Carbon Tax: paving the road towards carbon compliance in South Africa

Maryna Storie (*PrGISc*)

GeoInformatics, Sustainability & Disaster Risk Management

TERRA FIRMA ACADEMY
GREEN CAREER TRAINING

AECOM

*Less carbon does not mean less construction. It means constructing different **forms** of infrastructure, by different **methods**, using different **materials**.*

The aim is lower Greenhouse Gas emissions

(GHG emissions)

*Less carbon does not mean less construction. It means constructing different **forms** of infrastructure, by different **methods**, using different **materials**.*

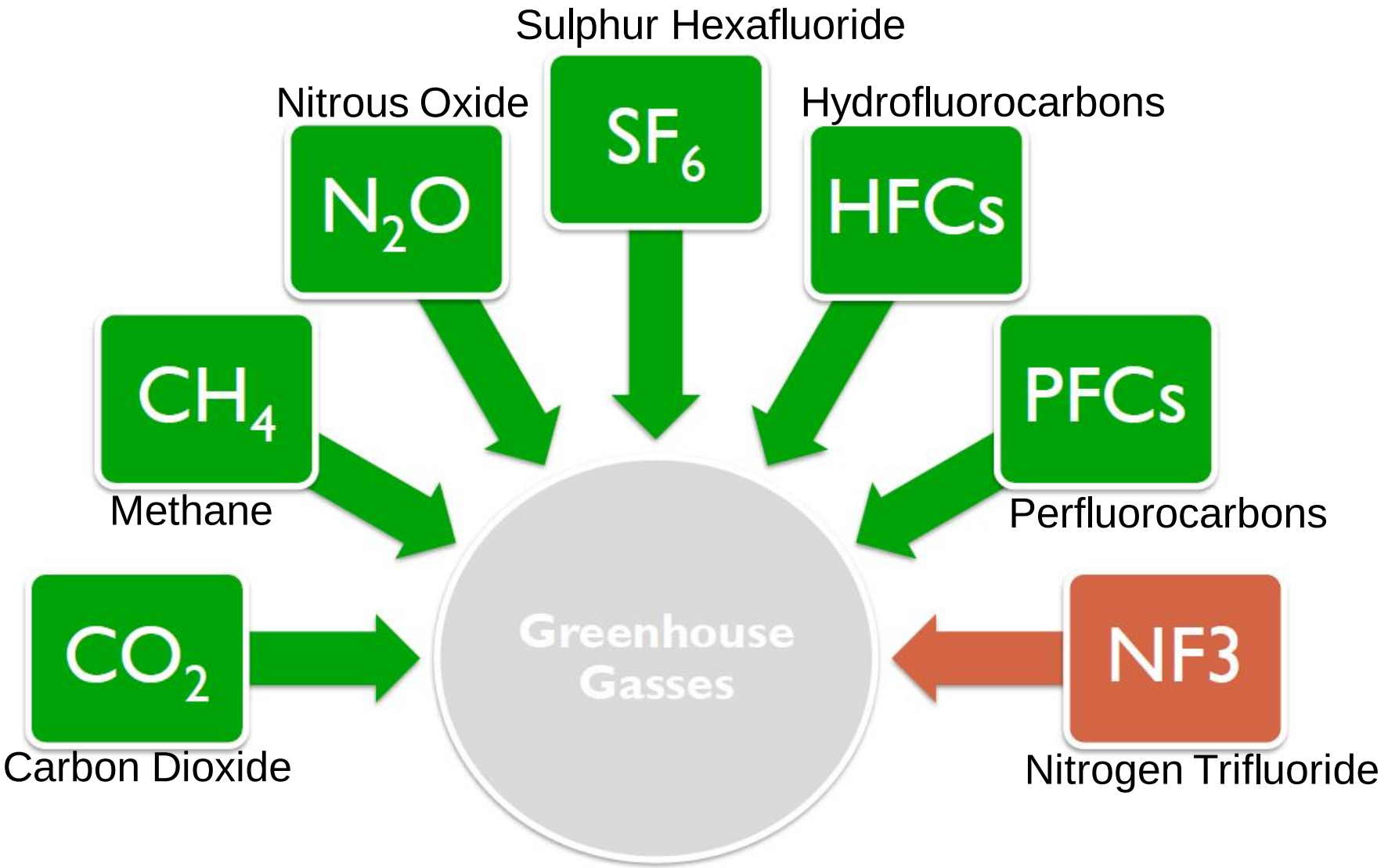
The aim is lower Greenhouse Gas emissions

(GHG emissions)

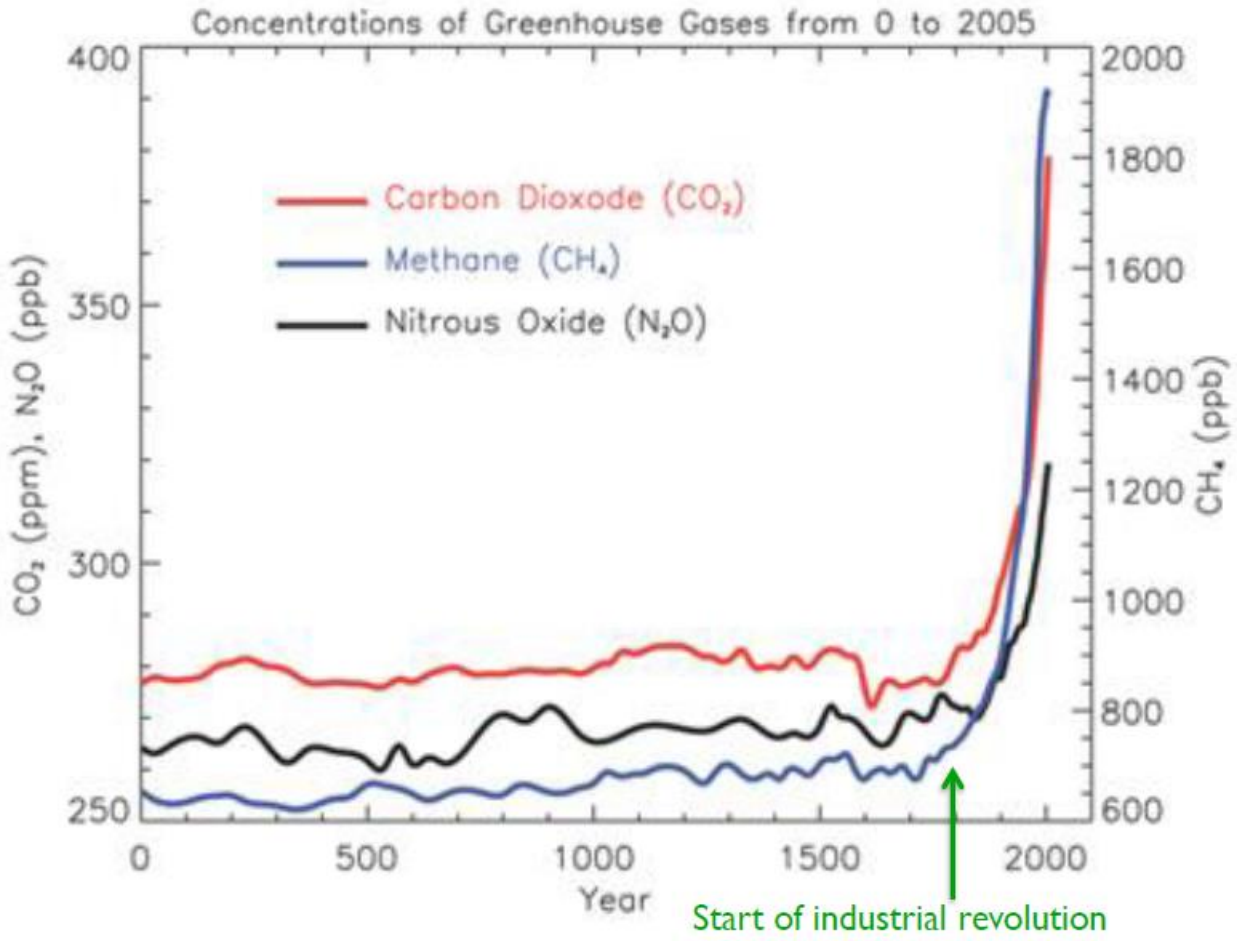
The way to get there is to start capture the data we need to calculate our GHG emissions and

report on the status, and implement opportunities for improvements.

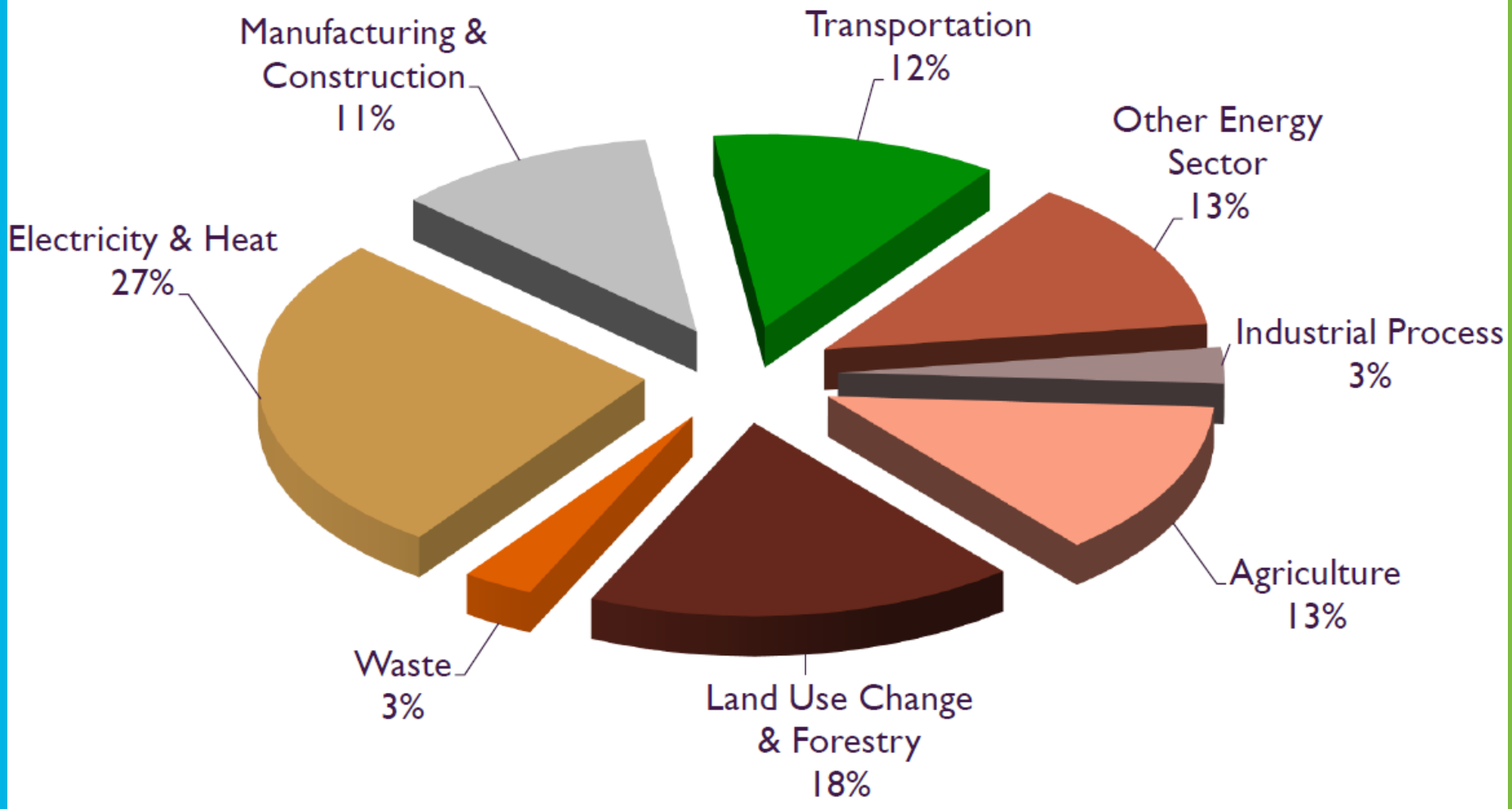
The New Seventh Greenhouse Gas



Historical CO_2 Concentration

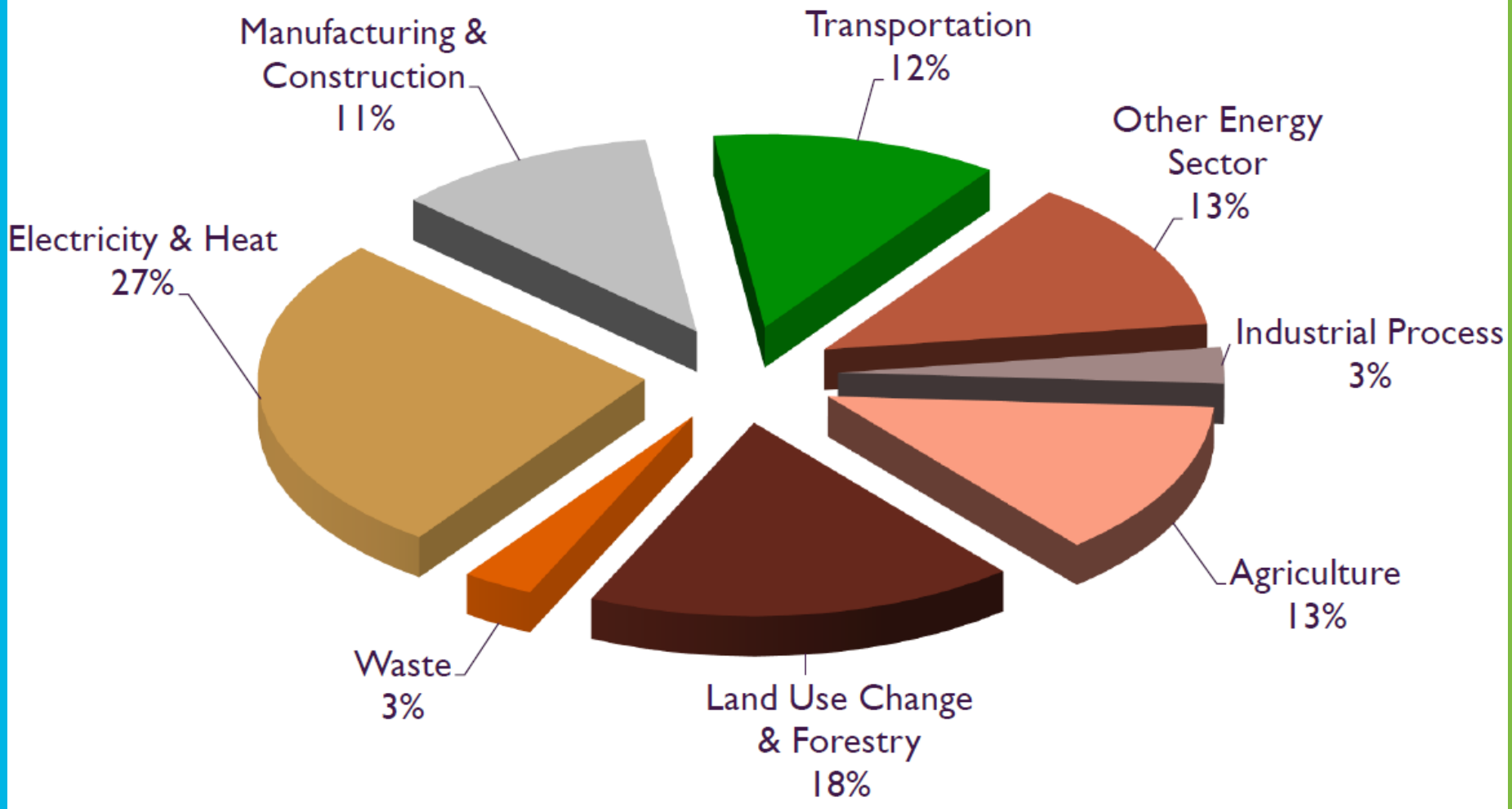


Global CO_2 Emissions



Global CO_2 Emissions

South Africa:
more electricity and heat (45%)
more industrial; less agriculture; less other)



1. Sustainability in road construction: current avenues of thinking

International Climate Change Adaptation Framework for Road Infrastructure (Client: World Road Association)

Framework to guide road agencies through:

- The identification of potential impacts of climate change on transport networks;
- The identification of potential risks and vulnerabilities;
- Understanding how to respond to risks effectively; and,
- Integrating findings into decision making and operational processes.

Operating under **any geographical, climatic, economic and environmental condition**, irrespective of locality, preparedness, resource and data availability etc.

Synthesises the best practice and knowledge available internationally into an effective and useable tool, for use by any road agency.

Developed through consultation with road agencies from China, New Zealand, Canada, the USA, Mexico, Romania, Norway and Scotland.

The Effects of Climate Change on Highway Network Policies and Standards

- Review of the impacts of climate change and extreme weather on key service areas (e.g. drainage, materials, grass cutting).
- Prioritisation of risks and development of an Adaptation Action Plan.
- Consultation with local authority.
- Good practice an innovation
- Facilitation of a collaborative approach to climate change adaptation across government spheres.
- Development of a series of measureable actions, strategies and aspirations that authorities can sign up to.

AECOM

Greenroads®

– Third-party certification for transportation projects
  - Applies to new and existing/reconstruction projects
  - Recognizes and quantifies roadway sustainability
  - Awards points for sustainable practices

What are the benefits of greening our roads?

FINANCIAL:

– Lower initial cost

– Lower lifecycle costs

– Lower user cost

– Strengthened local economies

– Higher property values

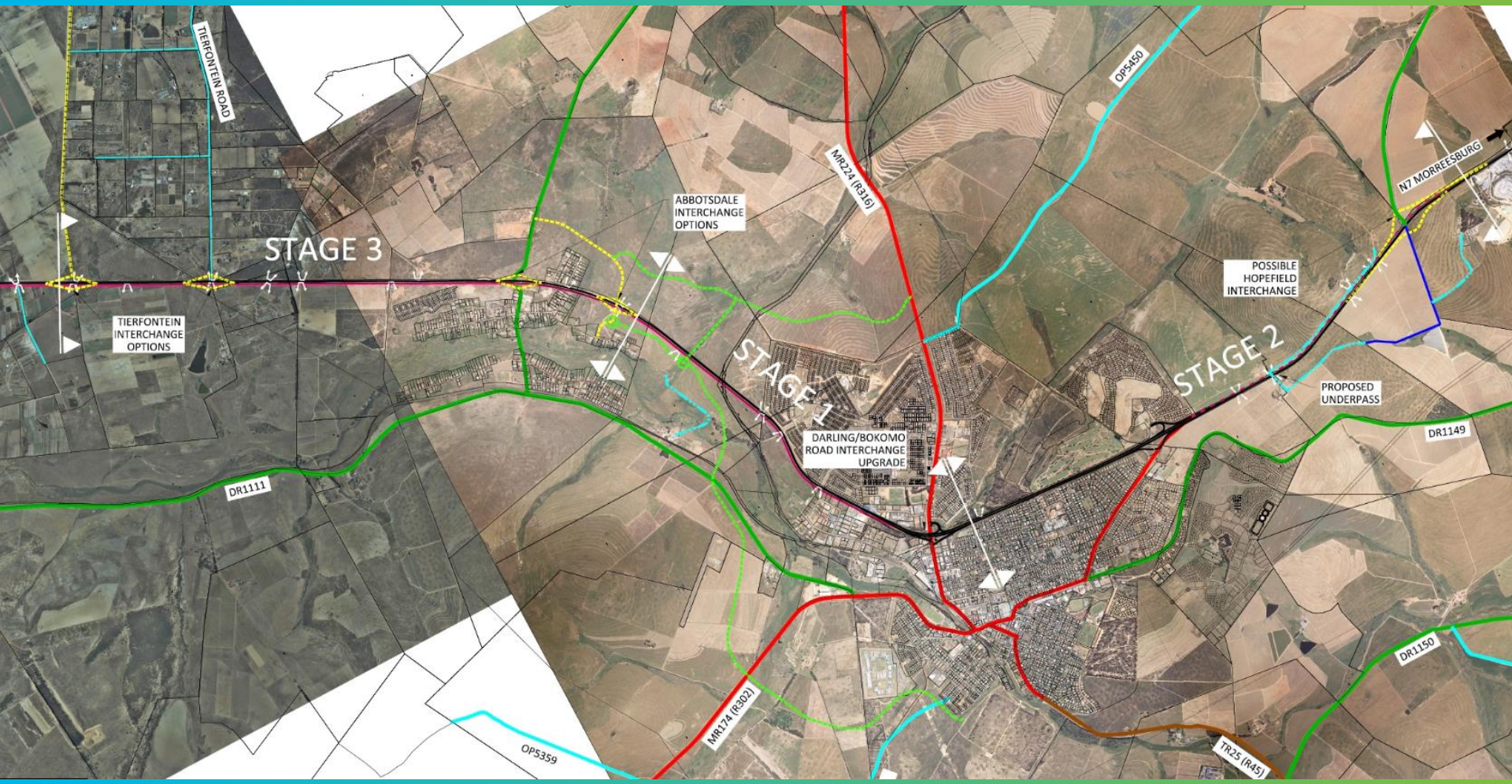
SOCIETAL:

– Healthier communities and people

– Reduced environmental impacts

SANRAL
example

N7 Phase 3: CF reporting: a Contractual obligation
Stage 1: under construction
Stage 2: design
Stage 3: design



N7 Phase 2: Out to tender

AECOM

2. Carbon Footprinting:
a) Why?

TERRA FIRMA ACADEMY
GREEN CAREER TRAINING

Applying Climate Change Knowledge- International Protocols and Conventions

- UNFCCC
- Kyoto Protocol
- SA National Climate Change Response White Paper

Why Conduct a Carbon Footprint?

Establish a baseline and carbon profile

Embark on an environmental efficiency program

Understand potential carbon liabilities

Identify opportunities

Set targets & measure performance

Enhance your brand

2. Carbon Footprinting:
b) Where is SA going?

SA Carbon Tax

- Promulgation expected mid-2016
- 5 Years “introductory” period
- Scope 1 emissions
- Report on Scope 1 & 2 emissions*

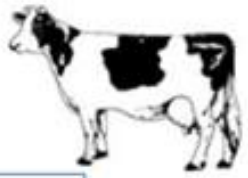
SA Carbon Tax

- Promulgation expected mid-2016
- 5 Years “introductory” period
- Scope 1 emissions
- Report on Scope 1 & 2 emissions*

- Minimum limit: 100 000 **tCO2e** per annum
- Above minimum limit: **R 120/t**, increasing amually
- Thresholds will apply and Offsets can be used to cover, in sectors OTHER than steel and cement – road construction aggregates can use offsets!

The Carbon Tax Cycle



Mining, exploration and energy production - **TAXED**

Carbon tax passed on

Cleaner technologies

Manufacturing, food production, construction supplies and utilities - **TAXED**




Innovation and efficiency

Carbon tax passed on




Consumers, households and end users – **INCREASED COSTS**

Modify consumption habits

Input costs passed on

Retailers, manufacturers, service providers, SME's, Banks etc. - **INCREASED COSTS**





2. Carbon Footprinting:
c) What is it and how does it work?

Wat is a Carbon Footprint?

“Quantity”

The **total amount** of greenhouse gases produced to **directly and indirectly** support human activities, usually expressed in equivalent tons of **carbon** dioxide (CO_2e)

Wat is a Carbon Footprint?

“Quantity”

The **total amount** of greenhouse gases produced to **directly and indirectly** support human activities, usually expressed in equivalent tons of **carbon** dioxide (CO_2e)

State your intent for Monitoring:

how far the **direct and indirect** emissions is measured from origin, and how far into future

Emission factors are important:
multiplication of emission with a local factor, based on local processes:

Emission factors are important:
multiplication of emission with a local factor, based on local processes:

Electricity: 1.015 **kgCO2e/kWh** *Emission factor*

(Eskom 2015)

(equivalent: *e* include GHG's, not just CO2)

Emission factors are important:
multiplication of emission with a local factor, based on local processes:

Electricity: 1.015 **kgCO2e/kWh** *Emission factor*

(Eskom 2015)

(equivalent: *e* include GHG's, not just CO2)

Example: $= \frac{kWh}{1} x \frac{kgCO2-e}{kWh} = \frac{200\,000 kWh}{1} x\ 1.015$

$=$ **203 000 kgCO2e**

= 203 tCO2e

INVENTORY OF CARBON & ENERGY (ICE) SUMMARY

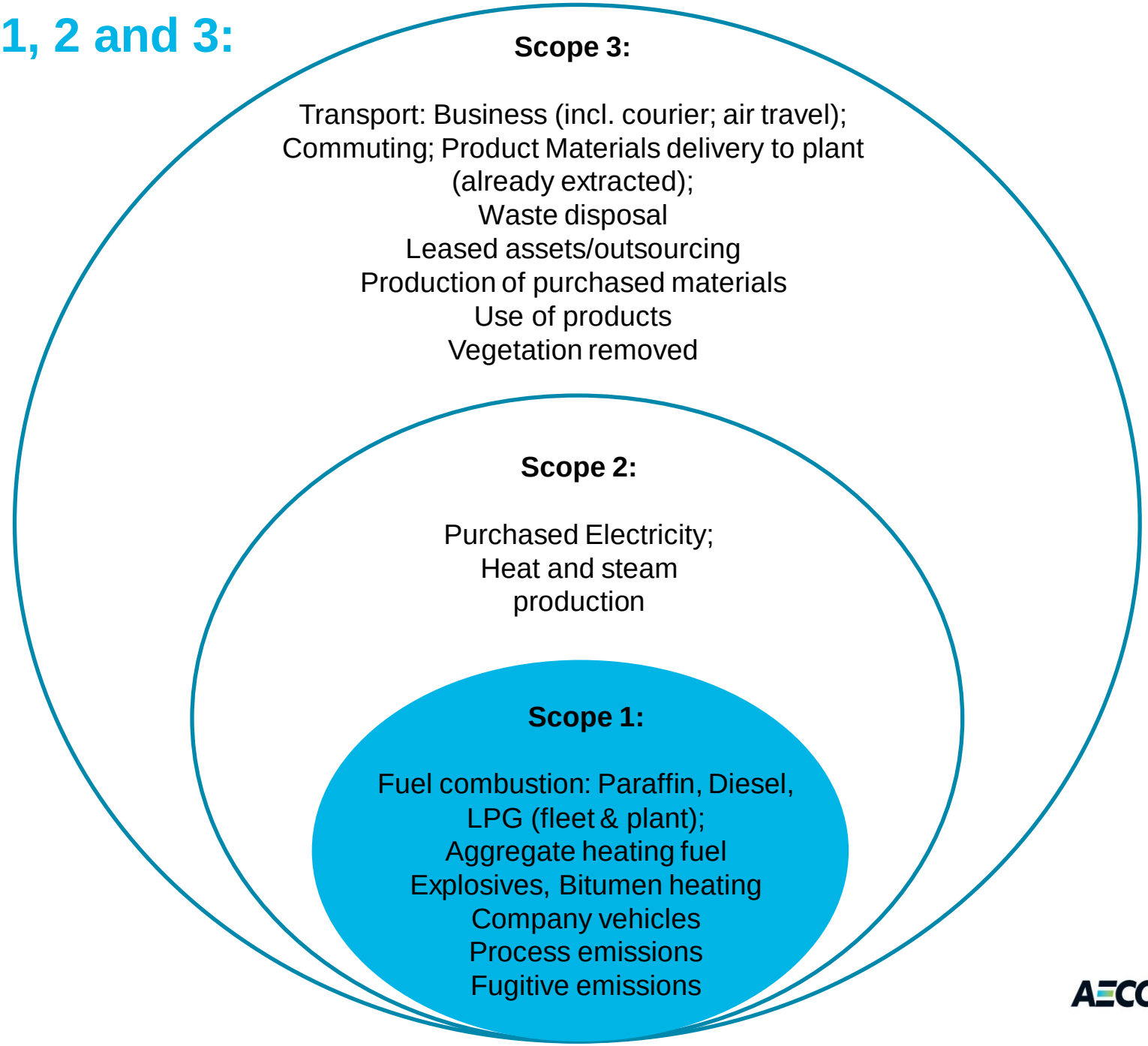
Materials	Embodied Energy & Carbon Coefficients			Comments
	EE - MJ/kg	EC - kgCO2/kg	EC - kgCO2e/kg	EE = Embodied Energy, EC = Embodied Carbon
Aggregate				
General (Gravel or Crushed Rock)	0.083	0.0048	0.0052	Estimated from measured UK industrial fuel consumption data
Asphalt				
Asphalt, 4% (bitumen) binder content (by mass)	2.86	0.059	0.066	1.68 MJ/kg Feedstock Energy (Included). Modelled from the bitumen binder content. The fuel consumption of asphalt mixing operations was taken from the Mineral Products Association (MPA). It represents typical UK industrial data. Feedstock energy is from the bitumen content.
Asphalt, 5% binder content	3.39	0.064	0.071	2.10 MJ/kg Feedstock Energy (Included). Comments from 4% mix also apply.
Asphalt, 6% binder content	3.93	0.068	0.076	2.52 MJ/kg Feedstock Energy (Included). Comments from 4% mix also apply.
Asphalt, 7% binder content	4.46	0.072	0.081	2.94 MJ/kg Feedstock Energy (Included). Comments from 4% mix also apply.
Asphalt, 8% binder content	5.00	0.076	0.086	3.36 MJ/kg Feedstock Energy (Included). Comments from 4% mix also apply.
Bitumen				
General	51	0.38 - 0.43 (?)	0.43 - 0.55 (?)	42 MJ/kg Feedstock Energy (Included). Feedstock assumed to be typical energy content of Bitumen. Carbon dioxide emissions are particularly difficult to estimate, range given.

Example: emission factors are available for every type of raw material/mix

(Inventory of Carbon and Energy Use: ICE: 2011)

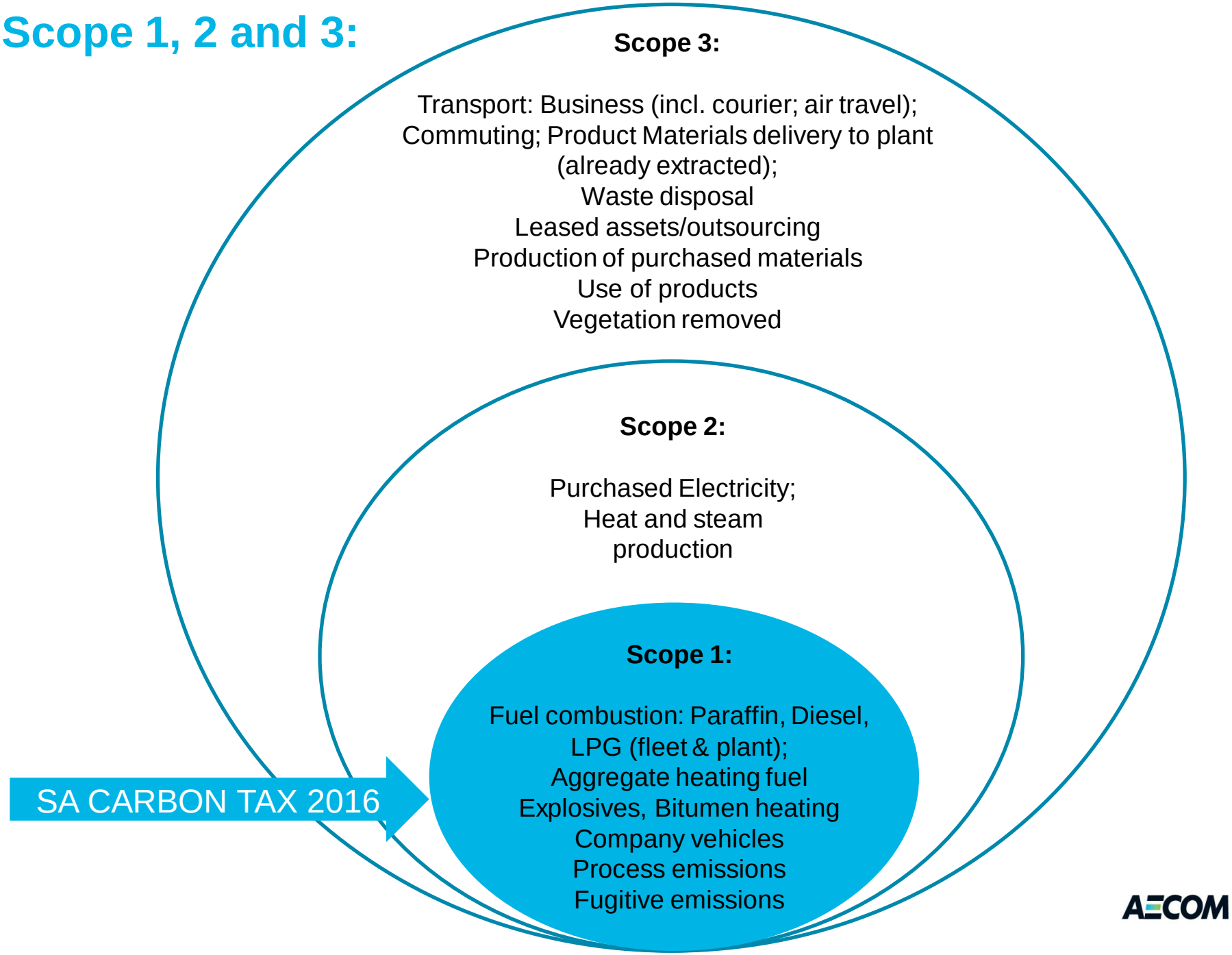
2. Carbon Footprinting:
d) Scopes and Data requirements

Scope 1, 2 and 3:

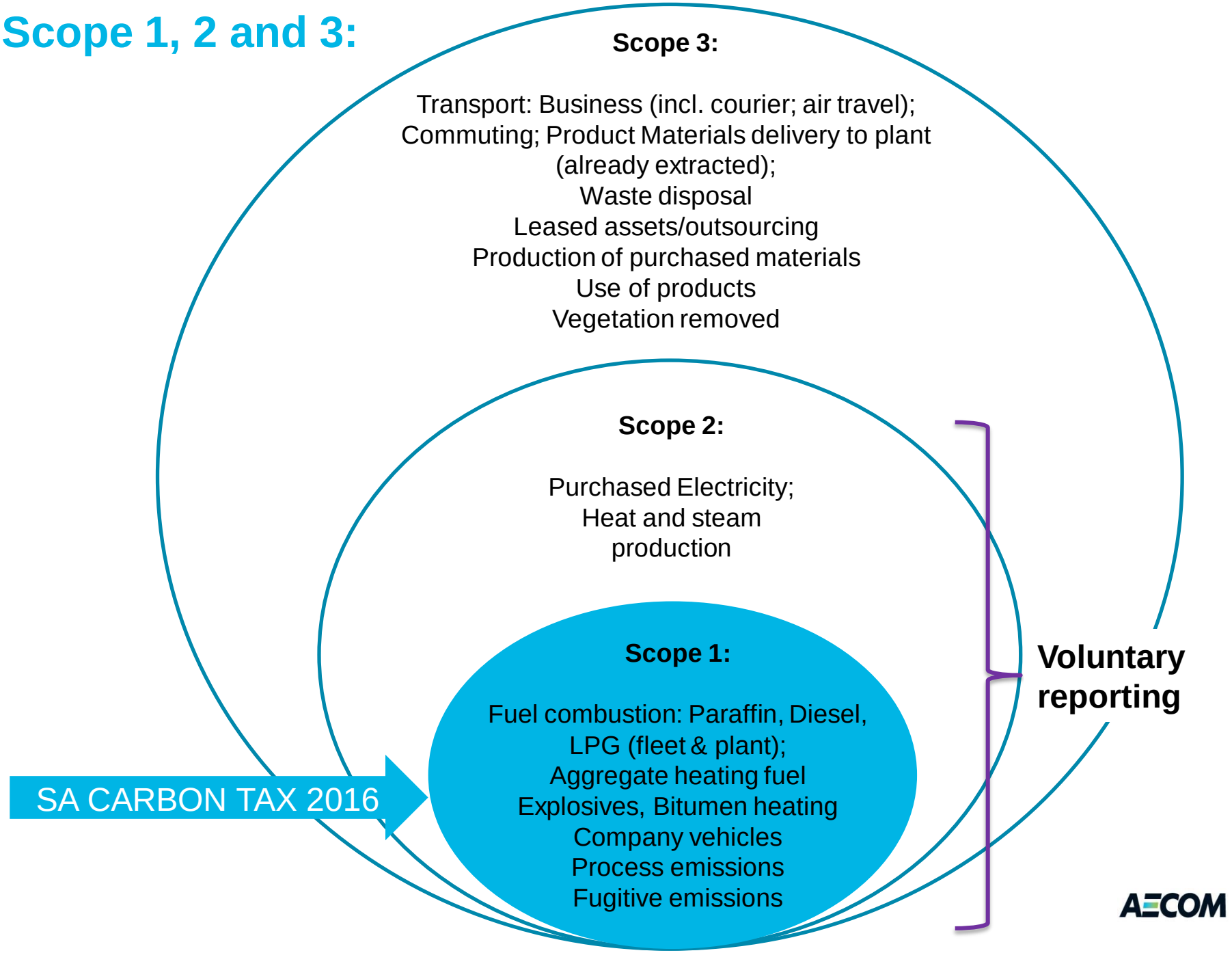


AECOM

Scope 1, 2 and 3:



Scope 1, 2 and 3:



- **Say what you are reporting on**

- State how data is collected and how the calculations are done (metadata)

Sources for CO_2e emissions during a road cycle

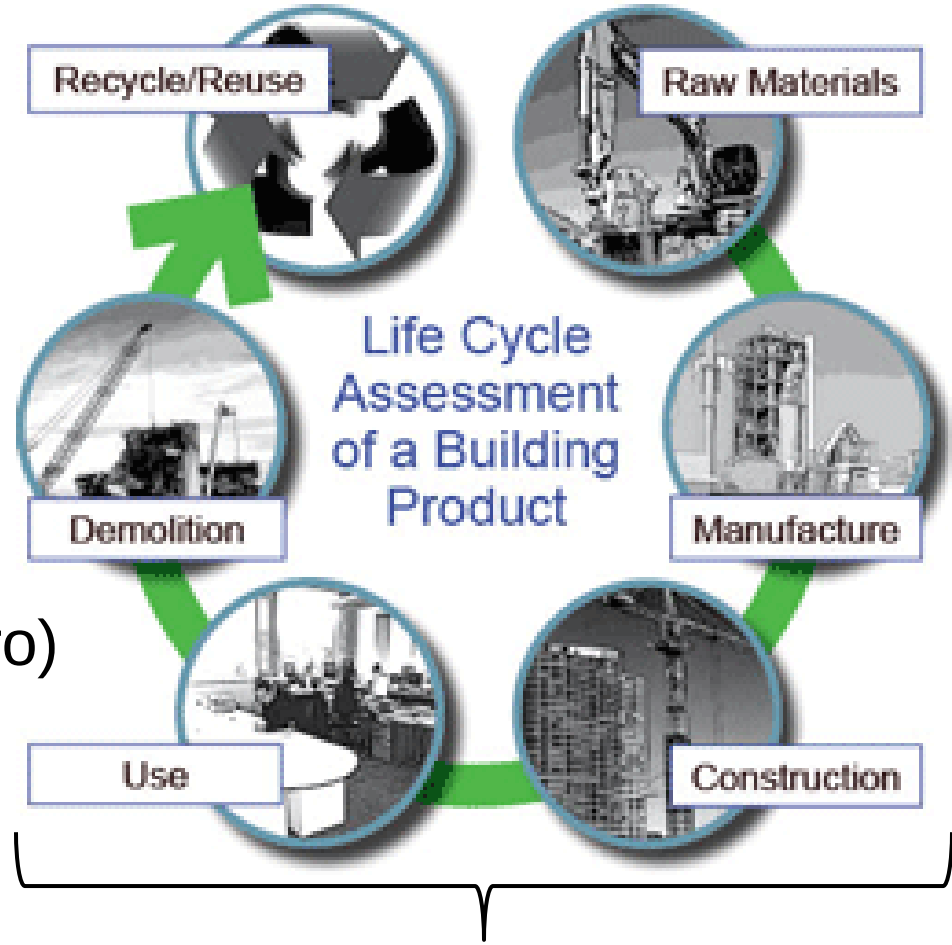
Benefits: 4 Tiers

1 Carbon Footprinting

2 Carbon Disclosure Project
(Voluntary Annual Reporting)

3 Carbon Neutrality
(purchase offsets to get to zero)
(Strategic Market Leadership)

4 Carbon Trading
(Profit-driven
emission offsets)



Asset Management > Auditing

2. Carbon Footprinting:
e) Tools to do calculations with

Variety of Calculators available:

- Refined Bitumen Association Life cycle inventory carbon calculator
- European Commission LCA http://lca.jrc.ec.europa.eu/lcainfohub/introduction.vm
- GHG Protocol Initiative www.ghgprotocol.org/calculation-tools/all-tools
- *asPECT:* Asphalt Pavement Embodied Carbon Tool (Asphalt Institute)

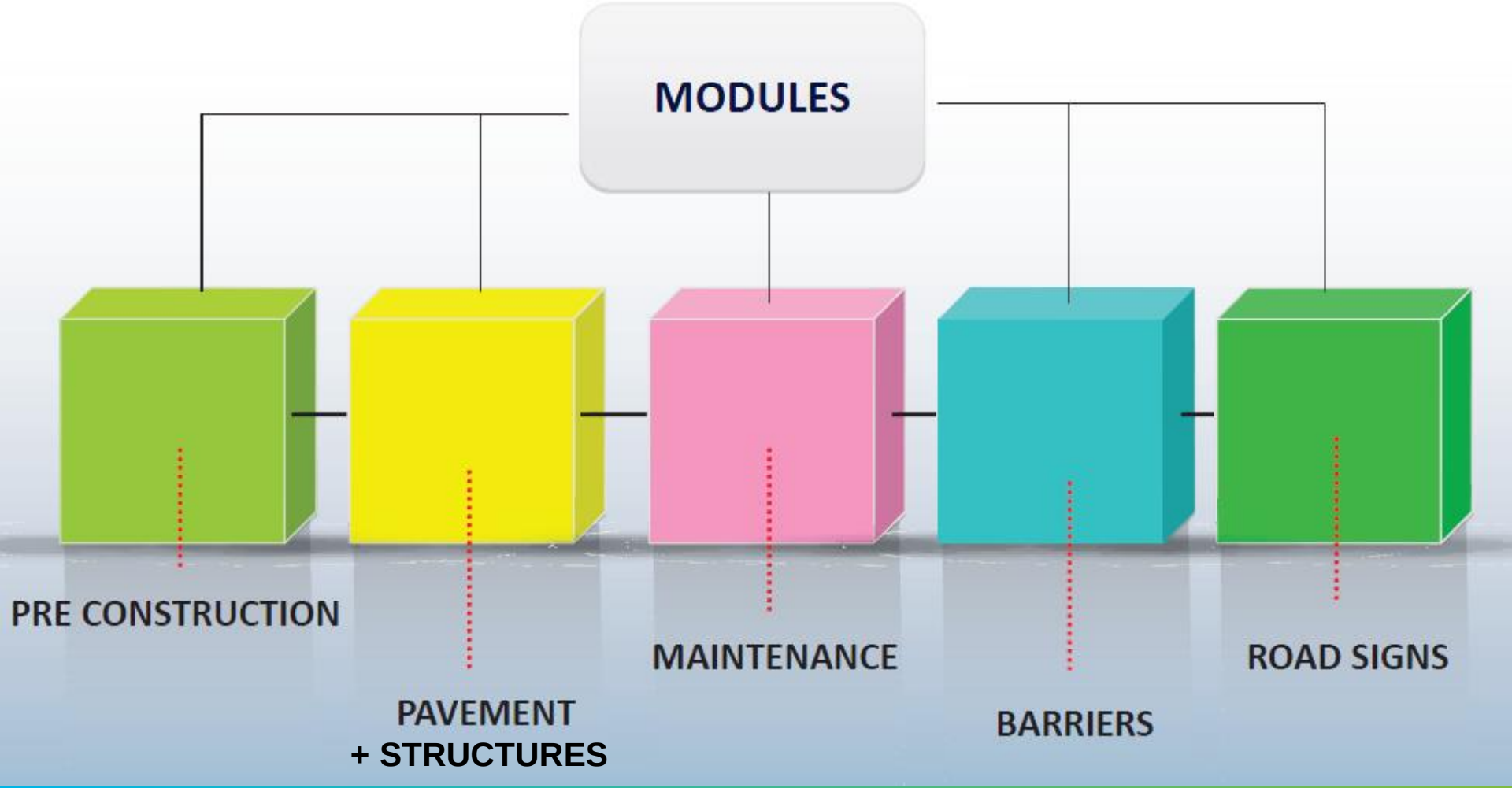
  http://sustainabilityofhighways.org.uk/
- SABITA Bitumen Energy/Carbon Footprint Calculator (CSIR)
- *Changer:* International Road Federation & AECOM
- **WLCO$_2$T** (URS AECOM's whole Life Cost & Carbon Measurement Tool, measures the whole life **cost** and whole life **CF** of alternative maintenance strategies for pavement assets over a 60-year analysis period
- *.xls*

Regardless of which calculation tool is used…

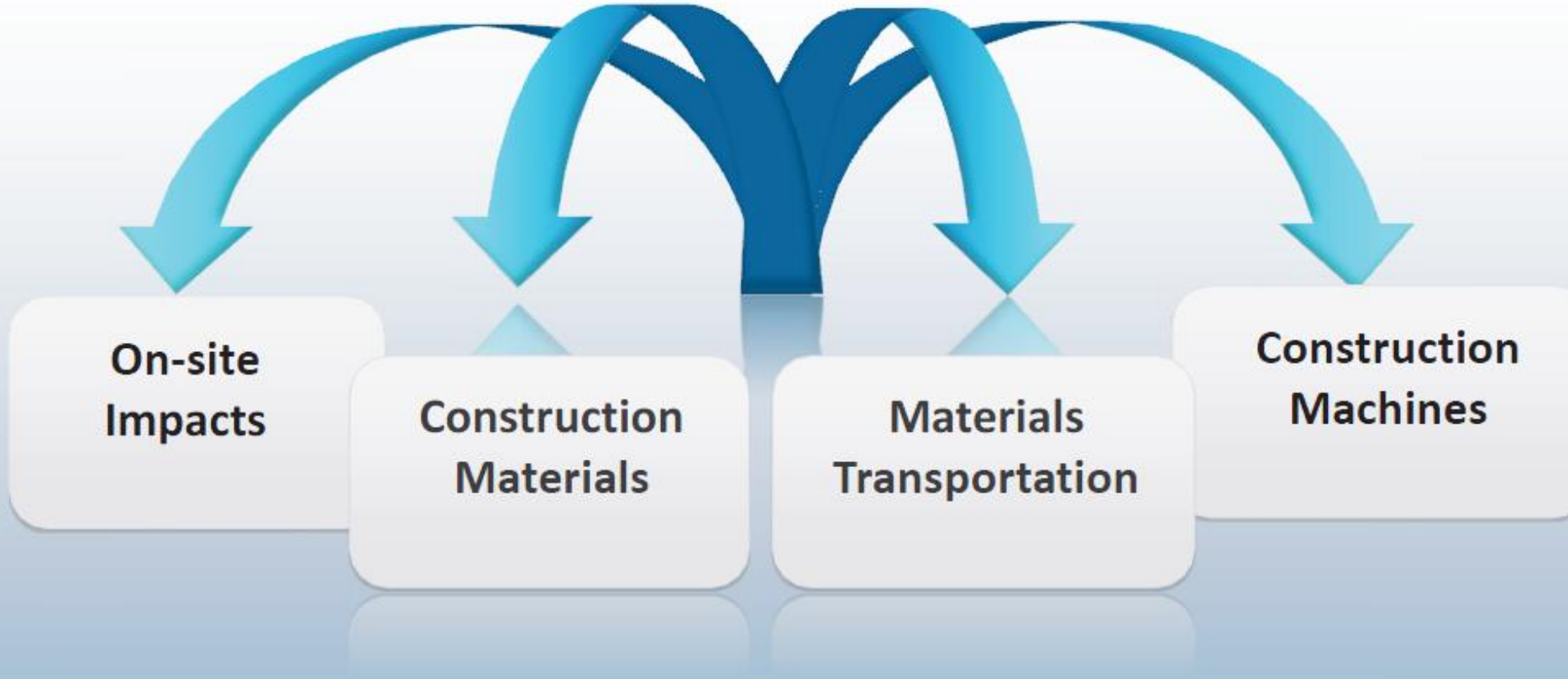
the decision making process re: Boundary and Data that is made BEFORE using any tool is critical

CHANGER
Greenhouse Gas Calculator

INTERNATIONAL ROAD FEDERATION
FEDERATION ROUTIERE INTERNATIONALE



PAVEMENT + STRUCTURES



DATA:

1. Determine the **aim and objectives** for the project/company/entity
2. **What should be measured** to achieve the **Boundary and Scope**
3. **How** should it be measured
4. **Frequency** of measure
5. Emission factors, Assumptions and Limitations

Thank You

maryna.storie@aecom.com

cell: 083 306 2804

TERRA FIRMA ACADEMY
GREEN CAREER TRAINING

AECOM