Funded by the European Union

EU4Environment
Green Economy in Eastern Partner Countries

Supported by
Federal Ministry for Economic Affairs and Climate Action
On the basis of a decision by the German Bundestag

Using biodegradable waste in Georgia with support of public expenditure

Designing and costing a green public investment programme

SUMMARY

Action implemented by:

OECD BETTER POLICIES FOR BETTER LIVES | UNECE | UN environment programme | UNIDO | THE WORLD BANK IBRD • IDA | WORLD BANK GROUP

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Project background

Efficient and effective public expenditure is important for meeting countries' environmental and climate-related objectives and fulfilling their international commitments. At the same time, national governments have become more aware of the need to move away from the financing of individual projects on an **ad hoc** basis towards **applying a programmatic approach**.

In 2021-22, the OECD assisted the Ministry of Environmental Protection and Agriculture of Georgia (MEPA) to prepare a green public investment programme in the waste management sector. Under the EU4Environment Action, the OECD worked with the partner country to **create pipelines of priority investment projects** that will help the government of Georgia achieve its environmental and climate-related targets.

The objective of the project "Designing Green Public Investment Programme and Conducting Training in Georgia" was to **develop a multi-year investment programme** in line with international good practices, with the aim of obtaining adequate resources from the national budget and leveraging international co-financing for its implementation.

The green public investment programme for Georgia aims to **utilise non-municipal organic waste** generated by agriculture, households, and food and beverage production. The programme will support the partner country to process biodegradable waste that is currently disposed of in landfills, illegally burned in the field or dumped in nature.

Using the OECD costing model, the programme calculates the level of funding needed for subsidies to convert waste into energy (biomass, biogas) or compost. This will result in a substantial reduction of greenhouse gas emissions, prevent water and soil pollution and, essentially, also **encourage private investment** to apply environment- and climate-friendly technologies and processes.

The project also aimed to **facilitate knowledge transfer** and help share experience between the EU and its Eastern Partnership (EaP) countries, on best practices and lessons learnt in:

- preparation and implementation of large-scale (national) public support programmes;
- approaches on utilising agricultural residues for energy generation.

The project has also supported complementary activities and requirements needed to launch the green public investment programme successfully in the waste sector.

Sector challenges

In recent years, Georgia has taken many positive steps in the field of waste management. This includes national commitments within the framework of an Association Agreement (AA) with the European Union (EU) to develop a waste management system in full compliance with EU requirements.

Despite achievements in harmonisation and approximation of its legislation with EU directives, important issues related to **proper waste management standards** at national and local levels in Georgia have not yet been addressed.

While Georgia's government has achieved progress in integrating waste management systems, it still faces many challenges. Its economic development produces increasing amounts of (solid) waste, and a significant part of its municipal waste is disposed of at dump sites and improperly arranged landfills built in the past century.

The most critical issues that need to be addressed include:

- reducing disposal of biodegradable waste at landfills;
- preventing illegal dumping;
- achieving full-cost recovery of waste systems;
- shifting to the circular economy to turn waste into resources and products.

Each of these challenges needs to be addressed in the short, medium and long term. The sector can further benefit from **better infrastructure and sustainable practices** – including know-how, financing mechanisms and improved capacity, especially at the municipal level.

Some of the significant gaps and challenges in Georgia's biodegradable waste management include:

- Waste management legislation and policy in Georgia set no quantitative targets for either biodegradable diversion (reuse, recycling, composting, etc.) or landfilling;
- No end-of-waste quality criteria for recyclable fractions of waste and bio-waste are set, to encourage proper treatment of these waste streams;
- Laws, regulations and policies do not encourage the prevention of food waste by food donations to charitable organisations or reuse, due to high food safety and hygiene levels.

Sector challenges

To establish a **modern legal framework** for sustainable solid waste management (SWM) policies – such as waste prevention and reduction, separate collection, reuse, recycling, recovery (including energy recovery) and disposal – Georgia's government needs, among other things, to:

- raise public awareness of these issues;
- consolidate different strategies and communicate clear dates for entering legislation into force;
- encourage producers, consumers and local authorities to collaborate better on setting and implementing the schemes (such as extended producer responsibility – EPR).

> *"Georgia's economic development produces increasing amounts of (solid) waste, and a significant part of its municipal waste is disposed of at dump sites and improperly arranged landfills built in the past century."*

Environmental issues

Environmental issues

The main environmental problems associated with rapid growth in biodegradable waste generation – especially those connected to landfilling and illegal disposal – include:

- **Production of landfill gas and leachate.** By volume, landfill gas typically contains 45%-60% methane, with the rest consisting mainly of carbon dioxide (CO_2). Conversely, leachate can contaminate groundwater. In addition to their odour, fugitive landfill gas emissions contribute to global warming, while leachate often contains high concentrations of pollutants;
- **Slow rate of waste degradation**. Landfills containing biodegradable waste continue to generate leachate and landfill gas many years after closure. This demands continuous landfill gas and leachate management over the long term. Moreover, decomposing biodegradable waste after closure results in site settling, due to volume reduction. This process likewise requires long-term maintenance and monitoring;

Dumping and landfilling waste mainly affects water or soil quality. Meanwhile, burning of residues has negative effects on air quality and increases GHG emissions:

- **Field burning of residual biomass** from perennial and annual crops. This includes burning orchard and vineyard cuttings, fine bay branches, and wheat and barley stems and roots. In most cases, this is illegal, and burning also causes GHG emissions without any accompanying energy benefit.

> *"Landfills containing biodegradable waste continue to generate leachate and landfill gas many years after closure. This demands continuous landfill gas and leachate management over the long term."*

Utilisation potential

About a half of more than 1 million tonnes of municipal waste generated annually in Georgia is of biological origin. Significant volumes of bio-waste are deposited in landfills and dumpsites with no attempt at further processing, alongside burnt or unused solid biomass residues. **Biodegradable waste accounts for over 60% of total waste** when all streams are included (food, green waste, paper, wood and other biodegradable fractions) – the largest component of waste in the country.

Utilisation potential

Biomass has the potential to play a major role in Georgia's energy supply. Biodegradable waste has a huge calorific value, and after processing, can be used to produce energy. Most often, wood waste is used for that purpose. However, alternative local energy resources for heating are needed to replace fuel wood. Residual biomass waste of forestry and agriculture – which generate the major streams of biodegradable waste in non-municipal sectors in Georgia – is a **viable substitute that many countries are already using effectively**.

In Georgia, however, agricultural residue is not used as an alternative energy resource, because of the high cost of biomass collection, transportation and storage. Residual biomass – including, in particular, cuttings from vineyards – does not have widespread alternative use.

The most frequent methods include:

- burning pruning residues directly in the field to:
  - prevent the spread of disease;
  - use the ash from burnt stems as a biological fertiliser in orchards and vineyards.
- leaving some residue on the fields and using it for other purposes (e.g. for cattle feed);
- paying for removal of residues from their orchards and wineries (this presents an opportunity for an alternative solution for waste disposal, but only a few farmers do this).

At the same time, **informal and poorly controlled exploitation**, like illegal logging for energy, is rapidly degrading Georgia's forests and causing significant environmental and economic damage. This is further reducing the accessibility of wood for fuel and may lead to further forest degradation and energy shortages.

OECD approach

Technical assistance provided by the EU4Environment project "Designing Green Public Investment Programme and Conducting Training in Georgia" aimed to enhance the investment planning and management capacities of government officials and associated experts in Georgia in **public environmental spending**. In particular, the EU4Environment support aimed to help equip government officials and experts with know-how and practical skills for designing a public environmental expenditure programme in one of Georgia's priority sectors.

OECD approach

This project will increase the chances of obtaining resources from the public budget and leveraging international co-financing. Economically sound and credible multi-year investment programmes are better positioned to successfully **compete for public support** – both from national and international sources – and leverage the funds to embark upon a path of greener, more sustainable development.

The OECD costing model helped national public authorities to **calculate the public funds** needed to contribute to Georgia's environmental and climate-related targets. The funding helps mobilise private investors, providing them not only with direct financial support – especially before the new technologies reach market maturity – but by giving them guidance on investments with the desired environmental and socially beneficial outcomes.

BOX 1. **HOW GREEN PUBLIC INVESTMENT PROGRAMMES ARE PREPARED**

The methodology applies a programmatic approach to low-carbon public expenditure by creating pipelines of priority environmental projects to be supported by public sector funds, mainly through subsidies in the form of grants. In the context of public finance, programming is a process by which decisions are made on which priority areas need public support and whose objectives would not be achieved without allocating funds.

OECD technical assistance projects apply four main pillars of the programmatic approach towards green public spending:

- **Pillar I:** Preparing economic analysis to investigate the supply and demand side of potential technologies and equipment in the agreed target sector, which could be included in the project pipelines;
- **Pillar II:** Developing costing methodology and an associated costing model that calculates how much finance – both on the supporters' and beneficiaries' side – is required to achieve the desired environmental (or other) outcomes;
- **Pillar III:** Proposing an institutional set-up that includes operating regulations (best practices of project cycle management) needed to be set up, and policy and regulatory barriers that need to be eliminated;
- **Pillar IV:** Providing capacity development that will enable the future implementer of the programme (national public authorities) to launch it, after the budget and personnel have been allocated.

Besides the main pillars, further areas of support in the designing and costing phase of the project also include an overview of possible financing sources (both national and international public sources), overview of applicable (green) technologies for the target sector, a description of project cycle management procedures, or an explanatory guide for using the adjusted OPTIC model.

Public support should not replace private financing, but encourage the private sector to take the lead in clean and socially important projects – i.e. **tip the scales of decision-making** towards more sustainable options, without making the investment too profitable for the private sector.

The programmes have been designed in line with international good practices and **can serve as a model** for preparing other low-carbon public investment programmes within national medium-term expenditure frameworks (MTEFs). The enhanced investment planning and management capacities will help make local public spending more transparent and accountable and use budgetary and human resources more effectively.

This project built on previous OECD work in public environmental spending management, integrating the environmental sector into **medium-term budgetary processes** and on climate change economics. The OECD has developed several policy tools that aim to support efforts of governments to design and implement green public investment programmes – either at the national or the local level – in a cost-effective way and in line with good international practices.

The activities, of an **analytical as well as practice-oriented** nature, included two levels:

- programme design (main elements, methodology, costing model, etc.);
- training on medium-term environmental and climate-related investment planning and management (e.g. selection procedures, project cycle management).

“The OECD has developed several policy tools that aim to support efforts of governments to design and implement green public investment programmes – either at the national or the local level – in a cost-effective way and in line with good international practices.”

Also, necessary associated actions required for the programme implementation phase were outlined (setting the timeframe, allocating necessary human resources, adopting administrative procedures, etc.). The existing and potential domestic financing mechanisms (including public-private partnerships) were also reviewed in light of facilitating green investments.

BOX 2. **ABOUT EU4ENVIRONMENT – GREEN ECONOMY**

The "European Union for Environment" (EU4Environment – Green Economy) Action helps the six EU's Eastern Partnership countries – Armenia, Azerbaijan, Belarus, Georgia, the Republic of Moldova and Ukraine – preserve their natural capital and increase people's environmental well-being, by supporting environment-related action, demonstrating and unlocking opportunities for greener growth, and setting mechanisms to better manage environmental risks and impacts.

The EU-funded Action supports countries in the EU's Eastern Partnership (EaP) region, including Georgia, in improving national governance and regulatory mechanisms that support the transition to a greener and more sustainable development path. Public expenditure forms an essential part in efforts to create a level playing field for environmental and climate-related objectives. The work area on greening public expenditure (Activity 3.3.1) focuses on assisting partner governments utilise public resources – both budgetary and personnel – effectively and efficiently, to reach countries' national environmental and climate-related objectives.

Under the overall direction of the European Commission, the implementing partners – the Organisation for Economic Co-operation and Development (OECD), UN Environment Programme (UNEP), the UN Economic Commission for Europe (UNIDO), and the World Bank – build on important achievements of past co-operation programmes, such as Greening Economies in the Eastern Neighbourhood (EaP GREEN), a large regional programme implemented in 2013-2017.

Note: For more information, see https://www.eu4environment.org.

Focus of the programme

The environmental objective of the proposed programme is to reduce the amount of biodegradable waste disposed of in landfills and illegally burnt or dumped into the countryside or rivers. These practices harm both air and water quality. The programme is mainly designed to contribute to Georgia's climate change mitigation efforts. In practice, the programme will achieve its environmental objectives by supporting investment in the use of biodegradable waste for energy or compost production.

Focus of the programme

Although the programme focuses on non-municipal waste of agricultural origin, it targets **three main waste streams** of biodegradable waste:

- agricultural residues (farmers);
- green waste (farmers, households);
- bio-waste (households, food and beverage producers).

Conversely, the programme will include **three main groups of beneficiaries**:

- Farmers: biodegradable waste from agricultural production (use of biomass to generate heat – local in the same farm or to produce biomass fuel, small-scale composting facilities for farmers);
- Households: biodegradable waste and bio-waste from households (green waste and kitchen waste for aerobic composting);
- Food and beverage producers: biodegradable waste (aerobic composting) and bio-waste from food and beverage production (anaerobic digestion).

These include investment in **three types of use**:

- **Biomass**: generation of heat (locally in the same farm or to produce biomass fuel);
- **Composting**: small-scale aerobic composting facilities for farmers and households in rural areas (green waste and bio-waste), larger-scale aerobic composting facilities for food and beverage producers (biodegradable waste;)
- **Digestion**: anaerobic digestion facilities for food and beverage producers (bio-waste).

In sum, the programme's market analysis identified **six groups of projects** (i.e. pipelines) for investment to reduce illegally dumped or burnt biodegradable waste:

WASTE TO ENERGY

- supply chain for vine pruning or similar residues for biomass boilers, mainly in public buildings;
- briquettes or pellet production facilities that use residues (hazelnut shells, fruit orchard pruning, sunflowers, wheat straw, bay leaf, etc.);
- biomass boilers and equipment for local incineration of biomass (wheat, corn straw, sunflower).

AEROBIC COMPOSTING AND ANAEROBIC DIGESTION

- farmers/household composting bins (aerobic composting of garden and kitchen residues);
- food industry composting containers (aerobic composting);
- food industry composting bioreactors (anaerobic digestion).

Other measures should accompany the proposed investment pipelines, especially laws against illegal burning, dumping, collecting or landfilling of biodegradable waste.

"The programme is mainly designed to contribute to Georgia's climate change mitigation efforts. In practice, the programme will achieve its environmental objectives by supporting investment in the use of biodegradable waste for energy or compost production."

Stepwise implementation

The programme has two (possibly three) phases:

- **The first (pilot) phase** will be launched on a small scale, establishing five supply chains for vine pruning or similar residues for biomass boilers (mainly for public buildings) and one producer of non-wood briquettes or pellets. In addition, it will help 20 farmers establish local incineration of biomass (wheat straw or similar). The pilot phase will also promote local composting in rural areas by supporting the supply of composting bins. In the case of food producers outside urban centres, the pilot phase will test setting up of local composting facilities: one composting container installation (aerobic composting) and one bioreactor (anaerobic digestion);
- **The second (scaling-up) phase** will extend the pilot phase. By 2030, it aims to use 35%-40% of the potential biomass for energy and cover 20% of the rural population with household composting. Before extending composting containers and bioreactors, the programme would wait for results of the pilot and development of /municipal collection of bio-waste and municipal composting;
- **A possible third phase,** which will scale up to the full potential of the market analysis, can be carried out after 2030.

The pilot phase will also test public support for production of non-wood pellets or briquettes. Wood briquettes are already produced in Georgia, but only on a limited scale. The pellets/briquettes will ensure the use of large amounts of residues (vine pruning; fruit orchard pruning; hazelnut shells; walnut shells; and bay leaf residues). In locations with no local demand for energy from heat, pellets/briquettes can be transported to locations with greater demand.

“In the case of food producers outside urban centres, the pilot phase will test setting up of local composting facilities: one composting container installation (aerobic composting) and one bioreactor (anaerobic digestion).”

Programme pipelines

To limit its scope, the programme focused on non-municipal waste generated by agriculture, households, and food and beverage producers. The study includes an economic analysis, which identified six groups of projects ("pipelines") in **two areas that offered potential** to reduce illegally dumped or burnt biodegradable waste. In practice, the environmental objectives of the programme will be accomplished by supporting investment in using the biodegradable waste for energy production (biomass and biogas) or producing compost.

The programme's main assumptions are:

1. Biodegradable waste has a **huge calorific value** and, after processing, can be used to produce energy. Most often, wood waste is used for this purpose. However, given the programme's focus on agriculture waste, biodegradable waste from farming is also considered (waste that is suitable for producing energy, i.e. relatively dry);

2. The programme may produce a large supply of the vine pruning residues,[1] but also hazelnut shells, fruit orchard pruning residues, sunflowers and bay leaf residues – to the extent that it could **exceed heat demand**. In this case, producing the pellets (or briquettes) could be a better option than using the biomass locally (since they could be sold and used elsewhere in Georgia and in the Caucasus);

3. Another solution to using biodegradable waste from farming and food production is aerobic composting and anaerobic digestion. Composting can be organised at the level of households and food producers,[2] and digestion can be achieved in bioreactors at food producers;[3]

   – The composting process produces good compost and reduces the amount of waste that needs to be disposed of. In this way, it reduces methane emissions from landfills and **lowers the carbon footprint**. The compost can be used in gardens to reduce the need for chemical fertilisers. Composting can thus also **offer economic value** for households (especially in rural areas). Home composting, using bins, however, is the cheapest and simplest way of composting;

   – An installation based on composting containers is mobile and modular, **allowing for expansion and flexibility**, depending on the quantity of waste available at different seasons. Installing the system is fast and simple, since only a concrete base is required. This process produces a stabilised, odourless material that can be used as fertiliser;

   – Bioreactors work well with many types of biodegradable waste; fruit and vegetable wastes fit the requirements. The bioreactor can work almost continuously if supplied with waste. The advantage of the installation is that the **biogas produced can be used locally** or **mixed with natural gas** and used in food processing.

1. Cuttings from vineyards may be the most abundant residual biomass that do not have widespread alternative use. Although the amount of pruning is difficult to assess accurately, most is immediately burnt after removal from the vineyards before the spring.
2. It can be also organised as part of municipal solid waste management, which this programme does not cover.
3. The installation will be set up next to food producers in urban centres that produce enough biodegradable waste. The installation has a minimum of 1 500 tonnes per year (t/a) capacity, although higher capacities are more economically effective.

Programme pipelines

TABLE 1. **Key input and output parameters of the programme's pilot and scaling-up phase**

	Unit	Phase 1	Phase 1+2
Total number of new supply chains for vine pruning or similar residues for biomass boilers	No.	5	1 005
Total number of non-wood briquettes or pellets installations	No.	1	5
Local incineration in biomass boilers	No.	20	1 020
Composting bins	No.	2 000	102 000
Composting containers	No.	1	1
Bioreactors	No.	1	1
Total costs of installations	**EUR mln**	**2.95**	**130.55**
Co-financed by the programme	EUR mln	1.74	99.92
Co-financed by private/public beneficiaries*	EUR mln	1.21	30.63
Total CO_2 reduction	**tCO_2/year****	**13 873**	**222 393**

Note: * Households, farmers, municipalities; ** Tonnes of CO_2 per year.

In general, both phases aim to:

- focus on supply chains for vine pruning or similar residues used for biomass boilers, mainly for public buildings or small heating systems,[4] aiming to utilise **37%** of Georgia's total potential by 2030;
- test public support for production of non-wood pellets or briquettes, which will ensure use of large amounts of residues[5] and eventually use **33%** of the total potential in Georgia by 2030;
- help farmers establish local incineration of biomass from wheat straw or similar residues (corn straw, sunflowers), that will eventually use **38%** of the total potential by 2030;
- support reduction of biodegradable waste in rural areas by composting through an inexpensive solution, such as local provision of composting bins, allowing **20%** of the rural population to home compost by 2030;
- help establish **one** composting container installation (for aerobic composting) and **one** bioreactor (for anaerobic digestion), installed next to food producers outside urban centres that produce sufficient amounts of biodegradable waste.[6]

4. Public buildings (or larger private buildings) are proposed because they require more power generation to maintain good combustion parameters and reduce air pollution. Such combustion parameters can be achieved in larger boilers of about 200 kilowatts (kW). They are difficult to achieve in small, household-size boilers, typically of 20 kW-30 kW.
5. Any biodegradable waste that has calorific value can be used, but dry materials are easier to process because they require less drying and produce better biomass (such as vine prunings, fruit orchard prunings, hazelnut shells, walnut shells and bay leaf residues).
6. The minimum capacity for installation is 3 000 t per year for composting containers and 1 500 t per year for bioreactors. While higher capacities are economically more efficient, the programme does not intend to interfere with municipal waste management and composting of biodegradable waste. (This needs to be solved by regulation of disposal and separate collection of biodegradable waste by municipalities).

Costs and benefits

The OECD applies a programme costing methodology focused on environmental and climate-related investment programmes. Using a modified OECD (Excel-based) model – Optimising Public Transport Investment Costs (OPTIC) – the project calculated programme costs and benefits for the first (pilot) phase and the second (scaling-up) phase. The project estimated the cost basis for the green public investment programme based on **unit cost estimates for various infrastructure components**. These include composting containers, bailers for biomass residue and boilers, etc.

Costs and benefits

The model is an analytical tool that can help make the decision-making process **better informed and more transparent**. The accompanying analytical report puts these calculations into a practical framework. It outlines additional conditions and actions needed for a public investment programme (the planned timeframe, human resources, adoption of administrative procedures, etc.).

The OPTIC model uses a set of pollution factors to estimate environmental outcomes. The environmental objective of the designed green public investment programme in Georgia is to reduce the amount of biodegradable waste disposed of at landfills, illegally burnt or dumped (dumpsites, rivers).

BOX 3. **THE OPTIC MODEL**

The spreadsheet-based Optimising Public Transport Investment Costs (OPTIC) model is a simple, easy-to-use decision support tool. It was developed to calculate and optimise total programme costs, as well as potential reductions of emissions of CO_2 and other pollutants from urban public transport (carbon monoxide, nitrogen oxides, particulate matter, sulphur dioxide), from the proposed project pipelines. The model also enables potential beneficiaries to calculate the optimal level of subsidy available to them.

Optimisation of costs and benefits means achieving given targets at the lowest possible cost for the public financier. Both targets and subsidy levels can be recalculated (or optimised) and adjusted accordingly if underlying economic conditions change over the programme period. For example, tariffs could be increased, interest rates on commercial loans lowered or available public financing reduced or augmented.

The model consists of seven modules: 1) assumptions; 2) emission factors; 3) determination of the subsidy level; 4) cost calculation; 5) calculation of emission reductions; 6) programme costing and 7) results.

Although the model was designed for public transport (and tested in Kazakhstan), it was adjusted for use of the green public investment programme (e.g. biodegradable waste).

Other types of similar models on the market focus on estimating greenhouse gas (GHG) emission reductions for a country or for groups of countries. These models mainly focus on GHG emissions from industry and consider different scenarios for the country's economic development. Such models, however, are not suitable for this investment programme, which focuses on reducing emissions only from particular pipelines.

The programme is designed to contribute to Georgia's climate change mitigation efforts, renewable energy targets and its transition to a green economic model of development. Using the OPTIC model, the programme benefits in **reducing GHG emissions** were calculated for the pilot phase and the second phase.[7]

As the OPTIC model calculations have shown, the total cost of implementing the programme will be substantial. New technologies are more expensive before they reach market maturity. Therefore, public financial support will be necessary to help private and public beneficiaries buy modern equipment and installations that have benefits for the environment.

TABLE 2. **Key parameters of the assessed programme**

	Investment costs		Subsidy		Emissions reductions per year	
	EUR mln		EUR mln		tCO_2	
Type	**Phase 1**	**Phase 1&2**	**Phase 1**	**Phase 1&2**	**Phase 1**	**Phase 1&2**
Vine pruning or similar residues for biomass boilers	0.47	95.07	0.38	76.06	709	142 499
Non-wood briquettes or pellets	1.0	5.0	0.50	2.50	7 150	35 750
Local incineration in biomass boilers	0.48	24.48	0.36	18.36	413	21 038
Composting bins	0.1	5.1	0.05	2.55	350	17 855
Composting containers	0.6	0.6	0.30	0.30	3 501	3 501
Bioreactors	0.3	0.3	0.15	0.15	1 751	1 751
Total	**2.95**	**130.55**	**1.74**	**99.92**	**13 873**	**222 393**

Source: OECD calculations, OPTIC model.

7. No sensitivity analysis for the scenarios was performed, but changes in the programme's cost effectiveness might occur if the prices used for the costing change.

Costs and benefits

The key (financing) input and (environmental) output parameters of the programme's implementation are summarised below.

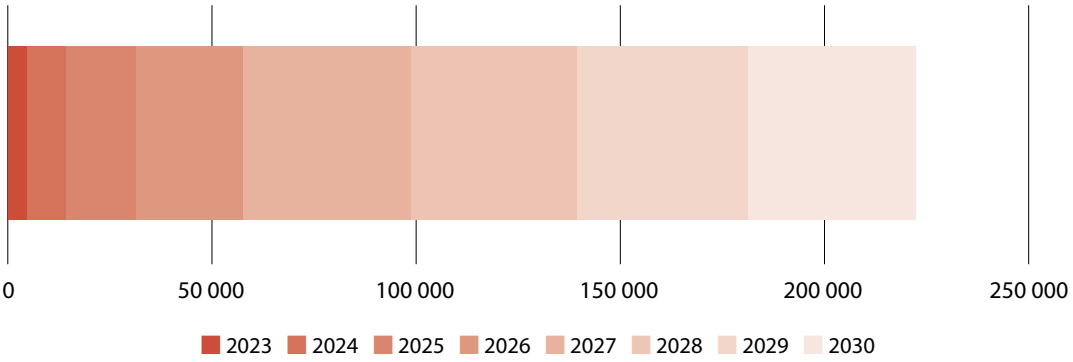
- Phase 1 will be launched on a small scale. The total cost of the programme is estimated to be **EUR 2.95 million**, of which **EUR 1.74 million** will be co-financed from the programme and **EUR 1.21 million** is expected to come from investment by private or public investors (households, farmers, municipalities). The pilot phase could help achieve a reduction of **13 873** tonnes of carbon dioxide per year **(tCO_2/a)**. This CO_2 reduction is relatively low, due to the small scale of the pilot phase;

- Phase 2 will extend the pilot phase. The investment cost of Phase 1 and Phase 2 is estimated at **EUR 130.55 million**, of which about **EUR 99.92 million** in public support will be needed;

- **EUR 30.63 million** is expected from investment by private or public investors. The estimated CO_2 reduction after implementation of the two phases is **222 393 tCO_2/a**;

- A Phase 3 that scaled up to the full potential described by the economic analysis could be implemented after 2030.

FIGURE 1. **Aggregated annual emissions reductions resulting from programme, 2023-2030** (tCO_2)



Source: OECD calculations, OPTIC model.

Co-financing options

Large-scale investment programmes in Georgia have been financed by international financial institutions (IFIs), donors, public money and private investment. This report reviews some of the potential financing sources for the programme, including:

- the state budget;
- the Municipal Development Fund of Georgia;
- donors and international financial institutions;
- local banks.

Co-financing options

Co-financing from the state budget is typical of state environmental programmes (mainly through subsidies in form of grants). However, considering the budget constraints in Georgia and the substantial total costs of the programme, it will be challenging for the Georgian public financier (mainly national governments) to cover all these costs by itself. To address this challenge, additional financial support will be needed from international donors.

Nevertheless, if the state covers only a part of programme costs, the national contribution will be important to demonstrate real commitment to international partners (i.e. potential co-financiers of the programme).

With respect to financial commitment, the economic analysis demonstrates that public support needs to be relatively high under current conditions – between 50%-80% – to ensure the interest of potential beneficiaries (municipalities and the private sector). At the same time, the module on determining the subsidy level considers both **investment costs and savings** that beneficiaries may achieve by using the new technology. For example, the use of the fuel from biodegradable waste will generate operating costs, but will also reduce use of other fuels for heating, like natural gas.

Experience shows this tool has been the main driver in many countries in motivating private and public beneficiaries to allocate their **own financial resources** to purchase new – and more environment- and climate-friendly – equipment or installations. These generally require a higher initial investment (in purchase cost) but entail several future benefits (in this case, cheap biomass fuel).

“Considering the budget constraints in Georgia and the substantial total costs of the programme, it will be challenging for the Georgian public financier (mainly national governments) to cover all these costs by itself.”

TABLE 3. **Summary of public support for the programme**

Programme pipeline	Investment	Estimated public co-financing
Waste to energy	Vine pruning or similar residues for biomass boilers	80%
	Non-wood briquettes or pellets	50%
	Local incineration in biomass boilers	75%
Aerobic composting and anaerobic digestion	Composting bins	50%
	Composting containers	50%
	Bioreactors	50%
	Side investments	Provided by municipalities

Note: Percentage values denote the level of public support in the purchase costs.

Source: OECD calculations, OPTIC model.

However, the rate of financial assistance (subsidy rate) should be set to ensure it leverages rather than replaces beneficiaries' spending. The subsidy should encourage potential beneficiaries to participate in the programme without providing incentives to profit from the subsidy.

In total investments (Phases 1 and 2), almost EUR 16 million will be disbursed annually from both public and private sources – calculated as EUR 130.55 million divided by eight years (two years for the pilot phase and six years for the second phase).

TABLE 4. **SUMMARY OF PROGRAMME COSTS, PHASES 1 AND 2**
(EUR)

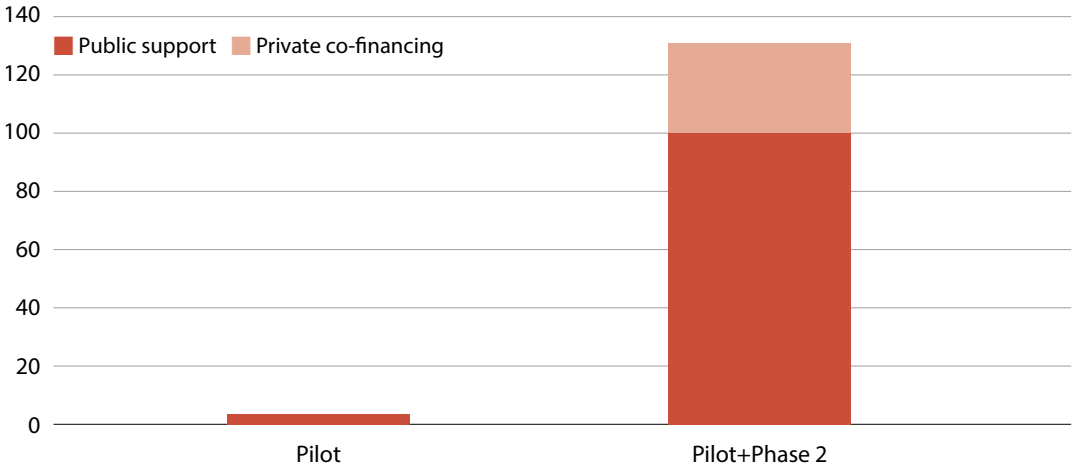
	Overall costs	Total	Public co-financing							
			Year							
			1	2	3	4	5	6	7	8
	EUR million									
Preparation costs (including fundraising)	0.2	0.2	0.1	0.1						
Pilot phase	2.95	1.7	0.9	0.9						
Implementation unit (operating costs)	0.6	0.6			0.1	0.1	0.1	0.1	0.1	0.1
Second phase	130.55	99.9			8.3	12.5	19.8	19.8	19.8	19.8
Total	**131.35**	**102.5**	**1.0**	**1.0**	**8.4**	**12.6**	**19.9**	**19.9**	**19.9**	**19.9**

Source: OECD calculations, OPTIC model.

Co-financing options

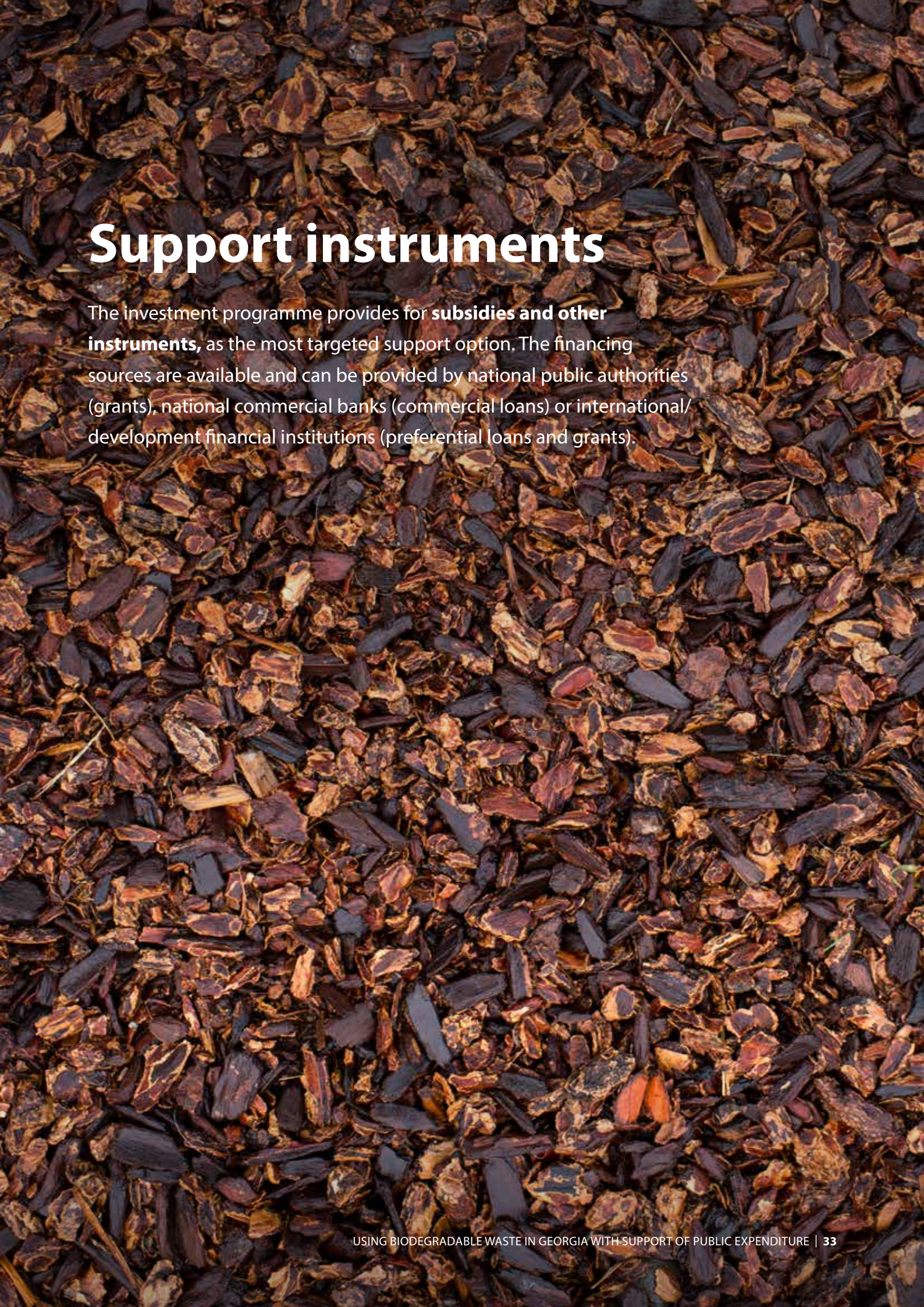
If the reviewed domestic financing sources are accepted, the state budget will be the main source of co-financing and ensure Georgia's commitment to the programme. The Municipal Development Fund of Georgia (MDF) cannot be used directly to provide purchase subsidies (grants) for new equipment under the programme. However, it could possibly finance necessary accompanying measures (e.g. energy-efficiency measures and boilers).

FIGURE 2. **Overview of programme's total investment costs**
(EUR million)



Source: OECD calculations, OPTIC model.

"With respect to financial commitment, the economic analysis demonstrates that public support needs to be relatively high under current conditions – between 50%-80% – to ensure the interest of potential beneficiaries (municipalities and the private sector)."



Support instruments

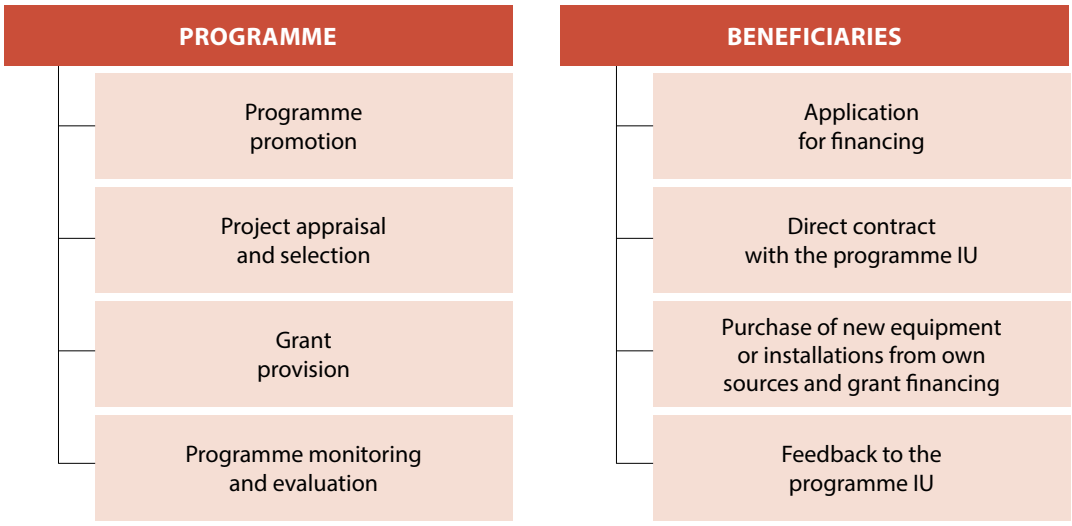
The investment programme provides for **subsidies and other instruments,** as the most targeted support option. The financing sources are available and can be provided by national public authorities (grants), national commercial banks (commercial loans) or international/ development financial institutions (preferential loans and grants).

These public grants and the associated loans aim to **motivate the beneficiaries** – including households, entrepreneurs and companies – to allocate their own financial resources to purchase new equipment or installations. Such an approach generally requires a higher initial investment (in purchase cost) but brings some future benefits (the low cost of biomass fuel).

When calculating the optimal level of public support (subsidies in the form of grants), the programme analysis considers contributory factors such as **lower running costs** (because biomass fuel is less expensive). For these reasons, the programme does not need to be completely grant-financed. It is designed to increase investments without making investments too profitable (or support purchases that would/could take place without public support).

In any case, a robust methodology to estimate investment costs, set the optimal level of subsidy and forecast the expected environmental benefits should be applied. This can make the programme more credible for both national and international public financiers.

FIGURE 3. **Financing from own sources and public grants**

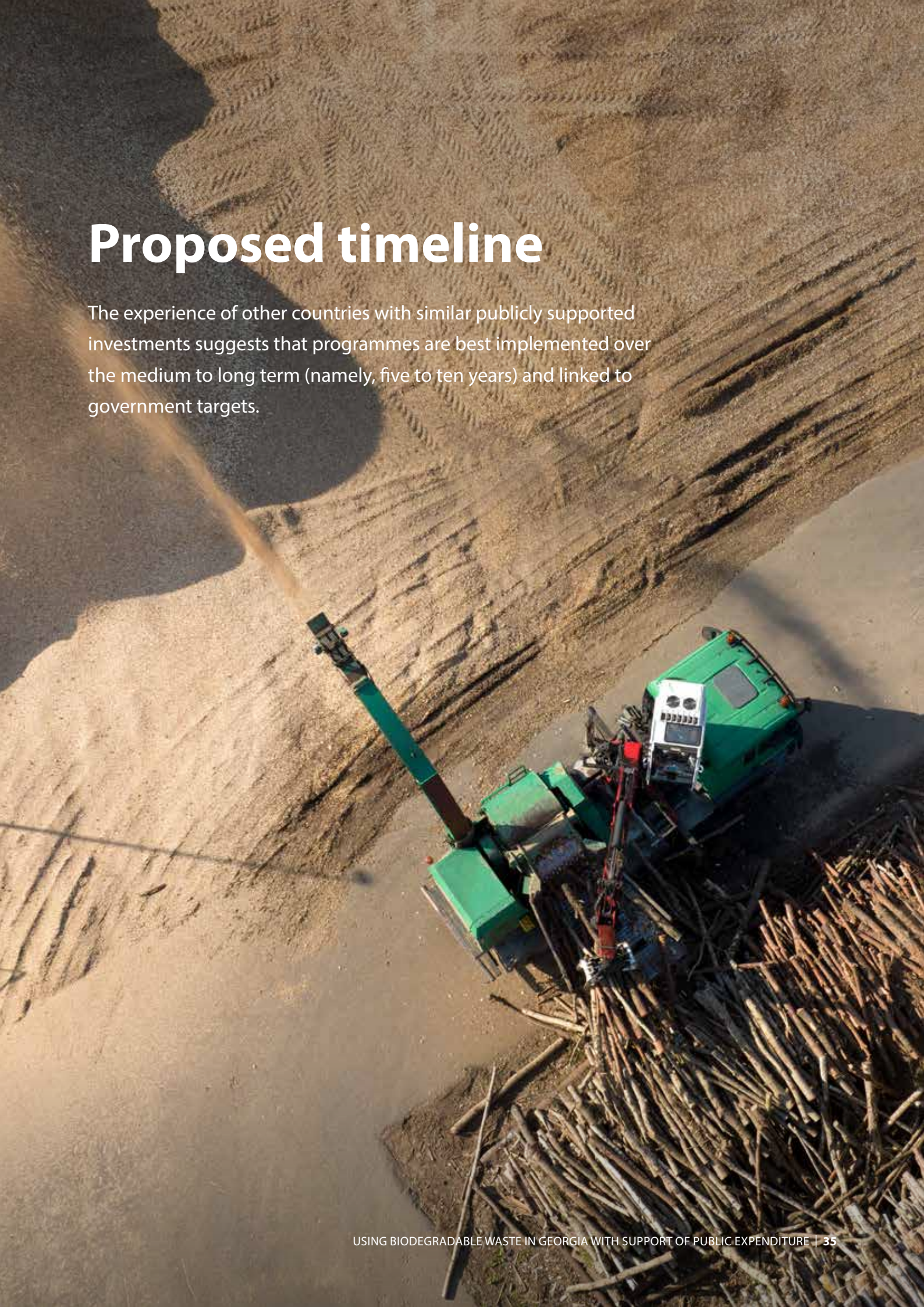


The Implementation Unit (IU) pays beneficiaries in one of two ways:

- Public funds, according to the agreed disbursement schedule, are transferred to the beneficiary, who organises a tender to select a contractor; the beneficiary pays the contractor upon delivery of service and submission of invoice;
- Public funds, according to the agreed disbursement schedule, are assigned to the beneficiary, who organises a tender to select a contractor; the bank pays the contractor upon delivery of service and submission of invoice.

Proposed timeline

The experience of other countries with similar publicly supported investments suggests that programmes are best implemented over the medium to long term (namely, five to ten years) and linked to government targets.



Proposed timeline

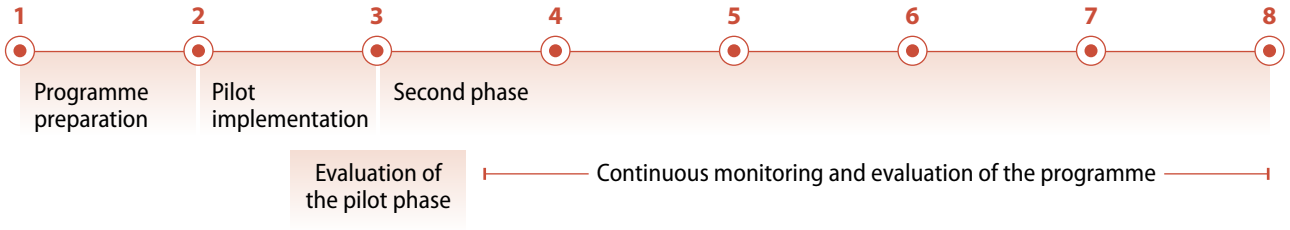
- Given that the programme will be co-financed with public funds, a **preparation period** will be needed before the first phase. This will allow time to include the programme provisions in the state budget process, as well as to identify and apply for funding from additional financing sources (including donors);
- Once project financing is agreed upon, the rollout of the programme will be relatively rapid. The **pilot phase** could thus take up to two years. The results of the first phase will be evaluated to decide whether to continue with the second phase. If it goes ahead, the second phase will be carried out over six years and then reviewed in detail;
- The **second phase** will take about five to six years. In the second phase, Georgia should evaluate the programme annually. After assessing whether the selected and implemented projects are helping to meet government objectives, the government should revise the programme, if necessary;
- A decision can then be made to extend the programme to a **third phase** or to end it, informed by possible new policy objectives and government goals or market developments. This phase could scale up to the full potential of the programme's market analysis and be implemented after 2030.

Annual evaluations of the programme should be conducted to see whether the selected and implemented projects are helping to meet government objectives and to revise the programme, if necessary. The results of the first phase will be evaluated to decide whether to:

- continue with the second phase without any modification;
- continue with the second phase with modifications;
- bring the programme to a close;
- prepare a new programme.

Since the programme is designed to be co-financed through the state budget, any update should be coordinated with the **multi-year budget and its requirements**. On this basis, the government should prepare annual financial plans for financing through the regular annual budget.

FIGURE 4. **Proposed timeline**
(in years)



Institutional set-up

An optimal institutional set-up for the programme's implementation should be selected and mandated. As this is the last step in programme preparation, all elements of the programme will have been clarified at this stage, and a consensus on its priorities reached.

Institutional set-up

Implementing the programme will require institutional arrangements that ensure transparent and cost-effective decision making. For larger-scale, targeted programmes – in particular, programmes that involve financing capital investments, such as this green public investment programme – **special institutional arrangements are recommended**. These special arrangements may take many institutional forms and involve various kinds of implementing units.

The report analyses several institutional options. In most instances, the institutional arrangement for large-scale (investment) programmes includes both a management (implementation) unit and a supervisory body. The institutional set-up proposed in this study includes three levels:

1. **The programming entity (PE)** adopts strategic documents and undertakes strategic decisions, and oversees implementation capacity of the project cycle management.
2. **The implementation unit (IU)** manages the project cycle (project selection, implementation and monitoring) and may also be charged with drafting the programme's operating regulations.
3. **The technical support unit (TSU)** gives specialised assistance, advice and expertise (e.g. in developing programme implementation documents, such as the list of approved technologies and accompanying investments).

The analysis suggests that the **Ministry of Environmental Protection and Agriculture (MEPA)** perform the role of programming entity (PE). The PE as a supervisory body retains the final decision-making authority to approve financing of the individual projects recommended by the implementation unit's technical staff after the appraisal process. It would also approve internal operating procedures and rules (including eligibility and appraisal criteria to guide project selection).

In the Georgian waste management sector, several ministries under the supervision and guidance of MEPA play major roles in developing national legislation and policies, budgeting, co-ordinating a variety of policies, law enforcement, waste accounting, reporting and database management, etc. Inter-ministerial co-operation is thus vital for successful implementation. Such a programme can help increase the profile of the environment and climate on the energy policy agenda.

Since programming is a political process, the responsibilities for programming and project cycle management (PCM) should be separate and distinct from the programming role. An institution with a co-operation agreement with MEPA could implement the programme, for example:

1. the Rural Development Agency, which implements a variety of programmes/ projects initiated by MEPA
2. the National Environmental Agency
3. an NGO (for example, Energy Efficiency Centre Georgia)
4. a local bank or banks selected through public tender, and which would sign a co-operation agreement with MEPA.

Regardless of the choice, the implementation unit should have:

- **a degree of independence** – this would ensure decisions respect rules and criteria aligned with programme objectives, and are not subject to undue political influence
- **capacity for programme implementation** – carrying a programme to completion requires capacity for project selection, implementation and monitoring. This means hiring skilled, trained personnel dedicated to the programme.

The implementation unit may also draft the programme's **operating regulations**, if MEPA so delegates. However, the IU's core role lies in:

- conducting marketing activities for the programme;
- identifying beneficiaries and appraising beneficiaries' project proposals for eligibility;[8]
- providing MEPA information on the planned number of beneficiaries and the programme's financial needs;
- reporting to MEPA on programme spending, so that MEPA can monitor budget implementation for a given year (or programming cycle) and project type (project "baskets").

Promotion, which is essential for success, is the responsibility of the IU. The **promotion package** might include the following elements:

- building awareness among local farmers;
- sending programme information to local administrations and potential beneficiaries;

8. For two project pipelines – local incineration of the biomass boilers and composting bins – there are only a limited number of technology providers. The simplified approach for pre-selected suppliers would thus be best. This is represented by the European Bank for Reconstruction and Development (EBRD) Green Technology Selector (https://techselector.com/georgia-en/).

- distributing programme rules to local administrations and potential beneficiaries;
- maintaining the IU's website with information on rules for awarding grants and application forms;
- issuing press releases.

The **technical support unit** would give specialised assistance, advice and expertise in the areas of production of energy from biodegradable waste and use of biodegradable waste for composting and anaerobic digestion.
Regardless of the type of institutional set-up, programme management should involve an institutional structure and procedures that:

- promote environmental effectiveness;
- embody fiscal prudence;
- use financial and human resources efficiently.

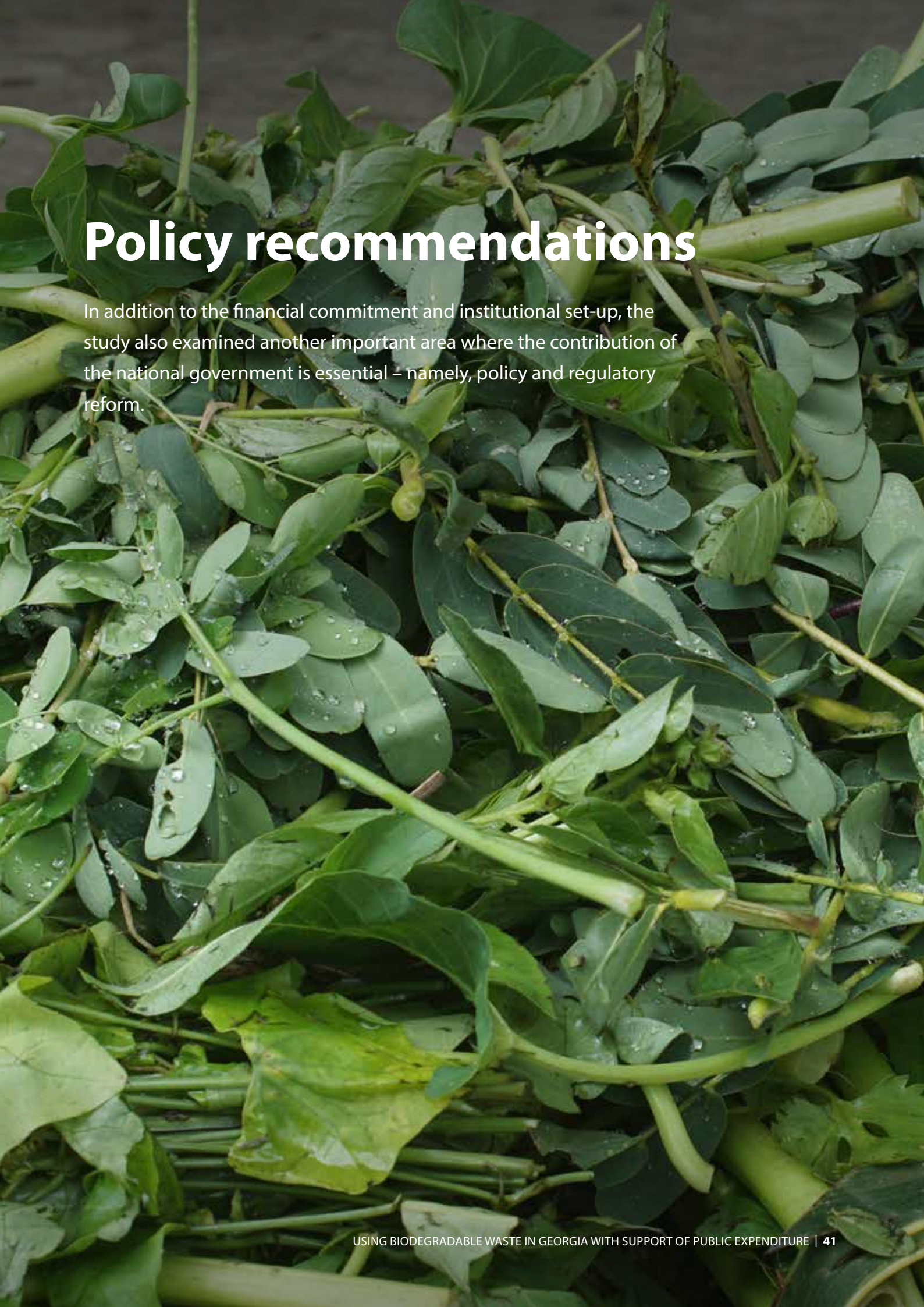
Subsequently, the government needs to ensure that **resources, qualified staff and instruments** are sufficient to implement the programme.

The OECD Handbook for Appraisal of Environmental Projects Financed from Public Funds includes details of all the rules that need to be considered in defining procedures for the programme IU. It could be useful in further defining procedural rules for the programme – see (OECD, 2007).

Deciding which form is most appropriate will generally **depend on a variety of factors**, including, but not limited to:

- sources of finance;
- types of disbursements envisaged;
- legal and political culture of governance.

Programme implementation should strictly apply project sustainability criteria, i.e. when public support is provided, the assets must be used for the assigned purpose for at least five years. This can be imposed on public bodies (municipalities), but a guarantee might also be required from the private entity that will be realised after five years.



Policy recommendations

In addition to the financial commitment and institutional set-up, the study also examined another important area where the contribution of the national government is essential – namely, policy and regulatory reform.

Policy recommendations

1. The programme needs to be **integrated into national policy, strategic documents and respective action plans**, so that input from the programme (i.e. programme costs) can feed into the budgeting process. If the programme is not integrated, the budget can still be finalised, albeit without contributions from the programme;
2. Various regulatory barriers may complicate implementation of even a well-designed investment programme. Therefore, before a programme is developed and financed, the government of Georgia should **review the relevant regulations and eliminate any barriers** to the extent possible.

One of the biggest obstacles for an investment programme in the biodegradable waste sector in Georgia is competition from low energy prices and the low level of enforcement of the proper disposal of biodegradable waste. Combining such regulatory improvements with financial support from the state is more likely to lead to reduction of biodegradable waste disposal or open burning and result in significant environmental and climate-related improvements.

For the same reasons, the programme may face several barriers in the second (scale-up) phase:

1. Competition for wood-based biomass is high. Possible measures include **reduction** of illegal and unsustainable consumption and "social cutting". This situation has a negative impact on the sustainability of forests but will continue if no regulatory changes are carried out;
2. The production costs of wood-based biomass are lower than other types of biomass, such as agricultural residues. **Certification** of biomass can be introduced, giving preference to agricultural biomass. This could be used to encourage the public sector, as well as the energy and cement industries, to use agricultural biomass;
3. **Competition** from cheap and low-efficient wood stoves that mostly use woodchips. More efficient stoves or automatic boilers will use briquettes and pellets that can be produced from wood waste and agricultural biomass;
4. **Competition** from natural gas. Although international natural gas prices are rising and consumer prices are following suit, investment costs for the agricultural biomass supply chain are high;
5. Agricultural residues are not covered under waste management **legislation**, and producers are not obliged to collect and use them sustainably. Thus, their alternative costs are low.

6. Alternative costs of biodegradable waste disposal are low, thanks to uncontrolled and illegal **disposal**. If properly implemented, the costs of biodegradable waste disposal (e.g. waste composted by municipal facilities) will make investments more attractive.
7. Farmers may change their **behaviour** when demand for agricultural biomass increases. Suppliers will increase prices once they realise a market exists for previously unused residues.
8. **Taxation**. Sale of agricultural biomass may raise the problem of income tax, which could reduce suppliers' interest. The universal value added tax of 18% is applied to all fuels, making no distinction between fossil and renewable fuels.
9. The **fragmentation** of agricultural producers will complicate setting up the supply chain. It should start in areas with a high concentration of agricultural biomass and bigger producers.
10. **Low awareness**. Neither the use of bio-waste for energy nor for composting is widely promoted or known in Georgia. This could prove a significant barrier to implementing the programme.

FURTHER READING

EU4Environment (2023), *Using biodegradable waste in Georgia with support of public expenditure: Designing and costing a green public investment programme*, European Union for Environment, https://www.eu4environment.org/app/uploads/2023/10/Using-biodegradable-waste-in-Georgia-with-support-of-public-expenditure.pdf.

OECD (2007), *Handbook for Appraisal of Environmental Projects Financed from Public Funds*, Environmental Action Plan (EAP) Task Force, OECD Publishing, Paris, www.oecd.org/env/outreach/38786197.pdf.

Funded by the European Union

EU4Environment
Green Economy in Eastern Partner Countries

Supported by
Federal Ministry for Economic Affairs and Climate Action
On the basis of a decision by the German Bundestag

Using biodegradable waste in Georgia with support of public expenditure

The green public investment programme for Georgia aims to utilise non-municipal organic waste generated by agriculture, households, food and beverage production. Within EU4Environment, the OECD applied a programmatic approach to create pipelines of priority investment projects that will help the Government of Georgia achieve its environmental and climate-related targets.

The programme will support the partner country to process biodegradable waste that is currently disposed in landfills, illegally burned, or dumped in nature. Using the OECD costing model, the programme calculates the level of funding needed for subsidies to convert waste into energy (biomass, biogas) or compost. This will result in a substantial reduction of greenhouse gas emissions, prevent water and soil pollution and will also encourage private investment in environment and climate-friendly technologies. Notably, government officials and experts in Georgia will be equipped with the know-how and practical skills to design similar public environmental expenditure programmes.

Such programmes are better positioned to successfully compete for both national and international public support, and to leverage the funds necessary to embark upon a greener and sustainable development path.

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