



Annual treatment with FlexPen® incl. drug and needles

Carbon Footprint Report

March 2025 (version 1.0)

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1. Background

Novo Nordisk's environmental strategy, Circular for Zero, and the certified ISO14001 Environmental Management System, drive continuous improvements in our environmental performance by setting high ambitions and integrating environmental considerations into daily business activities. Here, life cycle assessment/product carbon footprint is an integrated part of our product development process.

This document presents the Product Carbon Footprint of one year treatment with FlexPen® in combination with a range of drug substances (API), including the use of NovoFine® needles, hereafter referred to as the [drug product's brand name] FlexPen® carbon footprint¹, e.g. NovoRapid® FlexPen® carbon footprint.

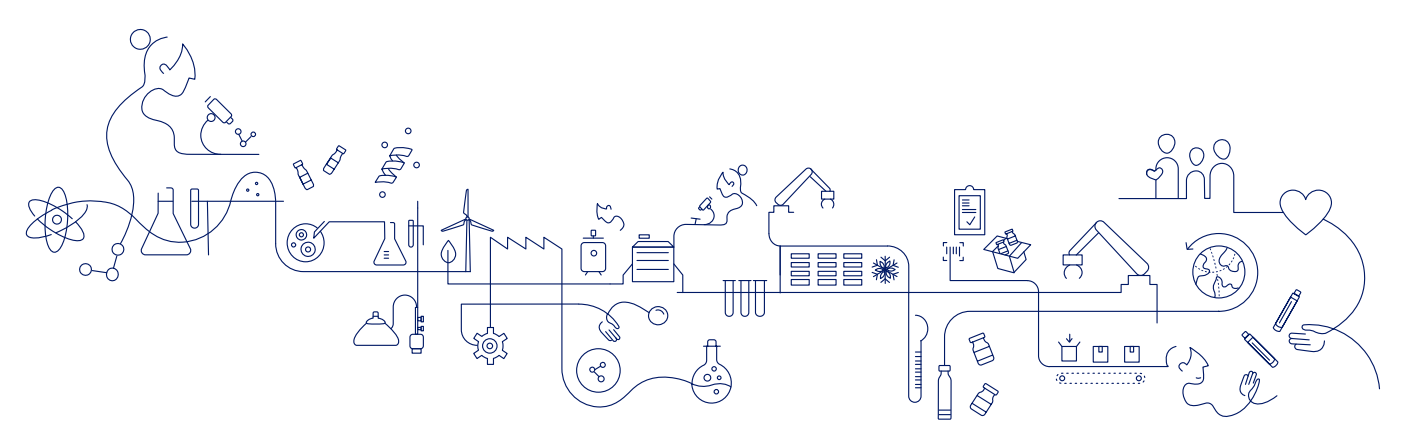
The carbon footprint for the yearly treatment is based on full third-party verified carbon footprint reports for the different drug substances, delivery solutions (device or oral) and needles included in this report.

The data presented in this document supports marketing claims and Q&As about the product carbon footprint. The data should not be used for comparison with competitor products or for claims related to 'green' or 'environmentally friendly' products.

¹ In the case of Victoza® it is the 'Victoza® carbon footprint' as the brand name covers both the drug and the device.

2. Methodology

The carbon footprint of a product is calculated by adding the greenhouse gas emissions (in kg CO₂ equivalents) from different stages of the product life cycle. The product carbon footprint of one year of treatment is calculated by adding the contributions from the drug substance, the delivery system and the needle².



The Novo Nordisk carbon footprint calculations follow the Greenhouse Gas Accounting Sector Guidance for Pharmaceutical Products and Medical Devices³, which is built on international life cycle assessment standards. The reports are third-party reviewed by PricewaterhouseCoopers Advisory.

The carbon footprint calculations are based on production data from 2022 and cover relevant drug substances, delivery system and needles as shown in Table 1. For each brand, the carbon footprints are calculated for the use in three major markets: Europe, the US and Japan. The calculations are made using Excel and the life cycle assessment tool *LCA for Experts*⁴.

Table 1. Products involved in the calculations for one year of treatment with FlexPen®.

Drug substance	Delivery system**	Needle**
<ul style="list-style-type: none">• Insulin analogues• GLP-1 analogues	<ul style="list-style-type: none">• FlexPen®• Excipients* (incl. WFI)	<ul style="list-style-type: none">• NovoFine®• NovoFine® Plus

Notes:
* Excluded due to proven low impact on carbon emissions, except for water (for injection).
** Including both secondary & tertiary packaging.

² Including the packaging for delivery systems and needles.
³ Greenhouse Gas Accounting Sector Guidance for Pharmaceutical Products and Medical Devices, GHG Protocol Product Life Cycle Accounting and Reporting Standard, November 2012. At: http://ghgprotocol.org/sites/default/files/ghgp/Summary-Document_Pharmaceutical-Product-and-Medical-Device-GHG-Accounting_November-2012_0.pdf.
⁴ Formerly GaBi.

2.1 Drug substance

The Defined Daily Dose (DDD) is the assumed average maintenance dose per day for a drug used for its main indication in adults. The DDD for insulin analogues (aspart, degludec, detemir, human insulin or icodec) is 40 international units (IU), corresponding to a weekly dose of 280 units, according to the WHO⁵.

For the remaining products, the defined dose is reflecting the actual products on the market and not an official DDD, see Table 2.

Table 2 Overview of defined dose of drug substance for the different products.

Brand name	Frequency	Drug substance
Insulin analogue: Actrapid®, Fiasp®, Insulatard®, Levemir®, Mixtard®, NovoMix®, NovoRapid®, Ryzodeg ⁶ and Tresiba®.	Daily	40 IU aspart, degludec, detemir or human insulin
Victoza®	Daily	1.2 mg liraglutide

2.2 Delivery system

FlexPen® is compatible with a variety of Novo Nordisk's drug products, available in a range of strengths tailored to the specific therapy area, see Table 3.

Table 3 Overview of drug product strength based on substance concentration and primary packaging size.

Brand name	Drug substance content	Cartridge [mL]	Strength
[Insulin analogue] U100 FlexPen®	300 IU	3	100 IU/mL
Victoza®	18 mg	3	6 mg/mL

Due to the physical design of the cartridge, a small volume of drug product is lost between the neck and the shoulders. The filling volume is adjusted to account for this loss with an additional 2.4% drug product volume. This has been considered as well for the estimation of the carbon footprint.

2.3 Needles

Novo Nordisk offers a series of needles for combination with our delivery systems. In this assessment, three different needles, namely, NovoFine®, NovoFine® Plus, and NovoFine® Plus (co-pack), are included for the EU and US markets. For the Japanese market only NovoFine® Plus is available.

⁵ WHO Collaborating Centre for Drug Statistics Methodology (WHOC): DDD Definition and general considerations. http://www.whocc.no/ddd/definition_and_general_considera/. Accessed Sep 2021.

⁶ 40 IU with the distribution of 70% degludec, 30% aspart

NovoFine® Plus needles are sold in packs of 100 pcs in EU and US markets and packs of 70 pcs in JP market. NovoFine® Plus (co-pack) are assumed co-packed with one FlexPen® and 4 needles as a representative for a co-pack.

Novo Nordisk recommends discarding the needle after use. However, market research shows that many patients use the needle several times⁷. To reflect an average patient, the one-year treatment scenario is based on the use of one needle per day, which can be considered a conservative estimate.

⁷ Roper U.S. Diabetes 2014 Patient Study. Insulin devices market. GFK, November 2014

3. Carbon footprint

This section presents the carbon footprints for specific treatments (assumptions described in Section 2) with FlexPen® in combinations with a range on drug substances and needles in the three representative markets, Europe, US and Japan. The contribution to the carbon footprints from drug substance, delivery system and needles are shown as well as the total carbon footprint per patient per year.

To put the results into perspective, the resulting carbon footprints has been recalculated into the distance driven by an average car (see Section 3.4).

The carbon footprint has inherent uncertainties and should be regarded as an indicative level and not as a precise measure. The uncertainties relate to the data collected from Novo Nordisk production, the data on carbon footprint for of each of the processes (e.g. plastic granulate production), carbon footprint impact factors and the key assumptions (e.g. distribution patterns). Moreover, the calculations consider that Novo Nordisk sources renewable energy through certificates, which results in a lower carbon footprint than if average electricity was used.

3.1 European market

Table 4. Carbon footprint of one year's treatment of one patient in the **European** market with FlexPen® and NovoFine®

	Drug substance [kg CO ₂ -eq./year]	FlexPen® incl. Cartridge [kg CO ₂ -eq./year]		NovoFine® [kg CO ₂ -eq./year]		One year treatment [kg CO ₂ -eq./year]	
Brand name		Delivery system	Packaging	Needle	Packaging	Excl. packaging	Incl. packaging
Actrapid® FlexPen®	1.1	4.7	0.7	2.6	0.2	8.4	9.4
Fiasp® FlexPen®	1.1	4.7	0.7	2.6	0.2	8.4	9.3
Insultard® FlexPen®	1.1	4.7	0.7	2.6	0.2	8.4	9.4
Levemir® FlexPen®	6.9	4.7	0.7	2.6	0.2	14.2	15.1
NovoMix® FlexPen®	1.1	4.7	0.7	2.6	0.2	8.4	9.3
Mixtard® FlexPen®	1.1	4.7	0.7	2.6	0.2	8.4	9.4
NovoRapid® FlexPen®	1.1	4.7	0.7	2.6	0.2	8.4	9.3
Tresiba® U100 FlexPen®	2.1	4.7	0.7	2.6	0.2	9.4	10.3
Ryzodeg® FlexPen®	1.8	4.7	0.7	2.6	0.2	9.1	10.0
Victoza®	4.2	2.4	0.4	2.6	0.2	9.1	9.7

Table 5. Carbon footprint of one year's treatment of one patient in the **European** market with FlexPen® and NovoFine® Plus.

Brand name	Drug substance [kg CO ₂ -eq./year]	FlexPen® incl. Cartridge [kg CO ₂ -eq./year]		NovoFine® Plus [kg CO ₂ -eq./year]		One year treatment [kg CO ₂ -eq./year]	
		Delivery system	Packaging	Needle	Packaging	Excl. packaging	Incl. packaging
Actrapid® FlexPen®	1.1	4.7	0.7	2.0	0.2	7.9	8.8
Fiasp® FlexPen®	1.1	4.7	0.7	2.0	0.2	7.8	8.8
Insultard® FlexPen®	1.1	4.7	0.7	2.0	0.2	7.9	8.8
Levemir® FlexPen®	6.9	4.7	0.7	2.0	0.2	13.7	14.6
Mixtard® FlexPen®	1.1	4.7	0.7	2.0	0.2	7.9	8.8
NovoMix® FlexPen®	1.1	4.7	0.7	2.0	0.2	7.8	8.8
NovoRapid® FlexPen®	1.1	4.7	0.7	2.0	0.2	7.8	8.8
Ryzodeg® FlexPen®	1.8	4.7	0.7	2.0	0.2	8.6	9.5
Tresiba® U100 FlexPen®	2.1	4.7	0.7	2.0	0.2	8.9	9.8
Victoza®	4.2	2.4	0.4	2.0	0.2	8.6	9.2

Table 6. Carbon footprint of one year's treatment of one patient in the **European** market with FlexPen® and NovoFine® Plus (co-pack).

Brand name	Drug substance [kg CO ₂ -eq./year]	FlexPen® incl. Cartridge [kg CO ₂ -eq./year]		NovoFine® Plus (co-pack) [kg CO ₂ -eq./year]		One year treatment [kg CO ₂ -eq./year]	
		Delivery system	Packaging	Needle	Packaging	Excl. packaging	Incl. packaging
Actrapid® FlexPen®	1.1	4.7	0.7	2.1	3.0	8.0	11.8
Fiasp® FlexPen®	1.1	4.7	0.7	2.1	3.0	7.9	11.7
Insultard® FlexPen®	1.1	4.7	0.7	2.1	3.0	8.0	11.8
Levemir® FlexPen®	6.9	4.7	0.7	2.1	3.0	13.7	17.5
Mixtard® FlexPen®	1.1	4.7	0.7	2.1	3.0	8.0	11.8
NovoMix® FlexPen®	1.1	4.7	0.7	2.1	3.0	7.9	11.7
NovoRapid® FlexPen®	1.1	4.7	0.7	2.1	3.0	7.9	11.7

Brand name	Drug substance [kg CO ₂ -eq./year]	FlexPen® incl. Cartridge [kg CO ₂ -eq./year]		NovoFine® Plus (co-pack) [kg CO ₂ -eq./year]		One year treatment [kg CO ₂ -eq./year]	
		Delivery system	Packaging	Needle	Packaging	Excl. packaging	Incl. packaging
Ryzodeg® FlexPen®	1.8	4.7	0.7	2.1	3.0	8.7	12.4
Tresiba® U100 FlexPen®	2.1	4.7	0.7	2.1	3.0	9.0	12.7
Victoza®	4.2	2.4	0.4	2.1	3.0	8.7	12.1

3.2 US market

Table 7 Carbon footprint of one year's treatment of one patient in the **US** market with FlexPen® and NovoFine®.

Brand name	Drug substance [kg CO ₂ -eq./year]	FlexPen® incl. Cartridge [kg CO ₂ -eq./year]		NovoFine® [kg CO ₂ -eq./year]		One year treatment [kg CO ₂ -eq./year]	
		Delivery system	Packaging	Needle	Packaging	Excl. packaging	Incl. packaging
Actrapid® FlexPen®	1.1	7.3	0.8	5.3	0.2	13.7	14.7
Fiasp® FlexPen®	1.1	7.3	0.8	5.3	0.2	13.6	14.7
Insultard® FlexPen®	1.1	7.3	0.8	5.3	0.2	13.7	14.7
Levemir® FlexPen®	6.9	7.3	0.8	5.3	0.2	19.5	20.5
Mixtard® FlexPen®	1.1	7.3	0.8	5.3	0.2	13.7	14.7
NovoMix® FlexPen®	1.1	7.3	0.8	5.3	0.2	13.6	14.7
NovoRapid® FlexPen®	1.1	7.3	0.8	5.3	0.2	13.6	14.7
Ryzodeg® FlexPen®	1.8	7.3	0.8	5.3	0.2	14.4	15.4
Tresiba® U100 FlexPen®	2.1	7.3	0.8	5.3	0.2	14.7	15.7
Victoza®	4.2	3.7	0.4	5.3	0.2	13.1	13.8

Table 8. Carbon footprint of one year's treatment of one patient in the **US** market with FlexPen® and NovoFine® Plus

	Drug substance [kg CO ₂ -eq./year]	FlexPen® incl. Cartridge [kg CO ₂ -eq./year]		NovoFine® Plus [kg CO ₂ -eq./year]		One year treatment [kg CO ₂ -eq./year]	
Brand name		Delivery system	Packaging	Needle	Packaging	Excl. packaging	Incl. packaging
Actrapid® FlexPen®	1.1	7.3	0.8	2.8	0.2	11.2	12.2
Fiasp® FlexPen®	1.1	7.3	0.8	2.8	0.2	11.2	12.2
Insultard® FlexPen®	1.1	7.3	0.8	2.8	0.2	11.2	12.2
Levemir® FlexPen®	6.9	7.3	0.8	2.8	0.2	17.0	18.0
Mixtard® FlexPen®	1.1	7.3	0.8	2.8	0.2	11.2	12.2
NovoMix® FlexPen®	1.1	7.3	0.8	2.8	0.2	11.2	12.2
NovoRapid® FlexPen®	1.1	7.3	0.8	2.8	0.2	11.2	12.2
Ryzodeg® FlexPen®	1.8	7.3	0.8	2.8	0.2	11.9	12.9
Tresiba® U100 FlexPen®	2.1	7.3	0.8	2.8	0.2	12.2	13.2
Victoza®	4.2	3.7	0.4	2.8	0.2	10.7	11.3

Table 9. Carbon footprint of one year's treatment of one patient in the **US** market with FlexPen® and NovoFine® Plus (co-pack).

	Drug substance [kg CO ₂ -eq./year]	FlexPen® incl. Cartridge [kg CO ₂ -eq./year]	NovoFine® Plus (co-pack) [kg CO ₂ -eq./year]		One year treatment (all) [kg CO ₂ -eq./year]		
	-	Delivery system	Packaging	Needle	Packaging	Excl. packaging	Incl. packaging
Brand name							
Actrapid® FlexPen®	1.1	7.3	0.8	6.8	3.0	15.2	19.0
Fiasp® FlexPen®	1.1	7.3	0.8	6.8	3.0	15.2	19.0
Insultard® FlexPen®	1.1	7.3	0.8	6.8	3.0	15.2	19.0
Levemir® FlexPen®	6.9	7.3	0.8	6.8	3.0	21.0	24.8
Mixtard® FlexPen®	1.1	7.3	0.8	6.8	3.0	15.2	19.0
NovoMix® FlexPen®	1.1	7.3	0.8	6.8	3.0	15.2	19.0
NovoRapid® FlexPen®	1.1	7.3	0.8	6.8	3.0	15.2	19.0

	Drug substance [kg CO ₂ -eq./year]	FlexPen® incl. Cartridge [kg CO ₂ -eq./year]	NovoFine® Plus (co-pack) [kg CO ₂ -eq./year]		One year treatment (all) [kg CO ₂ -eq./year]	
Brand name	-	Delivery system	Packaging	Needle	Packaging	Excl. packaging Incl. packaging
Ryzodeg® FlexPen®	1.8	7.3	0.8	6.8	3.0	15.9 19.7
Tresiba® U100 FlexPen®	2.1	7.3	0.8	6.8	3.0	16.2 20.0
Victoza®	4.2	3.7	0.4	6.8	3.0	14.7 18.1

3.3 Japanese market

Table 10. Carbon footprint of one year's treatment of one patient in the **Japanese** market with FlexPen® and NovoFine® Plus (70pcs).

	Drug substance [kg CO ₂ -eq./year]	FlexPen® incl. Cartridge [kg CO ₂ -eq./year]	NovoFine® Plus [kg CO ₂ -eq./year]		One year treatment (all) [kg CO ₂ -eq./year]	
Brand name		Delivery system	Packaging	Needle	Packaging	Excl. packaging Incl. packaging
Actrapid® FlexPen®	1.1	11.1	2.0	3.1	0.3	15.3 17.6
Fiasp® FlexPen®	1.1	11.1	2.0	3.1	0.3	15.3 17.5
Insultard® FlexPen®	1.1	11.1	2.0	3.1	0.3	15.3 17.6
Levemir® FlexPen®	6.9	11.1	2.0	3.1	0.3	21.1 23.4
Mixtard® FlexPen®	1.1	11.1	2.0	3.1	0.3	15.3 17.6
NovoMix® FlexPen®	1.1	11.1	2.0	3.1	0.3	15.3 17.5
NovoRapid® FlexPen®	1.1	11.1	2.0	3.1	0.3	15.3 17.5
Ryzodeg® FlexPen®	1.8	11.1	2.0	3.1	0.3	16.0 18.3
Tresiba® U100 FlexPen®	2.1	11.1	2.0	3.1	0.3	16.3 18.6
Victoza®	4.2	5.5	1.0	3.1	0.3	12.9 14.2

3.4 Comparison to other measurements

To put this into perspective for a non-expert, the carbon footprint of the yearly treatment (including API, delivery system, needle (NovoFine®Plus) and packaging) has been recalculated into a distance driven by an average new car at the European market in 2023⁸.

One year of treatment with [drug substance brand name] FlexPen® corresponds to driving 83-220 km in an average new car in Europe. For a more detailed comparison, select a specific treatment in [Table 11](#).

Table 11. The distance (km) travelled in an average new car in Europe that would equal the carbon footprint of one year's treatment of a patient with the specified treatment.

Brand name	EU	US	JP
	<i>Km travelled</i>	<i>Km travelled</i>	<i>Km travelled</i>
Actrapid® FlexPen®	83	115	165
Fiasp® FlexPen®	83	114	165
Insultard® FlexPen®	83	115	165
Levemir® FlexPen®	137	169	220
Mixtard® FlexPen®	83	115	165
NovoMix® FlexPen®	83	114	165
NovoRapid® FlexPen®	83	114	165
Ryzodeg® FlexPen®	90	121	172
Tresiba® U100 FlexPen®	93	124	175
Victoza®	86	106	133

⁸ European Environment Agency (2023) . Average carbon dioxide emissions per km from new passenger cars (106.4 g CO₂ eq/km), [CO₂ emissions performance of new passenger cars in Europe | European Environment Agency's home page](#)

4. Plastic footprint

The plastic footprint is defined by Novo Nordisk as the amount of plastic⁹ used by a patient or an organisation during a specific treatment. The footprint includes any plastic placed on the market by Novo Nordisk, regardless of its origin (virgin, recycled, fossil or non-fossil). The footprint is calculated both with and without secondary and tertiary packaging.

This section presents the plastic footprint for specific treatments (assumptions described in Section 2) with FlexPen® in combinations with a range on drug substances and needles in the three representative markets, Europe, US and Japan. The contribution to the plastic footprints from the delivery system, needle and packaging are shown as well as the total plastic footprint per patient per year.

Table 12 Plastic footprint for the different elements required for yearly treatment with *FlexPen* combined with *NovoFine*® with and without packaging. *Note that FlexPen® and Victoza® is a prefilled device and therefore the cartridge is already considered as part of the delivery solution.*

Brand name	FlexPen® incl. Cartridge [g plastic/year]		NovoFine® [g plastic/year]		One year treatment (all) [kg plastic/year]	
	Delivery system	Packaging	Needle	Packaging	Excl. packaging	Incl. packaging
	All	EU/US	All	EU/US	All	EU/US
Actrapid® FlexPen®	762	4	93	303	0.85	1.16
Fiasp® FlexPen®	762	4	93	303	0.85	1.16
Insultard® FlexPen®	762	4	93	303	0.85	1.16
Levemir® FlexPen®	762	4	93	303	0.85	1.16
Mixtard® FlexPen®	762	4	93	303	0.85	1.16
NovoMix® FlexPen®	762	4	93	303	0.85	1.16
NovoRapid® FlexPen®	762	4	93	303	0.85	1.16
Ryzodeg® FlexPen®	762	4	93	303	0.85	1.16
Tresiba® U100 FlexPen®	762	4	93	303	0.85	1.16
Victoza®	381	2	93	303	0.47	0.78

⁹ Rubber not included

Table 13. Plastic footprint for the different elements required for yearly treatment with *FlexPen*® combined with NovoFine® Plus with and without packaging. *Note that FlexPen® is a prefilled device and therefore the cartridge is already considered as part of the delivery solution.*

Brand Name	FlexPen® incl. cartridge [g plastic/year]			NovoFine® Plus [g plastic/year]			One year treatment (all) [kg plastic/year]		
	Delivery system	Packaging		Needle	Packaging		Excl. packaging	Incl. packaging	
		All	EU/US		JP	All		EU/US	JP
Actrapid® FlexPen®	762	4	25	143	261	288	0.90	1.17	1.22
Fiasp® FlexPen®	762	4	25	143	261	288	0.90	1.17	1.22
Insultard® FlexPen®	762	4	25	143	261	288	0.90	1.17	1.22
Levemir® FlexPen®	762	4	25	143	261	288	0.90	1.17	1.22
Mixtard® FlexPen®	762	4	25	143	261	288	0.90	1.17	1.22
NovoMix® FlexPen®	762	4	25	143	261	288	0.90	1.17	1.22
NovoRapid® FlexPen®	762	4	25	143	261	288	0.90	1.17	1.22
Ryzodeg® FlexPen®	762	4	25	143	261	288	0.90	1.17	1.22
Tresiba® U100 FlexPen®	762	4	25	143	261	288	0.90	1.17	1.22
Victoza®	381	2	12	143	261	288	0.52	0.79	0.82

Table 14. Plastic footprint for the different elements required for yearly treatment with *FlexPen*® combined with NovoFine® Plus (co-pack) with and without packaging. *Note that FlexPen® is a prefilled device and therefore the cartridge is already considered as part of the delivery solution.*

Brand name	FlexPen® incl. cartridge [g plastic/year]		NovoFine® Plus (co-pack) [g plastic/year]		One year treatment (all) [kg plastic/year]	
	Delivery system	Packaging	Needle	Packaging	Excl. packaging	Incl. packaging
	All	EU/US	All	EU/US	All	EU/US
Actrapid® FlexPen®	762	4	143	279	0.90	1.19
Fiasp® FlexPen®	762	4	143	279	0.90	1.19
Insultard® FlexPen®	762	4	143	279	0.90	1.19
Levemir® FlexPen®	762	4	143	279	0.90	1.19
Mixtard® FlexPen®	762	4	143	279	0.90	1.19
NovoMix® FlexPen®	762	4	143	279	0.90	1.19

Brand name	FlexPen® incl. cartridge [g plastic/year]		NovoFine® Plus (co-pack) [g plastic/year]		One year treatment (all) [kg plastic/year]	
	Delivery system	Packaging	Needle	Packaging	Excl. packaging	Incl. packaging
	All	EU/US	All	EU/US	All	EU/US
NovoRapid® FlexPen®	762	4	143	279	0.90	1.19
Ryzodeg® FlexPen®	762	4	143	279	0.90	1.19
Tresiba® U100 FlexPen®	762	4	143	279	0.90	1.19
Victoza®	381	2	143	279	0.52	0.80

References

GLP-1 analogues carbon footprint, Novo Nordisk, Apr 2024

Insulin analogues carbon footprint, Novo Nordisk, Mar 2024

FlexPen® carbon footprint, Novo Nordisk, Jul 2024

NovoFine® carbon footprint, Novo Nordisk, Dec 2024

Assumptions and background for carbon footprint
assessments, Novo Nordisk, Apr 2025

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