proceedings • Policy circulars and advisories	• Continued government support for enhancing current legal framework as well as regulations, standards and codes towards GUD
Outcome 2: Successful pilots on sustainable urban transport completed in Novopolotsk and Polotsk	• Kilometers of private car travel displaced from modal switches to public transport by EOP • Average number of minutes of reduced bus journey time through sustainable urban transport measures in Novopolotsk and Polotsk • Number of persons using improved public transport services during Year 5	• 0 • 0 • 0	• 4.3 million [73] • 10[74] • 75,000 [75]	• Completed feasibility studies • Awareness raising campaign assessments and feedback from participants • M&E reports on pilot project usage and energy saved	• State funds are available to finance these capital intensive projects.
Outcome 3:	• GJ saved on LEDs installed	• 0	• 21,423	• Feasibility studies	• State funds are available to

[70] *All outcomes monitored annually in the APR/PIR.*
[71] This includes two national policies and two sets of regulations on sustainable urban transport and EE public lighting
[72] For pilot cities of Polotsk, Novopolotsk and Novogrudok.
[73] To be done as a survey, the details of which are provided under Output 2.7 in Para 79. The target was estimated as 250 cars not traveling some 26 km/day during 220 days per year over a 3-year period during the Project.
[74] To be done as a survey and based on Route No. 5 to and from Polotsk and the Naftan Refinery where dedicated bus lanes and synchronized traffic lighting have reduced corridor journey times. Details of activities to design the survey are provided under Output 2.7
[75] Based on TEEMP analysis of an estimated 55.75 million passengers using the system during Year 5. This would translate into 152,700 person-trips on average each day or approximately 75,000 persons using the improved public transport systems (if they make 2 person-trips daily)

Outcomes	Indicator	Baseline	Targets End of Project (EOP)	Source of verification	Risks and Assumptions
Successful pilots on energy efficiency completed in Novogrudok	for street lighting and public areas (indoor and outdoor), as well as new control gear and EMIS by EOP • Lifetime GJ saved from EE measures on municipal laundry by EOP	• 0	• 215,605 [76]	• Replication plans • M&E reports on energy saved through the use of EE lighting in Novogrudok	finance these energy efficiency measures
Outcome 4: Growth in green city development in Belarus	• Number of completed or updated SEAPs and/or GUDPs by EOP • Number of officers in government who are dedicated to the promotion of urban low carbon growth to Belarusian cities by EOP • Number of hits on national website for promoting GUD by EOP	• 2[77] • 0 • 0	• 13[78] • 8 • 10,000	• Municipal SEAP reports • Municipal green urban development planning reports • Reports from the Green Cities of Belarus	• Continued government support and availability of state funds for scale-up of GUD in other municipalities

[76] Based on 10 years of service life from laundry equipment (see Table II-10)
[77] Includes completed SEAPs for Polotsk and Novogrudok which need to be updated towards the EOP
[78] Includes SEAP for Novogrudok, Novopolotsk, an updated SEAP for Polotsk, 10 new SEAPs for 10 additional municipalities

TOTAL BUDGET AND WORK PLAN

Award ID:	00081828	Project ID(s):	00090983
Award Title:	**"Belarus Green Cities: Supporting Green Urban Development in Small to Medium-Sized Cities in Belarus"**		
Business Unit:	BLR10		
Project Title:	**"Belarus Green Cities: Supporting Green Urban Development in Small to Medium-Sized Cities in Belarus"**		
PIMS no.	4981		
Executing Entity	Ministry of Natural Resources and Environmental Protection		

GEF Outcome/Atlas Activity	Responsible Party/ Implementing Agent	Fund ID	Donor Name	Atlas Budgetary Account Code	ATLAS Budget Description	Amount (USD) Year 1 2015-6	Amount (USD) Year 2 2016-7	Amount (USD) Year 3 2017-8	Amount (USD) Year 4 2018-9	Amount (USD) Year 5 2019-20	Total (USD)	Notes
Outcome 1: Green urban development plans successfully developed and adopted	MoNREP/ UNDP	**62000**	GEF	71200	International Consultants	20,000	12,000	16,000	16,000	16,000	80,000	See Note 1
				71300	Local Consultants	1,500	1,500	1,500	1,500	1,500	7,500	See Note 2
				71400	Individual Contractual Services	22,425	17,550	22,425	19,950	20,400	102,750	See Note 3
				72100	Contractual Services	5,000	5,000	5,000	5,000	5,000	25,000	See Note 4
				71600	Travel	5,000	5,000	5,000	5,000	4,800	24,800	
				75700	Training Workshops	3,000	3,000	3,000	3,000	6,000	18,000	See Note 5
	Total GEF Outcome 1					56,925	44,050	52,925	50,450	53,700	258,050	
	Total Outcome 1					**56,925**	**44,050**	**52,925**	**50,450**	**53,700**	**258,050**	
Outcome 2: Successful projects on sustainable transport completed in Novopolotsk and Polotsk	MoNREP/ UNDP	**62000**	GEF	71200	International Consultants	12,000	12,000	20,000	16,000	16,000	76,000	See Note 6
				71300	Local Consultants	0	2,400	2,400	2,400	0	7,200	See Note 7
				71400	Individual Contractual Services	23,775	24,000	21,300	20,550	19,350	108,975	See Note 8
				72100	Contractual Services	55,000	90,000	100,000			245,000	See Note 9

GEF Outcome/Atlas Activity	Responsible Party/ Implementing Agent	Fund ID	Donor Name	Atlas Budgetary Account Code	ATLAS Budget Description	Amount (USD) Year 1 2015-6	Amount (USD) Year 2 2016-7	Amount (USD) Year 3 2017-8	Amount (USD) Year 4 2018-9	Amount (USD) Year 5 2019-20	Total (USD)	Notes
				71600	Travel	20,000	35,000	20,000	20,000	20,000	115,000	See Note 10
				72100	Contractual Services	250,000		460,000	500,000		1,210,000	See Note 11
				75700	Training Workshops		3,000	3,000	3,000	2,975	11,975	See Note 5
	Total GEF Outcome 2					360,775	166,400	626,700	561,950	58,325	1,774,150	
	Total Outcome 2					**360,775**	**166,400**	**626,700**	**561,950**	**58,325**	**1,774,150**	
Outcome 3: Successful pilots on energy efficiency completed in Novogrudok	MoNREP/ UNDP	**62000**	GEF	71200	International Consultants	4,000	4,000	4,000	4,000	4,000	20,000	See Note 12
				71300	Local Consultants	7,500	9,300	7,800	2,550	750	27,900	See Note 13
				71400	Individual Contractual Services	7,650	9,900	5,100	5,700	6,300	34,650	See Note 14
				72100	Contractual Services						0	
				71600	Travel	5,000	5,000	5,000	3,000	1,000	19,000	
				72100	Contractual Services		329,500	121,800			451,300	See Note 15
				75700	Training Workshops			3,000	3,000		6,000	See Note 5
	Total GEF Outcome 3					24,150	357,700	146,700	18,250	12,050	558,850	
	Total Outcome 3					**24,150**	**357,700**	**146,700**	**18,250**	**12,050**	**558,850**	
Outcome 4: Growth in green city development in Belarus	MoNREP/ UNDP	**62000**	GEF	71200	International Consultants	8,000	0	16,000	24,000	24,000	72,000	See Note 16
				71300	Local Consultants	3,900	3,900	6,150	8,400	8,400	30,750	See Note 17
				71400	Individual Contractual Services	34,800	37,950	40,575	43,200	43,350	199,875	See Note 18

GEF Outcome/Atlas Activity	Responsible Party/ Implementing Agent	Fund ID	Donor Name	Atlas Budgetary Account Code	ATLAS Budget Description	Amount (USD) Year 1 2015-6	Amount (USD) Year 2 2016-7	Amount (USD) Year 3 2017-8	Amount (USD) Year 4 2018-9	Amount (USD) Year 5 2019-20	Total (USD)	Notes
				72100	Contractual Services	5,000	1,000	1,000	1,000	1,000	9,000	See Note 19
				71600	Travel	10,000	10,000	8,125	8,000	8,400	44,525	
					Total GEF Outcome 4	61,700	52,850	71,850	84,600	85,150	356,150	
					Total Outcome 4	**61,700**	**52,850**	**71,850**	**84,600**	**85,150**	**356,150**	
PROJECT MANAGEMENT (including M&E)	MoNREP/ UNDP	**62000**	GEF	71200	International Consultants	0	0	16,000	0	16,000	32,000	
				71300	Local Consultants	0	0	1,400	0	1,400	2,800	
				71400	Local Consultants and Local Staff	4,200	4,200	4,200	4,200	4,200	21,000	
				72200	Equipment	6,000	6,000	6,000			18,000	
				72400	Communications	500	500	500	500	500	2,500	
				72500	Office Supplies	5,000	5,000	5,000	5,000	3,000	23,000	
				74100	Audit			5,000		5,000	10,000	
				64398	Direct Project Costs	7,500	6,750	6,750	6,750	6,750	34,500	See Note 20
					Total GEF M&E and Project Management	23,200	22,450	44,850	16,450	36,850	143,800	
					Total M&E and Project Management	**23,200**	**22,450**	**44,850**	**16,450**	**36,850**	**143,800**	
GEF Total						**526,750**	**643,450**	**943,025**	**731,700**	**246,075**	**3,091,000**	
UNDP Total												
Grand Total						**526,750**	**643,450**	**943,025**	**731,700**	**246,075**	**3,091,000**	

Summary of Funds:

	Amount Year 1 (2015-16)	Amount Year 2 (2016-17)	Amount Year 3 (2017-18)	Amount Year 4 (2018-19)	Amount Year 5 (2019-20)	Total
GEF	**526,750**	**643,450**	**943,025**	**731,700**	**246,075**	**3,091,000**
Co-financing:	**735,000**	**1,879,500**	**3,574,420**	**3,301,000**	**2,945,500**	**12,435,420**
UNDP	300,000	1,500,000	1,200,000	0	0	3,000,000
MoNREP	30,000	30,000	30,000	30,000	30,000	150,000
MoAC (IRUP)	60,000	60,000	30,000	90,000	60,000	300,000
Polotsk Municipal Government	100,000	72,000	1,007,000	975,500	975,500	3,130,000
Novopolotsk Municipal Government	100,000	72,500	1,007,000	1,685,500	1,375,000	4,240,000
Novogrudok Municipal Government	0	0	138,000	500,000	487,000	1,125,000
EU Polotsk SUMP Project	120,000	120,000	137,420	0	0	377,420[79]
BTU	25,000	25,000	25,000	20,000	18,000	113,000[80]
Total:	**1,261,750**	**2,522,950**	**4,517,445**	**4,032,700**	**3,191,575**	**15,526,420**

Notes:

1. This includes professional time for the International Consultant on Green Urban Development (IGUD) (@USD 4,000/week) for 4 wks in Yr 1, and 2 wks in Yrs 2 to 5 and the International Consultant on Sustainable Transport (IST) (@USD 4,000/week) for 1 wk in Yrs 1 and 2, and 2 wks in Yrs 3 to 5;
2. This includes professional time for the Consultant on Energy Efficiency (NEE) (@USD 375/week) for 4 wks in Yrs 1 to 5 respectively
3. This includes professional time for the National Project Manager (NPM) (@USD 450/week) for 18, 13, 15, 13, 14 wks in Yrs 1 to 5 respectively; Consultant on Green Urban Development (NGUD) (@USD 375/week) for 15, 8, 17, 8 and 8 wks in Yrs 1 to 5 respectively; Consultant on Sustainable Transport (NST) (@USD375/wk) for 12 wks for every year of the Project; Communications Specialist (CS) (@USD300/wk) for 6 wks in Yrs 1 to 3, and 12 wks in Yrs 4 and 5; Administrative and Financial Assistant (AFA) (@USD300/wk) for 8 wks in Yrs 1 and 2, and 10 wks for Yrs 3 to 5
4. For translation services;
5. Assumes USD 3,000 per training workshop
6. This includes professional time for the IGUD (@USD 4,000/week) for 2 wks in Yrs 3, 4, and 5; and the IST (@USD 4,000/week) for 3 wks for Yrs 1 to 3, and 2 wks for Yrs 4 and 5;

[79] Based on €334,000 co-financing letter and the operational exchange rate of the Euro on February 1, 2015 (http://treasury.un.org/operationalrates/OperationalRates.aspx#E)

[80] Based on €100,000 co-financing letter and the operational exchange rate of the Euro on February 1, 2015 (http://treasury.un.org/operationalrates/OperationalRates.aspx#E)

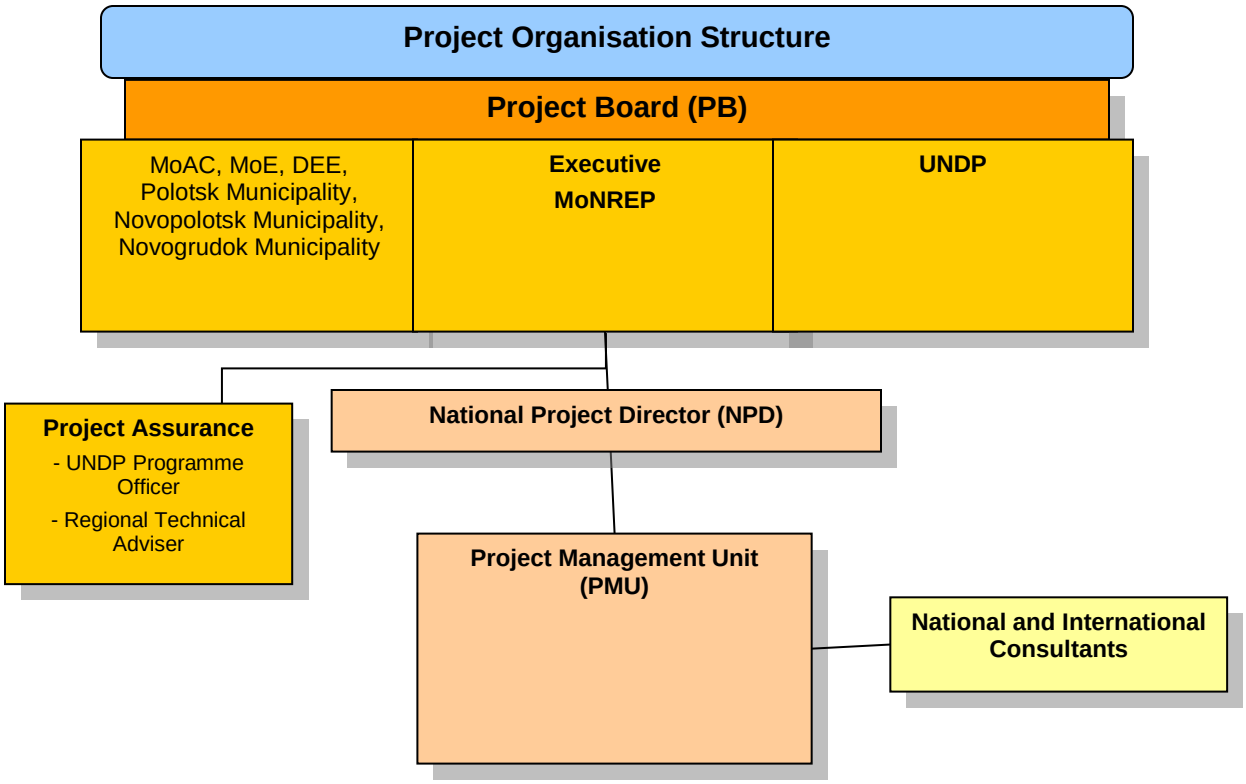
7. This includes professional time for the Procurement Specialist (PS) (@USD 300/week) for 8 wks for Yrs 3, 4, and 5
8. This includes professional time for the NPM (@USD 450/week) for 11, 21, 15, 12, 8 wks for Yrs 1 to 5 respectively; NGUD (@USD 375/week) for 11 wks in Yr 1 and 8 wks for Yrs 2, 3, 4 and 5; NST (@USD375/wk) for 28 wks in Yr 1 and 18 wks each year for the remainder of the Project; CS (@USD300/wk) for 2, 4, 6, 8, 10 wks for Yrs 1 to 5 respectively; AFA (@USD300/wk) for 12 wks for Yrs 1 and 2, and 10 wks for Yrs 3 to 5
9. USD 20,000 for traffic data collection (Year 1), USD 90,000 for ISUMP preparation (Yr 2), USD 100,000 for 4 feasibility studies for Output 2.3 (Yrs 2 and 3), USD 35,000 for cycling feasibility study for Output 2.2 (Year 1)
10. USD 20,000 per year for transport to and from Minsk to Polotsk/Novopolotsk, USD 15,000 in Yr 2 for study tour to EU country for 5 municipal officials for 6 days;
11. USD 250,000 for investment into 3D traffic software for ISUTP and training on software usage, USD 300,000 for 3.0 km of upgraded cycle paths, USD300,000 for dispatch office improvements (i.e. software), and improved conditions at bus and tram stops, USD 360,000 for 1.8 km of dedicated bus lanes, USD 300,000 for development of pilots on energy efficiency in Novogrudok;
12. This includes professional time for the IGUD (@USD 4,000/week) for 1 wk in Yrs 1, 2, 3, 4, and 5;
13. This includes professional time for the NEE (@USD375/wk) for 20, 20, 16, 1, and 1 wk for Yrs 1 to 5 respectively; and the PS (@USD 300/week) for 6 wks for Yrs 3, 4, and 5
14. This includes professional time for the NPM (@USD 450/week) for 5, 6, 3, 3, and 3 wks for Yrs 1 to 5 respectively; NGUD (@USD 375/week) for 18 and 12 wks for Yrs 1 and 2, and 2 wks for Yrs 3, 4 and 5; CS (@USD300/wk) for 1, 2, 4, and 6 wks for Yrs 2 to 5 respectively; AFA (@USD300/wk) for 8 wks for Yrs 1 to 5
15. USD 80,800 for investment into the supply of 404 units of control gear (@USD 200 each), USD 202,000 for 404 90W LED light heads (@USD 500 each), USD 51,500 for a City-wide EMIS for the LED street lighting system (that includes training), and USD 117,000 for 3 washing machines and 3 driers ;
16. This includes professional time for the IGUD (@USD 4,000/week) for 2 wks in Yr 1, and 4 wks in Yrs 3, 4, and 5; and the IST (@USD 4,000/week) for 2 wks for Yrs 4 and 5;
17. This includes professional time for the NEE (@USD375/wk) for 4, 4, 6, 12 and 12 wks for Yrs 1 to 5 respectively; and the PS (@USD 300/week) for 8 wks for Yrs 1 and 2, and 13 wks for Yrs 3, 4, and 5'
18. This includes professional time for the NPM (@USD 450/week) for 14, 8, 15, 20, 23 wks for Yrs 1 to 5 respectively; NGUD (@USD 375/week) for 18, 24, 25, 34 and 34 wks for Yrs 1 to 5 respectively; NST (@USD375/wk) for 10 wks in Yr 1 and 22 wks each year for the remainder of the Project; CS (@USD300/wk) for 44, 41, 38, 28, 24 wks for Yrs 1 to 5 respectively; AFA (@USD300/wk) for 16 wks for Yrs 1 to 5;
19. For the setup and maintenance of a dedicated GUD website on a government domain;
20. Direct Project Costs.

MANAGEMENT ARRANGEMENTS

Project Organization Structure

96. The Ministry of Natural Resources and Environmental Protection (MoNREP) of Belarus will act as the Executing Entity for this Project, undertaking responsibility for overall coordination of Project implementation, efficient use of Project resources and achievement all the planned Project results. The Executing Entity will closely cooperate with UNDP to ensure successful implementation of all Projects activities and achievement of all the objectives and tasks. The Executing Entity will assign a senior official as the National Project Director (NPD) who will provide general coordination and support to the project on behalf of the MoNREP. The Project organization structure as shown in Figure 9 will consist of a Project Board, Project Assurance, and a Project Management Unit (PMU).

Figure 9: Project Organization Structure



97. A Project Board (PB) will be established at the Project inception phase to monitor progress, guide its implementation and support the Project in achieving its listed outputs and outcomes. It will be chaired by the NPD and include representatives from the main stakeholders including the MoNREP, MoAC, MoE, DEE, municipalities of Polotsk, Novopolotsk and Novogrudok, IRUP and UNDP Belarus. Other members can be invited at

the decision of the PB on an as-needed basis, but taking due regard that the PB remains sufficiently lean to be operationally effective. The National Project Manager (NPM) will participate as a non-voting member in the PB meetings and will also be responsible for compiling a summary report of the discussions and conclusions of each meeting. The final list of the PB members will be completed at the outset of Project operations and will be approved by UNDP and MoNREP. The first PB meeting will take place within 6 months from the Project start date. The PB will meet at least twice a year to discuss the issues related to Project implementation. The PB could meet more often if it will be deemed necessary.

98. The Project Assurance role supports the PB Executive by carrying out objective and independent project oversight and monitoring functions. The Project Assurance role will rest with the respective UNDP Belarus Programme Officer and UNDPs Regional Technical Advisor in Istanbul.

99. The day-to-day management of the Project will be carried out by the PMU under the overall guidance of the PB. The PMU will include the NPM, full-time consultants on Green Urban Development and Sustainable Transport who will provide expert support to Project activities, and a full-time Administrative and Financial Assistant, and Communication Specialist. The PMU staff will be selected through an open competitive process in accordance with the respective UNDP rules and procedures taking into account consultations with the MoNREP. Effectiveness of the PMU staff work will be evaluated annually by the UNDP Belarus. Based on the evaluation results and consultations with the NPD, a decision will be made on renewal/non-renewal of the PMU staff contracts. The Project will be supported by short-term international and national experts, particularly a part-time national energy efficiency expert and a part-time Project Procurement Specialist. Tentative ToR for all staff and consultants are presented Annex V. Local short-term consultants from Novogrudok, Novopolotsk and Polotsk will be hired, as relevant, in order to facilitate coordination and aid local authorities with the implementation of demonstration activities.

100. A work plan for the first year of Project implementation will be developed and approved by the MoNREP and UNDP during the inception phase. Work plans for the second and subsequent project implementation years will be prepared during the last month of the work year.

101. To successfully achieve the objective and outcomes of the Project, it is essential that progress of the different Project components be closely monitored both by the key local and international stakeholders using detailed component-specific work plans and implementation arrangements throughout the entire implementation period. This should facilitate early identification of possible risks to successful completion of the Project together with adaptive management and early corrective action, when needed. During implementation, proper care will be taken to ensure communication and co-ordination mechanisms are in place to address areas of common interest in a cost-efficient way.

102. Both the PMU and the PB will implement mechanisms to ensure ongoing stakeholder participation and effectiveness with the commencement of the Project by conducting regular stakeholder meetings, the dedicated Project website, conducting feedback surveys, implementing strong project management practices. A list of Project stakeholders and their projected roles on the Project are provided on Table 13.

Table 13: List of Stakeholders and Proposed Roles on Project

Stakeholder	Role on the Project
Government Stakeholders	
Ministry of Natural Resources and Environmental Protection (MoNREP)	Serve as the Executing Entity for the Project responsible for overall delivery of Project outcomes and outputs
Ministry of Architecture and Construction (MoAC)	Contribution to the detailed Project designs including the development and elaboration of Project activities with the aim that this institution will bear responsibility for green urban planning policies and the development of a green urban development plan for Belarus
Belarusian Institute for Regional and Urban Planning (IRUP)	As a subordinate agency of MoAC responsible for urban development documents and research in urban sustainable development, IRUP will assist in the formulation of green urban development policies and plans for the Project (Component 1). This will include inputs for the updated Master Plans and the development of the ISUMP and CTS for both Polotsk and Novopolotsk (Output 2.1)
The Department of Energy Efficiency of the State Committee for Standardization (DEE)	With responsibility over state policy on energy efficiency and renewable energy sources , DEE will provide inputs into the development of standards and regulations for EE for various green urban development activities
Local Municipal Governments: • Novopolotsk • Polotsk • Novogrudok • Other municipalities	Provide support for green urban development plans, support for activities related to the EU Covenant of Mayors, support for the implementation of demonstration projects, contribution to the detailed designs of demonstration projects (Component 1). The municipal governments of Polotsk and Novopolotsk will also have joint custody of the integrated traffic model under Output 2.1 for the purposes of modelling future traffic volumes against current and future improvements on the roadways of both cities.
Civil Society Organizations	
Belarusian Transport Union (BTU)	Provides local expertise for design and implementation of sustainable urban mobility measures and modeling of traffic flows for Polotsk and Novopolotsk.
Donor Projects	
EU-funded Green Economy Project	Support for green urban development plans of other municipalities under Components 1 and 4
EU-funded Polotsk SUMP Development Project	Support for data collection, traffic modeling, and development of CTS and elaboration of SUMP for Polotsk

General

UNDP support service

103. The UNDP Belarus will maintain the project oversight and monitoring of project expenditures. It will be responsible for monitoring project implementation, timely reporting of the progress to the UNDP Regional Co-ordination Unit and GEF as well as organizing mandatory and possible complementary reviews and evaluations on an as-needed basis. It

will also support the implementing agency in the procurement of the required expert services and other project inputs and administer the required contracts. Furthermore, it will support the co-ordination and networking with other related initiatives and institutions in the country. The description of UNDP Country Office support services is provided in Annex IX.

Collaborative Arrangements with Related Projects

104. The Project will draw lessons learned from the UNDP-GEF project "Removing Barriers to Energy Efficiency Improvements in the State Sector in Belarus" which concluded activities in early 2012 and which highlighted the importance of special partnership agreements between the public and private sector in order to promote energy-efficiency as well as the need to incorporate energy-efficiency planning appropriately into the allocation of state budgets.

105. The Project will also coordinate closely with:

- the ongoing EU-supported project "From Energy Efficiency to Urban Mobility: Introducing Participatory Approach to Development of a Sustainable Mobility Plan in Polotsk" which is working towards a SUMP for Polotsk. This project has a close working relationship with IRUP on traffic modeling and is a co-financing partner of this GEF Project;
- the ongoing UNDP-GEF project "Improving Energy Efficiency in New Residential Buildings in the Republic of Belarus" which focuses on the reduction of energy consumption and related GHG emissions in new residential buildings by introducing new performance based building design and construction standards with related energy certification schemes and by ensuring their effective implementation and enforcement;
- the EBRD BELSEFF (Belarus Sustainable Energy Financing Facility) initiative which working through local banks to provide a credit line of USD 50 million to SMEs for energy-efficiency and renewable energy investments in Belarus;
- the ongoing UNDP-GEF project "Removing Barriers to Wind Power Development in Belarus", where . one pilot wind turbine is operating in Novogrudok; and
- the European Union Initiative "Supporting the Transition to a Green Economy in the Republic of Belarus" which has a total budget of € 12 million of which approximately € 5 million (over USD 6 million) has been given to UNDP to manage. The EU Green Economy Initiative is planned to run from January 2015 – December 2017 and aims to support the implementation of Belarus's environmental policies as well as supporting small-scale community projects in the field of green economy which could include renewable energy and energy-efficiency. This may include support for demonstration projects related to green economy which links in well with Component 4 of this Project where additional funding may be required depending on the level of interest of other cities;
- The ongoing project "Developing an Integrated Approach to a Stepped-Up Energy Saving Programme" (Energy Efficiency in Schools), financed by the European Union and implemented by UNDP, aims to enhance efficient use of energy resources at the local level in Belarus through application of energy-saving technologies and measures in educational buildings. The Vitebsk and Grodno regions are also pilot regions for this EU initiative.

106. MoNREP as the Executing Entity for the Project will ensure co-finance and cooperation from its other programs, some of which are funded by other donor agencies. Co-financing details are provided on Table 14.

Table 14: Co-Financing Details

Co-Financer	Amount (USD)	General Description of Co-Financed Activities
UNDP EU-funded Green Economy Project	3,000,000	• USD 2,695,000 for investments into, green "economy" and green urban development demonstration initiatives; • USD 305,000 for in-kind contribution to relevant PR actions and project management.
MoNREP	150,000	• Project management (in-kind): administrative support for the Project.
MoAC (IRUP)	300,000	• Component 1 (in-kind): support for the enhancement of existing regulations and standards to address green urban development plans
Local Governments of Polotsk and Novopolotsk	3,130,000 (Polotsk) 4,240,000 (Novopolotsk)	Component 2 support for SUT measures including construction of road and transport infrastructure, development of public transport route network, renovation of public transport stops, construction of cycle paths, provision of cycle parking, development of a CTS, and promotion of sustainable urban mobility to encourage a modal shift towards public transport
Local Government of Novogrudok	1,125,000	Component 3 for various street lighting equipment and energy efficient laundry equipment
EU-funded Polotsk SUMP Development Project[81]	377,420[82]	Support for data collection, traffic modeling, and development of CTS and elaboration of SUMP for Polotsk
Belarusian Transport Union (BTU)	113,000[83]	Provision of local expertise for design and implementation of sustainable urban mobility measures and modeling of traffic flows for Polotsk and Novopolotsk.
Total:	**12,435,420**	

Prior Obligations and Prerequisites

107. There are no prior obligations and prerequisites.

Audit Arrangements

108. The Audit will be conducted in accordance with UNDP Financial Regulations and Rules and applicable audit policies on UNDP projects.

Agreement on Intellectual Property Rights and Use of Logo on Project Deliverables

109. To accord proper acknowledgement to GEF for providing funding, a GEF logo should appear on all relevant GEF-supported project publications, including among others, project hardware, if any, purchased with GEF funds. Any citation on publications regarding projects funded by GEF should also accord proper acknowledgement to GEF. Alongside GEF and

[81] EU project "From Energy Efficiency to Urban Mobility: Introducing Participatory Approach to Development of a Sustainable Mobility Plan in Polotsk"

[82] Ibid 77

[83] Ibid 78

UNDP logo, a MoNREP logo may also feature as the Executing Entity of the proposed project.

MONITORING FRAMEWORK AND EVALUATION

110. The project team and the UNDP Office in Belarus supported by the UNDP-GEF Regional Coordination Unit in Istanbul will be responsible for project monitoring and evaluation conducted in accordance with established UNDP and GEF procedures. The Project Results Framework provides performance and impact indicators for project implementation along with their corresponding means of verification. The GEF CC Tracking Tool will also be used to monitor progress in reducing GHG emissions. The M&E plan includes: inception workshop and report, project implementation reviews, quarterly and annual review reports, independent mid-term evaluation, and independent final evaluation. The following sections outline the principle components of the Monitoring and Evaluation Plan and indicative cost estimates related to M&E activities. The M&E budget is provided on Table 15.

111. *Project start*: A Project Inception Workshop will be held within the first 4 months of the Project starting[84] (after the Project is officially registered by the Government) with those with assigned roles in the Project organization structure, UNDP country office and where appropriate/feasible regional technical policy and programme advisors as well as other stakeholders will be invited. The Inception Workshop is crucial to building ownership for the project results and to plan the first year annual work plan. The Inception Workshop would address a number of key issues including:

a) Assisting all partners to fully understand and take ownership of the project;
b) Detailing the roles, support services and complementary responsibilities of UNDP CO and RCU staff vis-à-vis the project team;
c) Discussing the roles, functions, and responsibilities within the Project's decision-making structure including reporting and communication lines, and conflict resolution mechanisms. The Terms of Reference of project staff will be discussed again as required;
d) Finalization of the first annual work plan based on the project results framework and the relevant GEF Tracking Tool if appropriate. A review and agreement on the indicators, targets and their means of verification will be required as well as a re-check of assumptions and risks;
e) Providing a detailed overview and reach consensus on reporting, monitoring and evaluation (M&E) requirements, the M&E work plan and budget;
f) Discussion of financial reporting procedures and obligations, and arrangements for annual audit;
g) Planning and scheduling PB meetings; and,

[84] Official commencement date of the Project would be with the recruitment date of the NPM

Table 15: M&E Work Plan and Budget

Type of M&E activity	Responsible Parties	Budget US$ *Excluding project team staff time*	Time Frame
Inception Workshop and Report	▪ Project Manager ▪ UNDP CO, UNDP GEF	Indicative cost: 10,000	Within first four months of project start up
Measurement of Means of Verification of project results.	▪ UNDP GEF RTA/Project Manager will oversee the hiring of specific studies and institutions, and delegate responsibilities to relevant team members.	To be finalized in Inception Phase and Workshop.	Start, mid and end of project (during evaluation cycle) and annually when required.
Measurement of Means of Verification for Project Progress on *output and implementation*	▪ Oversight by UNDP CO and UNDP GEF RTA with support from the Project Manager ▪ Project team	To be determined as part of the Annual Work Plan's preparation.	Annually prior to ARR/PIR and to the definition of annual work plans
APR/PIR	▪ Project manager and team ▪ UNDP CO ▪ UNDP RTA ▪ UNDP EEG	None	Annually by July
Project Board meetings	Project Manager	2,000 x 5 years	Following IW and annually thereafter.
Periodic status/ progress reports	▪ Project manager and team	None	Quarterly
Mid-term Evaluation	▪ Project manager and team ▪ UNDP CO ▪ UNDP RCU ▪ External Consultants (i.e. evaluation team)	Indicative cost: 30,000	At the mid-point of project implementation.
Final Evaluation	▪ Project manager and team, ▪ UNDP CO ▪ UNDP RCU ▪ External Consultants (i.e. evaluation team)	Indicative cost : 35,000	At least three months before the end of project implementation
Project Terminal Report	▪ Project manager and team ▪ UNDP CO	None	At least three months before the end of the project
Audit	▪ UNDP CO ▪ Project manager and team	Indicative cost per year: 5,000 X 2 years	At least once during the Project lifecycle
Scheduled audits and spot check	▪ UNDP CO ▪ Project manager and team	Indicative cost per year: 3,000 x 5 years	To be decided based on risk assessment from the micro-assessments
Visits to field sites (UNDP staff travel costs to be charged to IA fees)	▪ Project manager and team	5,000 x 5 years	Yearly
TOTAL indicative COST Excluding project team staff time and UNDP staff and travel expenses		135,000 (+/- 5% of total budget)	

h) Clarification of roles and responsibilities of all project organization structures as well as planned dates of meetings where the first PSC meeting should be held within the first 6 months following the inception workshop.

112. An Inception Workshop report is a key reference document and must be prepared and shared with participants to formalize various agreements and plans decided during the meeting.

113. *Quarterly Progress Report*: Contents of the QPR include:

- Progress made as reported in the Standard Progress Report (SPR) and monitored in the UNDP Enhanced Results Based Management Platform;
- Based on the initial risk analysis submitted, the risk log shall be regularly updated in ATLAS (if applicable otherwise outside ATLAS). Risks become critical when the impact and probability are high;
- Project Progress Reports (PPR) as generated in the Executive Snapshot and based on the information recorded in Atlas; and,
- Other ATLAS logs that are used to monitor issues and lessons learned. The use of these functions is a key indicator in the UNDP Executive Balanced Scorecard.

114. *Annual Project Review /Project Implementation Reports (APR/PIR)*: APRs/PIRs are key reports prepared to monitor progress since project start and in particular for the previous reporting period (30 June to 1 July). The APR/PIR combines both UNDP and GEF reporting requirements, and includes, but is not limited to, reporting on the following:

- Progress made toward project objective and project outcomes, each with indicators, baseline data and end-of-project targets (cumulative);
- Project outputs delivered per project outcome (annual);
- Lesson learned/good practice;
- AWP and other expenditure reports;
- Risk and adaptive management;
- ATLAS QPR; and,
- Portfolio level indicators (i.e. GEF focal area tracking tools) that are used by most focal areas on an annual basis.

115. *Periodic Monitoring through site visits:* UNDP CO and the UNDP RCU staff will conduct visits to project sites based on the agreed schedule in the project's Inception Report/Annual Work Plan to assess first hand project progress. Other members of the Project Board may also join these visits. A Field Visit Report/BTOR will be prepared by the CO and UNDP RCU and will be circulated no less than one month after the visit to the project team and Project Board members.

116. *Mid-term of project cycle*: The project will undergo an independent Mid-Term Evaluation at the mid-point of project implementation. The Mid-Term Evaluation will determine progress being made toward the achievement of outcomes and will identify course correction if needed. It will focus on the effectiveness, efficiency and timeliness of project implementation; will highlight issues requiring decisions and actions; and will present initial lessons learned about project design, implementation and management. Findings of this review will be incorporated as recommendations for enhanced implementation during the final half of the project's term. The organization, terms of reference and timing of the mid-term evaluation will be decided after consultation between the parties to the project document. The Terms of Reference for this Mid-term evaluation will be prepared by the UNDP CO based on guidance from the Regional Coordinating Unit and UNDP-GEF. The management response and the evaluation will be uploaded to UNDP corporate systems, in particular the UNDP Evaluation Office Evaluation Resource Center (ERC). The relevant GEF Focal Area Tracking Tools will also be completed during the mid-term evaluation cycle.

117. *End of Project*: An independent Final/Terminal Evaluation will take place three months prior to the final Project Board meeting and will be undertaken in accordance with UNDP and GEF guidance. The final evaluation will focus on the delivery of the project's results as initially planned (and as corrected after the mid-term evaluation, if any such correction took place). The final evaluation will look at impact and sustainability of results, including the contribution to capacity development and the achievement of global environmental benefits/goals. The Terms of Reference for this evaluation will be prepared by the UNDP CO based on guidance from the Regional Coordinating Unit and UNDP-GEF.

118. The Final Evaluation should also provide recommendations for follow-up activities and requires a management response which should be uploaded to PIMS and to the UNDP Evaluation Office Evaluation Resource Center (ERC). The relevant GEF Focal Area Tracking Tools will also be completed during the final evaluation. During the last three months, the project team will prepare the Project Terminal Report. This comprehensive report will summarize the results achieved (objectives, outcomes, outputs), lessons learned, problems met and areas where results may not have been achieved. It will also lay out recommendations for any further steps that may need to be taken to ensure sustainability and replicability of the project's results.

119. *Learning and knowledge sharing*: Results from the project will be disseminated within and beyond the Project intervention zone through a number of existing information sharing networks and forums. In addition, the Project will:

- The Project will participate, as relevant and appropriate, in UNDP/GEF sponsored networks, organized for senior personnel working on projects that share common characteristics;
- The Project will identify and participate, as relevant and appropriate, in scientific, policy-based and/or any other networks, which may be of benefit to project implementation though lessons learned; and,
- The Project will identify, analyze, and share lessons learned that might be beneficial in the design and implementation of similar future projects. Identifying and analyzing lessons learned is an on-going process and the need to communicate such lessons as one of the project's central contributions is a requirement to be delivered not less frequently than once every 12 months. UNDP/GEF shall provide a format and assist the project team in categorizing, documenting and reporting the lessons learned. To this end a percentage of project resources will also need to be allocated for these activities; and
- endeavor to compile and share its development results within a monitoring framework that is designed to meet the goals of the UNDAF outcomes.

LEGAL CONTEXT

120. This Project document shall be the instrument referred to as such in Article 1 of the Standard Basic Assistance Agreement (SBAA) between the Government of the Republic of Belarus and UNDP, signed on 24 September 1992.

121. Consistent with the Article III of the SBAA, the responsibility for the safety and security of the executing agency and its personnel and property, and of UNDP's property in the EA's custody, rests with EA. The EA shall:

a) put in place an appropriate security plan and maintain the security plan, taking into account the security situation in the country where the Project is being carried out;

b) assume all risks and liabilities related to the EA's security, and the full implementation of the security plan.

122. UNDP reserves the right to verify whether such a plan is in place, and to suggest modifications to the plan when necessary. Failure to maintain and implement an appropriate security plan as required hereunder shall be deemed a breach of this agreement.

123. The Executing Entity agrees to undertake all reasonable efforts to ensure that none of the UNDP funds received pursuant to the Project Document are used to provide support to individuals or entities associated with terrorism and that the recipients of any amounts provided by UNDP hereunder do not appear on the list maintained by the Security Council Committee established pursuant to resolution 1267 (1999). The list can be accessed via http://www.un.org/Docs/sc/committees/1267/1267ListEng.htm. This provision must be included in all sub-contracts or sub-agreements entered into under this Project Document.

ANNEXURES

Annex I – Risk Analysis

Annex II - Detailed CO2 Calculations and Assumptions

Annex III - Agreements

Annex IV – Novogrudok SEAP

Annex V – Terms of Reference for Project Staff and Consultants

Annex VI – Feasibility Study for Novopolotsk and Polotsk Pilots

Annex VII – Feasibility Study of Novogrudok Pilot

Annex VIII - Description of UNDP Country Office Support Services in Execution of the Project "Belarus: Supporting Green Urban Development in Small and Medium Sized Cities in Belarus

Annex I: Risk Analysis

OFFLINE RISK LOG

Project Title: "Belarus Green Cities: Supporting Green Urban Development in Small to Medium-Sized Cities in Belarus"	**Project ID:** 00090983	**Date: 1 July 2015**

#	Description	Date Identified	Type	Impact & Probability	Countermeasures / Management Response	Owner	Submitted, updated by	Last Update	Status (compared with previous evaluation)
1	**Data and information risks**: Lack of willingness of various stakeholders to provide information and data adding to the difficulties of measuring GHG emission reductions from this project and other impacts		Regulatory	P = 1 I = 3	The project will include in its design a heavy emphasis on monitoring, verification, and reporting of greenhouse gas emissions (both direct and indirect). This will be managed by a key national expert who will undertake the task of monitoring and reporting of GHG emission reductions and other impacts	National project manager	Submitted by Project Proponent, updated by Project Manager		
2	**Financing Risks related to demonstration projects**: Lack of Municipal Co-Financing in the three pilot cities means that pilot projects are not successfully realized.		Financial	P = 3 I = 5	The cities of Novopolotsk/Polotsk and Novogrudok have already committed some USD 8.495 million in co-financing to this project. In addition, they are committed to developing green urban development plans. They are strongly committed to working with UNDP and to making sure these demonstration projects are successful. The risk that municipal co-financing does not materialize is rated as medium given that over time municipal budgets can be changed and	Project manager	Submitted by Project Proponent, updated by Project Manager		

#	Description	Date Identified	Type	Impact & Probability	Countermeasures / Management Response	Owner	Submitted, updated by	Last Update	Status (compared with previous evaluation)
					there is the possibility they might be reduced in future. As a final resort, if co-financing does not materialize partner cities can be changed during project implementation.				
3	**Financing Risks related to replication**: Sustainable funding for green urban planning does not become available		Financial	P = 4 I = 4	This is the risk that plans are drawn up but then funding is not available to finance sustainable green urban development. The institutional mechanism to be facilitated as a part of the Project, will include a range of funding sources and modalities for green urban development in Belarus. The designated institution that promotes green cities for Belarus will provide a further vehicle for exchanging best-practices in green urban planning and thus facilitating greater state and municipal funding	National Project Manager			
4	**Political Risks**: The recent drop in oil prices reduces stakeholder urgency of green city development.		Technical	P = 2 I = 3	The Project will facilitate implementation of a replication mechanism, which will play a strong role in raising awareness and disseminating information on integrated urban development and sustainable green cities, and the associated fiscal benefits to municipalities. The drivenness of the Government should sustain the development of green urban development beyond the EOP	Project manager	Submitted by Project Proponent, updated by Project Manager		

Submitted by National Project Manager _____ Approved by UNDP Programme Analyst _____

Annex II: Detailed CO_2 Calculations and Assumptions

A. Purpose of Report

This annex provides details of the energy saved and GHG emissions reduced through implementation of proposed GEF investments in Components 2 and 3. Issues covered include:

- Baseline energy consumption of current activities. This would include estimates of the current urban transport fleets in Polotsk and Novopolotsk, and current electricity and energy consumption for street lights and the municipal laundry in Novogrudok;
- Estimates on life cycle energy consumptive information on the selected low carbon measures undertaken and technologies adopted (from demonstration projects and replication projects on Components 2 and 3);
- Direct, post-project direct and indirect CO_2 reductions resulting from life-cycle energy savings from the use and adoption of low carbon technologies and measures using appropriate GEF guidelines[85] and inputs from the PPG team on the timing of the investments and generation of CO_2 reductions.

A summary of the emission reductions from this Annex is provided on Table II-1.

Table II-1: Summary of GHG Reductions from the Belarus Green Cities Project Activities

Intervention Description	Detail	GHG Reductions (Tonne CO_{2eq})[86]			
		Direct[87]	Post-Project Direct[88]	Indirect Bottom--up[89]	Indirect Top-Down[90]
Sustainable transport measures	Modal switches to public transport along Route No. 5 where services have improved including "real-time" bus information, improved bus stops and reduced journey times.	77,786	0	9,944	135,864
	Increased fuel efficiencies for buses along Route No.5 where dedicated bus lanes and synchronized (or priority) signaling have been piloted.	0[91]	0	0	0
	Modal switches from private cars to bicycles based on improved access to safe cycling network provided by Project investment	0	0	0	0
Energy efficiency measures demonstrated at Novogrudok	LED street lighting in Novogrudok	3,140	0	5,023	73,584
	EE measures undertaken at municipal laundry in Novogrudok	10,190	0	10,191	21,577
Totals:		***91,116***	***0***	***25,158***	***231,025***

[85] http://www.thegef.org/gef/pubs/STAP/Methodology-for-Calculating-GHG-Benefits-of-GEF-Energy-Efficiency-Projects-v.1
[86] Grid emission factor for Belarus assumed to be 0.48 tonnes CO_{2e}/MWh.
[87] This is the cumulative emissions reduction during the lifetime of the investments.
[88] This includes cumulative emission reductions for the first 10 years after the EOP.
[89] Assumed replication factor or 2 due to lack of funds to implement similar demo projects
[90] Assumed causality factor of 20% due to anticipated shortage of funds
[91] Ibid 58

B. GHG Reductions from Component 2: Development of pilots on Sustainable Transport in Polotsk and Novopolotsk

The TEEMP MRT model was used to calculate project emission reductions based on the following assumptions:

- Data from Polotsk and Novopolotsk municipalities was received for public transport usage in both cities for 2009 to 2013;
- Number of daily trips in 2014 was 245,700 as reported by Polotsk municipality as shown on Table II-2. This was assumed as a baseline for the model. Modal shifts from the "without project scenario" to the "with project" scenario were assumed as follows on Table II-2:
  - ⇒ For mode share:
    - Walking and cycling 0.1% increase by EOP and 0.4% increase by 2030;
    - Decrease in marshrutka use by 0.1% by EOP and 0.3% by 2030;
    - Decrease in car use by 0.2% by EOP and 1.7% by 2030;
    - Increase in bus use by 0.% by EOP and 1.1% by 2030;
    - Increase in tram use by 0.1% by EOP and 0.4% by 2030.

  - ⇒ For average trip length:
    - Increase in walking cycling by 0.2 km by EOP and 1.0 km by 2030;
    - No change in trip length of marshrutkas;
    - Decrease in car trip length by 1.0 km by EOP and 2030;
    - Increase in bus trip length by 0.5 km by EOP and 2030; and
    - No change in tram trip length use

  - ⇒ For average speed:
    - Increase in walking cycling speed by 1.0 km/hr by EOP and 3.0 km/hr by 2030;
    - No change in average speed of marshrutkas;

  - ⇒ For average occupancy:
    - No change in occupancy for walking/cycling trips or marshrutkas;
    - No decrease in car trip occupancy of 1.3 persons throughout Project and by 2030;
    - Increase in bus occupancy from 48.5 to 49.9 by EOP, and from 48 to 52.3 by 2030; and
    - Increase in tram occupancy from 52.4 to 54.0 by EOP, and from 51.8 to 56.7 by 2030.

- Assumptions of the distribution of fuel usage amongst city transport fleets are shown on Table II-3. Buses are almost exclusively fuelled on diesel and trams on electricity. With marshrutkas, a 50-50 split was assumed in the usage of diesel and gasoline based on field observations and data from the municipalities. With no data on the fuel consumption efficiency of the fleet, default values for marshrutkas, cars and buses were made on the basis of km/liter (or km/kwh for the trams). While there was no change assumed in the distribution of fuel types from 2014 to 2020 to 2030, the TEEMP model assumes fuel consumption efficiency of the fleet increases by 1% annually;
- Table II-4 provides default emission factors of the fuels assumed;
- Table II-5 provides the CO_2 reductions resulting from increases in modal switches to public transit and NMT modes, decrease in average car trip lengths, increases in bus and tram occupancy;

- The information was used to setup the TEEMP model[92] and was checked with a manual GHG calculation that was based on actual project interventions (from investments in Component 2) that included improvements in public transit along Route #5 as shown on Table II-6;
- Table II-7 provides a GHG calculation assuming modal shifts of 250 cars onto public transit that avoid a round trip of 26 km to and from the park-and-ride facility to the Naftan Refinery. The model assumes there is a 2% increase in the use of the park-and-ride from Year 5 to Year 14 with no other increases in the use of other bus routes. The 543 tCO_{2eq} in Year 3 is in the same order of magnitude as the 474 tCO_{2eq} in 2015 in Table II-5. Given the accounting of dynamic growth of public transport accounted for in the TEEMP model, the GHG reductions calculated in Table II-5 will be used as the GHG reductions for SUT measures undertaken in Component 2.

Table II-2: TEEMP Inputs into "Trips" Worksheet

ansport Network - Trips

Without Project					With project			
	2014	2020	2030			2014	2020	2030
Daily Number of Trips ('000s)	245.7	253.2	266.1	0.25 0.40	Total Number of Trips ('000s)	245.7	253.2	266.1
Modeshare (% of Trips)					**Modeshare (% of Trips)**			
	2014	2020	2030	16.96		2014	2020	2030
Walking/cycling	0.1%	0.1%	0.2%	18.10	Walking/cycling	0.1%	0.2%	0.6%
Marshrutka	6.6%	6.7%	6.8%	77.15	Marshrutka	6.6%	6.6%	6.5%
Car	31.4%	33.0%	34.7%	83.54	Car	31.4%	32.8%	33.0%
Bus	59.6%	57.9%	54.4%	92.21	Bus	59.6%	58.0%	55.5%
Tram	2.3%	2.3%	4.0%	146	Tram	2.3%	2.4%	4.4%
	100%	100%	100%	147		100%	100%	100%
				145				
Average Trip Length (km)				5.65	**Average Trip Length (km)**			
	2014	2020	2030	5.82		2014	2020	2030
Walking/cycling	1.5	1.5	1.5	10.64	Walking/cycling	1.5	1.7	2.5
Marshrutka	6.4	6.4	6.4		Marshrutka	6.4	6.4	6.4
Car	11.0	11.0	11.0		Car	11.0	10.0	10.0
Bus	6.8	6.8	6.8		Bus	6.8	7.3	7.3
Tram	7.0	7.0	9.0		Tram	7.0	7.0	9.0
Average Speed (km/hr)					**Average Speed (km/hr)**			
	2014	2020	2030			2014	2020	2030
Walking/cycling	4.0	4.0	4.0		Walking/cycling	4.0	5.0	7.0
Marshrutka	25.0	24.0	23.0		Marshrutka	25.0	24.0	23.0
Car	27.0	26.0	25.0		Car	27.0	26.0	25.0
Bus	15.8	15.0	14.0		Bus	15.8	17.4	18.2
Tram	22.2	22.2	22.2		Tram	22.2	22.2	22.2
Average Occupancy					**Average Occupancy**			
	2014	2020	2030			2014	2020	2030
Walking/cycling	1.0	1.0	1.0		Walking/cycling	1.0	1.0	1.0
Marshrutka	7.0	7.0	7.0		Marshrutka	7.0	7.0	7.0
Car	1.3	1.3	1.3		Car	1.3	1.3	1.3
Bus	49.0	48.5	48.0		Bus	49.0	49.9	52.3
Tram	53.0	52.4	51.8		Tram	53.0	54.0	56.7

	000 pass/y	PKM / y
Walking/cycling	89.7	134.52
Marshrutka	5,918.9	37,969.83
Car	28,159.7	309,756.45
Bus	53,449.6	361,319.15
Tram	2,062.7	14,438.56

[92] http://www.thegef.org/gef/node/4638

Table II-3: Assumed Distribution of Fuel Usage amongst Various City Transport Fleets

City Transport Fleet Characteristics

Fuel Type	2014 Gasoline	2014 Diesel	2014 LPG	2014 Electric	2014 Other	2014 Sum
Marshrutka	50.00%	50.00%				100%
Car	50.00%	23.00%	27.00%			100%
Bus	2.00%	98.00%				100%
Tram				100.00%		100%

Fuel Type	2020 Gasoline	2020 Diesel	2020 LPG	2020 Electric	2020 Other	2020 Sum
Marshrutka	50.00%	50.00%				100%
Car	50.00%	23.00%	27.00%			100%
Bus	2.00%	98.00%				100%
Tram				100.00%		100%

Fuel Type	2030 Gasoline	2030 Diesel	2030 LPG	2030 Electric	2030 Other	2030 Sum
Marshrutka	50.00%	50.00%				100%
Car	50.00%	23.00%	27.00%			100%
Bus	2.00%	98.00%				100%
Tram				100.00%		100%

Fuel Efficiency at 50 kmph (km/unit of consumption)

unit of consumption	Gasoline liters	Diesel liters	LPG liters	Electric kwh	Other
Marshrutka	6.67	7.69			
Car	9.09	10.00	8.33		
Bus	3.33	4.00			
Tram				0.33	
0					

	Gasoline liters	Diesel liters	LPG liters	Electric kwh	Other -
	7.07	8.15			
	9.64	10.60	8.83		
	3.53	4.24			
				0.35	

	Gasoline liters	Diesel liters	LPG liters	Electric kwh	Other -
	7.77	8.97			
	10.60	11.66	9.45		
	3.89	4.66			
				0.38	

Table II-4: Emission Factors of the City Transport Fleet

City Transport Fleet - Emission Factors

CO2 (kg/unit)

Fuel	Gasoline	Diesel	LPG	Electric	Other
unit	kg/liters	kg/liters	kg/liters	kg/kwh	
Marshrutka	2.31				
Car	2.31				
Bus	2.31	2.66			
Tram				0.48	

DG:
data from GEF and/or CDM meths

	Gasoline kg/liters	Diesel kg/liters	LPG kg/liters	Electric kg/kwh	Other
	2.31	2.66			
	2.31	2.66	1.55		
	2.31	2.66			
				0.48	

	Gasoline kg/liters	Diesel kg/liters	LPG kg/liters	Electric kg/kwh	Other
	2.31	2.66	1.75		
	2.31	2.66	1.75		
	2.31	2.66			
		2.58		0.48	

Table II-5: CO2 reductions for SUT measures in Polotsk and Novopolotsk from TEEMP model

From Worksheet "ERs for Twin Cities SUT TEEMP" on file "GHG Reductions Novo-Polotsk SUT TEEMP"

CO2	Savings from Modeshift	Construction Emissions	Emissions from Electricity Use	Total Savings
Total Lifetime Direct GHG Reductions	**77,876**	-	-	-
2014	0	-		
2015	474	-		
2016	947	-		
2017	1,421	-		
2018	1,894	-		
2019	2,368	-		
2020	2,841	-		
2021	3,560	-		
2022	4,278	-		
2023	4,997	-		
2024	5,715	-		
2025	6,434	-		
2026	7,152	-		
2027	7,871	-		
2028	8,590	-		
2029	9,308	-		
2030	10,027	-		
Direct GHG Reductions	9,944	-		
Lifetime direct Post-Project GHG Reductions	70,773	-		
Replication Factor	1			
Indirect Bottom-Up GHG Reductions	9,944	-		
P10 GHG Reduction Potential (assuming 10 cities)	608,291			
Causality Factor	20%			
Indirect Top-Down GHG Reductions	121,658	-		
Total emission reductions	212,319	-		

PM	S
TOTAL (tons)	-
2014	-
2015	-
2016	-
2017	-
2018	-
2019	-
2020	-
2021	-
2022	-
2023	-
2024	-
2025	-
2026	-
2027	-
2028	-
2029	-
2030	-
Total emission re	

Table II-6: Information of fuel consumption along Bus Routes #2, #5 and tram

	Information and data on the bus/tram routes	Bus route No/Tram		
		2	5	tram
1	Daily liters of fuel consumption per bus (MWh electricity per tram)	Work day - 1183,6 л (disel) holiday/weekend - 416,8 л (disel)	Work day - 960,5 л (disel) holiday/weekend - 743,5 л (disel)	2500 KW-Hour
2	Number of kilometres traveled by one bus/tram (daily)	Work day - 165,7 km holiday/weekend - 184,8 km	Work day - 177,6 km holiday/weekend - 195,3 km	157 km
3	Number of kilometres traveled by bus/tram (round trip)	25 km	37,6 km	19,5 km
4	Liters of fuel consumption per bus/tram per round trip (MWh electricity per round trip)	9,4 л (disel)	15,1 (disel)	40 KW-Hour
5	Total passengers carried on the route each day	Work day - 20403,9 passengers. holiday/weekend - 7184,7 passengers.	Work day - 10327,5 passengers. holiday/weekend - 7994,7 passengers	5406 passengers.
6	Maximum number of passengers that can be carried by bus/tram (including passengers standing)	170 passengers.	170 passengers.	211 passengers.
7	Average number of passengers carried by each bus (or tram)	162 passengers.	162 passengers.	75 passengers.
8	Average minutes required for each bus/tram (round trip)	1 hour 12 min	1 hour 40 min	54 min
9	Number of minutes of wait time for bus at terminus stop	2 - 10 min	2 min	3 min
10	Number of round trips by each bus/tram (daily)	Work day - 6,6 holiday/weekend - 7,4	Work day - 4,7 holiday/weekend - 5,2	8

Notes:

1	Cell E8 indicates bus fuel consumption is	40.2 liters diesel/100 km
2	There are 10328 passengers carried each day	5,184 passengers on round trips each day
3	Average number of passengers per bus	162 passengers on round trips each day
4	Number of round trips by buses on Route #5	32 round trip/day
5	Liters diesel consumed per round trip	15 liters/round trip
6	Total diesel consumed by Route #5	483 liters /day
		106,304 liters/year (only working days)

Table II-7: Static GHG calculation of SUT measures undertaken along Bus Route #5

Description	Year 1 2015-16	Year 2 2016-17	Year 3 2017-18	Year 4 2018-19	Year 5 2019-20	Year 6 2019-20	Year 7 2020-21	Year 8 2021-22	Year 9 2022-23	Year 10 2023-24	Year 11 2024-25	Year 12 2025-26	Year 13 2026-27	Year 14 2027-28	Total
Baseline emissions through Bus Route #5*	313	316	319	322	325	328	332	335	338	342	345	349	352	356	**4,672**
SUT Measures:															
GHG reductions from traffic flow efficiency measures along Bus Route #5**			32	32	33	33	33	34	34	34	35	35	35	36	**404**
Average daily number of parked cars in park-and-ride facility throughout the year			250	250	255	260	265	271	276	282	287	293	299	305	
Added GHG emissions for additional buses added to accomodate additional park-and-ride passengers			0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.10	0.10	0.10	0.10	0.10	
GHG offset from transport modal switches (tonnes CO2)***			511	511	521	532	543	553	564	576	587	599	611	623	**6,732**
Annual Emission Reduction (tCO_{2eq})			**543**	**543**	**554**	**565**	**576**	**587**	**598**	**610**	**622**	**634**	**646**	**659**	**7,135**
Cumulative ERs			**543**	**1,086**	**1,640**	**2,205**	**2,780**	**3,367**	**3,965**	**4,575**	**5,197**	**5,831**	**6,477**	**7,135**	

End of GEF Project →

Notes and Assumptions:

This analysis is done as a cross-check to the TEEMP outputs. The comparisons are somewhat favorable considering the GHG reductions are 543 tonnes on this analysis compared to 474 tonnes on the TEEMP model. The problem is the escalation of GHG reductions on the TEEMP model

* These are the actual emissions from all buses along the GBC route in 2014 with a 1.0% escalation factor for each year.

** Assumed improvement of movement through the 18.8 km Route #5 corridor 10%

*** Assumes cars parked in park-and-ride lot will not travel 13 km for a certain number of days each year

1. Default CO2 emissions for diesel	2.94	kg CO2/liter
2. Default CO2 emissions for gasoline	2.75	kg CO2/liter
3. Annual days when congestion may occur	220	days
4. Distance from park-and-ride to Naftan Refinery	13	km
5.Assumed fuel consumption of private cars	13	liters/100 km
6.Estimated traffic flow efficiency improvement	0.25	
7. Direct ERs during Project	1,086	tonnes CO2
8. Direct post-project ERs from Route #5 SUT demo	6,049	tonnes CO2
9. Direct fossil fuel saved from modal switch to Route #5	561,418	liters gasoline
10. Energy per liter petrol	35	MJ/liter
11. Direct energy saved from offset gasoline	19,649,630	MJ
	5,458	MWh
12.:Lifetime direct energy saved from offset gasoline	85,480,289	MJ

C. GHG Reductions from Component 3: Development of pilots on Energy Efficiency Initiatives in Novogrudok

GHG reductions in Novogrudok were derived from:

- a switch from mercury discharge and sodium discharge street lights to LED lights. Table II-8 is the street light inventory for Novogrudok.
- replacement of inefficient laundry equipment and energy sources for the municipal laundry with energy efficient laundry equipment using electricity. Details of the equipment to be replaced in the municipal laundry are shown on Table II-9; and
- Energy consumption and GHG reductions are shown on Table II-10 using the 2013 GEF guidelines for estimation of GHG reductions from GEF investments on energy efficiency;
- Top-down GHG estimates are shown on Table II-11 and were calculated based on the following assumptions:
    - Without the benefit of any official statistics on the number of street lights that could be converted into LED street lights, an assumption was made that there are over 200,000 street lights that could be converted in the entire Belarus (excluding Minsk and oblast centers). By converting 200,000 street lights from the average baseline consumption of 188 watts to LED street lights at 83 watts, 36,972 tonnes CO_{2eq} can be reduced annually (based on 10 hrs of operation, 365 days/year, 105 watts saved per street light, and a grid emissions factor of 0.48 tonnes CO_{2eq}/MWh used;
    - The 10-year period of potential GHG reductions from the replacement of street lights is 369,720 tonnes CO2eq;
    - The annual GHG emission reductions from the Novogrudok laundry from the installation of EE laundry equipment is assumed to be 1,019 tonnes CO_{2eq} (derived from 4,076 tonnes CO_{2eq} direct GHG avoided (2016-2021) as shown in Table II-10;
    - Assuming around 11 similar laundries in Belarus, the 10-year emission reduction potential is 106,165 tonnes CO_{2eq};
    - Total 10-year market potential for EE lights and laundry in Belarus is 475,885 tonnes CO_{2eq} (369,720 + 106,165);
    - A 20% causality factor was applied since the availability of budget for replacing these street lights depends on state credit guarantees to arrive at the top-down GHG estimate of 95,177 tonnes CO_{2eq};

Table II-8: Street Light Inventory for Novogrudok

Total length of streets with street lighting (km)	Lighting Fixture Code	Number of street lighting fixtures	Types of lamps used in street lighting fixtures	Lamp type	Power rating of lamp (watt)	Total power rating of lighting fixture (kW)	Average annual operational time of street lighting during 2009-13 (hours/yr)	Number of street lighting fixtures by lamp type		
								Total	Lighting fixtures with sodium discharge lamps	Lighting fixtures with mercury discharge lamps
62.5	ZHKU-70	35	DNaT-70	Sodium discharge lamp	70	2.5	2500	1566	755	811
	ZHKU-100	128	DNaT-100	Sodium discharge lamp	100	12.8				
	ZHKU-150	487	DNaT-150	Sodium discharge lamp	150	73.1				
	ZHTU-70	18	DNaT-70	Sodium discharge lamp	70	1.3				
	ZHTU-150	87	DNaT-150	Sodium discharge lamp	150	13.1				
	RKU-125	93	DRL-125	Mercury discharge lamp	125	11.6				
	RKU-250	718	DRL-250	Mercury discharge lamp	250	179.5				

Source: Novogrudok Utility Company

Table II-9: Municipal Laundry Equipment for Novogrudok

Baseline: Municipal Laundry

Detail	Unit		
Amount of fuel used year	m3/yr	684,000	natural gas
Calorific value of natural gas	MJ/m3	34.6	https://bioenergy.ornl.gov/papers/misc/energy_conv.html
Annual steam load	MJ/year	23,666,400	from natural gas (based on legal emissions)
	MWh/yr	6,574	
Fuel emission factor	tCO2/TJ	56.0900	IPCC default value
CO2 emissions per year from laundry steam process	**tCO2**	**1,327**	
Daily Electricity Load	MWh/day	0.176	Yearly electricity consumption 44,000 kWh, operation time 250 days per year
	MJ/day	634	
Operational days for laundry	day	250	
Electricity used per year in laundry	MWh/yr	44	
	MJ/yr	158,400	
CO2 emissions per year from electricity use	**tCO2**	**21**	
Total annual CO2 emissions from laundry	**tCO2**	1,349	

Project Scenario for EE Laundry

Estimated daily capacity of laundry in Novogrudok **1500 kg per day**

Reference equipment:	
Washing machine model	**Electrolux W4400H**
Load	40 kg
Washing cycle	1 hour
Number of washing cycles per day	7
Electric capacity (3-phase current)	36 kW
Number of washing machines required to meet demand for services	6
Estimated equipment cost (USD, including VAT 20%)	$29000 per machine
Drying machine model	**Electrolux T4650**
Load	28 kg
Washing cycle	30 minutes
Number of washing cycles per day	14
Electric capacity (3-phase current)	36
Number of drying machines required to meet demand for services	4
Estimated equipment cost (USD, including VAT 20%)	$10000 per macnine

Table II-10: GHG Reductions for EE Lighting and EE Laundry for Novogrudok

Step 3: Model Activity Components

Demonstration/Diffusion Module

Project Information

Project Title	Belarus GUD
Country	Belarus
Contact Name	
First Year of Project	2016
Last Year of Project	2021

Results: Demonstration/Diffusion Activity Components

	Cumulative			Annual			
	Total	*2016-2021*	*2022-2031*	*2016*	*2021*	*2025*	*2035*
Direct Electricity Savings (MWh)	101	-555	656	0	10	10	0
Direct Natural Gas Savings (GJ)	236,664	94,666	141,998	0	23,666	23,666	0
N/A	0	0	0	0	0	0	0
N/A	0	0	0	0	0	0	0
Direct Total Energy Savings (GJ)	237,027	92,668	144,358	0	23,703	23,703	0
Direct GHG Emission Savings (tCO2)	**13,330**	5,018	8,312	0	1,333	1,333	0
Direct Post-project GHG Emission Savings (tCO2)							
Indirect Bottom-up Emission Savings (tCO2)	**15,214**		15,214				

Component 1: Novogrudok EE lighting -- General Inputs

Component Specifications	*Default*	*User-Specified*	*Per Unit*	*Notes*
Annual Electricity Savings (MWh)		0.076	LED street light installations	Weighted average savings per LED lamp based on number of specific wattage LEDs replacing respective wattage HIDs
Annual Natural Gas Savings (GJ)				

Useful Lifetime of Investment	15	10		10 year average useful lifetime of LED luminaires assumed

Baseline Assumptions	*Default*	*User-Specified*	*Notes*
Percent of Activities Implemented in the Baseline	10%	0%	baseline energy saving already accounted for

Indirect Bottom-up Estimate	*Default*	*User-Specified*	*Notes*
er of LED street light installationss Implemented During Project Period		6,264	Total number of LED street lighting fixtures installed in Novogrudok (1566/year x 4 years)
Number of Replications Post-project as Spillover		2	at least two other cities implemenent similar LED programs during 10 post-project years
Total		12,528	

Component 1: Novogrudok EE lighting -- Annual Inputs and Calculations

		2016	2017	2018	2019	2020	2021
PROGRAMME	LED street light installations(s) in Year		1,566	1,566	1,566	1,566	1,566
BASELINE	LED street light installations(s) in Year	0	0	0	0	0	0
NET	Cumulative LED street light installations(s) in Place	0	1,566	3,132	4,698	6,264	7,830
DIRECT SAVINGS	Annual Electricity Savings (MWh)	0	119	238	357	476	595
	Annual Natural Gas Savings (GJ)	0	0	0	0	0	0
	---	0	0	0	0	0	0
	---	0	0	0	0	0	0

TOTALS	Direct Energy Avoided 2016-2021 (GJ)	6,427	Direct GHG Avoided 2016-2021 (tCO2)	942
	Direct Energy Avoided 2022-2031 (GJ)	14,996	Direct GHG Avoided 2022-2031 (tCO2)	2,198
	Direct Post-project Energy Avoided 2022-2031 (GJ)	0	Direct Post-project GHG Avoided 2022-2031 (tCO2)	0

INDIRECT BOTTOM-UP SAVINGS	2022-2031	5,023	tCO2

Component 2: Novogrudok EE laundry -- General Inputs

Component Specifications	*Default*	*User-Specified*	*Per Unit*	*Notes*
Annual Electricity Savings (MWh)		-585	Laundry equipment set	Increased electricity consumption by new laundry equipment (6 washers, 4 driers), replacing NG-derived steam at municipal boiler
Annual Natural Gas Savings (GJ)		23,666		Based on avoided consumption of 684000 m3 of NG in municipal boiler to generate steam for laundry
---				

Useful Lifetime of Investment	15	10		

Baseline Assumptions	*Default*	*User-Specified*	*Notes*
Percent of Activities Implemented in the Baseline	10%	0%	baseline energy saving already accounted for

Indirect Bottom-up Estimate	*Default*	*User-Specified*	*Notes*
ıumber of Laundry equipment sets Implemented During Project Period		1	a set of 6 washers and 4 driers installed at Novogrudok laundry
Number of Replications Post-project as Spillover		1	At least one similar laundry is retrofitted during 10 post project years
Total		1	

Component 2: Novogrudok EE laundry -- Annual Inputs and Calculations

		2016	2017	2018	2019	2020	2021
PROGRAMME	Laundry equipment set(s) in Year	0	0	1	0	0	0
BASELINE	Laundry equipment set(s) in Year	0	0	0	0	0	0
NET	Cumulative Laundry equipment set(s) in Place	0	0	1	1	1	1
DIRECT SAVINGS	Annual Electricity Savings (MWh)	0	0	-585	-585	-585	-585
	Annual Natural Gas Savings (GJ)	0	0	23,666	23,666	23,666	23,666
	---	0	0	0	0	0	0
	---	0	0	0	0	0	0

TOTALS	Direct Energy Avoided 2016-2021 (GJ)	86,242	Direct GHG Avoided 2016-2021 (tCO2)	4,076
	Direct Energy Avoided 2022-2031 (GJ)	129,362	Direct GHG Avoided 2022-2031 (tCO2)	6,114
	Direct Post-project Energy Avoided 2022-2031 (GJ)	0	Direct Post-project GHG Avoided 2022-2031 (tCO2)	0

INDIRECT BOTTOM-UP SAVINGS	2022-2031	10,191	tCO2

Table II-11: Top-Down GHG Reduction Estimate for EE in Novogrudok

Step 4: Calculate Indirect Top-Down Impacts

	User-Specified	*Notes*
Total Market Potential (tCO2)	475,885	
Causality factor	20%	
Indirect Top-Down Emission Reductions (tCO2)	95,177	

Step 5: Review the Results

Overall Results

Demonstration & Diffusion Components	Cumulative			Annual			
	Total	*2016-2021*	*2022-2031*	*2016*	*2021*	*2025*	*2035*
Direct Electricity Savings (MWh)	101	-555	656	0	10	10	0
Direct Natural Gas Savings (GJ)	236,664	94,666	141,998	0	23,666	23,666	0
N/A	0	0	0	0	0	0	0
N/A	0	0	0	0	0	0	0
Direct Total Energy Savings (GJ)	237,027	92,668	144,358	0	23,703	23,703	0
Direct GHG Emission Savings (tCO2)	**13,330**	5,018	8,312	0	1,333	1,333	0
Direct Post-project GHG Emission Savings (tCO2)							
Indirect Bottom-up Emission Savings (tCO2)	**15,214**		15,214				

Annex III: Agreements

Annex IV: Novogrudok SEAP Summary

The Sustainable Energy Action Plan Development of Novogrudok for 2011-2020 (hereinafter - SEAP) was developed in the framework of the EU project - "DACO" (Grant-contract № EuropeAid/131258/C/ACT/Multi, approved by Decree of the Council of Ministers on August 23, 2013 № 742). The main objective of SEAP is to achieve a 20% GHG emissions reduction by 2020. This goal is expected to be achieved by implementation of energy efficient projects and renewable energy development.

Total emissions of GHG in 2010 amounted to 121.9 thousand tons of CO2-equivalent. A 20% reduction of emissions (24.38 thousand tons of CO2) corresponds to total emissions forecast 97.5 thousand tons by 2020, or 2.44 thousand tons per year reduction. According to SEAP total energy consumption in Novogrudok will not grow notably in 2014-2020 or stay stable at the level 744.93 GWh by 2020 as a result of SEAP implementation. Improvement of energy efficiency and GHG emissions reduction is one of the main priorities for local authorities. As a result of energy efficiency projects implemented in 2011-2013 total energy consumption reduction in Novogrudok region achieved 12.7 thousand tce, that corresponds to the 9.15% total primary energy consumption reduction.

Since 2011 new power generation projects have been developed in Novogrudok. The first 1.5 MW wind power plant started operation in 2011 in Grabniki village, total electricity generation amounted to 9994 thousand kWh in the beginning of 2014, that accounts for about 7% of total electricity consumption of Novogrudok region. Two reciprocating CHP units owned by Novogrudok Utility Company with total electrical capacity 4 MW started operation in June 2012. 602 vehicles switched from gasoline to CNG to reduce GHG emissions in 2011-2013.

Novogrudok SEAP assumes preliminary investment needs amounted to 23.38 thousand Euro by 2020. Expected sources of funding are: the district budget, regional budget funds for financing the national regional and district energy conservation programs, as well as investors' funds and grants from international organizations.

Two grants from the European Commission will be assigned to Novogrudok (60 and 600 thousand Euro) for energy efficiency projects as a part of SEAP. Also a €5 million financial support from the EU-sponsored “Green Economy” Project will be allocated to Novogrudok for expansion of wind power plant.

The following energy efficiency projects in schools, kindergartens, hospital were the priority for Novogrudok authorities in last several years:

- installation of energy efficiency lighting fixtures
- improvement of thermal performance of municipal buildings and installation of energy efficient windows
- installation of energy efficient heating and electrical equipment
- switching heating plant for using biomass

In heating and residential sector the following energy performance measures were implemented:

- replacement of old heating pipes with preliminary insulated pipes
- installation of efficient boilers
- installation of variable-speed drives and frequency controllers in heating plants
- replacement of pumps

- installation of heating automation systems
- improvement of insulation of heating pipes

As a result of EE projects implemented total energy savings in Novogrudok heating and residential sector amounted to 4425 tce (35.84 GWh) in 2011-2013. Several large-scale energy efficient projects were implemented in Novogrudok in 2011-2013 by the following city residents:

- Novogrudok Gas Equipment Plant (total energy savings were 419 tce in 2011-2013)
- Dairy Company "Novogrudsiye Dary" (total energy savings were 1949 tce in 2011-2013)
- Novogrudok Metal Works Plant (total energy savings were 123 tce in 2011-2013)

The main priorities for 2014-2020 outlined in SEAP are:

- achievement of energy savings in residential sector by means of improvement of energy efficiency of walls, roofs and windows
- replacement of inefficient lighting fixtures with incandescent lamps in residential sector with installation of LED lighting fixtures and lighting and presence sensors
- replacement of 50-100 W inefficient incandescent lamps in traffic light with LED's
- switching vehicles for using CNG and biofuels
- construction of 2.0-2.5 MW wind power plant in Grabniki village (support of the Ministry of Environment and Natural Resources of the Republic of Belarus and EU Program "Green Economy")
- construction of 9-12 MW wind park in Grabniki village by 2018 by Grodnoenergu regional power company
- a feasibility study for 15-18 MW wind power plant is expected to be developed with European Commission support under the project "Development of Renewable Energy in Novogrudok Region - Roadmap for Environmentally Clean Territory"
- a feasibility study for 1-3 MW roof-mounted and stand-alone photovoltaic power plants is expected to be developed with European Commission support under the project "Development of Renewable Energy in Novogrudok Region - Roadmap for Environmentally Clean Territory"
- a feasibility study for biogas plant using agricultural waste is expected to be developed in 2015 with European Commission support under the project "Development of Renewable Energy in Novogrudok Region - Roadmap for Environmentally Clean Territory" . The plant is expected to be constructed by "Schorsy" Agricultural Company
- a feasibility study for municipal waste processing plant and wastewater sludge processing is expected to be developed in 2014 with European Commission support under the project "Development of Renewable Energy in Novogrudok Region - Roadmap for Environmentally Clean Territory"
- a feasibility studies for 4 MW biomass CHP Power Plant as well as biogas power plant using municipal solid waste and wastewater sludge are expected to be developed with European Commission support under the project "Development of Renewable Energy in Novogrudok Region - Roadmap for Environmentally Clean Territory"
- replacement of 21.32 km of heat supply pipelines with installation of preliminary insulated pipes is scheduled for 2014-2020
- installation of solar heating panels in municipal buildings
- energy audits of municipal buildings
- installation of heat recuperation systems
- replacement of pumps in heating plants
- installation of wood chips boilers

Annex V: Terms of Reference for Project Staff and Consultants

Regular Project Staff

1. National Project Manager (NPM):

Duties and Responsibilities: The incumbent will be responsible for implementation of the project, including mobilization of all project inputs, setup, implementation and maintenance of project's internal control arrangements, supervision of project staff, consultants and oversight of sub-contractors. The PM will be the leader of the Project Team (PT) and shall liaise with the government, UNDP, and all stakeholders involved in the Project. S/he will be specifically responsible for (a) overall management of the project, (b) work closely with project stakeholders and ensure the project deliveries as per project document and work plan, (c) ensure technical coordination of the project and the work related to regulatory, institutional, financial and implementation aspects, (d) mobilize all project inputs in accordance with UNDP procedures and GEF principles, (e) finalize the ToR for the consultants and subcontractors and coordinate with Business Solution Center for recruitment, procurement and contracting, (f) supervise and coordinate the work of all project staff, consultants and sub-contractors, (g) ensure proper management of funds consistent with UNDP requirements, and budget planning and control, (h) prepare and ensure timely submission of monthly reports, quarterly consolidated financial reports, quarterly consolidated progress reports, annual, mid-term and terminal reports, and other reports as may be required by UNDP; (i) submit the progress reports and key issue report to the **Project Steering Committee**, (j) prepare quarterly and annual work plan, (k) arrange for audit of all project accounts for each fiscal year (l) undertake field visit to ensure quality of work, and (m) undertake any activities that may be assigned by UNDP and **Project Steering Committee**.

Qualifications and Experience: The incumbent should have a minimum Bachelor degree in Engineering with MBA/Master degree or Masters in energy/environment or other relevant academic discipline and profession qualifications with at least ten (10) years professional experience at senior level. S/he should have extensive experience and technical ability to manage a large project and a good technical knowledge in the fields related to private sector development, climate change, energy efficiency, the construction and building materials sector and institutional development and/or regulatory aspects. S/he must have effective interpersonal and negotiation skills proven through successful interactions with all levels of project stakeholder groups, including senior government officials, financial sectors, private entrepreneurs, technical groups and communities. S/he should have ability to effectively coordinate a complex, multi-stakeholder project and to lead, manage and motivate teams of international and local consultants to achieve results. Good capacities for strategic thinking, planning and management and excellent communication skills both in English and Russian are essential. Knowledge of UNDP project implementation procedures, including procurement, disbursements, and reporting and monitoring will be an added advantage.

2. **Administrative and Financial Assistant (AFA):**

Duties and Responsibilities:

- Assist the NPM in managing Project staff;
- Coordinate Project experts and ensure that their results are delivered on time;
- Prepare GEF quarterly project progress reports as well as any other reports requested by the Executing Agency and UNDP;
- Ensure collection of relevant data necessary to use in the SO-2 Tracking Tool;

- Assist the NPM in managing the administrative and finance staff and ensure that all information is accurate;
- Act as NPM in the absence of the NPM;
- Provide all necessary support to the NPM in implementation of the Project;
- Provide general administrative support to ensure the smooth running of the PMU;
- Provide logistical support to the NPM and Project consultants in conducting different Project activities such as training workshops, stakeholder consultations, and arrangements of field visits;
- During the visits of foreign experts, manage their visa support, transportation, hotel accommodation and other matters as requested;
- Organize control of budget expenditures by preparing payment documents, and compiling financial reports;
- Maintain Project's disbursement ledger and journal;
- Monitor the use of non-expendable equipment through record keeping and drawing up regular inventories;
- Arrange duty travel for all Project staff;
- Perform any other administrative/financial duties as requested by the NPM; and
- Organize and coordinate the procurement of services and goods under the Project

Qualifications and Experience: The incumbent should have at least a Bachelor degree in any discipline from a recognized university. S/he should have at least 3 years relevant working experience with foreign aided projects or international development or organizations. Computer proficiency in MS Office (Word, Excel and PowerPoint) and other common software is a prerequisite. Diploma in computer/secretarial science is desirable but not essential. Basic knowledge in procurement, petty cash handling, logistics supports, and filling systems is a basic requirement. Knowledge of UNDP project implementation procedures, including procurement, disbursements, and reporting and monitoring is preferable. Fluent both in written and spoken English and Russian is required.

Key Short-term Consultants

Detailed TORs of the national and international consultants will be developed during the Project Inception period, in the first 3 months after project start-up, by the NPM in consultation with UNDP and the implementing partners.

3. International Consultant on Green Urban Development (IGUD)

- Provide guidance and knowledge on best international practices for green urban development;
- Work closely with IRUP on identification of national GUD priorities and setup the necessary framework to develop national GUD standards and regulations;
- Identify and justify the import of foreign low carbon technologies that could be used for the demonstration projects in Components 2 and 3;
- Provide oversight in the monitoring of GHG reductions from GUD demonstrations on Components 2 and 3;
- Provide oversight in the development or updating of SEAPs and GUD plans
- Incorporate lessons learned from demonstration projects in Components 2 and 3 that can be used to develop GUD standards in sustainable transport and energy efficiency.

4. National Consultant on Green Urban Development (NGUD)

- In close collaboration with the IGUD, prepare drafts of national policies for GUD with a focus on sustainable transport and energy efficiency;

- Incorporate best international practices into the policies, standards and codes for sustainable transport and energy efficiency that have been demonstrated on Components 2 and 3;
- Lead in the dissemination of GUD information with other municipalities and facilitate the development of green urban development initiatives in other Belarusian municipalities.

5. International Consultant on Sustainable Transport (IST) for Components 1, 2, and 4

- Provide guidance and knowledge on best international practices for the development of integrated sustainable transport for the cities of Polotsk and Novopolotsk;
- Provide guidance in the setup of a dynamic traffic model and how to use the results in the ISUTP for sustainable transport investment decisions;
- Identify and justify the import of foreign low carbon technologies that could be used for the sustainable transport pilot projects in Component 2;
- Provide oversight in the implementation of demonstration sustainable transport projects in Component 2 including the setup of a monitoring program for GHG reductions from SUT investments;
- In close collaboration with the IGUD, prepare lessons learned and standards and regulations required for national GUD policies in the area of sustainable urban transport.

6. National Consultant on Sustainable Transport (NST) – Components 1 and 4

- Assist the IST in the delivery of best international practices for the development of integrated sustainable transport for the cities of Polotsk and Novopolotsk;
- Under the guidance of the IST, deliver knowledge transfer to municipal staff on the setup and operation of the dynamic traffic model;
- Assist the municipality in the preparation of proposed SUT investments based on the traffic model results for the ISUTP;
- Under the guidance of the IST, setup and implement the monitoring program for GHG reductions including surveys of modal switches from private cars to NMT or public transport;
- Provide support on implementing best international practices for the development of sustainable transport projects in Component 2.

7. National Consultant on Energy Efficiency (NEE) – Components 3 and 4

- Under the guidance of the IGUD, prepare business case and action plans for low carbon deployment for demonstration projects under Component 3;
- Source energy service providers and provide oversight in their deployment of low carbon and EE technologies under Component 3;
- Setup and implement a monitoring program for GHG reductions from the deployment of low carbon technologies in Component 3;
- Provide lessons learned on the deployment of low carbon technologies from the demonstration projects on Component 3 that can be used in the development of national GUD policies for Belarus.

8. National Consultant: Procurement Specialist (PS) – Components 2 and 3

- Provide guidance to the Project team on public procurement rules;
- Assist in preparing strategies and action plans for the procurement of imported low carbon technologies as recommended by the Project team;

- Assist municipal procurement personnel to purchase imported low carbon technologies employing procurement strategies that consider the service life of the technology instead of only the purchase cost.

9. National Consultant: Communication Specialist (CS)

- Design communications strategy appropriate for the Project and its objectives;
- Assist the Project team and the MoNREP in implementing information dissemination of the demonstration projects and national green urban development initiatives of the Government of Belarus;
- Monitor and report the effectiveness of information dissemination activities prepared by the Project.

Annex VI: Feasibility Study of Novopolotsk and Polotsk Pilots

VI-1. Background and Introduction

Introduction

This report seeks to outline the necessary actions and steps to achieve the ambition for sustainable transport and mobility in the municipalities of Polotsk and Novopolotsk. In support of a GEF application for funding under the title of 'Belarus Green Cities: Supporting Green Urban Development in Small and Medium Sized Cities in Belarus', this report outlines the actions that form the second of four components within the programme identified as 'Demonstration Projects on Transport'.

This report is in two sections, the first deals with the background of the project, the context and baseline position for the cities of Polotsk and Novopolotsk as a whole. The second part deals with the options considered, the preferred approach and the benefits that the actions will achieve in terms of sustainable urban mobility and greenhouse gas emissions, as well as the social and economic and environmental outcomes envisaged.

Project Background

Polotsk

Meetings with city officials in the city of Polotsk indicated a strong interest in collaboration with UNDP and GEF in the area of sustainable transport. Polotsk was the first Belarusian city to sign the Covenant of Mayors and complete a Sustainable Energy Action Plan (SEAP) in late 2012. The city has acted on this in a number of areas in terms of energy efficiency, installing LED street lights on the main street of the city and proposing a number of measures including solar water heating, efficiencies in the operation of the central boilerhouse and heat network. Under the 'business as usual' (BAU) scenario the city of Polotsk will focus on the energy efficiency measures that can be undertaken in the municipal estate and assets.

Novopolotsk

Novopolotsk plans to explore efficiencies in the distributed heat network and through the use of solar hot water heating in public buildings. Transportation accounts for 15% of the carbon dioxide emissions of the city, excluding the large process industries that dominate the local economy. The major employers, by their nature and scale are remote from the city centre and as such the mobility needs of the citizens offers scope for reduce emissions from transport and movement. The city has already taken steps to influence travel behaviour and has shown a keen interest in being a sustainable transport exemplar. In the BAU scenario, there will continue to be the development of energy efficiency in the industrial sector to meet emerging and current policy, but this will not, by nature, include sustainable transport measures.

Joint Working

Both cities have a number of shared transportation challenges and opportunities and by the nature of the employment patterns in the two cities, their transport issues are interrelated and have impacts upon each other. A significant number of residents of Polotsk make a daily

commute to the refineries and process industrial plants of Novopolotsk; similarly, a substantial number of Novopolotsk residents commute for work to Polotsk. To date, the cities have developed their transport policies and local plans independently, missing the opportunity to share resources and knowledge and work together to tackle issues of demand for public transport, congestion from increased private car use and urban mobility and the need for new infrastructure.

VI-2. Profile of the Municipalities of Polotsk and Novopolotsk

Geography and Location

The cities of Polotsk and Novopolotsk lie either side of the River Daugava in the north of Belarus, north north-east of Minsk. Polotsk gains its name from the River Palota that joins the Daugava where the city grew up in a strong defensive position. Novopolotsk (or new Polotsk) is a new city that grew in the late twentieth century around industry pioneered in the open land to the north west of Polotsk.

The underlying terrain is flat, and the cities are joined by three bridges that span the river Daugava. There are significant areas of wetland and swamp that have constrained the shape and form of the development of both cites.

Polotsk is served by a railway station. Polotsk and Novopolotsk are approximately 9 km apart by road.

Both cities are part of the Vitebsk Oblast which is strategically important in terms of road communications with Russia and the Baltic states. The region has more national parks, nature reserves and wildlife preserves of national importance than any other region of Belarus.

History

Polotsk dates from 862 and as such is the oldest city in Belarus, in contrast Novopolotsk was founded in 1958 and is has developed rapidly into a self-contained city with established services, cultural and sporting activities and extensive residential areas. Polotsk is a significant tourist destination on account of its importance historically in the development of Belarusian nationhood and is also an important place of pilgrimage.

Novopolotsk was founded at a sufficient distance away from Polotsk to mitigate the effect of any pollution or threats to health from the establishment of refineries and chemical plants and the city grew up around these activities spreading east towards Polotsk as development took place.

The cathedral of St Sophia was established in Polotsk around the middle of the 11th century and was part of the historic citadel that developed at the confluence of the Palota and Daugava Rivers. The city is still connected by a bridge over the Palota to the old quarter and the river was used to connect the Cathedral and citadel area to the convent further upstream. Polotsk, on account of its geographic position and importance has a varied history of occupation and control. In the French invasion of Russia, Polotsk was the site of two major battles.

Polotsk is the first Belarusian town named Belarus' Capital of Culture due to its outstanding historical and cultural heritage, and rich cultural life.

Population Trends

Polotsk has a population of around 83,000 people and Novopolotsk a population of around 100,000. In 1999 Novopolotsk had a population of around 105,000 from the census data, in 2009 this had fallen to just below 100,000. The population of Polotsk has remained relatively constant at around 82-83,000 people.

Economic Profile and Drivers

The economies of Polotsk and Novopolotsk are both intertwined and contrasting in character. The bulk of the employment in Novopolotsk is in the refineries and process and petrochemical industries on which the town was founded. In addition to this, the construction and engineering sectors are represented. Out of the total population, around 5,000 residents of Polotsk are employed daily in Novopolotsk. Polotsk itself has a mixed economy that is based on small businesses, agriculture and an increasingly important tourism industry.

The two city economies are complementary and transport presents a real opportunity to stimulate and facilitate economic growth and development.

The Polotsk Sustainable Energy Action Plan

In late 2012, the city of Polotsk developed a Sustainable Energy Action Plan (SEAP) to assist in the achievement of 20% reduction in carbon emissions before 2020.

The SEAP priorities are as follows;

- Energy efficiency measures in residential and municipal buildings including the installation of solar thermal facilities,
- Mechanical ventilation and heat recovery in municipal buildings.
- Modernisation of the district heating system.
- Improved insulation in buildings,.
- The installation of low energy lighting.
- The replacement of traffic signals and lights with LED lamps.
- Local decentralised energy production.

And specifically in the area of sustainable transport;

- Development and execution of a Sustainable Urban Mobility Plan (SUMP).
- The development of an on-road and off-road cycle network with associated parking for bicycles.

The Polotsk SEAP estimates these sustainable transport measures would save more than 17,777 MWh/yr or reduce CO_2 emissions by 4,717 tonnes annually (based on diesel savings).

The city of Novopolotsk has yet to develop a SEAP.

Emerging Urban Development Plans

Both Polotsk and Novopolotsk are planning for growth in the residential and leisure sectors based on an increasingly wealthy population. Polotsk is planning to expand to the west of the city into the Airport area where some infrastructure is already in place. The master plan for the city is in development.

Novopolotsk has continued to expand eastwards in the direction of Polotsk due to constraints posed by the river and marshland to the south west. The city has ambitious plans for the building of a new bridge and the expansion of the tram network to meet the needs of the expanding population in this area that is currently poorly served by public transport is already in the process of being delivered. The master plan for Novopolotsk is in the consultation stage with central government.

VI-3. Urban Mobility In Polotsk and Novopolotsk

Key Drivers and Issues

The major issue for both municipalities is the increasing use of private motorised transport in the form of cars. As the population have become relatively more affluent and as a result in changes in import tax on foreign vehicles, the number of cars in both cities has increased rapidly to around 340 private cars per 1000 population, a level approaching that of Western Europe. Whilst both of the cities are generously laid out and well planned, there are a number of key areas where this increasing use of the private car is causing infrastructure level problems of congestion, delays and parking demand.

Both cities have expressed a policy commitment to sustainable transport and have some emerging plans for improvements and additions to the cycling network and facilities. There is recognition of the need to plan for the future growth in private car ownership and use, whilst ensuring that public transport remains a viable alternative contributing to sustainable transport behaviour.

Transport Infrastructure

Bridges

The cities of Polotsk and Novopolotsk are connected by three road bridges over the River Daugava, each carrying a mix of traffic. Firstly to the west connecting Novopolotsk to Polotsk and the wider road network is the Vulica Kalinina that crosses the river in two lanes before reaching an interchange close to the centre that feeds the main corridor of Novopolotsk, Vulica Maladzioznaja. (Numbered 1 in the appended infrastructure map) This bridge suffers from significant congestion at peak hours.

The second bridge, to the east of Novopolotsk, is the main P46 highway crossing the Daugava in four lanes, named the Vulica Maksima Bandanovica. This bridge is a significant transport corridor of local, regional and national importance and is heavily trafficked for much of the day. (Numbered 2 in the appended infrastructure map)

Finally the Daugava is crossed by the Vulica Jubiliejnaja to the south of Polotsk in two lanes. (Numbered 3 in the appended infrastructure map) In common with other river crossings this bridge becomes congested at peak hours.

In addition to these road bridges, the railway crosses the river to the east of this bridge serving the industrial zones of Novopolotsk and Polotsk station.

Highways (Where there is congestion this is shown in RED on the appended infrastructure map)

The main P46 primary road passes through Polotsk and skirts Novopolotsk. This road connecting Minsk with Russia and the Baltic States carries large volumes of traffic consisting of cars, commercial and freight vehicles, local and national public transport and other road users. As Polotsk expands westward, this road will increasingly cause issues of severance between the two parts of the city. This road ranges from four to six lanes in width with no specific provision for buses or cyclists, although pavements provide pedestrian access.

Running from east to west and crossing the P46 on the outskirts of Novopolotsk is the P20 which connects to Latvia, and internally to Vitebsk to the east. Running parallel to the River Daugava, this dual carriageway, with a number of entrances and exits serving the adjoining hamlet of Achotnica, defines the northern development boundary. This road carries a large amount of freight traffic and is of regional significance. The P20 crosses the railway via a bridge in the northern part of Novopolotsk. There is no specific provision for cyclists and there is no pavement for pedestrian movement, despite the roads being in close proximity to residential areas.

One of the main street of Polotsk, Vulica Kastrycnickaja connects to the main road and provides as axial route with public parking either side of the road serving the city centre within this street and the Praspiekt Francyska Skaryny to the south. Praspiekt Francyska Skaryny is boulevard of six lanes of traffic straddling a central greenspace, again providing access to public parking for the city centre. This is an attractive street with significant tree cover and quality public realm.

Connecting these two main streets, the Vulica Jefrasinni Polackaj running north to south is crossed by the railway at grade, one of two level crossings in Polotsk. This level crossing is the cause of major congestion and delays for all forms of traffic.

In the direction of Novopolotsk, the riverside road bears left from the Vulica Zyhina before heading west. With two lanes, this road connects Polotsk and Novopolotsk passing through a predominantly rural landscape allowing a more rapid connection than taking the route to the south of the river. To the north west of this junction the railway again crosses the road at grade, this time the main P46 through the city, causing significant delays and congestion and preventing access along the road to Novopolotsk.

A connecting road connects with the P20 interchange to the north of Novopolotsk before joining the Vulica Kalinina, crossing the river and meeting Vulica Maladzioznaja, the main street with the bulk of the civic, commercial, leisure and retail uses alongside. Vulica Maladzioznaja is a wide street with four to six lanes of traffic in a dual carriageway. Running parallel to this street the Vulica Blanchina serves as a multifunctional transport corridor over six lanes. The tram runs alongside this street for some of its length, terminating at the junction of Zavodski Prajezd.

The general layout of streets in Novolpolotsk is a modified grid responding to the river and topography. In Polotsk beneath a similarly rational and well-ordered layout, the historic street pattern is in evidence.

Rail

Polotsk is served by a railway station and an extensive network of sidings and freight infrastructure serves the industrial areas of both cities, there are a number of rail halts on the outskirts of Polotsk serving the suburbs.

Trams

A tram system serves Novopolotsk connecting the older residential areas with the industrial sites to the south west. Starting at the junction of Zavodski Prajezd the tram terminates at the junction of Vulica Ktatorava where this road meets the industrial area of petrochemical plants and refineries.

The trams are, in the main, modern units that are in a good state of repair. The waiting facilities and information systems, however, appear outdated or non-existent, a potential barrier to greater ridership.

Public Parking

Both cities have public parking provision either provided on street or designated areas. In the main, these are peripheral but close to the city centre facilitating easy access to services and retail. There is currently no charge made for car parking. The parking facilities in both cities are of a good quality in terms of surface and spaces. There is some anecdotal evidence of under-supply at times of peak demand and illegal or anti-social car parking is not generally enforced. Specific municipal buildings and healthcare facilities have their own dedicated car parking provision.

Parking provision around residential areas is generally inadequate with grass verges used for parking in some areas. The increase in car ownership in recent years is the likely cause of this problem, in common with many European cities, where this has exceeded predicted numbers.

The factories, plants and facilities in the industrial area of Novopolotsk have significant levels of parking provision; however, this in now proving to be under pressure from demand and this is leading to fly-parking and overcrowding. Some of the provision appears to be ad-hoc and of a poor quality taking advantage of spare space on site or alongside facilities.

There appears to be no dedicated car parking in some of the new developments that are under construction, some of which are supermarkets for example, that are significant trip generators and car parking demand.

Impact of Travel Behaviour

Overall, the trend in recent years has been the increased use of the private car as the means of transport of choice. This has led to a number of outcomes;

- The use of public transport has declined.
- Public transport provision has become less viable for both public and private sector operators.
- Increased congestion has led to poor levels of reliability in terms of journey times for bus

users, exacerbating problems caused by travel behaviour.

- The average walk distance per day of residents has fallen leading to concerns over physical and mental well-being in the population.
- There is an undersupply of car parking at key destinations.
- Increased car usage has led to congestion in some areas, made worse by infrastructure constraints such as level crossings and bridge connections.
- Increased car usage has led to perceptions over road safety - potentially making cycling less attractive.
- Air quality, already under pressure in Novopolotsk, is deteriorating due to increased emissions of NOx.).
- Increased congestion is leading to higher fuel consumption and both NOx and CO2 emissions.
- Behaviour change programmes have been undertaken in Novopolotsk with limited success, but with enough to stimulate interest in further work in terms of walking, cycling and public transport.

Travel behaviour is a significant contributor to the current challenges faced by both Polotsk and Novopolotsk in terms of sustainable transport.

Existing Public Transport Services

There are three main types of public transport in Polotsk and Novopolotsk.

Buses

Accounting for 2.5 million journeys per month, bus travel is still the most popular choice in terms of both public and private transport. (Public transport accounts for around 80% of all journeys made despite the trend of increasing car use). The services are run by a single operator, with a fleet of buses in a variety of types and age deployed. The main fuel type is diesel, with a small number of petrol powered units. The fleet is exclusively Belarusian in manufacture or assembly, with modern units from Mercedes. The bus operator is based in Novopolotsk, serving both cities.

Table VI-1: Trends in the number of public transport vehicles in Polotsk

Number of registered public transport vehicles	2009	2010	2011	2012	2013
Number of Buses (gasoline)	8	7	7	5	4
Number of Buses (diesel)	164	164	143	138	117

Table VI-2: Trends in the number of public transport vehicles in Novopolotsk

Number of registered public transport vehicles	2009	2010	2011	2012	2013
Number of Buses (gasoline)	3	2	1	1	1
Number of Buses (diesel)	199	204	180	151	147

Bus shelters are of various types ranging from exposed seating to shelters. There is little information and few facilities for passengers and in the main these appear to be poorly lit. There

is a bus station in the industrial area with shelters. There are no facilities on board buses or at stops for disabled people.

Trams

Trams carry around 2 million passengers per year. This will rise to 3 million once the new proposed line is built extending the network eastwards. The tram system is limited and access from residential areas is often problematic due to severance caused by the highway network. As described earlier, the waiting facilities are rudimentary in many places, although the tram company is making investments at a small number of stops. Waiting areas appear poorly lit, giving rise to concerns over personal security.

The vehicles are modern and in good order. The average occupancy is around 25%, however at peak times there are issues around capacity, and this is limited by the number of vehicles. To achieve greater passenger numbers, an investment in new trams is required in the order of $300,000 per unit for a Belarusian model. The tram company, in common with the bus company is limited by procurement rules to purchasing Belarusian made vehicles. The trams are electrically powered from the grid.

Marshrutkas

Marshrutkas are a common sight in both Polotsk and Novopolotsk. Picked up at formal stops, these vehicles are privately run and are used for both local and inter-city journeys, by arrangement. Mashrutkas run on either diesel or more commonly petrol and are subject to the same delays and congestion as service buses and private cars. They are often running at 75% capacity and are a popular low-cost solution to transport needs for many. There are few, if any, accommodations for disabled people on board.

Table VI-3: Usage Capacity of Public Transit Vehicles in Polotsk and Novopolotsk

Mode	Vehicles	Capacity	Fuel	Share (of public transport)
Bus		50.00%*	D	60.00%
Tram		25.00%	E	10.00%
Marshutka		75.00%	D / P	30.00%

D = Diesel, E = Electricity, P = Petrol, *estimated average across the day

VI-4. Urban Transport Related GHG Emission Trends

Polotsk and Novopolotsk GHG emissions are based on the fuel consumption figures of Tables VI-4 and VI-5:

Table VI-4: Polotsk Fuel Consumption

		2009	2010	2011	2012	2013
2. Fuel consumption						
2.1. Consumed by enterprises, affiliated to the state-sector [93]						
- gasolines	Tons	2509	2479	1950	1845	3703
- diesel	Tons	4996	4247	5008	5043	13210
- LPG	Tons	549	553	141	99	118
2.2. Sold to private users through gas stations [94]						
- gasolines	Tons		3652			
- diesel	Tons		915			
- LPG	Tons		3652			
2.3. Public transport						
2.3.1.Bus public transport company						
- Bus, gasolines	Tons	132,5	121,0	99,6	75,8	42,1
- Bus, diesel	Tons	1790,7	1844,8	1771,1	1608,7	1499,7

Table VI-5: Novopolotsk Fuel Consumption

1. Amount of registered vehicles		2009	2010	2011	2012	2013
2. Fuel consumption						
2.1. Consumed by enterprises, affiliated to the state sector[95]						
- gasolines	Tons	3555	3073	2901	2589	2301
- diesel	Tons	10922	10211	10981	10849	9975
- LPG	Tons	104	84	50	47	63
2.2. Sold to private users through gas stations[96]						
- gasolines	Tons	8891	4814	885	1113	3845
- diesel	Tons	2351	1408	514	454	2413
- LPG	Tons	509	1337	472	425	409
2.3. Public transport						
2.3.1.Bus public transport company						
- Bus, gasolines	Tons	40,6	12,1	14,1	10,6	10,1
- Bus, diesel	Tons	2135,5	2396,2	2052,9	1759,1	1732,5

VI-5. Baseline Activities Relating to Sustainable Transport

Infrastructure

Highways

In an effort to reduce traffic congestion, a number of schemes are either in the planning or implementation stage. These schemes seek to tackle some of the pinch points where

[93] Consumption - is the amount of fuel that was consumed by limited range Polotsk enterprises (affiliated to the state sector legal entities and their subdivisions with separate balance, consume or implement fuel and petroleum products, including liquefied petroleum gas and natural). This data is available because they have to report to the city council on it.

[94] This figures present total sales of fuel by entities licensed to trade in petroleum products Polotsk.

[95] Consumption - is the amount of fuel that was consumed by limited range Novopolotsk enterprises (affiliated to the state sector legal entities and their subdivisions with separate balance, consume or implement fuel and petroleum products, including liquefied petroleum gas and natural). This data is avaliable because they have to report to the city council on it.

[96] This figures present total sales of fuel by entities licensed to trade in petroleum products Novopolotsk.

congestion is at is highest, through direct interventions such as widening or by providing an alternative route.

a) Bahdonovica - Kastrycnickaja Junction and Road Widening Scheme

This proposed road widening will add an addition two lanes to the existing road, with the possibility of integrating dedicated cycling provision. Bus priority is not planned as a part of this scheme but increased capacity will be generated in the network. The constraint of the level crossing is not tackled, however a filter lane could be developed allowing traffic to proceed in the direction of Novopolotsk.

There are a number of constants in the form of private property ownership to the north, as well as industrial uses, informing a strategy of bringing the carriageway south where publicly owned land exists, adjacent to an established residential area.

b) Traffic Light Synchronisation - Vulica Kastrycnickaja

In Polotsk, there has been some feasibility undertaken investigating the synchronising of the traffic flows through the 15 sets on lights on this major corridor. Whilst this is technologically feasible, this is not something that has been taken forward. The benefits of this approach are well understood; however, other constraints and issues (including high traffic volumes) may need to be tackled for this to have the desired effect, justifying the investment needed.

c) Traffic Light Synchronisation - Vulica Jefrasinni Polackaj

Similarly, this main corridor providing access to the north and the P20 trunk road has had some feasibility work undertaken looking at the synchronisation of the traffic lights to tackle congestion issues.

All of the above schemes are compromised by the level crossings that add complexity to the underlying baseline congestion issues in Polotsk.

d) Tramline Extension Allied to the New Road Bridge Over the River Daugava

The City of Novopolotsk have developed plans for a new bridge over the River Daugava connecting into the Airport area of Polotsk, where the road infrastructure is largely in place, facilitating the westward expansion of the city to meet the extension to the east from Novopolotsk. Integral to these plans is the inclusion of a central tramline extension.

The city of Novopolotsk have designed the bridge and further engineering design is being undertaken with a view have either regional or national government to finance the estimated $100,000M project. The current model on display in City Hall shows the road carried by the bridge, and the tramline, connecting to the main Polotsk - Novopolotsk road, with no clear route of achieving tram penetration in Polotsk. In part, this has been addressed by the City who have suggested a route for the tram that connects into a road currently under construction in the Airport area of Polotsk (this route is shown on the appended Infrastructure Map, the possible alternatives for the route of the tram one the river has been crossed are shown in dark grey).

e) Tackling Congestion in Novopolotsk

The city of Novopolotsk have made some inroads into understanding some of the emerging congestion issues in the city and are seeking solutions through improved traffic management. This has taken two forms:

- Firstly, the proposed one way systems on the parallel Vulica Kamsamolskaja and Vulica Maladzioznaja corridors creating a wider gyratory system, increasing network capacity and reducing junction conflicts;
- Secondly, to complement this, there are plans to improve the synchronisation of the traffic signals, further assisting in reducing congestion within the city.

Cycling Infrastructure

a) SEAP Cycling Provision - On Road

The city of Polotsk has an aspiration to create around 10km of cycle lanes within existing roads, streets and pathways through the use of 'lines and signs' demarcating those areas where cycling is to be encouraged and providing safe and convenient routes. The detailed design of these is not known but it is assumed there will be a degree of 'shared space' where cyclists and pedestrians will occupy the same infrastructure,

b) A Leisure and Tourism Route Along the River Palota

The city of Polotsk have ambitions to trace the route of pilgrimage from St Sophia Cathedral to the monastery in the north of the city along the course of the River Palota. This journey was traditionally made by boat, although the river is now no longer navigable. However, as a green infrastructure asset providing opportunities for movement, habitat creation, flood and water management and for amenity and leisure, the River Palota affords an excellent opportunity to add to the built and natural heritage of the city, whilst also promoting sustainable transport on what can be a busy route in the tourist season. This could be allied to better cycle parking and bike hire at either or both of the historic sites. An opportunity exists in terms of procurement as Belarus is a manufacturer of bicycles.

Travel Behaviour

In partnership with the Belarus Transport Union, the city of Novopolotsk has been proactive in influencing travel behaviour, in particular walking and cycling, by holding special events and raising the profile of these modes of transport. This has encouraged greater use of bicycles in the city, and the municipality is wanting to develop this for reasons of sustainable and low carbon transportation, improved air quality and ecological potential, and also for the improved health and well-being of the population.

It is explicit in the SEAP for Polotsk that this is also a priority for the city for the same reasons.

Partnerships

The work undertaken by both cities to promote sustainable transport has been in partnership with the bus and tram companies. In particular, the sustainable transport promotion in Novopolotsk has raised awareness specifically around the use of trams; as for some residents, the route was not sufficiently visible or accessible. Specific actions such as encouraging children to use the tram have gone some way to address this issue.

VI-6. Stakeholder Engagement

Validation of Existing PIF and Project Outputs and Outcomes

The main project outputs and outcomes were supported by the city officials from both Polotsk and Novopolotsk and stakeholder engagement sessions with partners. None of the outputs and outcomes identified in the PIF were challenged, although other opportunities were identified out of these sessions. Both cities fully understood the co-financing element to the project outputs.

Additional Information Relating to Sustainable Transportation

Prior to the stakeholder sessions in Polotsk and Novopolotsk, the team had met with the Belarus Transport Union, who have had specific involvement with emerging policy and activities in Novopolotsk. They have expressed a desire to add value to the proposed project through their expertise and local knowledge, building on existing recent work toward a concept of SUM.

The creation of a direct cycle path from Polotsk to Novopolotsk was supported.

Additional Opportunities for Sustainable Transport in Polotsk and Novopolotsk

The key outcome of the stakeholder engagement in Polotsk and Novopolotsk was the need to have a joint and integrated transport plan that deals with the issues holistically. Whilst the emphasis of the PIF had been on components that would potentially form a part of this, the shared and intertwined challenges of achieving an integrated solution, with predictable results, came to the fore. A joint debriefing with the Deputy Mayors of both cities confirmed this.

VI-7. Barriers to Achieving Targets and Aspirations for Low Carbon, Sustainable, Transport

Financial and Procurement Barriers

Both cities have bold and ambitious plans that will require a significant investment in infrastructure. Whilst this project can assist in binding these plans together into a whole (see Knowledge and Capacity Barriers), there is a need for plans that articulate the wider vision, city level investments and local projects that will deliver the wider outcomes envisaged through the life of this project and beyond. Without these ambitions being articulated with bankable benefits and developed business cases, funding will be difficult to secure. This project can assist in the development of a phased investment plan for the required public investment in strategic projects.

Knowledge and Capacity Barriers

It is likely that there is insufficient local capacity and resources to be able to undertake the survey work required, the data gathering and analysis of this, and its final application in a transport model that meets international best practice. This is a pre-requisite of the proposed integrated transport plan for both cities. Whist some modelling has been undertaken through the THOR methodology, it is unlikely to be transport specific in sufficient detail to inform a comprehensive plan. The project can provide suitable resources, knowledge and capacity as well as providing impartial advice and support to both municipalities, assisting in the setting of priorities and the phasing of investments for maximum return.

It is envisaged that local expertise and knowledge, along with that of the Belarus Transport Union will be integral to the delivery of the strategy ensuring that local issues are fully understood and to avoid duplication.

VI-8. Proposed Actions to Overcome Barriers

Action I: The Preparation of an Integrated Sustainable Urban Transport Plan (ISUMP) for Polotsk and Novopolotsk

Description:

This plan will form the basis for subsequent investments (including GEF) and the underpinning strategy that will inform decision making at a strategic level. Integral to this will be a traffic model to test infrastructure level interventions to form the baseline for understanding the effect of these, taking into consideration travel behaviour.

Options Appraisal:

Option 1 - Work with the city level plans in isolation.

Both cities have a statutory duty to plan for growth. However due to the interrelationship of the issues that effect them both in terms of access to employment and shared infrastructure needs, this will lead to potential conflicts and unexpected outcomes, potentially causing more challenges. This approach is not recommended.

Option 2 - Harmonise the city level plans.

There are a number of shared ambitions that could be harmonised and captured with cross-cutting themes, for example increases in cycle trips and modal share. However, this would not capture the underlying causes of congestion, the predicted effect of the proposed infrastructure interventions (including possible increased congestion as a result) and the ability to fine tune or change plans at a later date, responding to opportunities. This enhanced approach would represent a 'do-minimum scenario'.

Option 3 - Survey, model, plan and test the various proposed infrastructure interventions, through advanced modelling and an overarching strategy that looks at both cities jointly and holistically.

This option would consider the social, economic and environmental impacts of growth and the effect of promoting and facilitating sustainable transport through the holistic development of policy and action plans to achieve this. Using best international practice, the cities would have at their disposal a computer model to test interventions as well as a joint strategy that considers all modes of transport and informs spatial and infrastructure plans and the softer measures required to influence travel behaviour.

Suggested Preferred Option:

Option 3 offers the best opportunity to maximise the investment in both the feasibility and delivery of a solution that meets the needs of the present in the most efficient way whilst also

'future proofing' the transport needs of both cities. By considering the needs of both cities jointly, the opportunities and challenges can be met in a resilient and responsive way, with predictable results.

Scope:

An ISUMP and traffic model with the following components;

- Traffic counts, end to end journey analysis, destination mapping, trip generation and modal split for all forms of transport in Polotsk and Novopolotsk in the context of the national and regional context to form baseline data.
- The procurement, commissioning and necessary training in the use of a computer model (such as Aimsun microsimulation) to assist in the development of the ISUMP and to inform emerging infrastructure level interventions.
- A comprehensive survey of congestion points in the highway network with a focus on peak hours.
- The integrated planning for public transport penetration, routes, feeders, facilities and corridors.
- Plans to influence travel behaviour and smarter choices, including partnerships with public transport providers.
- A comprehensive understanding of future growth and employment and urban mobility needs.
- A comprehensive walking and cycling plan.
- Integration with emerging and adopted spatial plans.
- An action plan setting out the necessary steps, performance targets, phasing and delivery of the investment over a five year period and beyond in a fifteen year timeframe.
- A detailed business case identifying the level of investment required, the payback period, funding sources and procurement criteria for key infrastructure projects, feeding into detailed feasibility studies - see later Actions.
- An analysis of the potential for sustainable transport to stimulate the visitor economy and policies to facilitate this.
- Analysis of the greenhouse gas reductions that will be achieved se against the baseline position.
- A comprehensive maintenance plan for the good operation of the network.

Budget Cost:

The estimated cost of delivering this action is around $360,000. This could be reduced by local officers undertaking some of the survey work. (Based on Aimsun) It is assumed that the proposed EU project will provide a large amount of data and evidence that can be used to calibrate the model and inform the SUMP.

Table VI-6: Proposed GEF Technical Assistance for Output 2.1

Suggested Investment	Breakdown	Cost
3D traffic modelling software	Software and training	$250,000
Integrated SUMP	Covering Polotsk and Novopolotsk	$90,000
Data collection / surveys		$20,000
TOTAL INVESTMENT		**$360,000**

Action II: A Detailed Feasibility Study, Action Plan and Business Case for the Integration and Extension of the Cycle Network for Polotsk and Novopolotsk.

Description:

This study will form the basis for subsequent GEF investment, contributing towards the extension and integration of the current cycle network and facilities in Polotsk and Novopolotsk, improving access, amenity and the visibility of this mode of transport. It could, in addition include a suite of measures to promote cycling as a means of transport.

Options Appraisal:

Option 1 - Concentrate solely the individual proposed plans for cycling in each city in isolation.

Both Polotsk and Novopolotsk have expressed a desire to promote cycling and invest in the required infrastructure. Both cities have emerging plans, and these could be developed in isolation, and as discrete projects. However, this would not secure solution that will facilitate inter-community journeys and full integration with other lower carbon transport modes, such as buses and trams. This approach is not recommended.

Option 2 - Consider the cycling infrastructure of both cities and produce plans to integrate these into the current infrastructure, propose new commuting and leisure routes and connect both cities together. This could also include suggestions for improved lighting, signage and surface treatments.

This enhanced option would ensure that infrastructure investments secure the maximum benefits in terms of connectivity and that the network has logical points where cyclists can join and leave safely and connect destinations in a meaningful way. This would represent a 'do-minimum scenario'.

Option 3 - Enhance the work proposed in Option 2 adding in a programme of activities and promotion to increase awareness and use of the cycling network. This might include the production of network maps, events that increase the visibility of cycling and training for children in cycling proficiency and safety. It could also be an opportunity for city officials to travel to places where cycling is integrated to best international standards and practice.

This option would consider the cycling infrastructure as well as promoting this form of transport and awareness of safety considerations for cyclists and other road users.

Suggested Preferred Option:

Option 3 offers both cities the chance to design and enhance the cycling infrastructure of both cities whilst also raising awareness of this mode of transport. The experience of international best practice in this area should be an integral part of the design process, ensuring buy-in and the embedding of cycling into everyday life.

Scope:

An integrated feasibility study and action plan with the following components;

- An audit of the existing cycle network and the identification of new routes and destinations that can be connected together.
- A consideration of the options around providing the necessary infrastructure to include on-road, off road and shared space solutions.
- An awareness raising field study of international best practice for key stakeholders.
- The design of a comprehensive network that includes suitable bicycle parking, integration with other modes of transport and facilities such as hire and repairs.
- A funded programme of events at key points in the programme of investment to promote the use of the network and cycling in general.
- An examination of procurement routes, including the 'green procurement' of equipment and technology identifying suppliers and supporting innovation in the local supply chain, for example the sourcing of bicycles to hire.
- A detailed business case, identifying the level of investment required, for the proposed infrastructure.
- Proposals to ensure that access for disabled people can be secured alongside improvements to the network including dropped kerbs, resurfacing and appropriate signage.

Budget Cost:

The estimated cost of delivering this action is around $80,000.

Action III: 4 No. Specific Feasibility Studies, Action Plans and Business Cases for Network Improvements at Key Pinch Points.

Description:

Based on the outputs and outcomes of Action I, detailed feasibility studies will be required. The specific pinch points are not as yet known although it is likely that some of the areas of high congestion, already identified, will need to be studied in more detail including junction and highway designs. These should be designed to reflect international best practice and integrate sustainable transport, for example buses, trams, cycling and walking.

Options Appraisal:

Option 1 - Develop feasibility studies in isolation without first undertaking the surveys, modelling and strategic planning of Action I.

This option may rapidly assist in the reduction of congestion in specific areas, but would not consider the wider implications of this and the opportunity to integrate all forms of transport. This option is not recommended.

Option 2 - Develop feasibility studies in response to strategic need and detailed transport and traffic modelling.

Suggested Preferred Option:

Option 2 offers the opportunity to capture the benefits of an integrated plan that meets the needs of both Polotsk and Novopolotsk and avoids abortive work in terms of design solutions that may not solve the challenges faced in terms of congestion, travel behaviour, choice of route and trip generators.

Examples of feasibility work that may be required;

- The synchronisation of signals on key corridors such as the Vulica Kastrycnickaja in Polotsk and the Vulica Kamsamolskaja to Vulica Pramislovaja (or other to be

determined).

- The creation of bus priority lanes and junctions, and integration with feeder mashrutka routes and the bicycle network.

Scope:

Detailed feasibility studies in line with the integrated transport plan described in Action I;

- Feasibility studies taking into consideration constraints, underground services diversions, two and three dimensional alignments and levels.
- The detailed design of junction improvements, road widening schemes, public realm and transport corridors.
- The integration of sustainable modes of transport, for example cycling and walking.
- Safe crossing points for pedestrians, access for disabled people and safeguards to residential amenity in terms of noise.

Budget Cost:

The proposed investment in this area is $100,000 for each study amounting to a total investment of $400,000.

Table VI-7: Technical Assistance Expenditure Profile

Action	**Funding Source**	**Cost**
I	GEF (Investment): Software GEF: ISUMP + data collection	**$ 250,000** **$ 110,000**
II	GEF Co-financing	**$ 35,000** $ 45,000
III	GEF Co-financing	**$ 100,000** $ 300,000
TOTAL		**$ 840,000**[97]
Suggested apportionment GEF Investment GEF TA POLOTSK NOVOPOLOTSK	Comment Software Feasibility Shared equally	 **$ 250,000** **$ 135,000** **$ 227,500** **$ 227,500**

Action IV: Investment in the Cycle Network

Description:

Direct investments in improvements to the cycle network to include LED lighting, cycle parking, signage, dropped kerbs, on and off-road provision and facilities in buses for cycles.

[97] This is an indicative budget estimate and will require actual prices based on the software pricing, actual level of effort to collect data, and agreed cost of external expertise

Table VI-8: Cycle Investment Profile

Investments	Costs	Comments
Profile 1 - LED lighting of the existing cycle network.	Supply and installation of LED lighting columns where lighting levels are poor or in 'dark' areas that prevent connections to other parts of the network - $1200 per column, LED bollards $500.	The length of the existing network is not known, also the current lighting requirements over and above the existing street lights will need to be ascertained.
Profile 2 - The provision of cycle parking at key nodes, points of arrival and interchanges.	Supply and fit of a simple bicycle hoop $200. Cycle shelters range from $1000 - $2500 supplied and fitted, more for bespoke designs. Safe crossing points for cyclists if signal controlled cost around $70,000.	There is a local supply chain and procurement opportunity to create cycle parking that has an identity specific to Polotsk and Novopolotsk and forming a memorable part of any demonstration project.
Profile 3 - The creation of cycle paths in the existing public realm and pavements including improved signage, lines, dropped kerbs and tactile paving.	The provision of 'lines and signs' will cost around $150 per linear metre. Dropped kerbs and tactile paving of a suitable width will cost around $300 per intersection.	The new provision will need to link in with the existing provision, if any.
Profile 4 - The creation of off-road leisure routes allied to green infrastructure corridors such as the River Daugava and Palota.	The cost of providing a cycle path with a bonded surface is around $100,000 per km.	This should be considered in the context of the wider ecology of the area, adding to the amenity and value of the green infrastructure asset.
Profile 5 - Improved facilities for cyclists on buses, for example bike racks inside or outside.	The cost of this is not known.	

Suggested Investment Pending Feasibility:

A combination of some or all of the above could be used to create the beginnings of a functional cycling network that could prioritise for example safe routes to school, leisure and tourism and specific routes to work. Bicycle parking provision at workplaces, city centres and transport nodes would also improve access, visibility and acceptance of cycling.

Budget Cost:

Table VI-9: Details of Cycling Investment Costs for GEF, Polotsk and Novopolotsk (Output 2.4)

Suggested Investment	Breakdown	Cost
10km cycle provision (Profile 3)	10km @ $130,000 per km 30 intersections @ $300 6 signal controlled crossings @ $70,000	$1,300,000 $ 9,000 $ 420,000
		$1,729,000
8km Leisure Route R. Polota and R. Daugava	8km @ $100,000 per km Lighting 150 lit bollards @ $100 12 cycle hoops @ $200 per hoop	$ 800,000 $ 15,000 $ 2,400
		$ 817,400
Bike sheds in strategic locations	20 @ $2000	**$ 40,000**
Bus cycle racks	Two Bus Routes (4 vehicles) @ $1000 per bus	**$ 4,000**
Additional lighting of dark areas	20 columns @ $1200 per column	**$ 24,000**
TOTAL INVESTMENT		**$2,614,400**[98]
Suggested apportionment GEF POLOTSK NOVOPOLOTSK	Comment Cycle path improvements Remaining investment split: Polotsk Novopolotsk	 **$ 300,000** $1,187,500 $1,126,900

Action V: Park-and-Ride Lots, Real Time Bus and Tram Information Allied to Improvements to Waiting Facilities

Description:

Direct investment into strategically located park-and-ride lots, the bus and tram network providing 'Real Time' information for passengers on electronic display boards, via SMS and apps that track the route and predict the arrival and departure times of services. These actions may encourage modal shifts from private cars to public transport, thereby generating GHG reductions. Allied to this is the opportunity to improve the existing bus and tram waiting facilities as the 'Real Time' information technology is installed, further improving the passenger experience and setting the tone for further phased investment.

[98] This is an indicative budget estimate and will require actual prices based on the civil contracting bids and actual prices for supply of equipment

Table VI-10: Profiles of Investments into Public Transit Improvements

Investments	Costs	Comments
Profile 1 - The installation of 'Real Time' displays and GPS equipment on buses and trams and the development and deployment of apps for smartphones.	The cost including displays, software, app development and illuminated information boards at 30 stops is around $300,000 with economies of scale secured for wider deployment.	The costs for buses and trams are broadly similar, however the need for buses is greater due to more potential for delays.
Profile 2 - The provision of improved seating, lighting shelter, level access and passenger information.	The cost of a stand alone shelter with lighting and seating is in the region of $15,000 - $20,000. Level access with a raised pavement beside the bus stop will cost a further $5,000.	This may be an investment that could be made with the local bus and tram operators, adding quality and value to existing investment plans.

Budget Cost:

The suggested budget for this investment is $300,000 for the installation of the 'Real Time' information with a further suggested budget of $1,400,000 to improve the facilities on key transport corridors, in advance of a further roll out of 'Real Time' information.

Table VI-11: Details of Public Transit Improvement Investment Costs for GEF, Polotsk and Novopolotsk (Output 2.5)

Suggested Investment	Breakdown	Cost
Improved dispatch office, software and screens for 15 locations[99]	Improved dispatch office and software $210,000 30 screens installed @ $3,000	$ 210,000 $ 90,000
		$ 300,000
Bus stop improvements*	30 bus shelters and seating @ $20,000 inc. level access	$ 600,000
		$ 600,000
Tram stop improvements*	10 tram stops and seating @ $20,000	**$ 200,000**
Park-and-ride lots	1,500 metered spaces at $300 per space	**$ 450,000**
TOTAL INVESTMENT		**$1,550,000**[100]
Suggested apportionment GEF POLOTSK NOVOPOLOTSK	Comment Bus and tram stop improvements Remaining investment split - Polotsk - Novopolotsk	 **$ 300,000** $ 600,000 $ 650,000

[99] These improvements could be co-financed by the bus or tram operator or valued against private sector interventions (for example Adshel)

[100] This is an indicative budget estimate and will require actual prices based on the civil contracting bids and actual prices for supply of equipment

Action VI: Bus Lane Priority and Traffic Light Synchronisation Along Major Corridors

Description:

The installation of adaptive traffic control systems (SCOOT) along the major corridors subject to congestion and of strategic importance to the network. To support the free flow of buses and the realisation of bankable benefits in terms of journey times and efficiencies, the construction of dedicated bus lanes will increase the attractiveness of this mode of transport. Bus lanes could be constructed within the existing highway or be integrated into proposed road schemes, realising sustainable transport benefits and reducing congestion.

Table VI-12: Profiles of Investments into Bus Lane Priority and Traffic Light Synchronization

Investments	Costs	Comments
Profile 1 - The installation, commissioning and deployment of adaptive control systems for traffic lights.	The cost of this is largely dependant upon the complexity of the network, number of junctions and pedestrian crossings. Estimate around $20,000 per junction.	The system will require detailed design.
Profile 2 - The construction of dedicated bus lanes either using the existing carriageway or integrated into any proposed road widening scheme. These could also be used by cyclists with additional priority such as advanced stop lines.	The cost of a scheme in the existing highway is in the order of $2,000 per metre including resurfacing, lines, signage and junction modifications. Where this is integrated into a proposed widening scheme some of the costs will be absorbed by the overall construction of the project.	Without detailed design and surveys costs are difficult to estimate. The detailed design might be funded through Action III.

Budget Cost:

The suggested budget for this investment is $4,585,000.

Table VI-13: Details of Investments into Bus Lane Priority and Traffic Light Synchronization for GEF, Polotsk and Novopolotsk (Output 2.6)

Suggested Investment	Breakdown	Cost
Dedicated bus lanes within existing highway	22km @ $160,000 per km	$3,520,000
SCOOT system for traffic lights	Estimated cost of set up, training and 8 no. junctions including centralised control systems.	$ 190,600
TOTAL INVESTMENT		**$3,710,600**[101]

[101] This is an indicative budget estimate and will require actual prices based on the civil contracting bids and agreed

Suggested apportionment	Comment	
GEF	Dedicated bus lanes	**$ 360,000**
POLOTSK	Remaining investment split 33% Polotsk	$1,115,000
NOVOPOLOTSK	66% Novopolotsk	$2,235,600

VI-8. Co-financing Projects

The proposed investment in key infrastructure such as the proposed road and tram bridge, junction improvements and road widening will provide sufficient leverage, delivering an integrated suite of measures that contribute to the wider plans developed in Action I.

VI-9. Monitoring and Review

It is anticipated that the underpinning Feasibility Studies in Actions I to IV will be the basis for ongoing monitoring and review. A mechanism for measuring achievements against the actions will be set up and the project will benefit from mid-term reviews and review at project closure.

The project outputs will be measured against SMART objectives in line with GEF procedures.

VI-10. Expected Outcomes of GEF Investments

Outcomes from TA grant;

The feasibility studies outlined in this report will both inform the investments to be made in the city of Polotsk and Novopolotsk and also provide a methodology and framework for other cities wishing to undertake similar projects. The TA grant funded studies will;

- Inform policy and the development of SEAP's for other cites joining the EU Covenant of Mayors.
- Be a catalyst for other cities to invest in sustainable transport.
- Assist in the development of standard specifications.
- Provide a best practice exemplar of transport planning taking advantage of new technology and best international practice.
- Assist in the development of sustainable transport in Belarus.

The direct investment in the demonstration projects will;

- Generate tangible GHG reductions which can be used as a basis for replication along other corridors and other cities in Belarus.
- Inspire and enable other cites to make similar investments.
- Catalyse other sustainable transport plans and measures in addition to those demonstrated.
- Act as an exemplar for other cities.
- Be a pathfinder in terms of procurement and the local development of technology in line with the best international standards.

- Create iconic and memorable projects that demonstrate the forward thinking nature of the pilots, making smarter choices and innovation attractive attributes.

VI-10. Conclusion and Next Steps

This report has outlined the opportunity invest in sustainable transport in Polotsk and Novopolotsk, sets out the options and recommends a way forward that captures potential ways forward in terms of tackling congestion and the problems caused by the increased use of the private car and assisting in reducing greenhouse gas emissions. It is hoped that this is an accurate reflection of the context and issues and meets the expectations of the municipalities.

The next stage is to consult on this report before it is finalised and comments and suggestions are welcomed. This project offers a great opportunity to plan for future generations as well as for today, building on the rich heritage and spirit of innovation of both Polotsk and Novopolotsk.

Appendix VI-1

Equalities Impact Assessment for Sustainable Transport Actions

Group	Potential Impact (+/-)
Disability	
Visual Impairment	- The creation of shared space for pedestrians and cyclists may increase anxiety levels. This will need to be mitigated by careful design and provision for stick users to orientate and way find. - The creation of dropped kerbs for cyclists may cause difficulties in terms of orientation. This will need to be mitigated with the use of tactile paving. + Improved lighting, sensitively designed and located could have benefits for the partially sighted where this is allied to shared space provision.
Physical Disability	+ The provision of dropped kerbs for cyclists can improve access for wheelchair users and this should be consciously designed into any shared space scheme. + Improvements to shelters and waiting facilities should include level access to buses where feasible.
Gender	
Women	+ Improved and consistent lighting levels, particularly in areas that are currently poorly lit will improve personal safety and security. Safe walking and cycling routes promote access to jobs, social and leisure opportunities.
Men	+ Improved and consistent lighting levels, particularly in areas that are currently poorly lit will improve personal safety and security. Safe walking and cycling routes promote access to jobs, social and leisure opportunities.
Age	+ The proposed measures will improve the lighting levels promoting safe access and reducing the chances of trips and falls. Safe walking route promotes access to jobs, social and leisure opportunities.
Religion or Belief	No anticipated impact.
Sexuality	No anticipated impact.
Race	No anticipated impact.

Annex VII: Feasibility Study of Novogrudok Pilot

VII-1. Background and Introduction

Introduction

This report seeks to outline the necessary actions and steps to achieve the ambition for improved energy efficiency in a number of areas in the municipality of Novogrudok. In support of a GEF application for funding under the title of 'Belarus Green Cities: Supporting Green Urban Development in Small and Medium Sized Cities in Belarus', this report outlines the actions that form the third of four components within the programme identified as Demonstration Projects on Energy Efficiency.

This report is in two sections, the first deals with the background the project, the context and baseline position for the city of Novogrudok as a whole. The second part deals with the options considered, the preferred approach and the benefits that the actions will achieve in terms of energy efficiency, greenhouse gas emissions as well as social and economic and environmental outcomes envisaged.

Project Background

Early discussions with city officials prior to the development of the project revealed that energy efficiency was the top priority for reducing greenhouse gas emissions. Around 13% of the city's annual budget of $27.35M (over $3.5M) goes to pay for energy resources to meet the needs of the population and industry. The promotion of renewable and domestic sources of energy and energy efficiency is high on the municipality's agenda. Natural gas accounts for 42% of the final energy consumption of Novogrudok based on 2011 data.

Under the business-as-usual scenario, the city of Novogrudok is likely to go ahead with small-scale renewable generation through the installation of solar water heaters at some of its schools and day-care facilities. However, the city is expected to continue operation of existing street and public buildings lighting systems which are old and inefficient technologies that are cheaper and more abundant. Modern energy efficient lighting fixtures and intelligent control systems are not likely to get introduced under the business-as-usual (BAU) scenario.

VII-2. Profile of the Municipality of Novogrudok

Geography and Location

The Novogrudok region is located in the east of Grodno oblast. It borders on the Korelichi, Diatlovo, Lida and Ivie regions of Grodno oblast, the Baranovichi region of Brest oblast and the Stolbtsy region of Minsk oblast.

The biggest part of the region lies within Novogrudok Upland, part of the Belarusian Ridge that runs diagonally across the country. The lands along the Neman River occupy the lowland of the Upper Neman. One of the highest points in Belarus is alongside Novogrudok Castle at an altitude of around 323 m above sea level.

There are 47 rivers and 20 streams in the Novogrudok region. Their total length is 527km including the Neman River at 78km in length. Forests occupy 41.5% of the region, the total forested area is 69.4 thousand hectares.

History

The Novogrudok region was founded on January 15, 1940 as part of Baranovichi oblast with the regional centre in the town of Novogrudok.

According to archaeological excavations, Novogrudok is about 1,000 years old as it was first mentioned in chronicles in 1044. In the mid 13th century, the political and cultural centre shifted from Polotsk to Novogrudok, which became the cradle of the Belarusian statehood.

Within several centuries Novogrudok remained one of the most powerful and largest towns of the Great Principality of Lithuania. After the third partition of the Rzecz Pospolita, Novogrudok was annexed to the Russian Empire. In September 1915, it was occupied by German troops and in December 1918 was liberated by the Red Army. From 1919-1939, Novogrudok was part of Poland. From 1940 to 1954, it was the regional centre of Baranovichi oblast, and in 1954, it became part of Grodno oblast.

The town has a number of historically important buildings and assets, most notably Novogrudok Castle which dates from the 14th century, which is a popular tourist attraction with national significance.

Population Trends

The municipality of Novogrudok has a population of around 29,000 with a further 17,000 people living in the surrounding villages. The population of the city has declined slightly since 2009 from around 30.8 thousand inhabitants.

Economic Profile and Drivers

The economy of Novogrudok is made up of a mixture of agriculture, light industry, food processing, tourism, manufacturing and assembly. There are around ten major industrial

employers with some 6,000 people employed in these activities. These employers range from manufacturers of gas engine components and steel construction components through to a large dairy and butter processing plant and a vegetable processing and packing factory.

In addition to this, the city of Novogrudok has worked hard to create favourable conditions for business in the form of a Free Economic Zone extending over 52 hectares. Allied to over 400 hectares of well laid out business districts and facilities, the city is encouraging entrepreneurship and partnerships to stimulate jobs and economic growth.

Overall the city has a number of ambitions:

- The creation of jobs and businesses;
- Expansion of housing offer including both apartments and private dwellings;
- Stimulating the construction sector;
- Boosting the social, recreation, leisure and tourism offer;
- Supporting the health and social care sector;
- Supporting the education sector that includes funding three technical colleges, nine schools and a further nine kindergartens for 5,000 students;
- Local employment for younger people;
- The renovation and refurbishment of healthcare facilities; and
- Support for the arts including theatre and performances.

Overall, the average salary has risen from BYR 738,900 in 2009 to around BYR 4,136,600 in 2013. Taking into consideration currency fluctuations, this is a rise of around 176% over this period, indicating a substantial and rapid increase in income for many residents.

The Novogrudok Sustainable Energy Action Plan

On January 25, 2013, Novogrudok acceded to the EU Covenant of Mayors and has subsequently developed a Sustainable Energy Action Plan (SEAP) to assist in the achievement of 20% reduction in carbon emissions before 2020.

The Sustainable Energy Action Plan Development of Novogrudok for 2011-2020 was developed in the framework of the EU project "DACO" (Grant-contract № EuropeAid/131258/C/ACT/Multi, approved by Decree of the Council of Ministers on August 23, 2013 № 742).

Since 2011, the city of Novogrudok has implemented a number of projects contributing to this commitment:

- The first 1.5 MW wind power plant started operation in 2011 in Grabniki village., Total electricity generation amounted to 9,994 thousand kWh in the beginning of 2014 accounting for 7% of total electricity consumption of Novogrudok region;
- Two reciprocating CHP units owned by Novogrudok Utility Company with total electrical capacity 4 MW that started operation in June 2012;
- The installation of energy efficient lighting fixtures (in 2013 Novogrudok utility company replaced 40 old light fixtures of RKU-250 type with new ones ZhKU-150, 62 RKU-250 fixtures with ZhKU-100; 230 energy efficient luminaires installed at educational institutions in vil. Ladeniki, Benin, Vselluyb; 157 energy efficient luminaires installed in the central hospital);
- Improvement of thermal performance in municipal buildings and the installation of

energy efficient windows (a total of 459 sq.m, of energy efficient windows installed in kindergarten #10 and #8, gymnasium #1, schools #5 and #1);
- The installation of energy efficient heating and electrical equipment (Novogrudok utility company has installed 9 modern individual heating substations in buildings on Sovetskaya, Komsomolskaya, Mitskevicha, Volchetskogo street; 2 variable-frequency drives installed at local boiler house in village Lyubcha; lower-capacity 90 kW equipment installed at educationa facilities to replace old 100 kW units); and
- Conversion of equipment in heating plant for use of biomass as fuel (two biomass boilers installed at the central boiler house of Novogrudok utility company; an additional 1MW biomass boiler installed at a boiler house in village Negnevichi).

In the residential sector in Novogrudok, the following energy performance measures were implemented:
- Replacement of old heating pipes with preliminary insulated pipes;
- Installation of energy efficient boilers;
- Installation of variable-speed drives and frequency controllers in heating plants;
- Replacement of pumps; and
- Installation of heating automation systems.

Future priorities for the city of Novogrudok include:
- Improvements to the energy efficiency of residential buildings through improved insulation and multiple glazing;
- Replacement of inefficient incandescent lighting in common areas of residential buildings;
- The switching of vehicles to run on natural gas and biofuels;
- Construction of 2.0-2.5 MW wind power plant in Grabniki village;
- Construction of 9 to 12 MW wind park in Grabniki village by 2018 by the Grodnoenergu regional power company;
- A feasibility study followed by construction of a 15-18 MW wind power plant;
- A feasibility study followed by construction of a 1-3 MW roof-mounted and stand-alone photovoltaic power plants;
- A feasibility study followed by construction of a biogas plant using agricultural waste;
- A feasibility study followed by construction of a municipal waste processing plant and wastewater sludge processing;
- Feasibility studies for a 4 MW biomass CHP Power Plant as well as a biogas power plant using municipal solid waste and wastewater sludge to be developed with European Commission support under the project “Development of Renewable Energy in Novogrudok Region - Roadmap for Environmentally Clean Territory”;
- Replacement of 21.32 km of heat supply pipelines with the installation of primary insulated pipes is scheduled for 2014-2020;
- The installation of solar heating panels in municipal buildings;
- Energy audits of municipal buildings;
- The installation of heat recovery systems;
- The replacement of pumps in heating plants; and
- The installation of wood chip biomass boilers.

VII-3. Current Activities in Terms of Carbon Dioxide Emission Reduction

Key Drivers

In addition to the commitment made through the Covenant of Majors, and pre-dating in the main the adoption of the SEAP, there are already a number of initiatives that the city has undertaken to reduce carbon dioxide emissions and also reduce the cost of providing energy services. Cost reduction and bankable benefits are a key consideration for the city of Novogrudok and to date, a number of projects have been completed or have been initiated to this end. Other considerations include concerns over fuel security and better use of wood waste products.

Renewable Energy

Novogrudok has the first commercial scale wind turbine in Belarus in the form of a 1.5 MW HEAG turbine close to the city. Further monitoring is taking place to build the business case and feasibility for the installation of around 10 units in a commercial wind park at a nearby site. Initial monitoring is revealing better than expected wind energy potential at this location.

The city has recently invested in the equipment to burn biomass in the city boiler-house including a mobile wood chipping unit. Novogrudok is a participant in a Baltic Landscapes project that seeks to enable the sustainable management of forest assets in the area. Biomass currently forms around 7.6% of the share of energy consumption in the city and this is expected to increase. A number of local plants and industrial sites are using biomass in the form of wood chips.

In addition to this, solar water heaters are employed at some of the local schools and the hospital.

Combined Heat and Power

A natural gas-fired 2MW + 2MW mini CHP has been commissioned by the Novogrudok utility company, on line since 2012. This energy centre operates as a base load plant providing year-round hot water to the community, whilst the adjacent boiler houses provide extra load during the winter heating season.

Education and Training

The city of Novogrudok is a pioneer in the provision of specialist education and training in renewable energy technologies through technical colleges, as well as in biomass energy crop production and management through the local agricultural college.

Impact of Current Activities

Implementation of the set of energy efficiency measures in Novogrudok district has led to an estimated savings of 12.7 ktce in 2011-2013, thereby reducing the consumption of energy resources by 9.15%.

VII-4. Specific Activities Relating to Street Lighting

The National Context

According to the Decree of the Council of Ministers of the Republic of Belarus #248 dated 22.02.2010, a minimum of 100% of lighting fixtures for street and industrial lighting must meet national energy efficiency standards by the end of 2012.

Partly as a consequence of this, and also to drive down the cost of street-lighting (estimated to be $20,000 per month in the city and $7,500 in the villages), a number of actions have already been undertaken locally.

Local Energy Efficiency Measures

The city of Novogrudok has undertaken some measures to reduce the cost and carbon emissions of street lighting. This has taken the form of a number of typical responses to this including:

- Reduction in lighting hours of the current street lights;
- The alternate disabling of street lighting columns and some dimming of street lights;
- Greater vigilance and monitoring of lights that are manually controlled.

The ability to make savings has been hampered by the micro-climate which is typically foggy, Novogrudok is a 'fog island', making photocell switching problematic and there are technical issues with the use of time switches in terms of reliability. Overall, the limits of pedestrian and vehicle safety have been reached despite smart measures, such as the prioritisation of the lighting of junctions. The current regime of street lighting is not considered sustainable in the long term in the interests of further carbon and cost reduction, as well as public safety and equality considerations.

There are over 100 traffic signals and pedestrian crossings in Novogrudok that are equipped with LED lights, reducing energy consumption. There is desire to modify the control systems for these lights in the interests of better traffic management and there is an awareness of systems deployed in larger cites and parts of Europe that respond to traffic volumes. There has been the piloting of solar PV's to power lights and signals that are remote from grid, although this not extensive.

VII-5. Stakeholder Engagement

Validation of Existing PIF and Project Outputs and Outcomes

The concept of undertaking Demonstration Projects on Energy Efficient Lighting as outlined in the PIF was tested with the key stakeholders of the municipality. Overall, the desire to pilot this in Novogrudok was validated and the city officials and Mayor re-iterated their commitment to the project and co-financing arrangements. The concept of undertaking the necessary feasibility studies, leading to implementation of a demonstration project to be replicated elsewhere, was supported.

Additional Information Relating to Street Lighting

The city officials outlined a number of local issues, constraints and opportunities that the project might present relating to street lighting. These are outlined below:

- The majority of municipal street lights are attached to existing utility poles that are often constructed of pre-cast concrete and there is no imperative or programme to replace these structures:
- Their lack of knowledge and access to modern energy management information systems that can facilitate the maximization of operational costs savings to operate the system[102]. With the knowledge that modern energy efficient LED lights and intelligent control systems are less costly to operate over their service life compared with conventional lighting systems, Novogrudok's existing street and public buildings lighting will continue to operate with old and inefficient technologies without modern intelligent control systems.. The SMART sensors and energy management systems for lighting control that are available on the Belarusian market are cheaper to be cost competitive but do not always have the specifications that meet the best international standards;
- The quality of some of the locally manufactured street lights is problematic, and there are issues around premature failure and guarantee periods;
- Locally sourced LED units have often been sourced from China at low cost with attendant reliability and quality control issues;
- A viable business case has not been yet prepared for the replacement of sodium discharge lamps with LEDs by comparing the replacement costs and energy costs of the two types of lamps.

Overall these issues were not considered insurmountable and the solutions discussed included:

- The opportunity to apply an Energy Management Information System to the street lighting asset;
- The opportunity to explore 'green' procurement routes; and
- The development of technical solutions in partnership with local universities and colleges.

In addition, there may be the possibility of using solar PV panels to power the lighting of areas that are currently 'off-grid' such as the area around the castle.

Additional Opportunities for Energy Efficiency in Novogrudok

In Novogrudok, there are a number of potential additional projects that could contribute to the reduction of GHG emissions and costs to the municipality;

The first of these is the replacement of inefficient incandescent lighting in the common areas of public and residential buildings. Many of the common areas in residential buildings are lit by incandescent bulbs in inferior or damaged luminaires without any form of control other than manual switching. These bulbs are easily stolen and are often left on permanently. Recent pilots have shown that LED replacements with acoustic sensors work well, as well as the installation of sensors only and retaining existing luminaires, providing significant cost and carbon reductions. The improvements made to date have also improved personal security and safety in these areas.

[102] This would include the cost of energy for operating the lighting systems, and the costs of replacing cheaper lights that do not have a long service life

Table VII-1: Sectoral energy use for the City of Novogrudok (2010)

Sector	Consumption MWh	Share %
Residential Buildings	247,188	45.4
Industry	179,530	33
Municipal Buildings	69,931	12.8
Other	46,648	8.6
Transport	1,140	0.2

Another key opportunity lies in the area of the lighting of the compounds, forecourts and public realm outside municipal, educational and healthcare facilities. The current provision is often inadequate, inefficient, defective or non-existent and ad-hoc solutions have been installed to mitigate this problem utilising inappropriate or under-performing installations. This lighting is part of the wider lighting requirements of the municipality in some cases, and in others, the approach to buildings is hazardous or their use at night impossible. Some examples include the local hospital and a primary school close to the central boiler plant. The use of low energy lighting would replace outdated and inefficient luminaires whilst also improving access and the times of use of facilities such as hockey courts, with attendant health benefits.

Finally, and with great potential to reduce GHG emissions whilst also reducing costs to the city is a potential project to refurbish and modernise the local municipal laundry. This laundry is currently run on a combination of electricity, and steam generated from the city boiler-house that is transferred over a distance of 800m through unprotected and, crucially, uninsulated pipes at a pressure of up to 6 Bar. This is not only extremely wasteful in terms of heat losses through transmission, there are a number of health and safety concerns over the route of the pipes through a children's play area. In addition, the cooling of the excess steam at the laundry is causing problems related to the amount entering the laundry that remains unused, and the condensing plant is beginning to fail. Another key consideration is the inefficient use of one of the municipality's boilers that is currently deployed exclusively on steam generation for the laundry. The equipment within the laundry is outdated and inefficient; however, notwithstanding, productivity at the laundry remains high and the facility is an important employer and provider of services to the city.

VII-6. Barriers to Energy Efficiency Priorities

Financial and Procurement Barriers

Some of the potential solutions that reflect the best international practice and performance standards are both expensive and currently difficult to source within Belarus. The quality of locally sourced LED lighting is currently problematic in terms of cost and reliability and capacity may need to be built into the supply chain or partnerships developed with other cities that have successfully procured alternatives. The installation of LED lighting is a major investment and financial assistance may be required to enable the wholesale conversion of the assets, accepting that in the long term benefits will outweigh costs, once the investment has been made.

Technology such as SMART sensors, advanced or network monitored and actuated control gear and energy management systems currently available in the supply chain may not be of sufficient specification to meet the needs of an exemplar project.

Knowledge and Capacity Barriers

It is likely that there is insufficient local capacity and resources to be able to prepare the business case required for the projects to be undertaken in way that would reflect the best international practices. The technical knowledge required is not currently available in the municipality, taking into consideration the need to integrate emerging technology that may need to be developed within Belarus to allow the successful procurement, deployment and sustainable maintenance required for a demonstration project that can be replicated by other cites.

The preparation of the appropriate reports, specification and action plan for energy efficiency projects in Novogrudok will be hard to deliver without outside consultancy support, training for officials and operatives and assistance in producing promotional materials and demonstrations to assist other cites to adopt the approaches taken.

Overall, these barriers are not considered insurmountable with some of the possible being:

- The opportunity to apply an Energy Management Information System to the street lighting asset;
- The opportunity to explore “green” procurement routes; and
- The development of technical solutions in partnership with local universities and colleges.

VII-7. Proposed Actions to Overcome Barriers

Action I

A Detailed Feasibility Study and Action Plan and Business Case for the Installation of LED Street Lighting in Novogrudok

Description:

This study will form the basis for subsequent GEF investment in street lighting in Novogrudok. Providing specific prescriptions, actions and procurement modalities, this study will guide investment and be a tool to monitor performance and progress.

Options Appraisal:

Option 1 - Concentrate solely on street lighting

This would identify the options and technical considerations in replacing the current fixtures and lamps with LED technology without considering control gear or energy management information systems. The disadvantage to this approach is that it would not deal with the complex issues around management, control, target illuminance levels and SMART technologies. This approach is not recommended.

Option 2 - Consider street lighting alongside advanced control and monitoring

This would look at the street lighting allied to advanced control and management systems capturing greater cost and carbon savings and allow greater certainty over investment decisions and a greater ability to monitor performance. This enhanced approach would represent a 'do-minimum scenario'.

Option 3 - Consider the public realm around municipal buildings, street lighting traffic signals, advanced control and monitoring systems, target illuminance levels across the city that includes tourism assets.

This option would consider the lighting needs of Novogrudok holistically examining the lighting needs of the city as a whole and taking advantage of opportunities to share the purchase and running costs with other municipal partners, for example where the public realm adjoins the highway.

Suggested Preferred Option:

Option 3 offers the best opportunity to maximise the investment in both the feasibility and delivery of a solution that meets the needs of the present in the most efficient way whilst also 'future proofing' the design. By considering the lighting needs as whole, spin-off benefits can be secured in areas such as traffic management, equalities, disabled access and economic growth in areas such as tourism through the creation of an attractive and safe environment, whilst also maximising efficiency and reducing duplication of resources.

Scope:

An integrated feasibility study and action plan with the following components:

- An analysis and mapping of the target illuminance levels, colour temperature and needs across the city of Novogrudok taking into consideration amenity, road and personal safely and characteristics of the street and location. This would include the public realm around municipal buildings such as hospitals and schools;
- A feasibility study into the required control gear and energy management information systems to operate the street lighting efficiently;
- An examination of procurement modalities including the 'green procurement' of equipment and technology, identifying suppliers and supporting innovation in the local supply chain;
- The design of traffic light systems taking into consideration advanced control gear and improved traffic management;
- An action plan setting out the necessary steps, performance targets, phasing and delivery of the investment over a five-year period;
- A detailed business case identifying the level of investment required, the payback period, funding sources and procurement criteria;
- An analysis of the potential for lighting to stimulate the visitor economy;
- Analysis of the GHG reductions that will be achieved per se against the baseline scenario;
- A comprehensive maintenance plan and manual for local management of the system.

Budget Cost:

The estimated cost of delivering this action is around $45,000. This could be reduced by local officers undertaking some of the survey work.

Action II

A Detailed Feasibility Study and Action Plan and Business Case for the Installation of LED for Common Areas of Municipal Buildings and Residential Blocks

Description:

This study will form the basis for subsequent GEF investment in lighting the common areas of municipal buildings and residential blocks in Novogrudok. Providing specific prescriptions, actions and procurement modalities, this study will guide investment and be a tool to monitor performance and progress.

Options Appraisal:

Option 1 - Concentrate solely on residential buildings without considering other municipal buildings, taking into consideration the use of advanced control gear and sensors.

This option would only consider the communal areas of residential buildings. This is a significant sector in terms of electricity consumption and carbon emissions and the lighting will also improve issues are personal safety and security. Within this an analysis could be undertaken of the quality of the light in these communal areas. This approach would represent the 'do-minimum scenario'.

Option 2 - Consider the communal areas of other municipal buildings as appropriate for example stairwells and hallways in hospitals and offices for example.

This option would extend the study and allow other building types to benefit from the learning and research to be undertaken, avoiding duplication. In addition, the procurement and sourcing of LED fixtures and control gear may be streamlined and the capacity built in the supply chain to meet the additional demand. Other partner public bodies may benefit from group purchasing arrangements and the knowledge and technology will be transferrable to a variety of building types and contexts.

Option 3 - Concentrate solely on the replacement of bulbs without additional control gear or sensors.

This option would only deal with the procurement and installation of replacement bulbs. There would be cost and carbon savings in the long term but the installed bulbs may be vulnerable to theft if installed in standard luminaries and further efficiencies would be hard to secure at a later date. This approach is not recommended.

Suggested Preferred Option:

Option 2 offers the best opportunity to make the most of the research and development and will lead to a holistic and innovative set of solutions that are transferrable to a number of scenarios and contexts.

Scope:

An integrated feasibility study and action plan with the following components:

- An analysis of the needs, locations, target illuminance levels and condition of the wiring within municipal building assets of Novogrudok;
- A feasibility study into the required control gear and energy management information systems to reduce lighting management effort and costs;
- An examination of procurement routes, including the 'green procurement' of equipment and technology, identifying suppliers and supporting innovation in the local supply chain;
- An action plan setting out the necessary steps, performance targets, phasing and delivery of the investment over a five-year period;
- A detailed business case identifying the level of investment required, the payback period, funding sources and procurement criteria;
- Analysis of the GHG reductions that will be achieved against the baseline scenario; and
- A comprehensive maintenance plan and manual for local management of the system.

Budget Cost:

The estimated cost of delivering this action is around $15,000 assuming local operatives undertaking some of the survey work.

Action III

A Detailed Feasibility Study, Action Plan and Business Case for the Refurbishment and Modernisation of the Municipal Laundry

Description:

This study will form the basis for subsequent GEF investment, contributing towards the refurbishment and modernisation of the municipal laundry. Providing specific prescriptions, actions and procurement routes, this study will guide investment and be a tool to monitor performance and progress.

Options Appraisal:

Option 1 - Concentrate solely on the feasibility of insulating the existing steam pipes from the municipal boiler house and some consideration of the condensing plant.

This option would consider some of the energy losses through transmission and the condensing of excess heated steam. Health and safety issues should be explored and appropriate mitigation prescribed. This option would represent the 'do-minimum scenario'.

Option 2 - Consider the feasibility of disconnecting the municipal laundry from the boiler house reducing heat losses through transmission and replacing this with alternative plant and equipment.

This option would consider the stand alone application of energy efficiency measures and technology, utilising some or all of the existing equipment in the laundry. The condition and remaining service life of the existing equipment is not known, although a cursory visual survey revealed that equipment modernisation is required.

Option 3 - Consider the energy needs, equipment condition, working practices, energy efficiency measures and replacement plant required to bring the laundry up to a standard in line with the best international practice and performance standards.

This option would consider the whole operation of the municipal laundry in terms of energy efficiency and operations. Providing a suite of measures with cost estimates and a business case for investment, this study would outline the options available within a range of budgets.

Suggested Preferred Option:

Option 3 offers the municipality a range of considered options including an audit of the existing equipment and means of operation. Whilst all of the options above will help to reduce costs and carbon emissions, the holistic consideration of the issues will provide an exemplar energy efficiency project that has replicable outcomes and outputs that could be transferrable to other heat intensive operations.

Scope:

An integrated feasibility study and action plan with the following components:

- An audit of the existing plant equipment in the laundry and equipment fitness;
- An analysis of the impact upon the municipal boiler-house in terms of residual heat loads should the laundry be disconnected and the impact upon the efficiency of this plant;
- A consideration of options for centralised or decentralised heat sources;
- An investment programme that prioritises the most pressing issues in the short, medium and long term;
- The design of a comprehensive mechanical and electrical system tailored to maximise energy efficiency;
- A strategy for the recovery and re-use of waste heat;
- An examination of procurement routes, including the 'green procurement' of equipment and technology, identifying suppliers and supporting innovation in the local supply chain;
- A detailed business case identifying the level of investment required, the payback period, funding sources and procurement criteria;
- Analysis of GHG reductions that will be achieved per se against the baseline scenario;
- A comprehensive maintenance plan and manual for local management of the system.

Budget Cost:

The estimated cost of delivering this action is around $15,000.

Action IV

Investment in LED Street Lights, Control Gear and Energy Management Information Systems (EMIS)

Description:

Direct investment in the installation and commissioning of energy efficient LED street lighting, control gear and EMIS. This could extend to the improved management of traffic flows through investment is new technology controls for signals and pedestrian crossings.

Options Appraisal:

Option 1 - invest in the LED street lighting as appropriate to the existing fittings and columns, extensively across the city of Novogrudok.

This option would rapidly assist in delivering energy efficient lighting where this is feasible. However, the wider benefits may not be secured in terms of control and monitoring, leaving the city less resilient and able to respond to emerging new technologies and further energy efficient lighting products that may become available in the future. The advanced control and monitoring in line with the best international practice would not be delivered.

Option 2 - invest in EMIS in relation to street lighting and pilot LED lighting in specific areas up to the budget allocated, allied to improvements in control gear where the new lighting is installed.

This option allows the systems of monitoring and control to be set up in readiness for investment in the future. As part of a phased programme of installation across the city, the necessary technology will be in place. This allows best international practice to be embedded that can be replicated within the city and in other municipalities based on the feasibility study outlined in Action I.

Suggested Preferred Option:

Option 2 offers the opportunity to capture the benefits of investment in the development and adoption of new technology whilst providing a pilot and test bed that can be replicated across the city and elsewhere.

Scope:

The investment in pilot areas with Novogrudok, allied to the adoption of EMIS and new control gear to include in line with the Feasibility Study described in Action I:

- The development, commissioning and training of operatives in the use of an EMIS;
- The procurement of suitable control gear, LED lighting, systems and software;
- The installation of LED lighting in pilot areas;
- The installation of control gear in pilot areas; and
- The monitoring and review of the performance and reliability of the new systems in pilot areas against the performance criteria set.

Budget Cost:

The proposed investment in this area is $333,000 from the GEF funding.

Table VII-2: Unit Costs of Various Street Lighting Equipment

The commissioning and set up of an EMIS (or Central Management System)	$50,000
The conversion of one light column to LED lamp (where feasible)	$150 - $250
Control gear for one light column	$200-300
The replacement of one street light head	$300 - $1000

Table VII-3: Suggested GEF investment for Novogrudok Street Lights (Output 3.2)

Investment	**Detail**	**Total Cost**
City Wide EMIS	1no. System and Training @ $51,500	$ 51,500
Control Gear	404 @ $200[103]	$ 80,800
Installation of New Light Heads	404no. 90W units @ $500[104]	$ 202,000
TOTAL INVESTMENT		**$334,300**

Assuming that the greatest reduction in GHG will come from the replacement of mercury discharge lamps, as a priority.

Co-financing should facilitate a programme of investment in the remaining lamps throughout Novogrudok, equating to 1207 columns. Priority investment should be made in the remaining mercury discharge lamps in the early years of the project as these are the least efficient. Alternatively, a programme of investment could be made for remaining outdoor lamps in public areas in Novogrudok and in the rural areas under the jurisdiction of Novogrudok for which a baseline survey would be needed and conducted by Novogrudok.

Due to fluctuations in energy costs and the prices of LED technology, it is difficult to predict pay-back periods for investment in LED street lighting and this needs to be monitored and reviewed as a part of the demonstration projects to build a knowledge-base around this issue. In terms of monitoring there are a number of areas where data needs to be gathered;

- The long term efficiency and luminance of the units;
- The life span of the installed equipment;
- An analysis of the maintenance regime in comparison to conventional technology and the impact this has in term of workforce costs and health a safety considerations.

[103] There are possible savings from units with integral control gear. However this leads to more expensive units.
[104] Assumed to be required for older units, price based on current wholesale import price.

Table VII-4: Suggested Novogrudok Co-Financing investment for Street Lights

Investment	Detail	Total Cost
Remaining 250W Mercury		
Control Gear	314 @ $200[105]	$ 62,800
Installation of New Light Heads	314no. 90W units @ $500[106]	$157,000
Subtotal		**$219,800**
125W Mercury Lamps		
Control Gear	93 @ $200	$ 18,600
Installation of New Light Heads	93no. 60W units @ $400	$ 37,200
Subtotal		**$ 55,800**
100W Sodium Discharge Lamps		
Control Gear	128 @ $200	$ 25,600
Installation of New Light Heads	128no. 60W units @ $400	$ 51,200
Subtotal		**$ 76,800**
70W Sodium Discharge Lamps		
Control Gear	53 @ $200	$ 10,600
Installation of New Light Heads	53no. 40W units @ $400	$ 21,200
Subtotal		**$ 31,800**
150W Sodium Discharge Lamps		
Control Gear	574 @ $250	$143,500
Installation of New Light Heads	574no. 120W[107] units @ $800	$459,200
Subtotal		**$602,700**
TOTAL		**$986,900[108]**

Emerging evidence suggests that there is around a 20-year pay-back period on investment in LED street lighting assuming the replacement of 70W sodium lamp with 40W LED's.

[105] There are possible savings from units with integral control gear. However this leads to more expensive units.
[106] Assumed to be required for older units, price based on current wholesale import price.
[107] Achieving equivalent output in Lumens is difficult with LEDS at present - requires further feasibility
[108] This is an indicative budget estimate and will require actual prices based on the agreed procurement route from a selected supplier

Action V

Investment in Energy Efficient Equipment for Novogrudok Municipal Laundry

Description:
Direct investment in energy efficient equipment, plant and machinery towards the refurbishment and updating of the municipal laundry.

Table VII-5: Investment Profiles

Investments	Costs	Comments
Profile 1 - The insulation of the existing steam pipes and the upgrading of the condensing plant with possible heat recovery / re-use in the local sauna.	Supply and installation of insulation - 800m @ $200 per linear metre = $160,000 Supply and installation of replacement condensing plant $20,000 Supply and installation of additional pipework and heat exchange units to feed sauna $3,000 Total Cost $183,000	This is an intermediate solution that will provide quick wins in respect of heat losses; however, the use of the large municipal boiler on the heat supply side is inefficient and the steam will be hotter at the point of delivery leading to further demand on the condensing system. There is a possibility using the waste heat via a heat exchange and for example, the local sauna is next door, as well as residential properties.
Profile 2 – The disconnection of the laundry from the municipal boilerhouse and the replacement with a new energy efficient boiler either fired with gas or biomass.	The cost will depend on the heat output required but is likely to be upwards of $100,000 including fuel storage. A gas fired boiler will cost less than a biomass boiler.	Installation of the new boiler could be in the existing plant room where the condensing unit is currently located. There is sufficient space and access to facilitate the delivery and storage of a biomass fuel if this option is taken. The service life of the existing machinery is not known and the sourcing or replacement equipment may be problematic.
Profile 3 – The replacement of the current machinery with stand-alone modern equipment with integral heating systems.	The cost of replacement equipment will depend upon operational need. The table below gives an estimated cost based upon current demand allowing for 25% reserve capacity.	The need for a large scale heat source may be negated by the installation of modern up to date equipment.

Table VII-6: Details of Novogrudok Municipal Laundry[109]

Estimated daily capacity of laundry in Novogrudok	**1500 kg per day**
Reference equipment:	
Washing machine model	**Electrolux W4400H**
Load	40 kg
Washing cycle	1 hour
Number of washing cycles per day	7
Electric capacity (3-phase current)	36 kW
Number of washing machines required to meet demand for services	6
Estimated equipment cost (USD, including VAT 20%)	$29000 per machine
Drying machine model	**Electrolux T4650**
Load	28 kg
Washing cycle	30 minutes
Number of washing cycles per day	14
Electric capacity (3-phase current)	36
Number of drying machines required to meet demand for services	4
Estimated equipment cost (USD, including VAT 20%)	$10000 per machine

Suggested Investment Pending Feasibility:

Profile 3 has the most potential to both deliver energy efficiency and meet current and future operational needs. The partial replacement of equipment that is currently heat-source dependant may be a cost effective solution in the shot-term. Stand-alone machinery with decentralised heating may be more efficient and responsive that a single point source, depending upon demand.

Budget Cost:

Table VI-7: Suggested GEF Investment for Novogrudok Municipal Laundry (Output 3.3)

Investment	Detail	Total Cost
Washing Machines	3 @ $29,000	$87,000
Driers	3 @ $10,000	$30,000
TOTAL INVESTMENT		**$117,000**

Table VI-8: Suggested Novogrudok Co-Financing for Municipal Laundry

Investment	**Detail**	**Total Cost**
Washing Machines	2 @ $29,000	$ 58,000
Driers	1 @ $10,000	$ 10,000
Installation Enabling Works	Upgraded electricity supply & wiring assuming 3-Phase supply not already available)	$ 50,000
Decommissioning of Steam Equipment	Disconnection, building works and removal of redundant equipment	$ 20,000
TOTAL INVESTMENT		**$138,000[110]**

[109] Specific laundry equipment models are provided as an example of the energy savings that could be realized through their deployment. The Project will assist in the identification of appropriate laundry equipment to be procured for the pilot project

[110] Further investment is recommend in the building and working environment outside the scope of this project

VII-8. Co-Financing Requirements

The above actions and investments represent the application of GEF funding to secure the pilot demonstration projects. The subsequent roll-out of further investments, based upon these pilot demonstration projects, will require co-financing from the city of Novogrudok, providing the leverage to secure the GEF grant.

VII-9. Monitoring and Review

It is anticipated that the underpinning Feasibility Studies in Actions I to III will be the basis for ongoing monitoring and review. A mechanism for measuring achievements against the actions will be set up and the project will benefit from mid-term reviews and review at project closure.

The project outputs will be measured against SMART objectives in line with GEF procedures.

VII-10. Expected Outcomes of GEF Investments

Outcomes from TA grant

The feasibility studies outlined in this report will both inform the investments to be made in the city of Novogrudok and also provide a methodology and framework for other cities wishing to undertake similar projects. The TA grant funded studies will:

- Inform policy and the development of SEAPs for other cites joining the EU Covenant of Mayors;
- Be a catalyst for other cities to invest in energy efficiency;
- Assist in the development of standards and specifications;
- Provide a road map to the successful procurement of plant and equipment, in particular LED lamps; and
- Assist in the development of energy efficient technology in Belarus and tackle problems within the supply chain.

The direct investment in the demonstration projects will;

- Inspire and enable other cites to make similar investments;
- Catalyse other energy efficiency measures in addition to those demonstrated;
- Act as an exemplar for other cities; and
- Be a pathfinder in terms of procurement and the local development of technology in line with the best international standards.

Recommended Interventions for Demonstration Projects and Investments

The Proposed Actions, above, will provide the necessary evidence base for future energy efficiency initiatives in Novogrudok. In terms of prioritisation it is suggested that the greatest potential for GHG reductions will be from investment in the street lighting and the municipal laundry. In the case of the laundry there are significant savings to me made in proportion to the required investment in modern equipment, allied to the necessary investment in the buildings (outside the scope of this project). In terms of the street-lighting the relative scale of the asset in comparison to, for example, the communal areas in buildings will have the greatest impact in terms of GHG reductions within the life of the project. In addition the investment is EMIS and

control gear 'future proofs' the asset in the long term with attendant potential improvements in energy efficiency of around 20%.

VII-11. Conclusion and Next Steps

This report has outlined the opportunity invest in energy efficiency measures in Novogrudok, sets out the options and recommends a way forward that captures potential cost savings and GHG emission reductions. It is hoped that this is an accurate reflection of the context and issues and meets the expectations of the municipality. This project offers a great opportunity to plan for future generations as well as for today, building on the rich heritage of the city of Novogrudok.

Appendix VII-1

Equalities Impact Assessment for Lighting Projects

Group	Potential Impact (+/-)
Disability	
Visual Impairment	+ The analysis of target illuminance levels will allow for the planning of lighting that is consistent and has low variance differences improving the ability of those with visual impairment in way-finding and have safe access. (Many visually impaired people have some vision). + The replacement of any columns if required should take into consideration the position of these in relationship to the pavement to avoid collisions and accidents involving visually impaired people. + The installation of white LED light in place of either yellow or dimmed and sporadic lighting will improve the lighting environment for visually impaired people. + In common areas of residential buildings the increased security and additional improved control gear will improve access for the visually impaired.
Physical Disability	No anticipated impact.
Gender	
Women	+ Improved and consistent lighting levels, particularly in areas that are currently poorly lit will improve personal safety and security. Safe walking routes promotes access to jobs, social and leisure opportunities.
Men	+ Improved and consistent lighting levels, particularly in areas that are currently poorly lit will improve personal safety and security.
Age	+ The proposed measures will improve the lighting levels promoting safe access and reducing the chances of trips and falls.
Religion or Belief	No anticipated impact.
Sexuality	No anticipated impact.
Race	No anticipated impact.

Annex VIII: Description of UNDP Country Office Support Services in execution of the project "Belarus: Supporting Green Urban Development in Small and Medium-Sized Cities in Belarus"

The UNDP country office may provide at the request of the Executing Entity the following support services for the activities of the project:

(a) Identification and/or recruitment of project personnel;
(b) Identification and facilitation of training activities;
(c) Procurement of goods and services;

The procurement of goods and services and the recruitment of project personnel by the UNDP country office shall be in accordance with the UNDP regulations, rules, policies and procedures.

Pursuant to the relevant provisions of the Standard Basic Assistance Agreement (SBAA) between the Government of Belarus and UNDP, signed on 24 September 1992, and provisions of the project document, the provisions on liability and privileges and immunities shall apply. The Government shall retain overall responsibility for the nationally managed project through MoNREP. The responsibility of the UNDP country office for the provision of the support to the MoNREP shall be limited to the services detailed in the table below.

Any claim or dispute arising under or in connection with the provision of support by the UNDP country office shall be handled pursuant to the relevant provisions of the SBAA.

In accordance with the provisions of the project document "Belarus: Supporting Green Urban Development in Small and Medium-Sized Cities in Belarus", the UNDP country office shall provide support at the request of the MoNREP as described in the table below. Cost-recovery by UNDP country office for providing support services to the MoNREP shall be funded from the project budget in a way specified in Table IX-1.

Fee based method, when UNDP Country Office charges the project for provided services based on number of transactions and transaction fee in accordance with the country office pricelist.

Schedule for the provision of the Support Services, cost and method are described in the table below.

If the requirements for support services by the country office change during the life of a project, the annex may be revised with the mutual agreement of the UNDP Resident Representative and the MoNREP.

International Public Sector Accounting Standards are financial reporting standards used in UNDP.

Annex VIII: Description of UNDP Country Office Support Services in Execution of the Project "Belarus: Supporting Green Urban Development in Small and Medium Sized Cities in Belarus"

Support Services	Schedule for the provision of the support services	Cost to UNDP of providing such support services (where appropriate)	Amount and method of reimbursement of UNDP (where appropriate)
Processing of payments	Based on request for payment	In accordance with the country office pricelist	Amount of reimbursement is based on the quantity of transactions performed and reimbursed quarterly through the UNDP accounting system Atlas
Procurement of goods and services	Based on request and project annual work plan	In accordance with the country office pricelist	Amount of reimbursement is based on the quantity of transactions performed and reimbursed quarterly through the UNDP accounting system Atlas
Staff and consultants` selection and recruitment process	Based on request and project annual work plan	In accordance with the country office pricelist	Amount of reimbursement is based on the quantity of transactions performed and reimbursed quarterly through the UNDP accounting system Atlas
Travel arrangements	Based on request and project annual work plan	In accordance with the country office pricelist	Amount of reimbursement is based on the quantity of transactions performed and reimbursed quarterly through the UNDP accounting system Atlas
Administrative support service (pouch service, visa support, customs clearance, etc)	Based on request and project annual work plan	In accordance with the country office pricelist	Amount of reimbursement is based on the quantity of requests and reimbursed through the UNDP accounting system Atlas periodically
IT support service	Based on request	In accordance with the country office pricelist	Amount of reimbursement is based on the quantity of requests, service timeframe and reimbursed through the UNDP accounting system Atlas periodically