DESIGN FOR ENVIRONMENT

(DFE)

Aalto University
Design Factory

GROUP MEMBERS

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- San Vo
- Nick Semin
- Ahmed Uzair
- Elias Puolakka

- ***What is DFE…???***

- ***DFE is a practical method that is applicable to different organizations to follow to create environment friendly and sustainable products***

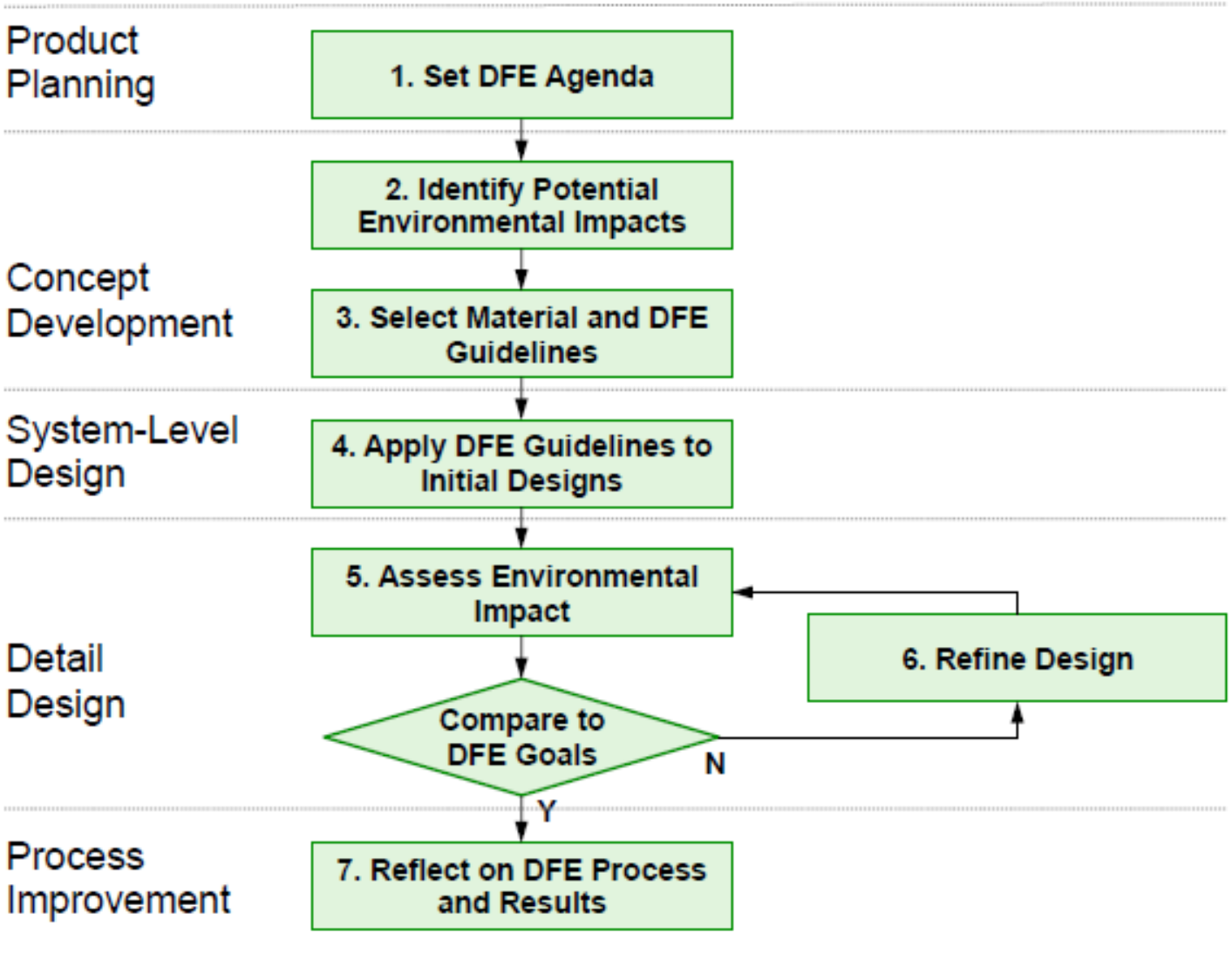
- ***DFE helps reduce cost and improve product quality without any harmful environmental impacts.***

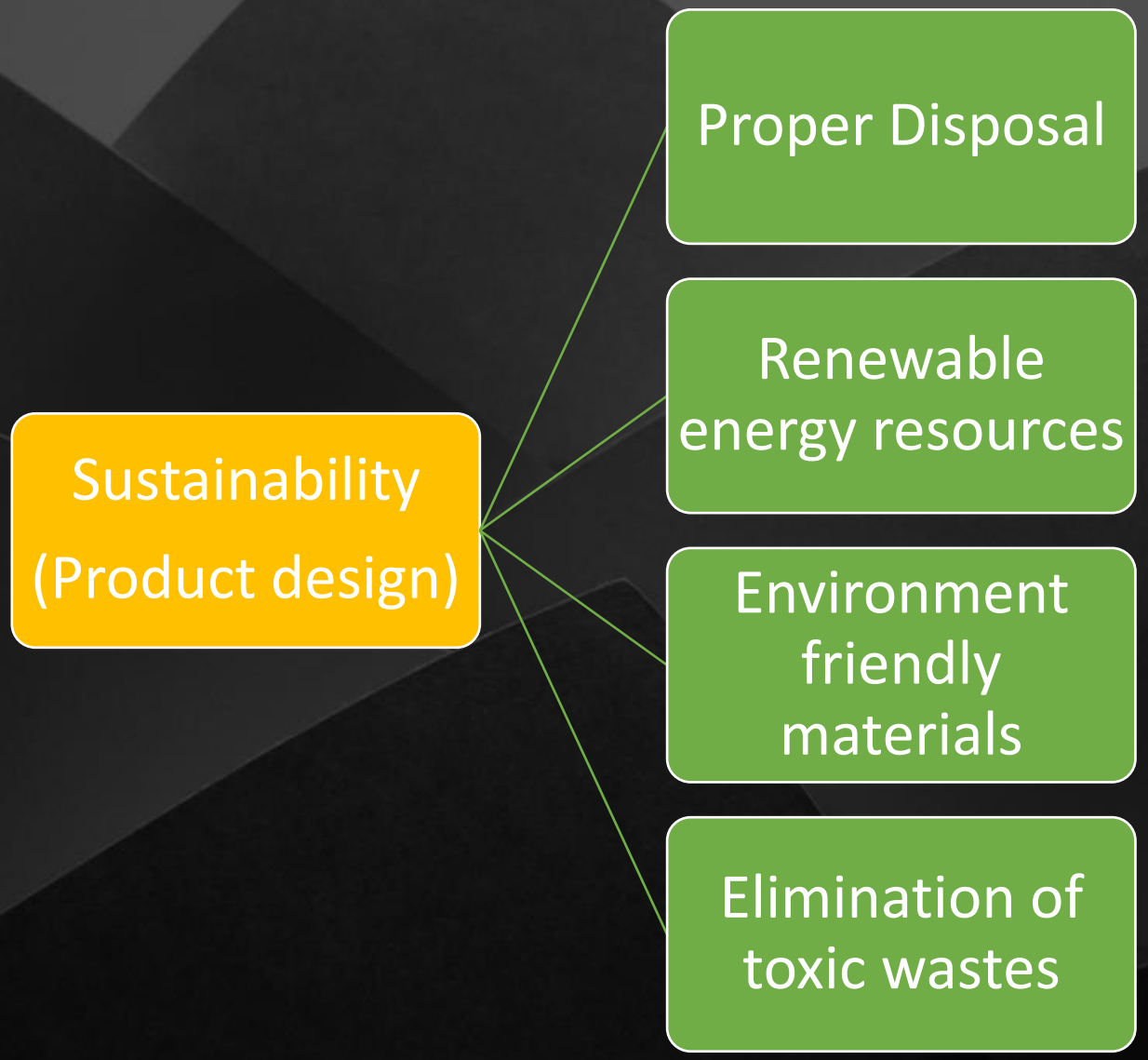
- ***DFE plays its tole through out the PD process from designing , manufacturing and disposal because all of these factors play a vital role in the development of Environment friendly products.***

- ***Specialized DFE training teams works in collaboration with the product development teams to fully understand and implement the principals of DFE.***

Energy + Materials = Environmental Impacts

DFE Process

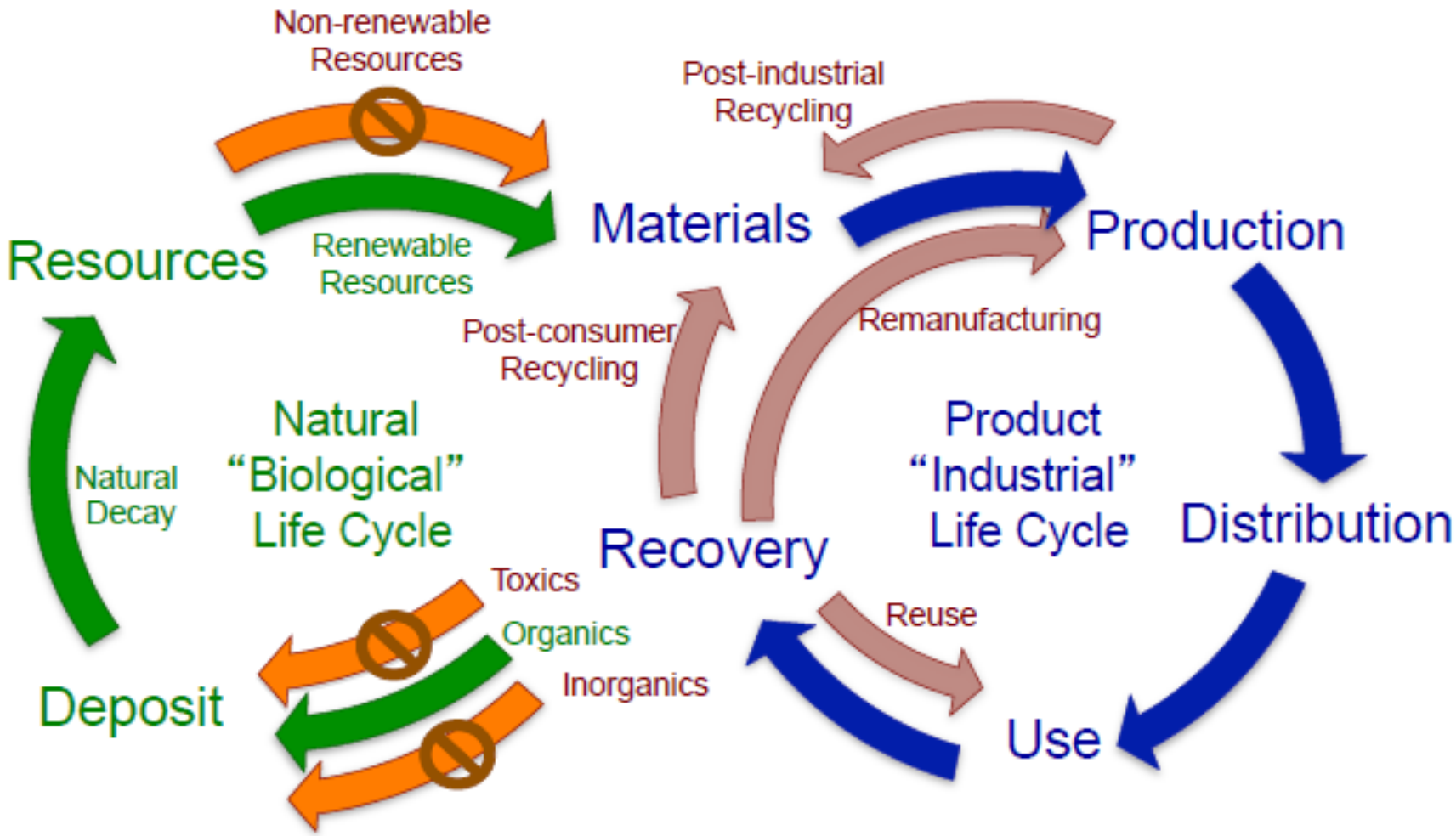

Product Planning
1. Set DFE Agenda
2. Identify Potential Environmental Impacts
Concept Development
3. Select Material and DFE Guidelines
System-Level Design
4. Apply DFE Guidelines to Initial Designs
5. Assess Environmental Impact
6. Refine Design
Detail Design
Compare to DFE Goals
N
Y
Process Improvement
7. Reflect on DFE Process and Results


Sustainability
(Product design)
Proper Disposal
Renewable energy resources
Environment friendly materials
Elimination of toxic wastes

DFE LIFE CYCLES

(PRODUCT & NATURAL)

Two Life Cycles

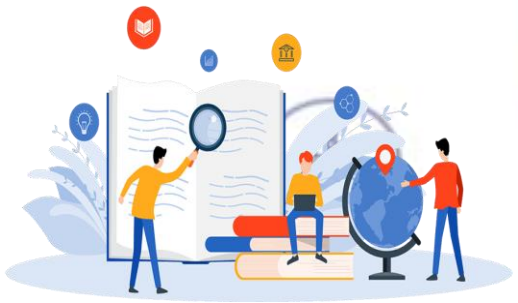



ORION


ORION
PHARMA


CHEMICALS AND RAW MATERIALS MANUFACTURING AND SOURCING
PRODUCT MANUFACTURING
R&D
PACKAGING
SUSTAINABLE LIFECYCLE MANAGEMENT
PRODUCT END-OF-LIFE & DISPOSAL
TRANSPORTATION AND DISTRIBUTION
PATIENT USE

CHEMICALS AND RAW MATERIALS MANUFACTURING AND SOURCING



PRODUCT MANUFACTURING

PACKAGING

TRANSPORTATION AND DISTRIBUTION

PATIENT USE

PRODUCT END-OF-LIFE & DISPOSAL

SUSTAINABLE LIFECYCLE MANAGEMENT

CHEMICALS AND RAW MATERIALS MANUFACTURING AND SOURCING

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PRODUCT END-OF-LIFE & DISPOSAL

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PACKAGING

SUSTAINABLE LIFECYCLE MANAGEMENT

WASTE DISPOSAL

TRANSPORTATION AND DISTRIBUTION

PRODUCT END-OF-LIFE & DISPOSAL

PATIENT USE

Why companies DFE?


stuff
stuff
mo stuff
stuff
box o'stuff
1
wuz yo stuff


When you sell something
The government

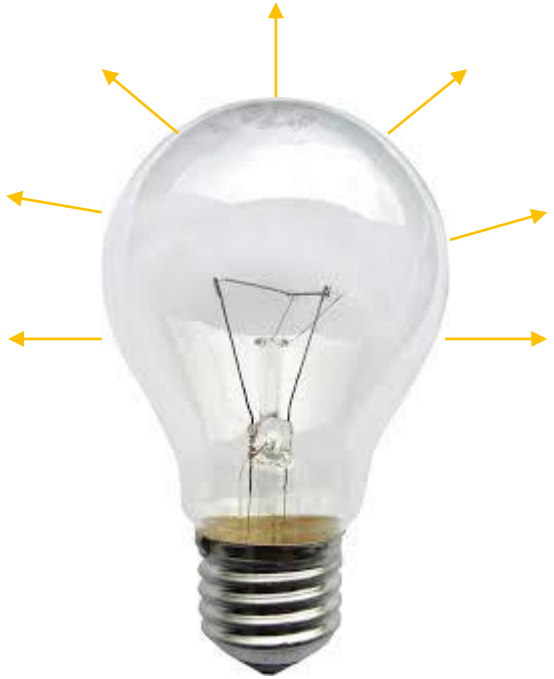
Role of Perception in Marketing

Enterprises want to appear Eco-friendly.

Environmental Regulations

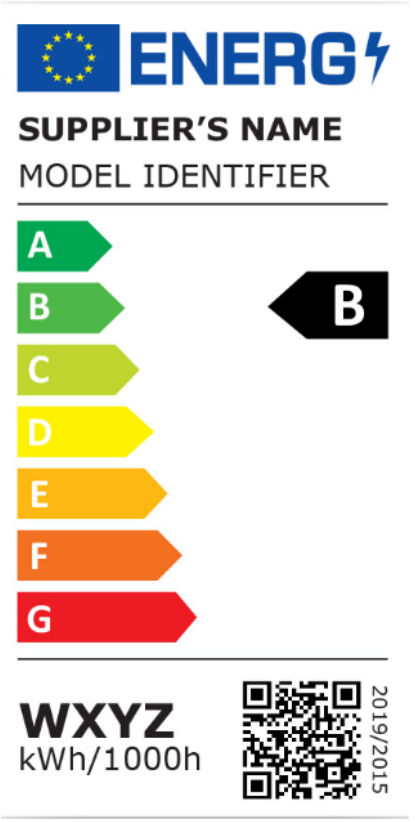
$$P_{onmax} = C \times (L + \Phi_{use}/(F \times \eta)) \times R$$

Excerpt from the official document that outlines the regulations for eco-design requirements taken from the European commission website.



Environmental Regulations

European Product Registry for Energy Labeling(EPREL)



Profits due to Regulations

Environmental impact


kamidiye
Kaynak Suyu
Spring Water
İSTANBUL
BÜYÜKŞEHİR
444 1902

Why to do that?

- Legislations
- Customer satisfaction
- Consciousness

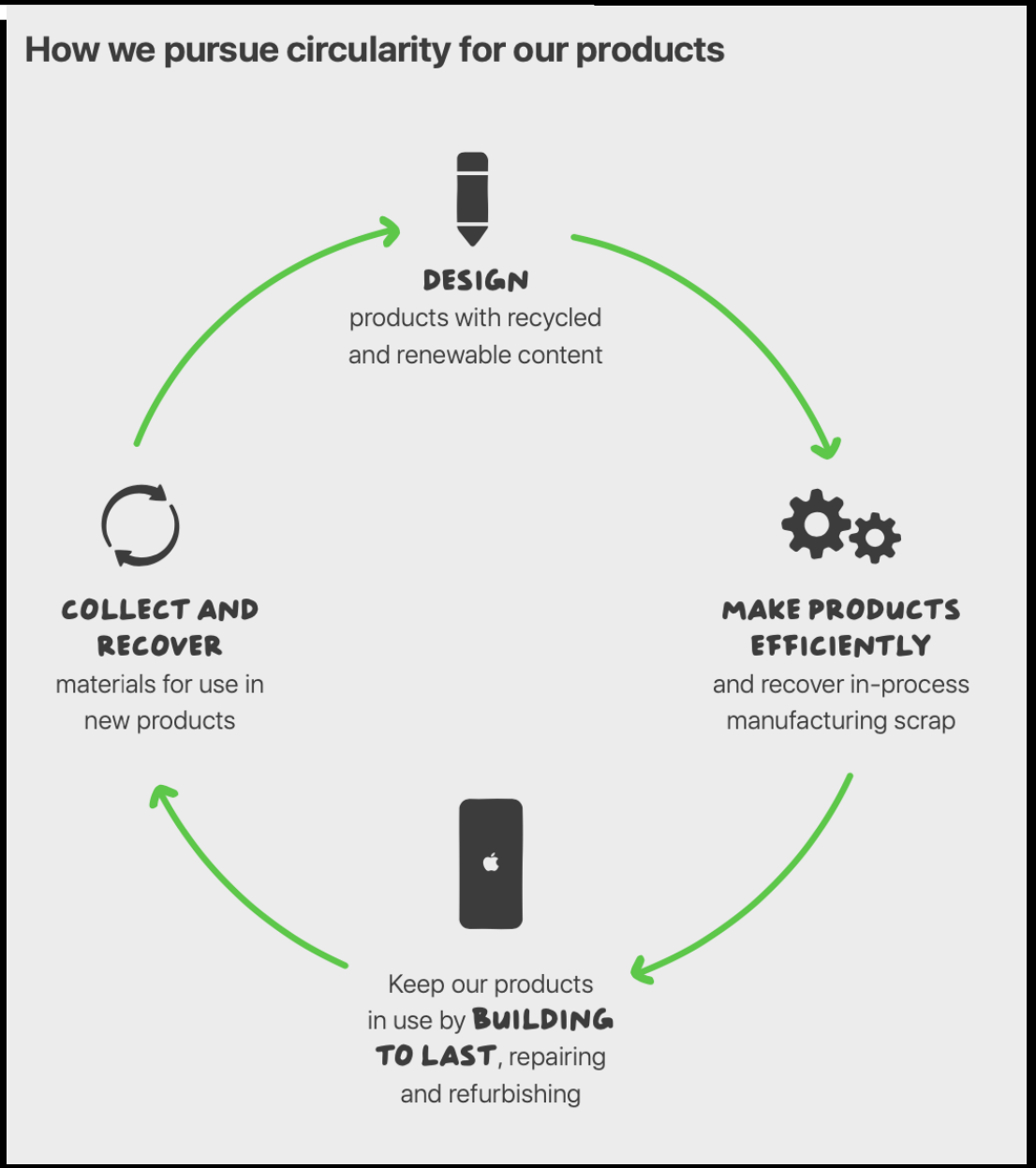
What impacts the environment?

- Production
- Delivery and packaging
- Product’s longevity
- Recycling options

Tools used for the assessment

Life cycle assessment

- Material chemistry
- Recycled content
- Disassembly
- Recyclability

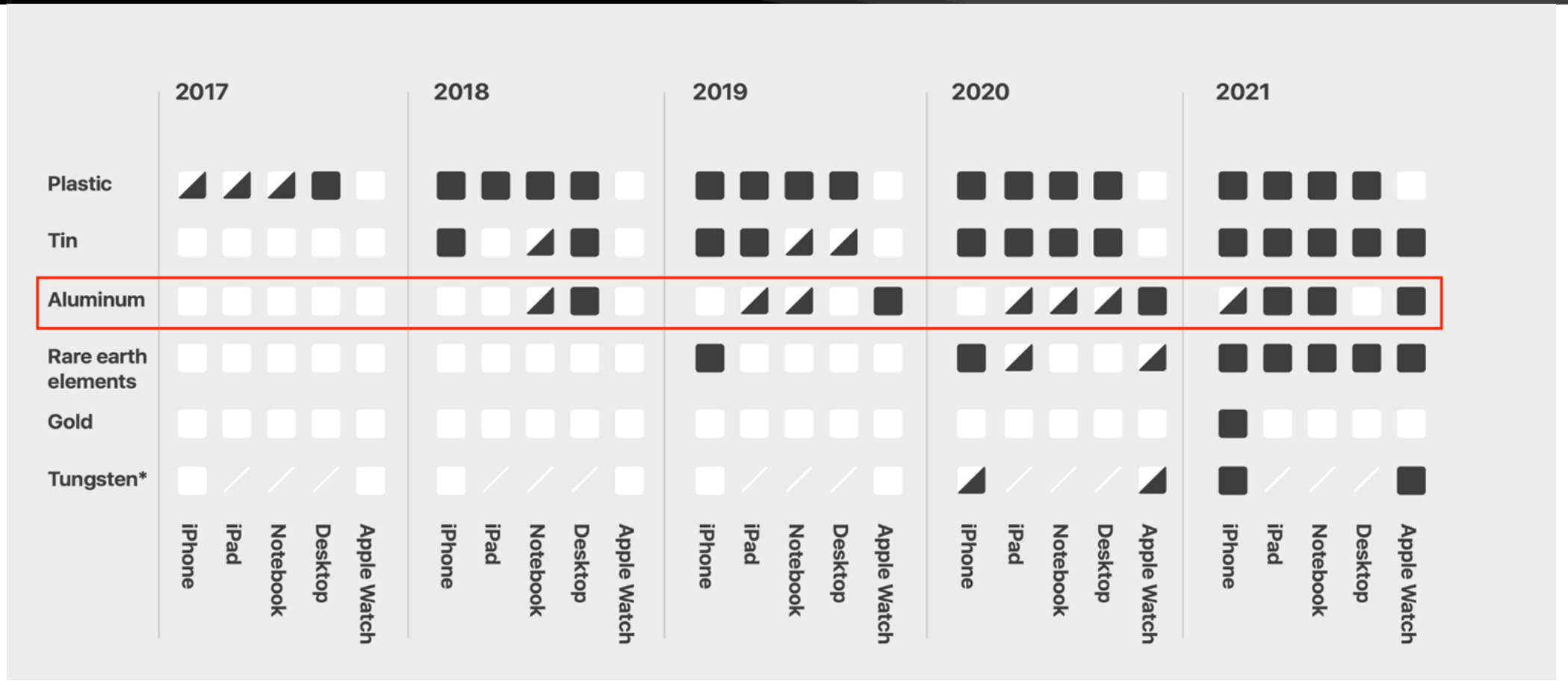


How do we do it?

How Apple considers its environmental impact

- Resources
- “Smarter chemistry”
- Engagement

Manufacturing



Delivery and packaging

No pla

iPhon

iPhone longevity journey

- ✓ Features to enhance durability
- ● Repairable at retail stores, Apple Authorized Service Providers, and central repair locations

Increased **DURABILITY** and **REPAIRABILITY** enhance iPhone longevity

iPhone (1st generation)

- ● SIM tray

2007

iPhone 4

- ● SIM tray
- ● Battery
- ● Haptics
- ● Rear camera

2010

iPhone 7

- ● SIM tray
- ● Battery
- ● Haptics
- ● Rear camera
- ● Main logic board
- ● Display
- ✓ Splash, water, and dust resistant: IP67*
- ✓ Sapphire crystal lens cover

2016

iPhone X

- ● SIM tray
- ● Battery
- ● Haptics
- ● Rear camera
- ● Main logic board
- ● Display
- ● Bottom speaker
- ● Enclosure
- ✓ Splash, water, and dust resistant: IP67*
- ✓ Sapphire crystal lens cover
- ✓ Surgical-grade stainless steel

2018

iPhone 13

- ● SIM tray
- ● Battery
- ● Haptics
- ● Rear camera
- ● Main logic board
- ● Display
- ● Bottom speaker
- ● Top speaker
- ● Enclosure
- ✓ Splash, water, and dust resistant: IP68*
- ✓ Sapphire crystal lens cover
- ✓ Surgical-grade stainless steel
- ✓ Ceramic Shield

2021

Recycling options

Manufacturer supports refurbishing:

- Product is easy to disassemble
- Supply chain is adapted


COQUILLETTES N°32
1Kg
DAL 1877
Barilla
AL DENTE 7 MIN
Barilla
COQUILLETTES
COTTURA 7 MINUTI
n.32
MASTERS OF PASTA*
500g
COQUILLETTES 500G
0 96

DFE Guidelines and their application

Example: Ford Model U DFE concept car

- 2003 North American International Auto Show

- 2.3-liter supercharged hydrogen engine

Example: Ford U DFE concept car

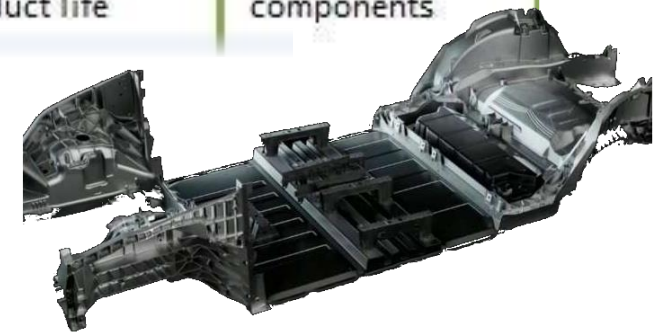
- Recyclable and biodegradable materials
- Modular design meaning easy part replacement

How does it fit into DFE guidelines?

- Ford VS Tesla approach: Modularity or minimizing parts?

Design for Environment Guidelines

Materials	Production	Distribution	Use	Recovery
•Specify Renewable Materials	•Employ as few manufacturing steps as possible	•Minimize Packaging	•Minimize failure	•Ensure easy acess to fasteners
•Specify Non-Hazardous Materials	•Minimize the number of components	•Use recyclable and reusable packaging	•Ensure minimal maintainance	•Promote use of common tools
		•Minimize total packing volume	•Ensure aesthetic life is equal to the functional product life	•Implement swapable components



Really ??

How to assess the Environment Impact?

Environment

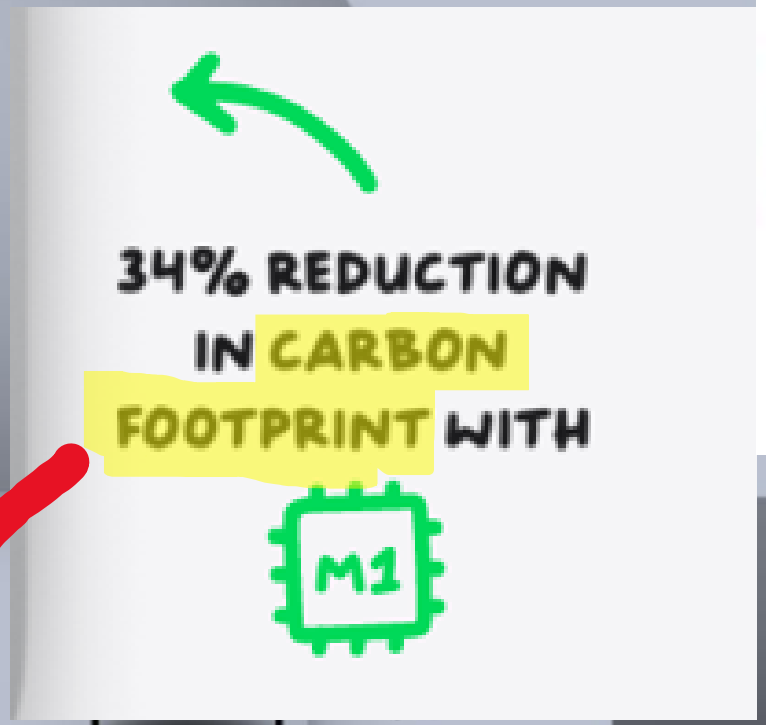
2022 Progress Report (PDF)

The products you love also love the planet.

2022 Progress Report (PDF)

Environment

2022 Progress Report (PDF)



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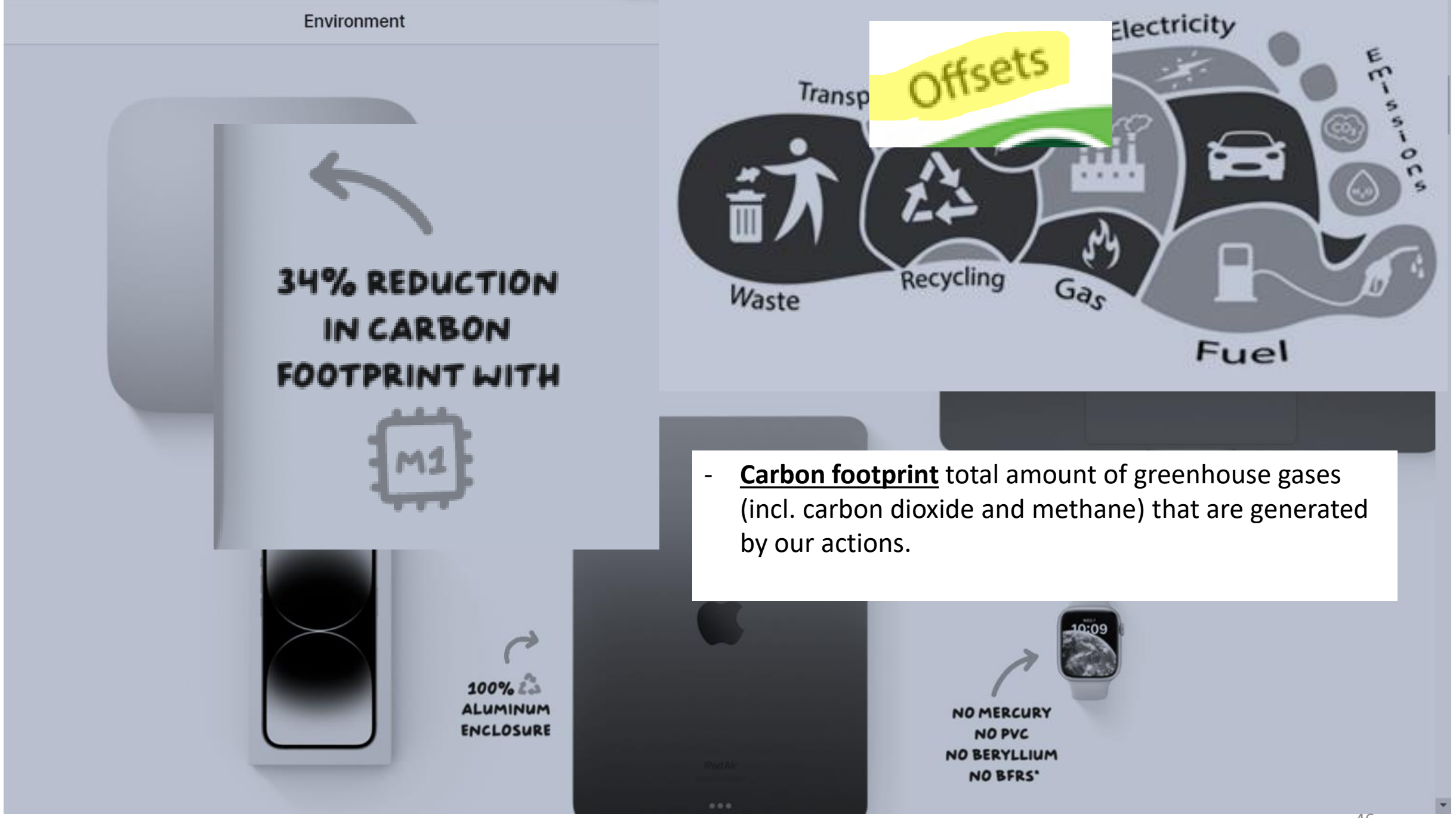

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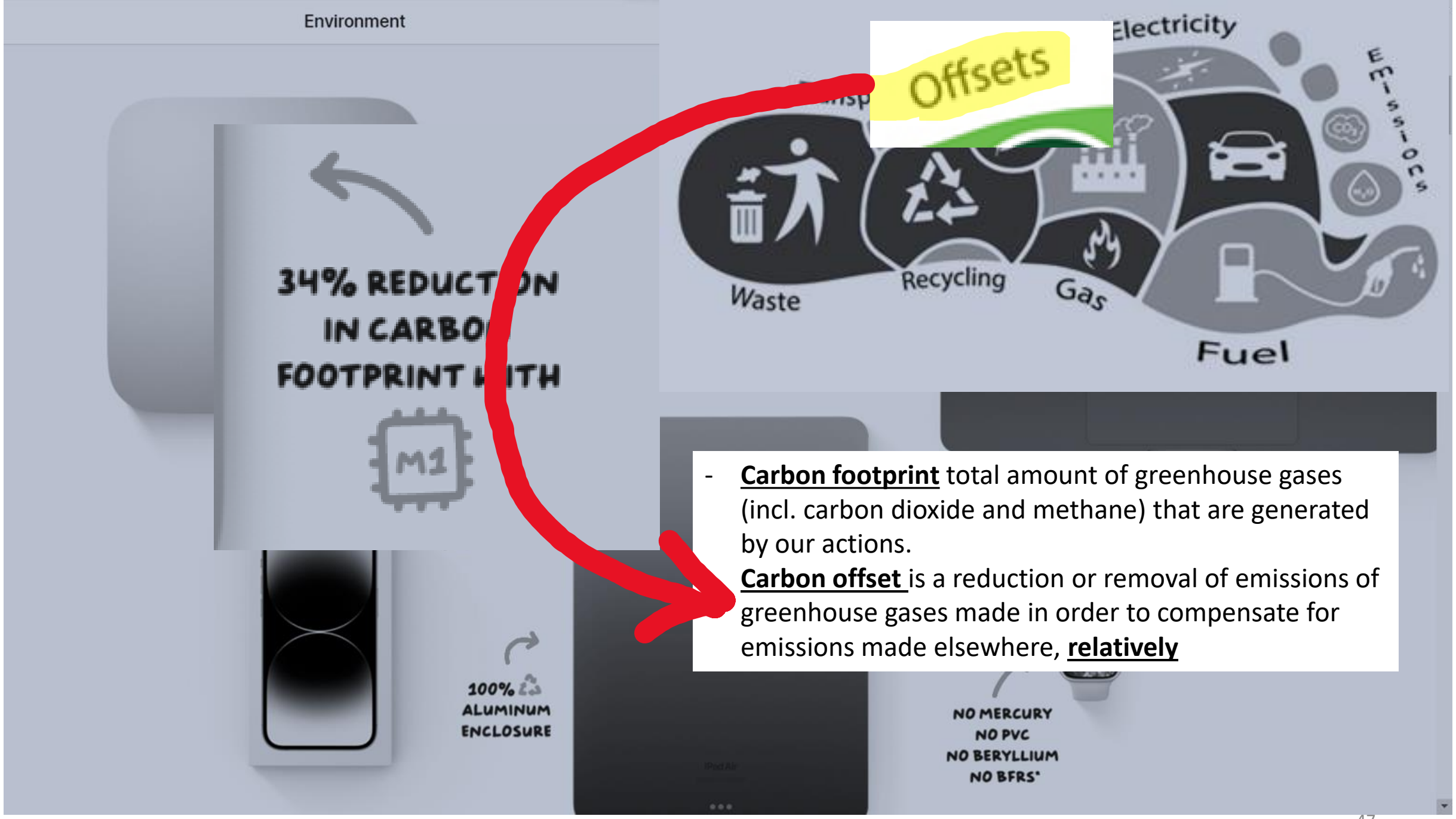

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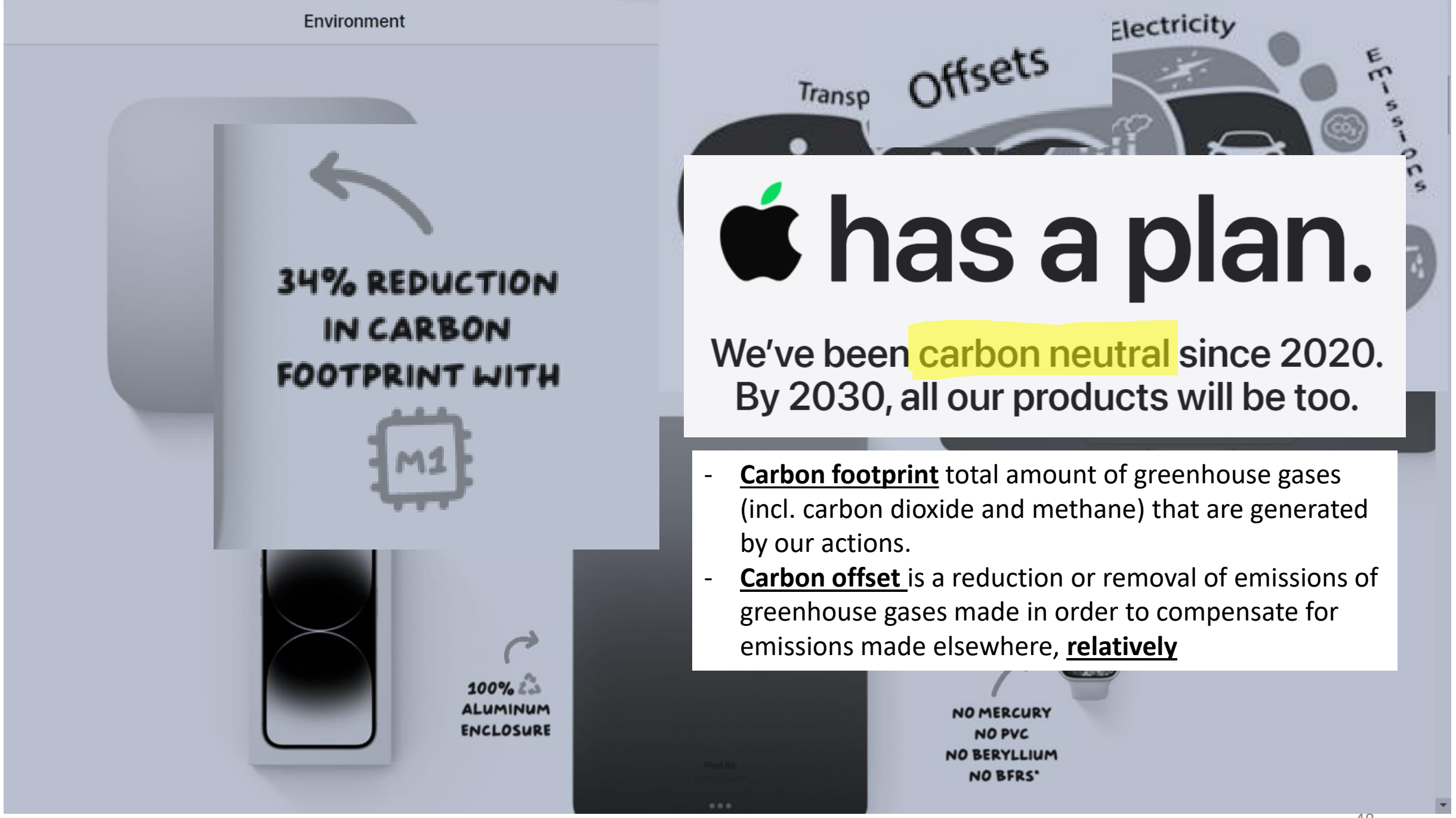

has a plan.

We've been carbon neutral since 2020.
By 2030, all our products will be too.

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Achieve carbon neutrality for our entire carbon footprint, including products, by 2030. And reduce related emissions by 75% compared with fiscal year 2015

Become carbon neutral for corporate operations

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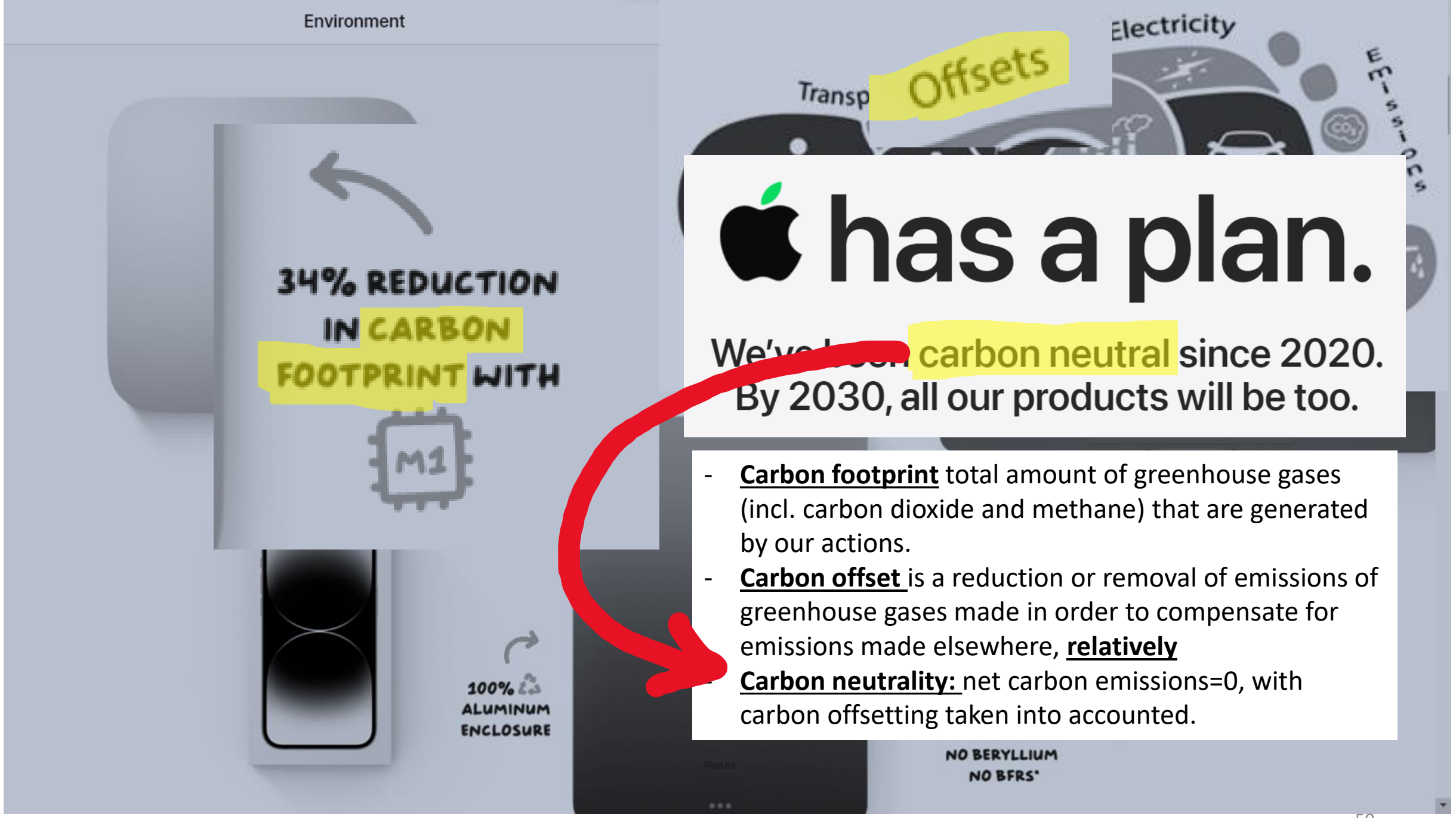

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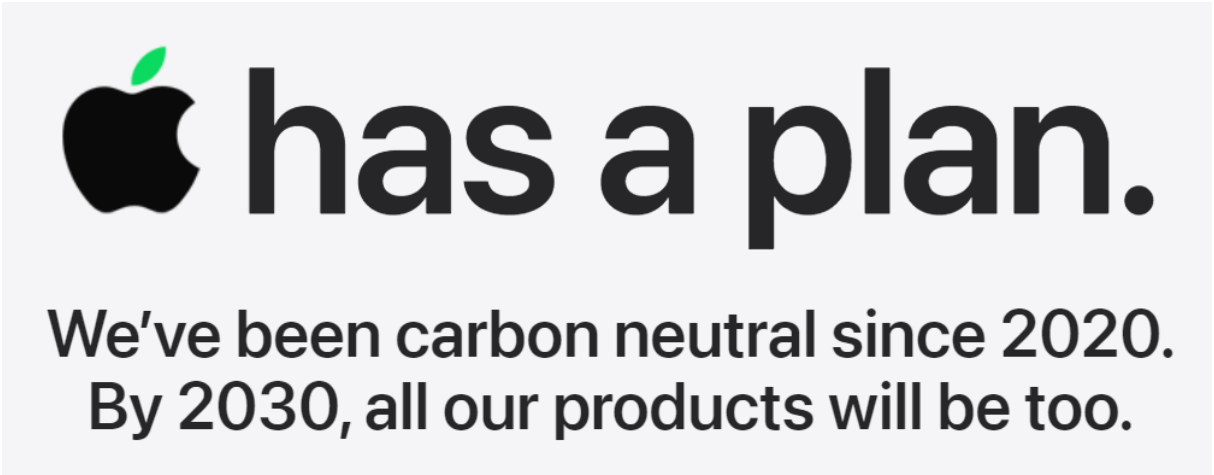
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has a plan.
We've been emitting the same amount since 2020
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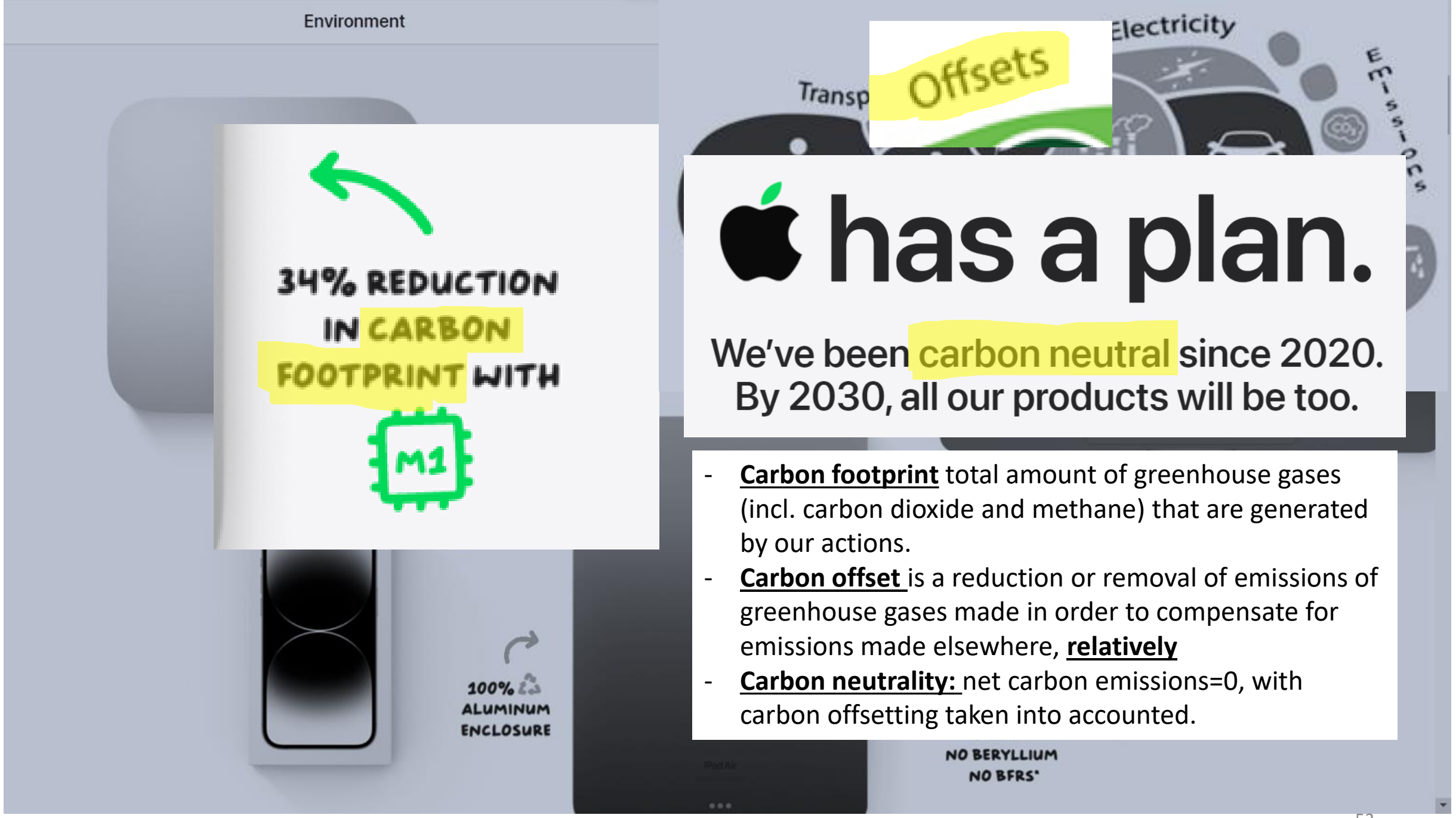

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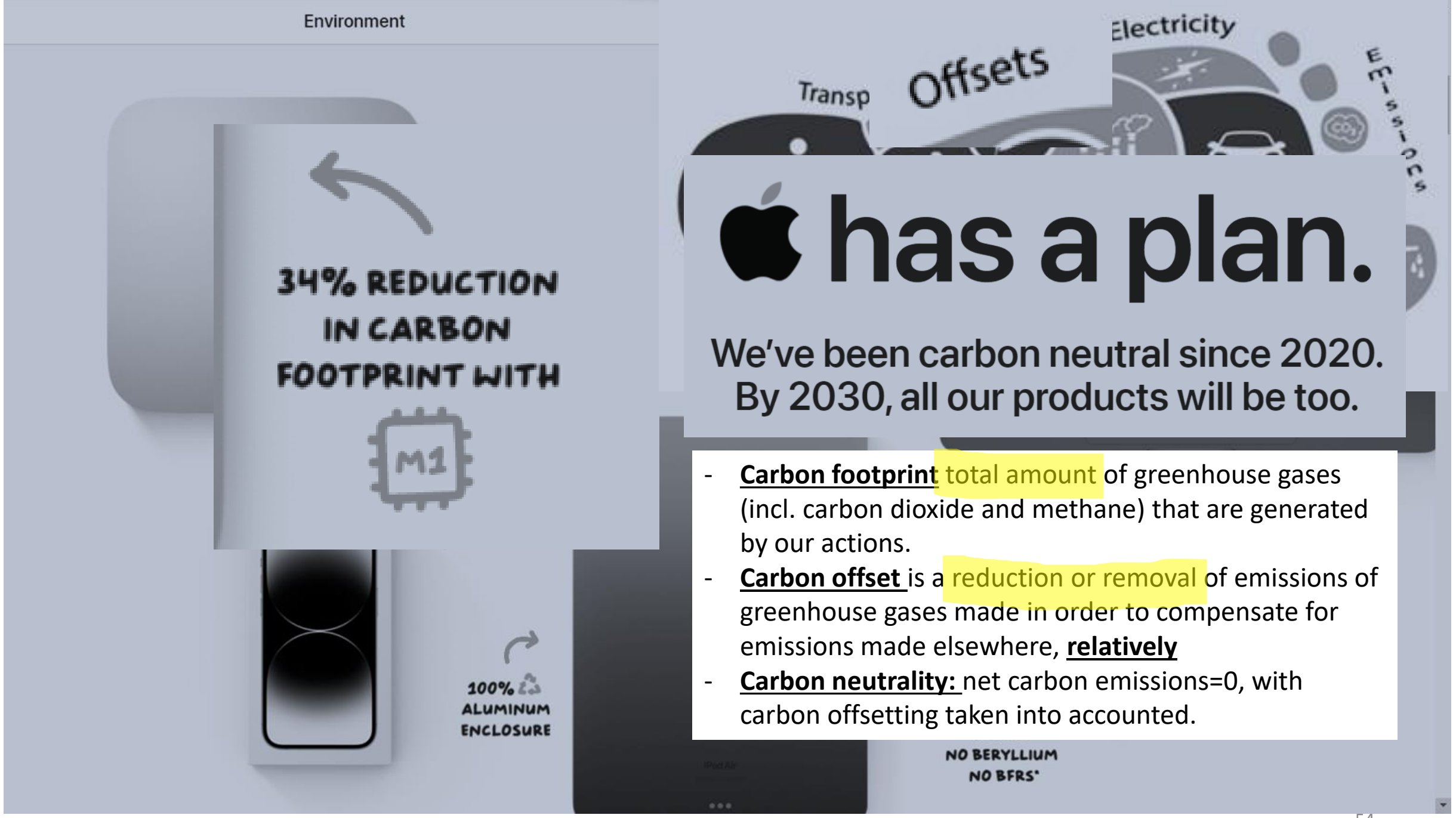

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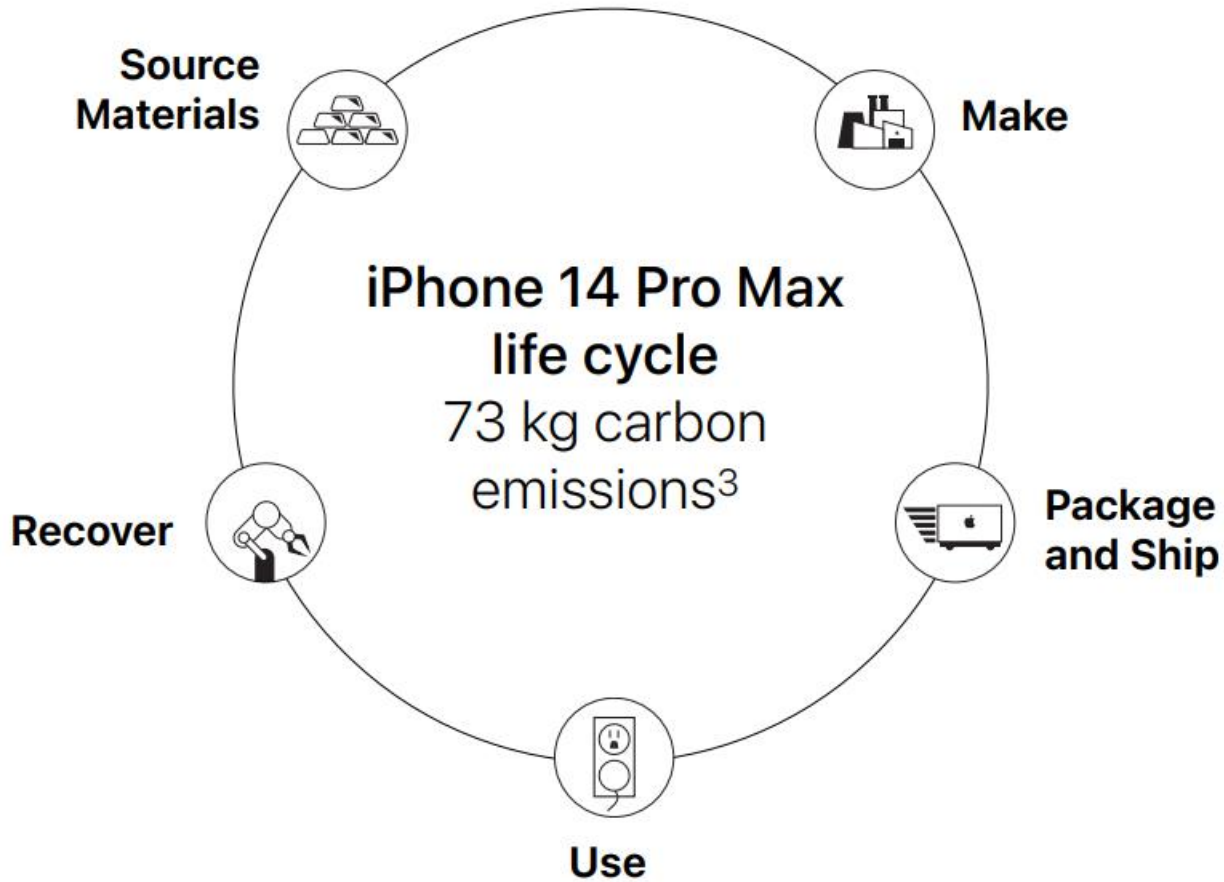
Source Materials
Make
iPhone 14 Pro Max life cycle
73 kg carbon emissions[3]
Recover
Package and Ship
Use

- Measure and weight part-by-part
- Yield loss
- Accessories and packaging
- Supplier Clean Energy Program
- Apple Care

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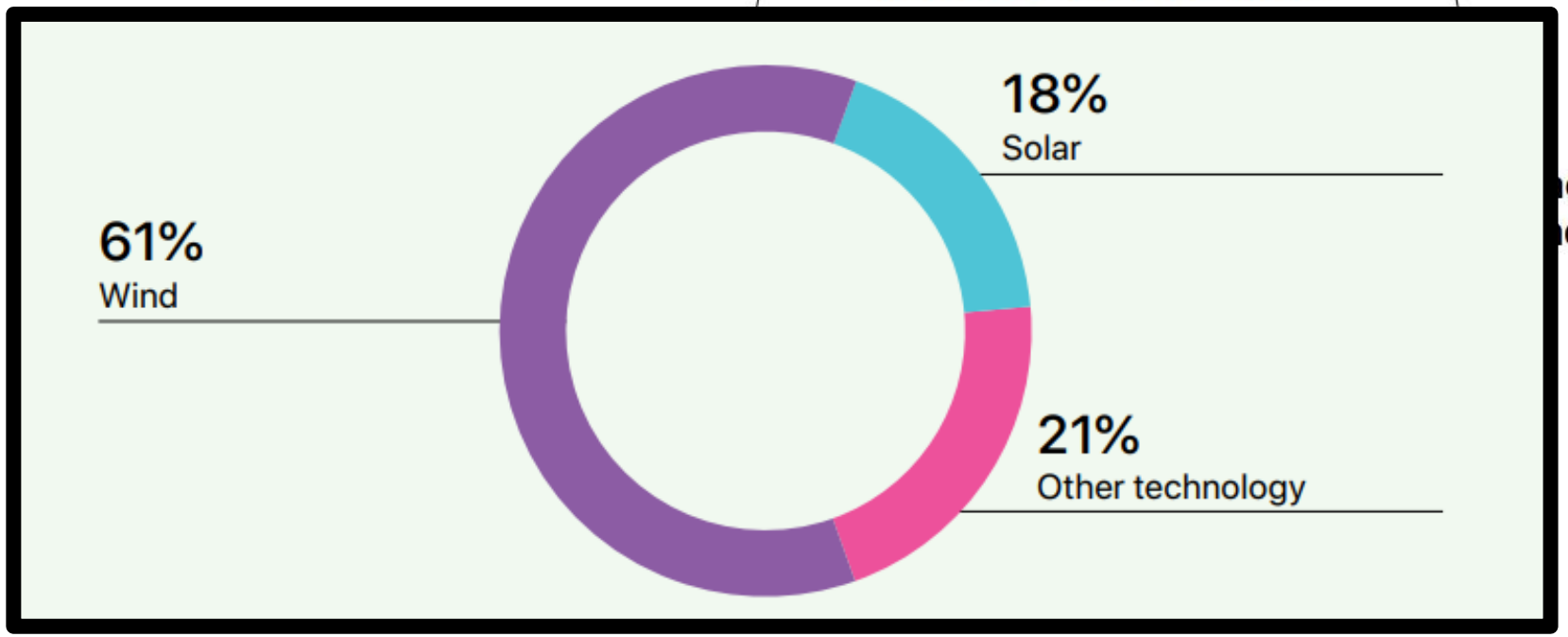

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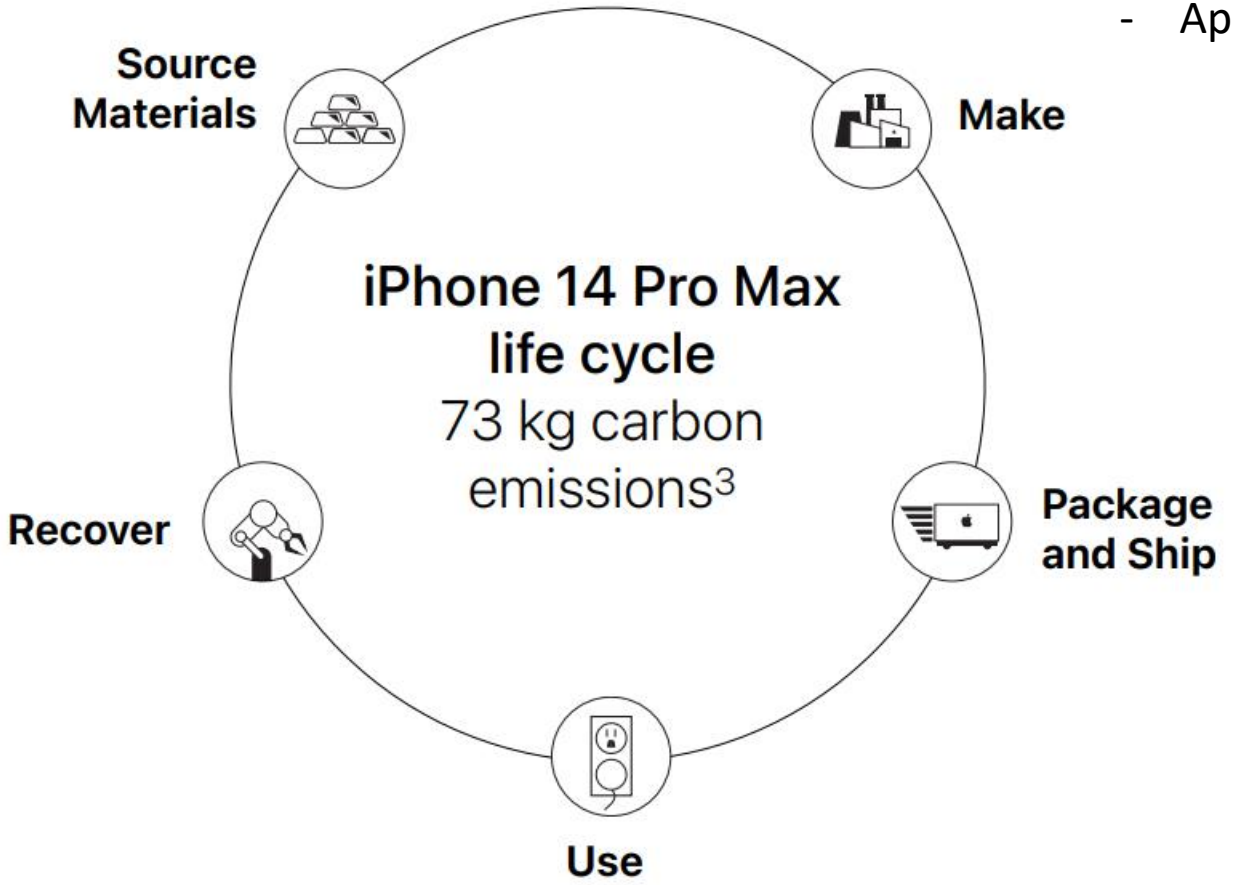

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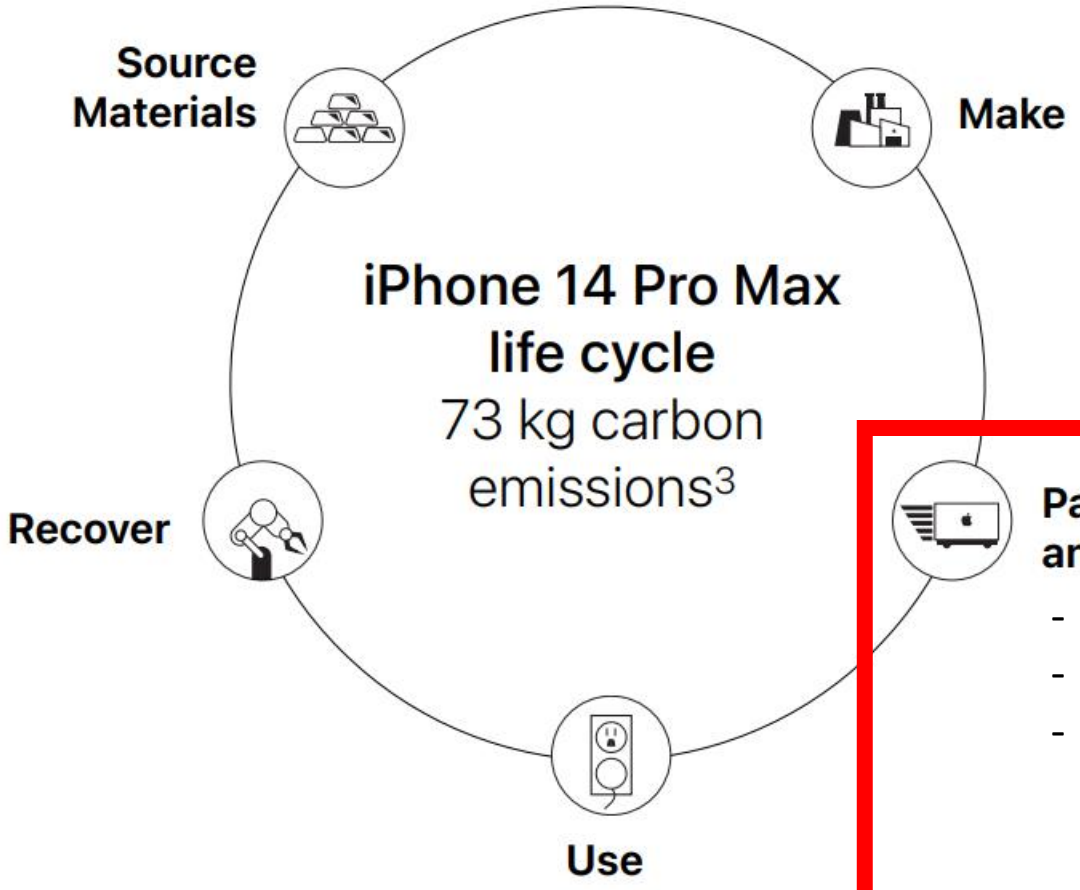

Package and Ship

- Shipment data: land, sea, air
- Single and multipack
- Site-site, site-hub, hub-customer, customer-recycling

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Make

emissions[3]

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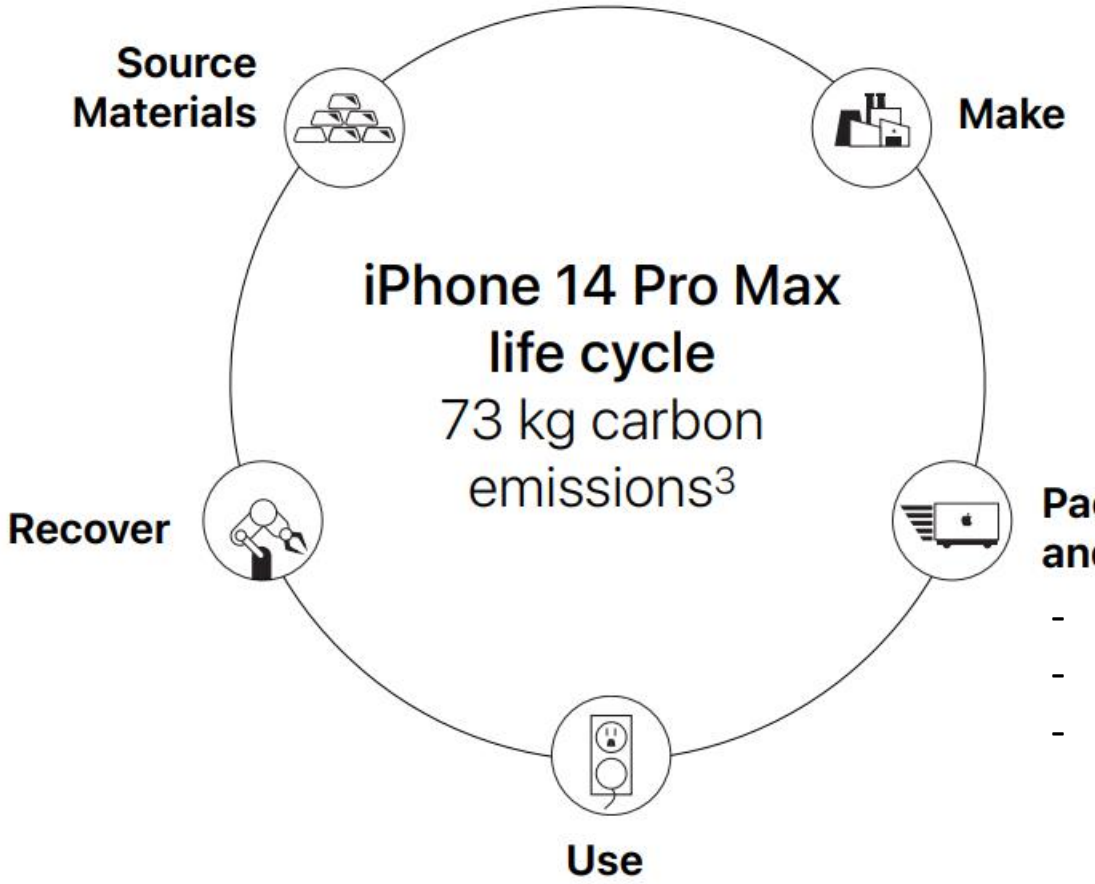

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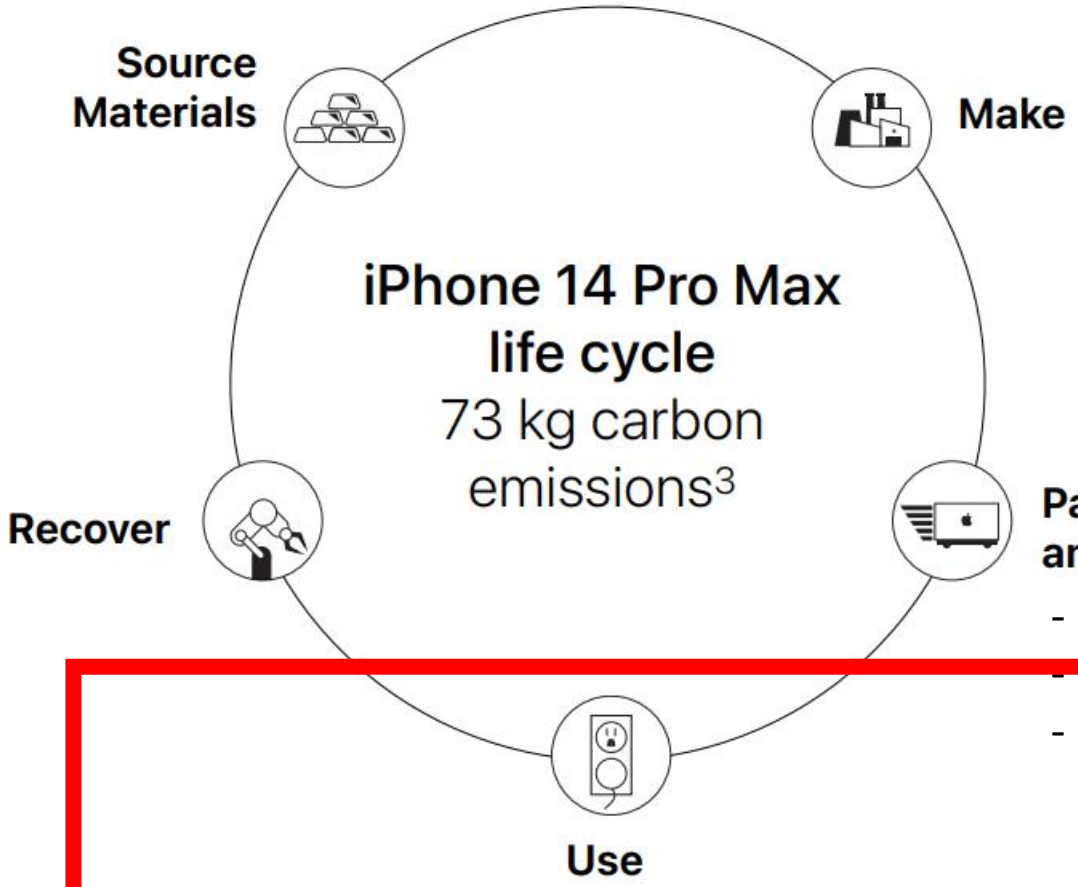

- Shipment data: land, sea, air
- Single and multipack
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- First ownership
- Product Consumed power: simulated
- Daily usage: mix of actual and modeled customers
- Year of use: 4 for macOS, tvOS; 3 for iOS, watchOS, ipadOS

emissions[3]

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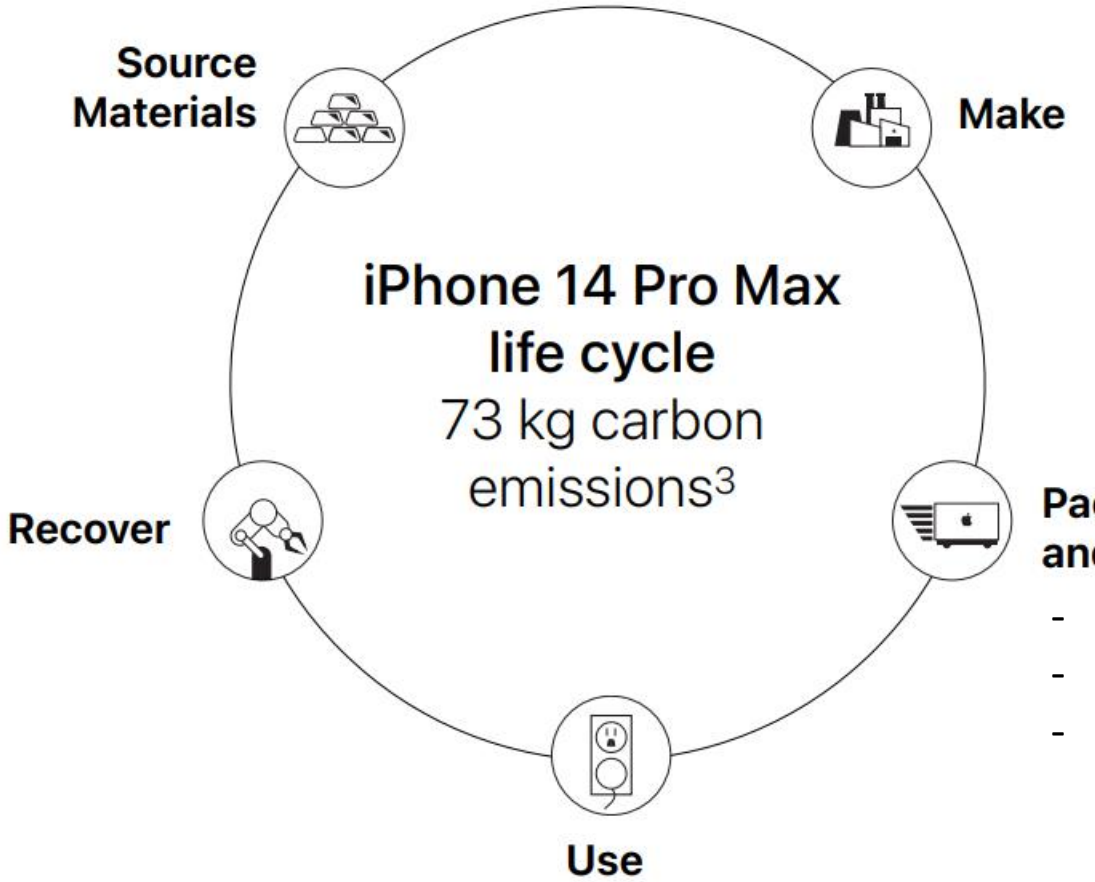

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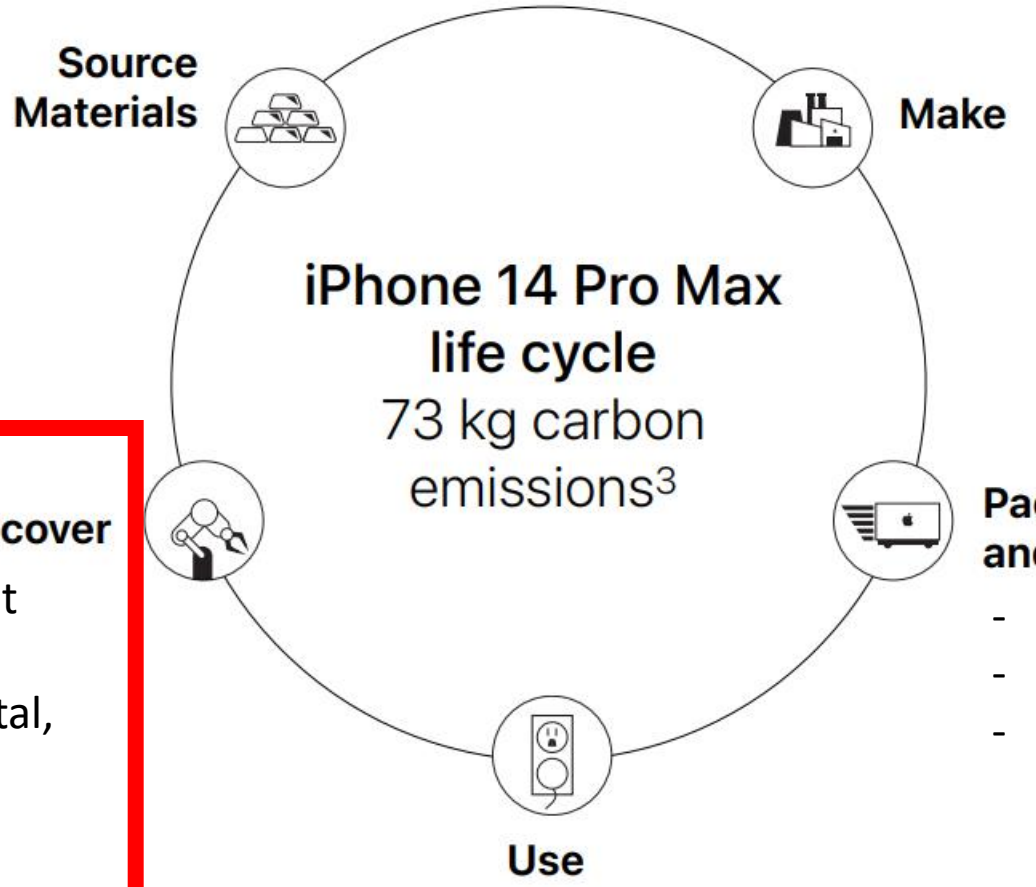

- Estimate ratio of products that are sent to recycle / disposal
- Initial process: electronic, metal, plastic, and glass material streams
- Downstream process = production
- Disposal: data from landfill and incineration

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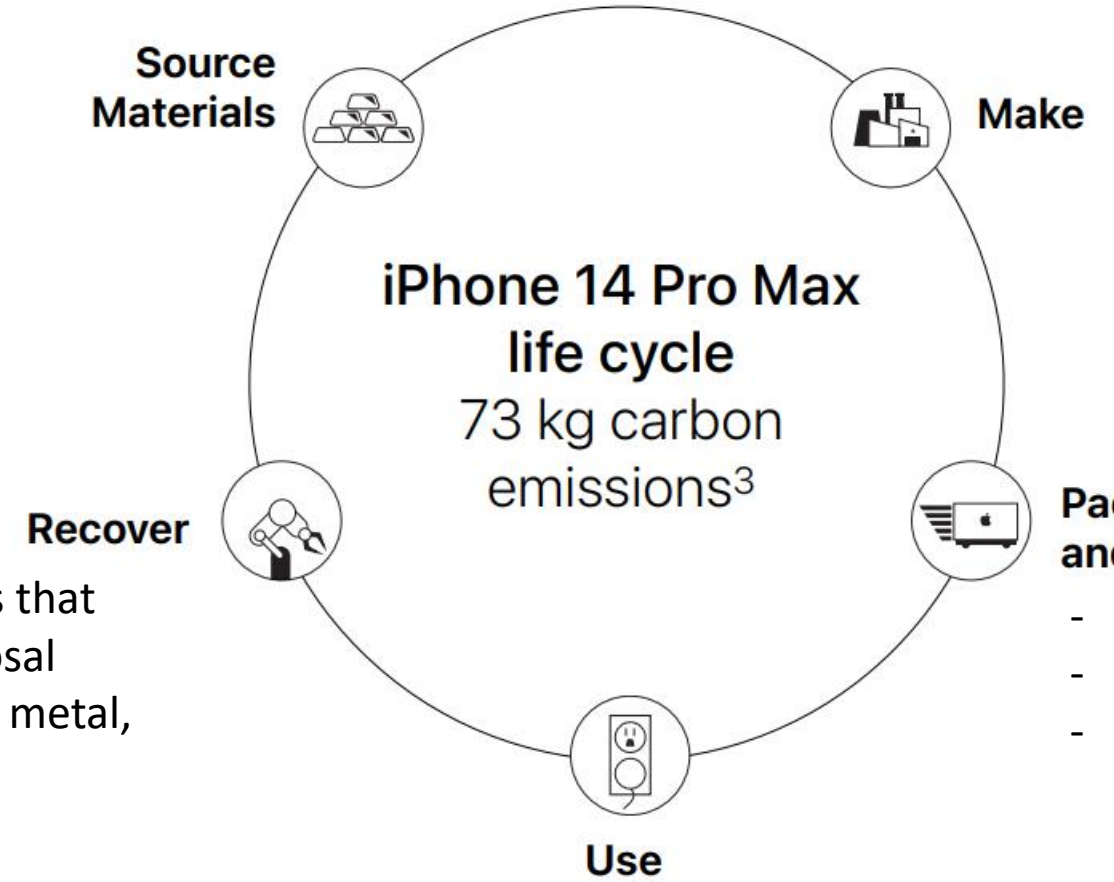

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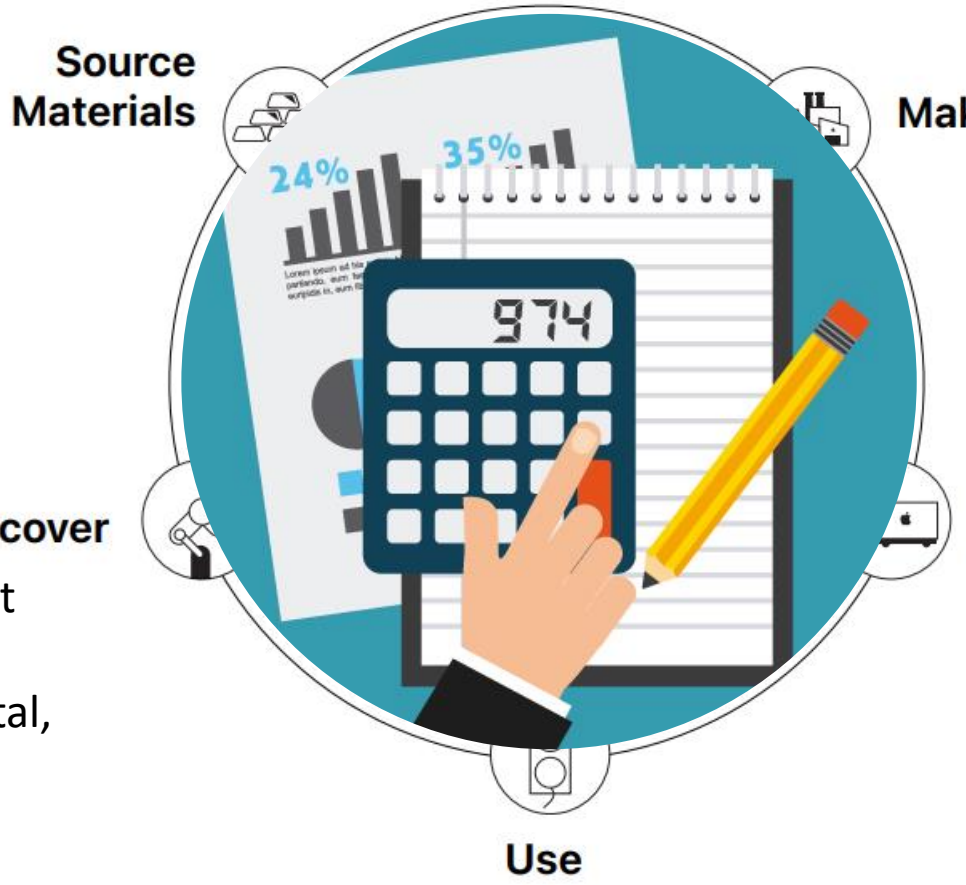

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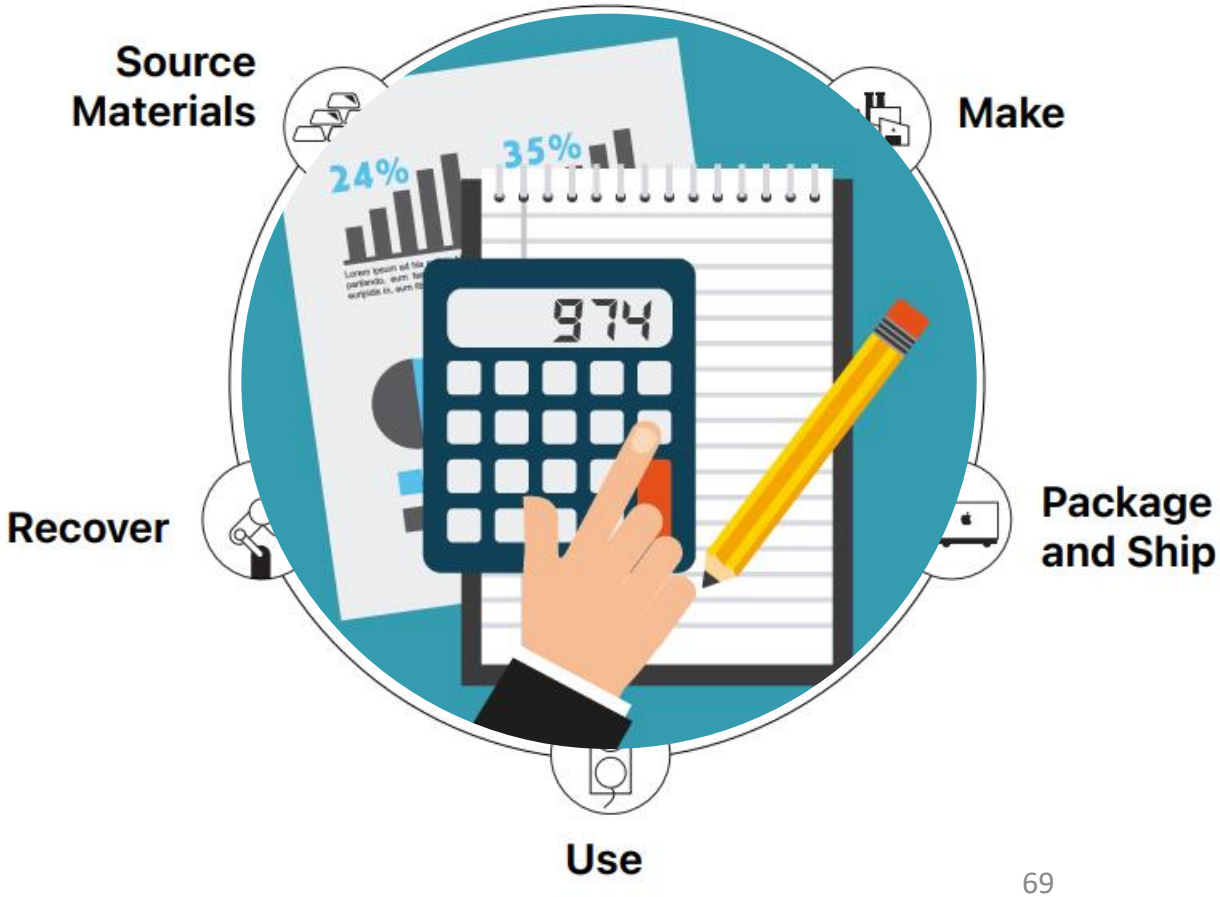
Model verified by Fraunhofer Institute

Fraunhofer



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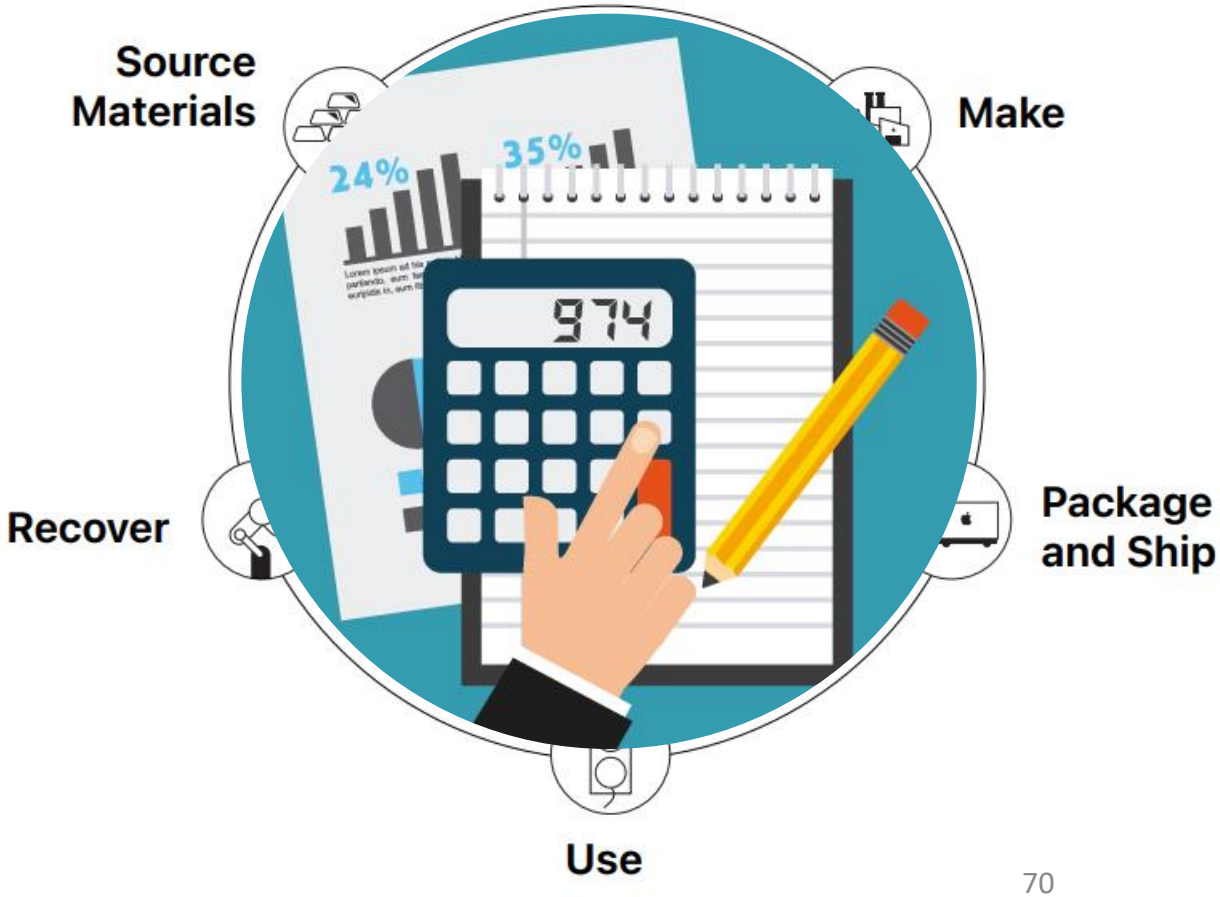
EMISSION DATA (Apple-specific and Industry-average)
+ Reports from suppliers



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EMISSION DATA (Apple-specific and Industry-average)
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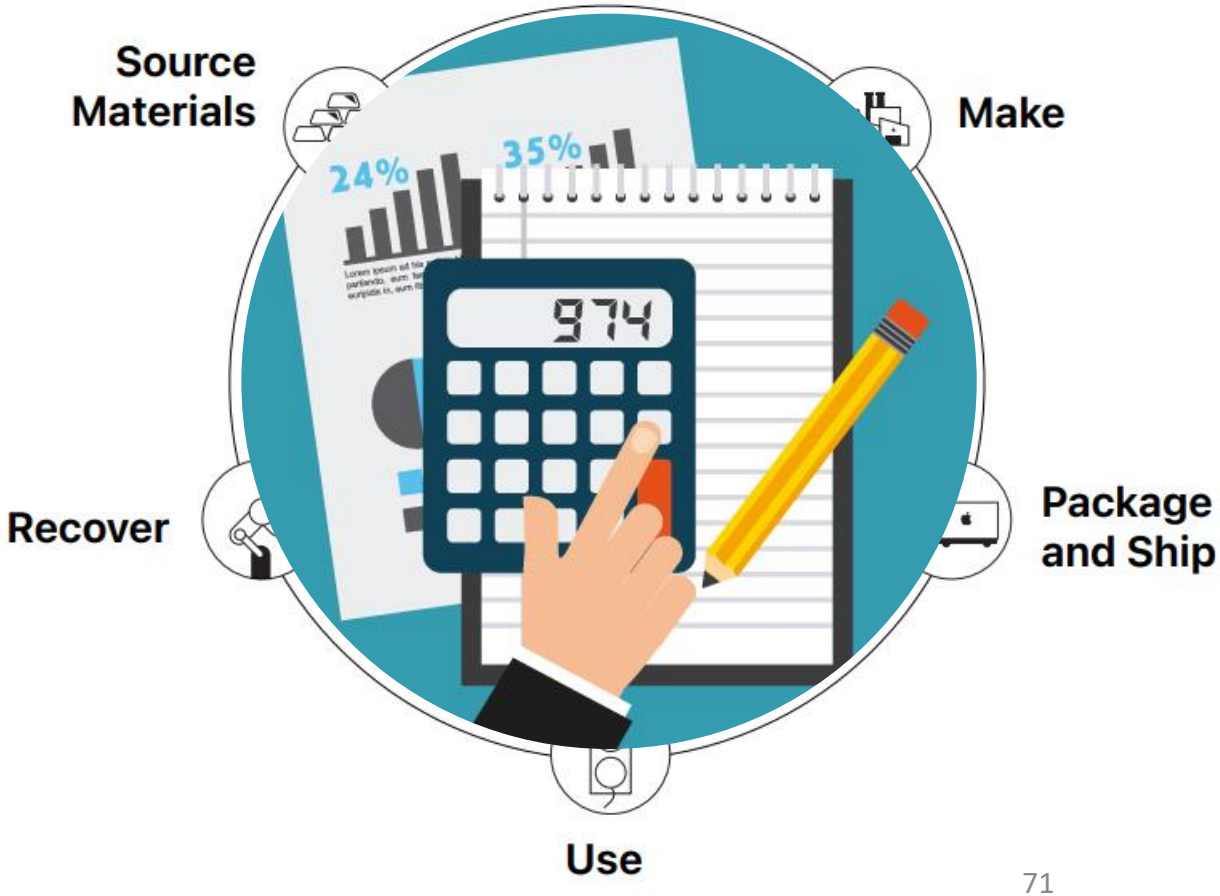
Greenhouse gas Emission verified by Apex "reasonable assurance"

APEX



THANK YOU!