IGE | IPI
Eidgenössisches Institut für Geistiges Eigentum
Institut Fédéral de la Propriété Intellectuelle
Istituto Federale della Proprietà Intellettuale
Swiss Federal Institute of Intellectual Property

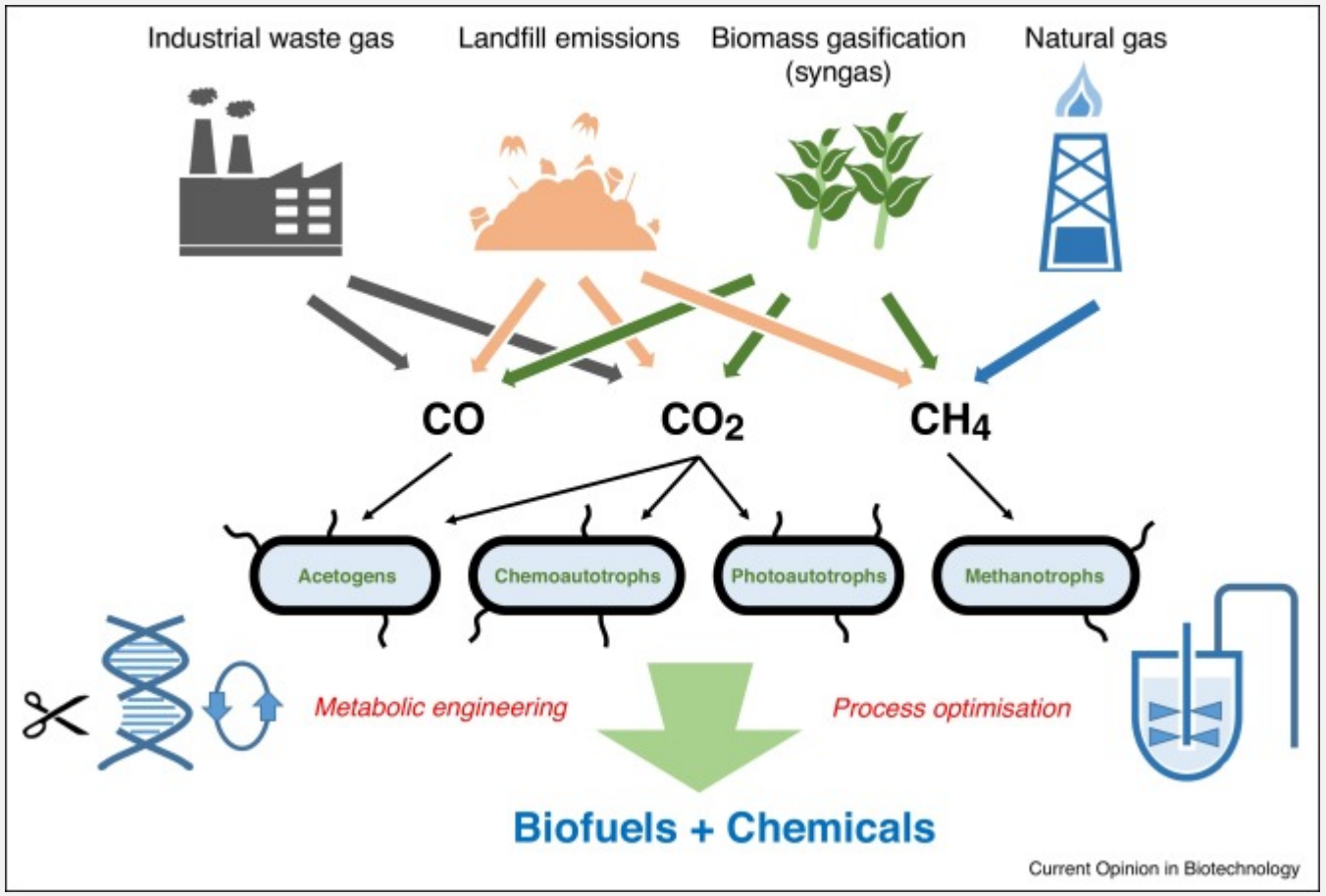
IP outlook: Technology landscape for sustainable biotech

biotechnet switzerland

Biotechnet Meet-Up 2024, 18.01.2024

Christian Moser Nikles, Dr. med. vet, PhD
Patent expert, Swiss Federal Institute of Intellectual Property (IPI)

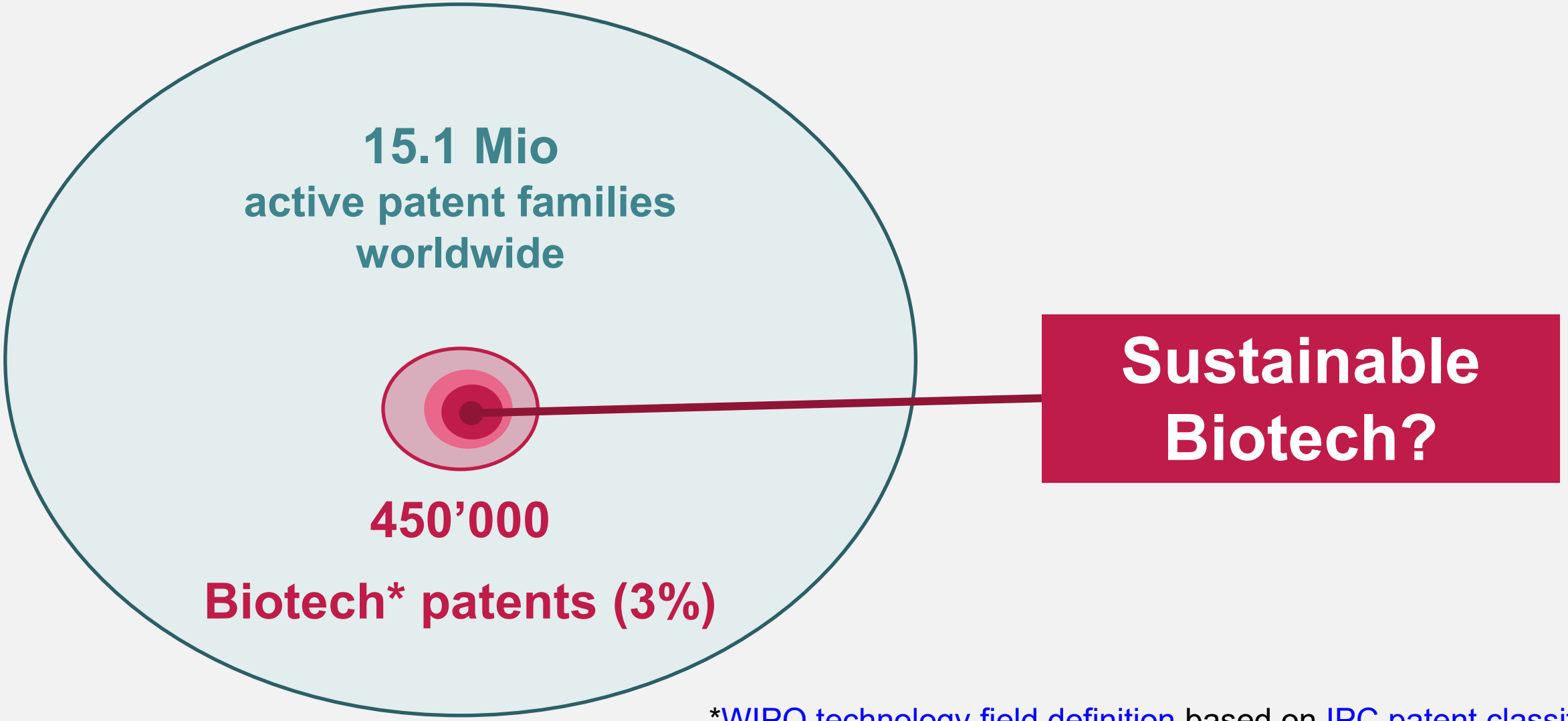
Sustainable biotechnology?



Christopher M Humphreys, Nigel P Minton, Advances in metabolic engineering in the microbial production of fuels and chemicals from C1 gas, Current Opinion in Biotechnology, Volume 50, 2018; https://doi.org/10.1016/j.copbio.2017.12.023.

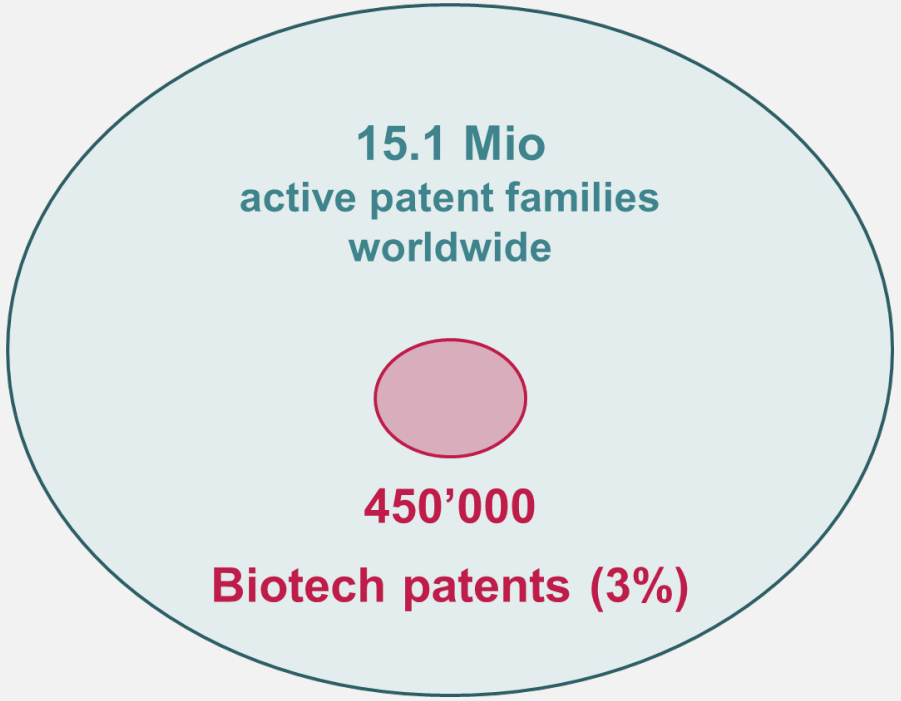
https://www.exeter.ac.uk/about/sustainability/sustainablelabs/labplastics/

The global patent thicket 2023



*WIPO technology field definition based on IPC patent classification, expanded by corresponding CPC classification

Biotechnology patents



Disciplines* within Biotech patents

- 85% Biochemistry
- 33% Medical Science
- 31% Organic Chemistry
- 17% Measuring, Testing
- 12% Agriculture

*based on IPC classification

Sustainable biotechnology?

WO2013176772

METHODS AND COMPOSITIONS FOR RNA-DIRECTED TARGET DNA MODIFICATION AND FOR RNA-DIRECTED MODULATION OF TRANSCRIPTION

University of California

The present disclosure provides a DNA-targeting RNA that comprises a targeting sequence and, together with a modifying polypeptide, provides for site-specific modification of a target DNA and/or a polypeptide associated with the target DNA.

WO2010077634

ANTI-PD-L1 ANTIBODIES AND THEIR USE TO ENHANCE T-CELL FUNCTION

Genentech

The present application relates to anti-PD-L1 antibodies, …and their use enhance T-cell function to upregulate cell-mediated immune responses and for the treatment of T cell dysfunctional disorders, including infection and tumor immunity

WO2016180748

ALPHA-AMYLASE VARIANTS AND POLYNUCLEOTIDES ENCODING SAME

Novozymes

The present invention also relates to polynucleotides encoding the variants; nucleic acid constructs, vectors, and host cells comprising the polynucleotides; and methods of using the variants.

WO2016061391

NOVEL CHIMERIC INSECTICIDAL PROTEINS TOXIC OR INHIBITORY TO LEPIDOPTERAN PESTS

Monsanto

Particular embodiments provide compositions and transformed plants, plant parts, and seeds containing the recombinant nucleic acid molecules encoding one or more of the chimeric insecticidal proteins.

Sustainable biotechnology patents?

Keyword search in title/abstract/claims within Biotech patents

Combined search:
4’480 patents
~ 1%
of all biotech patents

Theme 2024: Sustainability in Biotech

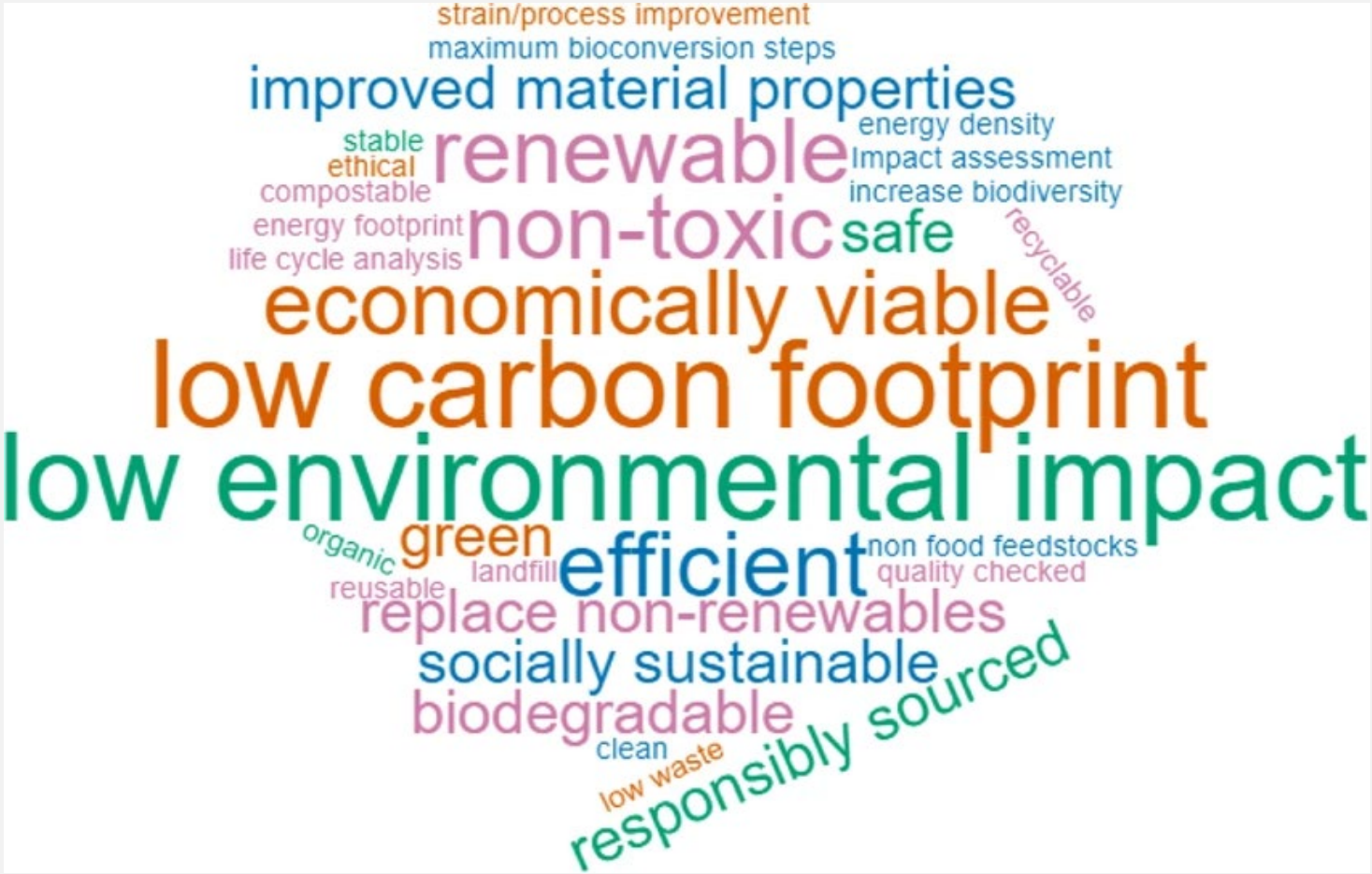
biotechnet switzerland

We will address topics such as:

0.48%	• Biocatalysis
0.12%	• Bioresources
0.13%	• Bioenergy
0	• Bioremediation
0.01%	• Circular economy
0.02%	• Biodegradable lab wares and resterilisation
0.02%	• Reusable materials and processes in biomanufacturing
0.02%	• Tackling plastic waste in diagnostics
0	• Continuing education in sustainable biotech

Sustainable biotechnology?

“What characteristics would a sustainable biotechnology product have?”

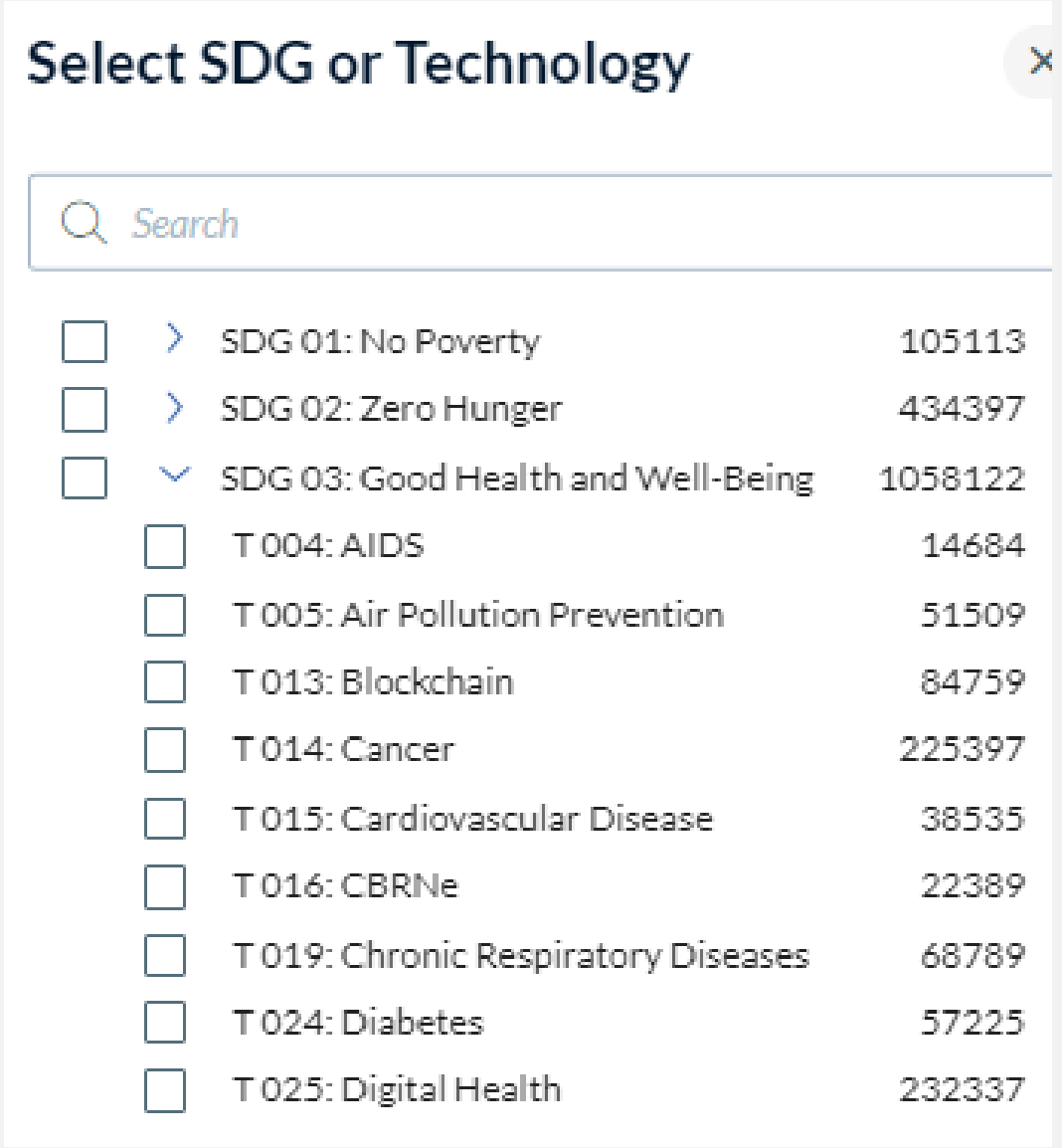


Wordcloud generated from responses in the initial formulation workshops to the question
Matthews, N.E., Cizauskas, C.A., Layton, D.S. *et al.* Collaborating constructively for sustainable biotechnology. *Sci Rep* **9**, 19033 (2019). https://doi.org/10.1038/s41598-019-54331-7

Sustainable biotechnology?

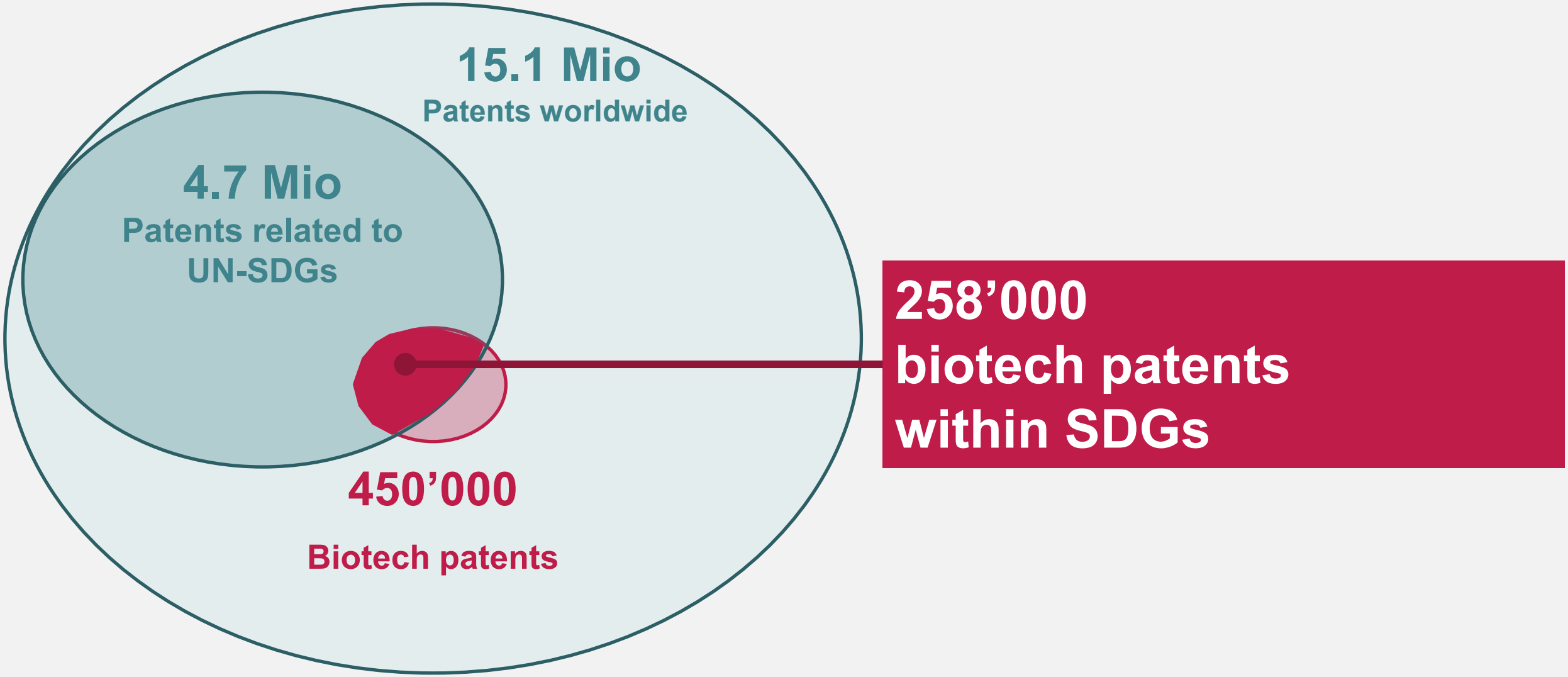
SDG related technologies

- **17 SDGs**
- **231 indicators to track progress**
- **100 technology fields**
  designed for patent categorization

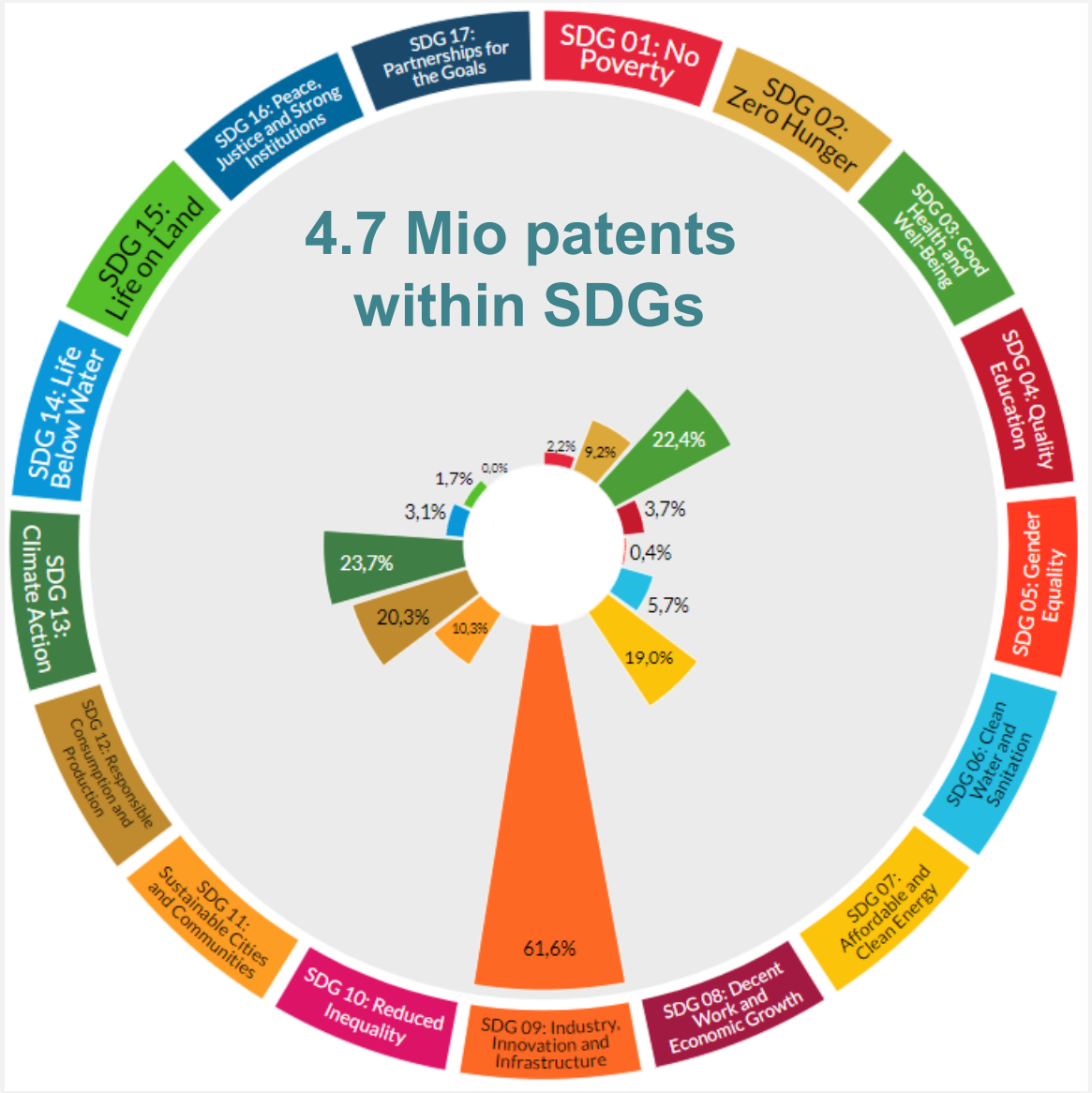


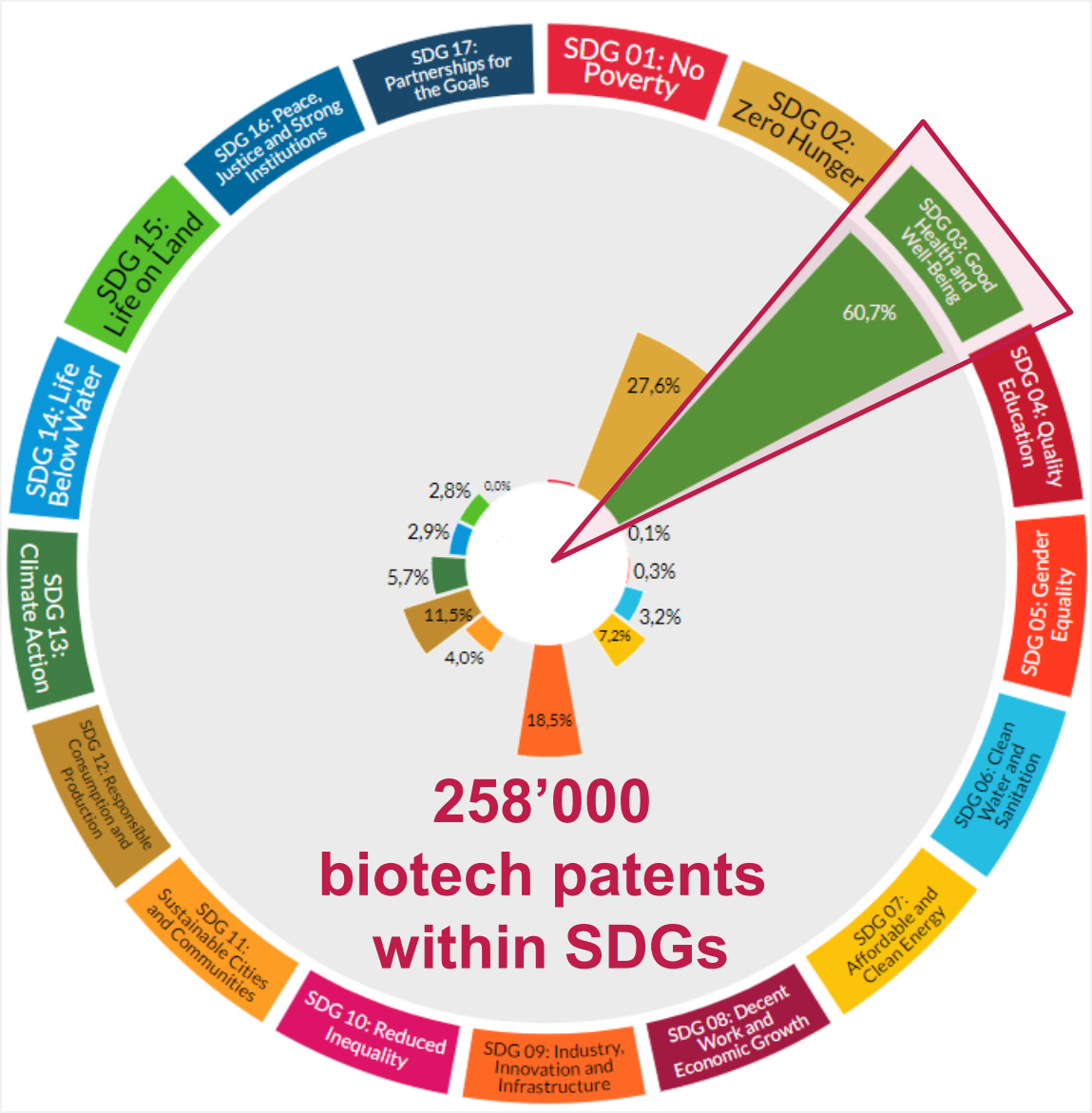
https://www.lexisnexisip.com/sustainable-innovation-report/

Sustainable biotechnology on the basis of UN-SDGs

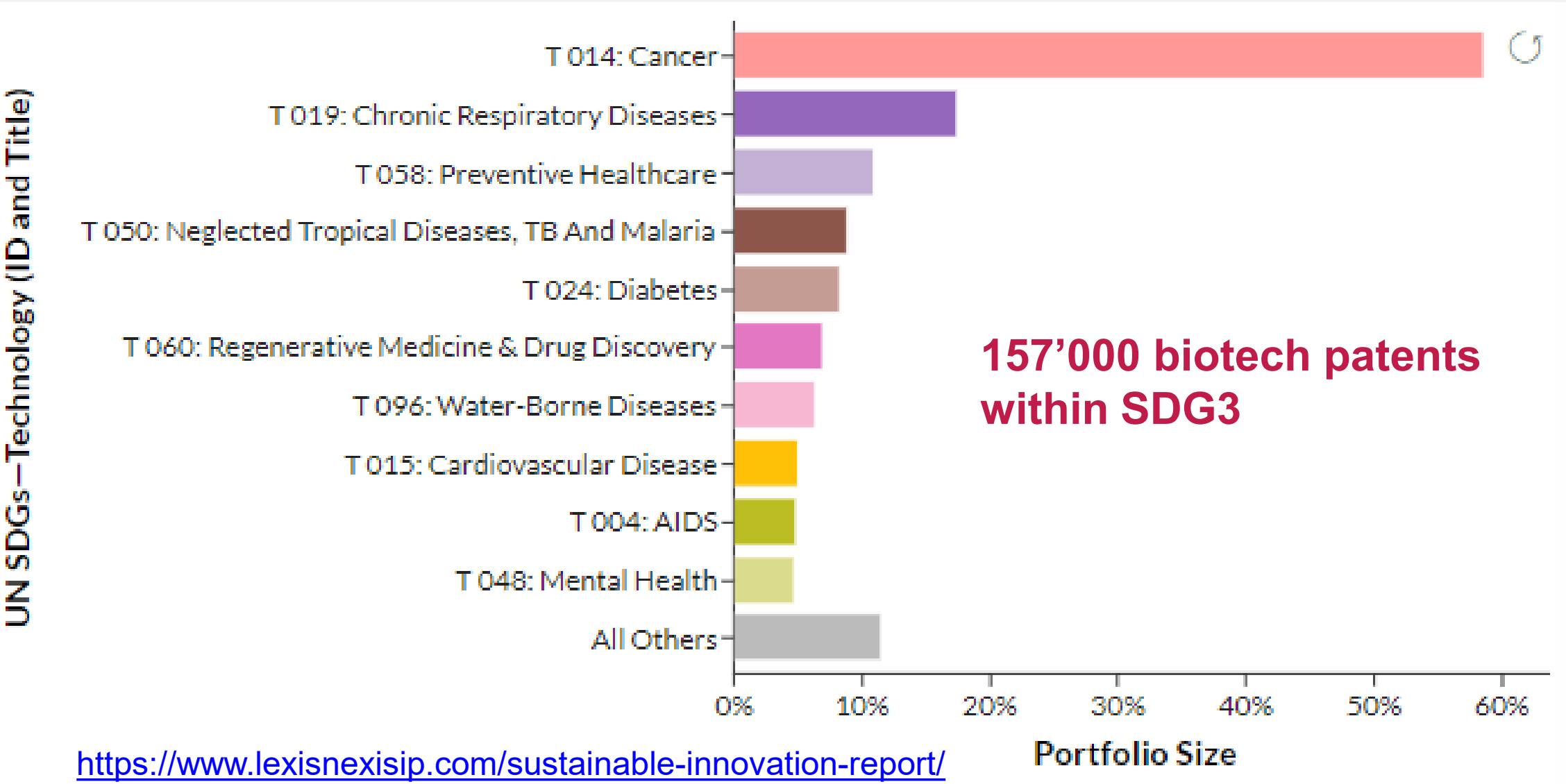


SDG-related patents and biotechnology





Technologies within SDG3



157'000 biotech patents within SDG3

https://www.lexisnexisip.com/sustainable-innovation-report/

Sustainable biotechnology?

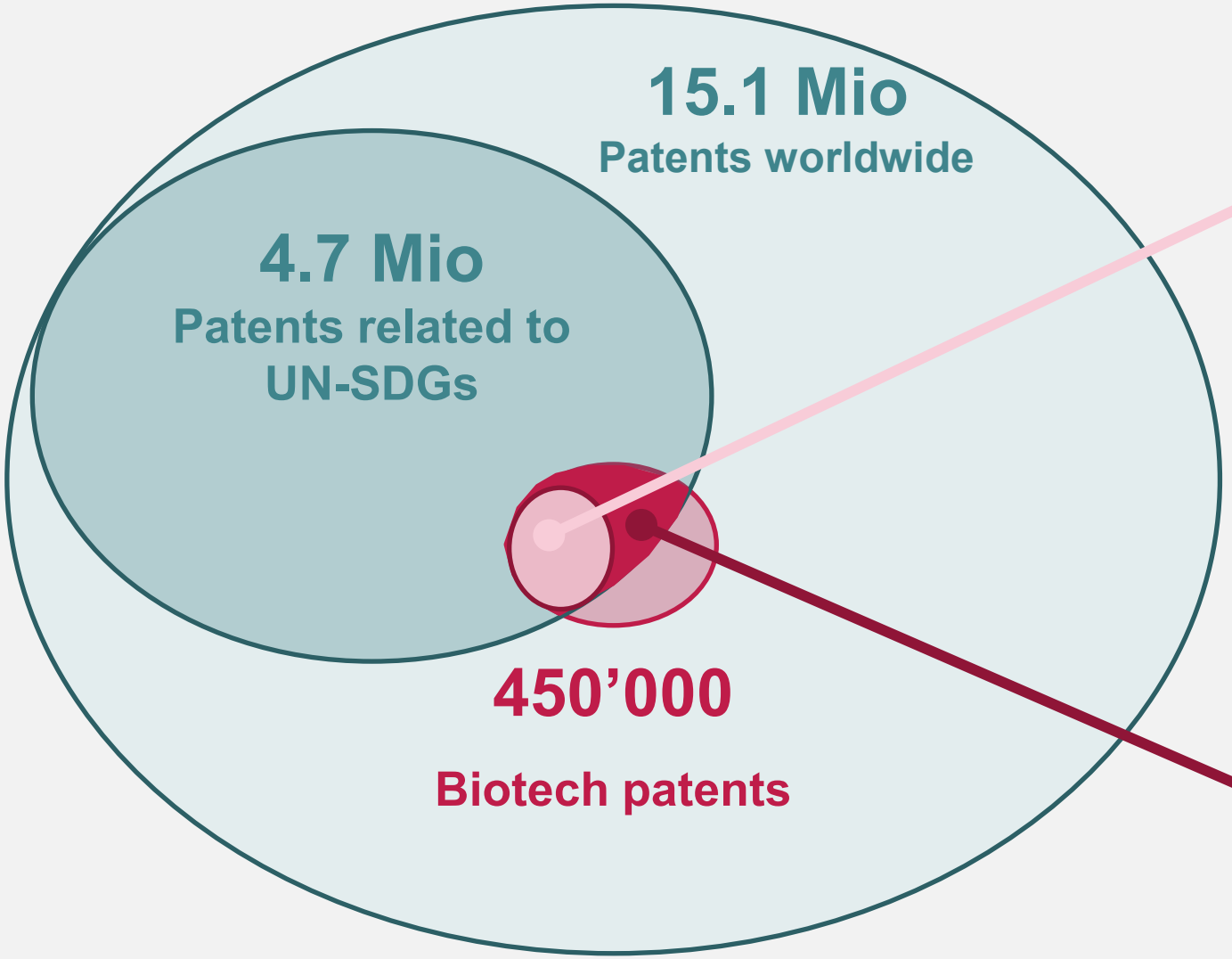
WO2012079000
USE OF CHIMERIC ANTIGEN RECEPTOR-MODIFIED T CELLS TO TREAT CANCER
University of Pennsylvania
The invention includes relates to administering a genetically modified T cell to express a CAR wherein the CAR comprises an antigen binding domain, a transmembrane domain, a costimulatory signaling region, and a CD3 zeta signaling domain.

WO2018114878
RE-USE OF ENZYMES IN IN VITRO GLYCOENGINEERING OF ANTIBODIES
Roche
Method for the enzymatic preparation/production of an antibody with a modified glycosylation in the Fc-region comprises the steps of incubating an antibody that has a glycosylation in the Fc-region with one or more enzymes, and repeating the incubating step with the one or more recycled enzymes at least once.

WO2021186454
COMPOSITIONS AND METHODS FOR TREATING AND PREVENTING NON-MALIGNANT RESPIRATORY DISEASE
Alkalay Rachel
Reducing infectivity of non-malignant respiratory disease virus e.g. Adenoviridae or Retroviridae virus, by modifying viral entry mechanism proteins in subject, by administering plant species e.g. Nigella sativa, Thymus capitatus and Panax ginseng to subject.

WO2023288130
METHODS OF DETECTING SJÖGREN'S SYNDROME USING SALIVARY EXOSOMES
Exosome Diagnostics Inc
Identifying presence or absence of Sjogren's syndrome comprises determining expression level of 7 biomarkers in microvesicular RNA isolated from saliva sample.

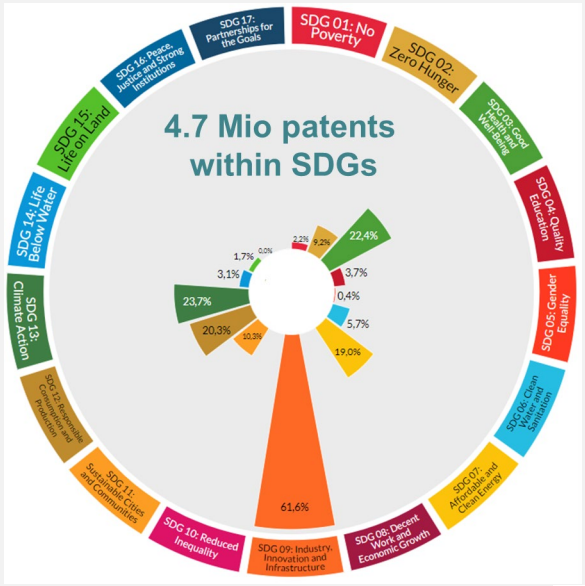
Sustainable biotechnology on the basis of UN-SDGs

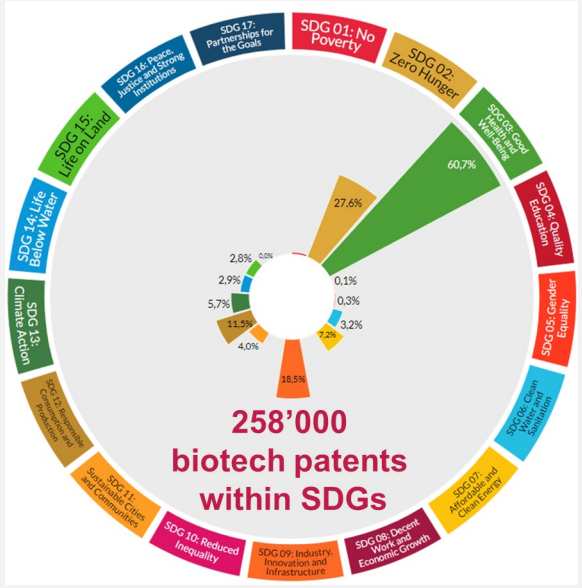


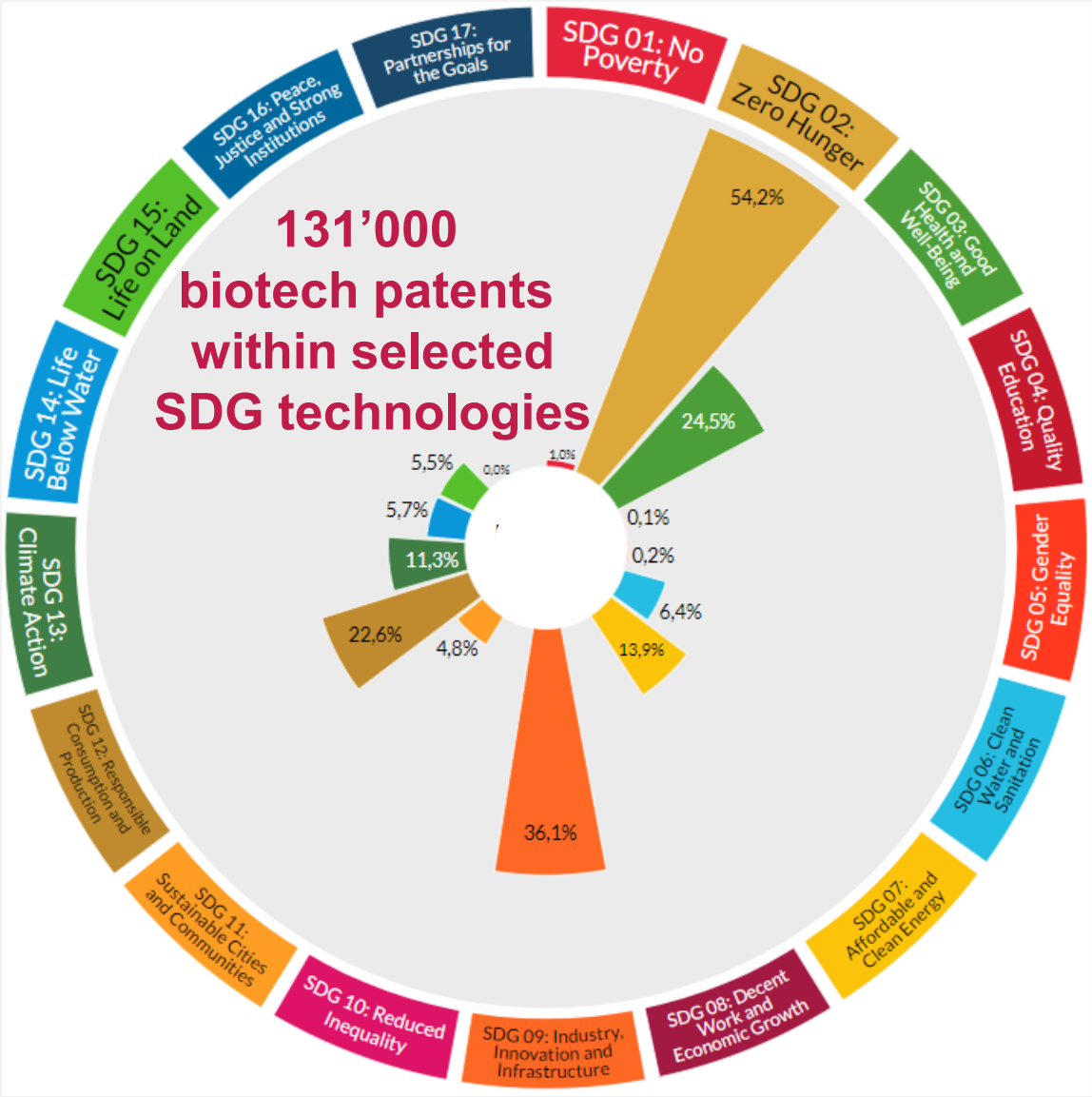
Exclude
SDG technologies relating to Disease Indications

Sustainable biotechnology:
132’000 patents

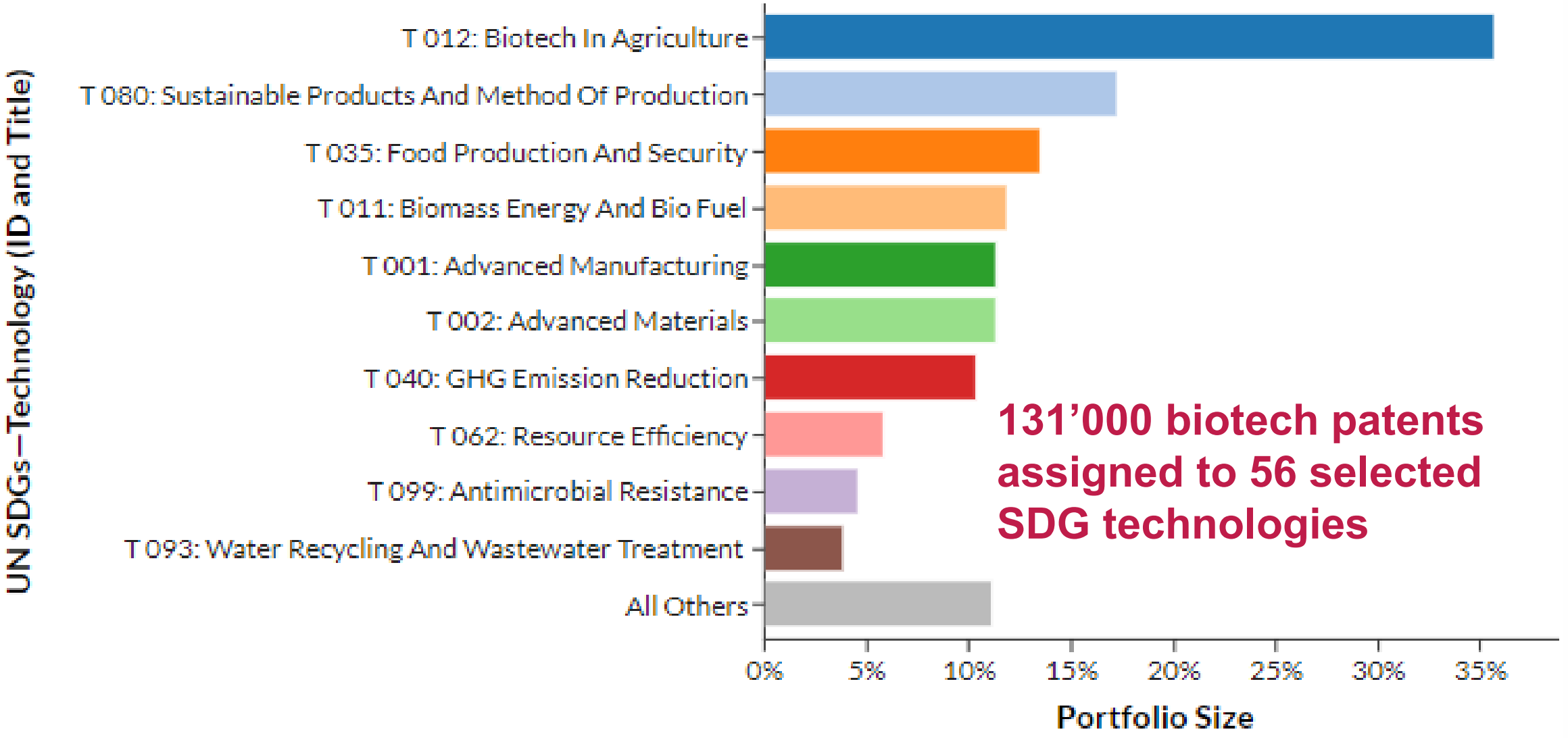
SDG-related patents and biotechnology







SDG-related patents and biotechnology



Sustainable biotechnology?

WO2016020371
ANTIFUNGAL PAENIBACILLUS STRAINS, FUSARICIDIN-TYPE COMPOUNDS
BASF
The present invention relates to novel isolated bacterial strains, which are members of the genus Paenibacillus, originally isolated from soil and showing antagonistic activity against a broad range of pathogens and being capable of producing antimicrobial metabolites.

WO2008079724
PHOTOBIOREACTOR
SOLIX BIOFUELS INC
Methods, apparatus and compositions for an economical, efficient closed system photobioreactor that is capable of growing high density algal cultures, designed to optimize utilization of solar light, and to produce bio fuels at a cost that is competitive with fossil fuels.

WO2023152164
MODIFIED ION CHANNELS
University of Glasgow
The invention relates to methods of increasing stomatal function in plants, which leads to an increase in water use efficiency and ultimately an increase in biomass and yield.

US8852157
DISPOSABLE ITEMS MADE FROM BIOPLASTIC RESINS
Innovative bottles LLC
The disposable device including a multidose syringe, a specimen tube, a scalpel, a lancet, a sharps container is useful in hospitals, pharmaceuticals, life sciences, and healthcare industries.

Sustainable biotechnology?

WO2022014542

METHOD FOR PRODUCING VEGETABLE PROTEIN FOOD

Amano Enzyme Inc

This method comprises treating a starting vegetable protein material with both of a lipase and a protein deamidase (for example, protein glutaminase) to thereby improve the flavor of a vegetable protein food.

WO2022149651

METHOD FOR PRODUCING FORMIC ACID BY USING CARBON MONOXIDE DEHYDROGENASE AND FORMATE DEHYDROGENASE

ULSAN NAT INST SCIENCE & TECH UNIST [KR]

Composition or device useful for preparing formic acid, removing carbon monoxide and carbon dioxide, performing waste gas treatment, and purifying air, comprises carbon monoxide dehydrogenase and formate dehydrogenase

WO2022072334

STERILE ORGANISMS, METHODS OF MAKING, AND METHODS OF USE THEREOF

University of Brandeis

“Sterile Insect Technology” (SIT) is a powerful and environmentally friendly strategy for mitigating and even eradicating insect pests and vectors of disease. In SIT, sterile male insects of a given species are released into the environment to compete with their wild male counterparts for mating to wild females.

WO2015124618

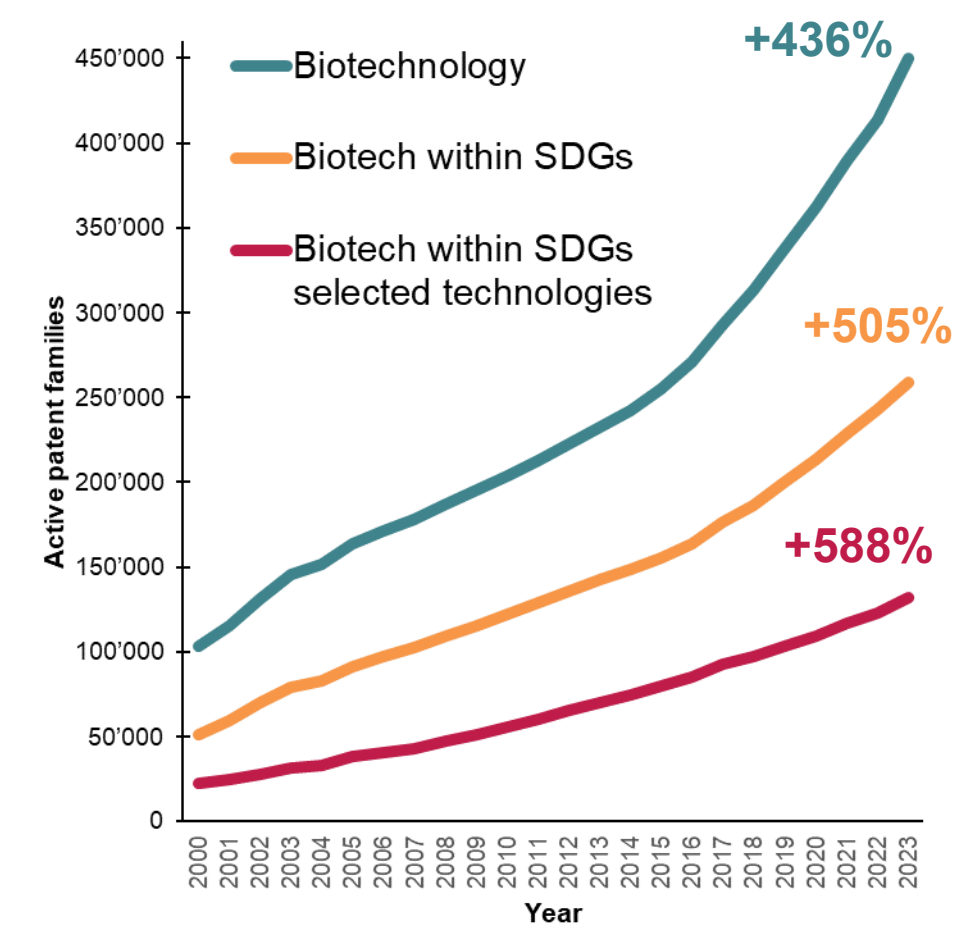
STANDARDIZING AND INCREASING THE SENSITIVITY OF CELLS TO BOTULINUM NEUROTOXINS IN IN VITRO TEST SYSTEMS

Merz Pharma GmbH & Co KGAA

Method for standardizing the sensitivity of induced pluripotent stem cell (iPS)-derived neurons to a neurotoxin polypeptide… Seek for alternative approaches to alleviate the need for animal testing.

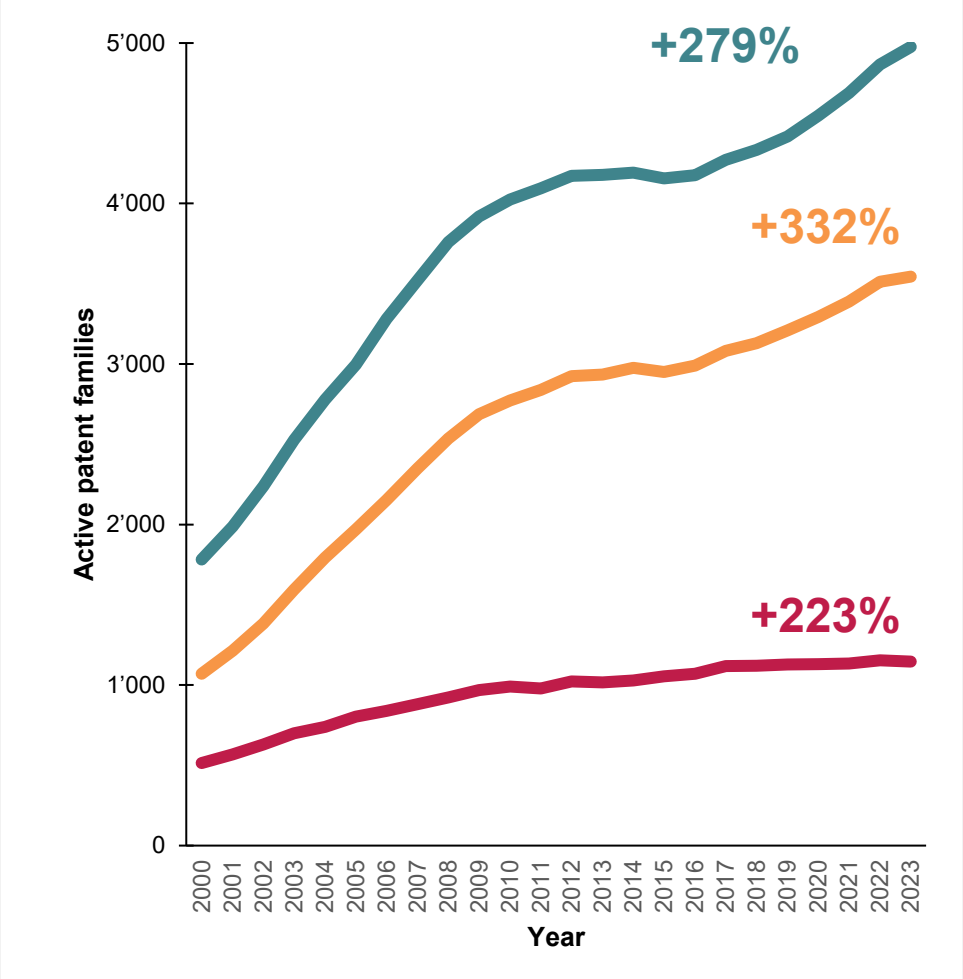
Developments 2000-2023

Global portfolio



Overall portfolio growth: +296%

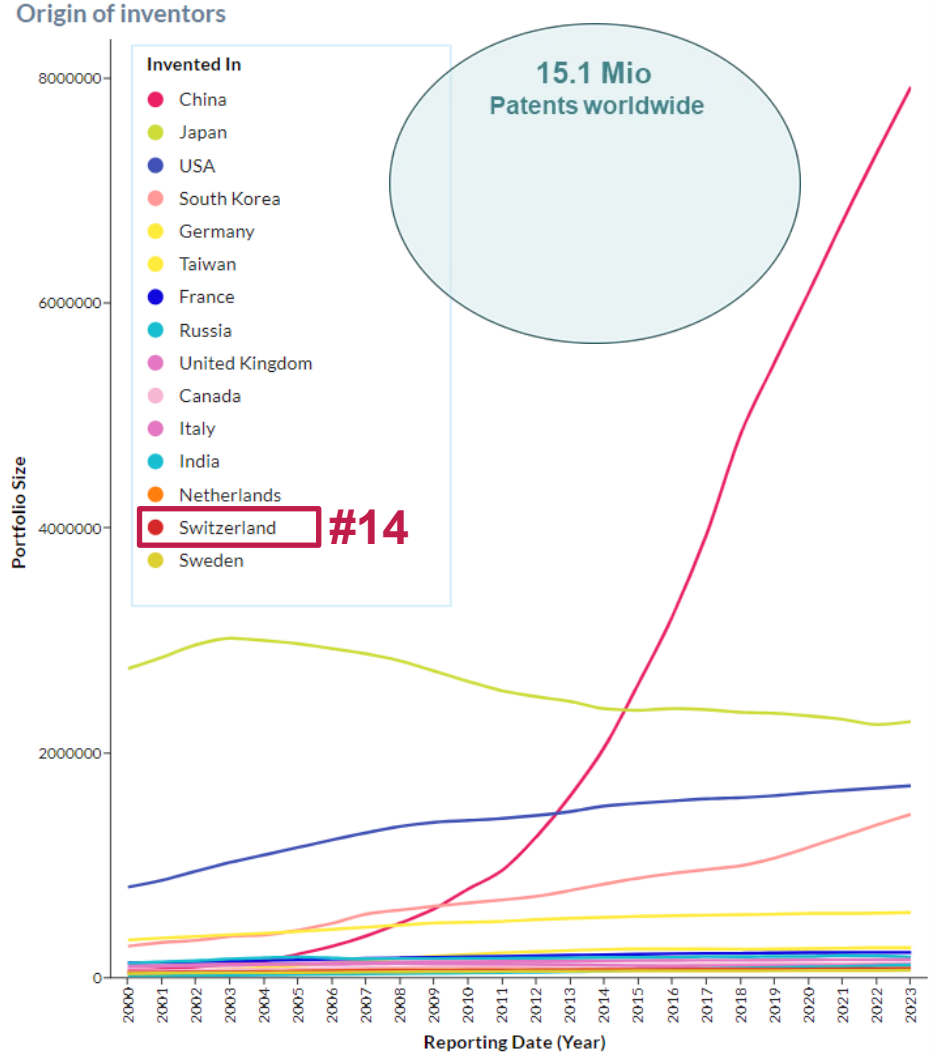
(co-)invented in Switzerland



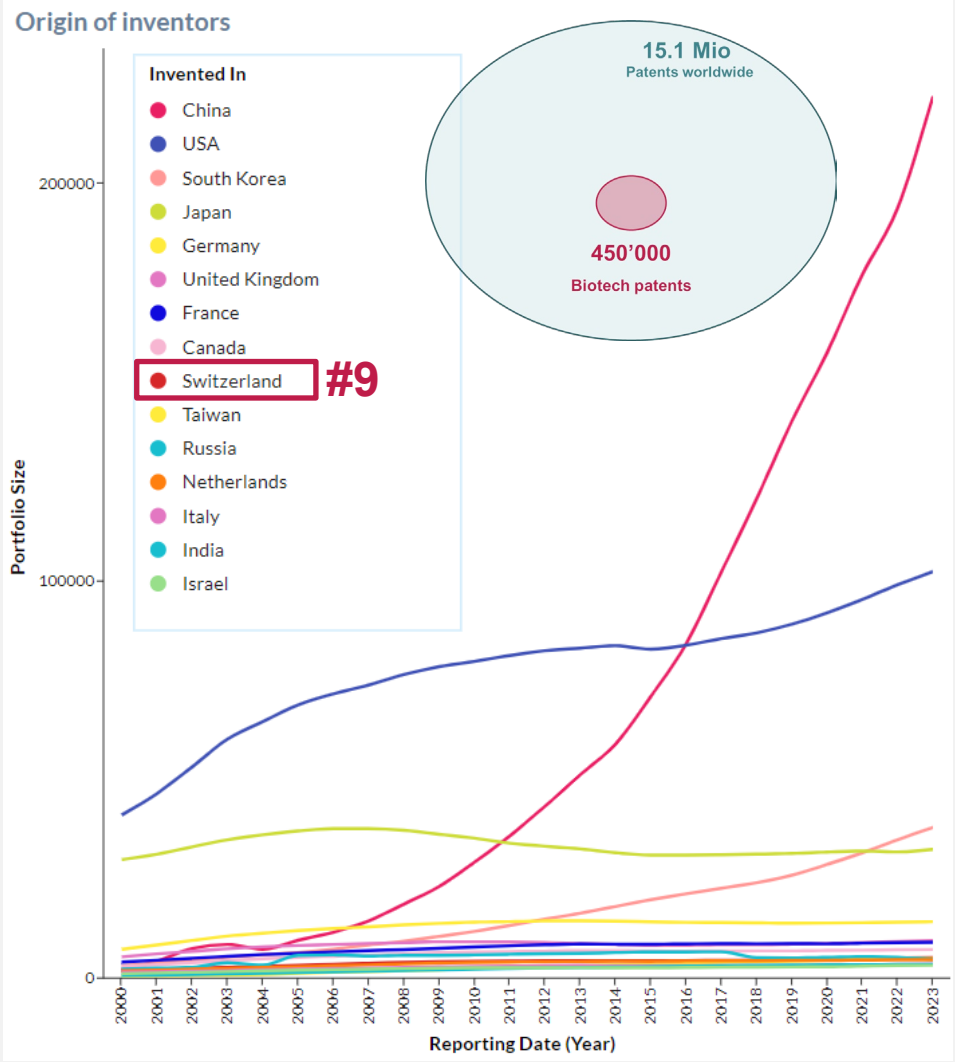
Overall portfolio growth: +188%

Developments 2000-2023

All patents

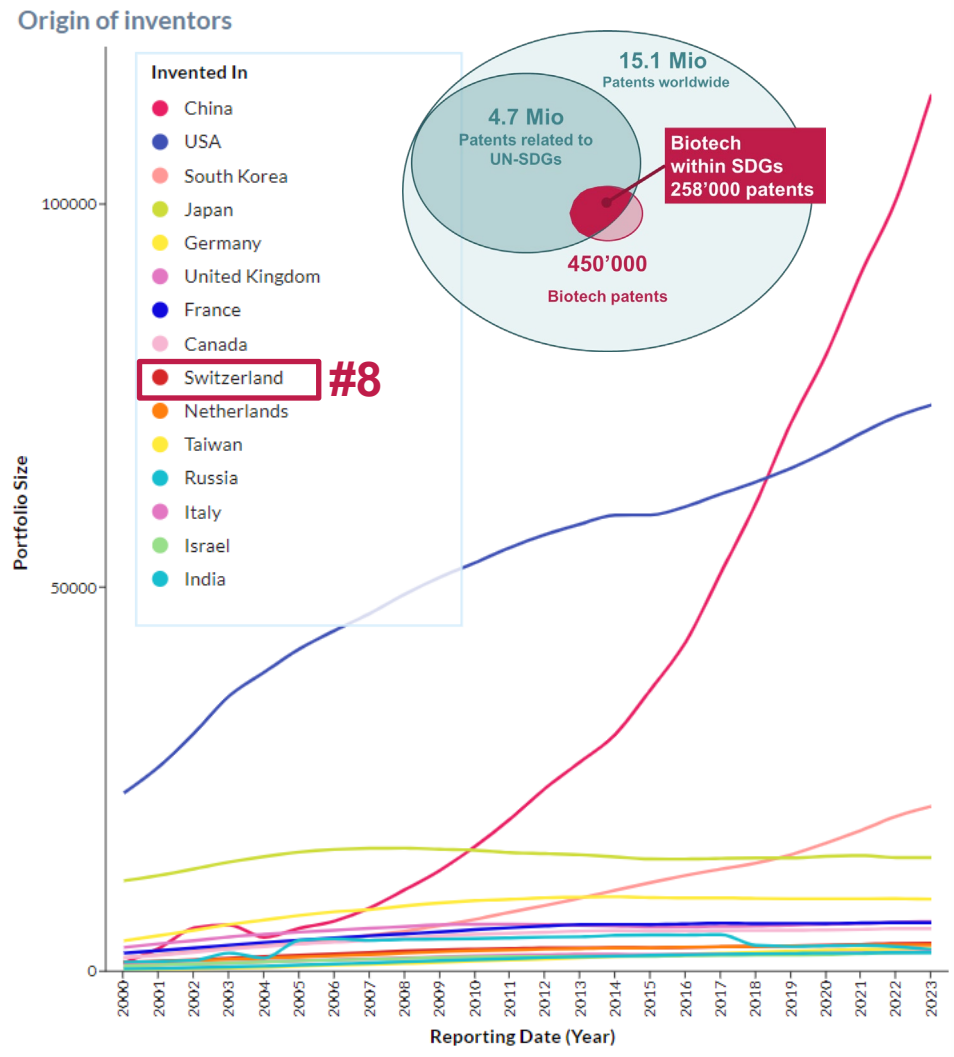


Biotech patents

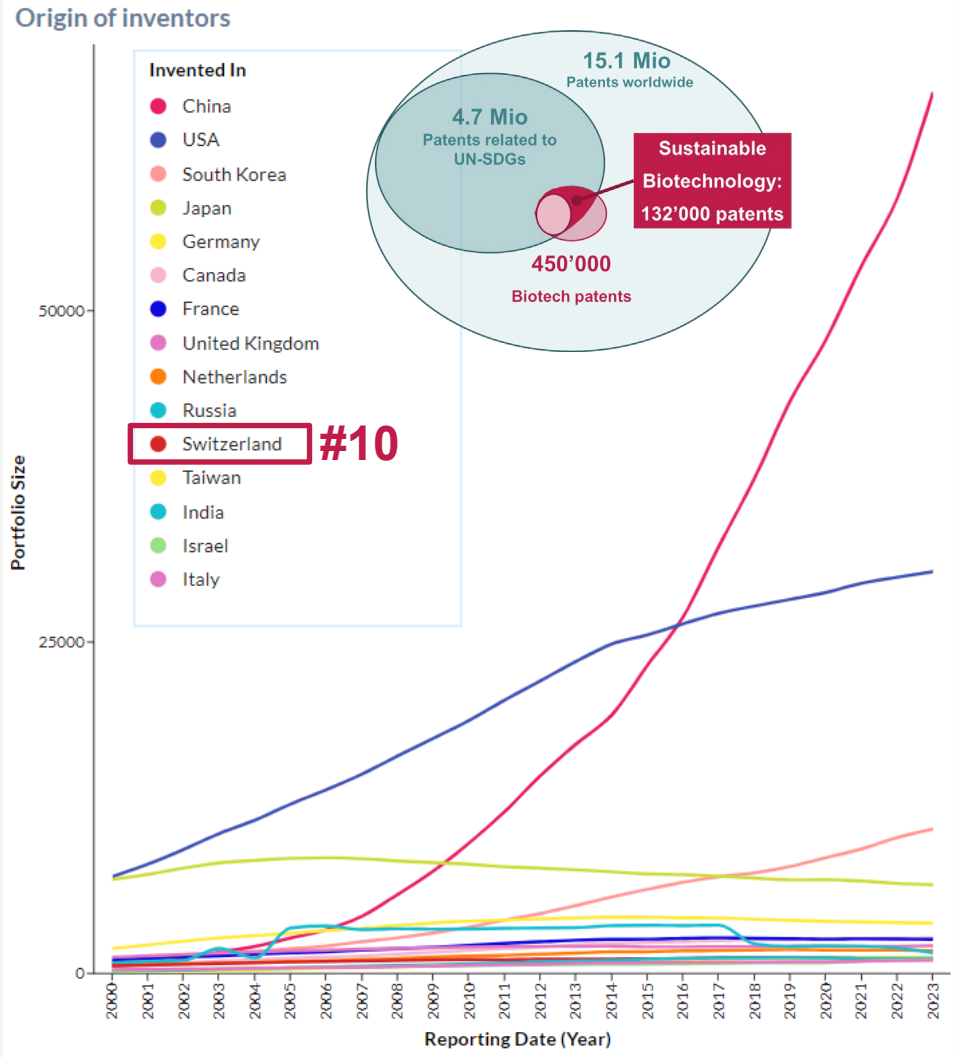


Developments 2000-2023

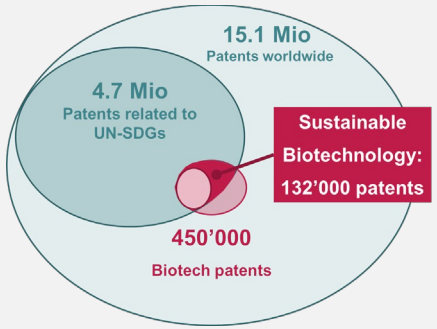
Biotech within SDGs



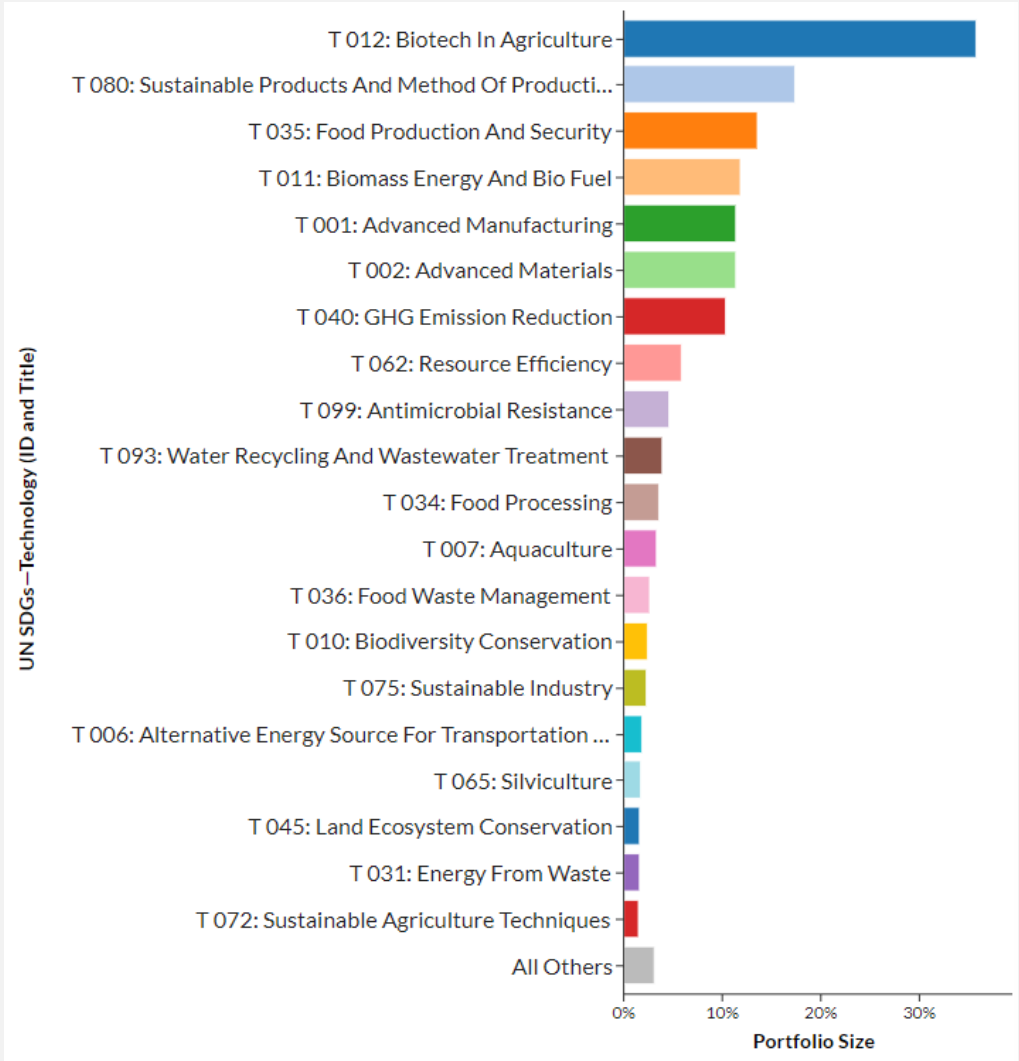
Biotech within SDGs, selected technologies



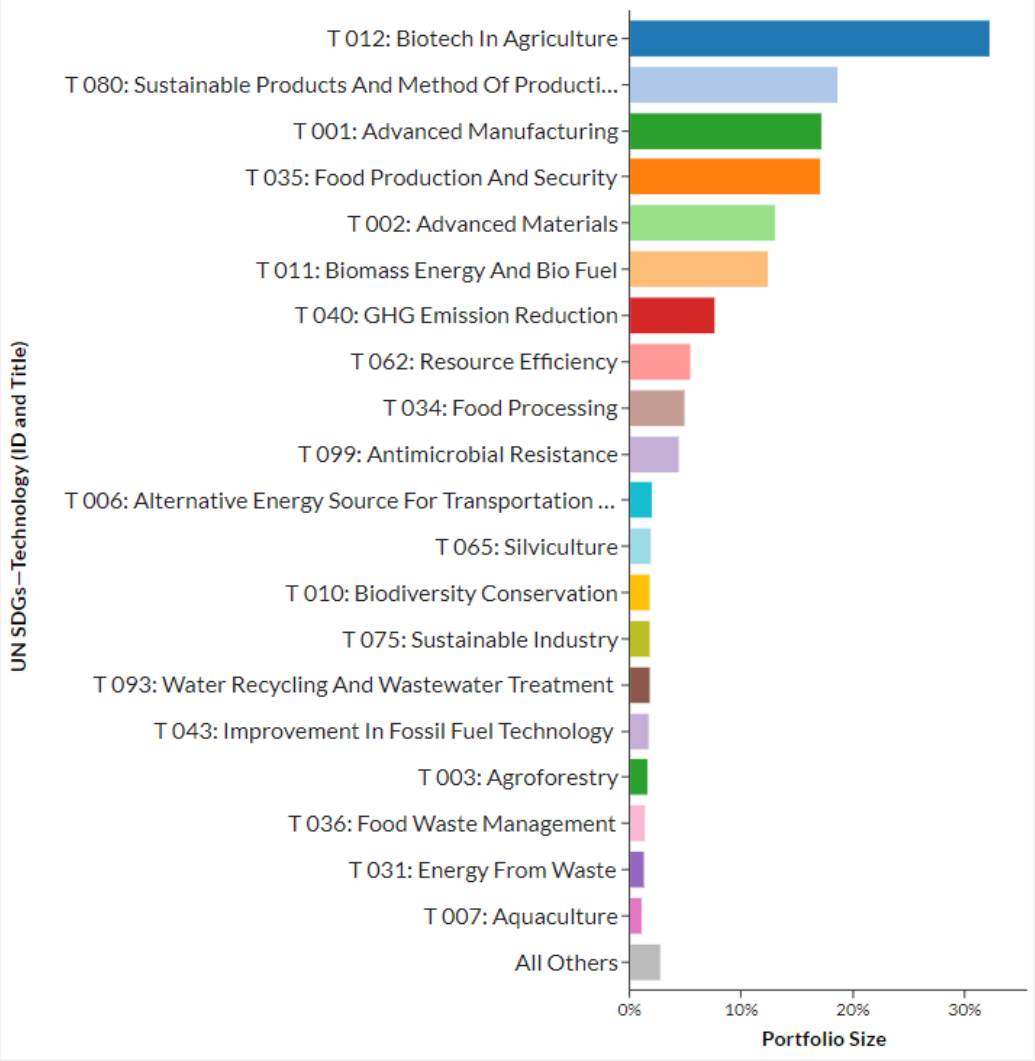
Key technologies in sustainable biotech



Global portfolio: 132'000 patents

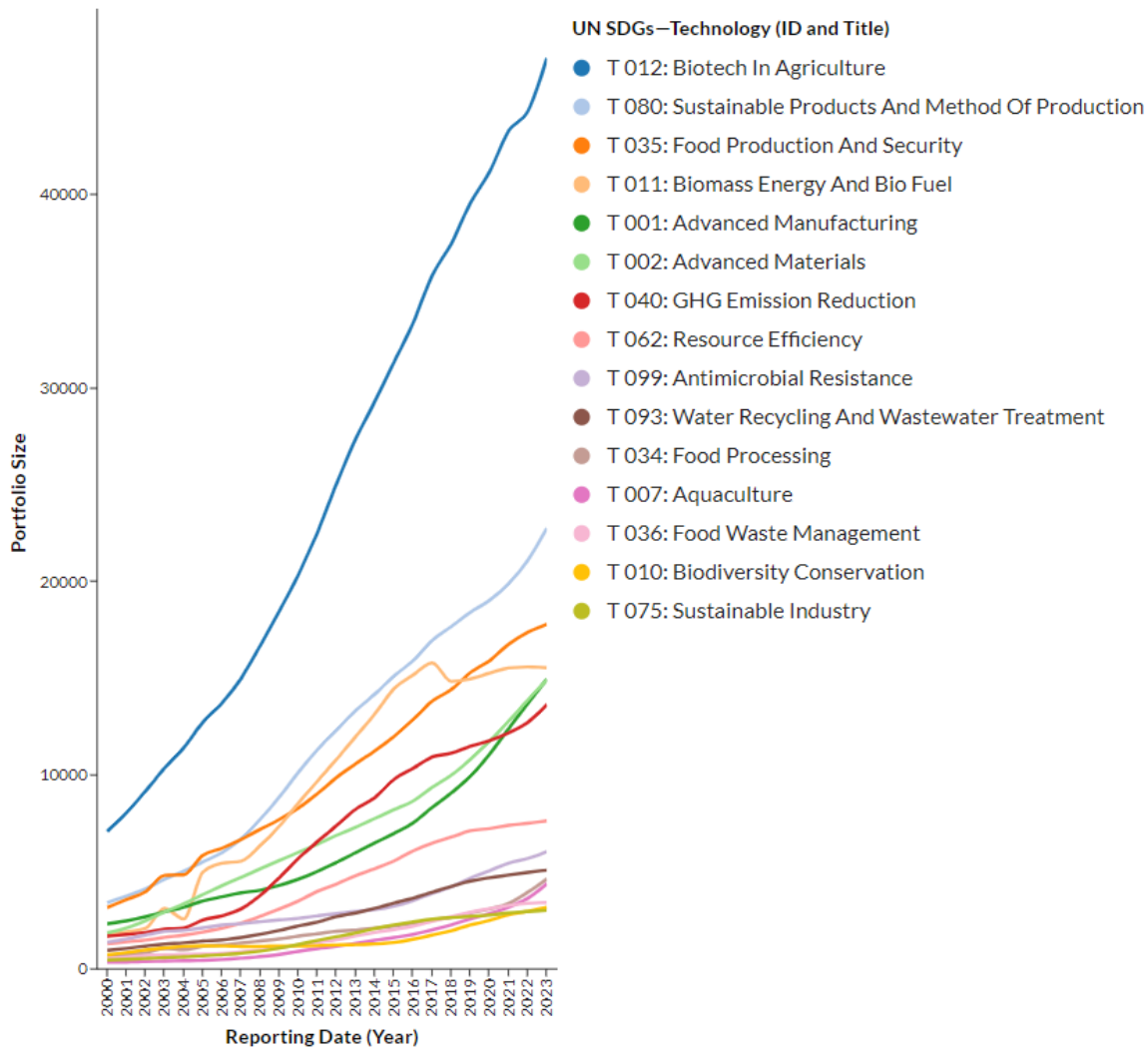


(co-)invented in Switzerland: 1146 patents

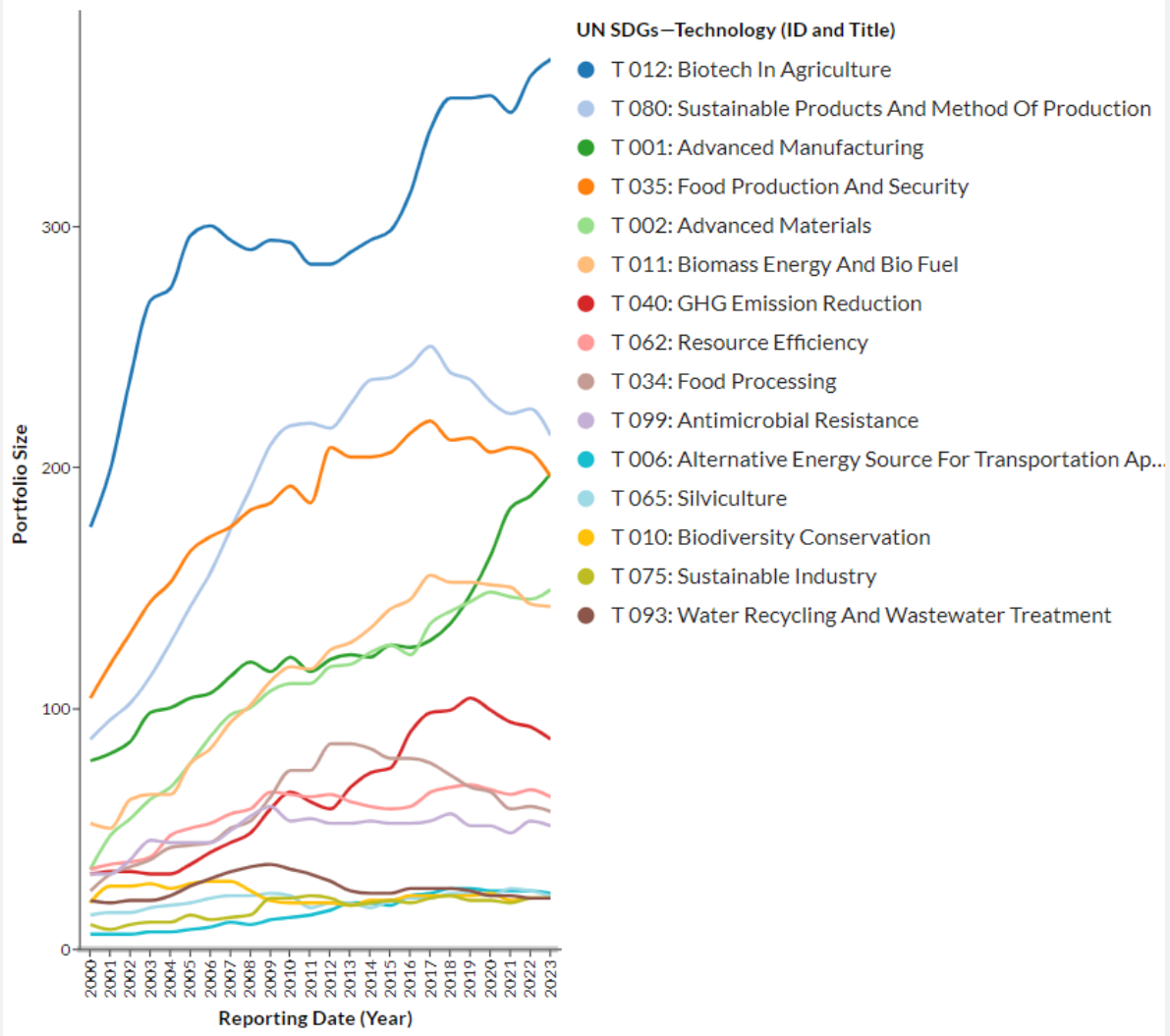


Key technologies: trends over time

Global portfolio: 132’000 patents



(co-)invented in Switzerland: 1146 patents



Sustainable biotechnology?

WO2021032866
METHOD FOR THE PRODUCTION OF PROTEIN-CONTAINING FOODS
Bühler AG
The present invention relates to novel foamed and textured, protein-rich food products having a protein content of more than 50% by weight, in particular based on vegetable proteins, insect proteins, cell proteins, such as of yeast, bacteria, microalgae, mould and the like, or a mixture of different proteins.

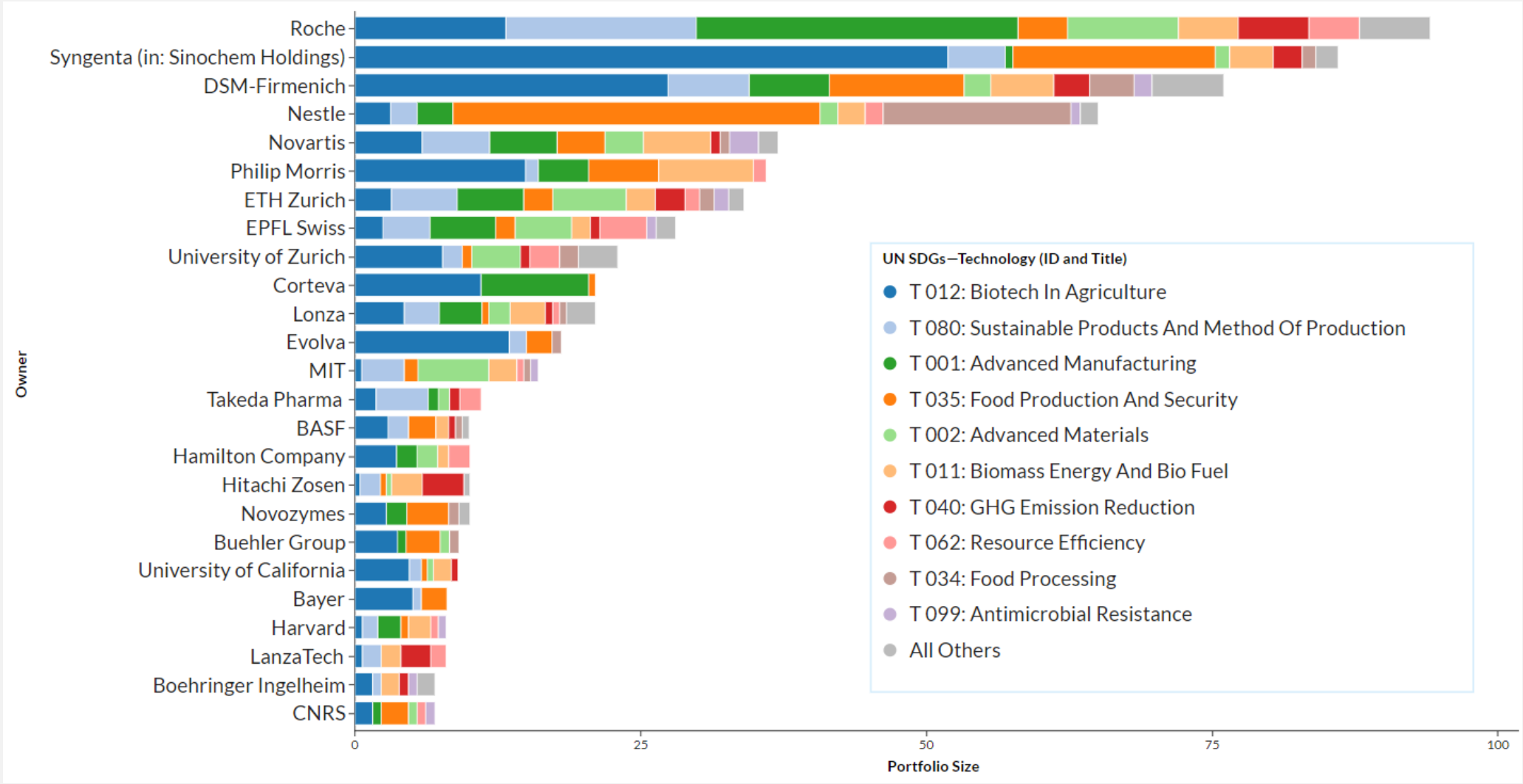
WO2020141168
NOVEL ACETYL-TRANSFERASES
DSM IP ASSETS BV
The present invention is related to production of retinyl acetate generated via enzymatic conversion of retinol, said process including the use of modified enzymes with improved activity.

WO2018091677
ORGANOID TISSUE ENGINEERING
EPFL
Method for obtaining an organoid having a pre-determined shape, comprising seeding self-renewing cells onto a surface having a 3D structure, culturing the cells under self-renewal conditions such that the cells proliferate to form a colony having the same 3D shape as the features of the surface, and culturing the colony under differentiation conditions such that the colony undergoes morphogenesis to form an organoid.

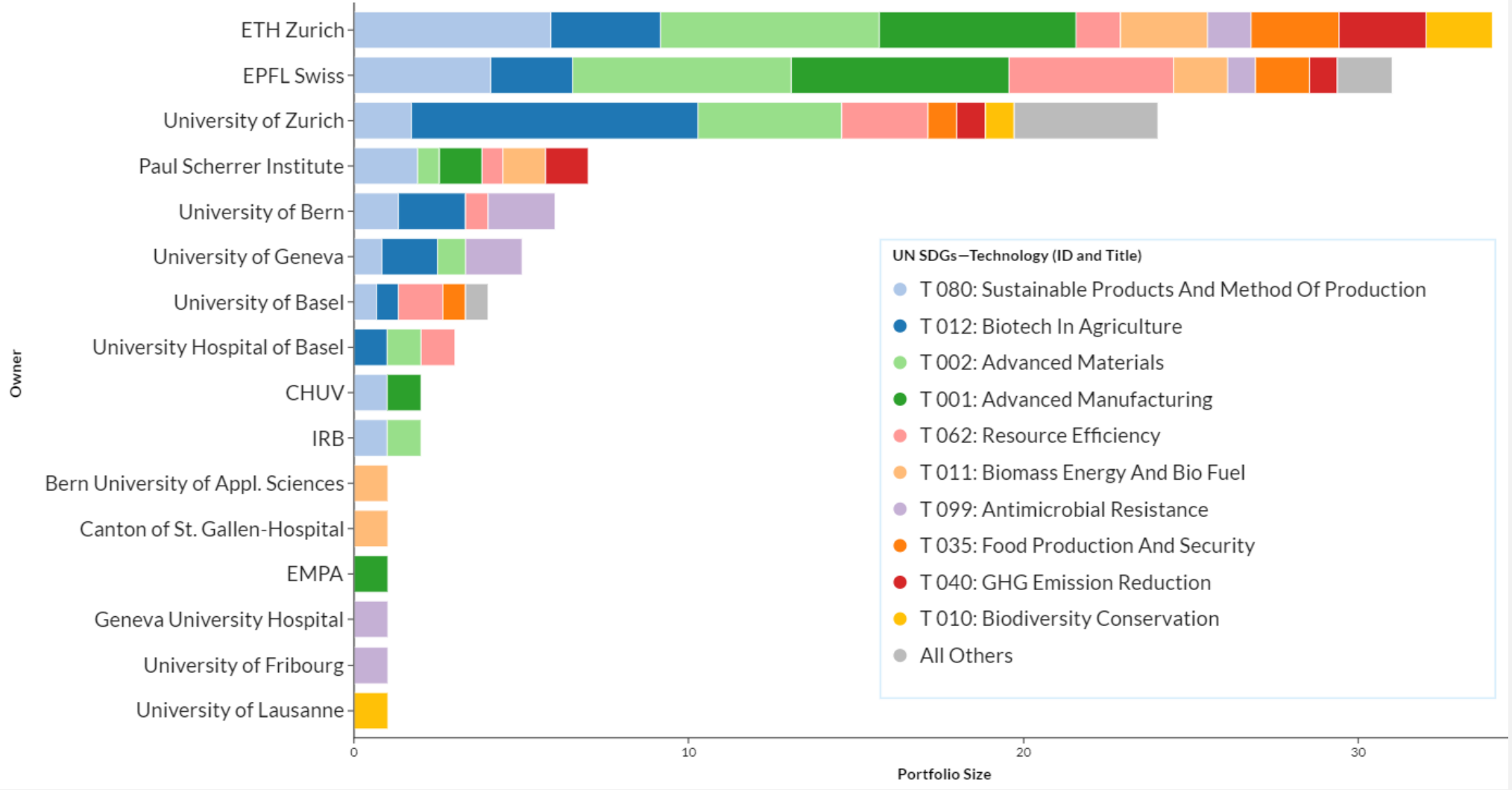
WO2009058028
IMPROVED CARBON CAPTURE IN FERMENTATION
Lanzatech New Zealand Ltd
The methods of the invention include converting CO to one or more products including alcohols and/or acids and optionally capturing CO2 to improve overall carbon capture.

Swiss inventions: owners and technologies

All swiTT members — **116 patents**



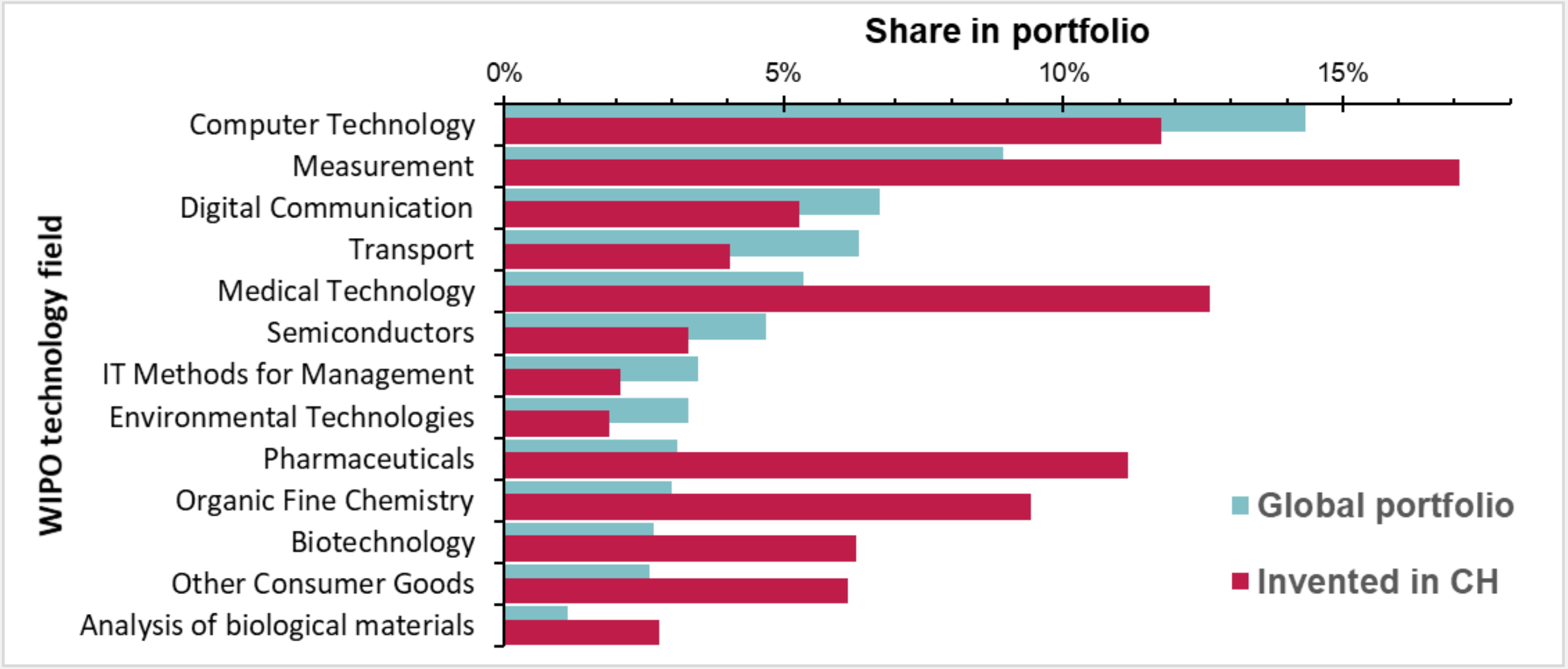
SwiTT inventions: owners and technologies



Conclusions

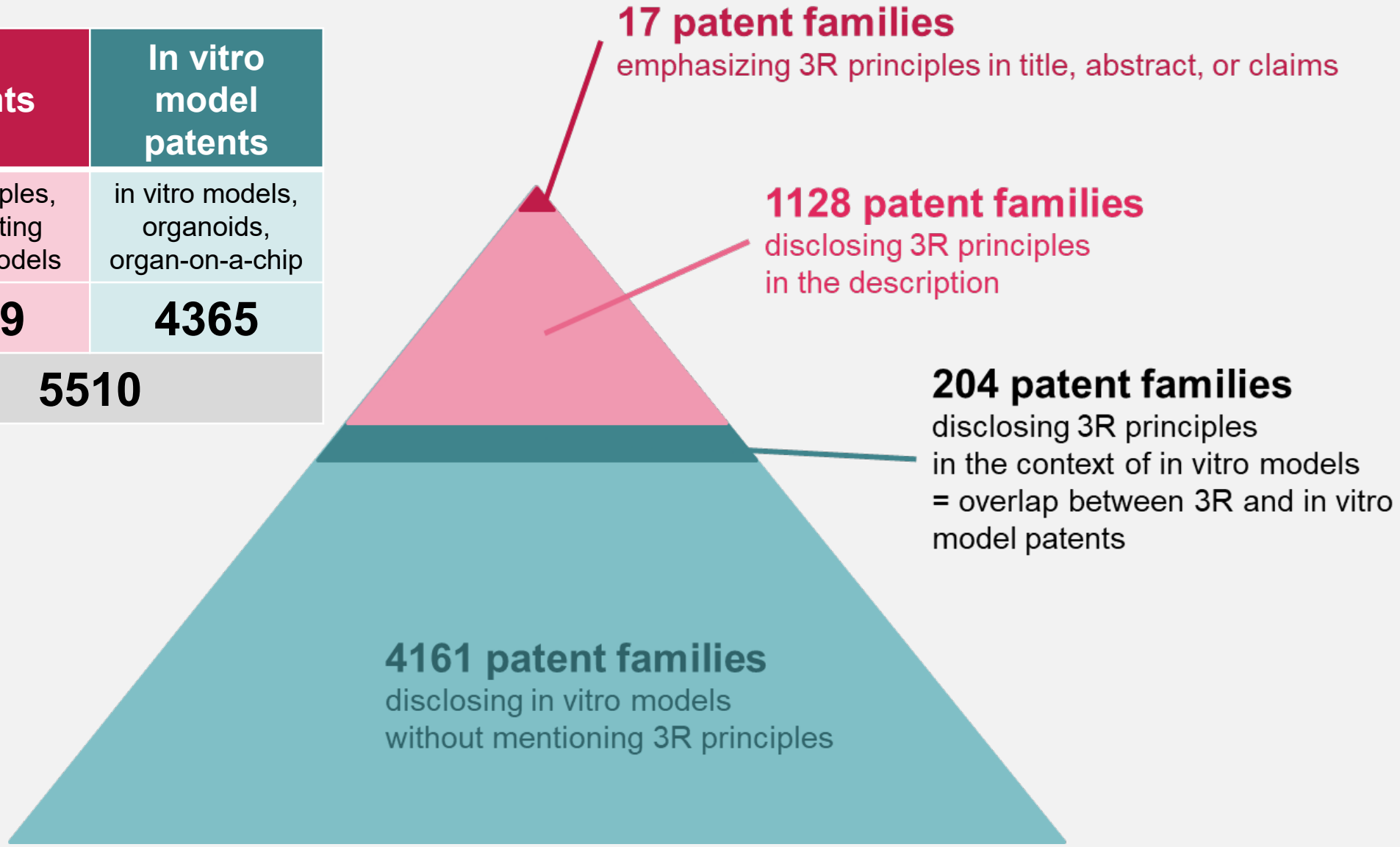
- Sustainable Biotechnology is highly diverse, identifying related patents is a real challenge
- Of all biotech patents, around 60% relate to UN-SDGs
  - thereof, around 60% relate to SDG3 alone (Good Health)
  - the remaining 40% concern mainly Agriculture and Food, Sustainable Production, Advanced Materials and Manufacturing, Biofuels, and GHG Emission Reduction
- Inventions from Switzerland contribute significantly, in particular to medical applications
- Swiss public research institutions account for 10% of the Swiss-invented patents in the sector of sustainable biotech

Swiss strengths and weaknesses



Searching for «3R patents»

	3R patents	In vitro model patents
Search concept	3R principles, substituting animal models	in vitro models, organoids, organ-on-a-chip
Number of patents	**1349**	**4365**
	5510	



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Thank you