



AIT Technology Event



Reducing the carbon footprint through Sustainable production practices

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Why analyze carbon footprint?

- **Macro perspective**
 - All emissions generated in an economy can be attributed to **delivery of products and services** in order to meet the **needs of the end consumer**
- **Micro perspective**
 - Potential for significant **emissions reduction** opportunities and large **financial benefits** by reducing carbon footprints of the products and services





Carbon footprint of a company

- **Definition**
 - The direct and indirect greenhouse gas emissions (GHGs) arising from all activities of an organization
 - It includes buildings, energy use, industrial processes and company vehicles
- **Drivers to reduce carbon footprint**
 - Reduce the **direct and indirect energy costs**
 - Address existing and planned legislation (**penalty** for high energy consumption and **reward** for emission reductions)
 - Present forward-thinking companies with an opportunity to **develop and market low-carbon products**

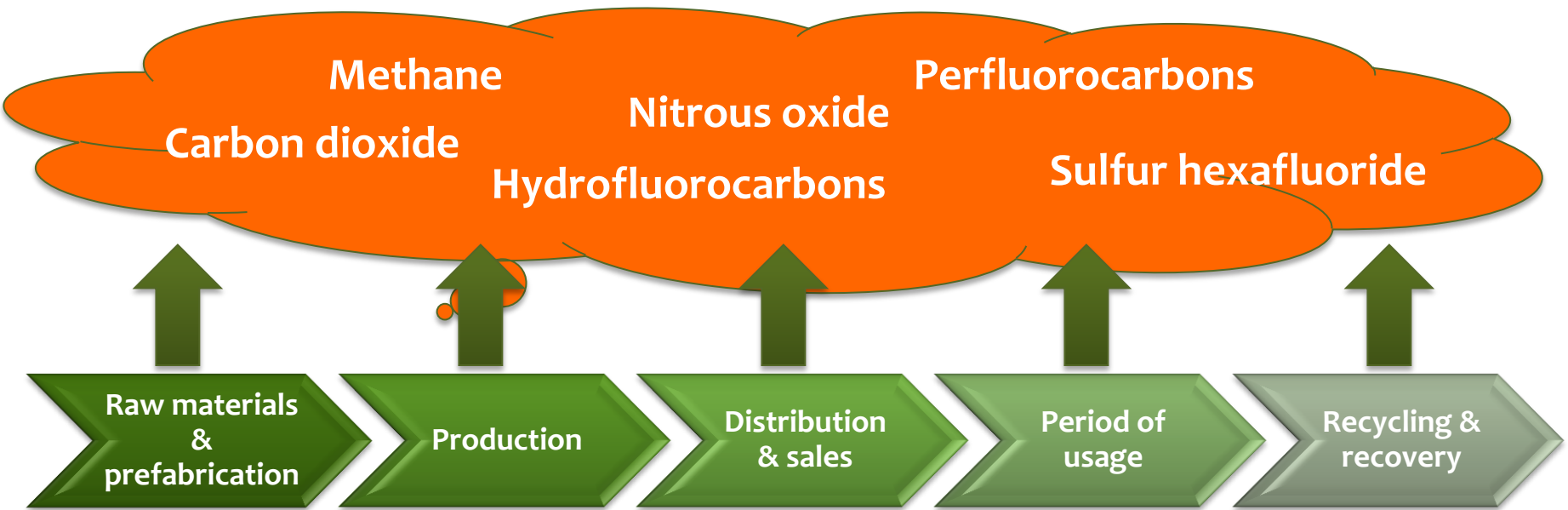




Carbon footprint of a product

- **Definition**

- Quantity of GHGs emitted across the supply chain for a single unit of a product (CO₂e)



Carbon Footprint of Product (CFP)





Carbon saving opportunities

- **Opportunities to create knowledge, reduce carbon emissions and generate financial returns**
 1. Correcting a market failure
 - Where there is a perverse incentive between companies in the supply chain, creating extra carbon emissions and incurring extra costs
 2. Changing product
 - Where changing the final product mix or product configuration can reduce the emission across the supply chain
 3. Reconfiguring supply chain
 - Where changing specific processes or the way processes are completed can reduce emissions at key stages in the supply chain

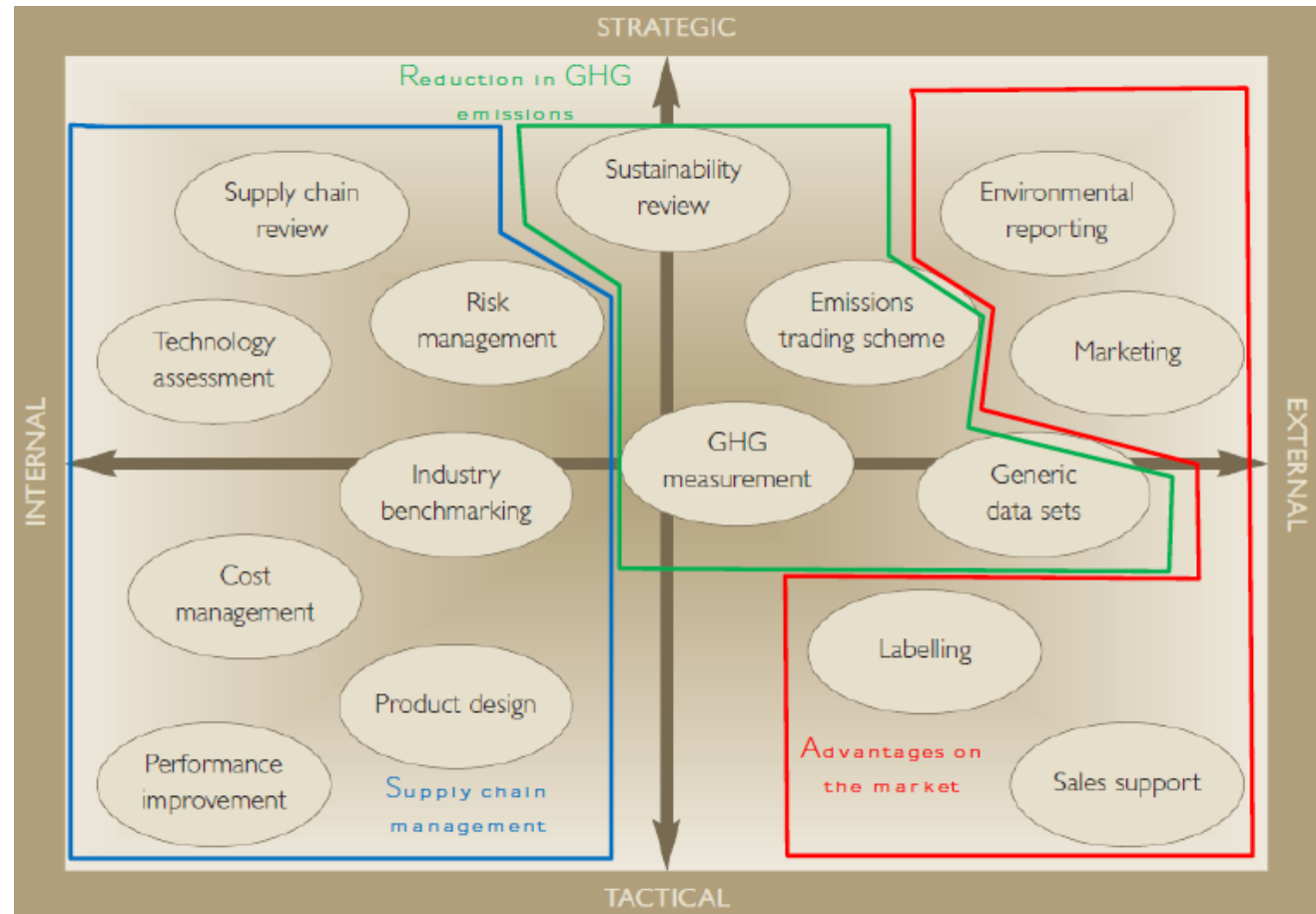




Benefits of CFP

Three major benefits

- *Market advantages*
- *Supply chain management*
- *GHG emissions reduction*



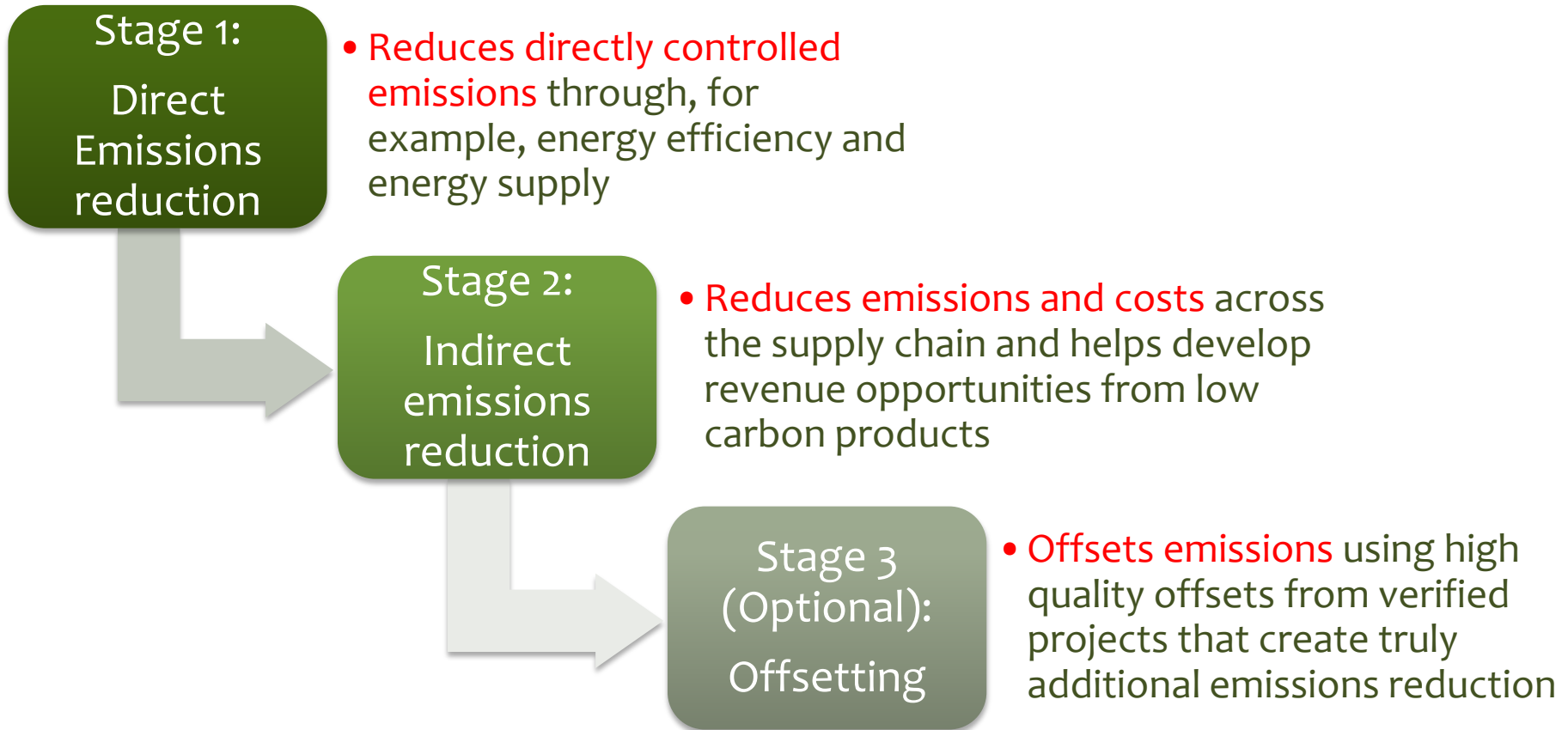
Source: Australian Government, 2009





Carbon emissions reduction

- **Three stages of carbon emissions reduction**





Case study 1: Apple company's footprints

- **Apple's comprehensive life cycle analysis**
 - Emissions generated from the manufacturing, transportation, use, and recycling of products, as well as the emissions generated by the facilities.





Manufacturing of Apple products

- Raw materials extraction and product assembly
 - 61% of the total GHG emissions
- Product designed to minimize the impact while ensuring growth
 - Use less materials
 - Ship with less packaging
 - Free from toxic substances
 - Energy-efficient
 - As much recyclable as possible



Kilograms of CO₂e Emissions per Dollar of Revenue



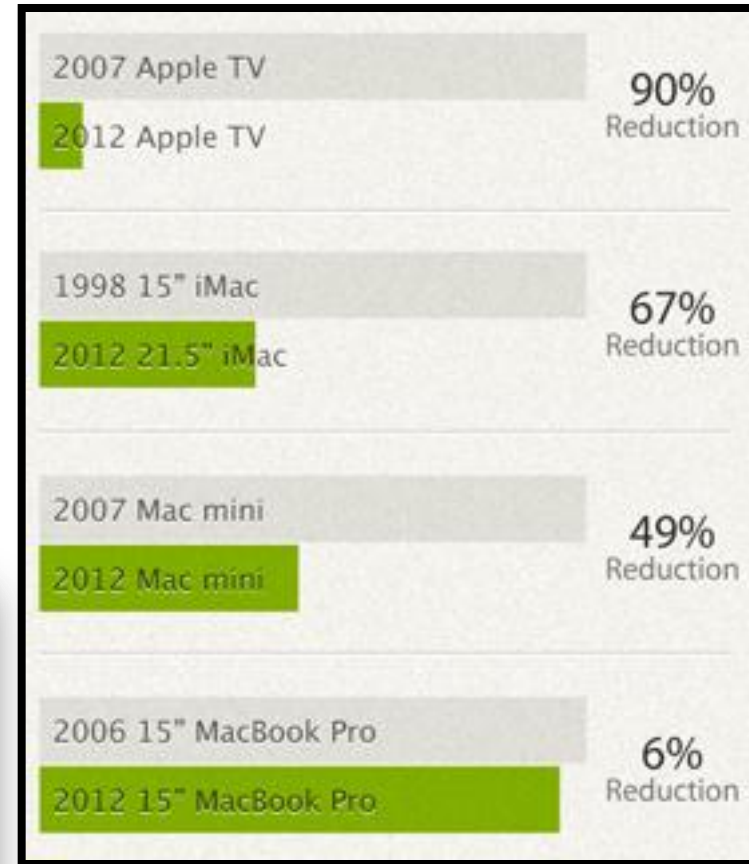
While revenue has grown, GHG emissions per Dollar of revenue has reduced by 21.5% between 2008 and 2012.





Manufacturing of Apple products

- **Manufacturing innovations**
 - Unibody construction has allowed MacBook and iPad products to become thinner while being even more resilient
 - Friction-stir welding helps enable iMac to use 68% less materials and generate 67% less carbon emissions



Improvement in product designing has led to significant amount of carbon emissions





Transportation of Apple products

- Products transport from assembly locations to distribution hubs
 - 5% of the total GHG emissions
- Thinner, lighter and material-efficient products
- Efficient packaging design
 - Slim and light yet protective packaging
 - Reduced materials and waste
 - Less transport energy and carbon emissions



Packaging of iPhone reduced by 28% from 2007 to 2012, allowing to ship 60% more boxes in each airline shipping container





Use of Apple products

- Use of electricity of Apple products by customers
 - 30% of the total GHG emissions
- All products exceed US EPA's Energy Star Efficiency Guidelines
- Hardware and operating systems designed to consume less power
 - More efficient power supplies
 - Components that require less power
 - Power management software



Average power consumed by Apple products reduced by 40% since 2008.





Recycling of Apple products

- **Recycling of products at the end of their useful life**
 - 2% of the total GHG emissions
- **Approach to recycling begins in the design stage**
 - Creation of compact and efficient products that require less materials
 - For example, built-in battery in the MacBook can be charged up to 1000 times, saving money on new batteries, producing less waste and increasing product lifespan
- **Materials used reclaimed by recyclers for use in new products**
 - Arsenic-free glass, high-grade aluminum and strong polycarbonate
- **Product packaging uses recyclable materials**

Since 2010, worldwide recycling rate of Apple products > 70%



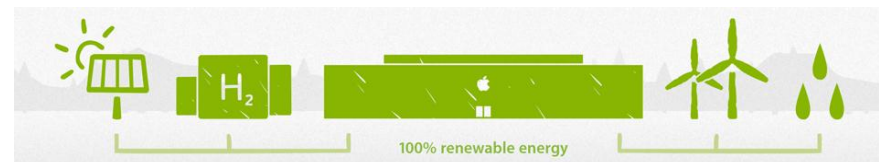


Apple's facilities

- Corporate offices, distribution hubs, data centers & retail stores
 - 2% of the total GHG emissions
- Working toward the goal of net zero status
 - Constructing new energy-efficient buildings & upgrading existing ones
 - Already converted 75% of energy needs at the corporate facilities and data centers to renewable sources
 - Installing on-site renewable energy sources (solar arrays, fuel cells)
 - Establishing long-term contracts with energy suppliers



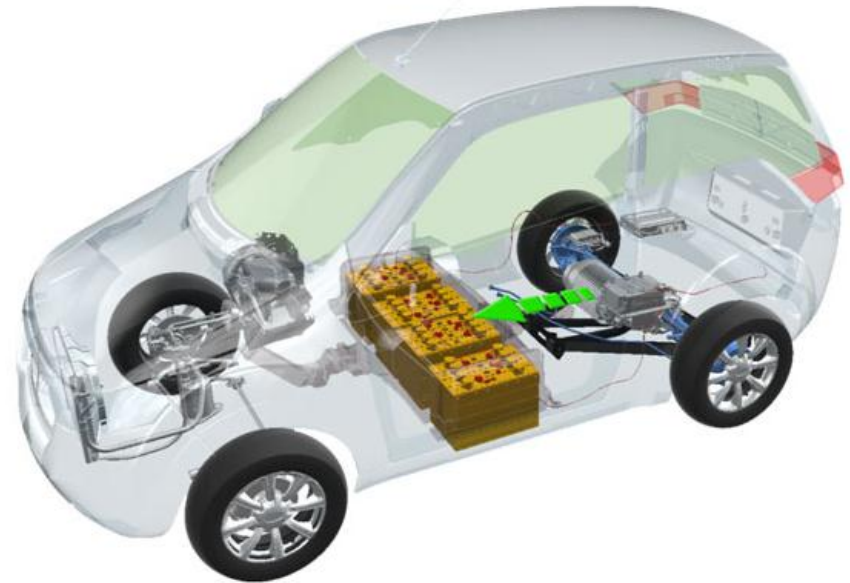
Apple's energy-efficient data center in Maiden, North Carolina.





Case study 2: Mahindra Reva's footprints

- Formerly known as “REVA”, a company working on the future of mobility
 - To address rising fuel costs, pollution and congested roads in developing countries
 - To design and manufacture compact vehicles with zero tail-end emissions and smaller carbon footprints



FUTURE OF MOBILITY



clean



convenient



connected



clever



cost effective





A few words about the company

- **Mahindra Reva**
 - Present across 24 countries
 - REVA unveiled the two-seater electric vehicle in 2001 in Bangalore
 - The same electric car launched in London in 2004 as the G-Wiz
 - Acquired by the Mahindra Group and renamed Mahindra REVA Electric Vehicles Pvt. Ltd.
 - Technical innovations
 - Designing light-weight structures
 - Creating efficient drivetrains
 - Intelligent and digitally connected car for the future





Innovation in designing

- **Features of the new-generation city car**

- Powered by maintenance-free Lithium ion batteries

- Can be charged overnight in a garage or a parking lot



- Advanced automatic transmission

- Smooth driving in peak traffic with no gear or clutch changes required

- Intelligent drive assist system

- Diagnoses, records and notifies information





Innovation in designing

- **Features of the new-generation city car**

- The owner can remain “connected” to the vehicle using a smart phone
 - Lock or unlock the vehicle and switch on the AC from anywhere
 - Know the driving efficiency
 - Plan trips based on the charge remaining in the car
- The patented “REVive” technology with advanced intelligent feature
 - a smart phone app to remotely active a reserve that allows the driver to continue further if the battery runs low on power
- Regenerative braking system





Innovation in designing

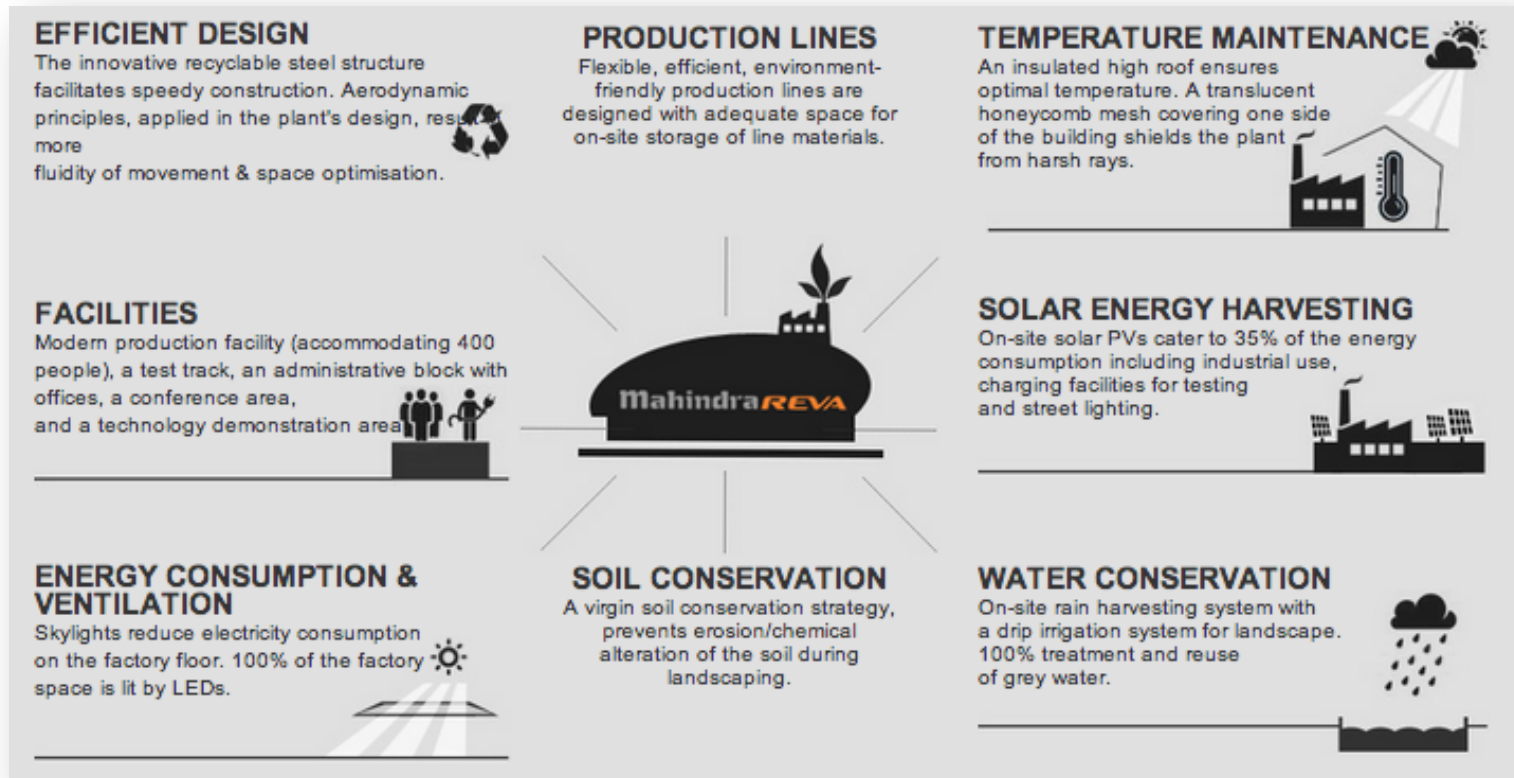
- **Features of the new-generation city car**
 - Ready for the future
 - Electricity in developing countries is produced from dirty coal
 - The car is future-ready with an electric drive that can run on solar energy, using Sun2Car technology.





Innovation in designing

- **A car that is born green:** Manufactured at India's first IGBC platinum rated eco-friendly facility in Bangalore





Future of mobility: **Clean**

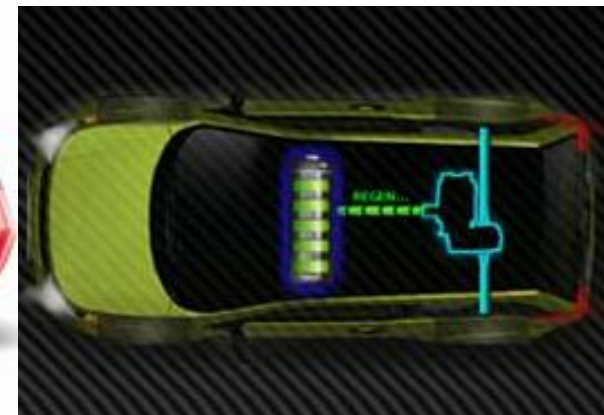


Green manufacturing

No tailpipe emission



Color impregnated body panel



Regenerative braking





Future of mobility: **Convenient**



Automatic drive

Easy home charging



Home Service



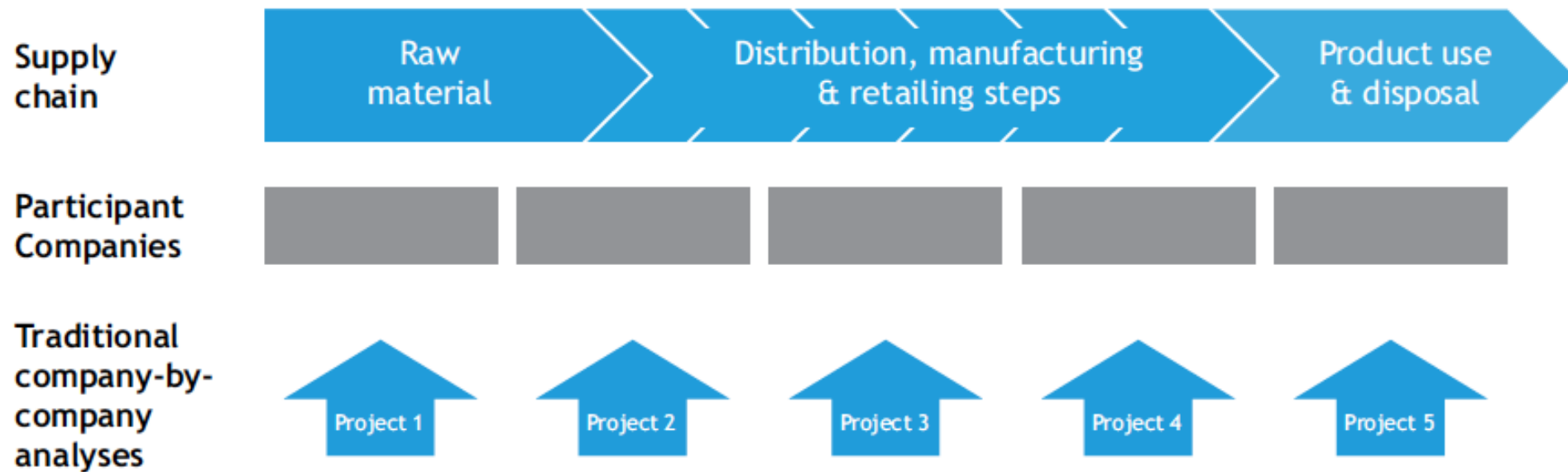
Driving range with GPS navigation





Carbon management options

- **Traditional energy efficiency and carbon management initiative**
 - Analyzes the operations of single companies or even single sites



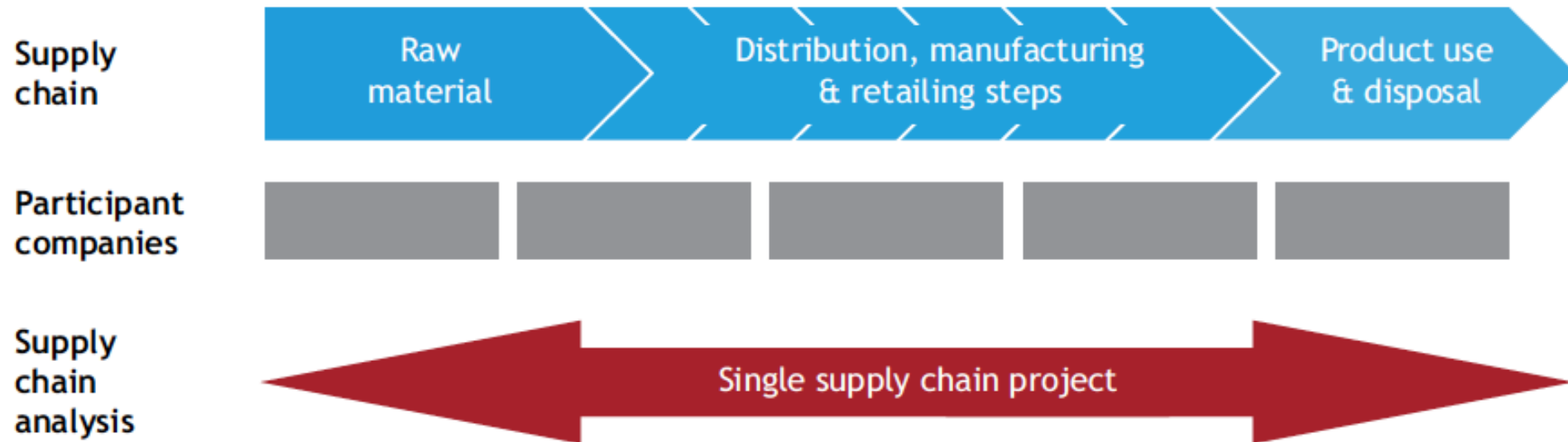
Source: Carbon Trust





Carbon management options

- **Carbon management across the supply chain**
 - Analyzes specific processes from multiple sites and multiple companies operating in a single supply chain



Source: Carbon Trust





Carbon management options

Traditional carbon management	Carbon management across the supply chain
Single participant involved	Multiple participants, starting with a “lead client”, typically a large company operating at the consumer-end of the supply chain
Analysis covering single supply chain stage for multiple products	Analysis covering complete supply chain for a single product
Companies engaged individually	Companies engaged collaboratively up and down the supply chain
Carbon savings typically come from efficiencies with each company’s operation	Carbon savings come from both internal efficiencies and from external process change and reorganization





Standards and methodologies

- **Worldwide initiatives of carbon footprinting protocols**
 - **UK: The Publicly Available Specification (PAS) 2050**
 - The Carbon Trust, DEFRA and British Standards Institute
 - **Japan: The General principles for the assessment and labeling of CFP**
 - The Japanese Ministry of Economy Trade and Industry (METI)
 - **France: Environment labeling of consumer goods, including GHG emissions**
 - AFNOR and ADEME
 - **USA: Product Life Cycle Accounting and Reporting Standard and Corporate Accounting and Reporting Standard**
 - The World Resources Institute (WRI) and the WBCSD
 - **Carbon Footprints of Products for the quantification and communication of GHG emissions associated with goods and services (ISO 14067)**
 - The International Organization for Standardization





ISO 14067 Standard

- **Objective**
 - **Support** the assessment of life cycle GHG emissions of products
 - **Enable** CFP to be reported and communicated to supply chains, consumers and other stakeholders
 - **Provide** a common basis for the comparison of results arising from the use of this standard





ISO 14067 Standard

- **Some of the benefits of ISO 14067 Standard**
 - Enhance the **credibility, consistency and transparency** of the **qualification** and **communication** of product-level carbon footprinting
 - Promote **continuous improvement** by facilitating
 - The evaluation of alternative product design and sourcing options,
 - Production and manufacturing methods,
 - Raw material choices, and
 - The selection of suppliers on the basis of a life cycle assessment
 - Facilitate the ability to **track performance and progress** in reducing GHG emissions





To conclude

- **Three-step approach for an enterprise wishing to reduce its carbon footprint**

Assess the carbon footprint by measuring emissions across the supply chain

Identify the major emissions sources across the supply chain

Prioritize emissions reduction opportunities with positive financial impacts





Thank You



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