INTRODUCTION TO Carbon footprints

Mike Berners-Lee

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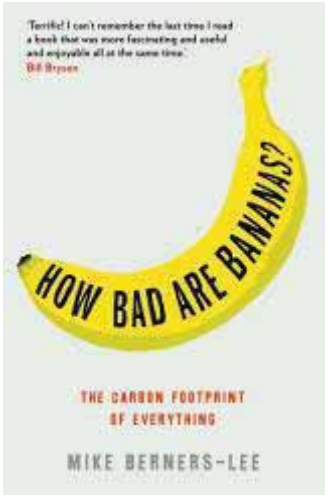
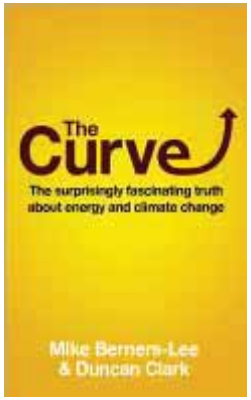
QUICKLY ABOUT ME





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Carbon Management with BT, Manchester City Council, Various Local Authorities, Lancaster University, , Taylor Wimpey, Booths supermarkets, Lake District National Park Authority, Eden Project, Guardian, etc...

WHAT'S COMMING UP

- Context
- Carbon Footprints
- Methods
- Examples
- IT Carbon

A TRICKY CHALLENGE FOR GLOBAL SOCIETY

We are OK at managing this kind of impact…

…but now we have to manage this kind too

TYPES OF EMISSIONS AND IMPACTS

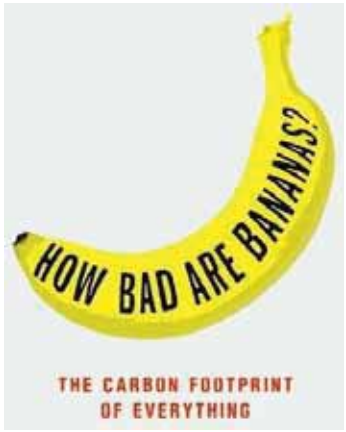
Direct
(Scope 1)

Electricity generation
(Scope 2)

Indirect
(Scope 3)

WE NEED A CARBON INSTINCT LIKE WE HAVE A MONEY INSTINCT

A BIT ABOUT CARBON FOOTPRINTS



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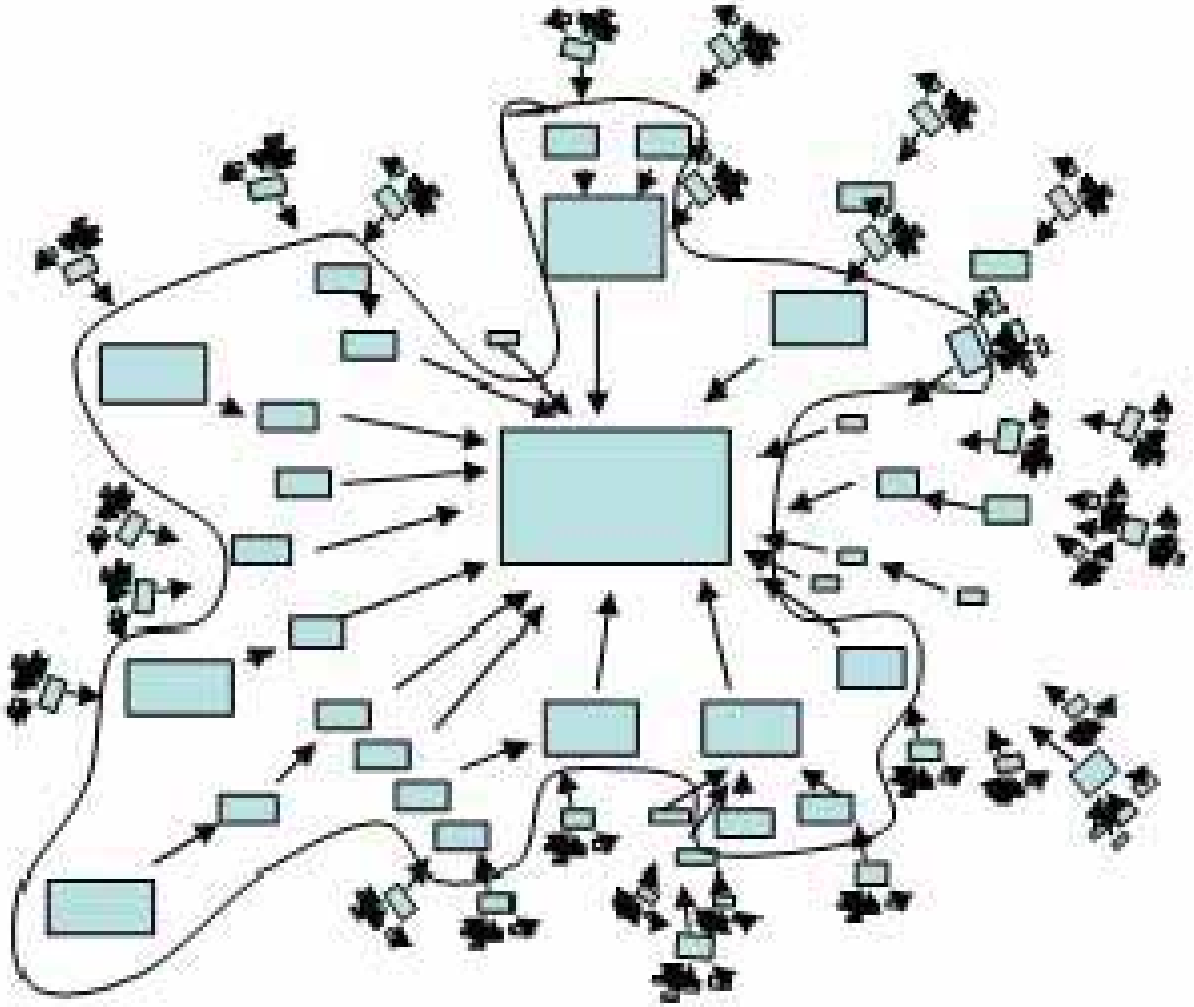
A CHOICE OF MEASURES

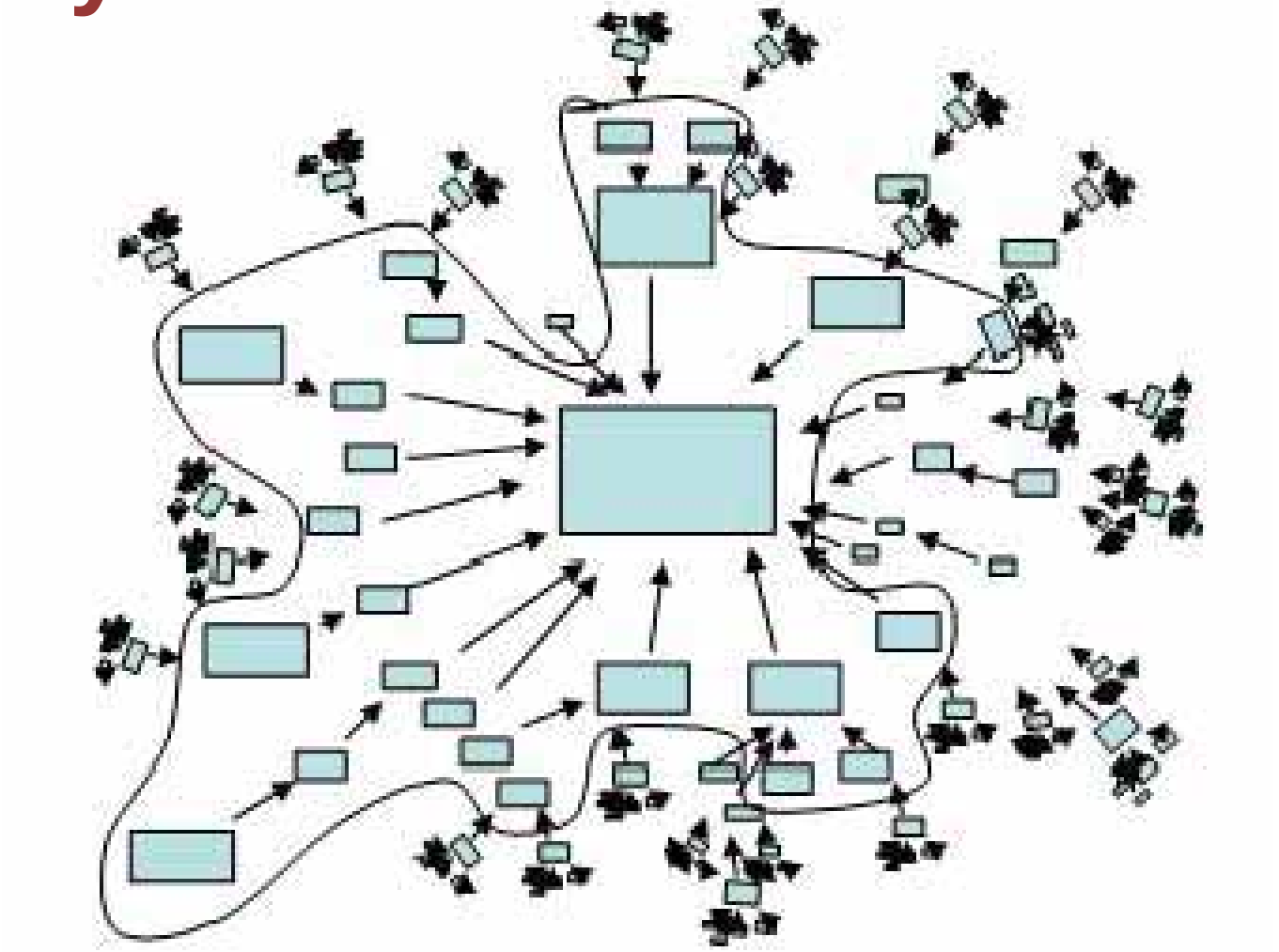
- Direct carbon emissions
- Direct greenhouse gases (CO_2e)
  - CO_2
  - Methane
  - Nitrous oxide
  - Refrigerant gasses
  - Others
- CO_2e footprint: including supply chains
- Other environmental and sustainability criteria

SUPPLY CHAINS ARE COMPLICATED

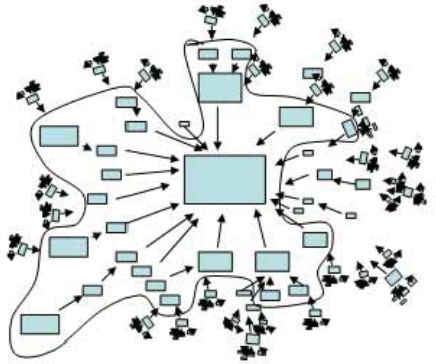


CARBON FOOTPRINTS ARE LIKE THE FIRST MAPS – AND DON’T LET ANYONE TELL YOU OTHERWISE !

Process Based Life Cycle Analysis



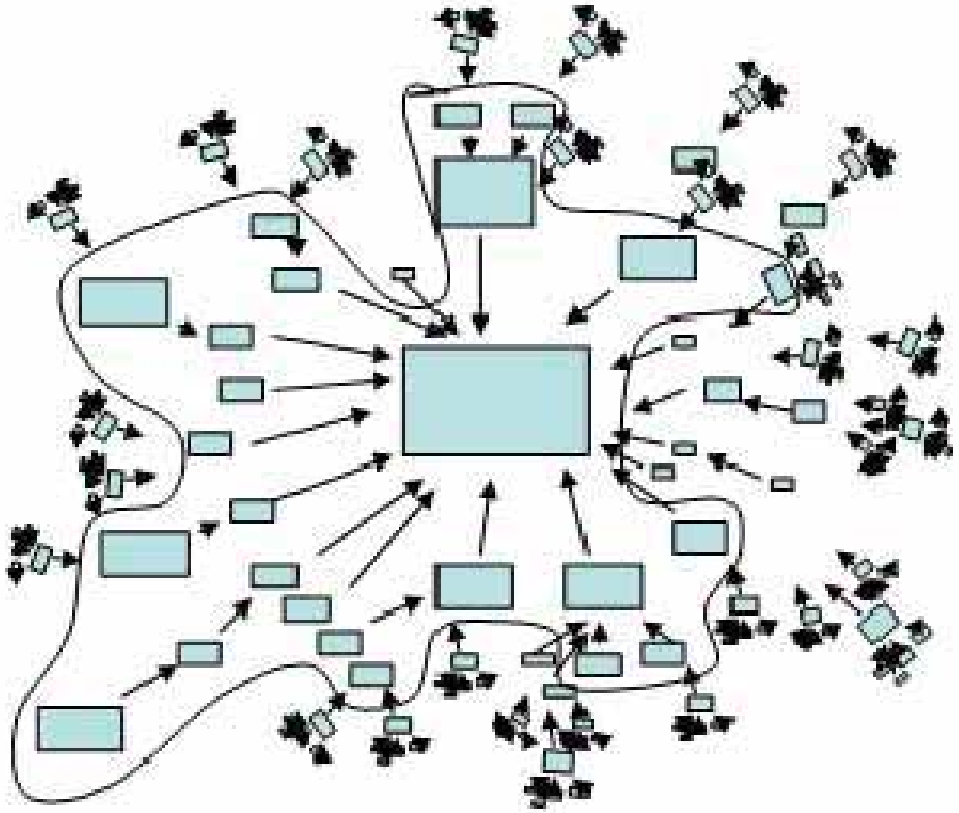
Process Based Life Cycle Analysis



- Bottom up: On your hands and knees groping around
- Hard work
- Different assumptions yield different results
- Always has arbitrary boundaries
- Hard to know the significance of omissions
- Tends to underestimate
- Accuracy often over stated.
- Has potential for specificity but in reality ends up relying on generic datasets

- *Can* be powerful for identifying specific hot-spots in a supply chain.
- Inferences can also be made about other similar supply chains.
- Requires huge resources to do properly.

PAS 2050 is a standard for Process based life cycle analysis of products



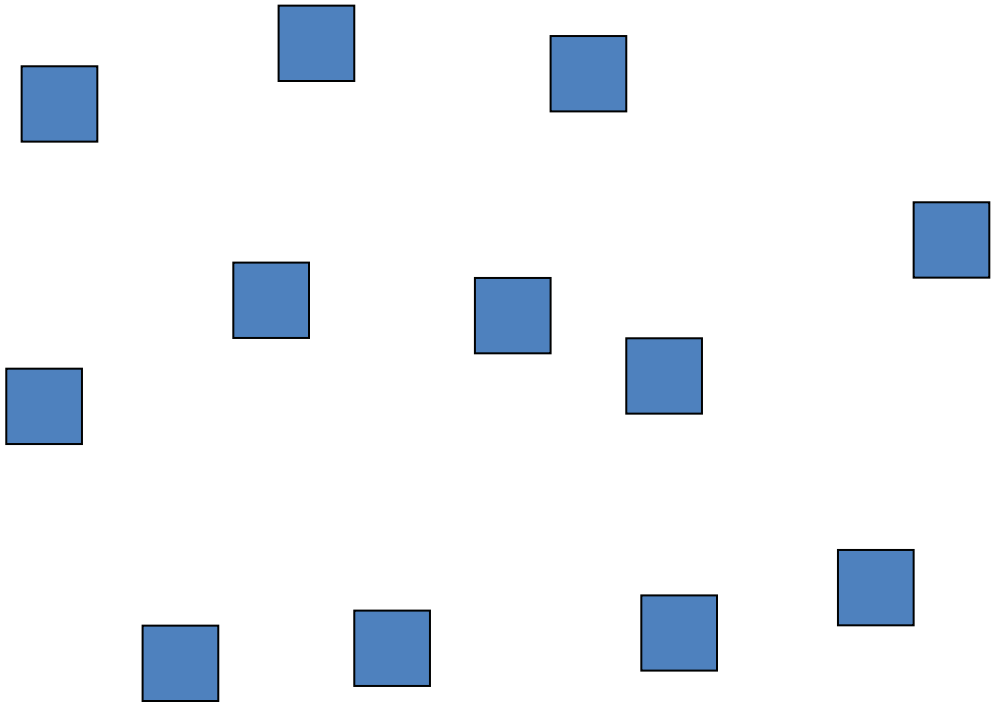
PAS 2050 – Review of methods

"Experts highlighted particularly two weaknesses of PLCA: cost and labour intensity of carrying out a PLCA and the system boundary problem … "system cut-off" is unavoidable in PLCA …The cut-off criteria suggested by ISO can be misleading and do not provide a satisfactory basis for a transparent system boundary selection…. The (resulting) truncation error is potentially very large. …

"…This is further aggravated when restrictions are imposed on the budget as typical in simplified PLCA approaches. Such simplified approaches usually fail to reliably reproduce results from detailed PLCA . However, only simplified PLCAs work under tight budget constraints required for the PAS to be applicable to organisations of all sizes. This seriously limits the usefulness of PLCA for the PAS development."

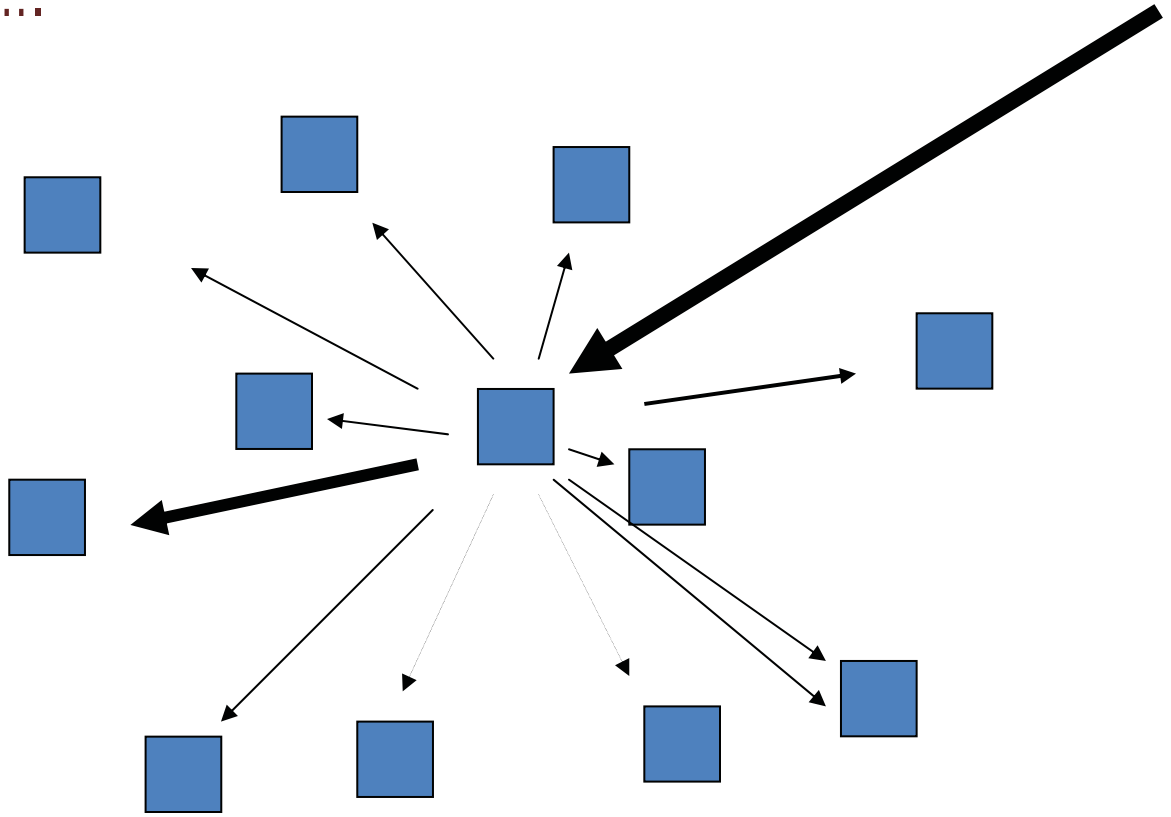
INPUT OUTPUT ANALYSIS

Looks at the whole economy divided into industry sectors.



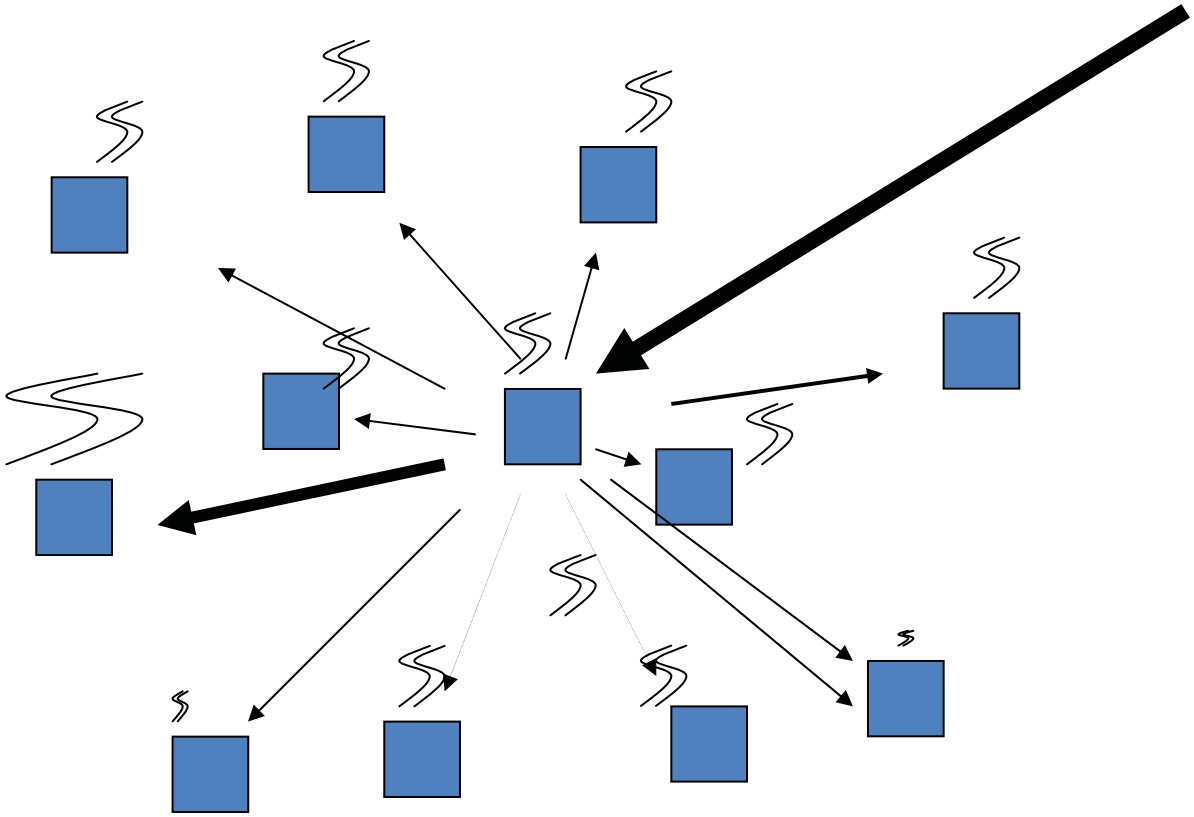
INPUT OUTPUT ANALYSIS

Demand for products stimulates output across the economy….



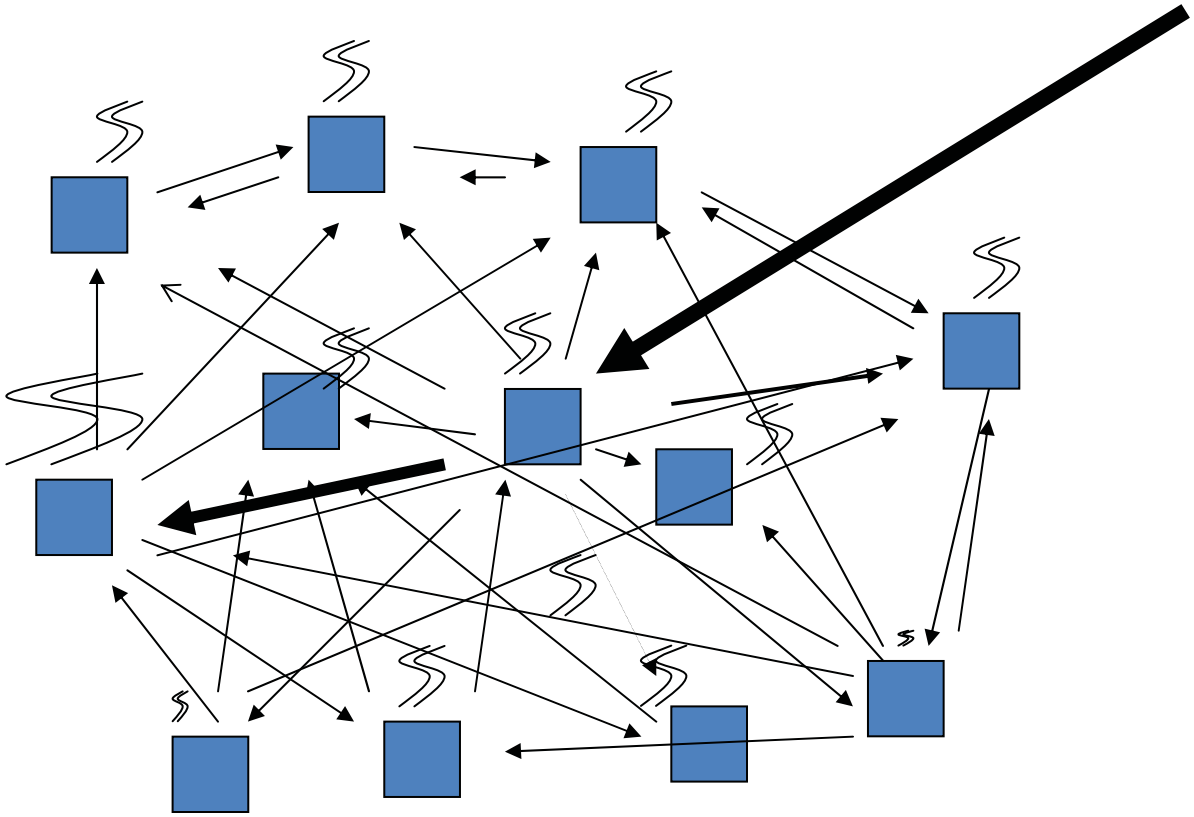
INPUT OUTPUT ANALYSIS

…. causing both direct and indirect emissions…



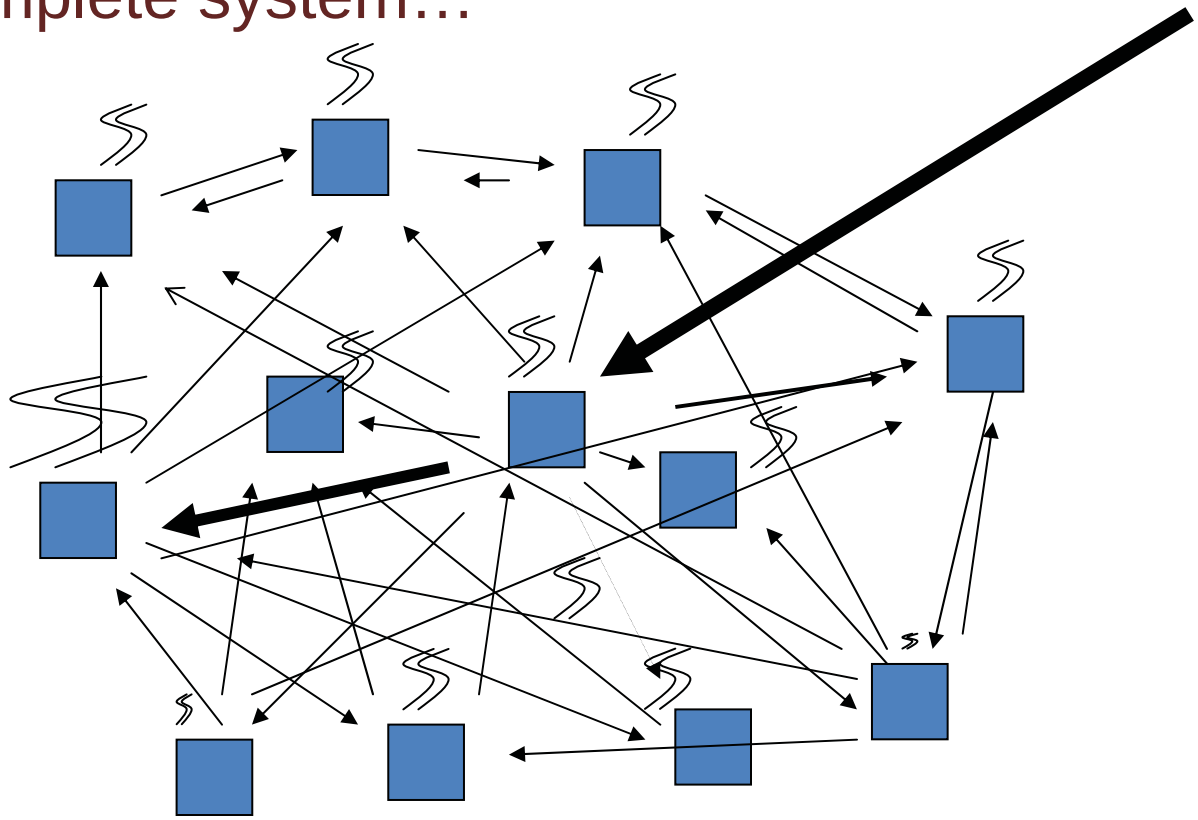
INPUT OUTPUT ANALYSIS

…. the ripple effects are endless…



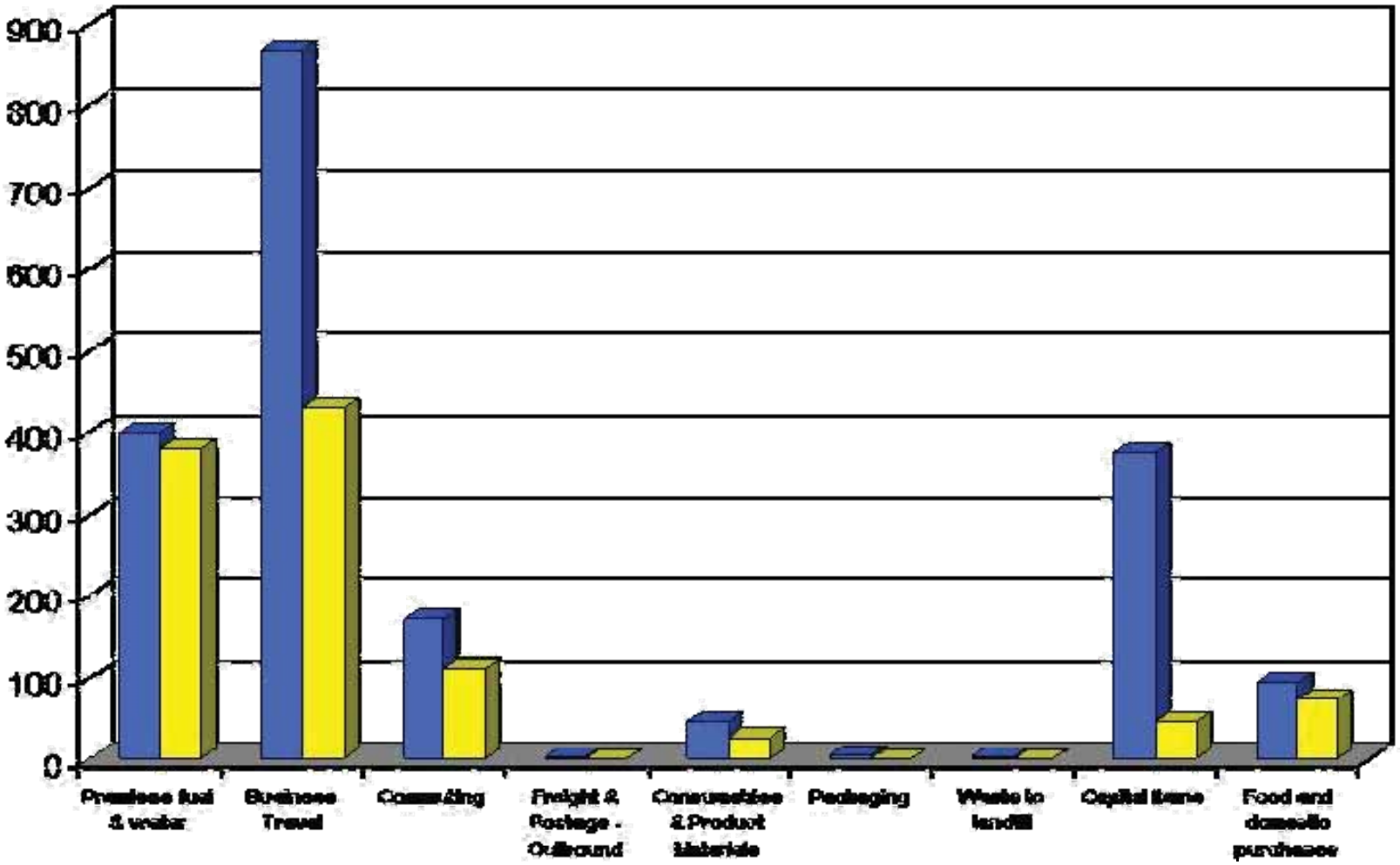
INPUT OUTPUT ANALYSIS

…. the ripple effects are endless… but can be modelled as a complete system…



…without systematic underestimation

DIFFERENT METHODOLOGIES GIVE DIFFERENT RESULTS



SOME FOOTPRINTS ...

MANKIND: 50 BILLION TONNES CO2E PER YEAR

HONG KONG RETURN: 4.6 TONNES

Low 3.4 tonnes

Average
4.6 tonnes

High 13.4 tonnes

Economy

First class

DRYING YOUR HANDS: 10G

Low 0 g

Let them drip

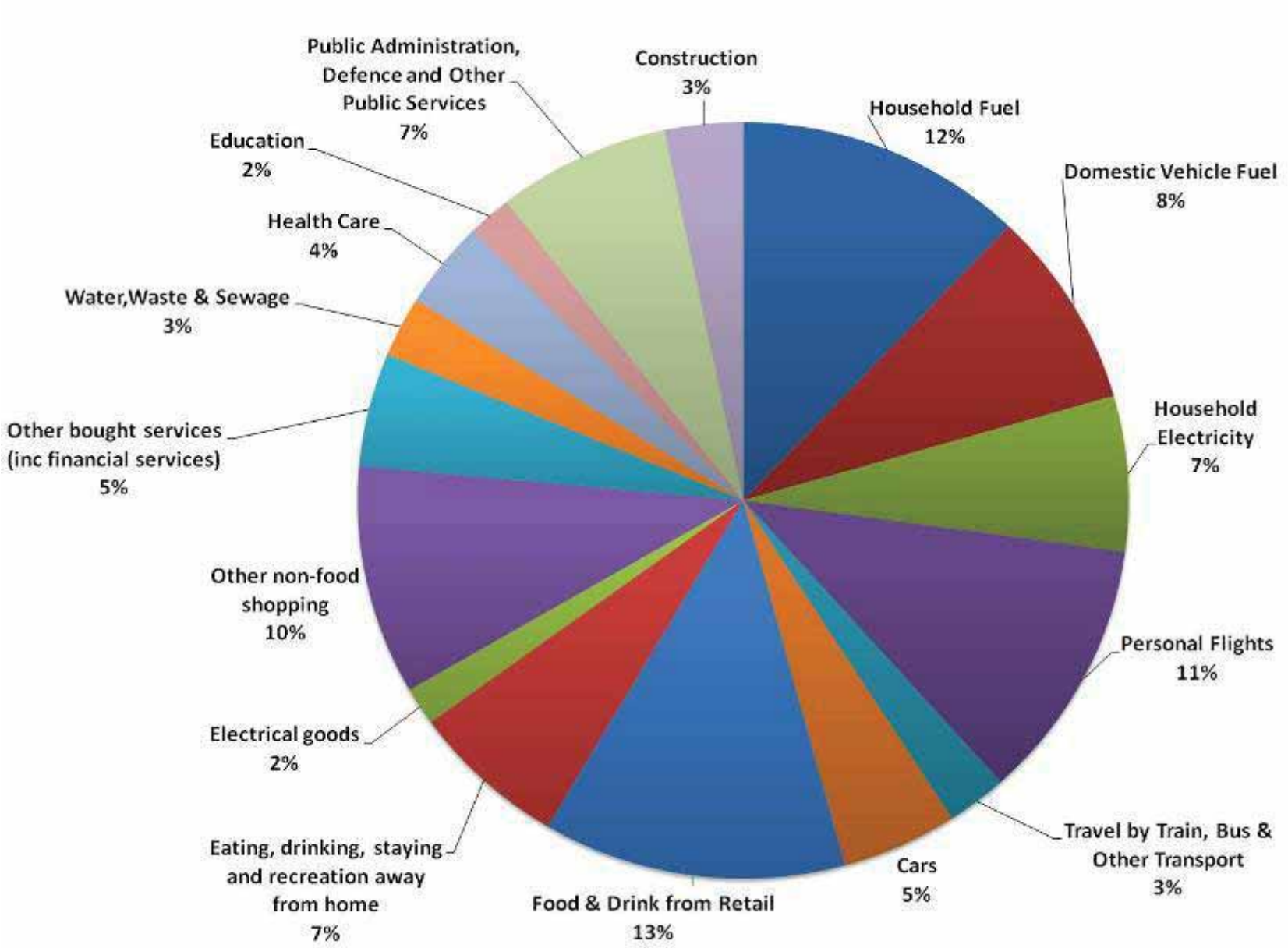
Average 10 g

Paper towels

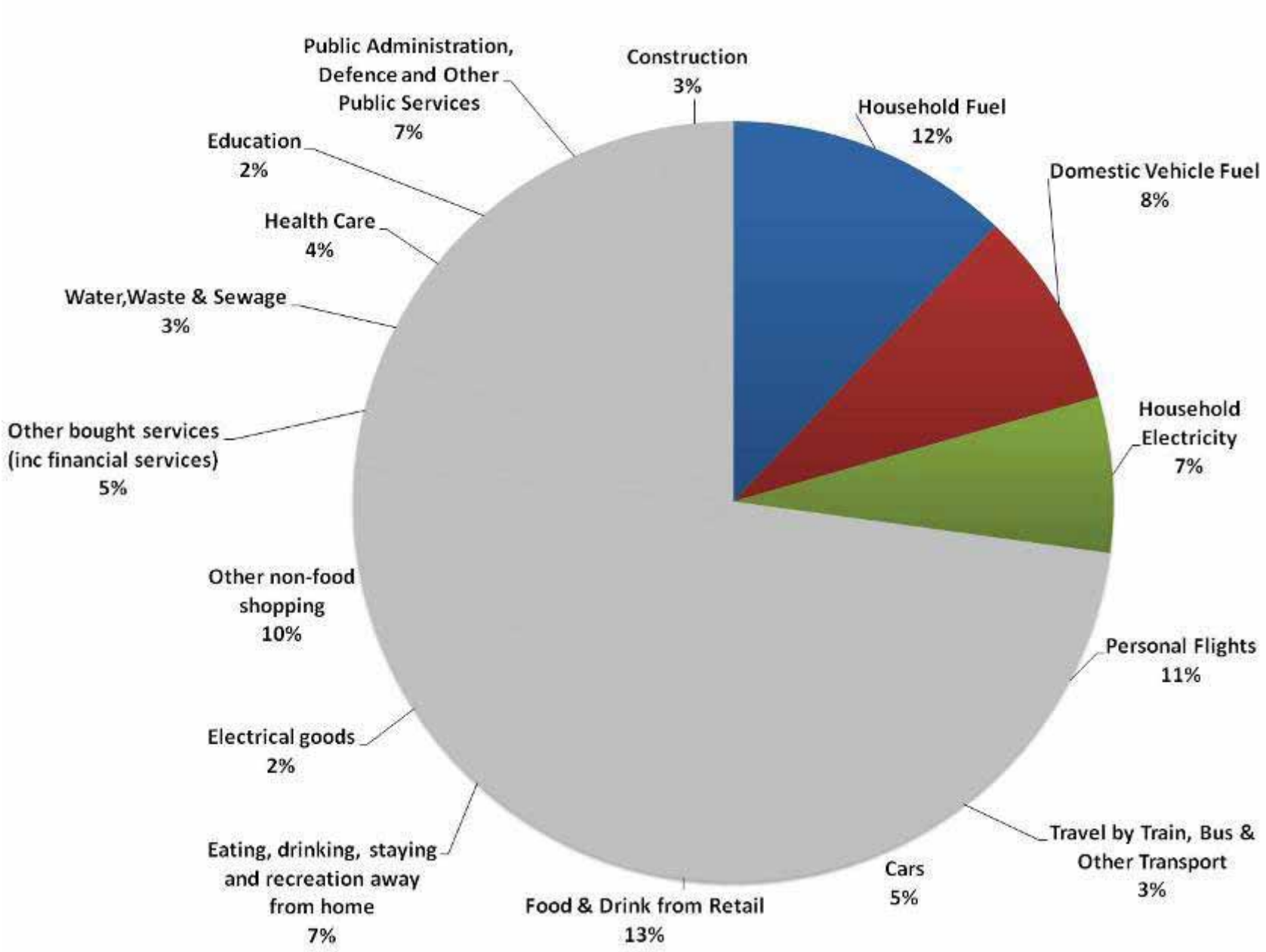
20g typical hand drier

TYPICAL MANCHESTER RESIDENT: 15.7 TONNES CO2E PER YEAR

AVERAGE GREATER MANCHESTER RESIDENT: 15.7 T PER PERSON



…OF WHICH DIRECT PLUS ELECTRICITY MIGHT ACCOUNT FOR ABOUT 30%



LONDON TO GLASGOW RETURN

120 kg CO_2e

53 kg CO_2e (by Banana power) to 2.3 tonnes (Peruvian asparagus power)

330 kg CO_2e

500 kg CO_2e

CARS

Basic Citroen C1	Ford Mondeo	Top Spec Landrover
		
6 tonnes CO_2e	17 tonnes CO_2e	35 tonnes CO_2e

ASPARAGUS (250G PACK): 2KG

Low
125 g

Average
2 kg

High
3.5 kg

Local In-season

Air freighted from Peru

A RED ROSE:

Zero

350g: Flown from Kenya

High 2.1 kg

From your garden

Hot-housed in Holland

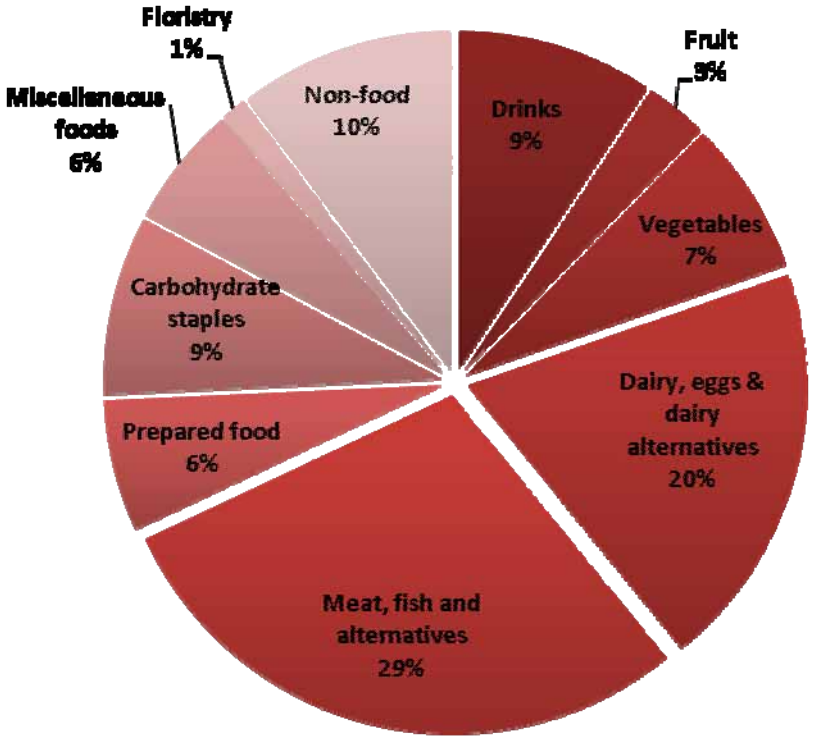
RICE

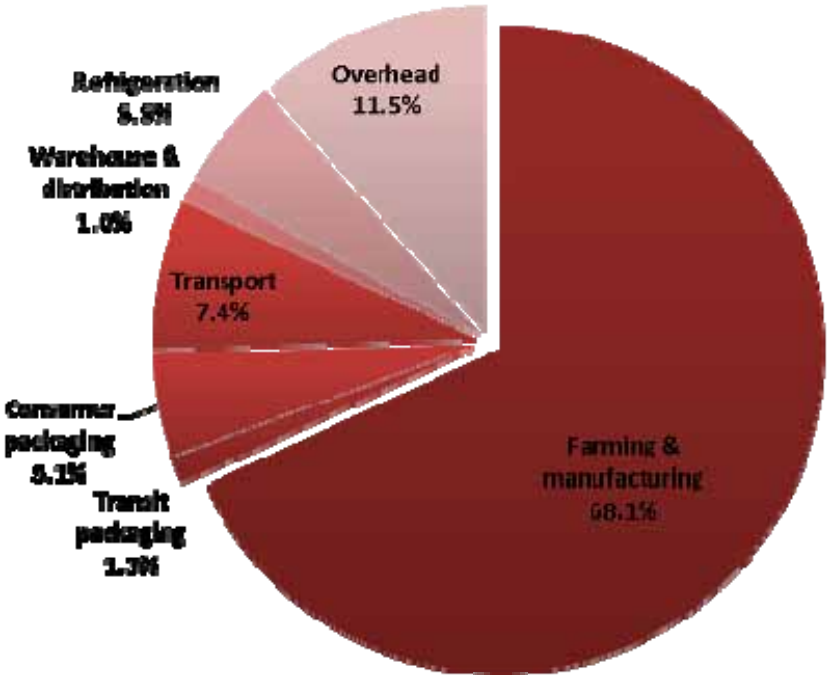
Efficiently produced:
2.5kg CO_2e

Average:
4 kg CO_2e

Inefficiently produced with excessive fertiliser:
6.1 kgCO_2e

BREAKDOWN OF TOTAL FOOTPRINT OF BOOTHS SUPERMARKETS





HAVING A CHILD: 373 TONNES

Low
100 tonnes

Average

2000
tonnes

A BURGER: 2.5KG

Low
1kg

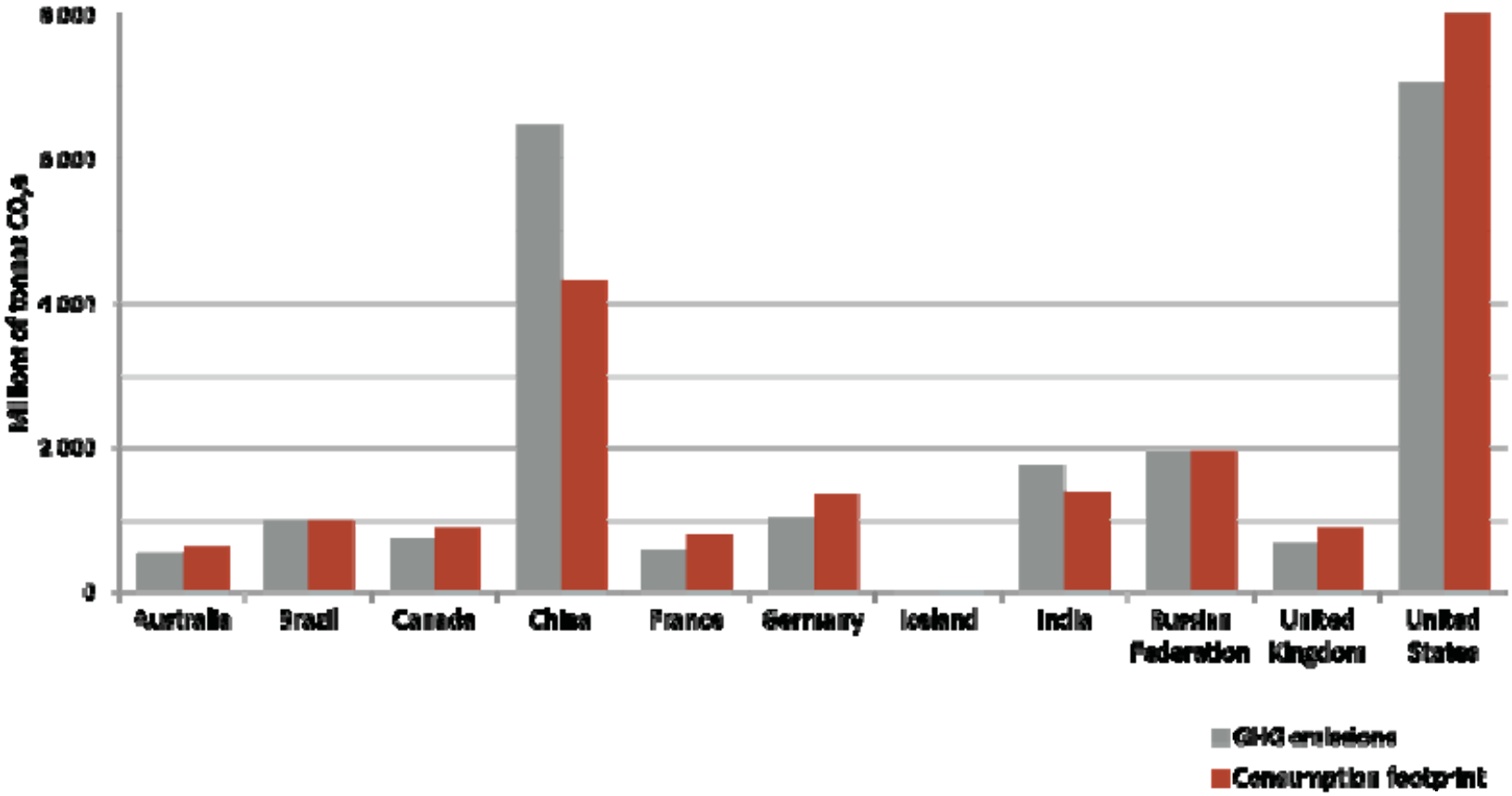
Average
2.5 kg

High
3.5kg

Veggie Burger

4 Oz Cheese burger

A COUNTRY


8 000
6 000
4 000
2 000
0
Millions of tonnes CO_2e
Australia
Brazil
Canada
China
France
Germany
Iceland
India
Russian Federation
United Kingdom
United States
GHG emissions
Consumption footprint

LAPTOP: 400KG EMBODIED

Low
~100Kg

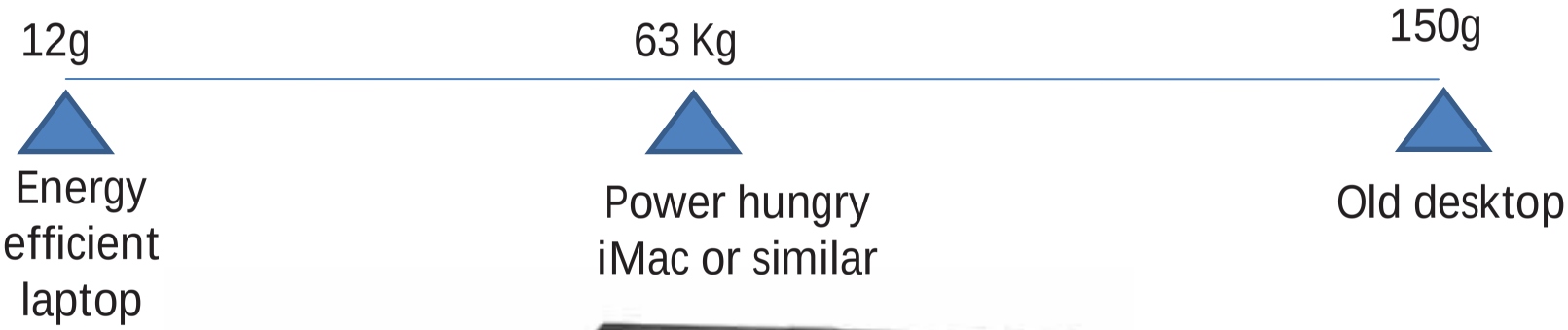
Average
400 Kg

High
~1 tonne

A simple low cost laptop

2010 21.5 inch iMac

LAPTOP: ~50G / HOUR OPERATIONAL



TEXT MESSAGE: 0.014G PER MESSAGE

0.014g

32,000 tonnes

One message

All the worlds texts per year

USING A MOBILE : 57G PER MINUTE

47kg

Average 1250 Kg

125 million tonnes

1 years usage at under 2mins per day

1 years usage at 1 hour per day

Global mobile usage

USING MOBILES

- So 1 hour per day = 1 tonnes per year.

- One estimate for a simple phone is 16 kg (same as 1 kg f beef)
  - Smart phones are a lot higher.

TEXT STATS

- 2.5 Trillion per year
  - (25% in China, 20% in Philipines where each phone sends 15 per day)
  - We send 6 per day, in the US it's 2 per pay)

  (Gartner 2007 Prediction for 2008)
- Globally, 32,000 tonne footprint per year
- Is that a lot?

DATA CENTRES

2010: 130 million tonnes CO_2e

Prediction for 2020:

250 – 340 million tonnes CO_2e

WEB SEARCH: ~1–5G FOR 30SECOND SEARCH

0.2g

Energy used at google's end

0.7g

Including energy used in an efficient laptop

4.5 g

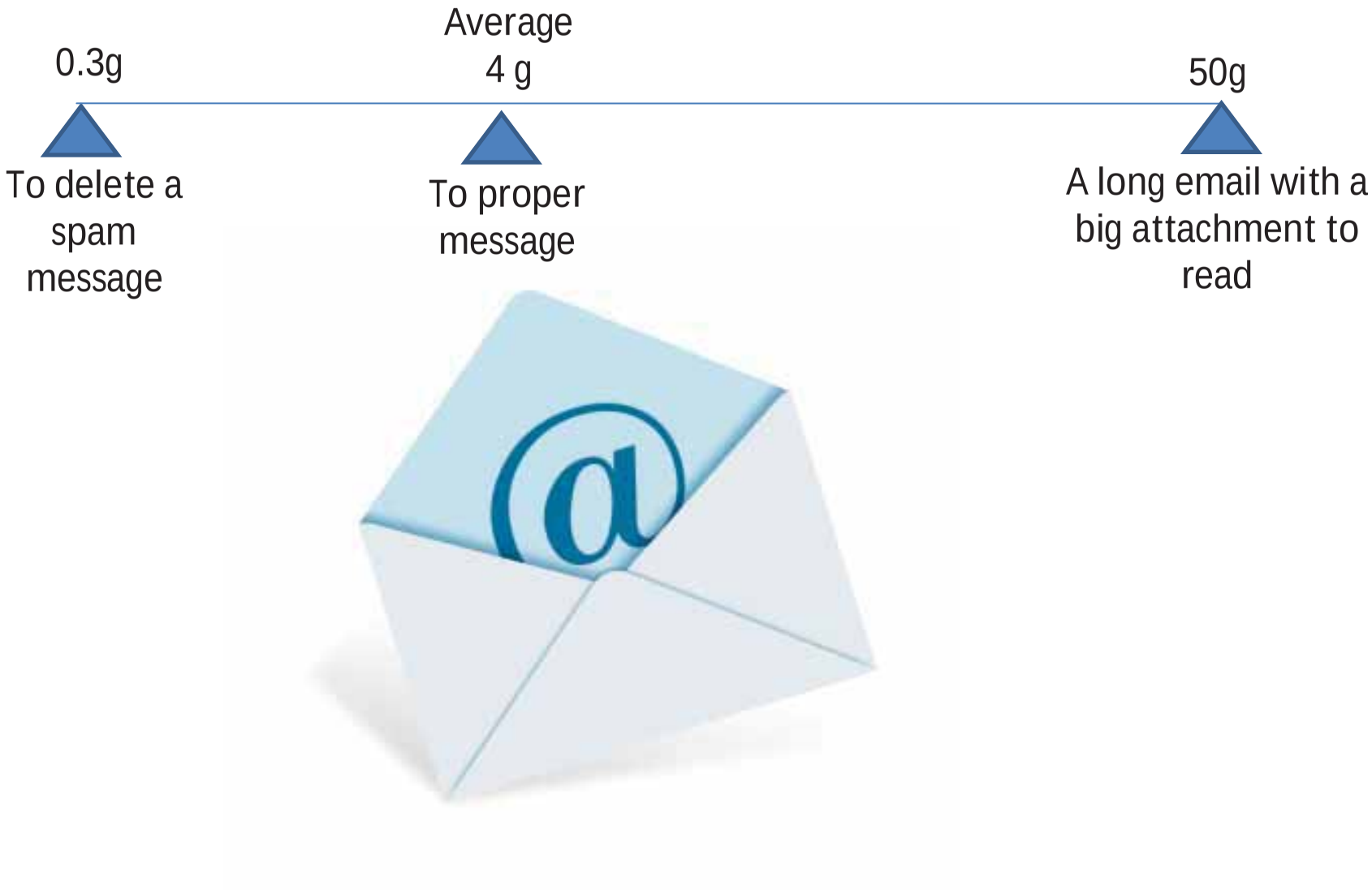
Energy used from a power hungry machine and higher estimates for the network

WEB SEARCHES

- Accounts for 1.3 million tonnes CO2e

- Is that a lot?

AN EMAIL: ~4-50G PER MESSAGE



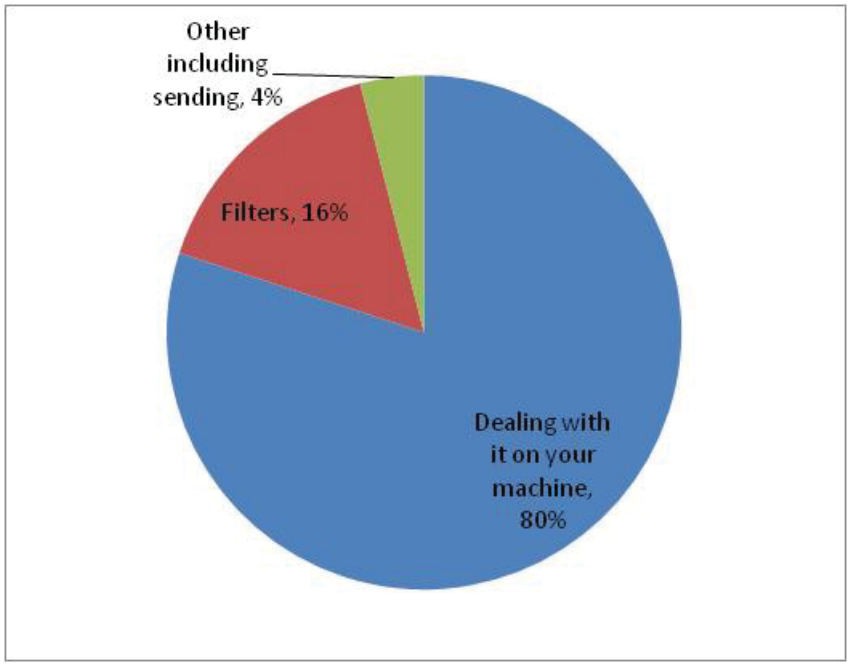
SPAM STATS

- 62 trillion spams per year requiring 33 billion KWh of electricity and 20 million tonnes of CO2e
- 78% of email incoming emails are spam, resulting in

22% of the footprint of your email (because they are quick to deal with)

- What if the cost

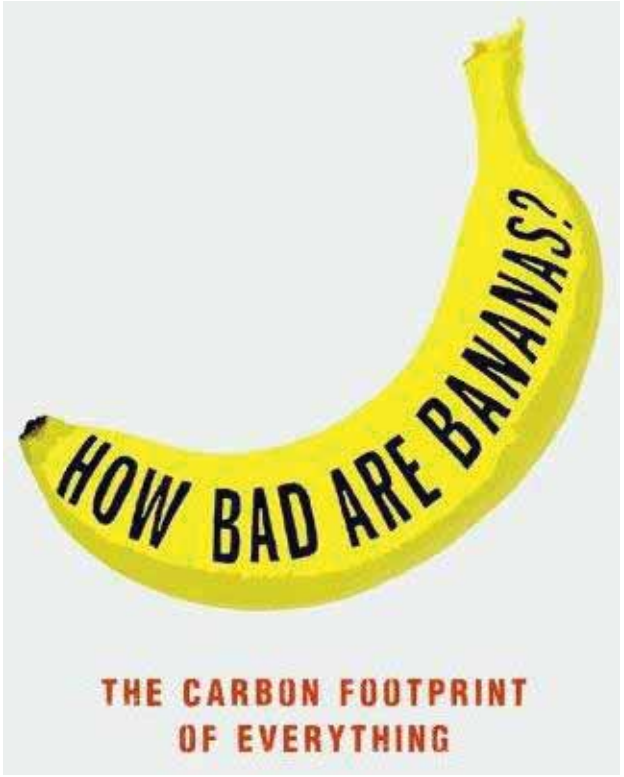
of an email was 1p?



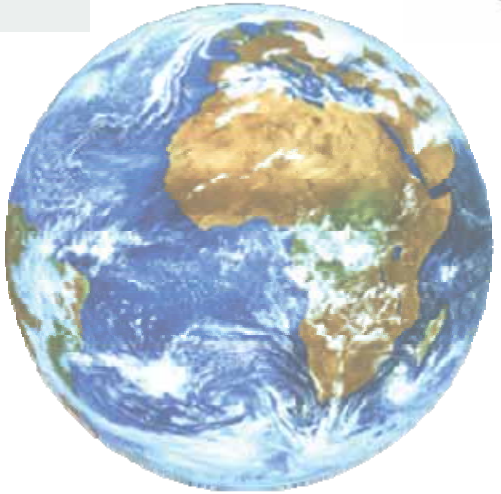
EMAIL CONTINUED …

- 60 emails (proper ones) has the same footprint as 1 letter

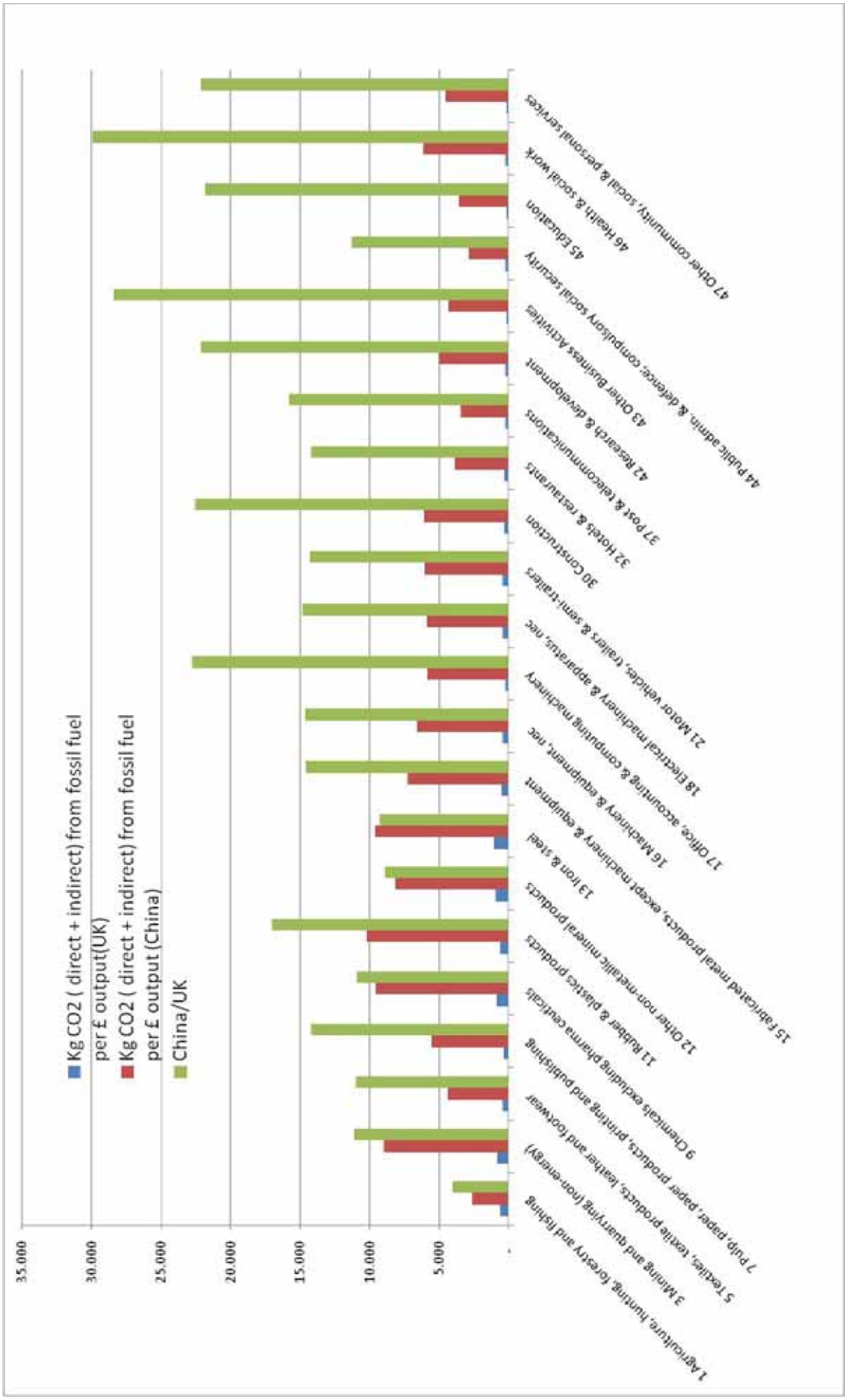
- So does email give us a carbon saving?


HOW BAD ARE BANANAS?
THE CARBON FOOTPRINT
OF EVERYTHING


Delta



The Global Economy Can Hide Our Impact



SOME GREEN IT QUESTIONS

- Is it better to replace or keep old kit?
- Do IT impacts outweigh the savings?

 - or do the benefits outweigh the impacts?

  – e.g. Does it replace paper and flights?

- Are efficiency improvements useful?

  – or do we just take up the slack with increased appetite?

THANK YOU FOR LISTENING

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A BIG PERSPECTIVE ON CLIMATE CHANGE

- Exponential emissions since 1850
- There are other similar environmental impact curves
- So Efficiency improvements haven't managed to reduce impact
- There is a need to raise the game.