



Agriculture

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Agriculture constitutes an important economic sector in the coastal zone¹ and is, from a historical perspective, responsible for land reclamation. Over the last few years, the importance of agriculture as an employer in the European coastal regions has gradually decreased. Agriculture in the coastal zone is under pressure, mainly due to the urban expansion. Between 1990 and 2000, 2,000 km² of farming land disappeared in the European coastal areas (first 10 km). In Belgium, the agricultural area decreased by 1.85% (*European Environment Agency (EEA) 2006*¹⁰⁰²⁸¹). Nevertheless, as an integral part of the agro-nutrition system, agriculture remains an important source of employment (*Landbouwrapport 2012*²²¹⁷¹¹). Agriculture also has an impact on the marine environment *inter alia* due to the supply of nutrients such as nitrogen and phosphorus that can cause eutrophication of the coastal waters. Especially in the southern part of the North Sea and the Channel, eutrophication constitutes a problem. 60% of the effluent nitrate and 31% of the effluent phosphorus derives from agriculture (*OSPAR QSR 2010*¹⁹⁸⁸¹⁷). However, these nutrients originate from the entire country and not only from agriculture in the coastal zone. Measurements by the Flemish Environment Agency (VMM) indicate a reduction of the nitrate and phosphorus concentration in the surface water in Flanders over the last few years. A further reduction of these nutrients from all sources remains important in order to achieve a good status of the surface water and coastal waters (see theme *Nature and environment*) (*Voortgangsrapport Mestbank 2012*²²⁶⁵⁵²).

8.1 Policy context

An important part of the agricultural policy is determined at the European level by the Common Agricultural Policy (CAP) of the *Directorate-General for Agriculture and Rural development* of the European Commission (EC) (more information: *Het GLB uit de doeken gedaan 2009*²¹⁴⁶⁷⁸). In 2012, the CAP is characterised by two policy lines. The first policy line is generally described as 'Pillar I' policy and includes market and price support as well as direct support towards the farmer. The second policy line ('Pillar II policy') concerns the policy with regard to rural development (*Landbouwrapport 2012*²²¹⁷¹¹). In June 2013, an agreement was reached about the *CAP reform* that should enter into force on 1 January 2014. At the Flemish level, the agricultural policy is developed by the Flemish Minister of Agriculture and Fisheries. The Agriculture and Fisheries Department (*Departement Landbouw en Visserij*) is responsible for the preparation and evaluation of the policy (*beleidsnota landbouw, visserij en plattelandsbeleid*²¹⁴⁷⁷⁸). The Agriculture and Fisheries Agency (*Agentschap voor Landbouw en Visserij*) implements the policy under the direct authority of the minister, but has operational autonomy. The policy is supported by the Institute for Agricultural and Fisheries Research (*ILVO*), Flanders' Agricultural Marketing Board (*VLAM*) and the Strategic Advisory Council for Agriculture and Fisheries (*SALV*). The province plays an important role in the education and innovation with regard to agriculture. The provincial authorities also have 'indirect competences' concerning the permit policy, spatial planning and the maintenance of non-navigable waters of the 2nd category (*provinciale beleidsnota landbouw 2007-2012*²²⁵⁴⁰⁸). Furthermore, the agricultural policy is linked to other policy domains and authorities such as the Flemish environment and spatial policy and the Federal Agency for the Safety of the Food Chain (FASFC). The developments in the international/European and Flemish agricultural policy are discussed in detail in the following publication: *Landbouwrapport 2012*²²¹⁷¹¹. A broader overview of the legal context with regard to agriculture is provided in the coastal codex theme *agriculture*.

8.2 Spatial use

In Flanders, the areas reserved for agricultural purposes are registered in the Flemish spatial structure plan (*RSV*) as the 'agricultural structure'. The regulations of the RSV demand that the Flemish Region demarcates a specific area for agriculture (750,000 ha), nature and forest in the regional spatial structure plans or in the regional spatial implementation plans. Regional plans have been reaffirmed when a consensus between the nature, forest and agriculture sector was present. In addition to the demarcation in the RSV and the reaffirmation of the agricultural area, it is possible to further refine this demarcation through the spatial implementation plans (RUPs). However, this process has a serious delay.

The process of the demarcation of the agricultural areas in the region Coast-Polders-Westhoek started in 2004. During this demarcation phase, a new integrated approach was used which took agriculture, nature and forest simultaneously into account. In consultation with the municipalities, provinces and stakeholders a spatial vision (*ruimtelijke visie*¹⁰⁸⁹⁴²) was drafted which indicates the most important structures: connected areas prohibited for

¹ Unless stated otherwise, the coastal zone consists of the 10 coastal municipalities (Blankenberge, Bruges, Knokke-Heist, Bredene, De Haan, Middelkerke, Ostend, De Panne, Koksijde and Nieuwpoort) and the 9 hinterland municipalities (Damme, Jabbeke, Zuienkerke, Diksmuide, Lo-Reninge, Gistel, Oudenburg, Alveringem and Veurne).

agriculture, valleys for nature development, etc. The consultation process finally resulted in 95,100 ha of reaffirmed agricultural area in the region Coast-Polders-Westhoek ([Danckaert 2013](#)²²⁵⁴⁰⁹). The regional spatial implementation plans (GRUPs) for agriculture, nature and forest in this region can be consulted on the website of the [RSV](#).

Parts of the agricultural structure are described in the spatial structure plan of the province of West Flanders ([PRS-WV](#)). The ‘coast’ and ‘the polder area’ (parts of the spatial structure in the PRS-WV) are important for the research area of the current document. Few agricultural activities are still present in the coastal zone due to the strong urban pressure, the economic developments (e.g. harbour of Zeebrugge) and increased nature protection.

The polders are a homogeneous agricultural area with few built-up areas. In Zeebrugge this area is significantly interrupted by the port activities. In the transition zone to the coastal municipalities and the agglomeration of Bruges, agriculture is under significant pressure due to urbanisation. To support agriculture, areas have been demarcated in the provincial spatial implementation plans in the western and eastern polder area where building is prohibited ([PRS-WV](#)).

The instrument of land exchange consolidation has been invented to achieve a solid agricultural structure, as described in the spatial planning (see above). In Flanders, the Flemish Land Agency ([VLM](#)) is responsible for these land exchange consolidation projects (more information: [website VLM](#)). The purpose of this instrument is to improve the economic exploitation of the agricultural enterprises as well as to improve the areas for nature and recreational purposes. Almost 20% of the total agricultural area of West Flanders has been subject to land exchange consolidation. In the Polder region, a high concentration of land exchange consolidations is present: approximately 28,700 ha of which the majority constitutes a connected area from the south of Ostend towards Veurne ([PRS-WV](#)). An overview of the spatial projects can be found in the [database on the VLM-website](#).

The agricultural area in the coastal zone constitutes a total surface of 70,761 ha (figures 1 and 2). This corresponds to 11.5% of the total agricultural area in Flanders (Source: Agriculture and Fisheries Department based on the FPS Economy - *Algemene Directie Statistiek en Economische Informatie* (ADSEI)). The polders are characterised by the large size of the agricultural enterprises. The largest enterprises of West Flanders are present in this area. In 1996, the average size of an agricultural enterprise was approximately 28 ha (West Flanders: 20 ha). In comparison with 1986, the surface of an average agricultural enterprise increased by 26% (West Flanders: 33%). Besides the land exchange consolidations (see above), the further automation and the relative decrease in land prices, the increase in scale can be largely attributed to the decline of the number of farmers resulting in lands being absorbed by other enterprises ([PRS-WV](#)). All parcels registered by the Agriculture and Fisheries Agency and their culture can be downloaded in GIS format on the website of the Flemish Geographical Information Agency ([FGIA](#)).

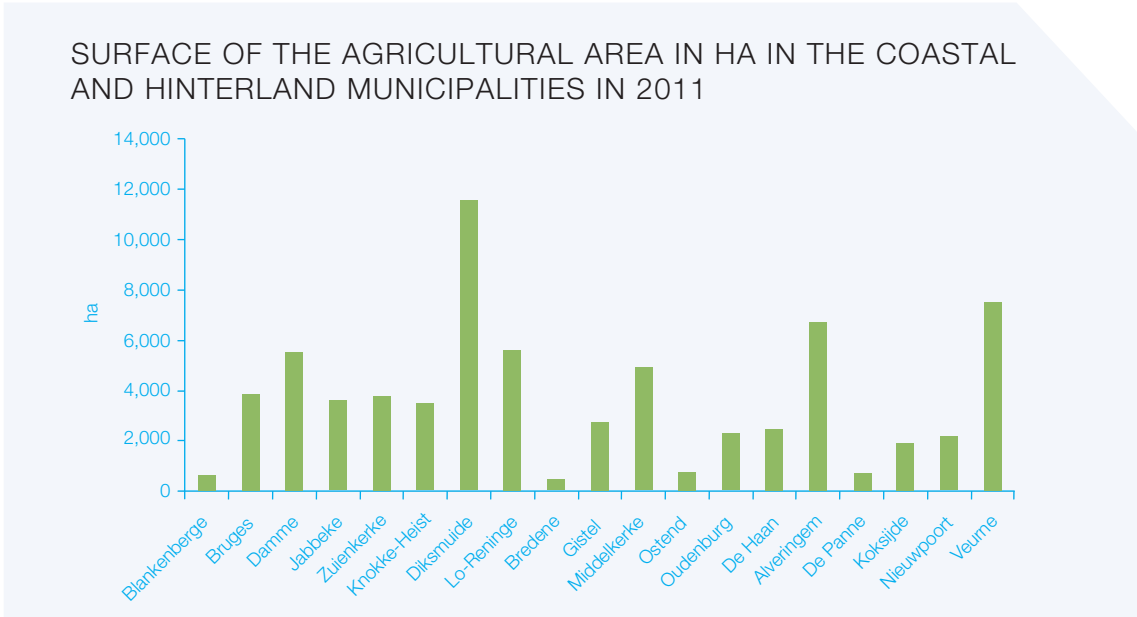


Figure 1. Surface of the agricultural area in ha in the coastal and hinterland municipalities (2011) (Source: Agriculture and Fisheries Department, based on FPS Economy - ADSEI).

AGRICULTURAL AREA IN THE COASTAL ZONE

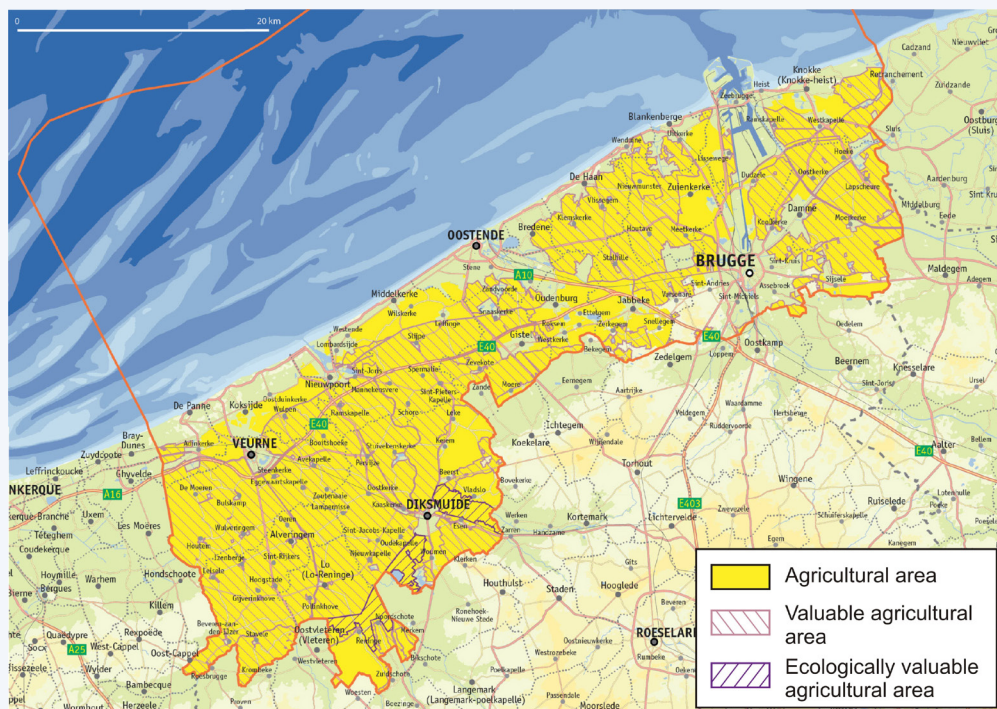


Figure 2. The agricultural area in the coastal zone (*Coastal Atlas*).

8.3 Societal interest

In 2011, 4,280 persons (3,146 full-time employees) were employed in 2,249 agricultural enterprises in the coastal and hinterland municipalities. This figure corresponds to 8.7% of all agricultural enterprises in Flanders. The majority of the enterprises and employment in the coastal zone is located in the hinterland municipalities (figure 3). The specialisation of these enterprises concerns primarily the cultivation of crops and the rearing of cattle, pigs and poultry (table 1) (Source: Agriculture and Fisheries Department, based on FPS Economy – ADSEI, see also the specific theme agriculture and horticulture in the publication: [West-Vlaanderen ontcijferd 2012](#) ²²⁶⁵⁰⁴).

Table 1. Number of enterprises in the coastal area in 2011 divided by specialisation (Source: Agriculture and Fisheries Department, based on FPS Economy - ADSEI).

SPECIALISATION	NUMBER OF ENTERPRISES IN THE COASTAL ZONE (2011)
1) agriculture	453
2) horticulture	81
3) milk production	254
4) beef production	352
5) mixed cattle breeding	198
6) other grazing livestock (sheep, etc.)	108
7) pigs and poultry	354
8) mixed enterprises	258
9) mixed cattle breeding enterprises	191
Total of enterprises	2.249

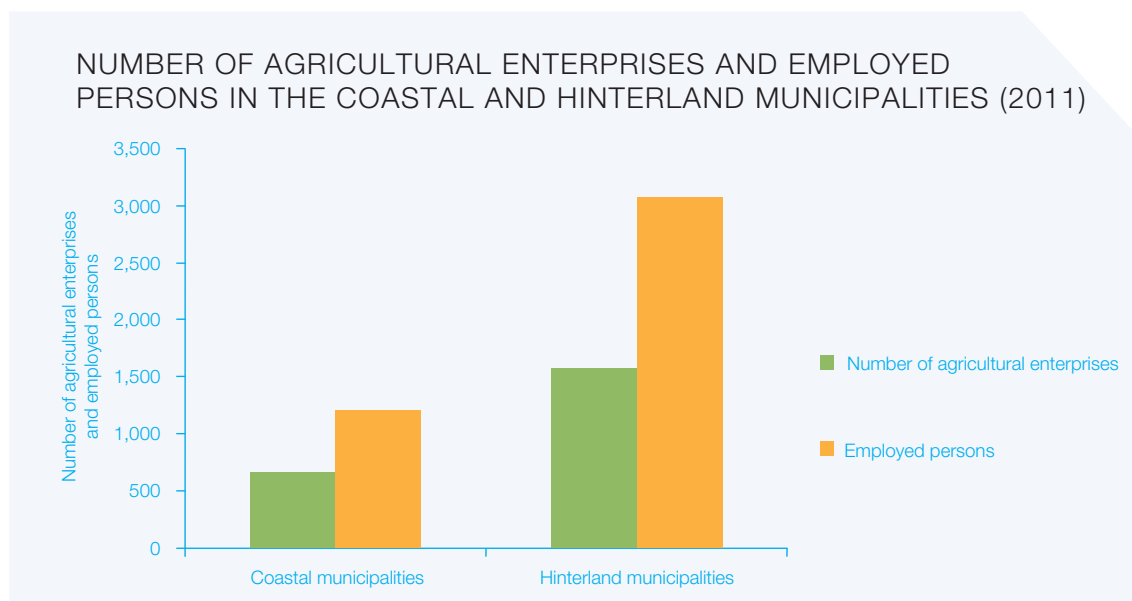


Figure 3. Number of agricultural enterprises and employed persons in the coastal and hinterland municipalities in 2011 (Source: Agriculture and Fisheries Department, based on FPS Economy - ADSEI).

The soil suitability of the polders is remarkably homogeneous: the complete area is 'very suitable' or 'suitable' for agriculture and grazing land (*PRS-WV*). For example, the cultivation of beets in 2011 accounted for 5.2% of the agricultural area in the coastal zone compared to 3.3% in Flanders (Source: Agriculture and Fisheries Department - AMS, based on FPS Economy - ADSEI). In general, the area is not suitable for the remaining cultivation groups, except for the cultivation of fruits for which local areas of moderate suitability are present. The polders differ from other regions due to the high amount of cereals in the agricultural area: about 28% (West Flanders: 19%). Not much horticulture is present in the polders (*PRS-WV*).

The agricultural enterprises in the coastal zone account for 140,984 cows, 9,597 sheep, 2,760 goats and 1,809,905 heads of poultry (Source: Agriculture and Fisheries Department, based on FPS Economy – ADSEI).

Besides the economic importance, agriculture also contributes to landscape creation, the management of open space (see also theme **Nature and environment**) and certain ecosystem services (e.g. water regulation, recharge of ground water, etc.) in the coastal zone.

8.4 Impact

In the section 'impact', the (general) effects of agricultural activities on the ecosystem are discussed, as well as the indirect effects of these activities on the marine environment (eutrophication). Also, the phenomenon of salinisation is discussed. Although salinisation is mainly caused by other human activities, it has a considerable effect on the agricultural activities in the coastal zone.

8.4.1 Effects on the ecosystem

The different effects of the agricultural activities on the environment in Flanders (not specific for the coastal area) are listed in the publications *Wustenberghs et al. (2009)*²¹⁴⁷³⁵, *Van Steertegem (2012)*¹³⁸⁵⁴² and *Landbouwrapport 2012*²²¹⁷¹¹. A description of the ecosystem of the polder area is discussed in the theme **Nature and environment**. The effects on the ecosystem are *inter alia*:

- The use of chemical products for crop protection (more information: *Lenders et al. 2011*²²⁵⁴¹⁰);
- The use of water (more information: salinisation of the coastal area, *Lenders et al. 2011*²²⁵⁴¹⁰);
- The use of energy (more information: *Lenders et al. 2011*²²⁵⁴¹⁰);
- The impact on the soil quality and erosion sensitivity;

- Fertilisation (more information: eutrophication of the coastal waters [Voortgangsrapport Mestbank 2012](#) ²²⁶⁵⁵², [Overloop et al. 2009](#) ²¹⁴⁷²⁸);
- The emission of greenhouse gases;
- The emission of particulates;
- Waste production;
- The impact on the spatial use.

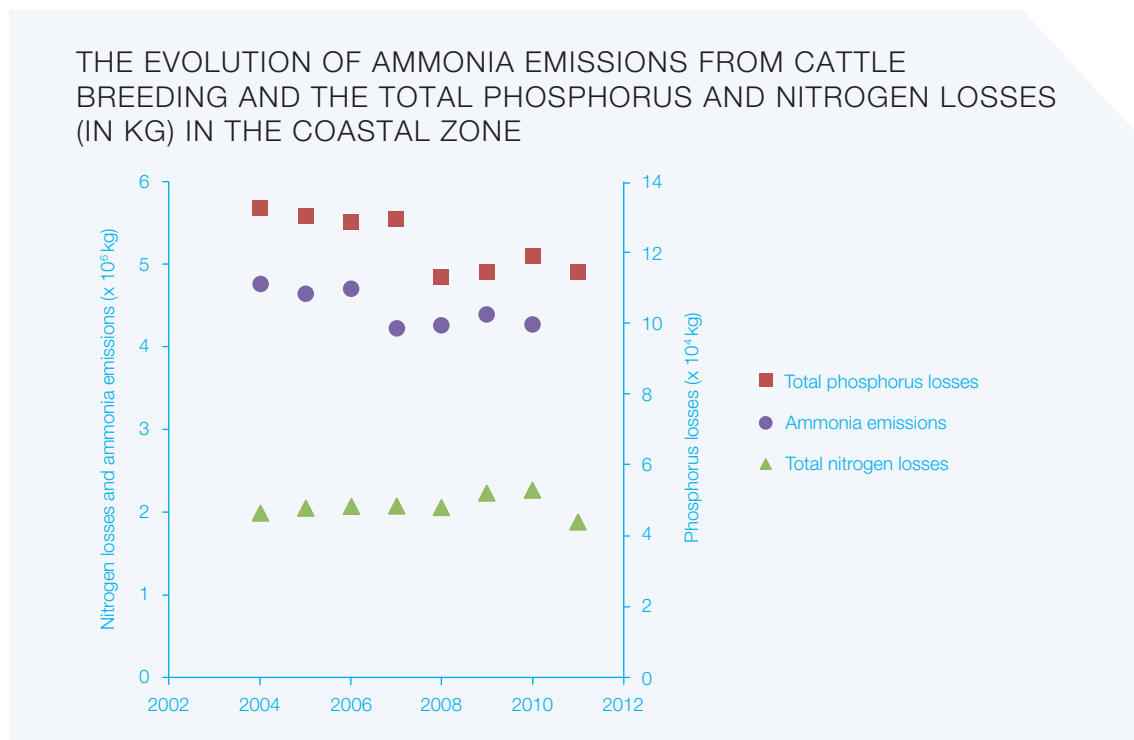


Figure 4. The evolution of ammonia emissions from cattle breeding and the total phosphorus and nitrogen losses (in kg) in the coastal zone (Source: www.lokaalstatistieken.be).

In 2010, the total ammonia emission in the coastal zone amounted to 11.1% of the total Flemish emission. The SENTWA model (System for the Evaluation of Nutrient Transport to Water) is used to estimate the losses of nitrogen and phosphorus from agriculture. This model indicates that the total phosphorus and nitrogen losses in the coastal zone in 2011 accounted for 9.9% and 11.6%, respectively, of the total Flemish losses.

8.4.2 Eutrophication of the coastal waters

Along with some other actors, the use of fertilisers in agriculture has played an important role in the increase of the nutrient concentrations (nitrogen N, phosphorus P) in the aquatic ecosystems. An excessive supply of nutrients or 'eutrophication' amplifies the production of phytoplankton. A phytoplankton bloom can lead to changes in the structure of the ecosystems, destruction of habitat and a decrease in biodiversity ([André et al. 2010](#) ²⁰⁰⁶¹³). Over the last 20 years, the phosphorus concentrations have decreased in the sea water of the Belgian part of the North Sea (BNS), whereas the nitrate concentrations have varied strongly and without any clear trend ([Goffin et al. 2007](#) ¹¹⁴²²⁵). Besides the transport of nutrients by rivers, there is an increased awareness of the atmospheric supply ([OSPAR QSR 2010](#) ¹⁹⁸⁸¹⁷). The eutrophication of the coastal waters has been comprehensively studied in the [AMORE](#) ([AMORE project BELSPO](#)), [AMORE II](#) ([AMORE II project BELSPO](#)) and [AMORE III](#) projects ([AMORE III project phase 1 en phase 2 BELSPO project](#)) (more information: [Lancelot & Rousseau 2004](#) ¹⁰⁹⁰³⁹, [Rousseau et al. 2006](#) ¹²⁷⁷²², [Lancelot et al. 2007](#) ¹⁰⁹⁷⁶⁹, [Lancelot et al. 2009](#) ²¹¹⁹⁴⁹). The [ISECA project](#) aggregates the knowledge and information about the eutrophication in the southern part of the North Sea.

8.4.3 The salinisation of the coastal area

An important impact on the agriculture in the coastal area is salinisation. During this process brackish or salt ground water can penetrate in the root layer of the soil. This causes an accumulation of salts ([Peeters et al. 2010](#)²¹⁴⁷³², [Peeters et al. 2011](#)²¹⁴⁷⁷¹⁰). Naturally, there is a distribution of fresh and salt/brackish water in the coastal area. This distribution between fresh and salt water is the result of a complex history, influenced by human activities such as water extraction, infrastructure works (such as harbour expansion, tunnels, drainage, etc.) and interventions in the water management. These hydraulic interventions in coastal areas may result in the short or long term in changes of the fresh-salt water distribution, possibly leading to salinisation ([Vanleberghe & Vanhoutte 2001](#)²⁴⁵³⁸, [Van Houtte 2002](#)²⁴⁶⁵⁴, [Vandenbohede et al. 2008](#)²¹⁴⁷⁶⁹). Furthermore, sea level rise increases the salt pressure towards shallow groundwater and surface water. The fresh water lens in the dunes acts as a buffer against the intrusion of salt sea water in the hinterland ([Van den Eynde et al. 2011](#)²¹²⁴²¹ (CLIMAR project [phase 1](#) en [phase 2](#) BELSPO) and [CLIWAT project](#)).

8.5 Sustainable use

The international (WTO, climate conference of Copenhagen 2009, conference about sustainability in New York 2009, etc.) and European policy (the Treaty of Lisbon, the EU-2020 Strategy, the CAP, etc.) to maintain a sustainable agriculture is discussed in [Landbouwrapport 2012](#)²²¹⁷¹¹. In [Landbouwrapport 2012](#)²²¹⁷¹¹ several sustainability themes in agriculture are linked with each other, based on indicators. Furthermore, recommendations and measures to reduce the environmental impact of agriculture in Flanders are listed in [Wustenberg et al. \(2009\)](#)²¹⁴⁷³⁵, [Van Steertegem \(2009\)](#)¹⁴²⁶⁰⁹ and [Van Steertegem \(2012\)](#)¹³⁸⁵⁴². [Gobin et al. \(2008\)](#)¹²⁷⁵⁸⁵ discusses the adaptation possibilities of Flemish agriculture whereas [Mathijs et al. \(2012\)](#)²²⁶⁵⁵³ focuses on the sustainability of food production and consumption from a transition perspective.

The sustainable compatibility of several user functions in the coastal area (housing, tourism, recreation, agriculture, industry, nature, etc.) is discussed within the *European recommendation for integrated coastal zone management* (ICZM) (COM (2002) 413). In Belgium, the Coordination Centre for ICZM is the contact point for coastal zone management (see theme **Integrated coastal zone management**). The compatibility of different sectors in the polders is discussed in a case study of the Uitkerkse polder (Blankenberghe) ([Bogaert et al. 2002](#)³⁰³⁰⁰).

Measures and regulations for certain effects linked to agricultural activities that have a specific importance for the coastal zone are discussed below.

8.5.1 Measures (in agriculture) against eutrophication

In the Northeast Atlantic Ocean, OSPAR created a '[common procedure \(2005\)](#)²²⁶⁵⁸² for the identification of the eutrophication status ([Eutrophication Status of the OSPAR Maritime Area, 2008](#)²¹⁴⁷²⁷). This procedure serves as a framework to identify the actions described in the [OSPAR Eutrophication Strategy \(2003\)](#)²¹⁴⁸⁴⁵. A part of this strategy concerns a eutrophication monitoring programme (see also [OSPAR website](#)).

At the European level, the issue of eutrophication is covered by several directives. The *Nitrates Directive* (91/676/EC) aims to reduce the leaching of nitrates from agriculture ([Goffin et al. 2007](#)¹¹⁴²²⁵). In the *Marine Strategy Framework Directive* (MSFD) (2008/56/EC), eutrophication is defined as one of the descriptors for determining the environmental status. The criteria and methodological standards to determine the environmental status are described in [Ferreira et al. \(2010\)](#)¹⁹⁹⁵⁵⁰. In the *Water Framework Directive* (WFD) (2000/60/EC) an obligation was imposed to reach a good status of the surface and ground waters by 2015 (see theme **Nature and environment**). In this context, chemicals that contribute to eutrophication such as nitrogen and phosphorus are listed among the pollutants. Furthermore, eutrophication is discussed in the *Directive 91/271/EC concerning urban waste-water treatment*, *Directive 2008/11/EC concerning integrated pollution prevention and control* and *Directive 2001/81/EC on national emission ceilings for certain atmospheric pollutants*.

On the Flemish level, the nitrates directive is implemented in the *Decree of 22 December 2006*. This decree was originally approved on 23 January 1991 and was afterwards repeatedly adapted. The *Decree of 22 December 2006* came into force on 1 January 2007. On 1 January 2011, the fourth fertiliser action plan was launched (MAP-4, 2011-2014) (for implementing decisions and changes: [website VLM](#)). The WFD was implemented on the Flemish level in

the *Decree of 18 July 2003* on integrated water management (for implementing decisions and changes: [website Coordination Committee on Integrated Water Policy](#)) and on the federal level in the *Royal Decree of 23 June 2010* concerning the good status of surface waters. In addition, the *MSFD* is incorporated in Belgian legislation by the *Royal Decree of 23 June 2010* concerning the marine strategy for the BNS. The *VMM* has a monitoring network for the water quality at its disposal that was expanded in 1999 with specific measuring points for agriculture (the so-called *MAP-network*). In *Lancelot et al. (2011)*²⁰⁴¹²⁰ the costs and ecological efficiency of measures to prevent eutrophication in the southern Bight of the North Sea were modelled (see also AMORE III project [phase 1](#) and [phase 2](#) of the BELSPO project, and *TIMOTHY BELSPO project*).

8.5.2 Measures against salinisation

In *COM (2002) 179* and *COM (2006) 231*, the EC pleads for a Thematic Strategy for Soil Protection. In spite of several attempts, no agreement has been reached between the Member States. This directive would be *inter alia* focused on the prevention of soil damage due to salinisation (*Landbouwrapport 2010*²⁰⁵⁸⁴⁵). Furthermore, intrusions of salt water were also included in the *WFD (2000/60/EC)* (see theme **Nature and environment**) as parameters for the quantitative status of the ground water.

The *WFD* was translated into Flemish legislation by the *Decree of 18 July 2003* concerning integrated water management ([website Coordination Committee on Integrated Water Policy](#)). The *WFD* is also partially implemented in Belgian legislation by the *Royal Decree of 23 June 2010* concerning the good status of surface waters. The quality of the surface and ground water is monitored by the *VMM* (more information: *Vandenbohede et al. 2010*¹⁴³⁹⁴³, the legislation is listed in the coastal codex theme [ground water extraction](#)).

Legislation reference list

Table with European legislation. The consolidated version of this legislation is available on [Eurlax](#).

EUROPEAN LEGISLATION			
Abbreviations (if available)	Title	Year	Number
Directives			
	Council Directive concerning urban waste-water treatment	1991	271
Nitrates Directive	Council Directive concerning the protection of waters against pollution caused by nitrates from agricultural sources	1991	676
Water Framework Directive	Directive 2000/60/EC establishing a framework for Community action in the field of water policy	2000	60
	Directive on national emission ceilings for certain atmospheric pollutants	2001	81
	Directive concerning integrated pollution prevention and control	2008	1
Marine Strategy Framework Directive	Directive 2008/56/EC establishing a framework for community action in the field of marine environmental policy	2008	56
Other (Decisions, Communications, White Papers, etc.)			
	Communication from the Commission to the Council, the European Parliament, the Economic and Social Committee and the Committee of the Regions - Towards a Thematic Strategy for Soil Protection	2002	179
	Recommendation of the European Parliament and of the Council of 30 May 2002 concerning the implementation of Integrated Coastal Zone Management in Europe	2002	413
	Communication from the Commission to the Council, the European Parliament, the European Economic and Social Committee and the Committee of the Regions - Thematic Strategy for Soil Protection	2006	231

Table with Belgian and Flemish legislation. The consolidated version of this legislation is available on [Belgisch staatsblad](#) and the [Justel-databases](#).

BELGIAN AND FLEMISH LEGISLATION	
Date	Title
Royal Decrees	
KB van 23 juni 2010	Koninklijk besluit betreffende de vaststelling van een kader voor het bereiken van een goede oppervlaktewatertoestand
KB van 23 juni 2010	Koninklijk besluit betreffende de mariene strategie voor de Belgische zeegebieden
Decrees	
Decreet van 18 juli 2003	Decreet betreffende het integraal waterbeleid
Decreet van 22 december 2006	Decreet houdende de bescherming van water tegen de verontreiniging door nitraten uit agrarische bronnen

