API

Conferenza

Eco-innovazione e sostenibilità:
Competitività, Occupazione, Competenze

API: BIOPLASTICS & LCA

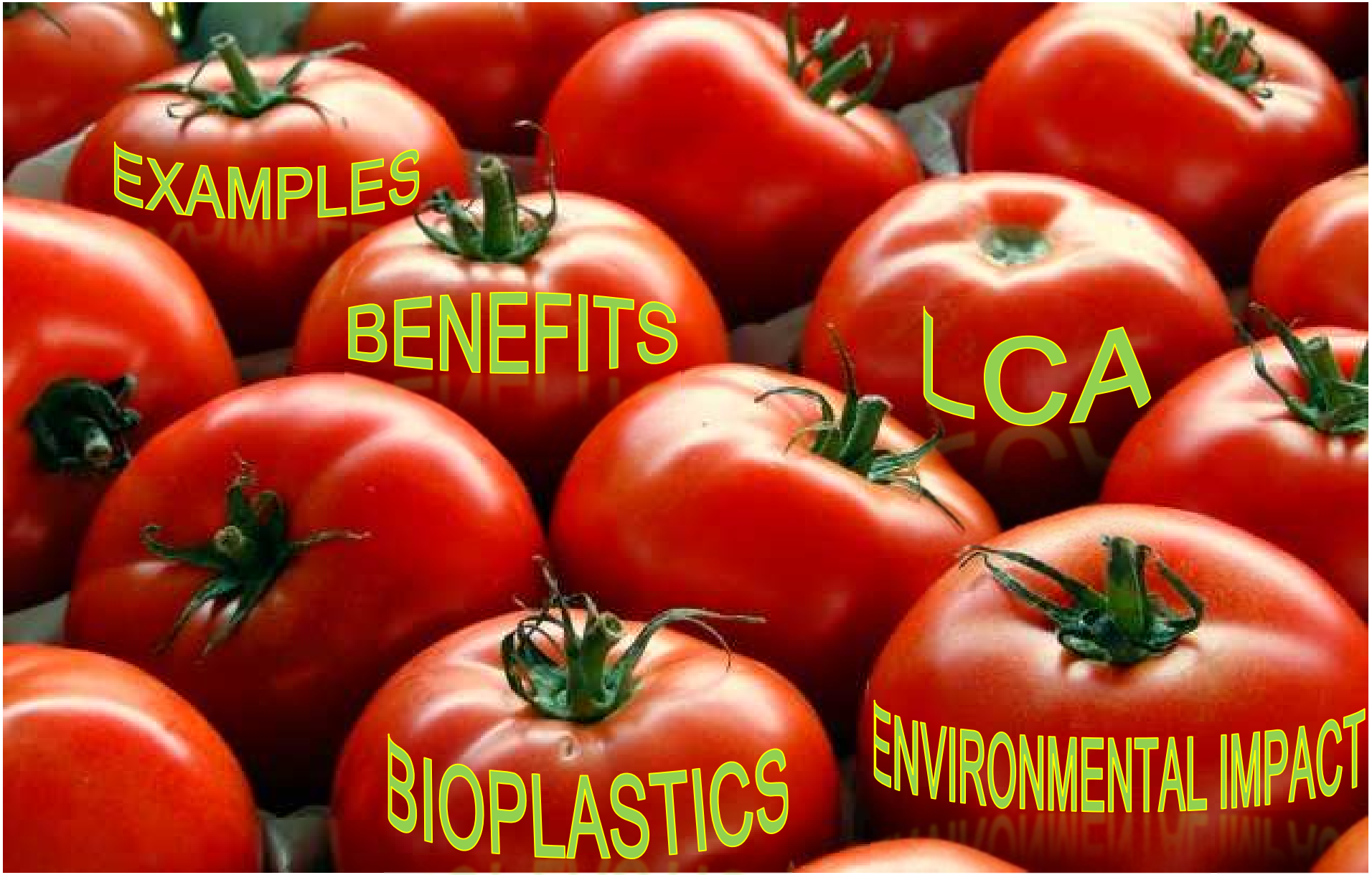
22th September 2015

GREEN STAR
GREEN skills for enterprises Sustainable Training for Automotive suppliers clusteR

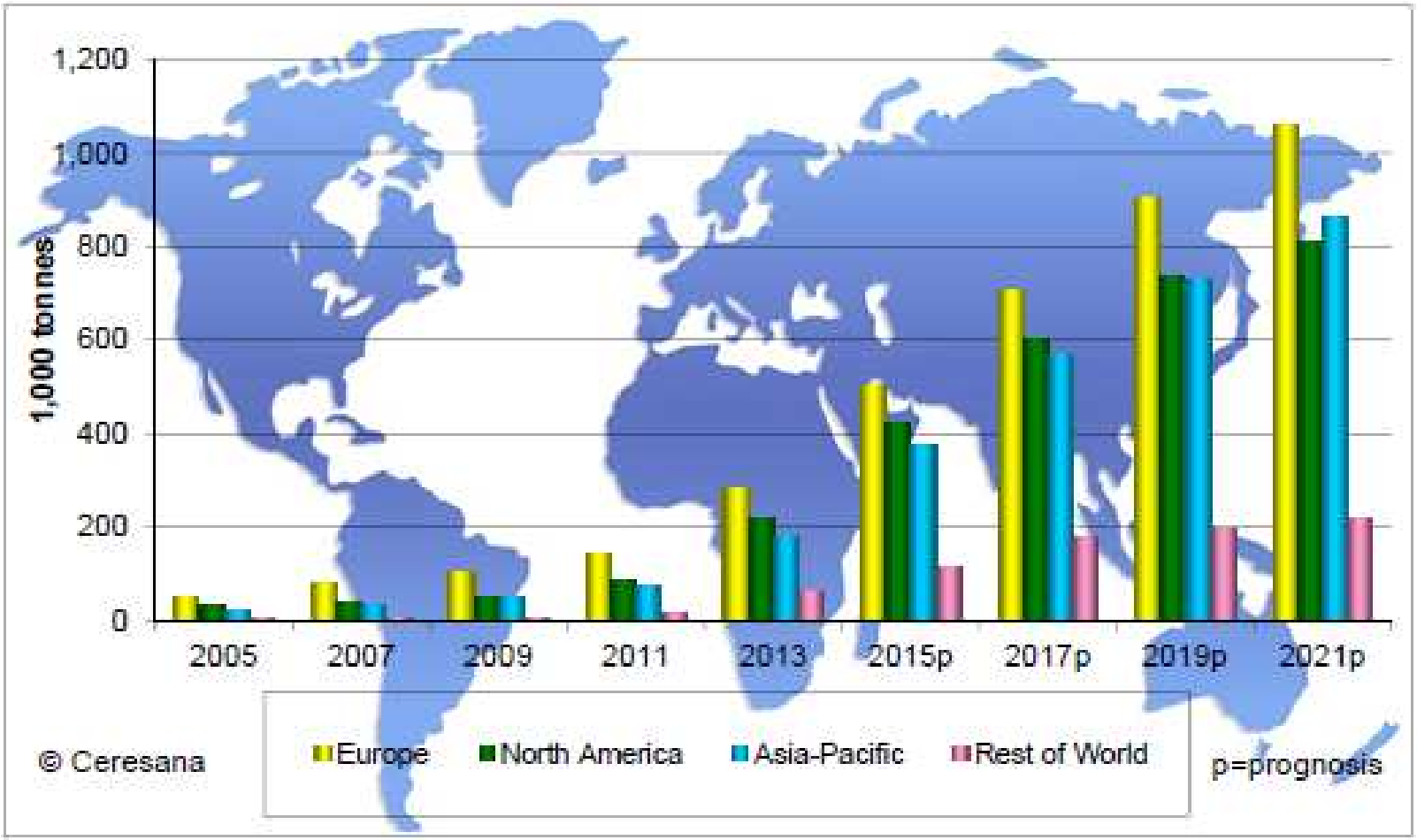
Programma di apprendimento permanente

LEONARDO DA VINCI

Leonardo da Vinci TOI n. 2013-1-IT1-LEOO5-03983 G73D13000280006


EXAMPLES
BENEFITS
LCA
BIOPLASTICS
ENVIRONMENTAL IMPACT

BIOPLASTICS Market - Worldwide demand



Graph 2: Worldwide bioplastics demand from 2005 to 2021 – split by region

BIOPLASTICS Market - Worldwide demand

in 1,000 tonnes	2005	2007	2009	2011	2013	2015p	2017p	2019p	2021p	2013-2021
PLA	22.0	35.2	54.1	86.6	143.2	217.1	307.4	385.2	465.5	15.9% p.a.
Starch	54.8	82.2	97.0	125.9	165.2	220.6	287.5	370.9	479.2	14.2% p.a.
Other Biodegradables	20.6	29.5	37.8	48.5	78.5	123.6	143.5	166.8	194.3	12.0% p.a.
Total Biodegradables	**97.3**	**146.9**	**188.9**	**260.9**	**386.9**	**561.4**	**738.4**	**922.9**	**1,139.1**	**14.5% p.a.**
PE, PP	0.0	0.0	0.0	36.0	163.8	286.8	419.8	461.4	508.6	15.2% p.a.
PET	0.0	0.0	0.0	0.0	158.7	490.5	788.3	1,058.6	1,174.3	28.4% p.a.
Other Non-biodegradables	8.2	12.1	16.4	23.5	30.6	76.2	106.5	122.4	135.1	20.4% p.a.
Total Non-biodegradables	**8.2**	**12.1**	**16.4**	**59.6**	**353.0**	**853.4**	**1,314.6**	**1,642.5**	**1,818.0**	**22.7% p.a.**
Total	**105.6**	**159.0**	**205.3**	**320.5**	**739.9**	**1,414.8**	**2,053.0**	**2,565.4**	**2,957.1**	**18.9% p.a.**

Table 2: Worldwide bioplastics demand from 2005 to 2021 – split by types of bioplastics

Market Study Bioplastics - Ceresana Research 2014 – 3rd edition

BIOPLASTICS Market - Europe demand

in 1,000 tonnes	2005	2007	2009	2011	2013	2015p	2017p	2019p	2021p	2013-2021
PLA	5.1	9.1	15.9	26.5	41.5	58.0	80.0	106.3	135.3	15.9% p.a.
Starch	37.1	57.7	66.1	84.5	109.5	144.2	186.0	240.9	313.3	14.0% p.a.
Other Biodegradables	7.3	11.7	16.2	22.6	33.0	48.1	54.3	61.4	71.3	10.1% p.a.
Total Biodegradables	**49.5**	**78.4**	**98.2**	**133.7**	**184.1**	**250.2**	**320.2**	**408.6**	**520.0**	**13.9% p.a.**
PE, PP	0.0	0.0	0.0	5.3	27.2	44.9	60.8	75.2	88.1	15.8% p.a.
PET	0.0	0.0	0.0	0.0	62.9	190.4	298.7	390.4	419.7	26.8% p.a.
Other Non-biodegradables	1.9	3.0	4.2	6.0	8.2	19.3	26.1	29.1	31.5	18.4% p.a.
Total Non-biodegradables	**1.9**	**3.0**	**4.2**	**11.2**	**98.3**	**254.6**	**385.6**	**494.6**	**539.3**	**23.7% p.a.**
Total	**51.4**	**81.4**	**102.4**	**144.9**	**282.3**	**504.8**	**705.8**	**903.2**	**1,0594**	**18.0% p.a.**

Table 6: Bioplastics demand in Europe from 2005 to 2021 – split by types of bioplastics

BIOPLASTICS Market - Drivers

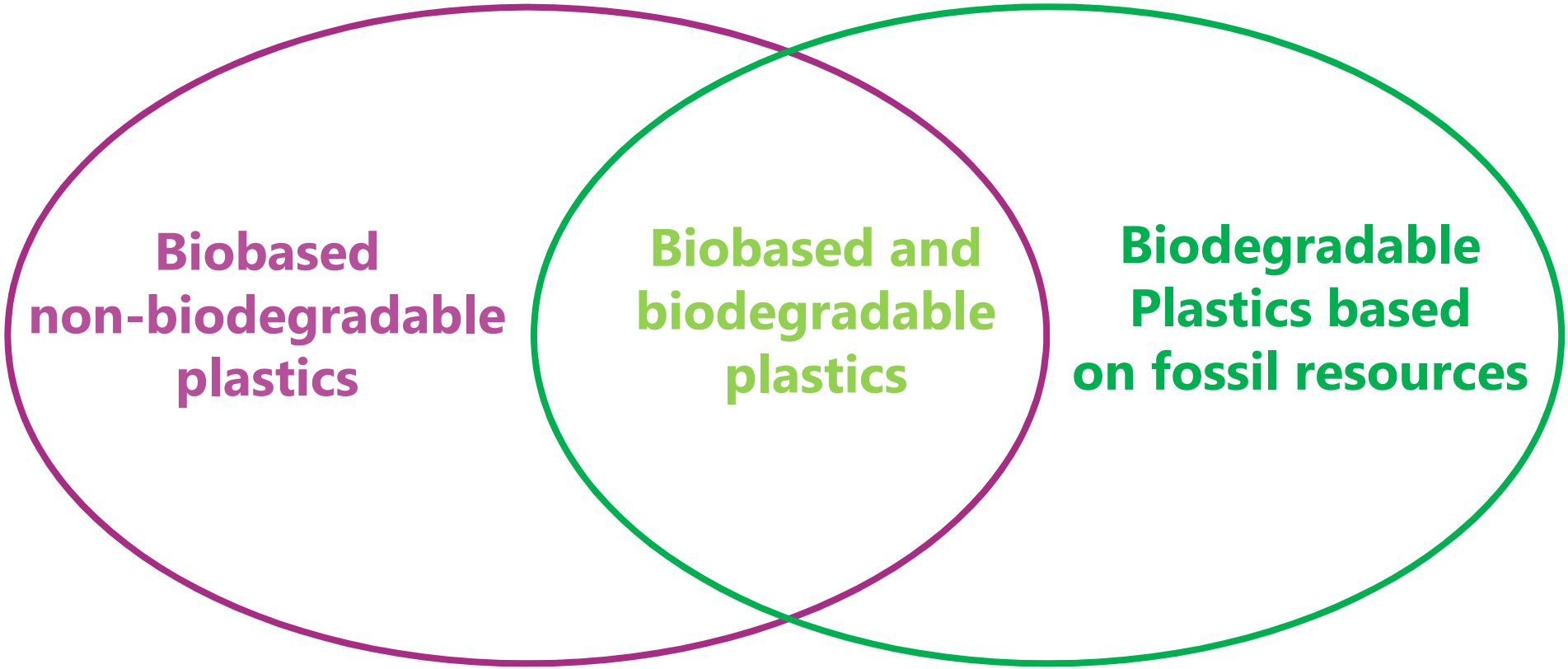
Biobased Bioplastics - Drivers

- ❑ new bio-developments (monomers and polymers)
- ❑ sustainability & environmental impacts (LCA, Carbon Footprint, …)
- ❑ emotive perception from customer
- ❑ green economy

Biodegradable Bioplastics - Drivers

- ❑ simple waste disposal_short life product
- ❑ rules & laws (EN 13432, DL, …)

BIOPLASTICS



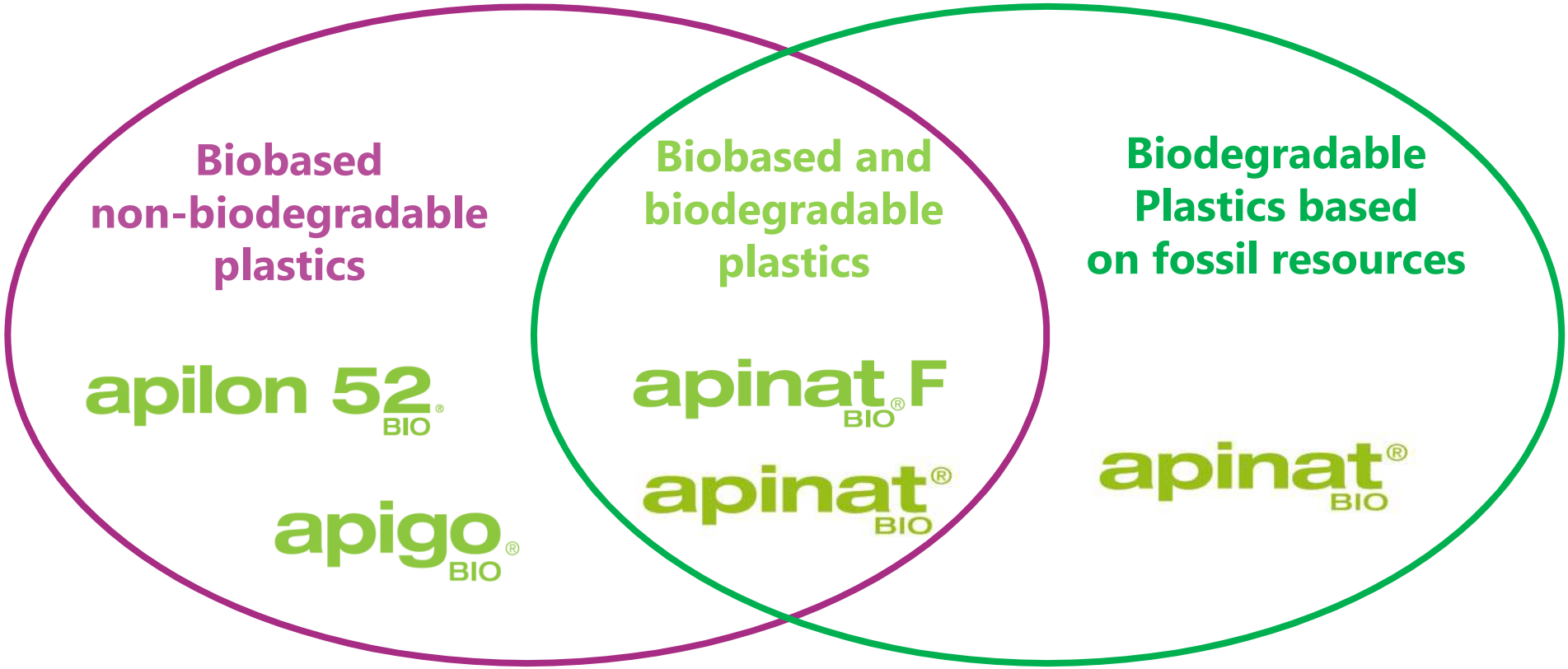
Why use bioplastics instead of plastics?

There are two major advantages of **bio-based plastic** products compared to their conventional versions:

- save fossil resources for future generation,
- reduce GHG-emissions.

Biodegradability is an add-on property of certain types of bioplastics, which offers additional ways for recovery at the end of a product's life.

BIOPLASTICS



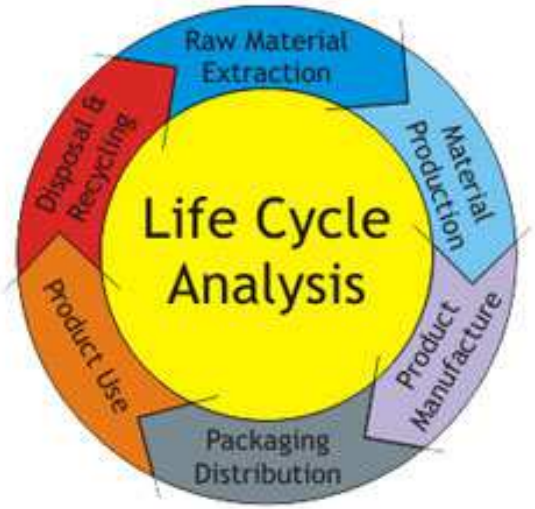
API is a member of European Bioplastics since 2009

API is a member of Assobioplastiche since 2012

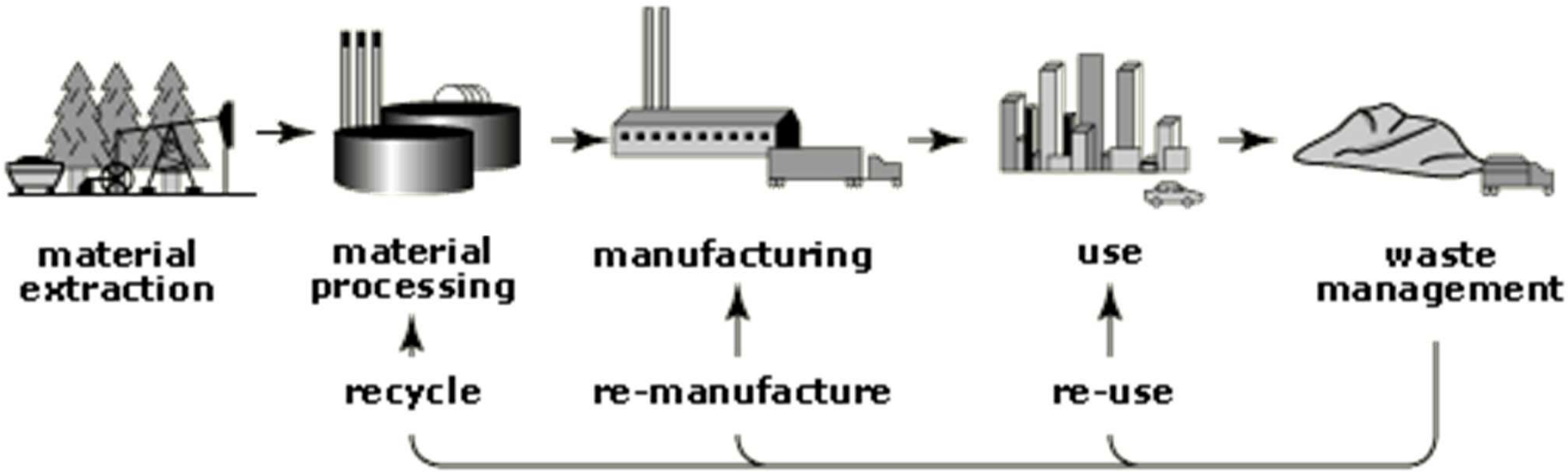
API BIOPLASTICS - Biodegradable & Biobased

How to measure?

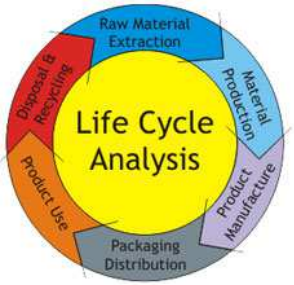
LCA



Life Cycle Assessment (LCA) is a methodology for evaluating all the **environmental impacts** associated with a product, considering its entire life cycle from the extraction of raw materials to its final disposal.



LCA



The International Organisation for Standardisation (ISO), provides guidelines for conducting an LCA within the series ISO 14040 and 14044.

The main phases of an LCA are:

1. Goal Definition and Scoping

Define and describe the product, process or activity. Establish the context in which the assessment is to be made and identify the boundaries and environmental effects to be reviewed for the assessment.

2. Inventory Analysis

Identify and quantify energy, water and materials usage and environmental releases (e.g., air emissions, solid waste disposal, waste water discharges).

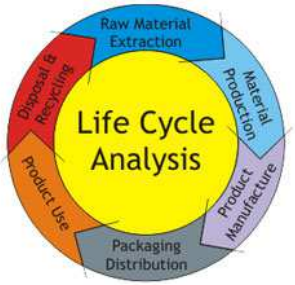
3. Impact Assessment

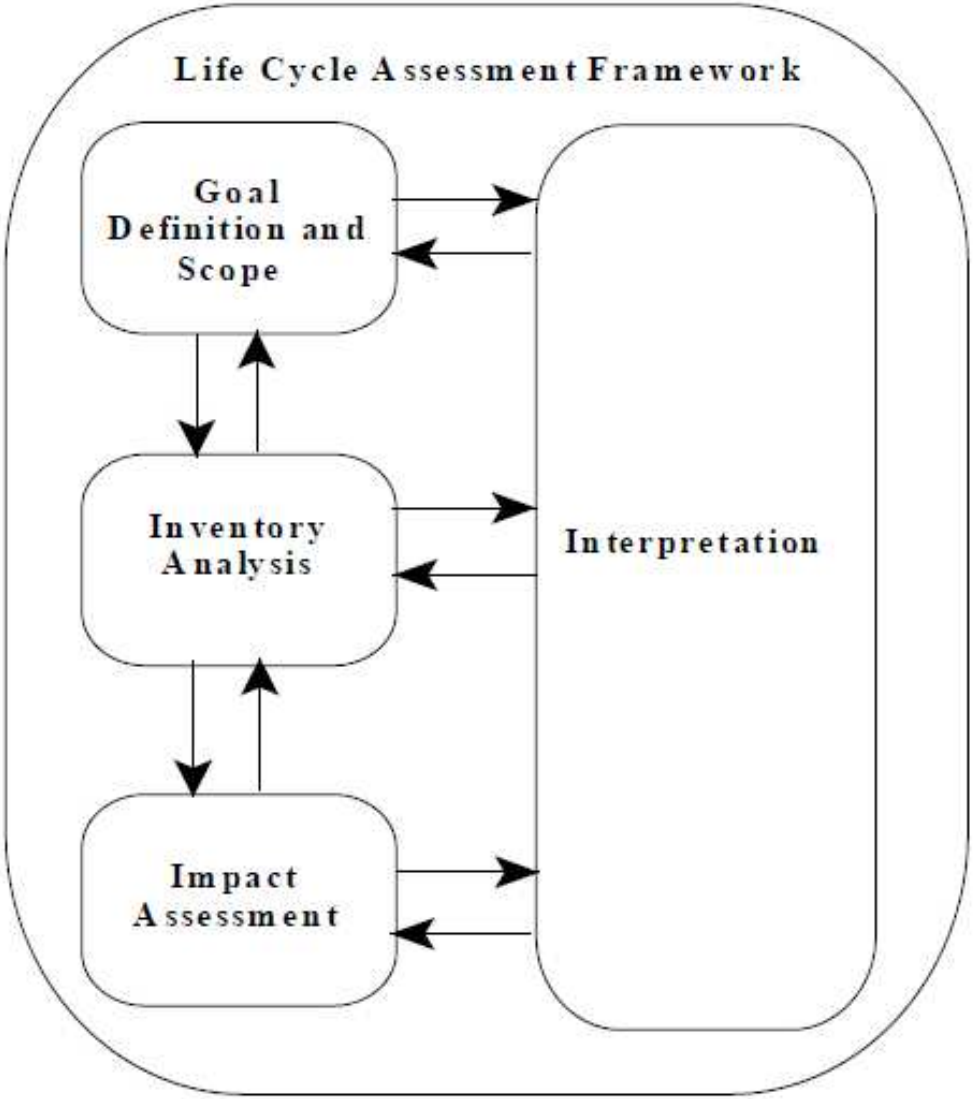
Assess the potential human and ecological effects of energy, water, and material usage and the environmental releases identified in the inventory analysis.

4. Interpretation

Evaluate the results of the inventory analysis and impact assessment to select the preferred product, process or service with a clear understanding of the uncertainty and the assumptions used to generate the results.

LCA


Raw Material Extraction
Material Production
Product Manufacture
Packaging Distribution
Product Use
Disposal & Recycling
Life Cycle Analysis


Life Cycle Assessment Framework
Goal Definition and Scope
Inventory Analysis
Impact Assessment
Interpretation

LCA - Environmental Impact

Life Cycle Assessment (LCA), based on ISO 14040-14044 standards, analyzes **environmental impact**.

Impact Category	Description of Impacts
Global Warming	Contributes to atmospheric absorption of infrared radiation
Acidification	Contributes to acid deposition
Eutrophication	Provision of nutrients contributes to biological oxygen demand
Photochemical Oxidant Formation	Contributes to photochemical smog
Aquatic/Terrestrial Ecotoxicity	Contributes to conditions toxic to flora and fauna
Human Toxicty	Contributes to conditions toxic to humans
Energy Use	Contributes to depletion of non-renewable energy resources
Abiotic Resource Use	Contributes to depletion of non-renewable resources
Biotic Resource Use	Contributes to depletion of renewable resources
Ozone Depletion	Contributes to depletion of stratospheric ozone

Global Warming Potential 100 (GWP 100)

a measure of the greenhouse effect ("heating of the earth") calculated over 100 years.
It 's also known as "carbon footprint".

Potential Consequences:
polar melt, soil moisture loss, longer seasons, forest loss/change, change in wind and ocean patterns.

Non-renewable Energy

the consumption of non-renewable primary energy (oil, coal, natural gas, natural uranium).

Potential:
fossil saving for future generations

What are the benefits of conducting an LCA?

LCA can help decision-makers to select the product or process that results in the **least impact** to the Environment, but also can evaluate its **cost and performance data**

What are the benefits of conducting an LCA?

- Strategic re-positioning of the product
- Communicate environmental information that can be used to enhance the product
- Get eco-labeling (es. Ecolabel, Carbo footprint)
- Release Environmental Product Declarations (EPD)
- Do technology strategies

LCA – API EXAMPLES - ROLLERBLADE

TECNICA GROUP

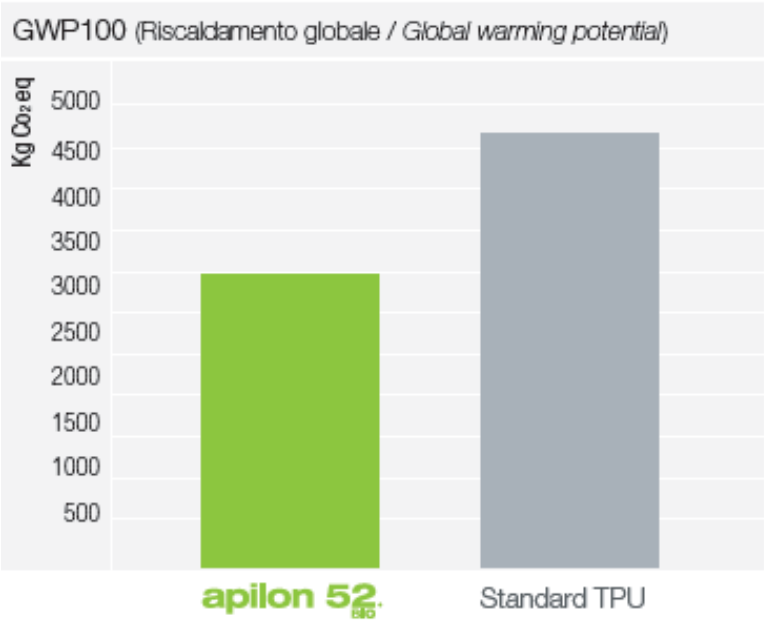
ROLLERBLADE

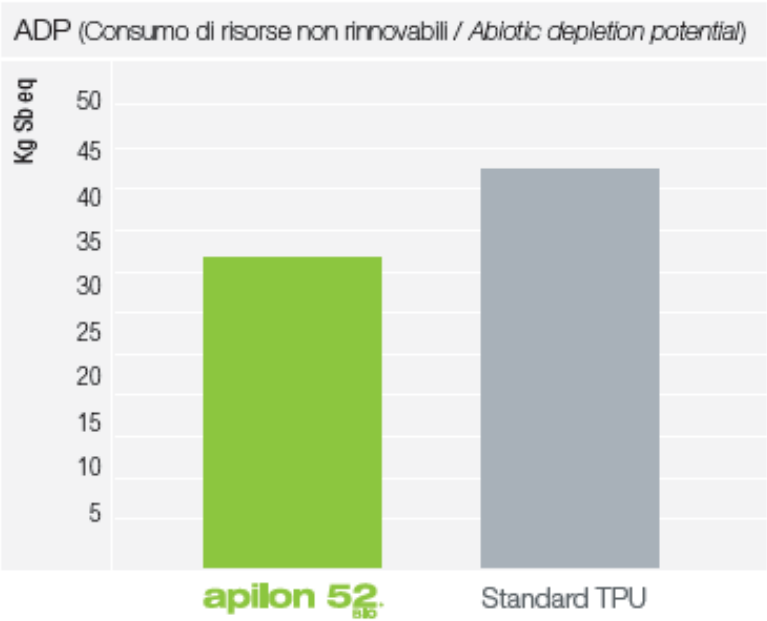
apilon 52 BIO

LCA – API EXAMPLES - ROLLERBLADE

The LCA (Life Cycle Assessment) from "cradle to gate" of APILON 52 BIO provides:

- a 36% reduction in greenhouse gas emissions - GWP (Global Warming Potential),
- a 25% saving in nonrenewable energy - ADP (Abiotic Depletion Potential).





VENEZIA RICERCHE

LCA – API EXAMPLES - InCycle Basket shoe

PUMA InCycle Basket shoe

LCA – API EXAMPLES - InCycle Basket shoe

PUMA InCycle Basket shoe

T.16 ENVIRONMENTAL COSTS OF SHOES

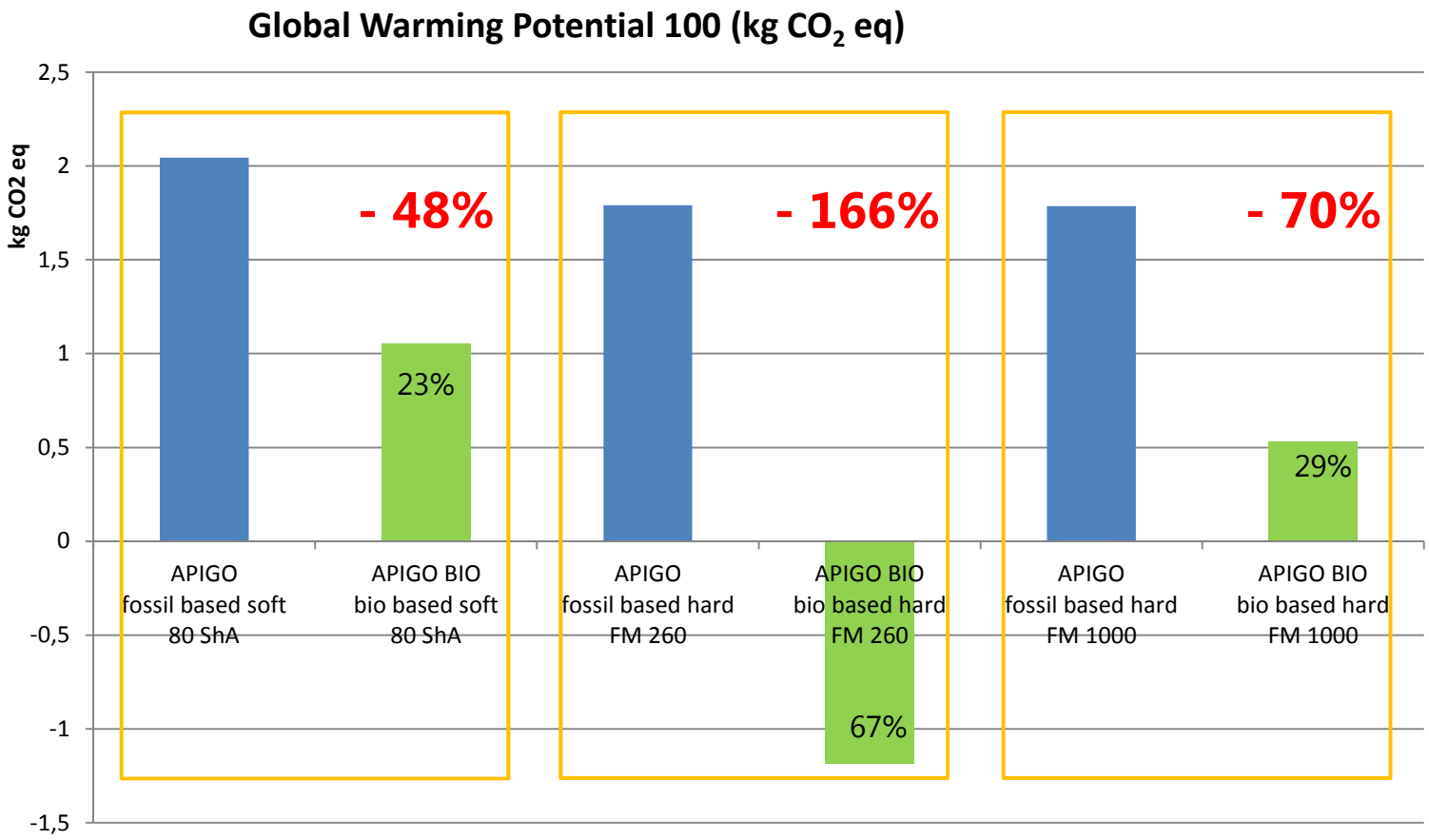
PRODUCT	GREEN-HOUSE GAS	WATER	WASTE	AIR POLLUTION	LAND USE	ENVIRONMEN-TAL COSTS
	€	€	€	€	€	€
CONVEN-TIONAL PUMA SUEDE	2.16	0.61	0.30	0.74	0.48	**4.29***
BIODEGRAD-ABLE PUMA INCYCLE BASKET	1.41	0.49	0.12	0.84	0.09	**2.95***
INCYCLE SAVINGS IN %	-35%	-21%	-60%	+14%	-20%	**-31%**

LCA – API EXAMPLES

apigo® BIO

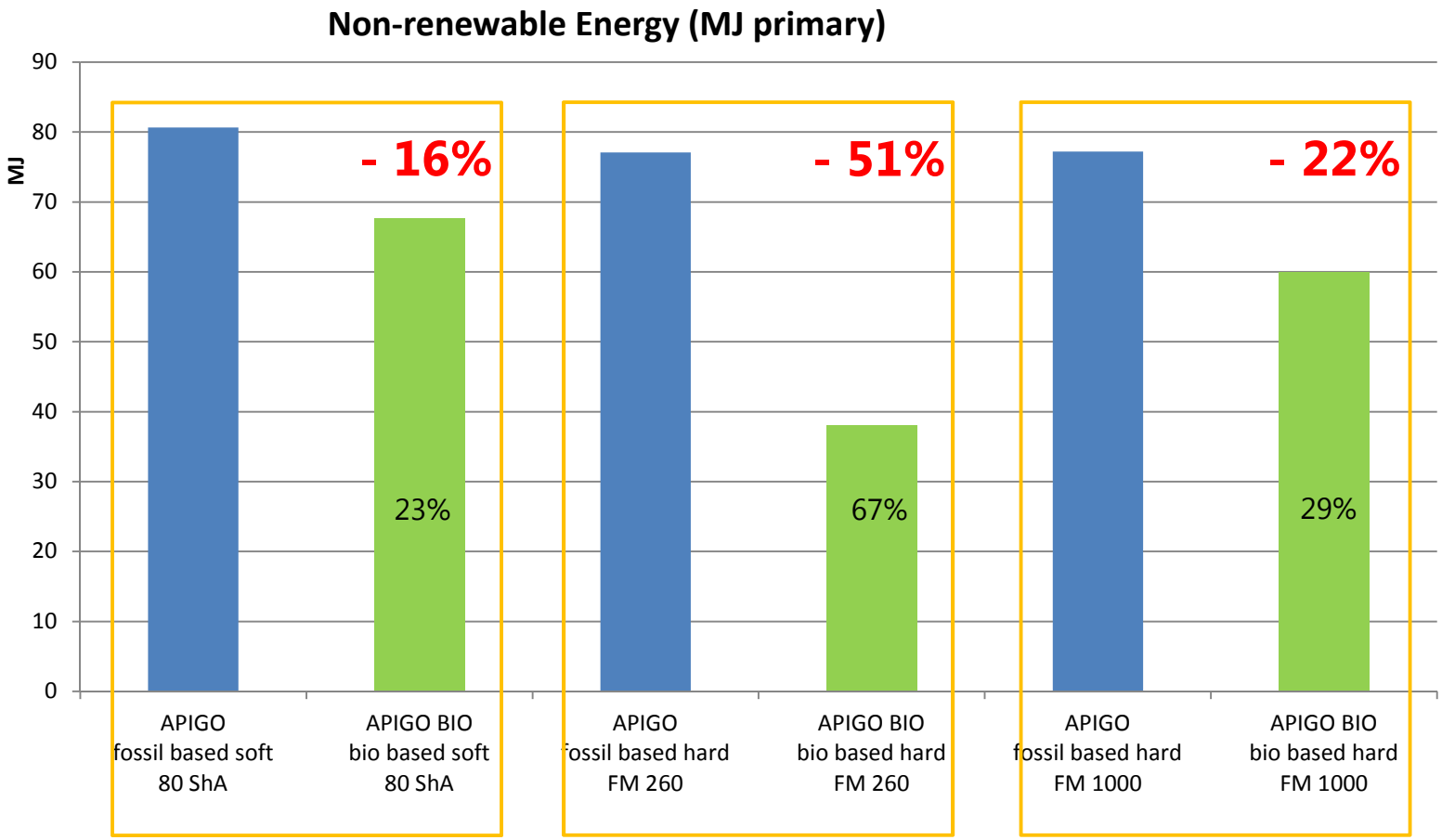
LCA – API EXAMPLES

Global Warming Potential 100 (GWP 100)



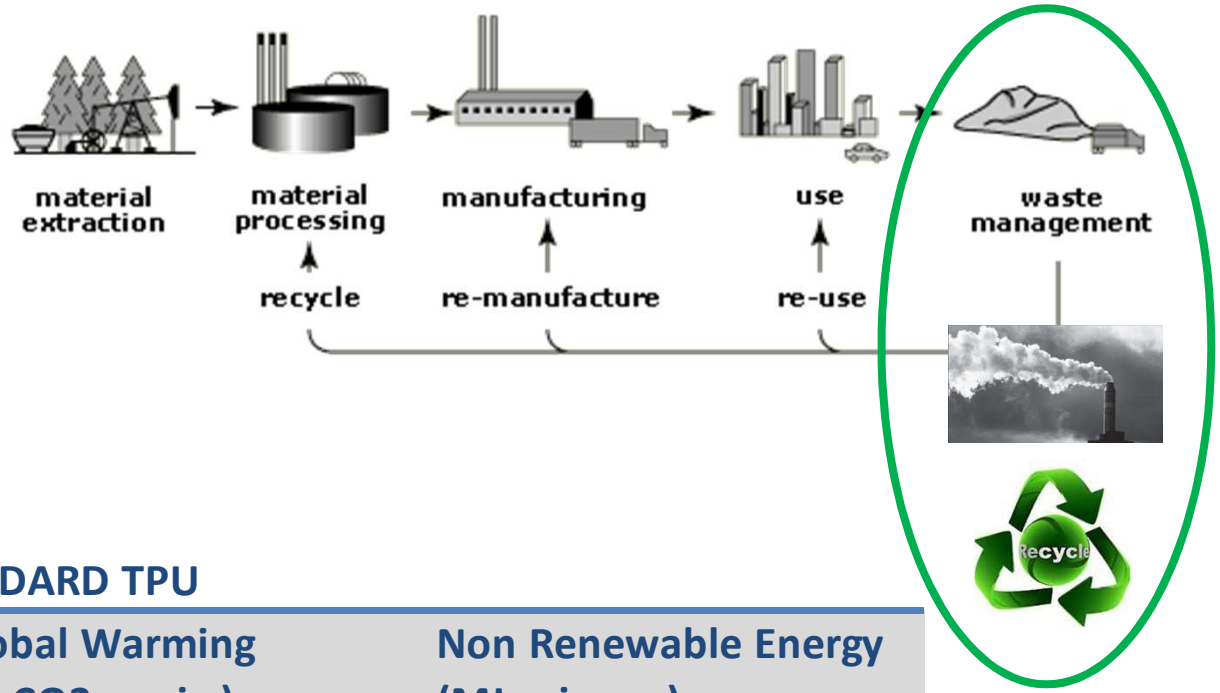
LCA – API EXAMPLES

Non-renewable Energy consuption



LCA – API EXAMPLES - Footwear

apilon 52 BIO



APILON 52 BIO ALLOY vs. STANDARD TPU

End of Life option	Global Warming (kg CO2 equiv.)	Non Renewable Energy (MJ primary)
Landfill or incineration	16% reduction	21% reduction
Recyclin	36% reduction	52% reduction

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bio!CAR

Conference on biobased Materials for Automotive Applications

24/25 sept 2015 Stuttgart / Germany

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