LIFE Project Number
LIFE19 ENV/BE/000102

C.1.1 Monitoring the use of biocides (final version)

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LIFE PROJECT NAME or Acronym
LIFE Oak Processionary

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1. Context

This report is a result of Action C.1.1, the monitoring of the use of biocides. It is the second project report on the monitoring of the use of biocides, covering the whole project research period (2020 to 2024). The first report, 'C.1.1. Monitoring the use of biocides (draft)' covering the results up to 2022 was delivered in 2023 in the Midterm reporting. The findings for 2025-2029 will be reported in 2030.

Following EU regulation 2009/128/CE, no government is allowed to use pesticides. In Flanders, all municipalities were obliged to report biocide use to the Flemish Environment Agency (VMM) for several years. The data are reported publicly.

1.1. Oak Processionary Caterpillar abundancy

In the following analysis, the use of these biocides must be related to the abundance of the Oak Processionary Caterpillar (OPC) during the same period. When the project started in 2020, OPC abundancy was at a peak level. Since then, the abundancy has decreased in the whole project area, with a low point in 2023. Since 2024 the abundancy is on the rise again.

Below are the observations of OPC individuals registered in Waarnemingen.be and Waarneming.nl for this period.

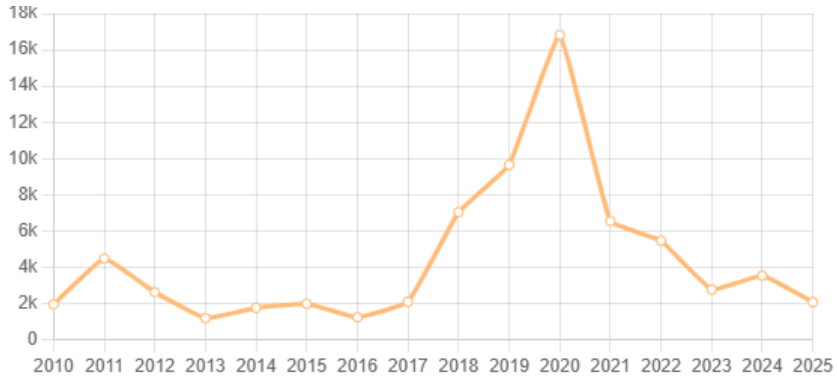

Figure 1: Evolution of OPC individuals observed in Flanders. Source: Waarnemingen.be

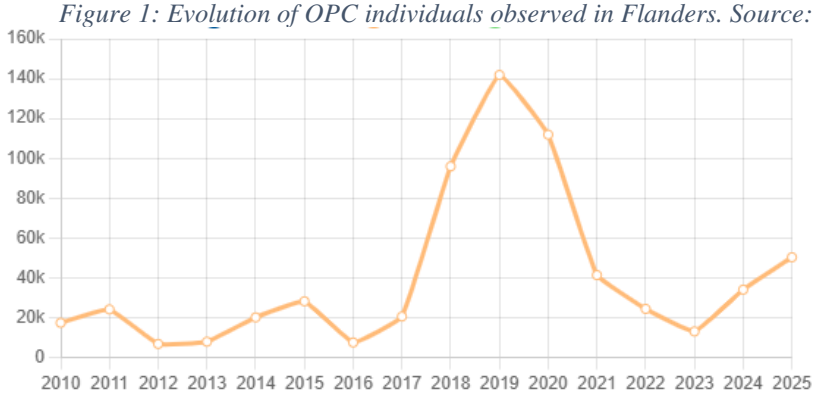

Figure 2: Evolution of OPC individuals observed in the Netherlands. Source: Waarneming.nl

1.2. Biocides used in the management of OPC.

In the project area and during the project lifetime, five different commercial products were used in the management of OPC plagues. Three of those, the most frequently used, are based on the bacteria *Bacillus thuringiensis* (Bt) and thus are considered biocides.

Two of those (Foray 48B and Foray ES) are sold as aqueous suspensions containing different strains of the subspecies *Bacillus thuringiensis kurstaki* (Btk*)*, with different biological potency. These products are only used in Flanders, the latter (Foray ES) replacing the former as from 2020, although a few municipalities have used up their stock of Foray 48B in 2020.

The third product, Xentari WG, is commercialised as water-dispersible granules to be dissolved in water, containing the subspecies *Bacillus thuringiensis aizawai* (Bta). This product is used both in Flanders and in The Netherlands.

Besides products based on Bt, a few communities use NeemProtect, a more recent used biocide based on the active product NeemAzal, an extract of the Neem- or Margosa-plant (*Azadiracta indica*) containing the chemical azadirachtin. The use of this product was during the project restricted to Flanders, where it was used by one community (up to 5% of total amount of biocides used in Flanders). Due to limited use, we did not include this product in our monitoring.

Nematodes, which were for this purpose only used in one municipality in the Netherlands, are not considered a biocide, since it is not a microorganism.

2. Objectives

The main aim of the project is to reduce biocide use with 50% in the LIFE project area by the end of the project. 5 years after the project the aim is to reduce biocides use by 50% all over Belgium and the Netherlands.

In this report we report the use of biocides in the management of OPC plagues in the project area, during the project lifetime (2020-2024).

2.1. Expected quantitative results:

- reduce biocide use by 50% in the LIFE project area by the end of the project.
- reduce biocide use by 50% all over BE and NL 5 years after the project.

2.2. Why do we intend to reduce the use of biocides only with 50%?

Although the ideal scenario would be to completely stop the use of biocides in the treatment of the oak processionary caterpillar, we do not think this is realistic in the short term.

The main reason is that in certain locations public health has a very high priority. Therefore, in regions with a high abundance of OPC, preventive treatment of oak trees with biocides is widespread practice at for instance playgrounds, around nursing homes and hospitals. Unless we find other methods that can guarantee the complete absence of OPC, we believe that preventive treatment will remain in place in suchlike sensitive places.

In addition, preventive treatment of oak trees with biocides (around 4,3 €/tree) is a lot cheaper than curative treatment (i.e. removing OPC nests; around 37 €/tree). For that reason, municipalities are a bit hesitant to stop preventive treatment, because this could result in a much higher cost if many OPC nests need to be removed later in the season. For more information of the cost, effectivity, and impact on biodiversity of the different techniques used, we refer to the report 'C.1.3. Monitoring the socio-economic impact'.

In our project, we therefore focus in the first place on convincing municipalities to stop using biocides in less frequented areas, in areas where there is less risk for public health, in the countryside, etc. Briefly, we encourage the municipalities to only use biocides in those places where the health risk is biggest. We show in our project that using ecological methods can considerably reduce the hinder by OPC, such that in most places preventive treatment is no longer needed.

But as we are aware that a better natural balance will reduce, but not completely remove the hinder, we acknowledge that biocides may still be needed in certain places, like explained above.

This is why we aim for a significant reduction (-50%), but not a complete cessation of biocide use.

3. How to measure the 50% reduction of biocides on OPM

As the main goal of this project is a strong reduction of the amount of biocides (BT) used to control the OPM, we need to monitor the usage of BT throughout the project lifetime. For that we need baseline data from the start of the project, such that we can compare the following years with this baseline.

Two indicators need to be considered:

- The **magnitude** of the spraying and thus the global possible effect on the environment, which we calculated in two ways:
    - The **number of trees sprayed** gives us an indication on how many tree ecosystems and insect populations are impacted, but does not consider the crown volume of the individual tree and thus the maturity of the tree ecosystem;
    - If the former is not available, the **amount of biocide used** can be used for the same goal. Depending on the specifics of the actual product used, this amount would be in litres (for aqueous suspensions like Foray ES) or in kilograms (for water-dispersible granules like Xentari). Since we have a fairly good idea on average how many trees can be sprayed with one liter of product - based on sources who cite both indicators -, we can interpolate the number of trees impacted based on the actual volume of product reported:
- The **effectivity** of the specific product used, and thus what percentage of OPM (and other related moths and butterflies) would be affected in a specific tree, Also for this indicator there are two ways of calculating:
    - The **amount of active substance** the product contains. The active substance of all BT biocides consists of crystalized bacterial proteins (CRY-proteins) and bacterial endospores. This number is expressed in kg, and specified on the product sheet as kg/kg or kg/l of the total product, or as a percentage of the total product;
    - The **bio-potency or biological effect** of the biocide, expressed in IU (International Units) or MIU (Million IU) and stated as IU/mg of active substance on the product sheet. The potency is dependent on the actual subspecies and strain of BT used in the product. However, the effect on caterpillars is species dependent; the potency labelled on available BT-biocides is mostly in reference to the effect on the cabbage looper (*Trichoplusia ni*), an unrelated species of moth from the family *Noctuidae* that is a plague on tomato plants. Therefore, there it is difficult to compare the potency of various products containing different subspecies or strains of BT on OPM. Both indicators are calculated in this study.

In the project area and during the project lifetime so far, five different commercial variants of BT were used, three of which very often. Two of those (Foray 48B and Foray ES) are available as aqueous suspensions containing different strains of the subspecies *Bacillus thuringiensis kurstaki*, with different biological potency. These products are only used in Flanders, the latter (Foray ES) replacing the former during the monitoring.

The third product, Xentari WG, is commercialised as water-dispersible granules to be dissolved in water, containing the subspecies *Bacillus thuringiensis aizawai.* This product is used both in Flanders and in The Netherlands.

In Flanders, these data are easy to obtain, because all municipalities that use biocides to combat EPR must report this annually to the Flemish Environmental Agency (VMM), and the VMM wants to share these data with us.

However, in the Netherlands, no such obligation exists. That is why we created the deliverable 'VNG survey'. VNG is the association of Dutch municipalities. The intention was to draw up a survey on the

use of biocides by Dutch municipalities and to send this to the municipalities annually via the VNG. This is also wat we tried to do in November 2020.

Unfortunately, hardly any responses came to that survey. Further enquiry showed that most Dutch municipalities prefer not to share their figures on the use of biocides for fear of the public opinion. As the VNG is not able to enforce municipalities to give us their data, our initial plan failed. Therefore, we needed to find other means to monitor the use of BT in the project region.

We decided to monitor three main sources of data about the use of biocide from the start of the project (or even earlier) until the end of the project.

1) The amount of biocides used in the project area as defined in 2018 when the project proposal was created:
   a. In all municipalities of the province of Limburg (B);
   b. In all municipalities of the province of Antwerp (B);
   c. In the municipalities Sittard-Geleen, Maastricht and Heerlen in Limburg (NL);
   d. By the province of Gelderland on provincial roads;
   e. By the province of North-Brabant on provincial roads;

   The information we receive contains the specific product, the amount (in l or kg), and the amount of active substance used.

   This gives us the baseline value of 2053 kg-l used in the KPI-table, calculated as the sum of the *amounts of the biocides used* (in kg or l). The corresponding goals to be reached are 50% or 1026 kg-l at the end of the project, and 25% or 513 kg-l five years later.

   Note that, to avoid confusion and allow a clear presentation of our figures, in this report we recalculated the volume of the aqueous suspensions to the actual mass, based on the density stated on the product sheet.

   So, the actual baseline expressed in mass of biocides used is 2301 kg of product, with a corresponding goal to be of 1150 kg at the end of the project, and 575 kg in 2030.

   We will recalculate this amount each year in the same way to see how it evolves during the project duration.

2) The **annual data we receive from the VMM** of the biocides used in the entire region of Flanders. This includes data from both the municipalities and what is used on provincial roads. For this dataset we can go back as far as 2011. The information we receive contains the specific product, the amount (in l or kg), and the amount of active substance used.

   This gives us a baseline value of 1581 kg or litres of biocide used in Flanders in 2018, and a goal of maximum 791 kg or litres to be reached in 2030.

   Since the amount of active substance per unit of biocide is dependent on the actual product being used, it can drastically change when municipalities decide or are obliged to use other products, as has occurred in Flanders in 2020 (with a switch from Foray 48B to Foray ES, which contains less active substance per liter of product).

3) To get a more detailed view on how our project influences local governments including in The Netherlands, we collaborated with **Ambassador municipalities** selected from the entire project region. These ambassadors receive guidance in how sensitization and the application of ecological methods can reduce the need to apply BT, and in return they fill out two questionnaires annually about their preventive and curative measures against the OPM. This allows us to monitor their biocide use and their experiences with alternative treatments. In total, around twenty-three municipalities joined this exercise, at least four for every province involved, and reported for at least four years (2021 to 2024).

   The Ambassador municipality-data gives us a baseline value of 32.8 kg of active substance used in the participating municipalities in 2021, and a goal of maximum 16.4 kg to be reached in 2030.

   Collaborating with ambassador communities will have a cost for the project, as we organise meetings and events for them. This can however be covered with budget foreseen at the coordinating partner for meetings, workshops, and demonstrations in general.

We are convinced that, although no complete figure will be available for all Dutch municipalities, the combination of these three monitoring efforts will give us a good view on how successful this project will be in reducing the use of BT used during the project lifecycle. Moreover, it allows us to monitor if we meet our KPI of reducing the initial amount of **2053 kg-l of biocides to 1026 kg-l by the end of the project** and to 513 kg-l five years later.

4. Results 2018-2024

4.1. Use of biocides in the project area

The preliminary results for the project area, as reported in the midterm report, were promising. It seemed that after two years of increased use of biocides due to OPC being highly active in the area, biocide use was going down as from 2021. But when re-evaluating the data from the various input sources we found out that some of the use had not yet been reported at the time of writing

With all data available up to and including 2024, we see that the use of biocides remains high in up to 2022, especially in Limburg, and it even rises in 2021. It took a lot of convincing from the province to the municipalities to finally reduce the amount of biocide use, but in 2023 it went below the 2025 objective of 50% (i.e. max. 1150 kg). After that, it went fast, and in 2024 we saw a reduction of 86%, surpassing the 2030 objective of a 75% reduction (max. 575 kg). Most progress has been made in Limburg (1938 kg -> 56 kg) and Noord-Brabant (60 kg -> 0 kg).

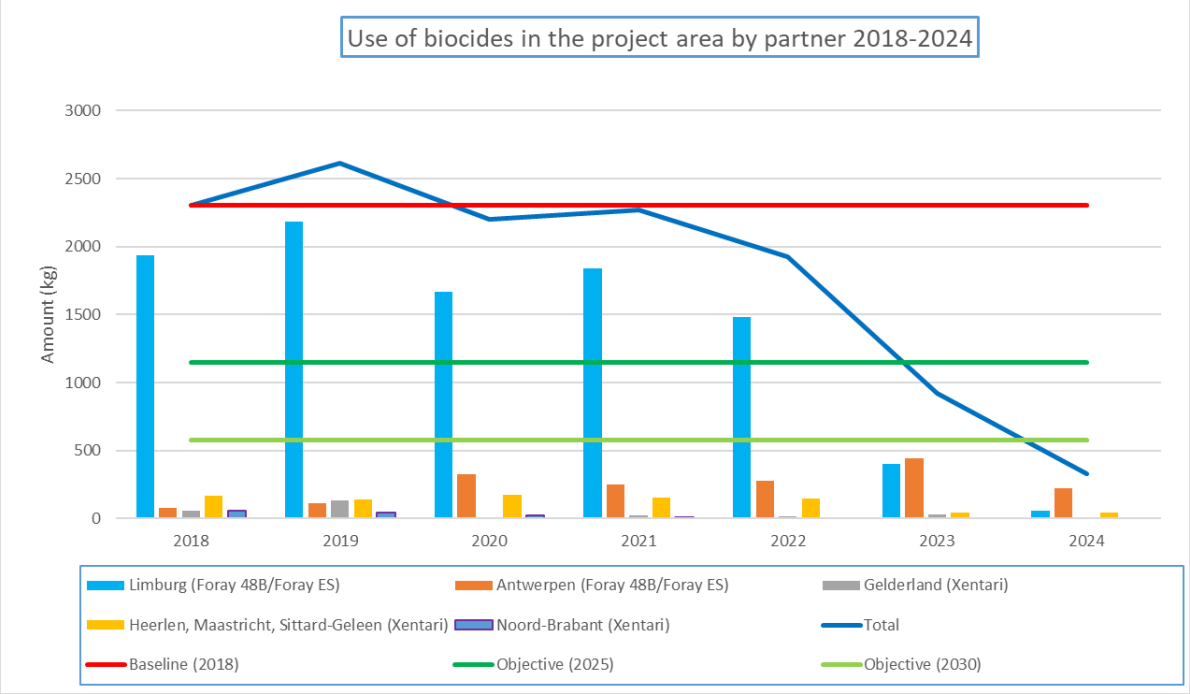

Figure 3: Use of biocides used in the project area by partner 2018-2024.

This trend is much more outspoken when looking at the amount of active substance and the potency of the biocides used. Also, the switch for most communities from Foray 48B to Foray ES (containing less active substance for the same volume) in 2020 has helped a lot. In fact, the two factors combined (less biocides used and smaller concentration of active substance) has made the yearly amount of active substance drop below the target for 2030 already in 2022.

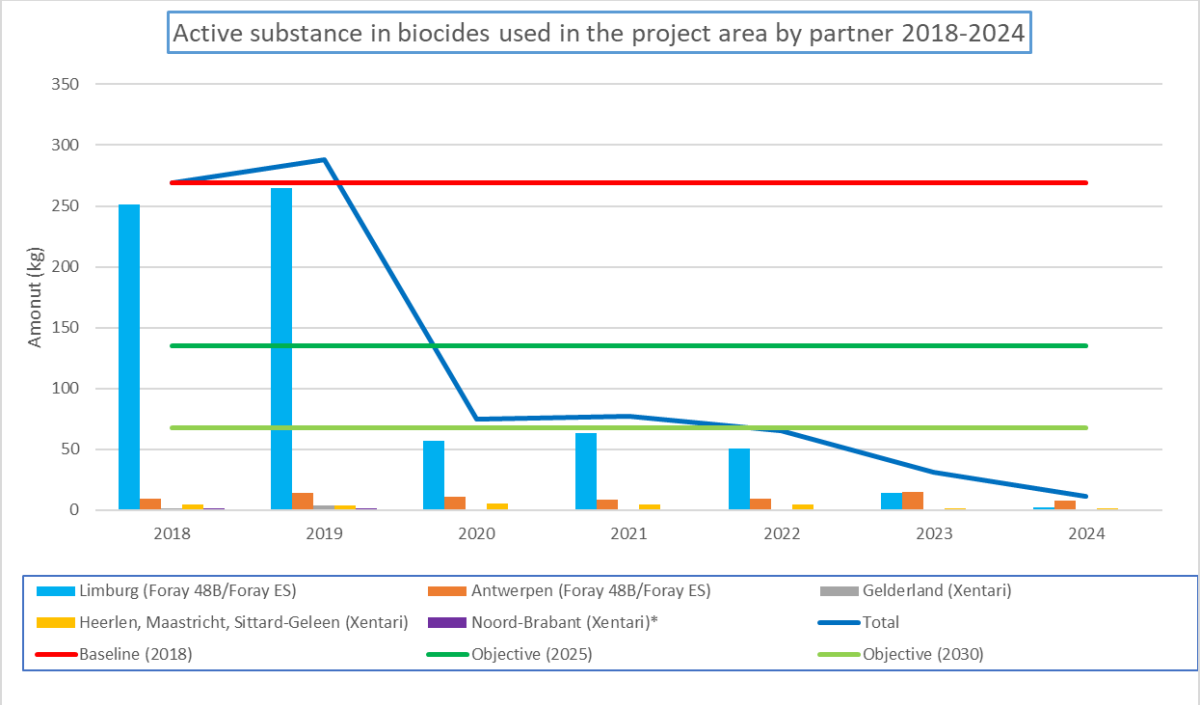

Figure 4: Active substance used in the project area by partner 2018-2024.

4.2. Use of biocides in Flanders

The data for the whole of Flanders (in this case the total amount of biocide used) show a remarkably similar trend. The amount remains at an elevated level for two years during the project until 2022, but in 2024, biocide use was reduced by 82%, surpassing the objective of a reduction of 50%.

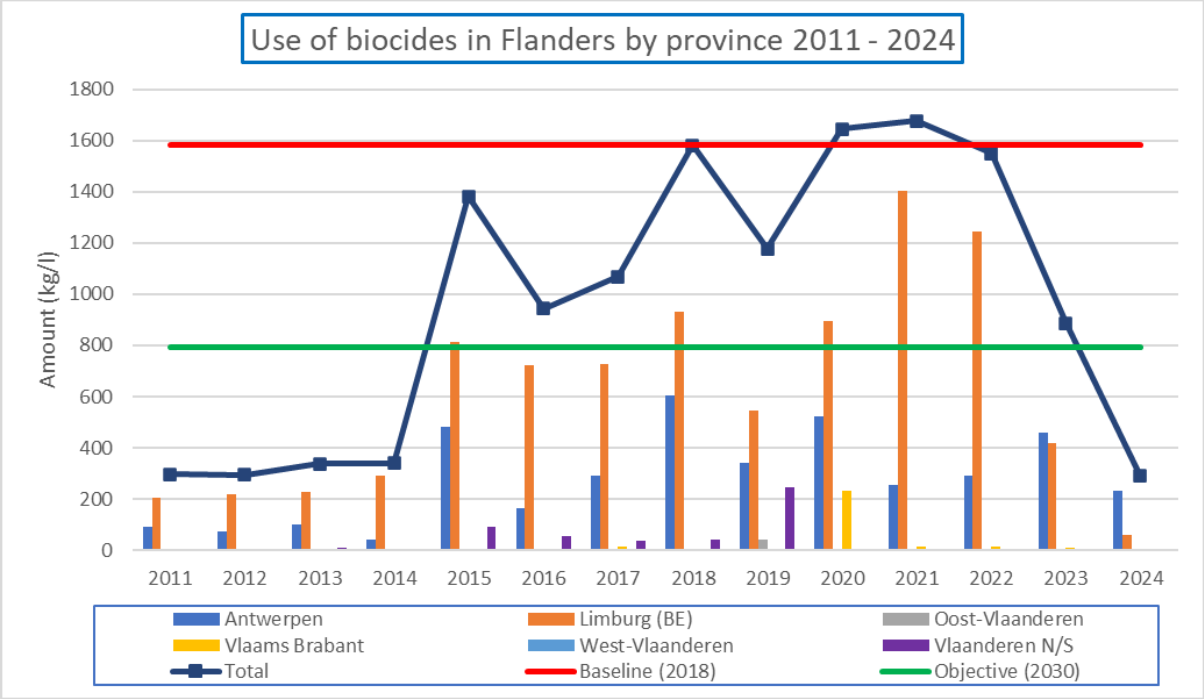

Figure 5: Use of biocides in Flanders by province 2011-2024.

However, again because of the switch from Foray 48B to Foray ES (containing less active substance for the same volume), the yearly amount of active substance and the potency of the biocides used are already significantly reduced as from 2020 and were already below the target for 2030 at that time. This can be clearly seen when we compare the use of the various products over time.

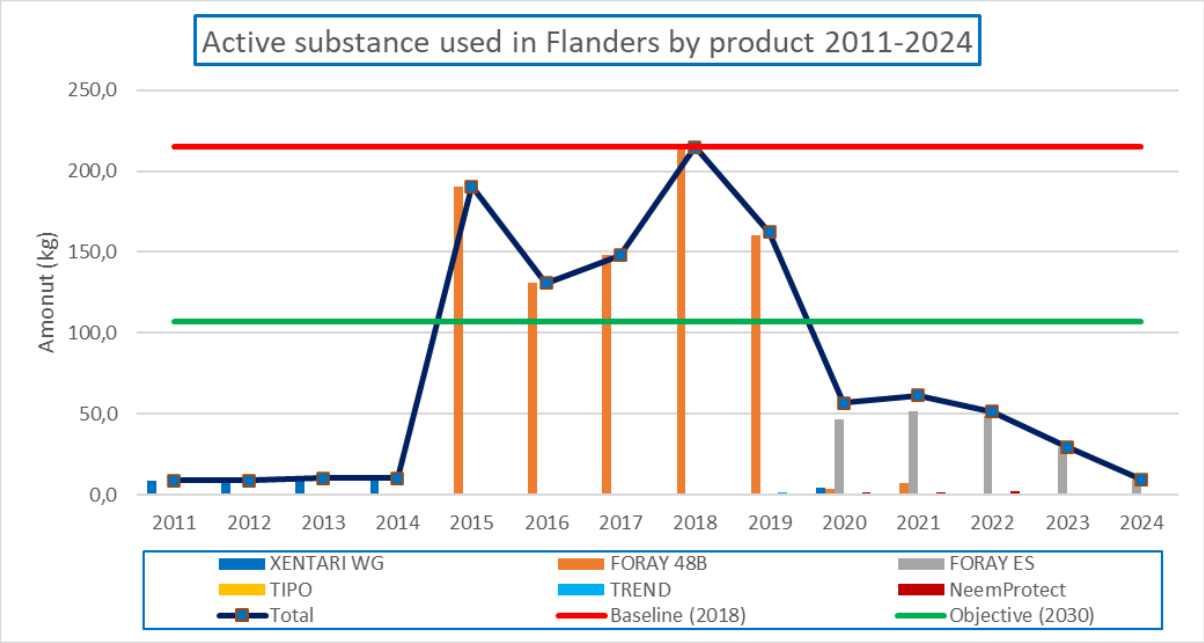

Figure 6: Active substance used in Flanders by product 2011-2024.

We get a comparable picture for the evolution of the potency of the biocides used, although a bit less outspoken since the potency of Foray ES is higher than that of the former product Foray 48B (17.600 IU/mg vs. 10.600 IU/mg).

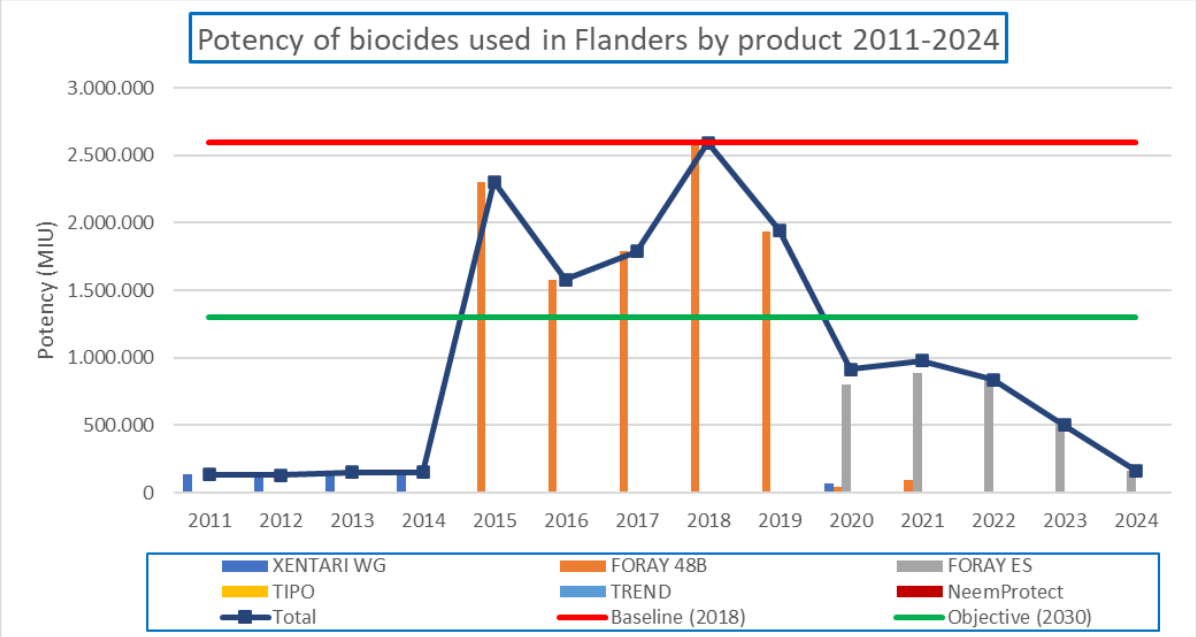

Figure 7: Potency of biocides used in Flanders by product 2011-2024.

4.3. Use of biocides in the Ambassador communities

The data from the Ambassador-communities is less extensive since we only took a baseline in 2021. However, the results for the last 4 years show the same trend as for the other indicators, and in 2024 the objective for 2030 (a reduction of 50% in active substance used, or max. 16,4 kg), was significantly surpassed up to 90% (3,3 kg).

The main gains have been achieved in the province of Limburg (Belgium). At the start of the project, the Ambassador communities in this province were responsible of +-75% of the biocides used by all Ambassador communities. They drastically reduced their use of biocides in 2023 and 2024, after a strong advice from the province, a project partner.

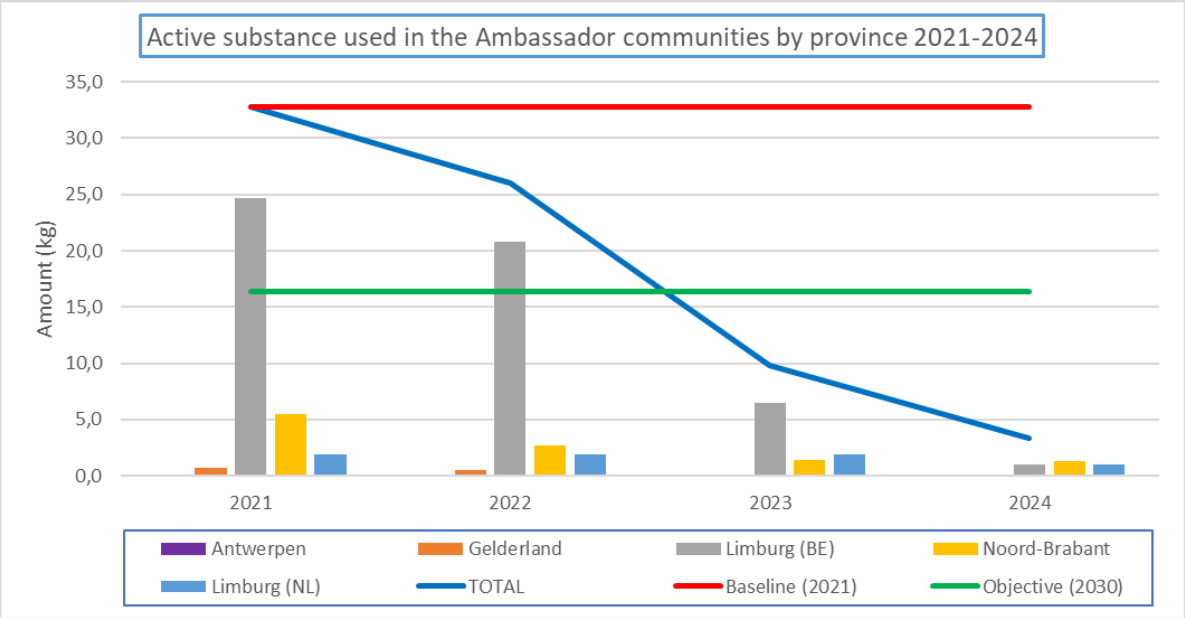

Figure 8: Active substance used in the Ambassador communities 2021-2024.

To illustrate the importance of appointing Ambassadors with an exemplary role in the project, we compared the evolution of biocide use for the Ambassador community with the use of non-ambassador municipalities in Flanders (In the Netherlands this information is not available).

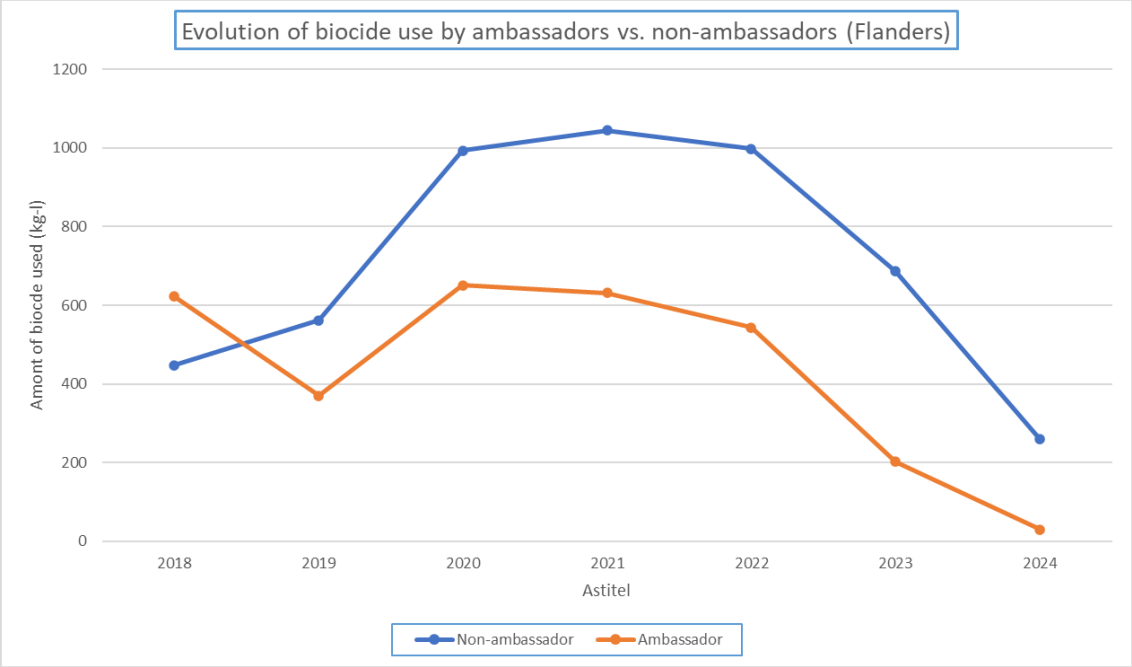

Figure 9: Evolution of biocide use by ambassadors vs. non-ambassadors (Flanders)

In this graph, we can clearly see the impact of the project team on the ambassador community - in 2018 still the major users of biocides in Flanders – once they were appointed in 2021. The ambassador community consistently used less biocides and managed to reduce their consumption to almost zero in the end.

5. Conclusions

With this view on the complete data, we can confirm the findings from the midterm report and conclude that the amount of biocides used (and thus the number of trees sprayed) in the project area and in the Ambassador communities in Flanders and the Netherlands have significantly decreased during the project lifetime, **to the extent that the 2025 objectives of reducing biocide use in the LIFE project area have been exceeded by a wide margin**. In fact, even the 2030 objectives have already been passed, but these will have to be review after 2030.

Those are the communities and governmental bodies where the project team has most influence – and that influence has certainly been used by all partners, especially in Limburg, with a reduction of more than 90 % from the baseline.

But the same effect is also visible for the whole of Flanders, so it is very probably wider than just the project area.

When taken into consideration the amount of active substance in the biocides used, the effect is much larger and is even positive for the whole of Flanders. This has a lot to do with the switch that was made to a product containing less active substance for the same volume in 2020.

Residual risks:

The reduction of biocides all over the project area since 2018, as shown by these three indicators, is clear. Certainly, in the project area the rising awareness of the negative effects of using biocides on

such a large scale will have contributed to this trend. There is however a caveat to be considered – it is conceivable that the use of biocides could rise again when the OPM becomes much more abundant again. This risk was described in the midterm-report as **Issue 6. Risk of rising biocide demand when OPM becomes more abundant.**

The second risk to be considered is the switch of products in the management of OPC plagues. The switch from Foray 48B to Foray ES had positive consequences on the impact because there was less active substance for the same volume, but it could have had drawbacks as well. The theoretical bio-potency or biological effect of the Foray ES (expressed in IU or International Units/mg of active product) is 60% higher than that of the former. So even when using less biocides containing les active substance, the biological effect could increase. This factor needs to be considered when a new commercial product is introduced on the market.

The bio-potency or biological effect is species dependent; the potency labelled on available BT-biocides is mostly in reference to the effect on the cabbage looper (*Trichoplusia ni*), an unrelated species of moth that is plague on tomato plants. Therefore, there it is difficult to compare the potency of various products containing different subspecies or strains of BT on OPM. Also, the effect of using more potent biocides in actual field conditions is unknown.

6. Continuation

The monitoring action will continue for five more years (2025 to 2030) in the same way using the same indicators.