

# **Business Carbon Footprint and Triple-Bottom-Line Accounting**

**Identifying efficiency gains for key economic sectors in the  
South West Region**

**SCPnet conference 5 March 2008, Birmingham**

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# Method and data inputs

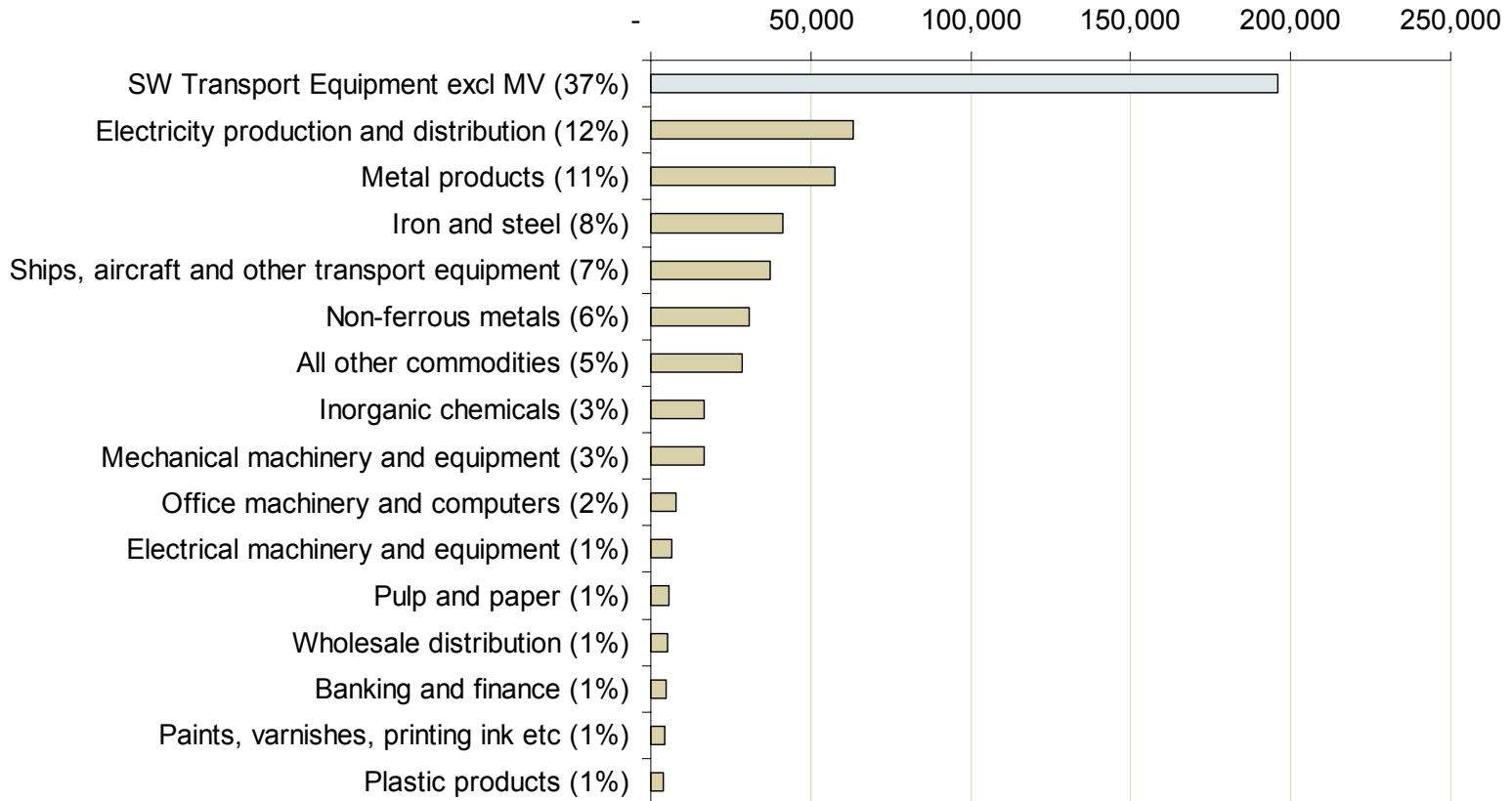
- Expenditure - ECON-I database
- Energy consumption – REEIO
- Built land EF - UK national accounts & GVA
- BL<sup>3</sup> software tool
- 2003 Financial Year

# Industry sectors

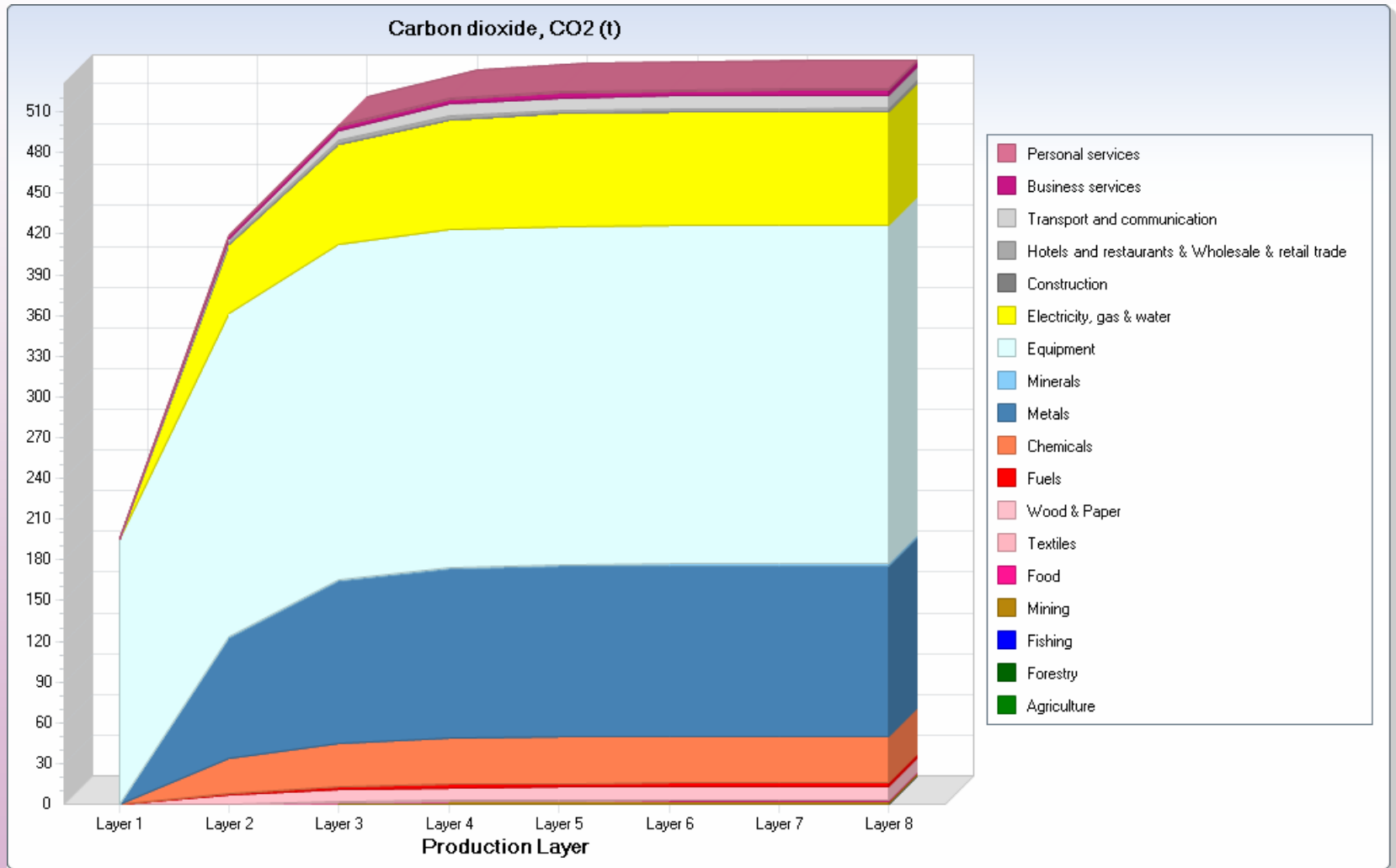
- Transport Equipment including aerospace
- Motor Vehicles
- Food and Drink
- Hotels and Catering
- Business Services

# Transport Equipment

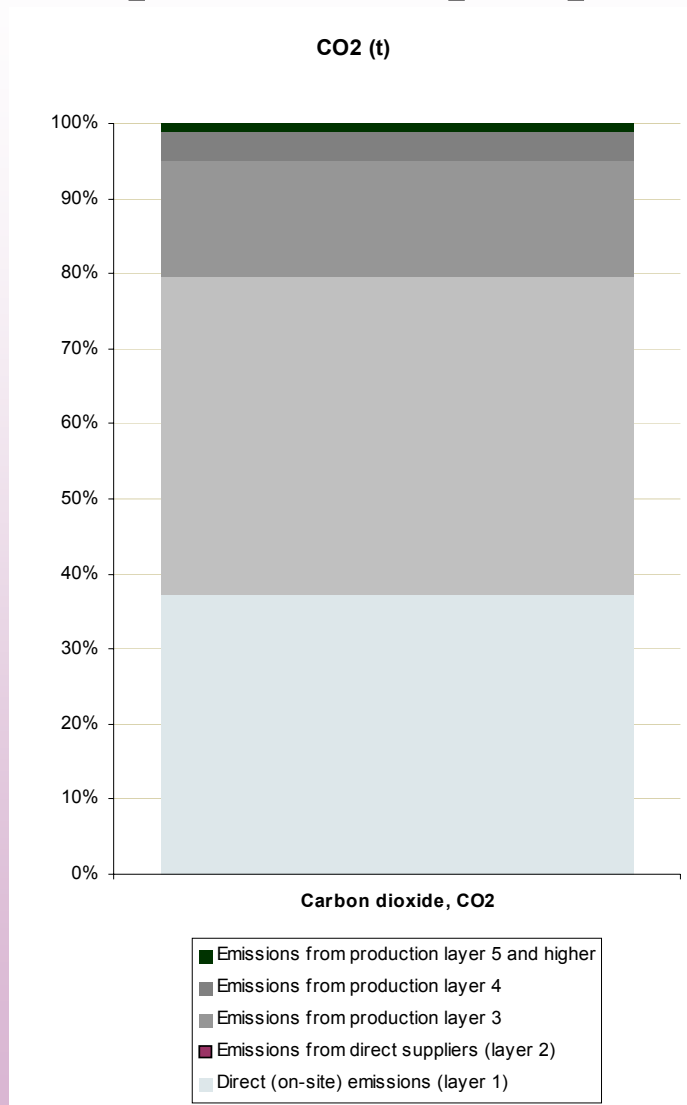
Total (direct and indirect) CO<sub>2</sub> emissions (t)



# Transport Equipment – CO<sub>2</sub>



# Transport Equipment



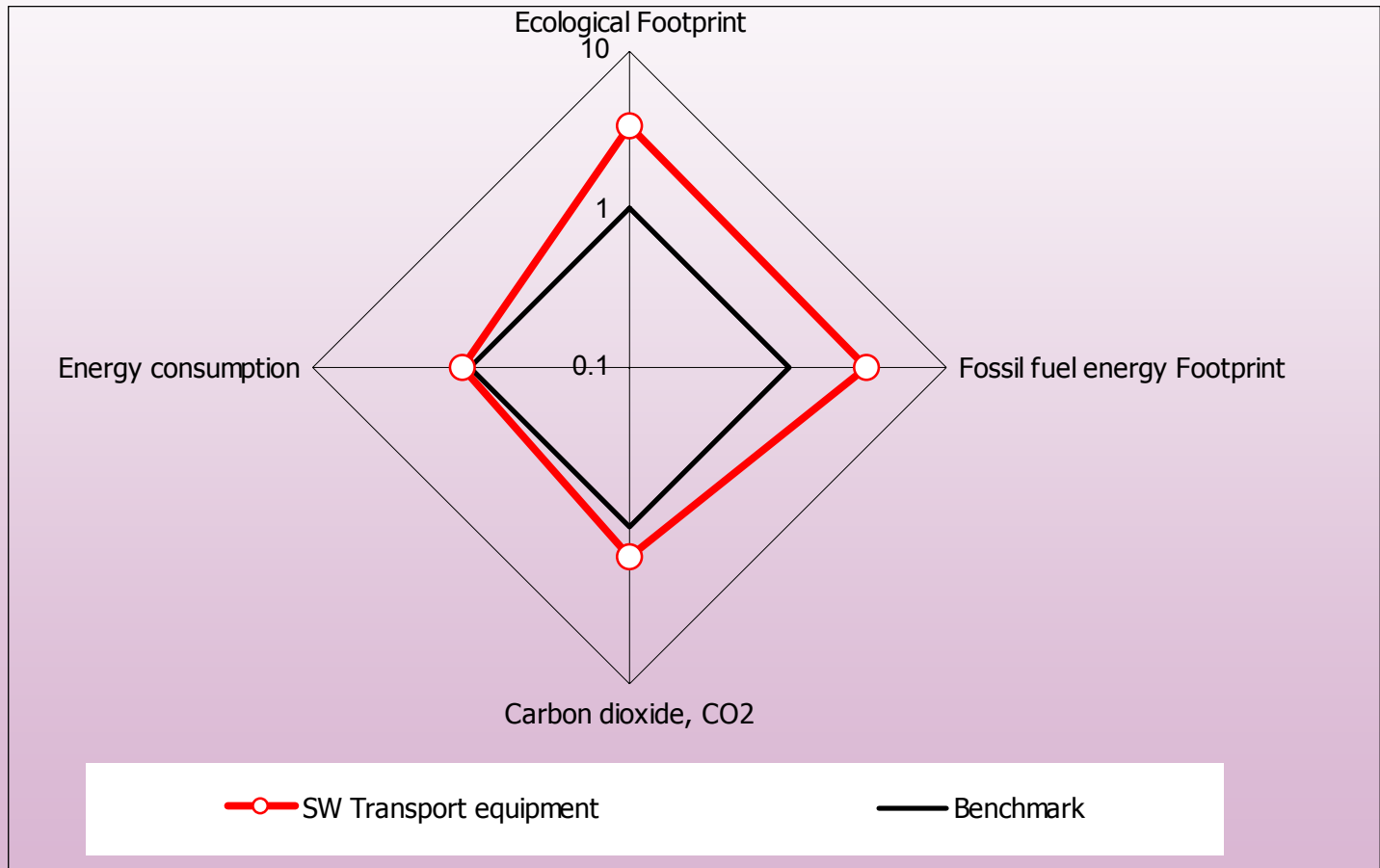
# Transport Equipment – CO<sub>2</sub> RSP

Path Description	Path Value (CO <sub>2</sub> in tonnes)	Unit	Path Order	Percentage in total impact
SW Transport Equipment excl MV	196,000	t	1	37%
Electricity production and distribution > SW Transport Equipment excl MV	50,000	t	2	9%
Iron and steel > SW Transport Equipment excl MV	36,200	t	2	7%
Non-ferrous metals > SW Transport Equipment excl MV	26,600	t	2	5%
Metal products > SW Transport Equipment excl MV	26,300	t	2	5%
Inorganic chemicals > SW Transport Equipment excl MV	15,900	t	2	3%
Ships, aircraft and other transport equipment > SW Transport Equipment excl MV	15,100	t	2	3%
Iron and steel > Metal products > SW Transport Equipment excl MV	12,600	t	3	2%
Mechanical machinery and equipment > SW Transport Equipment excl MV	12,400	t	2	2%
Electricity production and distribution > Electricity production and distribution > SW Transport Equipment excl MV	9,700	t	3	2%
Office machinery and computers > SW Transport Equipment excl MV	6,230	t	2	1%
Electrical machinery and equipment > SW Transport Equipment excl MV	5,010	t	2	1%
Pulp and paper > SW Transport Equipment excl MV	4,550	t	2	1%
Non-ferrous metals > Metal products > SW Transport Equipment excl MV	3,870	t	3	1%
Paints, varnishes, printing ink etc > SW Transport Equipment excl MV	3,820	t	2	1%
Electricity production and distribution > Ships, aircraft and other transport equipment > SW Transport Equipment excl MV	3,620	t	3	1%
Electricity production and distribution > Metal products > SW Transport Equipment excl MV	3,510	t	3	1%
Plastic products > SW Transport Equipment excl MV	3,050	t	2	1%
Medical and precision instruments > SW Transport Equipment excl MV	2,850	t	2	1%
Iron and steel > Iron and steel > SW Transport Equipment excl MV	2,300	t	3	0%
All other paths	87,390	t		17%
<b>Total</b>	<b>527,000</b>	<b>t</b>		<b>100%</b>

# Transport Equipment – CO<sub>2</sub> CB & RSP

- **SW Transport Equipment manufacture highest single emitter (196,000 tCO<sub>2</sub>)**
- **Electricity production and distribution (63,200 tCO<sub>2</sub>)**
  - Other electricity prod. & distr. (50,000 + 9,700 t CO<sub>2</sub>)
  - All other remaining indirect emissions from electricity prod. & distr. (3,500 tCO<sub>2</sub>)
- **Metal producers (57,500 t CO<sub>2</sub>)**
  - Other metal producers (26,300 t CO<sub>2</sub>)
  - Iron and steel industry (12,600 t CO<sub>2</sub>)
  - Non-ferrous metal producers (3,870 tCO<sub>2</sub>)
  - Electricity production and distribution (3,510 tCO<sub>2</sub>)
  - Remaining indirect emissions (11,220 tCO<sub>2</sub>)

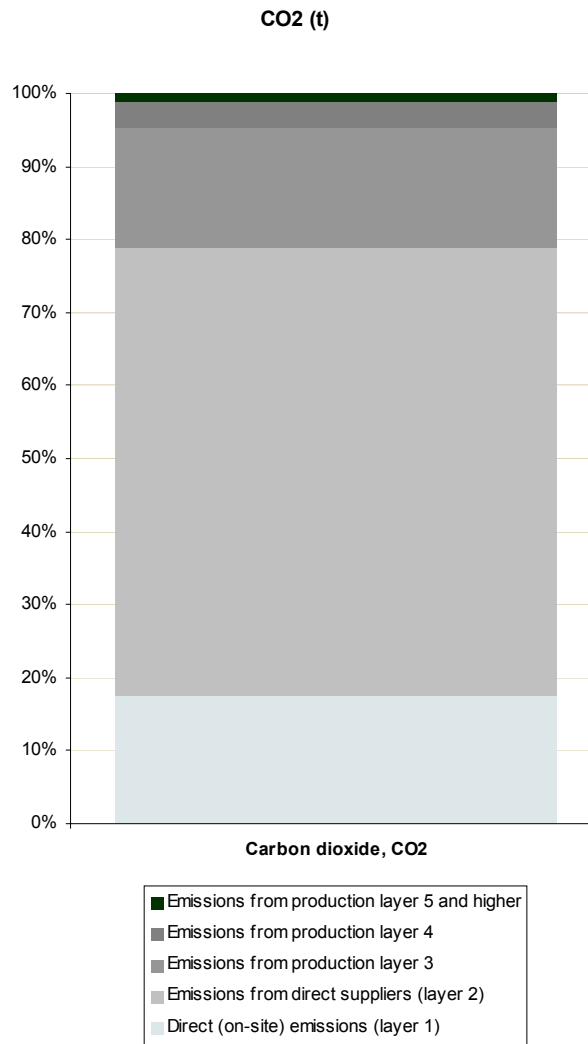
# Transport Equipment



# Motor Vehicles – CO<sub>2</sub>

Rank	Commodity	CO2 emissions (t)	% of total Carbon Footprint
1	SW Transport_Motor vehicles	85,900	18%
2	Motor vehicles	74,600	15%
3	Iron and steel	65,900	13%
4	Metal products	36,200	7%
5	Non-ferrous metals	32,800	7%
6	Plastic products	29,000	6%
7	Electricity production and distribution	27,400	6%
8	Mechanical machinery and equipment	23,700	5%
9	Inorganic chemicals	19,900	4%
10	Road transport	12,800	3%
11	Rubber products	11,900	2%
12	Electrical machinery and equipment	11,300	2%
13	Metal castings	9,010	2%
14	Paints, varnishes, printing ink etc	7,220	1%
15	Furniture and miscellaneous manufacturing	6,420	1%
>15	All other commodities	35,950	7%
<b>Total</b>		<b>490,000</b>	<b>100%</b>

# Motor Vehicles – direct and indirect impacts



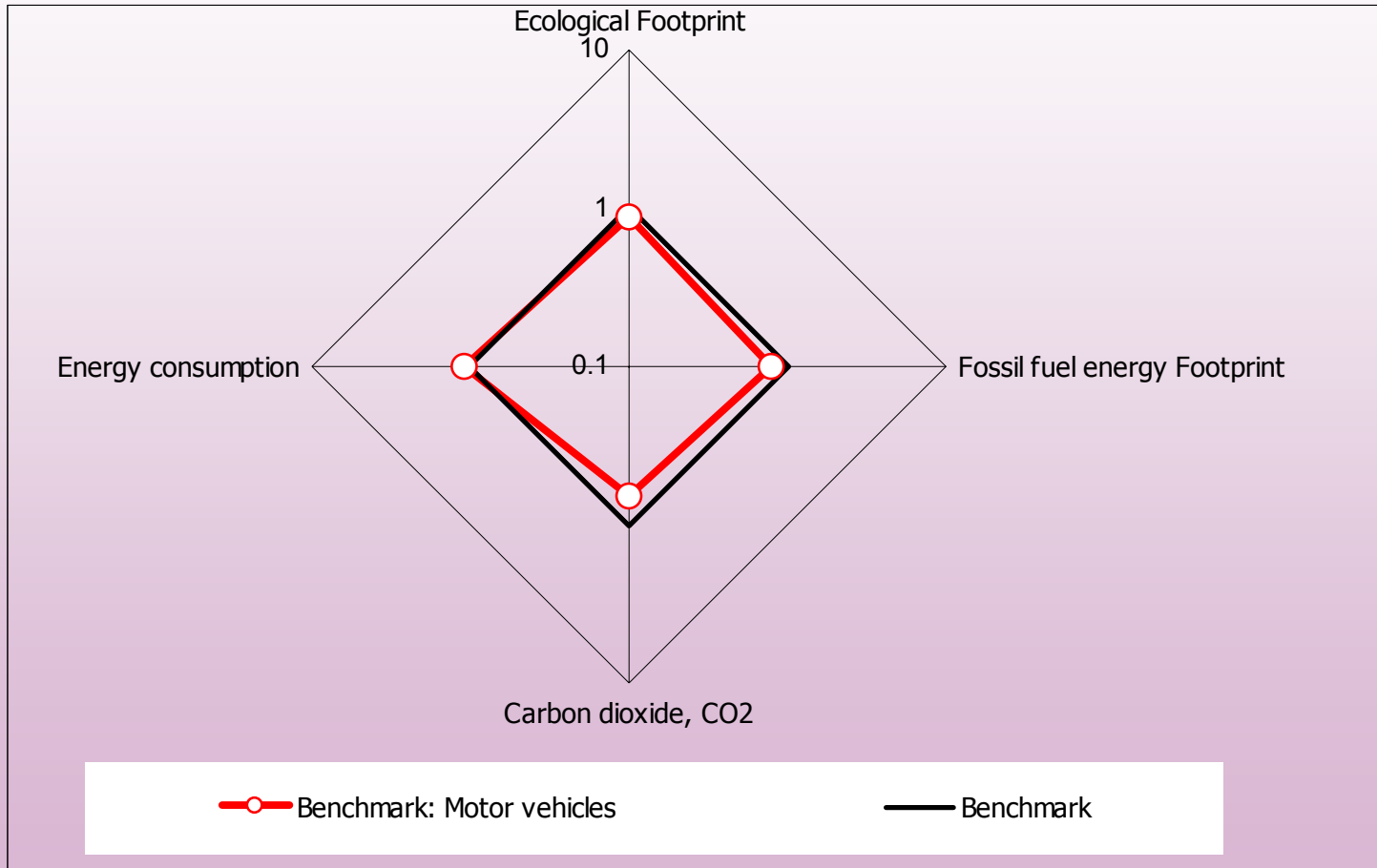
# Motor Vehicles CO2 RSP

Rank	Path Description	Path Value (CO2 in tonnes)	Unit	Path Order	Percentage total impact
1	SW Transport_Motor vehicles	85,900	t	1	18%
2	Iron and steel > SW Transport_Motor vehicles	57,800	t	2	12%
3	Motor vehicles > SW Transport_Motor vehicles	53,400	t	2	11%
4	Non-ferrous metals > SW Transport_Motor vehicles	28,400	t	2	6%
5	Plastic products > SW Transport_Motor vehicles	22,500	t	2	5%
6	Electricity production and distribution > SW Transport_Motor vehicles	21,700	t	2	4%
7	Inorganic chemicals > SW Transport_Motor vehicles	18,700	t	2	4%
8	Mechanical machinery and equipment > SW Transport_Motor vehicles	17,600	t	2	4%
9	Metal products > SW Transport_Motor vehicles	16,600	t	2	3%
10	Road transport > SW Transport_Motor vehicles	11,200	t	2	2%
11	Rubber products > SW Transport_Motor vehicles	9,800	t	2	2%
12	Electrical machinery and equipment > SW Transport_Motor vehicles	8,380	t	2	2%
13	Iron and steel > Metal products > SW Transport_Motor vehicles	7,950	t	3	2%
14	Paints, varnishes, printing ink etc > SW Transport_Motor vehicles	6,130	t	2	1%
15	Furniture and miscellaneous manufacturing > SW Transport_Motor vehicles	5,690	t	2	1%
16	Glass and glass products > SW Transport_Motor vehicles	4,720	t	2	1%
17	Electricity production and distribution > Electricity production and distribution > SW Transport_Motor vehicles	4,210	t	3	1%
18	Iron and steel > Iron and steel > SW Transport_Motor vehicles	3,680	t	3	1%
19	Iron and steel > Motor vehicles > SW Transport_Motor vehicles	3,590	t	3	1%
20	Textiles > SW Transport_Motor vehicles	2,900	t	2	1%
>20	All other paths	99,150	t		20%
<b>Total</b>		<b>490,000</b>	<b>t</b>		<b>100%</b>

# Motor Vehicles – CO<sub>2</sub> CB & RSP

- **SW Motor Vehicle manufacture sector (85,900 t CO<sub>2</sub>)**
- **Other motor vehicle producers (74,600 t CO<sub>2</sub>)**
  - Other motor vehicle producers (53,400 t)
  - Iron and steel production (3,590 t)
  - Other indirect emissions (17,610 t) above layer 3
- **Iron and steel production (65,900 t CO<sub>2</sub>)**
  - Other iron and steel producers (57,800 and 3,680 tCO<sub>2</sub>; layers 2 and 3)
  - Remaining 4,420 t emitted above layer 3

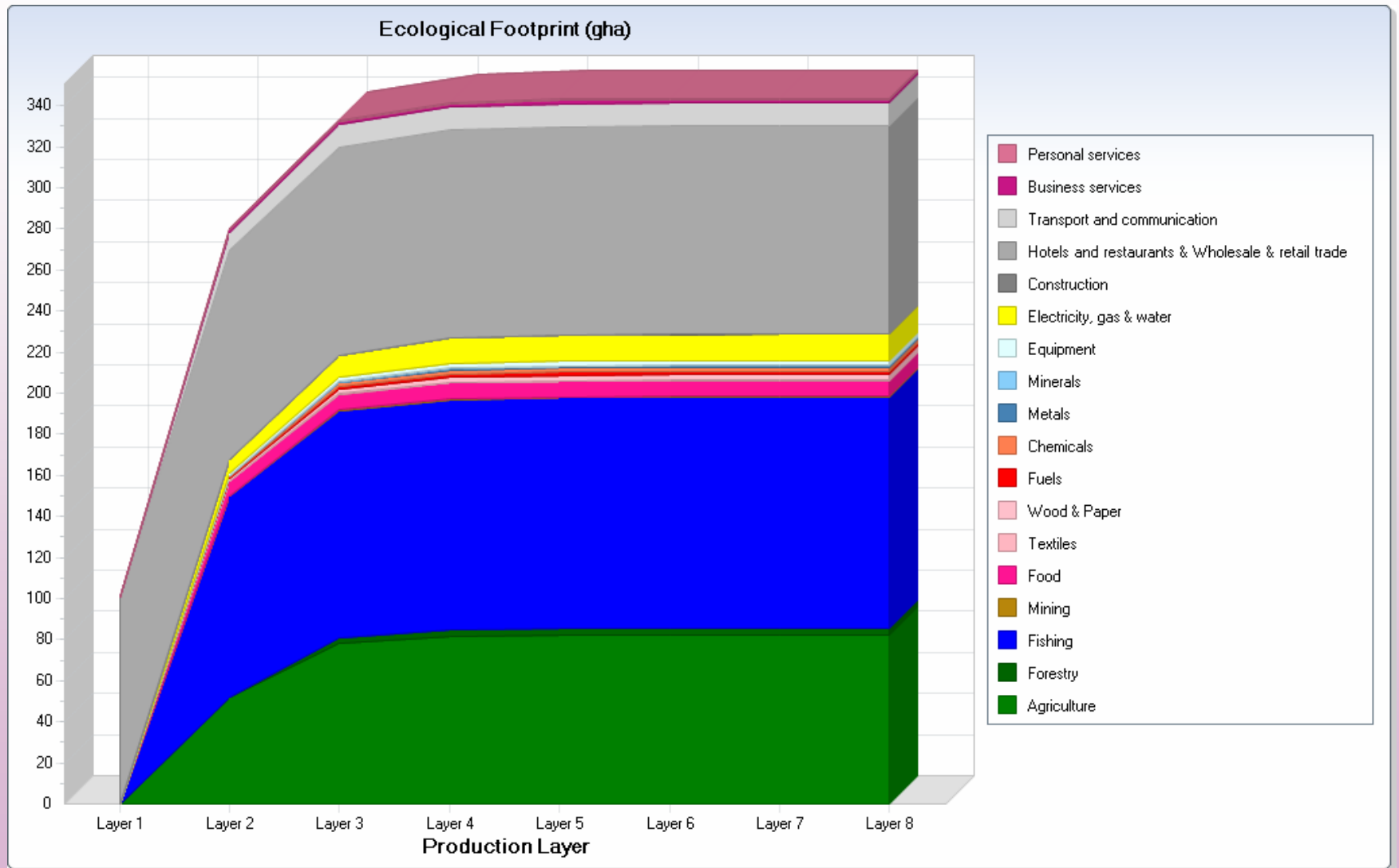
# Motor Vehicles



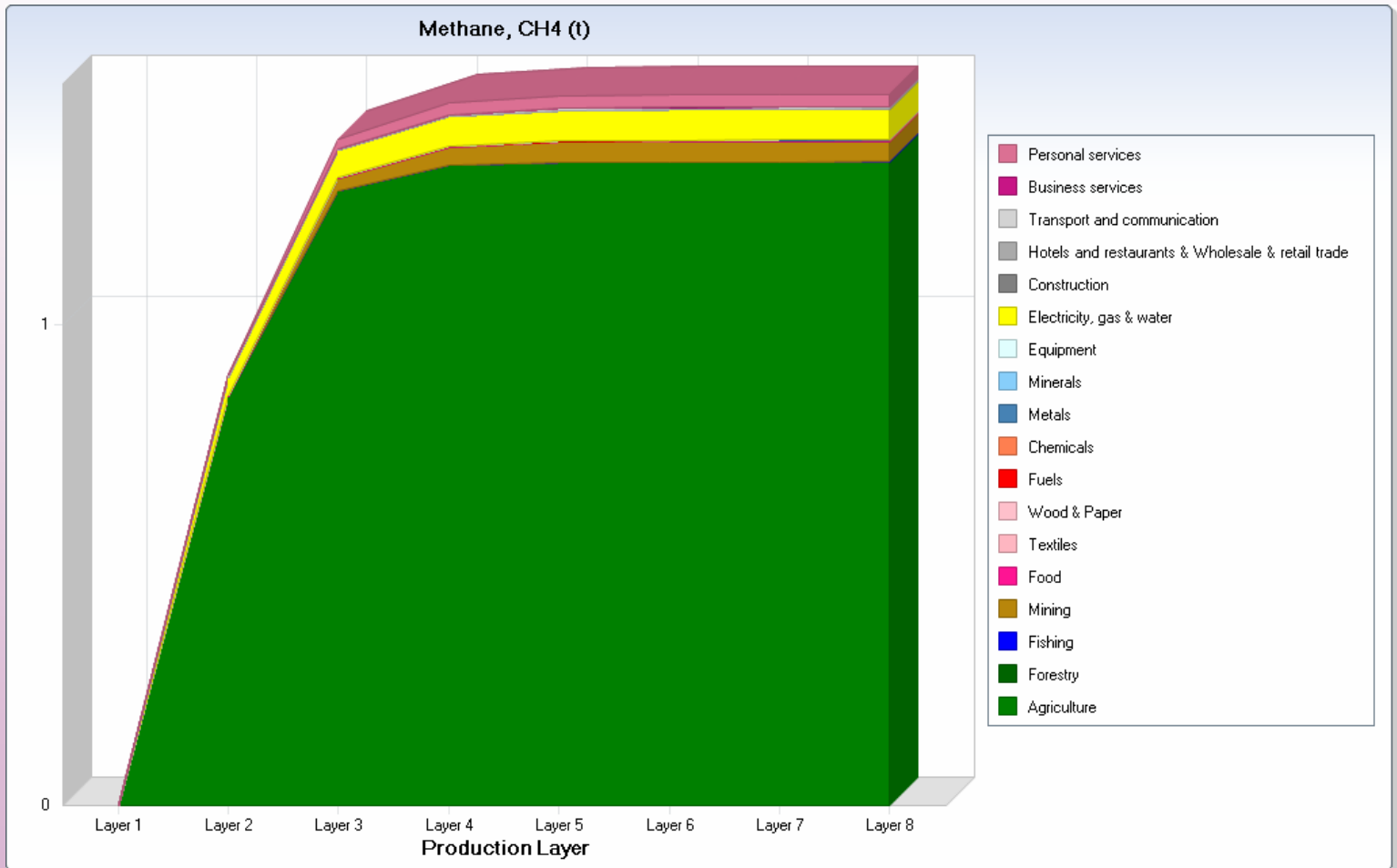
# Hotels & Catering – CO<sub>2</sub>

Rank	Commodity	CO2 emissions (t)	% of total Carbon Footprint
1	SW Hotels and catering	131,000	41%
2	Food and drink	57,100	18%
3	Road transport	36,400	11%
4	Electricity production and distribution	24,800	8%
5	Fishing	15,000	5%
6	Wholesale distribution	11,400	4%
7	Agriculture	9,040	3%
8	Furniture and miscellaneous manufacturing	5,050	2%
9	Coke ovens, refined petroleum & nuclear fuel	4,610	1%
10	Legal, consultancy and other business services	4,300	1%
11	Pulp and paper	3,590	1%
12	Other service activities	2,050	1%
13	Computer services	1,760	1%
14	Banking and finance	1,440	0%
15	Textiles	1,370	0%
>15	All other commodities	9,090	3%
	<b>Total</b>	<b>318,000</b>	<b>100%</b>

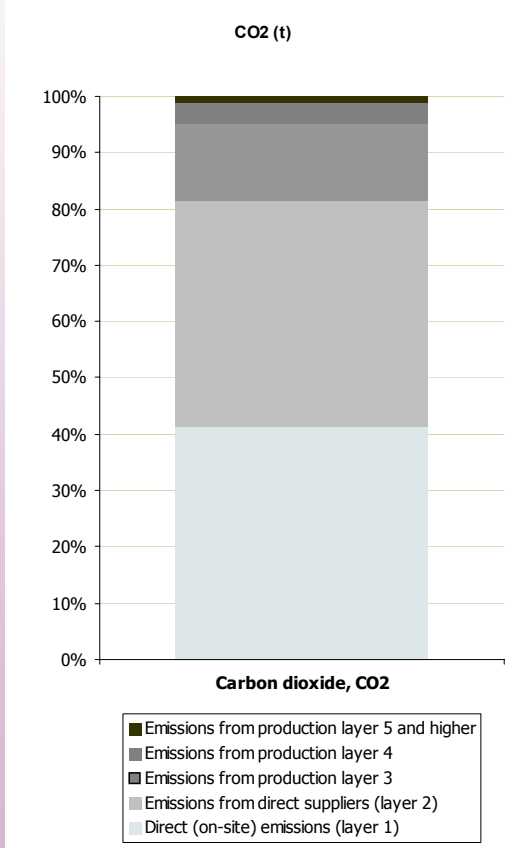
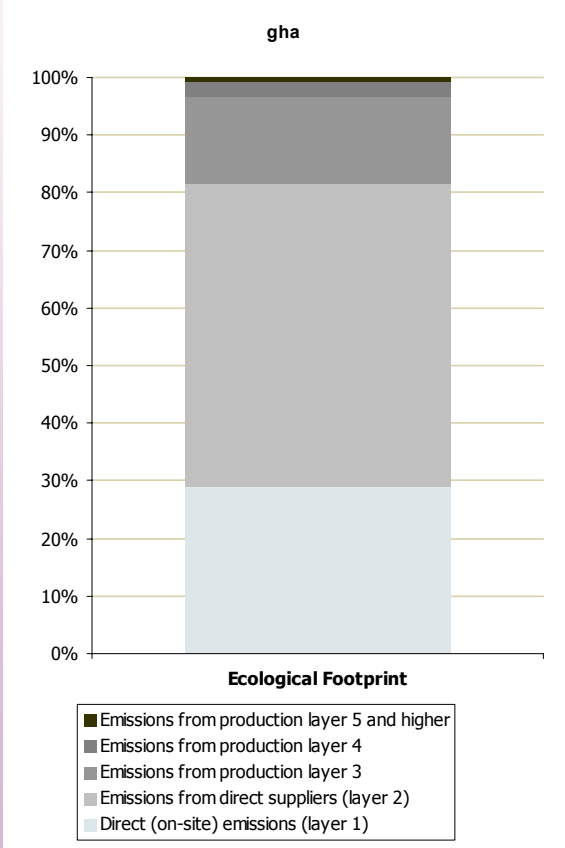
# Hotels & Catering - gha



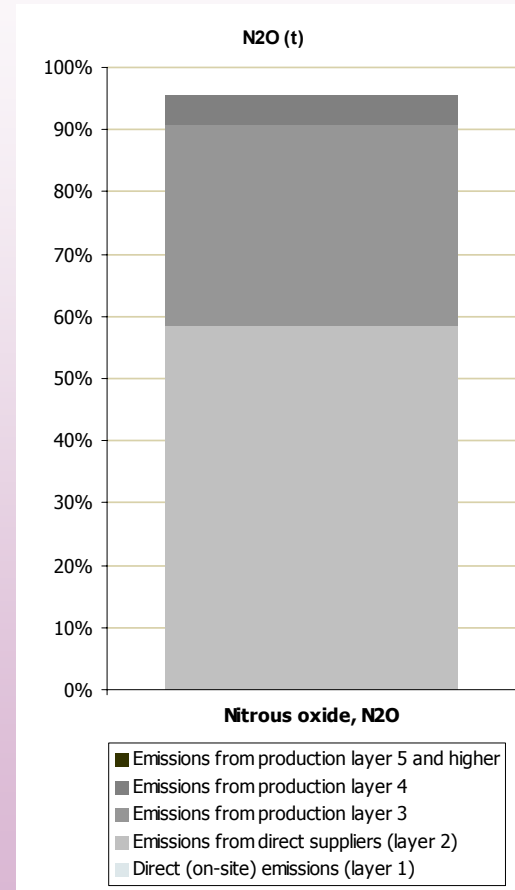
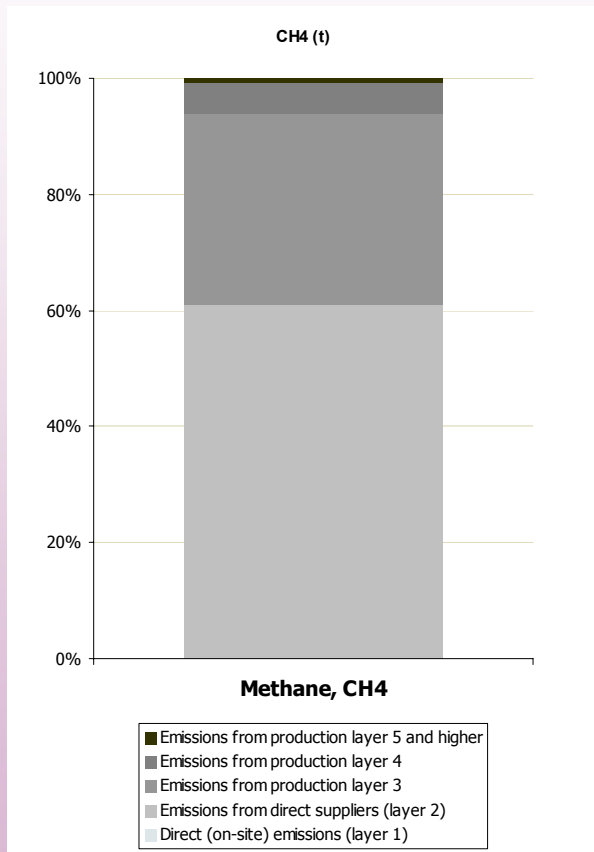
# Hotels & Catering – CH<sub>4</sub>



# Hotels & Catering – direct and indirect emissions



# Hotels & Catering – direct and indirect emissions



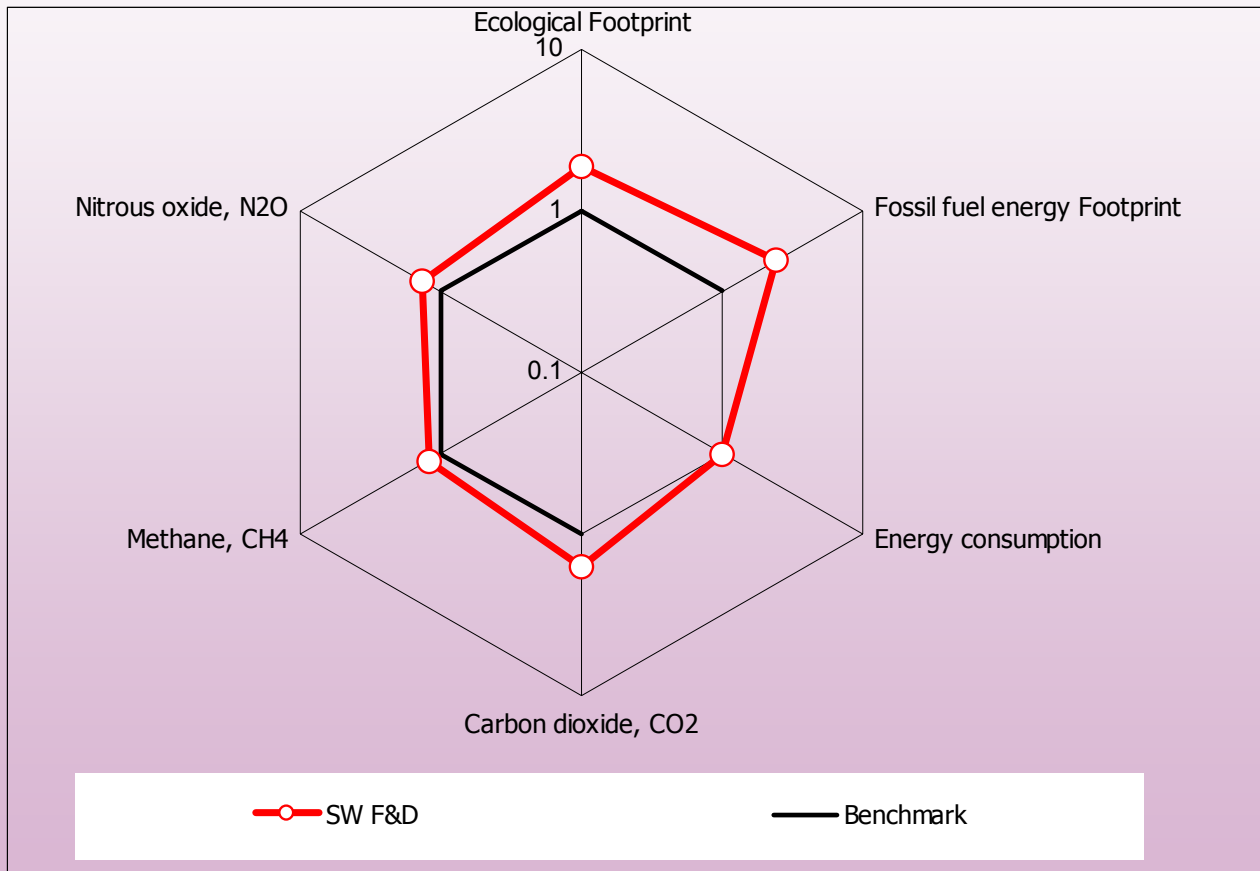
# Hotels & Catering – CO<sub>2</sub> CB & RSP

- **SW Hotels & Catering (131,000 t CO<sub>2</sub>)**
- **Food & Drink (57,000 t)**
  - Food & drinks industry (32,500 t)
  - Agriculture (2,970 t)
  - Other food and drink industries, pulp and paper production, plastic products, fishing and other road transport services (8,540 t)
  - Elsewhere upstream (12,990 t)
- **Road Transport Services (36,400t)**
  - Road transport (31,600 t)
  - Elsewhere upstream (4800 t)

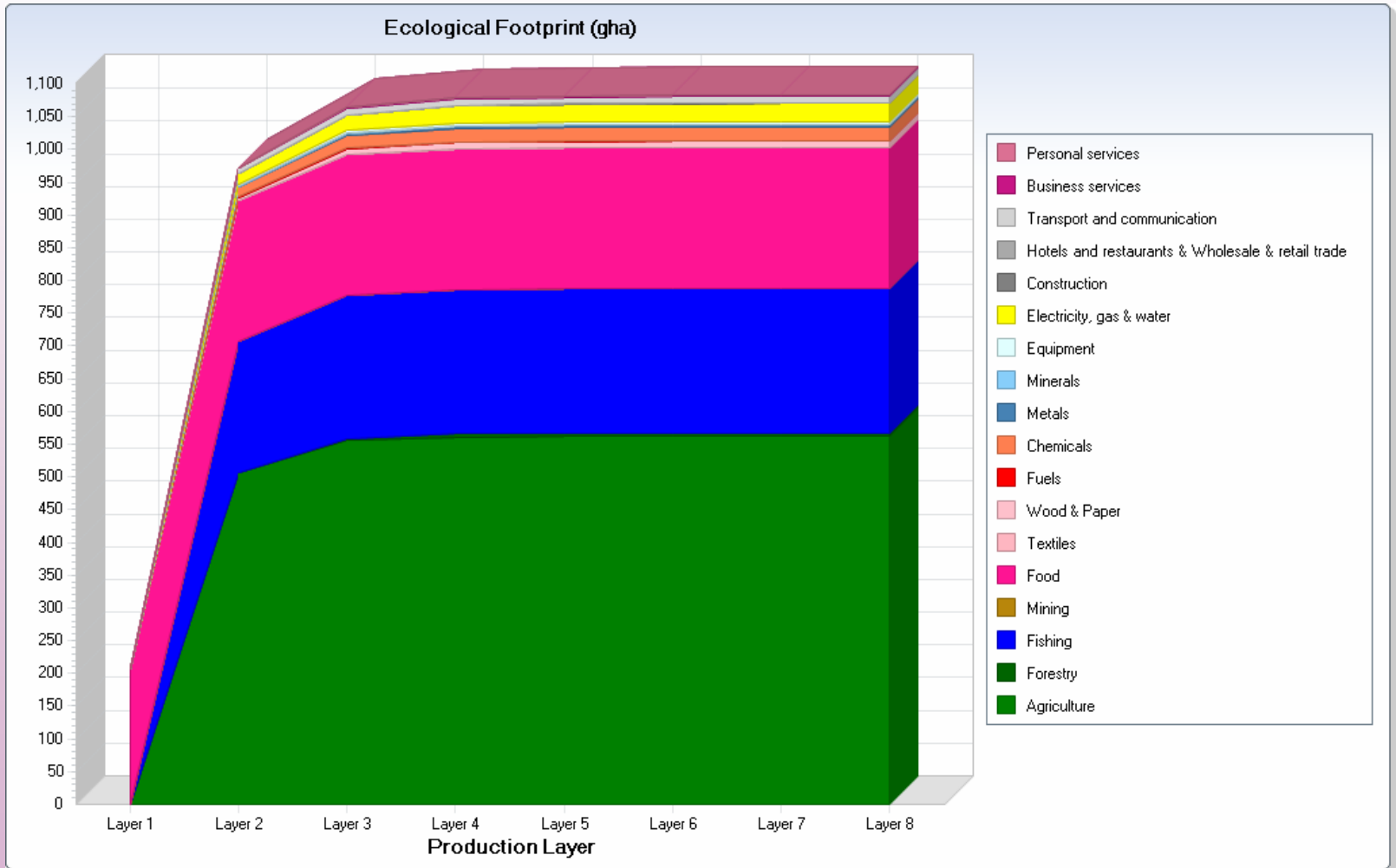
# Hotels & Catering – CH<sub>4</sub> CB & RSP

- **Agriculture itself (890 t)**
  - Agriculture (850 t)
  - Remaining 40 t emitted above layer 2
- **Food and drink sector (480 t)**
  - F&D sector (390 t)
  - other agriculture sectors in layers 3, 4, and 5; sewage services, and coal and gas distribution
- **Gas distribution (40 t)**

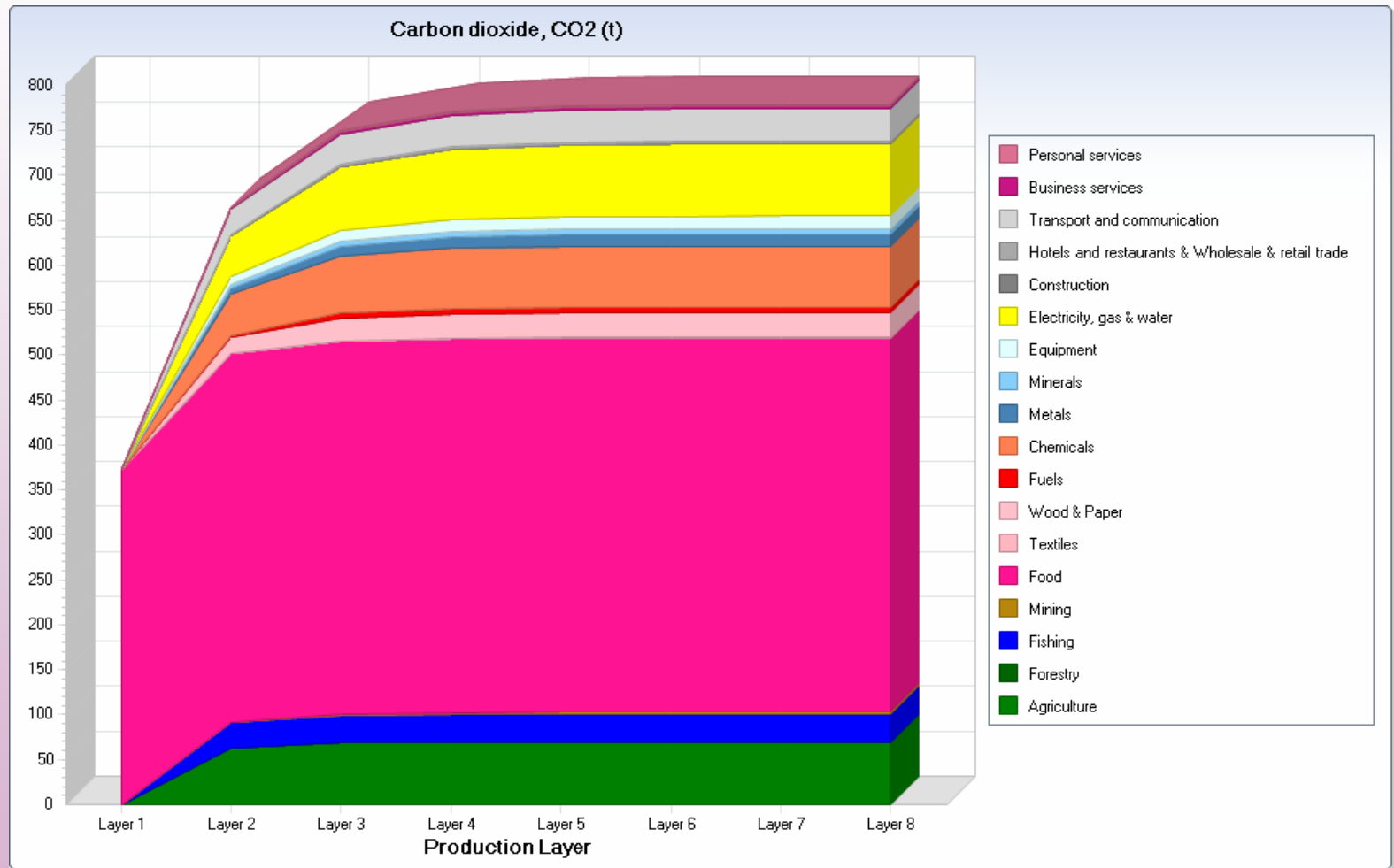
# Hotels & Catering spider



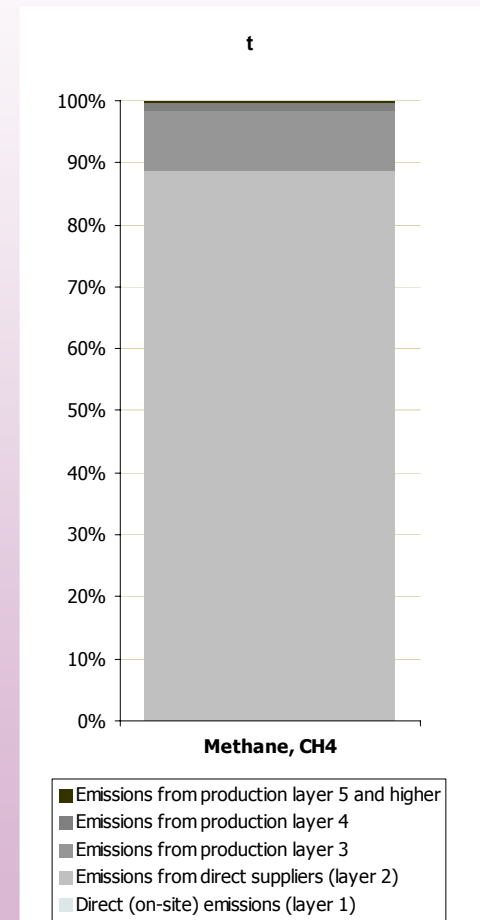
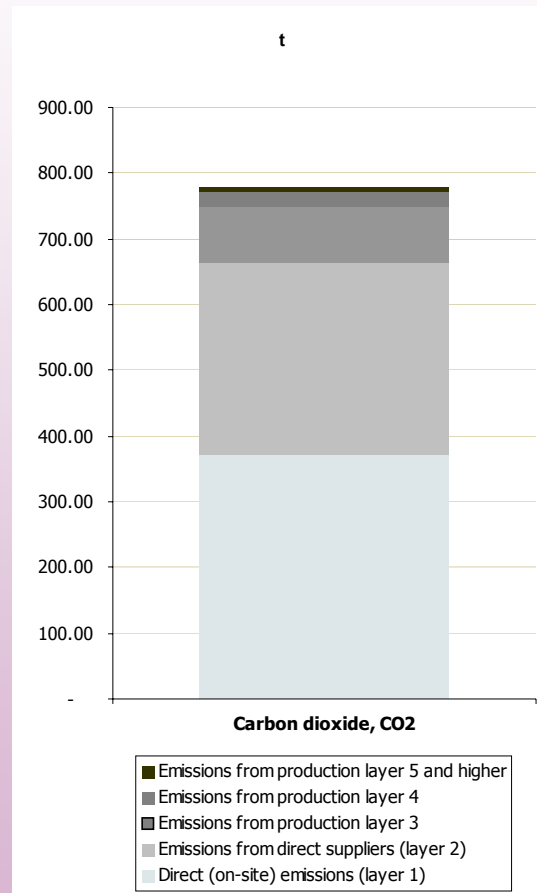
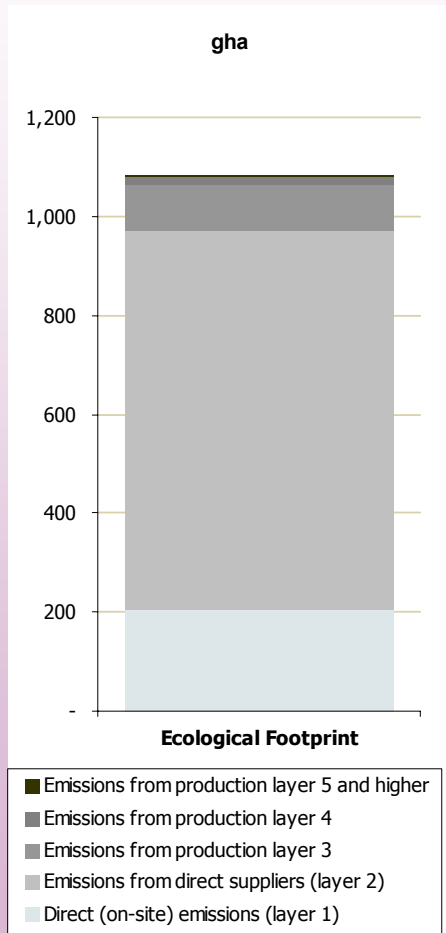
# Food & Drink - gha



# Food & drink – CO<sub>2</sub>



# F&D – direct and indirect impacts



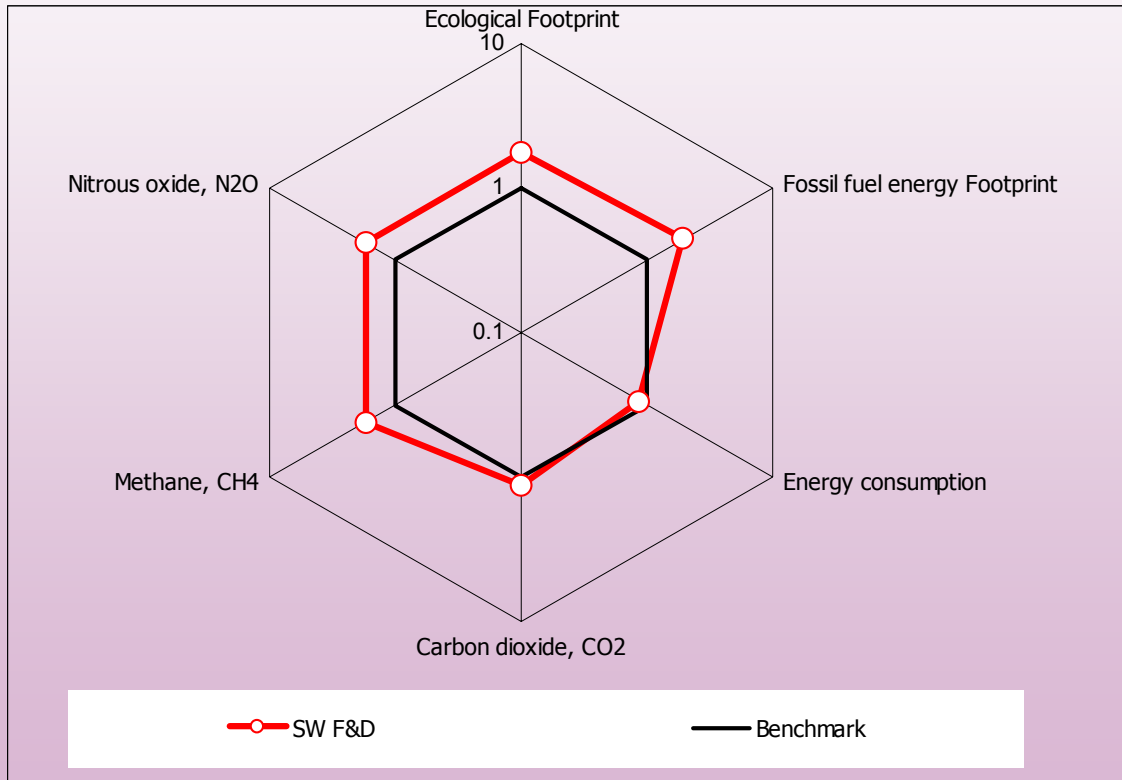
# Food & Drink CO<sub>2</sub> CB & RSP

- **Food& Drink (372,000 t)**
- **Agriculture (87,700 t)**
  - Agriculture (63,000 t)
  - Fertilisers (3,970)
  - Electricity production (3,700)
  - also other agriculture sectors (2,490)
  - Remaining 14,540 t from other upstream processes
- **Other food and drink industries (67,400 t)**
  - Other food and drink producers 38,300 + 2,840 t
  - Remaining indirect emissions (26,260 t) further upstream

# Food & Drink CH<sub>4</sub> RSP

Rank	Path Description	Path Value	Unit	Path Order	Percentage in total impact
1	Agriculture > Food & Drink	8,260	t	2	87.00%
2	Agriculture > Food and drink > Food & Drink	460	t	3	4.84%
3	Agriculture > Agriculture > Food & Drink	330	t	3	3.44%
4	Coal extraction > Food & Drink	90	t	2	0.98%
5	Gas distribution > Food & Drink	70	t	2	0.71%
6	Agriculture > Food and drink > Food and drink > Food & Drink	30	t	4	0.36%
7	Coal extraction > Electricity production and distribution > Food & Drink	29	t	3	0.30%
8	Agriculture > Agriculture > Food and drink > Food & Drink	18	t	4	0.19%
9	Agriculture > Food and drink > Agriculture > Food & Drink	18	t	4	0.19%
10	Agriculture > Agriculture > Agriculture > Food & Drink	13	t	4	0.14%
11	Sewage and refuse services > Food and drink > Food & Drink	11	t	3	0.12%
12	Gas distribution > Electricity production and distribution > Food & Drink	10	t	3	0.10%
13	Coal extraction > Food and drink > Food & Drink	9	t	3	0.10%
14	Electricity production and distribution > Food & Drink	8	t	2	0.08%
15	Gas distribution > Food and drink > Food & Drink	6	t	3	0.07%
16	Coal extraction > Electricity production and distribution > Electricity production and distribution > Food & Drink	6	t	4	0.06%
17	Gas distribution > Gas distribution > Food & Drink	3	t	3	0.02%
18	Agriculture > Food and drink > Food and drink > Food and drink > Food & Drink	3	t	5	0.02%
19	Road transport > Food & Drink	3	t	2	0.02%
20	Coal extraction > Electricity production and distribution > Agriculture > Food & Drink	2	t	4	0.02%
>20	All other paths	122	t		1.2%
	<b>Total</b>	<b>9,500</b>	<b>t</b>		<b>100%</b>

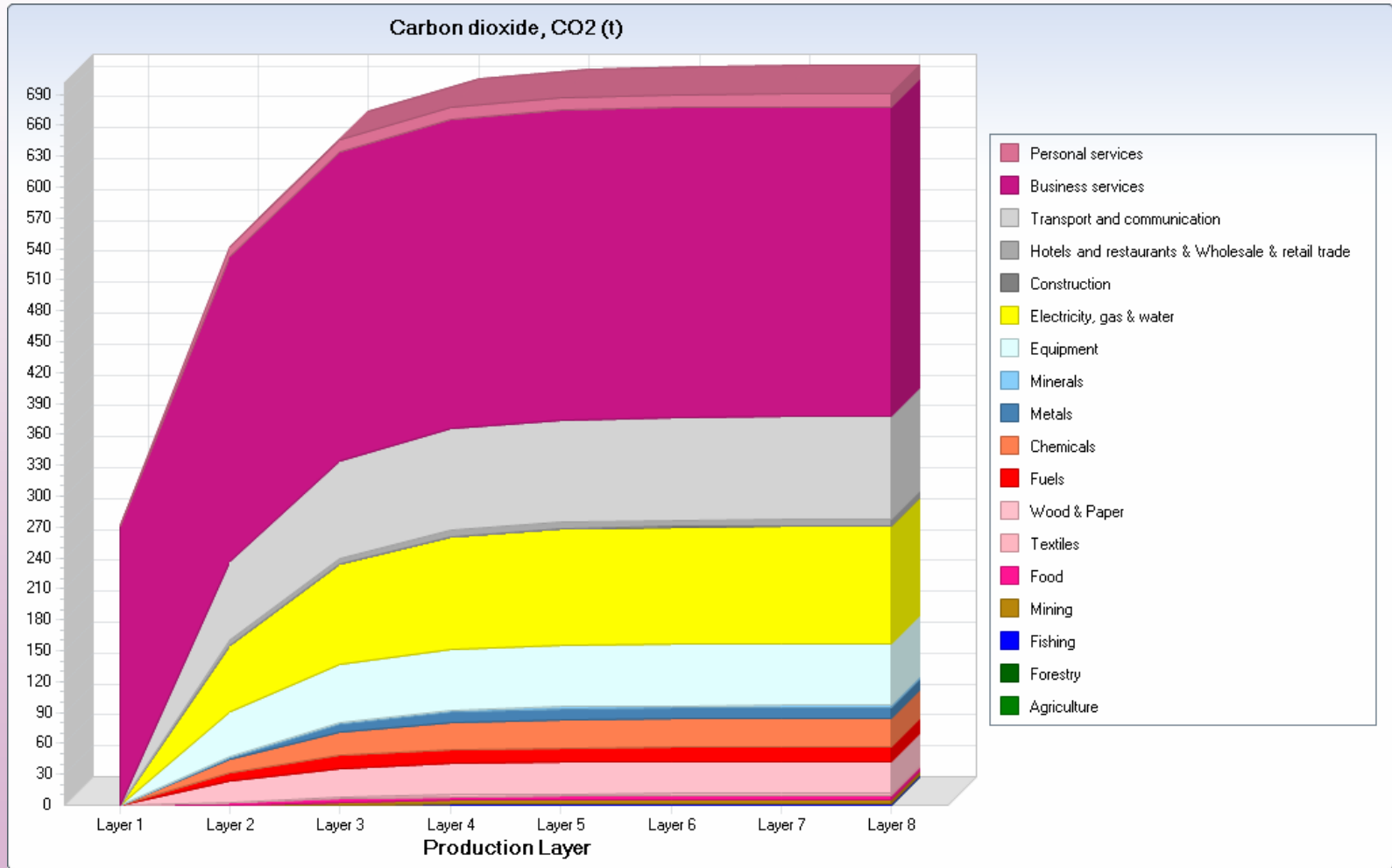
# Food & Drink Spider



# Business services – CO<sub>2</sub>

Commodity	CO2 emissions (t)	% of total Carbon Footprint
SW Business services sector (39%)	271,000	39%
Road transport (12%)	84,100	12%
Electricity production and distribution (12%)	80,800	12%
Legal, consultancy and other business services (9%)	61,500	9%
Pulp and paper (3%)	22,100	3%
Motor vehicles (3%)	19,300	3%
Furniture and miscellaneous manufacturing (2%)	15,100	2%
Mechanical machinery and equipment (2%)	14,900	2%
Post and telecommunications (2%)	11,600	2%
Computer services (1%)	9,830	1%
Renting of machinery etc (1%)	9,700	1%
Coke ovens, refined petroleum & nuclear fuel (1%)	9,500	1%
Motor vehicle distribution and repair, automotive fuel retail (1%)	8,930	1%
Banking and finance (1%)	7,270	1%
Other service activities (1%)	7,020	1%
All other commodities (8%)	58,350	8%
<b>Total</b>	<b>691,000</b>	<b>100%</b>

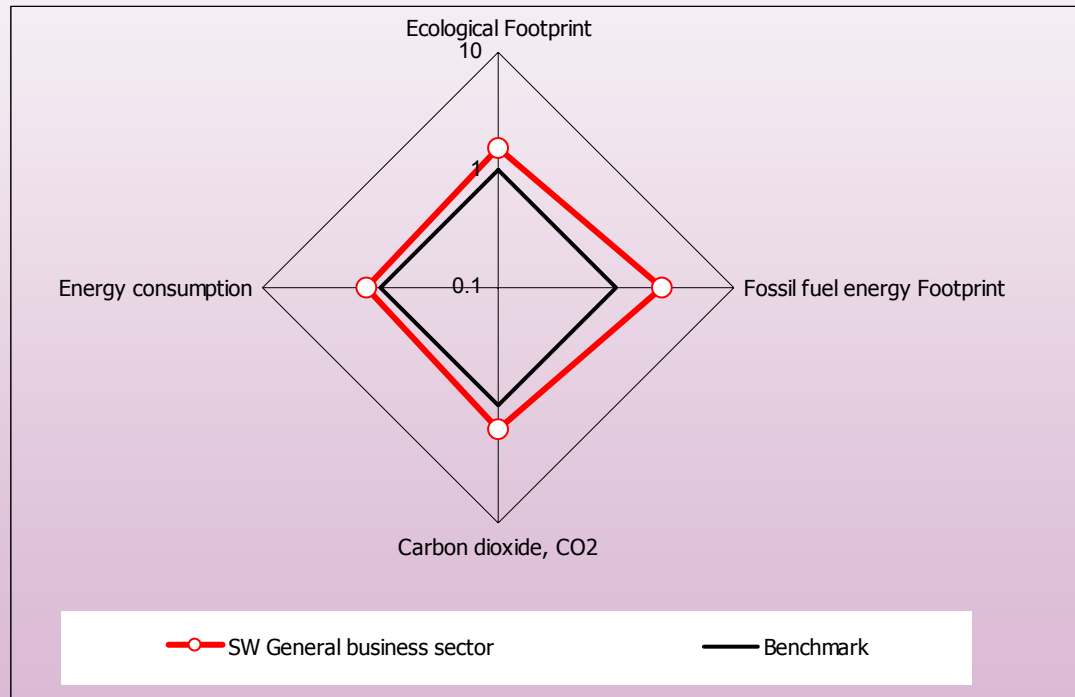
# Business services - CO<sub>2</sub>



# Business services CO<sub>2</sub> CB & RSP

- **Business services itself (271,000 t)**
- **Road transport services (84,100 t)**
  - Road transport itself (73,100 t) – remainder upstream (11,000 t)
- **Electricity production and distribution (80,800 t)**
  - Other Electricity production & distribution (63,900 + 12,400 t)
  - Remaining 4,500 t emitted further upstream > layer 3
- **Legal, consultancy & other business services (61,500 t)**
  - Legal, consultancy & other business services (16,800 t)
  - Electricity production (7,630 t)
  - Air transport services (5,140 t)
  - Remainder upstream (31,930 t)

# Business services - spider

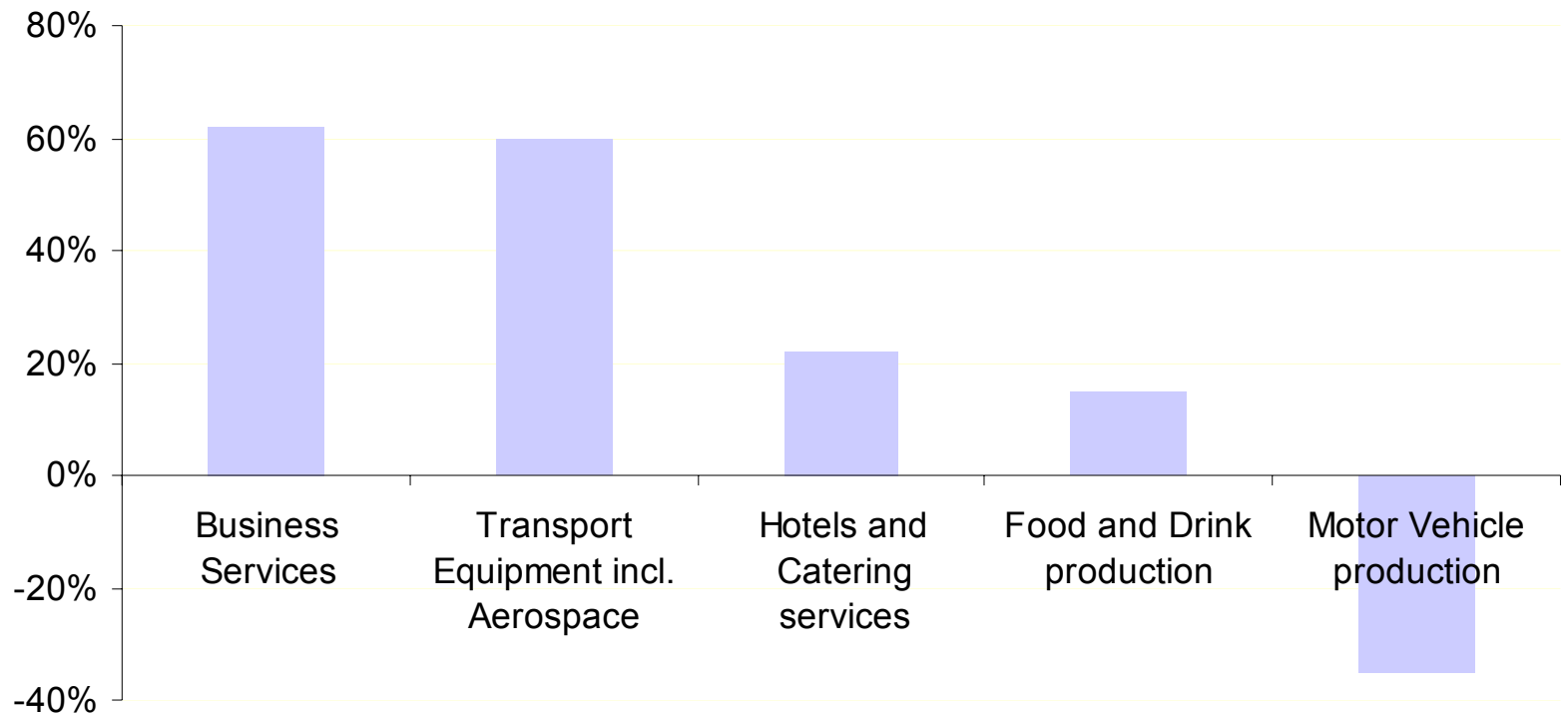


# Total CO<sub>2</sub> emissions all sectors

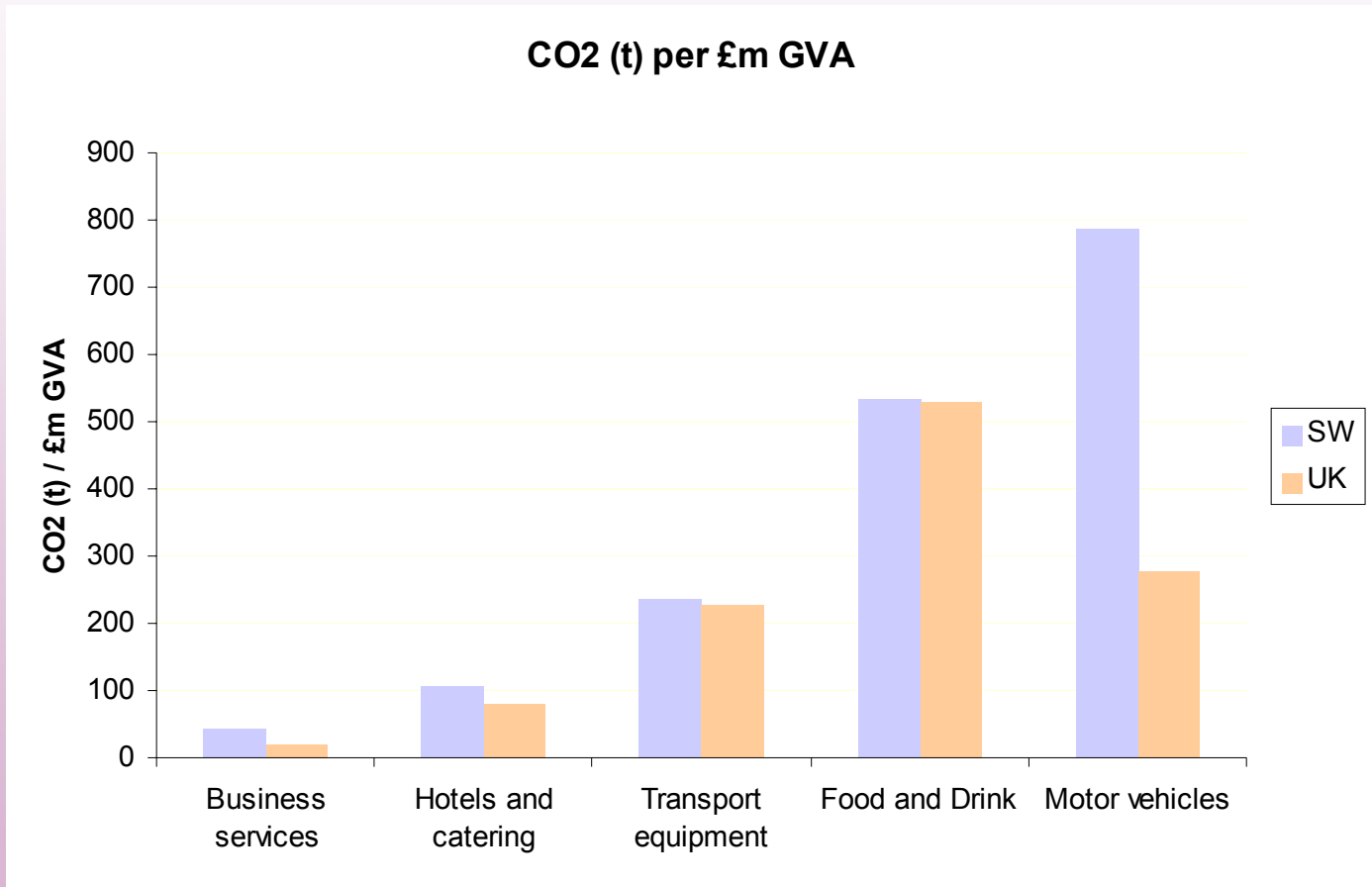
Rank	SW Sector	CO2 (t)
1.	Food and Drink production	779,000
2.	Business Services	691,000
3.	Transport Equipment incl. aerospace	527,000
4.	Motor Vehicle production	490,000
5.	Hotels and Catering services	318,000

# CO2 (t) / £ spent vs UK benchmark

Impacts per £ spent relative to UK sector



# CO<sub>2</sub> (t) / £m GVA



# Summary impact breakdown

SW Sector	CO2 by Commodity Group	CO2 by Supply Chain Layer	CO2 by Path Value
Transport Equipment manufacture	Layer 1	2 (direct suppliers to SW sector)	Transport equipment manufacture itself
Motor Vehicle manufacture	Layer 1	2	Motor Vehicle manufacture itself
Hotels and Catering services	Layer 1	1 (layer 2 for methane and nitrous oxide)	Hotels and Catering services itself (Agriculture sector for methane and nitrous oxide, layer 2)
Food and Drink manufacture	Layer 1	1 (layer 2 for methane and nitrous oxide)	Food and Drink production itself (Agriculture sector for methane and nitrous oxide, layer 2)
Business Services	Layer 1	2	Business Services itself

# Summary and main conclusions

- Direct impacts highest single share → PA, on-site energy & resource management
- Electricity main energy source → decentralise supply, increase renewables in mix
- Indirect impacts mainly in direct suppliers (L2) → supply chain management
- H&C / F&D: EF: Agriculture (cattle), fishing (sea catch); CH<sub>4</sub> & N<sub>2</sub>O higher layers → complex supply chains; high CO<sub>2</sub> agriculture → geography SW?
- F&D highest overall CO<sub>2</sub> but one of the most efficient in impacts per £ spent (after MV)
- **BS** and **TE** least efficient (tCO<sub>2</sub>/£ spent); **MV** and BS least efficient (tCO<sub>2</sub>/£m GVA) relative to UK sectors → Prime targets for further analysis of operations
- Productivity gains sectors can support SO RES (competitiveness, innovation...)
- Environmental Limits Debate: Not just production side alone but consumption also important, i.e. demographic and other growth figures including ambitious infrastructure projects → pressures add to challenges identified in RES
- Efficiency gains in economic sectors may be outweighed by increase in final demand SW region

# Conclusions SW Transport equipment manufacture

- Transport equipment production itself highest emitter
  - Address direct impacts electricity use and mix in aerospace equipment production (plants and machinery)
- Suppliers significant, 43% of CO2 from layer 2:
  - Metal producers
  - Iron and steel manufacturing
  - Non-ferrous metal producers

# Conclusions SW Motor vehicle manufacture

- Motor vehicle production itself highest CO2
  - although using 10% more energy than UK average, only 87% of EF and only 65% of CO2 emissions (but potential to get in line with average kwh use/£)
- Indirect impacts mainly located in layer 2 (heavy industries - other MV producers, iron and steel production)
- Most efficient sector relative to UK sector (CO2/£ spent) but least efficient per £m GVA

# Conclusion SW Hotels & Catering

- H&C Industry itself biggest CO2 emitter; 40% from direct emissions
  - Electricity use and mix hotels; energy efficiency measures
- Food and drink sector and road transport (layers 2 and 3) – efficiencies F&D sector and alternative transport options ??
- Fishing highest EF – menu choices SW region
- Methane and Nitrous oxide from agriculture (livestock production SW) in L2 and in higher supply chain orders (complexity agricultural interactions)
- Analysis food supply chains

# Conclusions SW Food & Drink manufacture

- Highest total impacts agriculture, fishing (EF) but SW F&D sector for CO<sub>2</sub> → meat and seafood turnover; geographic conditions re. fossil fuels
- Almost half of direct CO<sub>2</sub> emissions from SW F&D production itself, 42% electricity but also 18% coal
  - On-site energy management food processing
  - Electricity use and mix –coal
- For methane and nitrous oxide mostly agricultural sectors (livestock, layers 2+3) → supply chain analysis

# Conclusions SW Business services

- Business services itself 39% of total emissions (71% from electricity use)
  - Address energy use in offices; switch to green suppliers
- Road transport services and electricity production (L2)
  - Increase use of ICT (teleconferencing etc)
  - Alternatives to road transport??