Action Plan for the Sustainable Management of (Residual) Biomass Streams 2015-2020

Summary

The aim of this action plan is to further stimulate the prevention, separate collection and recycling of (residual) biomass streams with a view to cost, (raw) material and energy savings.

This action plan for (residual) biomass streams offers opportunities for the authorities and the industries to jointly shape the sustainable management of (residual) biomass streams in Flanders and implement it over the next years.

What is biomass?

Biomass comprises the biodegradable fraction of products, waste and residues of biological origin from agriculture (including plant and animal substances), forestry and related industries, including fisheries and aquaculture, as well as the biodegradable fraction of industrial and household waste.

What are residual biomass streams?

Residual biomass streams comprise waste and residual fractions of biomass which 1) are not used for the purpose for which the biomass was originally intended or produced, 2) are released and can be mobilised, and 3) for which recovery is desirable; e.g. unsold vegetables/fruit, residual waste streams from the food industry, animal by-products, VFG (Vegetable, Fruit and Garden) waste, wood waste, residual waste streams from the wood industry or streams generated by the management of gardens, parks, verges and banks, nature and landscapes.

Context

There is a strong need for an **integrated, coordinated approach of (residual) biomass streams**, in which all efforts are directed towards the same goal. There is a growing demand for (residual) biomass streams, which are often becoming increasingly scarce, from various applications and sectors. In fact, biomass and residual biomass streams are occupying an increasingly important place in the transition from a fossil-based to a non-fossil-based society. They have become an interesting raw material and, at the same time, streams such as wood, oils and fats, thanks to their high calorific value, are also an attractive source of renewable energy. The question is how the supply of (residual) biomass streams can be increased in a sustainable way and used as optimally as possible in society. In doing so, the various concerns and considerations must be taken into account as much as possible. For instance, there are industries, such as the food, feed and wood industries, which, as a result of their activities, intrinsically depend on (residual) biomass streams for raw materials, as well as industries which have traditionally depended on fossil sources for their raw materials and are now increasingly turning to (residual) biomass streams, e.g. as a more stable source of renewable energy. Concretely, the concerns and objectives of the waste and materials policy, the energy policy, the economic policy and the broader environmental and nature policy when it comes to the use of (residual) biomass streams, which may differ between them, must be weighed up against each other. For instance, the objective of the waste and materials policy is to close cycles and keep (residual) biomass streams in the chain of production and use for as long as possible. The energy policy aims to produce as much reliable and cost-efficient sustainable energy as possible with the (residual) biomass streams. The economic and innovation policy aims to use (residual) biomass streams to stimulate economic activity and sustainable growth.

This is not an easy thing to do. On the one hand, there is a need for guiding principles and agreements, but, on the other hand, there is also a need for more specific considerations and corrections. In addition, the policy on biomass, both in Flanders and in Europe, is constantly evolving.

The drawing up of this plan is included in the actions of the **Flemish Materials Programme,** in the **Flemish vision, strategy and initiative for the action plan of the Flemish Government for a sustainable and competitive bioeconomy by 2030** and **in the 2015-2020 policy document on energy** (see 2.1.1) in order to combine the closing of material cycles and the achievement of objectives relating to the **bioeconomy and Renewable Energy 2020** in a sustainable way and on a win-win basis. It is also connected to other Flemish policy initiatives, such as the New Industrial Policy and the Climate Policy Plan. Finally, the action plan also fits into the European policy developments in the area of resources. The action plan builds on the implementation plan for biowaste (2000) and the implementation plan for wood waste (2003), on the Biomass Inventory (OVAM), the environment analysis (OVAM), and the study on supply forecasts and processing possibilities of residual biomass streams (VITO). The plan was created after intensive consultations with the broad group of stakeholders in the biomass landscape.

Objective

This action plan approaches the main (residual) biomass streams from the Biomass Inventory from an integrated perspective. The action plan aims to:

- coordinate different policy objectives and initiatives which have an impact on the use of (residual) biomass streams;
- clarify the coordinated vision and the policy on (residual) biomass streams and develop them further where necessary;
- clarify the possible and desired uses of (residual) biomass streams as well as the principles on which those choices are based;
- provide an integrated working framework and action programmes for all parties involved in order to jointly implement the sustainable management of (residual) biomass streams in Flanders.

The principles, objectives and actions of this action plan are aimed at creating clarity by giving each application and processing option a place that is as clear as possible and creating a framework for the next 5 years. Based on changing circumstances, new insights or other considerations, the use of (residual) biomass streams for diverse applications can be further refined or adapted. The plan makes clear choices and contains action programmes that are able to ensure a sustainable management over the next five years. In each action programme objectives are formulated for the year 2020. In addition, the plan expresses the ambition to deal with all (residual) biomass streams in a sustainable and integrated way by 2030.

Three cycles

The action plan comprises three material cycles:

- the cycle of (residual) organic waste streams from the agriculture-food-consumer chain;
- the cycle of (residual) streams from green and open space management;
- the cycle of (residual) wood streams from the industry and households.

1. The cycle of (residual) organic waste streams from the agriculture-food-consumer chain

The action programmes for this cycle follow three steps in the chain: prevention, separate collection and material recycling.

Prevention

The objective is to reduce food losses throughout the chain to a minimum by 2020 and to work on this in a structured manner together with all sectors involved.

Prevention of food losses. Action programme 1 includes actions from the 'Chain Roadmap for Food Losses 2020' for the various sectors involved: agriculture, the food industry, distribution, public administrations and citizens, and the hotel and catering industry. The Chain Roadmap formulates a number of objectives and actions to prevent food losses as much as possible and, where they cannot be prevented, maximise their use for **human** consumption.

Home recycling systems. Action programme 2 focuses on the conversion of some of the compost experts into recycling workers, and on actions aimed at home recycling systems.

Separate collection

The aim for 2020 is to collect the (residual) biomass streams that are released separately - despite the preventive actions - in order to make them available for their most optimal use. Action programmes 3 and 4 are aimed at increasing or optimising separate collection in the various sectors involved.

Agriculture, horticulture and fisheries. The partners involved will continue the research and focus on validating the research results for applications such as new harvesting machines, better storage of the harvest, etc.

Food industry. This action programme focuses on research projects on the optimisation of the logistics of the production chain.

Municipalities and intermunicipal cooperation partnerships. This action programme is being developed in the framework of the implementation plan on waste and materials that is being prepared at the local level.

Hotel and catering industry, distribution and canteens. This action programme is being developed in the framework of the implementation plan on waste and materials that is being prepared at the local level.

Material recycling

The Roadmap on the circular economy mentions the following motives for closing cycles: a high-quality reuse of raw materials, the use of nutrients from residual waste streams, the use of bio-based materials, an efficient use of residual biomass streams, and the improvement of energy efficiency. Consequently, these motives have been translated into action programmes for this policy plan.

Nutrient recovery and organic carbon. Action programme 7 further develops the actions mentioned in the summary document on nutrient recovery of the Nutrient Platform. Efforts are also directed at facilitating and stimulating nutrient recovery, among other things by adapting regulations that constitute an impediment, and at continuing research activities.

Bio-based products. In action programme 8 the actions set out in the vision and strategy document on the bioeconomy are implemented in order to stimulate applications of bio-based

products among both businesses and consumers.

Use of residual biomass streams in agriculture/the animal feed industry. Action programme 9 is aimed at, among other things, the use of new or modified by-products as animal feed and the treatment of harvesting residues, etc., to make them suitable as animal feed. The results of the action programme on Alternative Sources of Protein are continuing to be validated.

Use of residual biomass streams via biorefining, in the food industry and in pharma and green chemistry. Via research programmes, action programme 10 focuses on possible uses via bio-refining for the food industry. Among other things, these research programmes focus on dietary fibres, proteins, antioxidants, bioaromatics, biopolymers, etc. The feasibility of some research results as concrete business cases is also an objective within this action programme.

Biological processing and sale. Action programme 11 sets out actions aimed at optimising the biological processing of (residual) biomass streams and the sale of streams. It strives for the coordination and optimisation of the various links throughout the chain. The actions apply to the input streams (quality, regulations), to the processing methods and to the sale (compost, digestate, biomethane).

2. The cycle of (residual) streams from green space, nature, forest and landscape management

The action programmes of this cycle fit into the common objective of maximising the mobilisation of residual waste streams from green space, nature, forest and landscape management, respecting the main functions that have been assigned to each area, and on condition that the biodiversity objectives and the organic content of the soil are not put at risk.

Mobilisation of residual waste streams. Action programme 12 focuses on the mobilisation of residual biomass streams by striving for an unambiguous framework for the management of those residual biomass streams, reinforcing the efforts of the social economy in this management, developing financial support measures to improve the mobilisation of biomass, creating cooperation partnerships with a view to the management of (residual) biomass streams, and striving for a uniform approach of data recording and monitoring on the (residual) biomass streams obtained.

Residual wood streams from forest exploitation and maintenance. Action programme 13 further develops the partial projects of the KOBE project of the Agency for Nature and Forests (ANB) and focuses, among other things, on upscaling the biomass harvest. It also aims to stimulate consultation between the different partners involved at the Flemish level.

Non-woody residual waste streams from the management of nature areas and landscape elements. Action programme 14 is aimed, among other things, on research into the economic impact of different management options for non-woody residual waste streams from nature management, drawing up guidelines for land managers for an optimised management, and setting up a specific practical test of the use of organic material from chopper activities as a replacement for peat in the production of potting soil.

Closing the materials cycle. The actions of action programme 15 are mainly aimed at a sustainable and cost-efficient management of verge cuttings. Proposed actions are providing information about processing possibilities, monitoring and recording collected amounts, the exemplary role of the authorities, etc. It is also being studied whether investment support for biomass hubs is possible, so that the storage of verge cuttings in pits becomes interesting from an economic perspective. Storage in pits is important to preserve the quality of the verge cuttings, so that they can be optimally used for composting or anaerobic digestion.

3. The cycle of (residual) wood streams from the industry and households.

The objective for (residual) wood streams from the industry and households is their sustainable use in material and renewable energy applications.

There are two action programmes.

Sustainable use of (residual) woody biomass streams for green energy and heat production. Action programme 16 works on a balanced assessment framework for wood streams and wood residues, taking into account, among other things, the criteria that exist at the international level, in neighbouring countries, etc. and criteria proposed by stakeholders, such as the MiNa Council and SALV, closely adapted to the support policy for the production of renewable energy.

Primary and post-consumer wood. The objective for 2020 is to use more recycled post-consumer wood waste, e.g. in the production of chipboard, and to subject Flemish class B wood to additional sorting, so that it can be recycled more efficiently. Action programme 17 comprises all actions that have to do with the collection, sorting and sustainable use of primary and post-consumer wood. Concrete actions include: studying which sorting scenarios are possible for post-consumer wood (cost-efficiency, environmental impact, technical feasibility, etc.), how the separate collection of primary wood waste can take place more efficiently, what actions could facilitate the import of wood waste for material recycling. When it comes to regulations, the aim is to create a clear legal framework for the recycling of post-consumer wood waste and preference is given to reviewing the prohibitions of incineration contained in VLAREMA, given the evolution in the possibilities of material recycling that has taken place over the past years.

4. Contribution from (residual) streams to climate policy/renewable energy

The aim of the following action programmes is to direct biomass that is eligible for an energy application (incineration), where possible, towards green energy production and the use of residual heat, and to introduce the concept of carbon storage as a new instrument within the climate policy.

Revaluing recycled residual biomass streams as a carbon reservoir. Action programme 18 studies the policy and legislative possibilities for increasing the role of material recycling as a carbon reservoir within the climate policy. These possibilities are explored both in the existing instruments and in new concepts.

Focus towards green heat production. Action programme 19 focuses on studying ways to direct (residual) biomass streams that are eligible for an energy application (incineration) towards green heat production as much as possible and to optimally use the residual heat produced. It is also studied whether residues from biomass incineration can be used in a more optimal way.

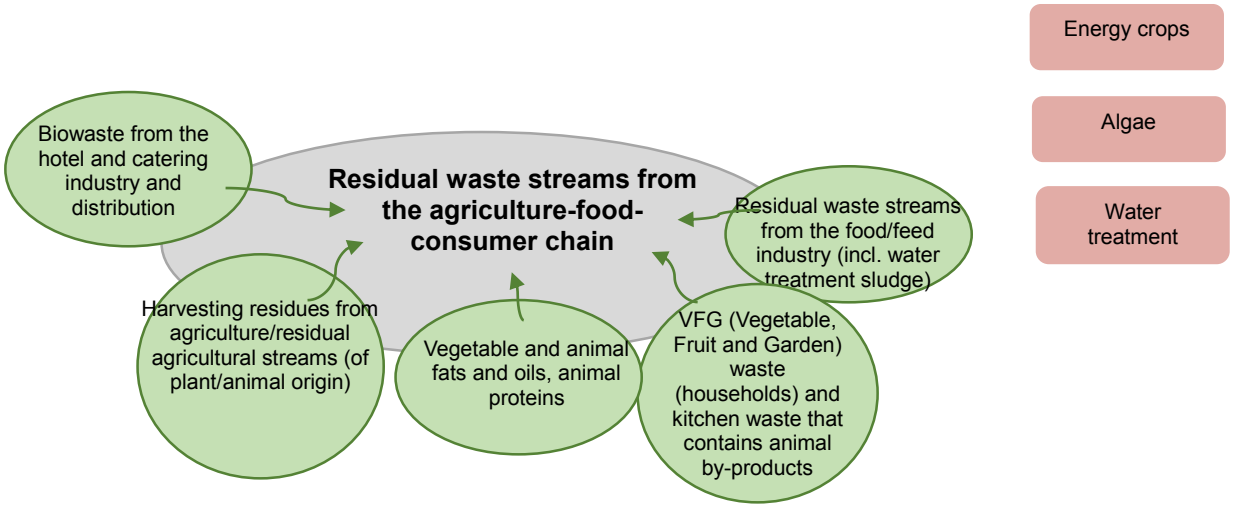
In addition to the action programmes per cycle, the policy contains a number of **general action programmes**, such as the optimisation of the policy framework, an integrated, programmed interaction between the policy on materials and the energy policy, and frequent monitoring of the market for (residual) biomass streams.

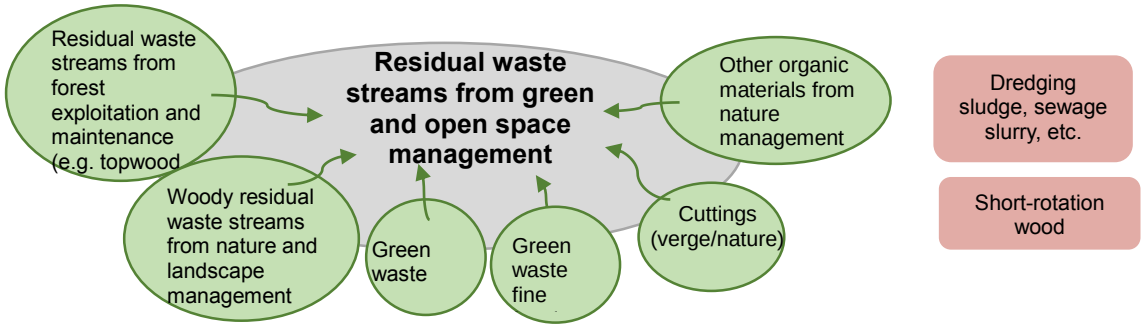
6 Action programmes for three cycles

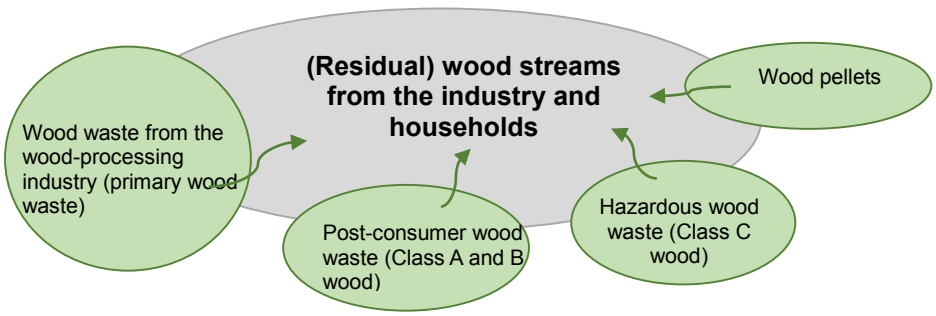
(Residual) biomass streams are generated in diverse sectors. Examples are wood residues from nature and landscape management, food losses in the production chain, harvest residues, industrial residue streams… This action plan is based on material cycles. We will formulate a strategy, objectives and action programmes for three cycles.

1. The cycle of residual organic waste streams from the agriculture-food-consumer chain.
2. The cycle of residual waste streams from green and open space management.
3. The cycle of residual wood streams from the industry and households.

The figures below provide an overview of (residual) biomass streams and the cycle to which they belong. In the pink frames it is shown which streams fall outside the scope of this action plan.







At the stakeholder consultations in the framework of the Flemish Materials Programme roadmap for the circular economy (the part on bio-economy, sector of agriculture and food) it became clear that these are the main motives for closing the cycle:

- high-quality reuse of raw materials;
- use of nutrients from residual waste streams/reducing the loss of nutrients;
- use of bio-based materials;
- efficient and flexible use of residual biomass streams;
- improving energy efficiency.

These motives have been included in the development of the action programmes.

6.1 The cycle of residual organic waste streams from the agriculture-food-consumer chain

6.1.1 Preventing residual biomass streams

6.1.1.1 Strategy

Inefficiency and wastage is reduced in the entire food chain. We make sure that residual organic streams released by agriculture, companies and households are kept as small as possible. We will keep up the current efforts aimed at the prevention of residual organic waste streams in households and companies. Where necessary and feasible, we will further increase those efforts. Residual waste streams that are difficult to reuse or process will be given special attention. To the extent possible, we prevent those streams from being released.

6.1.1.2 What do we want to achieve?

By 2020:

- to reduce food losses to a minimum throughout the chain:

  'The chain and the Flemish authorities are committing to reducing food losses as much as possible throughout the chain (production, processing, distribution, preparation and consumption) and maximising the use of resources, with the cascade of value preservation as a basis and in line with the European objectives.' (from the commitment statement 'Samen tegen Voedselverlies');
- that all companies in the food industry, the distribution sector and the catering industry work together in a structural manner on the prevention of residual waste streams.

6.1.1.3 Action programmes 2015-2020

Action programme 1: prevention of food losses

Over the past years, a package of measures has already been adopted to map food losses, reduce them and use them in a high-quality way. To this end, the Flemish authorities and the various links in the agro-food chain have worked together closely. The priorities of the package of measures are:

- cooperation;
- sectoral measures in the primary sector, the food industry and the hotel and catering industry;
- putting food surpluses to use from a social perspective;
- creating awareness among consumers;
- discussion and cooperation at the international level;

- research and monitoring;
- internal functioning of the authorities.

The **Interdepartmental Working Group on Food Loss** (IWV) coordinates the work. At the end of March 2014 a report on performed and ongoing measures was submitted to the Flemish Government (for a short overview: see background document on (residual) biomass streams). For more information on the Interdepartmental Working Group on Food Loss, see http://www.vlaanderen.be/landbouw/voedselverlies.

At the end of March 2014, all links of the chain (agriculture, processing, distribution, hotel and catering, consumers) and the Flemish authorities drew up a joint **commitment statement** 'Vlaanderen in Actie: Samen tegen Voedselverlies' aimed at continuing the efforts directed at reducing food loss in society. Based on this statement and the efforts already made, the members of the Flemish Chain Consultation on Food Loss (Flemish authorities – IWV, Boerenbond, Fevia Vlaanderen, Comeos Vlaanderen, UBC, Horeca Vlaanderen, Gezinsbond) have, in consultation with the stakeholders, drawn up a 'Chain Roadmap on Food Loss 2020', which they approved on 1 April 2015. This roadmap formulates objectives and actions to prevent food losses as much as possible and, where they cannot be prevented, maximise their use for **human** consumption.

The commitment statement comprises a few priority actions, which constitute the basis for a joint approach:

- building a **robust knowledge base**: collecting data, continuing cooperation in order to map the problem (food losses, causes, best practices, innovative cooperation partnerships, etc.);
- **increasing awareness** in all links of the chain;
- striving for a sustainable partnership with **social initiatives that are active in the area of food aid**;
- **involving consumers**.

The parties signing the statement call on all companies and organisations in the chain, as well as all social stakeholders, to subscribe to the statement and take action to prevent food loss based on the cascade of value preservation.

For more information: http://www.vlaanderen.be/landbouw/voedselverlies

These actions (the overview is non-exhaustive) can be set up, continued or further developed by the sector in question in the framework of the roadmap on food losses: (*actions in the framework of the roadmap will be completed based on the chain consultations on food loss*).

1.1. Actions for the prevention of food losses in agriculture

- Recommendations for the reduction, where necessary, of production losses in **arable farming and horticulture**.
- In fisheries, priority is given to the prevention of e.g. undesired bycatch through selective fishing.

1.2. Actions for the prevention of food losses in the food industry

- Continuing the **audit and awareness programme of Fevia** in companies in order to further reduce the loss of residual waste streams. As a part of this, e.g. production errors causing product loss are reduced. Fevia, in cooperation with Flanders' FOOD and the companies, is working out concrete action programmes;
- Taking into account the **entire chain** when reviewing existing and designing new production processes;

- Designing a **plan for the use** of all residual waste streams in the processing industry of agricultural raw materials, the food industry, bio-fuels, etc.;
- Improving the storage of food products further down the chain through **innovation** (intelligent packaging, protected atmosphere packaging, active packaging that provides accurate and clear information about the use-by date at that moment, etc.)**in cooperation with the packaging institutes**. Continuing the research into the life cycle impact of packaging, including their effect on food losses (cf. 'Factory of the future – food' project);
- Improving the logistical capacity and quality assurance of **food banks, social shops and similar initiatives**, so that more food reaches consumers through those channels.

1.3. Actions for the prevention of food losses in the distribution sector

- Mapping the **amounts and destinations** of food losses in the distribution sector;
- **Adapting supermarkets' purchase policies** better to sales. Encouraging supermarkets to find markets for products that are not sold in time (e.g. food banks).

1.4. Actions for the prevention of food losses caused by public administrations and citizens

- Reducing food losses via **purposeful actions directed at citizens**:
    - Actions integrated into the **home recycling systems** (action programme 2);
    - Informing consumers about the **use-by date information** on food products as well as producers. Encouraging packaging and distribution companies to make use-by date information clearer and communicate it better;
    - Informing consumers about how to **adapt their purchasing and consumption behaviour** in order to prevent wastage.
- Concrete actions: OVAM project on packaging, LNE pilot project for consumers (distributing clear information to consumers via various links in the chain), theoretical information sessions and practical sessions by Vlaco about reducing food loss, via recycling systems, social media, etc.

1.5. Actions for the prevention of food losses in the hotel and catering industry

- Implementing cost-saving measures to adapt the **supply** better to the **demand**. **Improving the storage of food products** (refrigerator temperature, packaging...).

1.6. Prevention of food losses in case of peaks in supply

Sometimes the food chain is faced with unpredictable situations, boycotts or sanitary problems. In such cases, large amounts of food products may be released in a short period of time. It is often impossible to accommodate these within the normal commercial market. Hence, some Government control is necessary. Peaks in supply must be managed respecting the cascade as much as possible, to the extent feasible from a technical and economic perspective.

Such situations require a smooth and firm approach. This action comprises the development of a scenario that can serve as a guide. The scenario will be prepared in 2015 in consultation with the industries concerned and federal and regional administrations. The scenario will be based on the cascade principle and the legal framework: residual waste streams will first go to human consumption, then to animal feed, composting/anaerobic digestion, use as a soil improver, and as a last step to incineration or landfilling. In part, this action is connected to the activities of the Interdepartmental Working Group on Food Loss, but it also comprises a lot of measures aimed at collection and processing that fit into action programmes 3 to 11.

Action programme 2: home recycling systems

The study on home recycling systems (OVAM, 2012) has shown that waste prevention and home recycling systems of VFG and green waste in households are becoming increasingly

important, both from an ecological perspective and with a view to the reduction of the amount of household waste. The purpose of these actions is to further improve the existing home recycling systems:

- Volunteers as ambassadors of the biological cycle

The compost expert functions have made an important contribution to the achievements when it comes to the prevention of biowaste. Times change, the policy has undergone a transition from home composting to garden recycling and new concepts and topics, such as urban gardening, the reduction of food loss, etc. In order to continue adapting to new trends and developments in society, efforts are being dedicated to home recycling systems, where **compost experts and recycling workers** play an active role providing visibility to the biological cycle. The top-down information model to convince citizens is linked to an activation model.

- Improvement and reinforcement of communication.
- Communication materials are kept **up-to-date**.
- Organisation of two major annual events: the **recycling weekend** and the **recycling fe(a)stival**:
    - Via the organisation of an annual **weekend of the biological cycle**, the recycling message is given increasing visibility via local actions, also among the general public.
    - The organisation of a biennial biological **recycling fe(a)stival**, with lectures, workshops and demonstrations, intended for the professional sector, garden owners, citizens who do not have a garden, recycling teams and recycling workers.

The actions are directed at all citizens, regardless of whether they have a garden.

- Further development of the network of home recycling systems.

  This can be done e.g. by further developing the cooperation partnerships with **social organisations** (see overview of partners in the overview table in Chapter 9), through permanent **training** of teachers and permanent **research** into the effects and further needs.

The local administrations also support the compost experts and the evolution from compost experts to recycling workers, and give the food and green cycle a central place. Via Vlaco the intermunicipal cooperation partnerships co-finance the assistance with and the development of the recycling principle. The Public Centres for Social Welfare are involved in social initiatives related to food loss, such as the creation of social grocers and social restaurants. The role taken up by municipalities and intermunicipal companies in the promotion of home recycling is very much present in the daily lives of their inhabitants: the purchase of compost boxes and composting bins, group purchases of chickens, all kinds of advice on garden recycling, information provision and awareness campaigns on food loss, etc.

6.1.2 Separate collection of residual biomass streams

6.1.2.1 Strategy

Through separate collection we make residual biomass streams available for their most **optimal use**. Via separate collection combined with proper quality assurance, we generate **clean residual streams of biomass,** VFG waste, green waste and residual biowaste, with as little contamination and as few foreign substances as possible, which can be given a use in the next step. The European Commission also recognises this in its proposal for amendment of the Waste Framework Directive (2014). In this proposal, the Commission states that Member States should collect their biowaste separately by 2025.

The chain will only be closed when **products from biological processing** are recovered. Efficient separate collection is also becoming increasingly important for the bio(-based)

economy, because raw materials are generated via recycling (biological processing). This leads to the production of valuable end products, which can replace scarce raw materials. As a result of the ethical discussion about the use of primary biomass (agricultural crops) for non-food applications, among other things, other biomass streams are gaining importance. Here as well, there is competition between reuse for animal feed and for non-food and feed applications such as energy or industrial applications. In order for a residual waste stream to be eligible for use in the industry, **supply and purity** are important aspects.

The presence of bio-based products in the waste chain can have an influence on the quality of sorting and recycling. That is why, when introducing bio-based materials into the economy, their impact on the material cycle in which they will end up must be taken into account.

6.1.2.2 What do we want to achieve?

By 2020:

- to collect more residual biowaste streams **in agriculture**, concretely streams with the greatest chance of causing environmental nuisance (leaching of nutrients, odour, etc.), to increase their possible reuse;
- to optimise the collection of residual biowaste streams in the food industry;
- for the remaining links in the food chain, objectives will be formulated in the draft Implementation Plan on Waste and Materials that is under preparation.

6.1.2.3 Action programmes 2015-2020

Action programme 3: separate collection for agriculture and horticulture and fisheries

Putting research results to use in feasible applications and best practices, such as:

- Research into the **obligation to bring the bycatch ashore** for further processing and research into undesired bycatch in fisheries.
- Putting research into **new harvesting machines** to use in practice, to enable farmers to simultaneously collect the crops and the harvesting residues. First of all, the intention is to collect harvesting residues that result in a loss of nutrients if they stay on the field (e.g. cauliflower leaves).

  Carrying out **pilot and demonstration projects** on the harvesting and storage of secondary agricultural streams, including all kinds of aspects of biomass logistics.
- Long-term research into the effects of the use of residual waste streams on, for instance, the **organic content of the soil**. In this context, attention is paid to maintaining the organic content of the soil.
- Research into the **stabilisation of harvesting residues** via storage in pits/acidification… in order to increase the possibilities of high-quality use afterwards.
- Research into **better harvest storage**, where still possible.

Action programme 4: separate collection for the food industry

- Setting up projects to support companies with a view to an **optimisation of the use and logistics** of residual waste streams. Awareness is created among companies by means of articles, newsletters, info sessions, etc., in order to reduce the amount of residual waste as much as possible. For the waste streams that are generated, efforts will be made to ensure that these are (re)valued in a high-quality way. The existing channels to achieve this will be further optimised.

- Research into the feasibility of separate collection and the use of specific animal by-products with a view to their use in animal feed, cf. action programme 9.

Action programme 5: separate collection from households

- This action programme is being developed in the draft implementation plan that is being prepared for household waste and equivalent industrial waste.

Action programme 6: separate collection for the hotel and catering industry, distribution and canteens

- This action programme is being developed in the draft implementation plan that is being prepared for household waste and equivalent industrial waste.

6.1.3 Material recycling from residual biomass streams

6.1.3.1 Strategy

Animal feed. A large portion of the vegetable and animal components that are not suitable for human consumption have been used in the **animal feed industry** for a long time, and are an economically interesting alternative to (imported) primary biomass. This way, the use of residual biomass streams contributes to a more sustainable use of agricultural land. The sale can take place both directly and indirectly (e.g. after heat treatment, unpacking, via conversion with insects, etc.). The legislation on food safety also plays a role here. The use of certain residual biomass streams as animal feed is limited by the strict application of the Animal By-Products Regulation, the federal obligations of HACCP, traceability, etc. Under very strict conditions, permission can already be obtained from FASFC for the production of species-specific animal meal for aquafeed. Other possibilities for use in animal feed are currently being assessed at the European level. A positive assessment will have a favourable effect on material recycling.

The policy on renewable energy and the processing of fertiliser is pushing certain fermentable waste streams towards **anaerobic digestion facilities**. As (residual) biomass streams are also gradually becoming more interesting to the bio-based industry (as a source of carbohydrates, proteins, fats and fibre), the use of a number of residual waste streams is shifting between animal feed and anaerobic digestion, depending on the economic added value. The policy must strive for an optimal solution that offers perspectives for a **combination of sales channels**. In this context, a lot is to be expected from **biorefining**, which allows for residual waste streams from bio-based industries to still be used as animal feed.

Industrial raw materials. In green chemistry, residual biomass streams are a sustainable and strategically interesting substitute for fossil resources. Residual biomass streams can, on condition that their quality is good, be used as a raw material for recycling or as an auxiliary material for other recycling processes. Especially residual biomass streams that **are homogeneous, of a high quality and available in sufficient amounts, and can easily be collected and stored**, are eligible for use in the industry (e.g. damaged vegetables and fruit, other food products, etc.).

An increasing number of companies are setting up cooperation partnerships, in which they exchange residual waste streams and give them a valuable use. The pilot project Symbiose (2012-2014), the VISIONS project, the European project Arbor and the MIP project DuPoCo, Syneco, etc., are examples of this.

We try to keep bio-based materials within the biological cycle as much as possible, and limit losses to the extent possible. When for specific reasons (quality, properties, …) we are unable to keep bio-based materials within the biological cycle, we integrate them into other, non-biological cycle systems as much as possible, always respecting the processing hierarchy.

Organic matter and nutrients. Soil improvers and fertilisers produced from residual biomass streams contribute to the preservation of the **fertility of the soil** and the **production capacity** of the Flemish soil. Maintaining the organic content of the soil is important for a good soil structure, the soil food web, water and air permeability and a good water storage capacity, and

hence the prevention of soil compaction, soil sealing and soil erosion. Maintaining fertility is important in order to be able to continue answering the need for food and raw materials for a bioeconomy. This way, the streams released locally can be used locally, replacing imported primary raw materials, or they can be exported.

For soils with a **lower organic content** the following choice must be considered: collecting harvesting residues with the harvest and replacing them with sources that are richer in organic matter, or leaving them on the land and working them into the soil to improve the fertility of the soil. By maintaining organic matter within the cycle and via carbon storage the soil contributes to reaching the climate targets and maintaining fertile soil by reducing erosion. Organic matter also plays an important role for climate adaptation: drought stress, better infiltration, etc. Thanks to better harvesting techniques and a wider range of possible uses, the direct application of harvesting residues and production waste on the soil will decrease. Here as well, materials with a high organic content offer a valid alternative.

Digestate is increasingly removed and taken to manure processing plants for further treatment. This way, the cycle for biowaste is not closed.
The processing of digestate by means of biological processes still leads to too much **nutrient losses**, concretely as a result of the breakdown of nitrogen during the nitrification/denitrification process. This processing method must be eliminated where possible. Instead, there is a need for new techniques that do guarantee the effective recycling of the nitrogen content of manure and digestates. This implies, in the first place, that the manure policy must be redirected: more recovery instead of disposal. This change requires a gradual transition, because the manure processing industry does not have any valid alternatives to biological processing in the short term. That is why, in consultation with the sectors concerned, by 2020 a realistic but ambitious **path for the future** needs to be designed, which tackles the existing obstacles (legislation, profitability of technology), provides investment security for operators of existing plants, and creates room for the new innovative technologies. In 2020 an assessment will be performed, which should indicate whether the elimination of biological manure processing after 2020 is feasible.

The **closing of the cycles of nitrogen, phosphorus and other nutrients**, via a well-planned use of the end products of composting, anaerobic digestion and other methods for nutrient recovery, contributes to an efficient and productive system. The mixed feed industry continues to work towards, among other things, an efficient use of nutrients in the feed. Examples are the adaptation of the phosphorus and nitrogen content of the feed to the needs of the animal (low-nutrient feeds, phase feed, etc.) and the use of the enzyme phytase and various types of amino acids in the feed. The efforts related to phosphorus recovery help reduce the consumption of primary phosphorus. To this end, there is intense cooperation with all stakeholders involved.

In order to guarantee the preservation of organic carbon, a **prohibition of incineration** continues to exist for end products of composting or anaerobic digestion of biowaste and manure.[1] The thermal conversion of organic carbon to e.g. Biochar is leading to disappointing results. Therefore, this end product cannot be considered an equivalent alternative to compost or digestate.

Contribution of fermentable residual biomass streams to renewable energy. Fermentable residual biomass streams contribute to the simultaneous achievement of the objectives for renewable energy and materials in the following ways:

- Through efforts in favour of the **anaerobic digestion of wet residual biomass streams**. The anaerobic digestion of VFG waste and industrial biowaste with production of biogas and continued composting where necessary result in a better CO_2 balance than the incineration of such waste. This is because in the case of anaerobic digestion, in addition to fertilisers and soil improvers, biogas is produced. The anaerobic digestion technique to be chosen depends on the input stream. For a wet stream from the food industry, wet

[1] Except for the woody sub-streams from VFG and green waste composting and end products which are not suitable for use as a soil improver/fertiliser due to their non-compliance with VLAREMA.

anaerobic digestion is the recommended processing method. Drier VFG waste is preferably processed by means of dry anaerobic digestion, with continued composting for hygienisation reasons.

- Making **optimal use of the available infrastructure**. In order to increase the yield of the investment of public money, better use must be made of the existing available anaerobic digestion infrastructure. Where input streams are concerned, attention is paid to occasional residual waste streams (e.g. lots which cannot be used for human consumption or animal feed due to sanitary measures or economic problems with their sale). According to VLAREMA and the BAT for composting/anaerobic digestion, the waste status determines the processing facility. By using a combination of different processing and continued treatment techniques (the know-how for this is widely available in Flanders), a varied offer of end products is put on the market, with possibilities in different market sectors and the potential substitution of a range of primary raw materials.
- Optimal **use of the various end products**. The sector continues to focus attention on integral chain monitoring and the quality assurance system, with a view to an optimal use of the various end products (compost, digestate fractions).
- Making the **conversion of energy** from residual biomass streams more efficient, and using the heat for materials and energy. In order to increase the profitability of anaerobic digestion, research and projects are used to achieve the right mix of end products (digestate, heat, biogas, electricity) necessary.

6.1.3.2 What do we want to achieve?

By 2020:

- **to spread less production waste in agriculture** because of nutrient leaching. Solutions are being sought in order to give a high-quality use to residual waste streams from agriculture that are not being used yet, and, at the same time, keep a sufficient amount of organic matter in the soil by applying soil improvers;
- to use residual biomass streams as feed for alternatives, such as **insects and algae**. In turn, these are converted into proteins and other nutrients for animal feed in order to cater for the growing demand for raw materials;
- that companies in the food industry consistently work on **putting to use residual waste streams from production, distribution and catering** in the best way possible. In this context, the industry should, in the first place, look for possible uses within the food industry. **Bridge** – a public-private partnership between the European Commission and forty European companies and clusters – proposes the following target: a 15% increase in the use of underused residual waste streams by 2020, and a 25% increase by 2030;
- to achieve the following **percentages** of the amounts collected through processing, at the latest by 2020:
    - for vegetable, fruit and garden waste: 95%;
    - for household and industrial green waste: 95%;
    - for industrial biowaste: 90%.

This implies that the monitoring of the high quality of the input material is continued in all collection areas, as a result of which the contamination percentage does not exceed 5-10%.

- to further optimise the **integral chain monitoring** of the residual biowaste streams;
- to (partly) convert some composting facilities for VFG waste to allow for **anaerobic digestion with continued composting**, cf. sub-objective renewable energy;
- to contribute to renewable energy objectives via **anaerobic digestion of wet residual biomass streams** from companies;
- to facilitate the **use of nutrients from residual waste streams** (sludges, digestate fractions …) and the **marketing of recovered nutrients and organic carbon**;
- to optimise the processes and sale of various **end products of anaerobic digestion**;

- to make it possible to inject **green gas** into the natural gas network or use it as fuel for transport.

By 2030:

- that agricultural companies make optimal use of the potential of residual biomass streams. Manure and biomass are **converted into phosphorus, nitrogen, carbon, water and residual heat in a profitable way** via flexible modular routes – in the first place for the producers' own use. In addition, various (combinations of) residual waste streams are given a high-quality use in the feed, chemical and pharma industries. The separate collection of those residual biomass streams can help achieve their high-quality use via the cascade principle (from: roadmap on the circular economy – residual biomass streams in agriculture and the food industry);
- **to make optimal use of** residual biomass streams from the food industry that are not yet being used optimally e.g. taking into account the cascade principle and using Best Available Technologies.

Based on the roadmap on the circular economy – residual biomass streams in agriculture and the food industry, the main opportunities lie in the following:

- the use of biomass/biomass nutrients, CO_2 and water for the **cultivation of algae and the breeding of insects**;
- the conversion of residual streams of plant origin into (specific) **proteins for animal feed**;
- the conversion of specific components into **high-quality applications** such as bio-aromatics, special glues and coatings …;
- the use of specific components of animal and vegetable waste for **cosmetics and medicines**;
- the recovery of phosphorus, nitrogen and other minerals for **chemical fertilisers**;
- the **distillation of basic chemicals** (alcohols, acids, etc.) for the chemical industry.

The action programmes for 2015-2020 mentioned below set out the path for these processes.

6.1.3.3 Action programmes 2015-2020

Action programme 7: nutrient recovery and organic carbon

- Continuation of the actions described in the summary document on nutrient recovery of the Nutrient Platform, including:
  - mapping the demand for **recovered nutrients**;
  - defining a realistic quantitative objective for the **recovery of nutrients from organic matrices**;
  - drawing up an action plan in order to **better market** recovered nutrients and organic carbon;
  - **carrying out demonstration projects** on nutrient recovery.
- Facilitating and stimulating nutrient recovery in Flanders, e.g. by **adapting legislation that presents an obstacle** (Manure Decree, Regulation on Fertilisers, Nitrate Directive, VLAREMA, the feed ban, i.e. the ban on the use of animal proteins in animal feed, Royal Decree on Trade in Fertilisers and Soil Improvers).
- Continuing research into **alternative technologies** for the recovery of nitrogen/phosphorus from end products of anaerobic digestion.

Action programme 8: bio-based products

Performance of actions included in the vision and strategy document on the bioeconomy:

- **Mapping and stimulating** demand for bio-based products and materials. Making recommendations for the creation of a market for bio-based products. Government bodies play an important exemplary role via green public contracts.
- **Stimulating SMEs** to develop, use or offer bio-based products.
- Working on **creating awareness among consumers** (citizens, companies, authorities) about bio-based products and the bioeconomy in general.

Action programme 9: use of residual biomass streams in agriculture/the animal feed industry

- **Appreciation as feed** of new or modified by-products from the food industry and bioenergy production (e.g. based on oil-rich seeds, grains, beets) and surplus vegetables and fruit, so that they can be optimally used in feed for ruminants and feed for pigs and poultry. In this process, feed-related technical, economic and ecological aspects are taken into account.
- Treatment of **harvesting residues of vegetables** (e.g. sprout stalks, cabbage leaves) to make them more suitable for use in pig feed.
- **Bioconversion of organic residual streams** (e.g. vegetables and fruit that are not/no longer suitable for human consumption, but also pig manure) with black soldier fly larvae. The larvae can then be used for the extraction of certain components (protein, fat, chitin) as well as for feed for fish, pets, and possibly poultry.
- Use of the results when it comes to the use of residual biomass streams as animal feed from the **action programme on Alternative Sources of Protein** (2011-2015). The action programme on Alternative Sources of Protein has been drawn up by the animal feed industry and the Flemish authorities for the period 2011-2015. The clear objective of the action plan is to optimise and promote the use of the existing sources of protein of animal or vegetable origin in Europe. In addition, the dependence on the import of sources of protein from outside the EU must be reduced. This could offer concrete advantages by boosting biodiversity, when it comes to the environment (good nitrogen balance, better crop rotation, preservation of the soil structure), a high level of food safety (guaranteed by the production within the EU), employment, food self-sufficiency, etc.

  Animal meal for animal feed will be permitted again under very specific conditions, the animal meal in question must come from processors with specific accreditation for this and from a traceable production, cf. action programme 4.

Action programme 10: use of residual biomass streams via biorefining

10.1: Biorefining of residual biomass streams for use in the food industry

- Research into the use of residual waste streams via **biorefining for the food industry**

  For residual waste streams from agricultural companies and the agro-food industry with potential for use in the food industry and which can be collected separately in sufficient amounts (e.g. vegetables and fruit rejected based on quality specifications): continuation of research at lab level in direct interaction and continuous consultation with the agricultural and horticultural sectors and the food industry. In the research specific attention will be paid to wet residual streams which, on the one hand, are highly perishable, but, on the other hand, have potential for a high-quality use (e.g. residual vegetable and fruit streams). The involvement of all stakeholders from the agro-food chain from the start of the research process is very important in order to adopt a market-driven approach as much as possible and map all potential bottlenecks as soon as possible (technical, legislative, economic, logistical…).

Concrete lines of approach are biorefining of overproduction/residual streams from tomato cultivation[2], forced chicory roots[1], use of residual streams from the vegetable and fruit-processing industry (focus on pectin extraction)[3], use of residual streams from cauliflower cultivation for the processing industry[4],...

The focus of the research can be on food fibres, proteins and health-enhancing components such as antioxidants in order to allow for a high-quality use.

- Performance of **pilot biorefining projects** on a semi-industrial scale

  Upscaling of innovative research performed at a lab scale to a semi-industrial scale in order to be able to properly determine the technical and economic feasibility of selected research cases. Specific attention will be paid to the development of mobile processing units. The conversion of vegetables and fruit that are not suitable for the fresh produce market and of production surpluses into juice is a case which will be further developed. Mobile units for pressing residual biomass streams in an oxygen-free environment are close to the use in industrial practice. At the same time, certain obstacles that have been identified must be removed in order to be able to achieve successful business cases. This could refer to research cases identified in Flanders or involve the implementation of chains developed in other European countries (e.g. use of residues from vegetables such as leeks, sprout stalks, implementation of biorefining of grass, biorefining of tomato leaves, etc.).

- Demonstration projects and **communication** for and by the industry

  In order to accelerate the implementation of possible uses of innovative residual biomass streams in the food industry, demos of **successful projects at company level**, among other things, are of great importance. These activities, together with specific communication activities, can create a learning and multiplying effect by stimulating the urge to innovate among other stakeholders.

10.2: Biorefining of (residual) biomass streams for use in the pharma and green chemical industries

- Intensive research together with the chemical industry on the use of residual streams from agriculture, the agro-industry, etc., such as maize straw, tomato leaves or grass (cultivated), material from auctions... for the production of **applications in the chemical industry**, such as:
  - PLA/bioplastics and detergents;
  - proteins;
  - fibres for integration into packaging cardboard and textile production;
  - basic raw materials such as acids and alcohols for the chemical industry;
  - bio-aromatics, biopolymers.

It is expected that the use of residual biomass streams for green chemistry will remain fairly constant over the years, as food companies are improving their processes for reintroducing these streams into the food chains in a safe and profitable way.

- Attention continues to be paid to the extraction of **specific higher-quality components** of the 'input streams'. For years, components that are antibacterial, anticarcinogenic, lower blood pressure or thin the blood have been extracted from pig and cow blood. Skin, hair and feathers can serve as a source for biodegradable polymers (OVAM, 2014). End products with a higher added value can also be obtained from residual streams of plant

[2] Research case in the GENESYS project (2012-2016)

[3] Ongoing Flanders' Food Project NoWaste

[4] Coöperatief Plus project submitted in the context of project call Flanders' Food 2014

origin. For instance, there is a growing demand for nutraceuticals and pharmaceuticals derived from natural products.

Action programme 11: Biological processing and sale

- **Integral chain monitoring** has been the basic principle for biological processing and sale in Flanders for years. Practice has shown that a solid system in the field leads to results. The coordination and optimisation of the different links in the chain require solid experience in the field and a fair amount of pragmatism, given the diverse European, federal and Flemish regulatory developments.
- The use of **organic soil improvers** also ensures a higher added value, through the preservation and improvement of the fertility of the soil, improved disease resistance and water management, a higher yield and a more stable soil structure. Via composting and anaerobic digestion quality soil improvers and organic fertilisers (compost and digestate products) are produced. These can help boost the carbon content in the soil. Moreover, they are produced locally and can replace imports of scarce primary raw materials (e.g. peat in potting soil). The high stable organic content makes compost unique. Nevertheless, the Manure Decree currently imposes significant limitations on (among other things) the use of compost in agriculture. This must be remedied if we want to put the carbon in the soil to use.

11.1: Acceptance of input streams

- The closing of the cycle will depend on the **quality of the input streams**. On a regular basis new (residual) industrial streams are made available, sometimes contaminated, sometimes not, some of unknown origin, from within and outside Flanders. Acceptance criteria, based on risk classes, determine which (residual) biomass streams can be used or processed into soil improvers or fertilisers. Dilution is not permitted under Article 4.4.2 of VLAREMA. In the case of dilution individual streams which do not comply with the acceptance criteria separately are combined in order to be used as a soil improver or fertiliser. If the streams do not comply with the regional and/or federal regulations, they must be incinerated with energy recovery, possibly after pretreatment. This processing method is only permitted for streams which do not comply with VLAREMA and streams which cannot be used as/for the production of soil improvers or fertilisers for other legal reasons.
- Use of (residual) biomass streams via **use as energy**. In 6.4 an overview is provided of (residual) biomass streams which are eligible for green energy certificates via anaerobic digestion/incineration.
- Use of **specific non-renewable fermentable waste streams**. The current support framework only values the production of energy from renewable residual streams. There are also specific non-contaminated fermentable residual streams of fossil origin (from the chemical industry) available on the market, which often increase the profitability of the anaerobic digestion. In quality monitoring and certification it is assumed that each input stream must comply with VLAREMA and that the input stream must offer added value for the end product or the process. If the residual streams from fossil processes meet these conditions, they should also be eligible for processing into digestate in anaerobic digestion plants (possibly with continued treatment). This, in turn, could be used as fertiliser or soil improver. From this perspective, the acceptance of these input streams should be facilitated.

11.2: Optimisation of biological processing

- With a view to the closing of the cycle, the **biological processing of the residual biomass streams that are collected separately** in Flanders is being further optimised (for an overview table of the current supply/capacity, see background document). In each process there will be residual streams that need to be processed in a biological manner in order to close the cycle. VFG and kitchen waste that is collected separately from

households and similar waste from companies must be integrally processed according to the Best Available Techniques (BAT) in composting and (pre)anaerobic digestion plants that are licensed for VFG/kitchen waste in order to comply with clear hygienisation requirements (both animal and plant pathogens). Residual biomass streams from the agriculture and horticulture sectors and the food and food distribution industries can – depending on the hygiene requirements and the licensing conditions – be processed into animal feed or processed in anaerobic (co)digestion plants. Green waste that is collected separately must be processed in composting plants licensed for green waste (see 6.2.1). In this context, the available capacity must be used as optimally as possible, both by the local potential and by the potential of residual biomass streams from the surrounding regions.

- The feasibility of the demand for an **extension of the range of (residual) biomass streams** eligible for processing at a green waste composting plant is being studied.
- **Reduction of risks related to the spread of (plant) pathogens and weed seeds**. With traditional composting and anaerobic digestion with continued composting, the elimination of pathogens and weed seeds is guaranteed by the right process conditions. In case of anaerobic digestion of verge cuttings without continued composting, the standard hygienisation process (usually 1h at 70 °C) will not be sufficient to eliminate some resistant plant pathogens. This is also the case for VFG waste. Anaerobic digestion with continued composting is a proven technology that complies with clear hygienisation requirements. For alternatives further research is needed.

  The current draft report of the Joint Research Centre (JRC, 2014) on the end waste status of compost and digestate mentions a number of alternative time/temperature combinations which should be able to guarantee the elimination of pathogens and weed seeds. JRC states that pasteurisation would be sufficient. The study of the European and Mediterranean Plant Protection Organisation (EPPO) gives a number of recommendations with more far-reaching consequences. These recommendations must be translated within the quality monitoring system of the biological processing facilities, taking into account the risk profile of different input streams for (plant) pathogens and weed seeds.
- **Dry anaerobic pre-digestion in case of VFG waste composting** will be implemented in phases if a number of conditions with respect to support from the waste and energy policy are met.
- Continuation and optimisation of the **quality assurance system for fertilisers-soil improvers** for the biological processing of biowaste streams. The quality assurance system needs to guarantee that waste is converted into high-quality end materials for recovery.
- The expected life of a well-maintained facility is around 10 to 20 years, depending on the type of facility. The investments made by the industry over the past years, with the help of the Government, must be **put to optimum use** and must not go to waste.
- Evaluation of the practical technical-economic experience of **small-scale anaerobic digestion**, such as micro-anaerobic digestion of manure and energy crops (less than 5,000 tonnes), with a view to policy recommendations, taking into account its low profitability (e.g. for pig manure and wet residual streams from agriculture due to the low biogas yield) despite supporting measures. The monitoring of methane emissions is also important. The main objective of micro-anaerobic digestion is to provide energy for the agricultural company itself, and currently it mainly contributes to the reduction of emissions via the direct processing of manure instead of storing it in a cellar.
- Studying the further expansion of **alternative hygienisation** at anaerobic digestion plants. As a result of the elimination of traditional pasteurisation (1h at 70 °C) less energy needs to be consumed, making it available for other applications.

- Research is important for **technically and economically interesting optimisations**. E.g. implementation of the results of the SYNECO study (Nov. 2012 – Nov. 2014). This study changes the focus of the VFG and green waste composting industry towards the production of green energy, via innovation: additional anaerobic pre-digestion combined with the sale of high-quality sub-streams of VFG and green waste for use in energy production.

11.3: Optimisation of sales

11.3.1: Compost and digestate products

- Research and stimulating **differentiation in sales applications of compost and digestate from VFG and green waste processing** are necessary e.g. to be able to serve niche markets with higher added value. Compost is a quality soil improver, with a wide use in green spaces, potting soil, etc. Compost is sold to private persons and replaces primary raw materials, such as peat, in that segment. Digestate and digestate with continued treatment are rather organic manure, which is currently disposed of and exported mainly in agriculture. Applications in public green spaces, by private persons and as a component of organic or chemical fertilisers must be studied further. Thus, cycles are closed in a different way; both are necessary. Both for compost and for digestate (with and without continued treatment), more attention needs to be paid to a high-quality replacement of primary raw materials.
- Implementation of the results of the **DuPoCo project** (MIP, 2011-2013). The study focused on the development of a sustainable, high-quality universal potting soil based on compost for use in garden centres, shopping centres and by private persons. The approach consisted in, on the one hand, identifying and describing sustainable alternative raw materials that are available and produced locally, e.g. green compost, and evaluating their applicability in the production of potting soil, possibly as a replacement for peat. On the other hand, quality monitoring and regulations that are feasible in practice and fit into an integral chain monitoring approach were developed for both the raw materials and the potting soil mixtures, intended for the hobby market. The results of the research have shown that green waste compost has a lot of potential as a replacement for peat for potting soil and organic fertilisers. VFG compost from anaerobic digestion with continued composting also has potential as a replacement for peat, but this needs to be studied further. Taking into account the seasonality of the sales, good cooperation is necessary, e.g. when it comes to buffer storage. The use of dried digestate as fertiliser in potting soil can reduce the need for artificial fertilisers. The research shows that there is potential, but that further research is required.
- Optimising the **sale of digestate**: processing into compost, use as a source of green artificial fertiliser and in organic fertilisers, etc. The results of the various studies and projects must be translated into the effective implementation of successful business cases in practice as a continued differentiation process. Attention is paid to opportunities offered by differentiated sales of digestate with active matching of new buyers. Increased sales of digestate products with continued treatment, tailor-made and clearly defined, in existing and new sectors (horticulture, green space maintenance, producers of fertilisers, private persons) must take place at a price that reflects the intrinsic value. Anaerobic digestion plants become producers of raw materials.

- **Stimulating the use of compost and digestate**, e.g. by adapting legislation that presents an obstacle (e.g. Manure Decree - MAP 5, Regulation on Biological Agriculture, etc.). This legislation imposes restrictions on the use of compost and digestate. Even so, there is a clear demand from (biological) farmers in Flanders to be allowed to use compost and digestate. A point of attention for digestate is the possible registration obligation in the framework of the REACH legislation and the impact of this on the status of the digestate. Via the inclusion of the use of tested products from recycled materials in standard specifications for e.g. public contracts in the framework of green space management, this use can be stimulated. This idea has been explicitly described by the Flemish Government for compost in the guiding document

published for specifications for public contracts in the area of green space management (e.g. soil improvers) (see www.bestuurszaken.be/Groenbeheer). Green space management services of both the Flemish authorities and local authorities can make their specifications more sustainable based on these guiding documents.

- Reduction in **administrative costs** to meet the legal requirements.

11.3.2: Biomethane

- Optimising the storage and use of biogas/biomethane: setting up a **'green deal'** between the relevant stakeholders and the Government based on the preconditions determined for the use of biogas. Making it possible over the next years, and at the latest by 2020, to inject green gas into the natural gas network or use it as fuel for transport afterwards. The idea is to find solutions for all bottlenecks, also the legal ones.
- It is important to recognise biomethane **at the policy and at the legal level, also federally**. This can be achieved by means of a recognised independent body which can issue a label or certificate to producers of biomethane per unit of biomethane.
- In addition to the use of biomethane for the production of green energy and green heat, purified biomethane can also be used as **fuel for transport**. To this end, the policy on biomethane should be included into the (federal) policy on renewable transport fuels, and into the actions relating to transport that uses natural gas as fuel, as is already the case in several neighbouring countries.
- An important advantage of biomethane injected into the natural gas network in comparison with a biogas network or heat networks based on biogas/methane is that no additional large-scale distribution infrastructure needs to be installed under the ground.
- In order to carry out a project, the **current investment support must at least be maintained** for the production and injection of biomethane.
- **Feasibility study for biogas purification plant**. Support for pilot plants is important, so that experience can be gained when it comes to connection conditions and testing the business cases. It is studied whether the current support framework in the context of renewable energy is sufficient to proceed with business cases (Biogas-E, 2014).

6.2 The material cycle of (residual) biomass streams from green space, nature, forest and landscape management

This Chapter comprises all (residual) biomass streams that are released in the context of the management of the areas mentioned above, including green waste[5]. Residual streams that are released in the context of the production of agricultural crops fall under the strategy of Chapter 6.1.

6.2.1 Strategy

Green waste

For green waste the strategy builds on the existing policy framework, as described in the implementation plan for biowaste, supplemented with the new insights in the management of the residual streams from these activities:

- further attention to prevention by promoting the concept of **garden recycling**;
- maintenance and reorientation of the **green waste processing chain**.

Green waste must be eliminated via **green composting**. This processing chain is reoriented by offering not only high-quality compost, but also woody biomass for renewable energy production.
Verge cuttings can be processed by **anaerobic digestion**, on condition that the elimination of weed seeds and plant pathogens is guaranteed.
Prunings can only be processed into **mulch**, if the conditions of the circular letter[6] are met. The remaining prunings will be made available for green composting.

At the level of green/VFG waste composting, the need for structural material is determined based on optimal processing. In case of a surplus of structural material at the level of green/VFG waste composting[7], this can be removed with a view to renewable energy production.

The purity of the sieve overflow is regulated via environmental taxes. In order to be exempted, the sieve overflow has to meet the following conditions:

- The sieve overflow is obtained by sieving the compost with a sieve with a maximum mesh size of 20 millimetres;
- The sieve overflow must not contain more than 3 percent by weight of contamination (i.e. non-woody, non-inert components).
- The contamination in the sieve overflow must be checked every six months by an accredited VLAREL sampler and an accredited laboratory.

---

[5] Residual biomass streams that are released in e.g. private and public gardens, parks, on river banks and road verges in nature areas, according to the definition of green waste mentioned in VLAREMA. Specifically, prunings with a diameter of up to 10 cm fall under the definition of green waste (OVAM, 2000). For some residual streams from these areas a raw material certificate has been issued, see Chapter 2 of this document.

[6] Circular letter of 8 June 2004 on the quality of wood chips for use as mulch

[7] Woody material that is separated before composting (this requires an exemption from the ban on fuel), or sieve overflow that is separated during or after the composting process, generated by a licensed green composting facility with quality monitoring and an inspection certificate for the compost.

.

The limit value for non-woody, non-inert components can be revised in consultation with the sector and authorities concerned.

The sale of the end products of the processing of these residual streams is described under action programme 11.

Management of nature, forest and landscapes

The management of these areas must cater for the various functions assigned to them. For instance, ecological, economic, recreational and cultural-historical aspects are important. The challenge lies in combining all these aspects to reach an optimal management of these areas and the (residual) biomass streams that are released there.

Specific forms of management that result in integral[8] management must be stimulated by the legislation as much as possible. For instance, raw material certificates can be an instrument to support the transition to such an integral approach. However, one must ensure that this process is coordinated with the policy on green waste management.

For nature and forest areas the concept of **'integrated management plan'** offers important opportunities. Besides this management planning, there is also a need for consultations between the actors involved in the management of these areas. Within IPO (an inter-administrative consultation body on rural matters), the Flemish Land Agency has created the temporary **theme group Harvestable Landscapes**. The composition of this theme group transcends individual administrations and policy areas and comprises civil society organisations, authorities, knowledge centres, etc. Its aim is to deliver policy advice and suggestions for actions by mid-2015. The idea is to be able to respond quickly to certain opportunities and bottlenecks for the local use of biomass from landscape management in Flanders. Based on a detailed SWOT analysis of relevant biomass chains, the theme group developed action documents for five priority themes in 2014. In order to achieve synergies with this action plan, the theme group plays a leading role in 3 actions from action programme 12 that are closely related to its own priority themes.

Where (residual) biomass streams need to be removed from nature, forests or other landscapes in order to achieve or maintain the functions of those areas, these become available for the **bioeconomy**. For a variety of reasons, it is often impossible to take this first step. Therefore, due attention must be paid to the **'mobilisation'** of residual biomass streams that have been released. Among others, the EU strategy on forest management attaches great importance to this. The mobilisation of residual biomass streams is also an example of efficient management of raw materials. Where many projects in Flanders focused on generating (residual) biomass streams for renewable energy production, the results of these projects can often also be used to mobilise (residual) biomass streams that have been released for material recycling (e.g. board production, composting, paper production, etc.). In this context, this strategy also refers to the development of a Flemish vision on the economic function of forests, and it will adapt the operational objectives in 6.2.2. to this vision. In addition to the mobilisation of the biomass, there is a need for **cooperation** when it comes to the joint management of infrastructure and materials and the collection of residual biomass streams (the concept of **biomass hubs**), so that a sufficient scale and hence efficiency gains can be achieved. The combination of increased mobilisation and the development of biomass hubs for joint management also automatically leads to a higher potential for a high-quality use of residual biomass streams.

[8] Integral: taking into account ecological, economic and social aspects.

Towards an efficient integral approach

The knowledge gathered by local actors over the past years on the management of this biomass is a good starting point for the further development of biomass hubs. It concerns licensed composting and anaerobic digestion facilities for green waste and VFG waste in Flanders. The strategy of this cycle wants to offer possibilities to strengthen their role in this. They follow the quality manual of the certification, they already have an inspection certificate and a quality label for compost and they have experience with the storage of various biomass streams. From a cost-efficiency perspective as well, the development of existing processing facilities seems the most logical option given the infrastructure and equipment already available and the appropriate location of these facilities.
The development of both existing and new biomass hubs must be based on an **integral approach of the biomass streams** and hence must not focus only on wood waste streams. The scale must be such that an integral approach is possible, including the local revaluation of the various biomass streams. Concretely, this means, among other things, converting compostable/fermentable streams into high-quality compost and making pure woody streams available for material applications or energy production.

The (residual) biomass streams released (waste and non-waste) must be used respecting the cascade as much as possible.

Concretely, the cascade means:

Use as feed (e.g. nature cuttings that are suitable as feed).

Use as material: wood, paper and board material production, lignin or lignocellulose-based materials (e.g. platform chemicals), insulation materials, shock-absorbing materials, compost, digestate, growing substrates.

Use as a source of energy: energy generation via incineration, use of e.g. biogas as fuel for transport.

Disposal: incineration without energy recovery and landfilling are prohibited.

As mentioned under 4.5, when implementing the cascade we should strive for **social and economic added value**, complying with a number of (e.g. ecological) preconditions. Below, the criteria are indicated to determine when the cascade for woody (residual) biomass streams from forest and nature management and landscape elements could be deviated from:

- The biomass is mobilised in accordance with the approved management plans[9]. These management plans have to guarantee that the area where the biomass is mobilised is managed with a view to achieving ecological objectives for that area.
- The management and the use of the biomass take place within the region of origin, which leads to greater added value for society.
- The use of the biomass takes place in accordance with the applicable environmental conditions.

Under the Materials Decree it is possible to deviate from the cascade in order to reach the best result for the environment and health from a general point of view. This can mean that when defining measures for certain materials the processing hierarchy must be deviated from when this is justified based on the life cycle theory. Table 1 in section 6.4 provides a concrete description of the cascade per residual biomass stream and also mentions for which streams the cascade is/can be deviated from. According to need, the table will be adapted using OVAM's biomass inventory in order to use the results of studies via the policy framework for biomass management.

In order to be able to measure the progress of the strategy and the objectives following from it, the actors involved report at least every two years the amounts and use of the (residual)

[9] Verge management plan, forest management plan, nature management plan, landscape management plan.

biomass streams that fall under this cycle. The concrete implementation of the reporting is developed, among other places, in action programme 12.5. Furthermore, OVAM will, in the framework of the biomass inventory, request the data from the waste and material records with at least the same frequency, as provided for in Article 7.1.3 of VLAREMA.

6.2.2 What do we want to achieve?

Residual waste streams from green space, nature, forest and landscape management are **mobilised as much as possible**, respecting the main functions that have been assigned to each area, and on condition that the biodiversity objectives and the organic content of the soil are not put at risk. More concretely, the following indicative quantitative objectives are being proposed, so that in 2020:

- **135,000 tonnes of waste wood** is collected from Flemish forests.

  The forecast study by VITO (OVAM, 2014b) shows that there is a harvestable potential of branchwood and topwood in Flanders of approx. 46,000 tonnes. However, the amount that can actually be harvested depends on various factors, which results in a reduction of the objective to 35,000 tonnes. Where the remaining waste wood is concerned,[10] currently already approx. 90,000 tonnes are being harvested. The greatest additional potential lies in **private forests**, which is why forest groups will play an important role in the process of making available this additional supply. In the context of this operational objective it must be ensured that non-registered existing streams (e.g. use of firewood by private persons) are not counted, as these are not newly harvested potential.

- **114,000 tonnes of woody biomass** from landscape management[11] (excl. forest management) is being harvested in Flanders.

  The forecast study by VITO (OVAM, 2014b) estimates that 38% of the harvestable potential from landscape management can actually be harvested by 2020.

- at least 10% of the annual Flemish supply of verge cuttings that fulfil the quality requirements is processed in dry anaerobic digestion plants with continued composting.

  The annual amount of verge cuttings in Flanders is estimated at 149,000 tonnes. The results of the Graskracht[12] studies and the Bermg(r)as project (IGEAN, OWS) indicate **dry anaerobic digestion with continued composting** as the treatment method with the greatest potential. Full-scale tests even suggest that up to 25% of all VFG waste could be replaced by verge cuttings. Therefore, in the coming policy period removal to anaerobic digestion will be focused on in addition to the existing removal to green waste composting. The main suppliers of verge cuttings work for the Agency for Roads and Traffic and for the municipalities. A precondition for this objective is the creation of additional capacity for dry anaerobic pre-digestion in Flanders and high-quality storage capacity for verge cuttings.

- **2,000 tonnes of organic fraction** from chopper activities are disposed of as a **replacement for peat** in the production of potting soil or used as a soil improver (sometimes after composting).

  The KOBE study by the Agency for Nature and Forests and the Institute for Agriculture and Fisheries Research (ILVO) mentioned a number of promising approaches for sub-fractions from nature management. More specifically, it concerns the organic fraction that is released in the context of **heathland repair** (chopping of heathland). There appear to be promising possibilities especially for the sale as a replacement for peat.

[10] Wood that is not used for industrial material applications, excluding branchwood and topwood.

[11] Maintenance works on roads and land and management of small landscape elements (shelterbelts, hedges, rows of pollard willows).

[12] www.graskracht.be

By 2030:

- all harvestable residual streams from green, nature, forest and landscape management according to the **cascade** are used in the Flemish bioeconomy, respecting the main objective of the area and without conflicting with biodiversity objectives.

6.2.3 Action programmes 2015-2020

Action programme 12: mobilisation of residual biomass streams from nature, forest and landscape management

This action programme comprises the **general actions** for biomass from the management of nature, forests and other landscapes. The remaining action programmes comprise measures for specific sub-streams from these areas.

12.1. Development of a clear framework for the management of biomass from nature, forest and landscape management

- The project Limburgs Groen of the Environmental Innovation Platform (MIP) has shown, among other things, that **several bodies are involved** in the granting of permissions/licences for landscape management (Planning Department, Agency for Nature and Forests, municipalities, Agency for Architectural Heritage). We have also detected inefficiencies in the organisation of the management (e.g. status of farmers who participate in landscape management: as a farmer or as a contractor). Especially when it comes to the management of biomass, we should strive for a **clear licensing and management system**. This will facilitate an efficient management as well as a better coordination of management activities (also in the framework of e.g. erosion prevention) in an area. Here, the Agency for Nature and Forests (integrated management plan), the local administrations, agricultural organisations, the Flemish Land Agency and other members of the IPO theme group Harvestable Landscapes have an important role to play.

12.2. Reinforcing the role of the social economy in the management of biomass from nature, forest and landscape management

- The pilot projects have shown that the role of a **social economy** in addition to the regular economy can provide a solution for labour-intensive management work. In order to increase this role and make it more efficient, a training programme can be set up within the social sector. In this training, the Support Centre of the Agency for Nature and Forests, Pro Natura, the umbrella organisation for the social economy, and other specialised training centres can play an important role.

12.3. Financial support for the mobilisation and storage of biomass

- The mobilisation of biomass is a central aim that is indicated by the entire wood chain as an important measure to reduce the growing pressure on the use of woody biomass. In addition, for other biomass, such as cuttings, the economic cost of collecting and storing these streams is also often problematic. Besides stimulating the role of the social economy, it can be studied what **financial incentives** would be possible to boost the mobilisation of biomass. This could be e.g. support for the purchase of specific rolling stock for land that is difficult to access.

12.4. Setting up local cooperation partnerships with a view to the management of (residual) biomass streams

- Thanks to the variety of management measures and the different actors involved, **local cooperation** can improve the efficient management of the (residual) biomass streams that are released. At the local level, local actors work together on the management of biomass, including woody biomass. This collaboration can take place both in the chain itself and between the different biomass chains. Possible areas of work of such cooperation partnerships are:

- The purchase, renting and/or management of **central biomass hubs**: storage spaces for storage and pretreatment of biomass, storage in anticipation of recovery (silage from (verge) cuttings, dry storage for woody biomass, sieving and chopping of biomass);
- **Coordination** of management works;
- **Joint tenders** for management works or the collection of residual biomass streams;
- **Joint purchases** of materials or auxiliary materials for the management;
- **Starting up workshops** based on the IPO consultations to put suppliers and buyers of biomass streams in contact with each other.

12.5. Monitoring of the amounts and use of the harvested (residual) biomass streams

- For an efficient management it is important to **monitor in detail** the amounts and use of the harvested (residual) biomass streams of all verge, forest and nature managers. Work is ongoing on a **uniform approach of the recording and monitoring of data** from the various managers by bringing together the expertise in Flanders. For instance, attention can be paid to this in the revision of the verge management plans of the Agency for Roads and Traffic ('Werken aan de berm' project of the LNE Departement).

12.6. Demonstration projects related to the mobilisation of (residual) biomass streams from nature, forest and landscape management

- Concrete efforts are made to mobilise (residual) biomass streams. Demonstration projects can be a preparation with a view to the practical implementation of projects.
- Eco²eco project proposal (subject to approval): The 'biomass site Limburg' sub-project has elements in common with the following sub-actions of action programme 12:
    - 12.3. Financial support for the mobilisation of biomass
    - 12.4. Setting up local cooperation partnerships with a view to the management of biomass
    - 12.5. Monitoring of the amounts and use of the harvested (residual) biomass streams

Action programme 13: residual wood streams from forest exploitation and maintenance

- The sub-projects of the KOBE project of the Agency for Nature and Forests give a better idea of the potential of harvestable woody biomass from the Flemish forests. A **general assessment framework** has been designed and will be further developed. Furthermore, there turned out to be a need to **upscale the biomass harvest**; this is another argument in favour of coordination with the 'biomass hubs' mentioned earlier in this section.
- Around 70% of the Flemish forest area consists of private property. This is managed by the forest groups, which are organised at the provincial level and represented at the Flemish level by the umbrella organisation of Flemish forest groups. At the Flemish level, **consultation and cooperation** between the various partners involved are important.

Action programme 14: non-woody residual streams from nature and landscape management

Besides woody biomass, numerous other residual streams are generated in the context of nature and landscape management. Pure streams, such as **nature cuttings**, are often used as animal feed. Within the KOBE project 'biomass as a soil improver – research into the use of management residues as a soil improver', ILVO – commissioned by the Agency for Nature and Forests – performed a detailed study of the qualities of **sods, chopper material, dredging sludge and forest litter** for use as a soil improver or a raw material for the production of potting soil or compost. This showed that a number of (sub-)streams of these residual streams are very valuable as raw materials for growing substrates. A number of concrete points of action can be selected from the recommendations of this research report.

- **Mapping the economic component of an optimal management of non-woody residual streams from nature management**

The results of the KOBE project expose a number of very promising options for residual streams from nature management. However, the economic impact of these options has not yet been described in detail. Follow-up research can clarify this.

- **Drawing up guidelines for site managers with a view to an optimised management of residual waste streams that are released**

  The way in which the site managers deal with their residual streams strongly determines the possibilities for use elsewhere in the chain. The guidelines are drawn up by the Agency for Nature and Forests and implement the results of the tests performed in the context of the KOBE project and the conclusions of the Graskracht project.

- **Setting up a practical test for the use of organic material from chopper activities as a replacement for peat in the production of potting soil**

  Together with Flemish potting soil producers, a test is set up in order to test the results of the KOBE project in practice.

Action programme 15: closing the materials cycle for green waste

- The **separate collection** of green waste with a view to composting/anaerobic digestion must be encouraged. As a recyclable residual stream, green waste is subject to the prohibition of landfilling and incineration of VLAREMA. That is why green waste must in the first place be taken to a recycling facility (composting or anaerobic digestion plant with continued composting). In theory, woody green waste is always **recycled 100% via composting processes or direct reuse**. In the SYNECO project (Vlaco, 2014) the conditions and consequences have been studied of the use of woody fractions of green waste as a source of energy, the composting process and the quality of the compost produced. Based on the conditions defined in the conclusions of the study, the composter can, subject to the production of approved, high-quality compost and compliance with the preconditions, remove the excess woody material **for use as energy**. The requirements for the use of the woody fraction of green waste as a source of energy are shown in Table 1 under 6.4.

- **Illegal processing of green waste** must be dealt with more intensively. In 2013 OVAM and the Environmental Inspectorate set up a joint enforcement initiative. However, there continue to be signals from the green waste composting sector that the situation is not significantly improving. Over the coming years efforts must continue when it comes to **enforcement against illegal processing of green waste and biomass**. The Environmental Inspectorate, local enforcers and OVAM have an efficient set of instruments at their disposal (administrative measures, registers, levies, Manure Bank reports), which should actually be used when infringements are detected. Enforcement by the Environmental Inspectorate takes place mainly in large intermediary companies. The smaller actors, such as **garden contractors**, are first subjected to further awareness actions. After that, **local enforcers** will be trained to enforce the regulations in this specific sector in the green waste cycle.

  OVAM will, via its advisory power for waste-processing activities subject to a licence obligation in the framework of the **environmental licensing legislation**, pay special attention to the correct treatment of green waste. In addition, it can check, through the monitoring of the biomass streams used in het framework of **green energy certification**, whether these biomass streams have been approved for use as a source of renewable energy.

  Based on the latest VLAREM amendment it has to be included in the municipal police regulations that the incineration of green waste in the open air is prohibited**.**

- The **sustainable and cost-efficient management of verge cuttings** remains a major challenge. Via specific measures throughout the chain it is attempted to make more optimal use of these residual biomass streams.

As a verge management plan only has to be drawn up when the provisions of the verge decree are deviated from, this instrument cannot lead to a general approach of the matter of verge cuttings. Therefore, priority is being given to adapting the **standard specifications** for verge management, developing the following aspects in more depth: information provision about processing possibilities, monitoring and recording of the amounts removed, monitoring of the actual processing of the cuttings. The working group of standard specification 250 is in charge of the adaptation of the standard specifications. In this process, the recommendations of the IPO theme working group Harvestable Landscapes are also taken into account (see action document 12.5).

In the cases where a verge management plan is drawn up, the **collection and processing possibilities** (time of cutting, nature of vegetation, available local storage and processing locations) are taken into account when defining the management measures. These reflections can significantly improve the collection and removal of cuttings when it comes to cost and quality control.

Not only managers of road verges (the Agency for Roads and Traffic, municipalities), but also managers of banks of all kinds of watercourses and railways must be involved in these initiatives for a better monitoring of the amounts and processing of verge cuttings.

- **Quality of verge cuttings.** A good quality of the verge cuttings is crucial for smooth and cost-efficient processing, both for composting and for anaerobic digestion. The biogas potential of verge cuttings strongly depends on the **storage method**. Moreover, the use of verge cuttings is interesting to fill the capacity that is freed up as a result of the decrease in the VFG waste supply during the winter period. In the context of the life cycle theory, proper storage of verge cuttings is also essential in order to be able to consider anaerobic digestion at least equivalent to green waste composting when it comes to environmental impact. Via the environmental licensing legislation options have already been provided for the storage of verge cuttings in pits.

  Storage in pits can be integrated into the regional management of biomass streams via the concept of biomass hubs. As mentioned earlier, investment support must be sought for biomass hubs, so that the storage of verge cuttings in pits also becomes interesting from an economic perspective.

- **Anaerobic digestion of verge cuttings.** Various projects (Graskracht, Bermg(r)as ...) have studied the possibilities of anaerobic digestion for various types of cuttings. Both wet and dry anaerobic digestion have been assessed for their potential as a processing method. **Dry anaerobic digestion** has been identified as the option with the greatest potential of success. By keeping the biogas potential of verge cuttings as high as possible via quality control, the probability that verge cuttings will be used will be increased.

For further actions related to the closure of the green waste cycle we refer to action programme 11. Biological processing and sale and Action programme 2. Home recycling systems.

6.3 The cycle of residual wood streams from the industry and households

6.3.1 More recycling of woody residual streams from the wood industry and households

6.3.1.1 Strategy

For untreated wood waste (‘Class A wood’) OVAM has tried to consistently lead this stream to **material recycling** via its licensing policy and its advisory role in the granting of green energy

certificates. Class B wood, on the other hand, is a residual stream with varying chemical and physical properties, which renders a standard approach with respect to material recycling infeasible in practice. Furthermore, the licensing situation of the chipboard companies does not allow for more class B wood to be diverted to material recycling, as these do not all have the waste licence required for the thorough processing of class B wood.

In addition, the supply forecasts of the VITO study (OVAM, 2014) show that the amount of woody residual streams is decreasing, which further increases the pressure on these residual streams (cf. figure illustrating supply and capacity in the background document on residual biomass streams).

A number of important developments when it comes to policy, technology and the legal framework are leading to the **adaptation of the policy with respect to primary and post-consumer wood waste**:

- **Contribution to renewable energy production**: In order to reach the indicative Flemish renewable energy objectives for 2020, the contribution from a number of large-scale biomass projects is crucial. These projects are already operational or are under way and use, among other things, imported wood streams. In the indicative Flemish renewable energy objectives, a share of 19.2% of green energy in gross electricity consumption is aimed for by 2020. Every year, the sub-objectives are assessed by the Flemish Energy Agency, which can consider remedial measures or an adjustment of the sub-objectives.
- Where the existing policy was based on a non-mandatory approach, it was found that precisely the waste and energy policy had a great influence on the use of these residual streams. Within both **policy areas** powerful instruments are available, but these need to be **adapted to the strategy** for the coming years.
- The **composition of post-consumer wood waste** has changed significantly over the years, towards a mix with a larger proportion of board material and less massive wood.
- The **suitability for material recycling of primary and post-consumer wood waste** continues to increase as a result of the following developments:
    - The technology for the **treatment of post-consumer wood waste** has evolved greatly.
    - Depending on the **quality requirements for the end product** (board material), the share of post-consumer wood waste can vary, up to a proportion of 90%.
- The **legislative framework for the use of wood waste in the production of chipboard** needs to be revised based on the developments described above.
- The **use of woody residual streams by the renewable energy sector** has undergone a clear evolution over the years. In the initial phase, it concentrated on easily available, cheap streams (mostly post-consumer wood waste). As the availability of these streams decreased and prices rose, the sector diversified when it came to raw materials so that woody residual streams from green waste and the management of open spaces also became an option. The same evolution can be observed in material recycling. The **new wood raw materials of material recycling** also come from the management of open space.
- The import of wood waste is not only of potentially strategic importance for the energy sector, but, depending on its origin, also for the chipboard industry due to the **local scarcity** of wood waste in Flanders.

The strategy for material recycling for this cycle consists of the following principles:

- Separately collected untreated wood waste (class A wood) is used for **material recycling**. There is an exception to this obligation for producers of such wood waste in the wood-processing industry who use this wood waste on site as a source of energy, complying with the applicable environmental legislation.

- As the supply of wood waste diminishes, the focus is shifted to increasing the quality of the wood waste collected with a view to material recycling. This can be done through **further differentiation of the separate collection or through additional sorting**.
- **Recycling** has to fulfil the following preconditions:
    - The recycling has to take place via an **efficient use** of resources (energy, materials)
    - The effects during the **rest of the life** of the recycled material (e.g. emissions, buffer capacity for carbon, etc.) must be mapped and taken into consideration.
    - Recycled residual streams must have a **potential life that is as long as possible** before they end up in the waste cycle again, but without affecting the quality of the product. This way, the carbon buffer capacity of the material cycle increases.
- The aim is to **increase the share of recycled materials in the end products** of the Flemish wood industry.
- The import of wood waste for material recycling is **facilitated** as much as possible within the applicable legal framework for **cross-border transport** of waste, by using the status of *'pre-authorized facility'*.
- The **export** of wood waste must **fit into the policy** pursued by the Flemish Government with respect to the high-quality use of wood waste.
- Increasing the recycling possibilities in Flanders via legal and technological developments does not necessarily have a negative effect on the use of wood as a renewable source of energy. As can be seen on the wood waste market, buyers quickly adapt to **new developments** by exploring new sourcing areas or adapting their sales. An important precondition is that the **price-setting is in line with market conditions** for recyclable wood waste. This implies that consumers of wood waste should at least be able to compete with each other on an equal basis within Flanders. If necessary, the support policy for the production of renewable energy must be adapted, without jeopardising the achievement of the renewable energy objectives themselves.

6.3.1.2 What do we want to achieve?

By 2020:

- **at least 70% of all chipboard produced in Flanders must consist of recycled post-consumer wood waste**.

  In 2011 the Flemish wood industry had a recycling capacity of 600,000 tonnes of post-consumer wood waste, which corresponds to a share of 51% of recycled material in the end product.

  This share should increase via additional measures when it comes to legislation and technology. Furthermore, new possibilities for the use of wood waste in other types of board material must be studied. Obviously, the achievement of this objective will depend on a number of preconditions, such as the economic situation of the wood industry.
- **50% of the Flemish supply of class B wood must be subjected to additional sorting** with a view to supplying a recyclable and a non-recyclable stream of class B wood.

  Based on pilot projects the most optimal collection and sorting scenario for class B wood must be determined. The results of these pilot projects should lead to a reorientation of the class B wood stream to this most optimal scenario, with the aforementioned objective as an obligation of result.

By 2030:

- Flemish class B wood **is no longer disposed of to energy applications without prior sorting of recyclable streams**.

In order to reach these objectives, the implementation of a number of guiding instruments will be necessary. Based on studies such as Opt-I-Sort the most optimal scenario for an optimal

management of wood waste will be selected in consultation with the relevant stakeholders (municipalities, companies).

In order to put this scenario into practice, a mix of instruments will be used. Possible instruments are legislation, levies and advice in the framework of green energy certificates. The most appropriate instruments to reach the aforementioned objectives for 2020 will be implemented at the latest from 1 January 2018 onwards.

6.3.1.3 Action programmes

Promotion of material recycling of woody (residual) biomass streams

Action programme 16: sustainable use of woody (residual) biomass streams for renewable energy production

On 9 May 2014 the Flemish Government amended the Energy Decree, modifying, among other things, Article 6.1.16, §1. As a result, **the assessment framework for the use of wood streams for green energy production changed**. A concrete change was that, besides Fedustria and Cobelpa, OVAM was also assigned an advisory role on the use of wood streams as an industrial raw material. OVAM is given a period of 30 days to issue advice on the use of wood as an industrial raw material. Due to this short period, it is essential for OVAM to have **well-developed, practical assessment criteria at its disposal for its assessment of whether the use as an industrial raw material is appropriate.**

OVAM and the Flemish Energy Agency will, in consultation with stakeholders, develop a proposal for assessment and sustainability criteria. These criteria are in line with European policy developments and with well-functioning systems in other European countries (e.g. the Netherlands, the United Kingdom, Denmark). They take into account the results of the VITO study '*Assessment framework for the use of wood stream for the production of green energy'* and can be adapted according to changing European or Flemish insights.

The following principles proposed by the Mina Council and SALV in their joint advice (ref. 14-034) about this action plan will also be taken into account in the further development of the assessment framework in consultation with the relevant stakeholders:

- consequences of the application of the cascade system for soil quality, water management, ecosystems, CO_2 emissions and other environmental parameters;
- disproportionate costs compared to the (environmental) benefits of applying the cascade principle;
- conflict with regulations that do not permit the application of the cascade principle;
- unavailability of infrastructure.

Besides this assessment framework, a sustainable use of wood for energy production also requires a **support policy in line with market conditions** which also takes into account the European and international framework for biomass policy and markets for biomass. The Government will also be able to influence the wood market with other **instruments** (environmental levies, rules for separate collection and processing, etc.).

Action programme 17: primary and post-consumer wood waste 17.1. Collection and additional sorting of post-consumer wood waste and separate collection of primary wood waste

- Analyses of the sorting of bulky waste (2011) show that there is still a share of approx. 18% wood waste in this waste stream. Wood waste is a waste stream for which separate collection is mandatory, but it can also be subjected to additional sorting. Taking into account the high share of materials that can still be recycled in bulky waste, **maximum additional sorting** must be strived for. Currently bulky waste is still taken directly to incineration by many collectors. Based on the figures for 2012 for bulky waste it concerns

an annual amount of at least 25,000 tonnes of wood waste. This stream can be processed into a recyclable fraction.

In addition, industrial waste also contains wood waste. However, figures relating to the share of wood waste in industrial waste are harder to deduce from the available data. The analysis (2013) of the sorting of large rubbish skips containing residual industrial waste showed that 6% of the weight of this waste consists of wood waste. However, this is an underestimation, because a minimum limit was used during the sorting. Pieces of wood smaller than 25 centimetres were not counted. According to the OVAM publication on industrial waste 'bedrijfsafvalstoffen 2004-2012', secondary residual waste[13] contains 10% wood (without the packaging material).

- Half of post-consumer wood waste consists of board material, which is difficult to recycle. The aim of this action is to find the **most optimal separation between recyclable and non-recyclable wood waste**, so that it is clear for both streams what kind of recovery they are suitable for. Various collection and sorting scenarios are possible for post-consumer wood waste. In collaboration with waste collectors, sorters, the chipboard industry and the renewable energy sector, the most optimal collection scenario must be determined. In doing so, at least the following aspects should be studied: cost-efficiency, environmental impact, recycling efficiency, technical feasibility, effects of further processing of the sub-streams.
- Furniture companies use a wide range of wood products (massive wood, board material…), as a result of which a lot of their wood waste is heterogeneous. This is often an impediment to smooth material recycling. It must be assessed whether **a separation into various wood fractions at the source** would be an efficient measure in favour of material recycling.
- Currently approx. 25% of municipal recycling centres collect hazardous wood waste separately. However, there is no obligation to do so. This way, a new collection channel is created, which also contributes to the improvement of the recyclability of the fractions of class A and class B wood. A **generalisation of separate collection** must be studied.

17.2. Clarification of the legal framework for the recycling of post-consumer wood waste

- In order to keep contamination in post-consumer wood waste under control, OVAM applies a number of rules for the use of such wood waste in the production of chipboard. Due to the **evolution of recycling technology** this **regulatory framework** also needs to be **adapted**. Points of attention in this context include the effects of an increased use of post-consumer wood waste in the rest of the life cycle of chipboard, with a focus on emissions in case of incineration in small-scale facilities, taking into account the possible remaining concentrations of contamination in the chipboard in combination with the limited set of emission standards that applies to small biomass incineration plants.

17.3. Revision of the prohibitions of VLAREMA relating to incineration

- The evolution of the possibilities for material recycling makes a revision of the prohibitions of incineration necessary. In this process, the putting into practice of the **cascade principle and the objectives for renewable energy production** must be taken into account. The prohibition of incineration is also the most powerful instrument against the diversion of recyclable streams to foreign power plants.

17.4. Facilitating the import of wood waste

- In the framework of the regulations on cross-border transport of waste[14] the possibility exists to assign the status of '*pre-authorised facility'* to recovery facilities. With such a

[13] Waste generated by companies that treat waste.

[14] Regulation 1013/2006/EC

status, approvals from the competent authority for the import of wood waste can be assigned for a period of **three years** instead of the legal period of one year. The development of this action is closely connected to the **review of the licensing situation** of the facilities in question. In addition, the existing monitoring procedure for the chemical quality of the wood waste imported will be assessed and adapted where necessary to the new legal and licensing conditions.

6.4 Contribution from residual streams to climate policy/renewable energy

6.4.1.1 Strategy

The use of residual biomass streams for renewable energy production must be the result of weighing up the concerns related to the materials policy and the core principles of the energy policy. For residual wood streams, the current principle that **preferably non-recyclable woody residual streams must be used for use as energy** is maintained. The ambition of the *step-by-step plan for an efficient use of resources in Europe* is that by 2020 only non-recyclable (residual) biomass streams are used for incineration for energy purposes. Given the international framework of the trade in residual wood streams, the various stakeholders are working together to create a European framework for this.

As this action plan is based on the principles contained in the vision and strategy for the Flemish bioeconomy (see 4.4), the role of biomass as a renewable energy source is acknowledged. In view of the binding targets for renewable energy production for 2020, the short-term strategy must take into account as much as possible the commitments and investments made in order to reach those targets, but without undermining ongoing and future efforts in the area of material recycling.

The short-term horizon for the renewable energy policy is 2020. However, the developments after 2020 will take place in a different context given the policy choices made by the European Commission. That is why the strategy has been divided up into the period up to 2020 and the period 2020-2030.

Strategy 2020

On 31 January 2014 the Flemish Government laid down the provisional indicative sub-objectives for renewable energy production for 2020. The sub-objectives are assessed each year and corrected or subjected to remedial measures if necessary. Specifically for solid biomass, two **new large-scale biomass projects** were assigned a provisional banding factor.

Biomass. If the licensed plants of E.On and Belgian Eco Energy (BEE) become operational, **gross green energy production from biomass** will increase considerably. The necessary biomass will come almost exclusively from abroad (wood pellets, energy crops).

The challenge when using imported wood streams for renewable energy production is to guarantee that this biomass stream is produced and used in a sustainable way. Therefore, in action programme 16, besides the refining of the assessment framework for material recycling, the necessary attention is also paid to **sustainability aspects** connected to the production and generation of wood streams for renewable energy production. Benchmarking with the sustainability criteria used by our neighbouring countries in this context is an important element to pay attention to.

The policy choices for material recycling for post-consumer wood waste will have an impact on the **Flemish supply** of such wood waste and hence also on the possibility of reaching the objectives. The smaller supply can be compensated by increasing imports of wood waste from foreign regions. In addition, the existing exports of *post-consumer* wood waste (around 80,000 tonnes in 2013) can be a possible market source to compensate the growing Flemish demand.

Biogas. For the production of biogas an annual capacity growth of 4 MWe[15] is taken into account, around 20-25% of the annual growth in capacity during the period 2008-2012. This is achieved by means of several new industrial anaerobic digestion facilities which were put into operation in 2013-2014. A few micro-fermenters for cattle manure with a maximum capacity of 200 kWe are also taken into account. The latter are fed with **cattle manure and the agricultural business's own residual streams.**

Furthermore, from 2015 onwards, several **new** anaerobic digestion plants**, incl. anaerobic pre-digestion plants for VFG waste,** can contribute to achieving this annual growth. However, the evolution of the financial-economic situation of the existing agricultural, industrial and VFG waste anaerobic digestion facilities, especially as a result of the future choices relating to support for green energy certificates, will also be decisive when it comes to reaching the sub-objective for biogas. This sector is currently functioning in a sub-optimal way when it comes to the use of the capacity installed. In action programme 11 the policy action plan proposes measures aimed at improving the legal and economic preconditions for this sector.

Use of **residual streams from biomass incineration**. Increasing incineration of biomass also generates residual streams in the shape of ashes and slag. The recycling of these residual streams is the final step in the biomass cycle and must therefore be stimulated, respecting the ecological and economic preconditions.
The contribution of the processing of the **organic fraction of residual household and industrial waste** (as an integral part of residual waste) is not discussed in this strategy, but will be dealt with in the new implementation plan for household waste and similar industrial waste.

Strategy 2030

Biomass will continue to play an important role in the renewable energy landscape after 2020 as well. However, the Flemish potential of biomass for energy applications is limited, which is why considerable amounts of biomass already need to be imported in order to meet the renewable energy objectives.

The strategy of the action plan for (residual) biomass streams when it comes to renewable energy production is to focus strongly on the **mobilisation of local biomass that has been produced in a sustainable way** and cannot be used for other high-quality applications based on the local circumstances.

The biomass is preferably disposed of to a local use, concretely heat and CHP applications, and this in the **industry, the tertiary sector and the agricultural sector**[16]. This is where the largest potential of **renewable heat production based on biomass** can be found. Furthermore, this way the support for **local biomass use** is increased and a contribution is made to the efforts in the Flemish climate policy plan 2013-2020 to reduce the impact of the industry and agriculture on the climate problem.

The use of biomass for renewable energy in Flanders must also be placed in the context of the broader European policy framework on energy and renewable energy.

Carbon storage. The use of woody residual streams in material applications is included in the climate policy via the concept of **carbon sequestration**. This approach leads to higher material recycling rates and, at the same time, contributes to the reaching of objectives with respect to greenhouse gas emissions. This method will also favour sustainable applications of residual streams, as the carbon will be stored for longer there. A general acceptance of the principle of carbon sequestration will also lead to the stimulation of biomass production in general. For instance, when more biowaste is recycled, the carbon buffer capacity can be increased: the composting and anaerobic digestion sectors, among others, annually contribute to CO_2

[15] Determination of the annual gross domestic green energy production and indicative sub-objectives per source of renewable energy (VR 2014 3101 DOC.0134)

[16] From 2013 to 2020 the production of renewable heat in households will remain constant.

reduction as follows: 500,000 tonnes of CO_2 by composting and 380,000 tonnes of CO_2 by anaerobic digestion[17].

Efficient use of biomass. Many residual biomass streams are merely used for the production of electricity. The strategy consists in making the facilities that are currently functioning in a sub-optimal way when it comes to energy yield evolve towards an **increase of their energy yield**, where possible by means of an adapted approach in the framework of the renewable energy policy. In consultation with the authorities and sectors concerned, a step-by-step plan must be designed in order to achieve the desired situation.

6.4.1.2 What do we want to achieve?

By 2020:

- we must study how biomass streams can be directed as much as possible towards **combined heat and power applications or electricity production combined with the use of residual heat, taking into account the commitments entered into and the international framework and markets**;
- we must study the feasibility of **carbon storage** as a new instrument within the climate policy.

By 2030:

- in case of energy production, non-recyclable woody residual streams in Flanders are preferably used for **heat or combined heat and power applications**. Insofar as this is feasible, the implementation of the principle of **biogenic carbon storage** through material recycling (recycling of wood, recycling of biowaste) is prepared within the instruments of the climate policy, taking into account the European and international policy context.

6.4.1.3 Action programmes

Action programme 18: revaluing recycled residual biomass streams as a carbon reservoir

- This action programme studies the policy and legislative possibilities for increasing the role of material recycling as **a carbon reservoir** within the climate policy. The possibilities of the existing set of instruments of the climate policy must be studied, while new concepts are developed for the use of carbon storage within the climate policy. Based on an initial exploratory analysis, the possibilities offered by the currently available set of instruments (ETS system and LULUCF activities) in practice are very limited, both in the short term (2020) and in the long term (2030). However, during the period of the action plan attention will be given to possible opportunities and synergies.

Action programme 19: directing biomass streams as much as possible towards heat and power or green heat production

- We will continue to study how, in the context of the use of biomass, combined applications can be stimulated as much as possible, both in new and existing facilities.
- A clear framework for the development of **heat networks** is also an important aspect.
- When making these adjustments, it is important to take into account the results of the pilot project for the collection and sorting of post-consumer wood waste, as the sorting will change the composition of the post-consumer wood waste for incineration, which can have an impact on the plant and hence the cost of additional facilities.
- Besides increasing the energy yield and maximising savings on fossil fuel, this action programme also focuses on closing the cycle for incineration residues of biomass incineration. The Flemish legislative framework already contains a number of possibilities

[17] Ecological and economic advantages of compost (Vlaco, 2009), Ecological and economic advantages of digestate (Vlaco, 2011), BioGrace tool

for the recycling of residual streams from biomass incineration via their use as a building material or as a soil improver/fertiliser. The action plan will map the management of these residual streams, detect bottlenecks and look for environmentally responsible solutions to those problems. In this context, the comparison is made as well with the legal options that exist in our neighbouring countries for the use of the residual waste streams.

This action programme does not apply to facilities licensed for the treatment of household and/or industrial residual waste. Yield-increasing measures for these final disposal facilities are regulated by the implementation plan on environmentally sound household waste management.

6.4.1.4 Concrete application of the strategy to specific (residual) biomass streams

In the past, OVAM has taken a number of **views** on the **use of biomass for energy production**. The table below provides an overview of (residual) biomass streams and the permitted applications and also mentions the conditions under which they can be used for energy production. Where necessary, this table will be adapted every two years based on the biomass inventory in order to use the results of studies via the policy framework for biomass management as soon as possible.

Description	Sub-streams/ origin	Permitted for the production of renewable energy		Prohibition of incineration[18]	Explanation
		Incineration	Anaerobic digestion [19]		
Cycle of residual biomass streams from the agriculture-food-consumer chain					
Animal by-products[20]	Cat. 1 fats	Yes	Yes, conditions for ABP	No	
	Cat. 2 fats	Yes	Yes	Yes	
	Cat. 3 fats	Annual quota	Yes	Yes	Quota to be determined by the Minister responsible for the Environment
	Cat. 1 animal meal	Yes	No	No	
	Cat. 2 animal meal	No	Yes	Yes	
	Cat. 3 animal meal	No	Yes	Yes	
VFG waste	VFG	No	Yes	Yes	
	Sieve overflow after composting	Conditions[21]	No	No	
Used deep-frying fats and oils	Households or hotel and catering industry	Annual quota	Yes	Yes	Quota to be determined by the Minister responsible for the Environment

[18] This column shows whether a prohibition of incineration applies. If so, an exemption must be applied for to incinerate insofar as this is possible under 4.5.2. of VLAREMA
.

[19] Anaerobic digestion with a view to the combined production of a soil improver/fertiliser and biogas.

[20] The conditions of Regulation 1069/2009 (EC) apply to all animal by-products used for the production of renewable energy.

[21] Generated by licensed VFG waste composting activities with quality monitoring, where an inspection certificate is available for the compost produced

Residues of vegetable oils and fats	Food industry	Yes	Yes	Yes	Of vegetable origin and calorific value > 11,500 kJ/kg
Residues of vegetable oils and fats that comply with VLAREMA	Food chain	No	Yes	Yes	
Residual waste streams that comply with VLAREMA	Food chain	No	Yes	Yes	
Residual waste streams that do not comply with VLAREMA	Food chain	Yes	Yes, on condition that the digestate is removed	No	
Compost and digestate	Biological treatment facility	No	Yes	Yes	
Description	**Sub-streams/ origin**	**Permitted for the production of renewable energy**		**Prohibition of incineration[17]**	**Explanation**
		Incineration	**Anaerobic digestion[18]**		
Cycle of (residual) biomass streams from green space, nature, forest and landscape management					
Green waste	Woody fraction/prunings	Conditions[22]	No	Yes	
	Mixed garden waste	No	No	Yes	
	(Verge, nature) cuttings, leaves	No	Yes	Yes	Hygienisation conditions for nature and verge cuttings

[22] Generated by licensed green waste composting activities with quality monitoring, where an inspection certificate is available for the compost produced

	Sieve overflow after composting	Conditions[23]	No	No	
Wood pellets		Conditions	No	No	For green energy production see Energy Decree, Article 6.1.16.
Woody biomass from landscape management (excl. forest management)		Conditions	No	Yes	Conditions: see 6.2.1. (Strategy)
Residual waste streams from forest exploitation and maintenance[24]	Thinnings, branches and topwood	Conditions	No	No	Conditions: see 6.2.1. (Strategy)
Sods and chopper material	Organic fraction Rough woody fraction	No Yes	Yes No	Yes Yes	Use as a raw material for the production of potting soil
Compost and digestate	Biological treatment facility	No	Yes	Yes	

Description	**Sub-streams/ origin**	**Permitted for the production of renewable energy**		**Prohibition of incineration[17]**	**Explanation**
		Incineration	**Anaerobic digestion[1]8**		
Cycle of residual biomass streams from the industry and households					

[23] Generated by licensed green waste composting activities with quality monitoring, where an inspection certificate is available for the compost produced

[24] Woody biomass from the felling of standard trees, regardless of its origin (e.g. parks, gardens, verges), also falls under this description.

Class A wood	Wood-processing industry Post-consumer wood	Conditions No	Yes No	No No	Only if generated by own production and energy recovery
Class B wood		Conditions	No	No	Conditions: To be assessed based on results of study on collection and sorting of class B wood.
Class C wood		Yes	No	No	

Table 1: (Residual) biomass streams permitted for renewable energy production in the period 2015-2020

Note: Residual biomass streams that are not mentioned in this table will be assessed separately by OVAM