

## Pilot information

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# Diagnosis of seashells recovery in Hauts-de-France in the tourism sector



# Colophon

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Facilitate the adoption of circular entrepreneurship in tourism and leisure sector (FACET) is an Interreg 2 Seas 2014 - 2020 project. Interreg 2 Seas is a European Territorial Cooperation programme. FACET has received funding from the Interreg 2 Seas programme 2014 -2020 co-funded by the European Regional Development Fund.

**More about the project:** <http://www.facetwiki.eu>

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## About the document

Within the project FACET project has projectpartner ADEME mobilized external expertise to help the local Government of Baie de Somme, who is the core project developer, accelerate the process of collecting and transforming shell waste into by—product potentially used by local touristic operators. But the actors gravitating around the project also benefited from the report conclusions. This has led to the production of this current document that first makes a diagnosis of the situation : potential for shell waste collection (the deposits), barriers to collect and valorize this resources, ecosystem of actors that could be involved in the project, etc.

Then, based on the results of the diagnosis, the aim was to define an action plan that includes steps to follow to move from a linear model to a circular model, and is translated into a business model integrating the circular economy for each of the private tourism operators involved.

The document provides an in-depth regulatory analysis which enabled the project leader NV Economisch Impuls Zeeland to engage in discussions with the competent regulatory authorities in the region and to remove some of the regulatory constraints. In addition, the diagnosis made it possible to identify new actors to associate with the project to give it more scope: Ecaille de mer has thus emerged. This actor proposes a new method of processing shellfish, less expensive than that proposed by the previously identified processing industry (Etnisi). In addition, it expands the deposit of mussels to oysters.

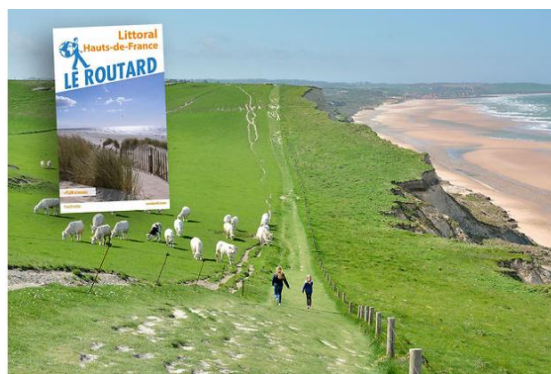
The document lists the next steps to be put in place to initiate a second phase of testing on a larger scale with the new treatment processes. This phase will make it possible to validate the feasibility of the project and to consider its sustainability and then its deployment.

# Diagnosis of seashells recovery in Hauts-de-France in the tourism sector

## 1.1. Tourism context of Hauts-de-France

A differentiating tourism profile

The Hauts-de-France coastline has a tourist profile that differentiates it from nearby coastlines: less densely built up than the Belgian coast or the Normandy coast, it has a profile of "small" resorts with vast preserved natural areas. The passage on foot from the French commune of Bray-Dunes to its Belgian neighbor of De Panne is edifying in this respect.



Sentier des falaises du site des 2 caps entre le cap Blanc-Nez et Wissant © aquaphoto - stock.adobe.com

This lower density of construction, long seen as a weakness in a mechanical vision of tourist activity linked to the number of beds built, is now proving to be a strength with the evolution of tourist clientele's expectations towards less dense, less frequented, more natural destinations, etc. These trends are certainly old, but are reinforced by the current crisis.

On the other hand, the regional coastline is also structured by strong centralities, in particular 3 large agglomerations offering both services, hotel accommodation, shops, etc. but also tourist, cultural and leisure offers complementary to seaside offers. Thus, the Hauts-de-France coast offers a complete and diversified offer that responds well to the new expectations that increasingly underpin the motivations of tourist clientele.

However, this strength of the Hauts-de-France coastline must be managed so that the increase in tourist attendance does not generate negative externalities likely to call into question the attractiveness of the deposit.

It is therefore a question of controlling tourist flows and managing their environmental impact in order to optimize the spread of tourist flows in space and time and to maximize the economic benefits for the local ecosystem.

### **Geopolitical and climate change issues at different time steps**

The Hauts-de-France region is facing a complex context that adds additional issues to take into account:

- Geopolitical issues: in addition to the health crisis, how will the Brexit crisis impact the behaviour of British families? Depending on the impact of Brexit on their standard of living, the attendance of this population could be modified on the other side of the Channel, in the Hauts-de-France region.

- Climate change within the territory: the region must adapt in the longer term, so as not to suffer the rise of the waters on the coast and the polders of Hauts-de-France but to anticipate it.

## **1.2. Project 1: Tricoquille/Sea Scales**

### **1.2.1. State of play**

#### 1.2.1.1. Shell waste deposits

Problems of territories and stakeholders

In the Hauts-de-France region, several territories report a problem of shellfish waste management and the lack of recovery solutions. Among these territories we can mention:

- **The Communauté d'Agglomération Baie de Somme (CABS).** The CABS is currently responsible for the collection and treatment of shellfish waste that ends up in residual household waste. The territory of the Bay of Somme has been working for several years on the valorization of mussel shells. A study on the shell deposit and their potential for valorization was carried out in 2017. A full-scale test was then conducted in the Bay of Somme, recovering about fifteen tons of mussel shells from restaurants and campsites, and calling on a Lille company, Etnisi, for their recovery. The territory now wishes to perpetuate this approach and extend it to other types of shells.
- **The Boulonnais.** In Boulogne-sur-Mer, there is a very high consumption of scallops, particularly by industrial players who process products from fishing. It is estimated that shell waste will be produced at about 1,800 tons/year (mainly scallops)<sup>1</sup> in the Capécure Zone (industrial port zone of Boulogne/Mer).
- **The territory of Crotoy.** In this territory, the union of traders is looking for a solution for the recovery of shell waste generated by restaurateurs and fishmongers. An article in the local press had mentioned this subject in 2022.

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<sup>1</sup> Feasibility study of an EIT approach on the port of Boulogne-sur-Mer – 2022 – Boulogne Development Opal Coast



Figure 1 : Excerpts from an article in the Courrier Picard (21/01/2022) denouncing the lack of solutions for the valorization of scallops

- **The Dunkirk territory.** The fishmongers of Dunkirk asked Ecopal (association specialized in Industrial and Territorial Ecology) on the subject of shellfish waste management. These traders want to find solutions for valuing shells.
- **The restorers of the Baie de Somme territory, represented by Baie de Somme Zéro Carbone.** The restaurateurs are at the origin of the shell deposit, and are looking for solutions to recover the shells other than by treatment via household waste. The Baie de Somme Zéro Carbone association is a structure created at the initiative of tourism professionals wishing to invest in ecotourism. This structure is mobilized in particular as part of the Tricoquille project.
- **Theregional shellfish farming** committee. At the level of the shellfish farming sector, the problem mainly concerns mussels harvested but too small to be marketed. They are often put back on the foreshore, a tolerated but not optimal practice, which nevertheless seems the most logical if the mussels are still alive. Otherwise, they are crushed, and recovered in composting or methanization.

### Deposits according to producers

The study<sup>2</sup> carried out in 2017 on the Bay of Somme gives an idea of the deposit on this territory but also according to the different typologies of actors. This estimate may make it possible to extrapolate deposits from other territories.

<sup>2</sup> Technical and economic feasibility study for the establishment of a shellfish by-product management sector: from collection to recovery in the Bay of Somme - Picardie Maritime. Syndicat Mixte Baie de Somme Trois Vallées

- **Mussel production in the** Artois-Picardy basin is about **3,500 tonnes/year**, 57% of which is concentrated in the shellfish farming centre of Crotoy (Baie de Somme). The other producers are spread over the territories of the Bay of Authie, Dannes, Ambleteuse, Oye Plage, and Dunkirk. Production extends from February-m ars to October.

The shellfish by-products generated by this activity are undersized mussels that cannot be marketed. They are full and represent about 16% of production, i.e. a quantity of **560 tonnes/year**, of which **320 tonnes/year on the territory of the Bay of Somme**.

- **Fishmongers:** the by-products of shellfish from fishmongers are essentially related to the shelling activities of scallops. The production extends from October 1st to April 30th with a peak during the end of year holidays. The deposit is estimated at **7.8 tonnes of shell by-products per year and per fishmonger**. On the territory of the Bay of Somme this represents a deposit of **460 tons per year**.
- **Restaurants:** The shellfish by-products from restaurants are mainly:
  - o Mussel waste (mixed with other table waste) – 79%
  - o Waste from other mixed shells (mainly seafood) – 12%
  - o Scallop shell waste – 9%

The deposit is seasonal and depends on tourist activity. It also varies depending on the types of restaurants.

- **Industrial: at** the industrial level, deposits have mainly been identified in the Capécure area of Boulogne sur Mer, an area which brings together the industries processing fishery products. The estimated amount of shell waste in this area is between **1,650 and 2,000 tonnes/year**. This important deposit is located in a specific area, which can facilitate the logistical management of possible recovery.
- **Events:** events are not to be neglected either since various events in the region highlight shellfish products such as oysters or mussels:
  - o Oyster Festival in Marcq-en Baroeul
  - o Oyster Fair in Dunkirk
  - o Mussel Festival at Equihen Plage
  - o Wimereuse mussel festival
  - o The mussel fair in Calais
  - o etc.

On each of these events, several tons of shells are thrown (Dunkirk: 7 tonnes, Marcq-en-Barœul: 4 tonnes) and which could find a way of valorization.



### 1.2.1.2. Logistics associated with shell waste collection

#### Collection in the territories with separation of flows

Several issues must be taken into account in the logistical organization of collection from the different "deposits":

- **The seasonality of the deposit:** the mussel shell will be present in quantity during the summer period and especially during weekends and school holidays. The weather also plays a role because the amount generated depends on the tourist influx. The scallop will concern the autumn and winter period with a peak for the end of year celebrations. Events also add a punctual fluctuation of deposits. All this requires an adaptation of the locations and frequency of collections throughout the year.
- **Equipment:** collections can be made with dump trucks or vans. The advantage of the van and the non-need for a specific permit. Collection containers must be adapted to each deposit. Depending on the project, a voluntary drop-off point can be set up, requiring the establishment of a specific collective container.
- **Communication and support: to obtain the** support of the actors to this project, communication and support are essential: communication to explain the project, its environmental and economic benefits, support on the use of containers, the rhythm of collections, the separation of waste streams, etc.

#### The storage area

The storage area is an important point when setting up a shellfish waste recovery project. This area must comply with a certain number of rules (see regulation section, section 1.1.1.5 remote residential area, protected from pests, etc.

#### Transport to the hygienization and/or recovery site

Once the shells are stored on the territory, two solutions exist:

- Carry out the hygienization (see hygienization section, section 1.1.1.3, 1.2.1.3) of the shells on site and then organize the transport of the inert shells to the recovery site.
- Organize directly the transport of unhygienized shells to a hygienization and recovery site.

These two solutions are subject to different economic and regulatory issues for transportation.

### 1.2.1.3. Hygienization / separation of soft bodies

In order to enhance the value of the shells, the regulations require a system of separation of soft bodies from shells or hygienization.

The purpose of hygienization (or inerting) is to remove the soft body from the shells and thus to remove all traces of organic matter.

Several solutions or solutions for hygienization or separation of soft bodies exist:

- Existing solutions:
  - o Natural inerting: the shell is stored in a pile for 8 to 10 weeks and turned regularly. Organic matter degrades by natural action.
  - o Industrial inerting: organic matter is completely destroyed by a dehydrator via a high-temperature heat stream.
  - o Separation of the flesh by enzymatic process: this process exists in Brittany and makes it possible to valorize the flesh recovered in prepared food.
  - o Sheller: mechanical shelling of shells, requiring a sheller.
  
- Solutions in development:
  - o Steam inerting: small-scale test conducted in the Bay of Somme by the Agglomeration Community.
  - o Water inerting: separation of soft bodies and shell by flotation. Small-scale tests conducted by Etnisi.
  - o Mechanical separation of soft bodies and recovery of organic matter : prototype under development in Normandy by BinHappy (a company specializing in the sorting, collection and recovery of biowaste).<sup>3</sup>

Note that there is also a difference between oyster shells, which are generally quite clean, mussel shells from restaurateurs, which often contain residues from other types of waste (onions, etc.). A first sorting may therefore be necessary before hygienization.

Processes requiring energy (heat, steam, etc.) or special techniques (enzymatic process + sheller) have the constraint of having a high purchase and operating cost. For example, the Grand Littoral Picard joint association had thought about setting up a sheller for shells, but the price was too expensive (1M euros). It was cheaper to send the shells to Spain for shelling and then repatriate them. The operating cost of equipment requiring heat/steam is very high due to the cost of energy. Thus, the environmental balance of this type of operation can be debated.

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<sup>3</sup> <https://bin-happy.fr/>

#### 1.2.1.4. Valuation and opportunities

##### Valorisation actors in Hauts-de-France



**Etnisi** is a Lille company that recycles and recycles local used materials to make design objects. Etnisi manufactures different types of products from the shells: **pavers, tile tiles, engraved plates ("Here begins the sea")**. The company is committed to manufacturing products that are composed of at least 75% waste and 25% binders. For indoor objects, binders are made from recycled materials, and Etnisi is researching bio-based binders.

Etnisi has several sources of shell waste:

- Shells from Hauts-de-France, as part of the partnership with CABS on mussel shells.
- Mussel shells from the Lille braderie, in connection with the MEL.
- Oyster shells from Normandy.



**Ecailles de Mer** is a company that processes approximately 5,000 tonnes of shellfish products per year, mainly calcareous marine shells and oyster shells. The company grinds the shells to make **powders for animal feed**, and also produces **cage bottoms for birds, bath sand for chinchillas, aquariums, etc.** Their products can also be used **in mulch, decorative paths, pedestrian and communal** to avoid excessive regrowth of weeds. The company provides the network heads of the garden center. Oyster shells are currently imported from the Netherlands. Sea Scales also imports shell sand.



A partnership has emerged between players in the Boulonnais region and **Alkern**, a manufacturer of concrete products. Alkern has developed a **porous concrete paving** stone that incorporates scallops, with a pavement composed of 20% scallops. Boulogne Développement assisted Alkern in identifying the shell deposit. A collection and storage operation for shell waste was carried out.

The porous pavers developed by Alkern were installed in Wimereux as part of the renovation of a square. Alkern also carried out a shellfish waste collection operation with the port of Dieppe.

##### Opportunities

Due to its physical characteristics, the marine shell has many advantages that can be used in different applications.

In the regions, the actors are therefore able to value the shells in the form of:

- Porous pavers and pavers (Alkern)

- Tiles (Etnisi)
- Engraved plates (Etnisi)
- Animal feed powders (Sea Scales)
- Product for animals (cage bottom for birds, bath sand for chinchillas, aquariums) (Sea Scales)
- Mulch, decorative paths (Sea Scales)
- Ready meals container (Scallops)
- Toothbrush in scallop shell (Bioseptyl in Beauvais)

Among the opportunities other than those present in the regions, were also identified:

- Road Lane Markings (Aximum)
- Filament for 3D printer with oyster shells (Francofil)
- Integration in concrete (Experimentation by the *engineering school ESTIC Caen, Colas...*)
- Plasters with oyster shells (Lucile Viaud workshop, Entre Terre et Mer)
- Calcium amendment for agricultural land
- Porcelain tableware (Algeline start-up<sup>4</sup> that created Kaomer porcelain in Pays de la Loire)
- Incorporation into the production of subsea suits (Soörüz<sup>5</sup>, supported by the Nouvelle Aquitaine Region)

#### 1.2.1.5. Regulatory Issues

The recovery of shells is part of a particular regulatory context, due to the classification of shell waste as biowaste.

### Focus on bio-waste management regulations

#### Definitions

Bio-waste: "any non-hazardous biod waste from gardens or parks, any non-hazardous food or kitchen waste from, in particular, shops, caterers or retail stores, as well as anycomparable waste from food production or processing establishments. Article R.541-8 of the Environmental Code.

Bio-waste can be classified into several subcategories:

- Catering waste (CSD), i.e. all food waste including cooking oil, from catering and kitchens, including central kitchens and household kitchens (Annex 1, point 22 of the European Health Regulation).
- Waste from the agri-food industry and commerce.
- Green waste from gardens or parks.

<sup>4</sup><https://www.lesartsdelatable.fr/rencontre-avec/philippe-gaboriau/#:~:text=Le%20Kaomer%20est%20une%20p%C3%A2te,sens%20%C3%A9cologique%20et%20%C3%A9conomique%20!>

<sup>5</sup> <https://surfwear.sooruz.com/histoire-sooruz/>

SPan (Animal by-products): "whole animal carcasses or parts thereof, products of animal origin or other products obtained from animals, which are not intended for human consumption" Regulation (EC) No 1069/2009 of the European Parliament and of the Council of 21 October 2009.

### Regulatory framework

#### For biowaste:

- Large producers of biowaste are subject to an obligation to sort at source according to degressive thresholds

Referring text s	Formats and application criteria
R. 543-225	From 01/01/2012 to 31/12/2012 included: 120 tons/year
	From 01/01/2013 to 31/12/2013: 80 tons/year
	From 01/01/2014 to 31/12/2014: 40 tons per year
	From 01/01/2015 to 31/12/2015: 20 tons per year
	From 01/01/2016 to 31/12/2016: 10 tons per year
Article 88 AGEC Act	From 01/01/2023: 5tons/year

- A bio-waste source separation solution will be mandatory for all households in 2025

Referent text	Date and criteria of application
Energy Transition for Green Growth Act	From 01/01/2025

- An obligation to sort at source, collect and recover biowaste will apply to all producers or holders of biowaste, including local authorities in the context of the public waste management service and private and public establishments generating biowaste.

Referent text	Date and criteria of application
Article L, 541-21-1 of the Environmental Code, resulting from the AGEC Law	No later than 31/12/2023

#### ForSPan (animal by-products):

The health rules<sup>6</sup> concerning animal by-products and derived products not intended for human consumption shall apply to each treatment site as long as SPans have transited through it.

<sup>6</sup> Regulation (EC) No 1069/2009 of the European Parliament and of the Council of 21 October 2009 repealing Regulation (EC) No 1774/2002 (Animal by-products Regulation)

The producer/keeper must classify the animal by-product into a category and subcategory. It must provide the operator of the processing site with a Commercial Accompanying Document (DAC) attesting to the SPan category. The regulations classify SPan, according to the health risk, according to 3 categories. They include:

- 2 closed lists (categories 1 and 3), i.e. the SPans presented in these categories are fixed and defined.
- An open list (category 2), by default, SPans excluded from lists 1 and 3 are included in category 2.3

Haut risque sanitaire		Faible risque
Catégorie 1 (C1)	Catégorie 2 (C2)	Catégorie 3 (C3)
<ul style="list-style-type: none"> <li>• Risques « Vache folle » et autres maladies</li> <li>• Risques environnementaux</li> <li>• Substances interdites</li> <li>• DCT transports internationaux</li> <li>• etc</li> </ul> <p>DCT : déchets cuisine table</p>	<ul style="list-style-type: none"> <li>• « Lisier »</li> <li>• Contenu de l'appareil digestif (matières stercoraires)</li> <li>• Limites de résidus dépassées</li> <li>• C3 « pas frais »</li> <li>• Poussins morts dans l'œuf, fœtus</li> <li>• etc</li> </ul>	<ul style="list-style-type: none"> <li>• 16 sources provenant d'animaux aptes à l'abattage (sang, viande, plumes, graisses etc)</li> <li>• Matières d'IAA</li> <li>• Autres DCT,</li> <li>• etc</li> </ul>
LISTE FERMEE(R.1069 – Article 8)	Liste OUVERTE (R.1069 – Art. 9)	Liste FERMEE(R.1069 – Article 10)
<b>INTERDITS EN METHANISATION</b>	<b>AUTORISES EN METHANISATION STERILISATION</b>	<b>HYGIENISATION</b>

Figure 2: Classification and Treatment of Animal By-Products – infometha.org

### The ICPE classification

Facilities for sorting, transiting or grouping animal by-products, if they correspond to bio-waste, fall under ICPE 2716.

The administrative regimes applied to this ICPE heading are:

- Registration for a volume greater than 1000m<sup>3</sup>
- Controlled Declaration for a volume greater than or equal to 100m<sup>3</sup> and less than 1000 m<sup>3</sup>

### Approvals

Transient storage sites, inerting sites and also conveyors (if inerting occurs after transport) must have a health approval<sup>7</sup>. This request for approval must be made to the Departmental Directorate for the Protection of Populations.

Storage and inerting sites must be subject to different requirements<sup>8</sup>. They must have a reception in a covered area, a device of protection against pests, including insects and birds. Animal juices and by-products recovered at each stage must be disposed of or recovered. Disposal in the natural environment is not permitted.

<sup>7</sup> Pursuant to Article 24 (1) (h) of Regulation No 1069/2009 laying down health rules concerning animal by-products and derived products not intended for human consumption

<sup>8</sup> Requirements of Annex IX of R142/2011 Chapter II, Section 1

### For shell waste

Regulation (EC) No 1069/2009 (page 6, paragraph 42 and page 11 Article 2.2.) states that shells from which the soft flesh and body have been removed are not considered to be SPan and may be used without sanitary restrictions for various purposes (fertilisation, road painting, animal feed, jewellery, artistic activities, etc.) and without prejudice to other applicable regulations.

For shells with soft flesh and body, Regulation (EC) No 1069/2009 defines shell waste with soft flesh and body as **SPan category 3**, whether it comes from catering waste or from the agri-food industries. Shell waste is also considered bio-waste.

During transport, soft body shells and soft body juices and remains must be accompanied by a Commercial Document (DAC) and transport establishments must be registered under Article 23 of R1069/2009 and meet different requirements.<sup>9</sup>

Care must also be taken not to mix the different types of shells (mussels, oysters) for health reasons. At the drying/grinding level, it is necessary to wash the machines between the processing of two different types of shells to avoid cross-contamination.

The thresholds used to establish the administrative procedures for sorting, transit or grouping facilities for animal by-products under ICPE 2716 correspond to shells as:

- Recording: a volume greater than 1000m<sup>3</sup> or 330T of shells
- Controlled Declaration: a volume greater than or equal to 100m<sup>3</sup> and less than 1000 m<sup>3</sup> or between 33T and 330T of shells.

#### 1.2.1.6. The business model

At the economic level, several issues arise. First, the business model associated with the implementation of the separate collection solution (equipment, collection and transport) and the recovery solution (inerting, drying, grinding and material transformation costs) must be competitive. Thus, the costs incurred must be offset by the avoided costs of waste management and/or by the costs of reselling the processed material.

Costs to households, businesses and communities can vary significantly, depending on:

- Taxes applicable to the collection and treatment of shellfish waste (General Tax on Polluting Activities, Household Waste Removal Tax).
- Types of treatment (landfill, energy recovery).
- Volumes concerned.

Depending on the territory, the special fee can be set up, which represents **the** contribution due by professionals who use the public waste collection service dedicated

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<sup>9</sup> Requirements of Annex VIII of R142/2011.

to individuals. The special levy must thus ensure that households do not bear the cost of collecting and disposing of non-household waste.

To ensure a viable economic model, it is also necessary to ensure the existence of a demand for products resulting from the valorization of shells, despite potentially higher costs than standard products (to be counterbalanced with appropriate communication/marketing and demonstrating the circular, innovative and territorial nature of the solution).

## 1.2.2. The Tricoquille project

### 1.2.2.1. Project Summary

#### Context

As mentioned in the previous section, a full-scale test of collection and recovery of shellfish waste was conducted between the CABS and Etnisi. The CABS provided the tourism actors participating in the operation (restaurateurs and campsites) with kits including collector buckets for customers, as well as educational placemats in French and English. She was thus able to recover about fifteen tons of shells, which were valued by Etnisi in furniture, decorative and everyday objects, tiles / not Japanese.



Figure 3 : Communication elements around Operation Tricoquille

#### Proposed approach to be part of the Touristic Territoriale Ecology

Following this first test, and in view of the context described in the previous section, the Tricoquille project aims to use the material (shells) from the deposits of restaurateurs



to value it locally in products for the tourism sector (e.g. creation of tidal tanks to be placed on the Picardy coast), mulch for hiking trails, furniture or objects used by the tourist sector).

This project consists of an operation of Touristic Territorial, on two aspects:

- Pooling: group collection solution for restaurateurs in the Bay of Somme.
- Substitution: use of shells as a secondary raw material to make new products

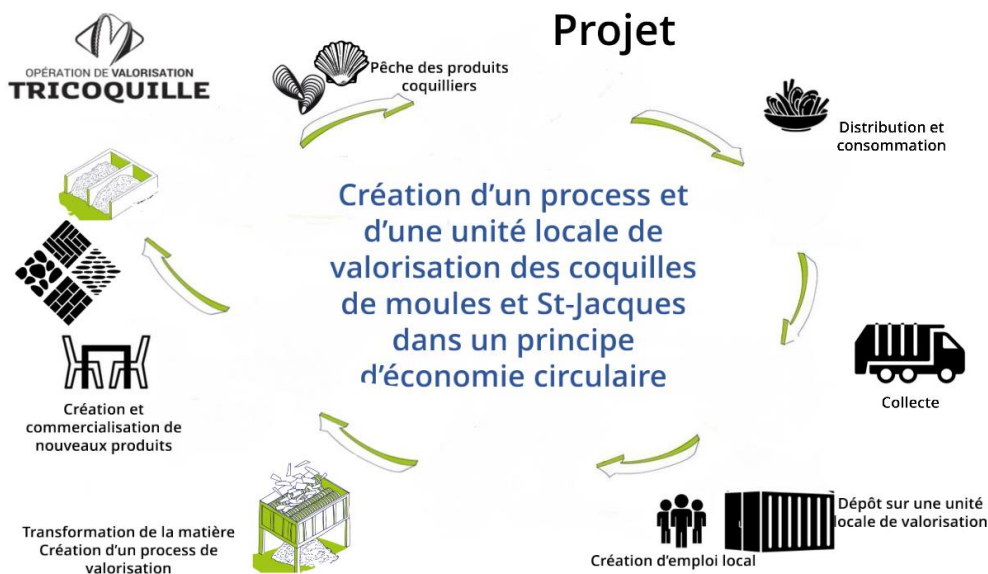


Figure 4 : Overview of Tricoquille Project Milestones

Actors concerned and responsibilities approached

<b>Actors</b>	<b>Responsibilities</b>
Restaurateurs (Association Baie de Somme Zéro Carbone)	At the origin of the deposit of shellfish waste. Involved in the collection of deposits from an organizational point of view   for the modification of waste management processes, and potentially financial (waste management service)).
CABS	In charge of the collection and processing of OMR. Pilot of the Tricoquille project
Sea Litter	Recovery of shell waste for inerting/hygienization and shredding of shells.
Etnisi	Transformation of shells and/or powder from shells into objects/furniture.
Tourist Office	In charge of promoting the approach to tourists. Relay for the potential sale of manufactured objects.

### 1.2.2.2. Deposits on the CABS

The study<sup>10</sup> carried out in 2017 made it possible to estimate the deposit on the territory of the Bay of Somme. As presented in the previous section, the territory has several types of deposits.

<i>Source of the deposit</i>	<i>Detail</i>	<i>Quantities</i>
Restaurants and campsites	This deposit is seasonal and depends on tourist activity. It also varies according to the types of restaurants and territories.	<b>688 tonnes (79% mussel shells)</b>
Farmers	Undersized moulds that cannot be marketed. February-March to October	<b>320 tonnes/year</b>
Fishmongers	Mainly scallops from October to April with a peak in December	<b>460 tonnes/year</b>
Households	Very diffuse deposit. Voluntary contribution may be considered.	<b>750-1000 tonnes/year</b>

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<sup>10</sup> Technical and economic feasibility study for the establishment of a shellfish by-product management sector: from collection to recovery in the Bay of Somme - Picardie Maritime. Syndicat Mixte Baie de Somme Trois Vallées

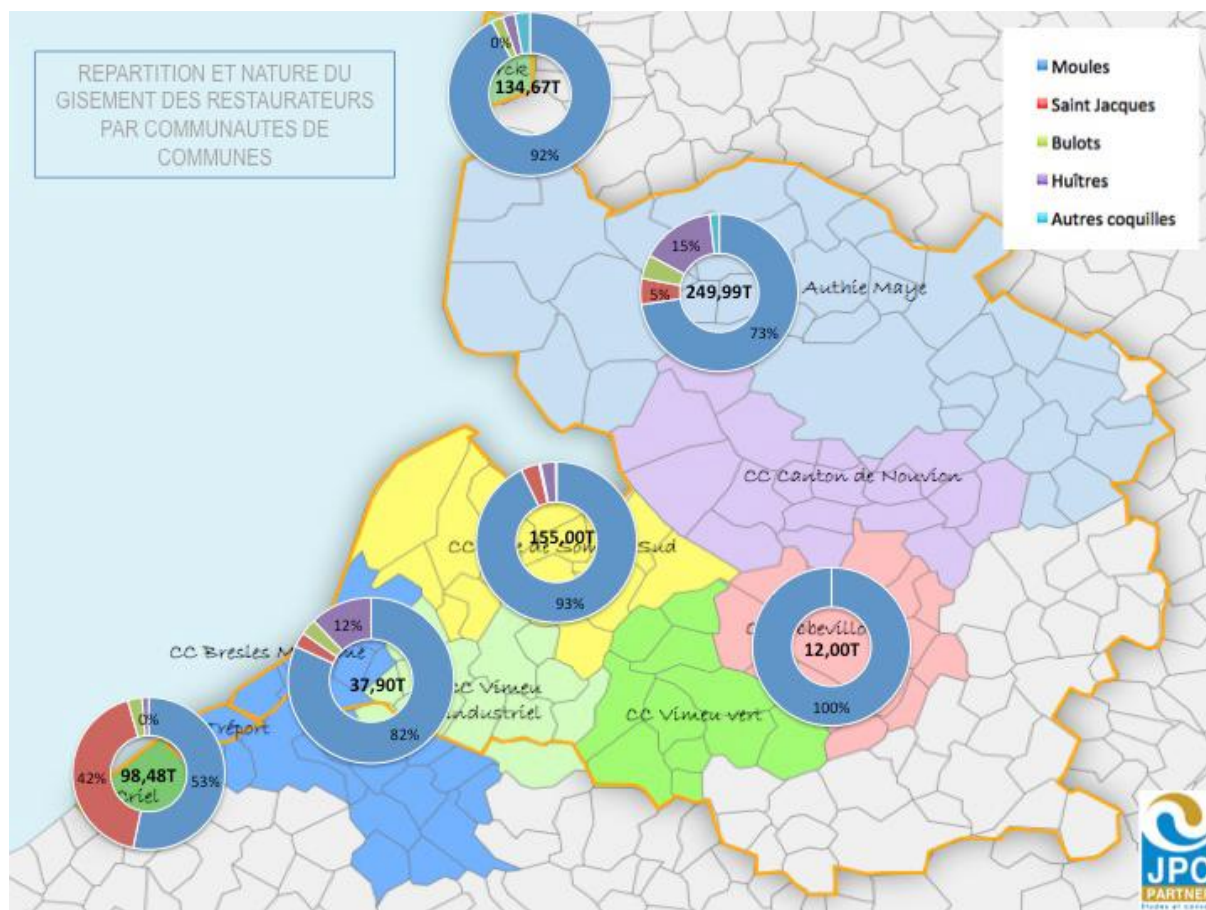


Figure 5: Distribution and nature of the restaurateurs' deposit by communities of communes - Techno-economic study for the establishment of a sector for the valorization of shellfish by-products - Syndicat Mixte Baie de Somme Trois Vallées

The analysis of these different deposits makes it possible to see a potential complementarity of collections. The seasonality of the deposits makes it possible to organize the collection throughout the year and the large quantity could allow a massification potentially beneficial for the economic model.

### 1.2.2.3. Logistics organization on the CABS

Pre-collection:

The collection of shell waste requires a separation of flows within catering establishments. The CABS territory therefore provides restaurateurs with dedicated containers of 240 and 400 liters to recover respectively 192 kg and 320 kg of shells.

To ensure the quality of the collections, it is planned that these bins are secured by a locking system (to avoid deposits of unwanted waste), that they have an identification system and a specific color.

Collection:

Collection with dump trucks has been tested on the territory but is not optimal, especially because this type of vehicle requires a driver with a truck license. In addition, the shells can damage the dumpster.

The use of a large capacity utility vehicle is being studied to facilitate collection. This only requires a B permit, which facilitates its use and reduces costs. In addition, it is adapted to the distances to be covered and meets the various constraints of collection (narrow streets, traffic limitation beyond a certain tonnage, etc.).

An operation as a voluntary contribution point for restaurateurs does not seem relevant because

- This would require an effort and adapted means of transport for each restaurateur involved which would reduce the number of restaurateurs involved.
- This would multiply the trips, with a detrimental effect on the environmental impacts of the project.

Other complementary or alternative solutions could be explored:

- in dense areas, bicycle collection as proposed by the Tricyclerie in Nantes for biowaste<sup>11</sup>
- the optimization of transport by identifying mutualizable routes (return logistics for example).

Points for clarification:

- A traceability system will have to be set up to be able to identify the number of bins and the quantities collected by professionals.
- The collection schedule will have to be studied and implemented to meet the size of the deposit and the seasonality of the flows.
- A collection circuit will have to be studied and set up to optimize transport and meet local constraints (market, closed streets, etc.).

Upon collection, shellfish waste is followed by a Commercial Accompanying Document.

### **The storage area**

The storage area is a problematic point for the territory of CABS. During the test phase, the shells were collected and then put in big bags at a transport dock, before being sent to Etnisi.

In addition to having a specific approval, this area must be far from habitation and protected from pests. To reduce these constraints, the possibility of performing inerting/separation of soft bodies quickly after the arrival of the shells to obtain an inert product very quickly must be studied.

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<sup>11</sup> <https://www.latricyclerie.fr/>

## Transport to the hygienization and/or recovery site

For the test phase, inerting was not carried out on the territory of the CABS since no local solution exists. The shells were therefore sent directly to the valuator. This solution leads to additional costs and regulatory constraints for the carrier because the waste is considered as SPan and requires approval (see regulation section). As part of the Tricoquille project, the desire is to be able to carry out inerting before transport, to get rid of the regulatory constraints associated with transport.

### 1.2.2.4. Hygienization and the first tests

The separation of soft bodies within the shells is problematic for the Tricoquille project. The choice must be made on the internalization or outsourcing of this step, knowing that outsourcing poses new regulatory and economic constraints on the storage and transport of shells.

During the test phase of the Tricoquille project, the drying and inerting was outsourced and carried out by a partner of Etnisi via an energy-intensive and very expensive process. In order to reduce this cost, several avenues were discussed:

- Steam inerting: a small-scale test was conducted by CABS.
- Water inerting (separation of floating soft bodies and sinking shell): a small-scale test is conducted by Etnisi.
- Natural inerting: test carried out and validated in the laboratory by Ecailles de Mer.

Note that the organic matter collected must be evacuated to an authorized center. In order to sustain its project, CABS will have to find a system that will allow inerting to be carried out locally. This system will have to be optimized in terms of energy (energy efficient, coupled with a source of waste heat, etc.) and economically viable. The question of porting will remain to be defined to know which actor will carry this stage of the project (CABS, private actor, other ...).

### 1.2.2.5. Regulation

As mentioned in the first part, transient storage sites, inerting sites and conveyors (if inerting occurs after transport) must have a health approval. This request for approval must be made to the <sup>12</sup>Departmental Directorate for the Protection of Populations (DDPP).

Storage and inerting sites must be subject to the requirements of Annex IX of R142/2011 Chapter II, section 1: they must have a reception on a covered area and a protection device against pests, including insects and birds. Animal juices and by-products recovered at each stage must be disposed of or recovered. Disposal in the natural environment is not permitted. During transport, soft body shells and soft body

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<sup>12</sup> Hasunder Article 24 (1) (h) of Regulation No 1069/2009 laying down health rules concerning animal by-products and derived products not intended for human consumption

juices and remains must be accompanied by a Commercial Document (DAC) and transport establishments must be registered under Article 23 of R1069/2009 and meet the requirements of Annex VIII of R142/2011.

On the Tricoquille project, the CABS will therefore have to apply to the DDPP for approval for its storage site. In order not to be subject to the controlled declaration imposed by the ICPE 2716 classification, the CABS must have a volume of shelled waste with organic matter less than 100 m<sup>3</sup> (i.e. 33T). The shells should be inert before the stored volume reaches the threshold, and ideally soon after collection to avoid nuisance. It is therefore a logistical constraint to be taken into account in this project.

#### 1.2.2.6. The business model

On the territory of the Bay of Somme, restaurateurs are subject to the special fee for the management of this waste. Currently, the treatment of residual household waste (RMW) is done via landfill and methanization. Treatment costs range from €75 to nearly €90/tonne including the TGAP, to be borne by the waste producer, i.e. the restaurateur.<sup>13</sup> The special fee introduced for producers other than households at a cost of 135 to 153 € / T for restaurateurs on the territory<sup>14</sup>.

Given the quantity of shells produced by restaurateurs throughout the country, the overall cost of this shell waste is estimated at between €92,88,00 and €105,264 for restaurateurs and **15** between €51,600 **16** and €61,920/year for the community. Taking into account the shelled waste of mussel farmers and fishmongers, the cost amounts to between €110,100 and €132,120/year for the community.

To have a stable economic model, the Tricoquille project will therefore have to reach a maximum operating cost that corresponds to the current cost of managing this waste, i.e. approximately €144,500 to €167,200. For this, it will be necessary to take into account the investment in inerting and collection equipment, the operating costs, the logistics and the potential cost of processing or buying back the shells and the possible participation of restaurants for the service rendered.

The financial impact of the project on conservators will need to be studied. It will thus be necessary to define the financial participation (if any) of restaurateurs in the treatment of their shellfish waste.

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<sup>13</sup> Technical and economic feasibility study for the establishment of a shellfish by-product management sector: from collection to recovery in the Bay of Somme - Picardie Maritime. Syndicat Mixte Baie de Somme Trois Vallées

<sup>14</sup><https://www.baiedesommeagglo.fr/environnement/gestion-des-dechets/la-redevance-speciale/#:~:text=Elle%20est%20instaur%C3%A9e%20par%20la,Code%20G%C3%A9n%C3%A9ral%20des%20Collectiv%C3%A9s%20Territoriales.>

<sup>15</sup> 688 tons x 135€

<sup>16</sup> 688 tons x 153€

### 1.2.2.7. The larger-scale testing phase

In order to massiveize the Tricoquille project, the CABS wishes to broaden the geographical scope of the action and add new actors to the collection. This requires first of all the sustainability of the inerting system, the mobilization of additional and adapted logistical resources and the mobilization of actors through good communication on the project.

On the subject of communication, the services of the Agglomeration Community of the Bay of Somme will have to be mobilized as well as the Tourist Office and the Association Baie de Somme Zéro Carbone. This communication phase will have to be done in a very broad way, with the means of dissemination of each of the structures, but also in a very targeted way by soliciting each of the restorers concerned by the subject of shellfish waste. A phase of explanation and "training" in good gestures will also have to be done with them.

### 1.2.2.8. Opportunities and benefits for the tourism sector

The outlets for shell products for the tourism sector are varied:

For territories, Regional Natural Parks, tourist sites:

- Development of tourist sites (, squares, cycle routes, paths, etc.) with porous paving stones and paving stones made from scallops, tile blocks from mussel shells or mulch.
- Installation of equipment (bench, signage...) on tourist sites, cycle routes...

For tourism stakeholders (restaurateurs, tourist offices, traders)

- Sale of objects made from shell waste (soap holders, pot, knife ...)

The main benefits for the tourism sector are:

- Savings on household waste management fees (to be determined)
- Participation in a circular economy project at the territorial level
- The possibility of selling products from the valorization of shells. Positive communication on the approach with customers.

## ABOUT THE FACET PROJECT

**The EU Interreg 2 Seas FACET project implements measures to encourage entrepreneurs in the tourism sector to apply circular solutions within their companies, thereby creating new sustainable revenue models. With a strong consortium of project partners from Belgium, England, France, and the Netherlands, experiments are being conducted with circular applications in the fields of accommodation, waste re-duction, and circular operations.**

As a coastal region, the 2 Seas region (covering the coastal areas of Belgium, England, France, and the Netherlands and connected by the Channel and the North Sea) has traditionally been a tourist destination with a strong impact on the regional economy. However, tourism also entails the mass consumption of raw materials and puts pressure on their limited availability in the region, where industry, agriculture, and tourism are already competing. Circular solutions are needed to ensure that tourism remains economically beneficial. Moreover, the COVID-19 pandemic has induced a crisis in the tourism and leisure sector; many tourism firms have suffered – many businesses are in stagnation or facing survival challenges. Now is the time to look at how we have organised our society and economy and how we want to build our systems more sustainably, in the post-COVID era.

Throughout the 2 Seas area, FACET locally develops various practical, accessible, and small-scale pilot and demonstration projects to help entrepreneurs gain practical knowledge and experience to make circular business models. FACET provides expertise and support in setting up these pilots.

Interreg 2 Seas 2014-2020 is a European Territorial Cooperation Programme for England, France, the Netherlands, and Belgium. The Programme is co-financed by the European Regional Development Fund (ERDF). The objective is to develop an innovative, knowledge and research-based, sustainable and inclusive 2 Seas area, where natural resources are protected, and the green economy is promoted.



## Project partners



**Norfolk** County Council

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