# Measure the impact of response measures!

# But how?

Marek Harsdorff and Sophie Heald
ILO and Cambridge Econometrics

ILO UNFCCC workshop , Cape Town , 26-28 Sep 2018

# What is it you want to know?

Response measure!

What's the impact?

But on what?

GDP

Job loss/gain

Poverty

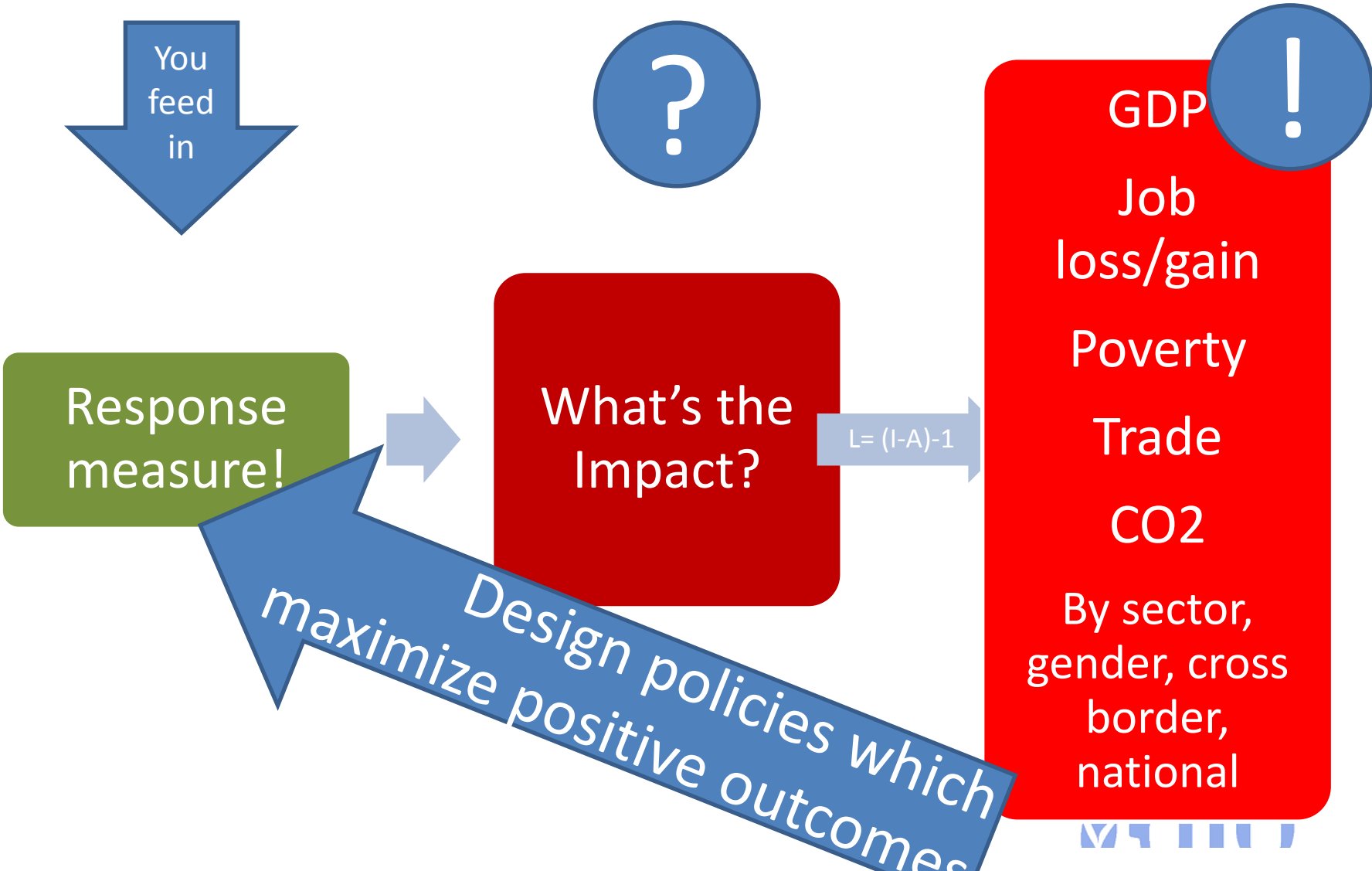
Trade

CO2

By sector, gender, cross border, national

Which flanking measures to take?

# You want to have a tool that:



All models start with statistics

But: Should be based on international standards

# System of Environment and Economic Accounting (SEEA) and Green Jobs

- ✓ SEEA framework adopted by UN
- ✓ A statistical system with economic and environmental information into a **common framework** to measure -> *the contribution of the environment to the economy*, and -->*the impact of the economy on the environment*
- ✓ Better informed decision-making.

# Environment statistics

1. production, employment and expenditure relating to environmental activities (e.g. contribution of environmental activities to GDP, share of government expenditure on environmental protection)

2. resource intensity per unit GDP of the economy (e.g. water and energy productivity, waste and emission intensity)

3. environmental taxes, environmental subsidies and similar transfers (e.g. total environmental taxes to GDP)

4. environmental assets and their role in the economy (e.g., changes in stocks of natural resources, depletion adjusted value added for extractive industries).

# Employment & Decent Work Statistics

1 – Employment-to-population ratio
2 – Unemployment rate
3 – Youth not in education and not in employment
4 – Informal employment
5 – Working poverty rate
6 – Low pay rate (below 2/3 of average hourly earnings)
7 – Excessive hours (more than 48 hours per week)
8 – Incidence of children in child labour
9 – Precarious employment rate
10 – Occupational segregation by sex
11 – Female share of employment in ISCO-08 sub-major groups 11,12 and 13
12 – Occupational injury rate, fatal
13 – Share of population above a specified age benefiting from a pension
14 – Public social security expenditure (% of GDP)
15 – Union density rate
16 – Enterprises belonging to employer organization [rate]
17 – Collective bargaining coverage rate
18 – Indicator for Fundamental Principles and Rights at Work (to be developed)

**Based on international labour standards:**

**GUIDELINES FOR PRODUCERS AND USERS OF STATISTICAL AND LEGAL FRAMEWORK INDICATORS, ILO MANUAL , Sept.2013**

available at http://www.ilo.org/wcmsp5/groups/public/---dgreports/---stat/documents/publication/wcms_223121.pdf

With multiple soc-eco-envi policy questions sources need to be combined

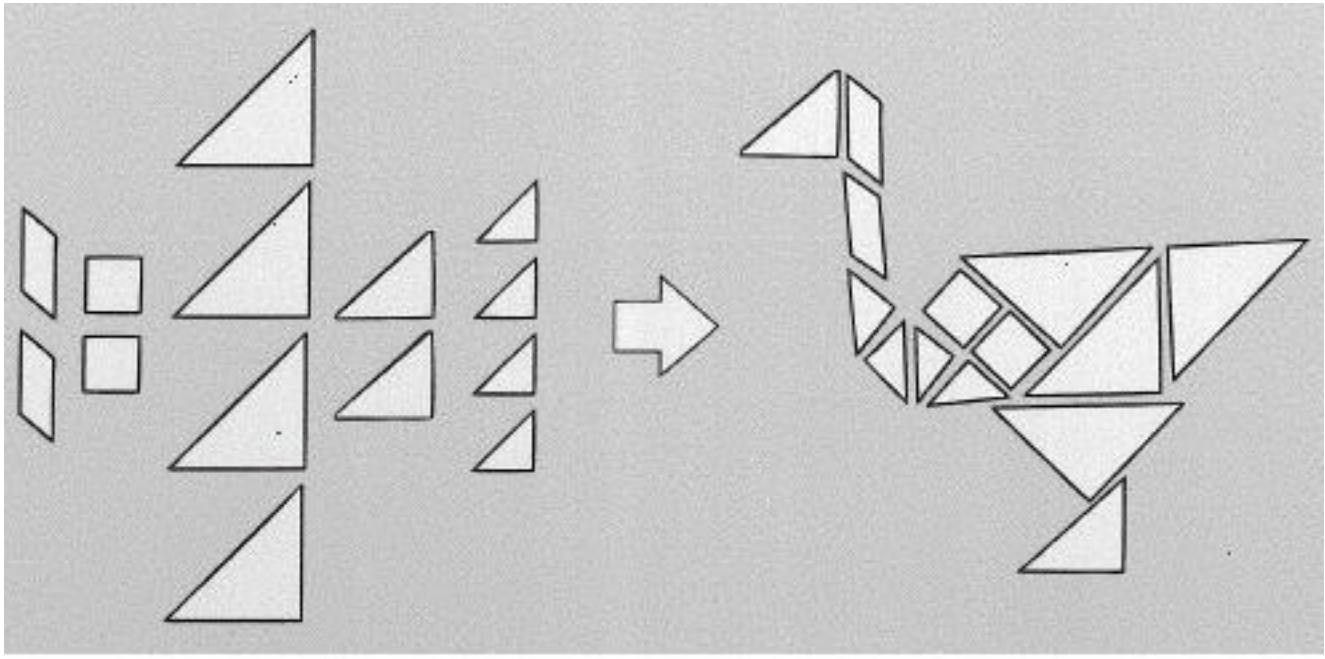

System of
nal

Labour
Force
Surveys

Household
Budget
Survey

Environmental
Assessment

# And, statistics have to be integrated:
# Input Output framework & model



Statistics

Integrated information

# The IO Table

The amount of industrial products used up by service activities.

| Industries / Products | Industries | | | Final uses | | | Total |
|---|---|---|---|---|---|---|---|
| | Agricul-ture | Industry | Service activities | Final consump-tion | Gross capital formation | Exports | |
| Agricultural products | 34 | 59 | 143 | 81 | 21 | 32 | 370 |
| Industrial products | 106 | 119 | 77 | 123 | 103 | 62 | 590 |
| Services | 70 | 112 | 75 | 291 | 61 | 31 | 640 |
| Value added | 90 | 210 | 405 | | | | 705 |
| Total | 300 | 500 | 700 | 495 | 185 | 125 | |

Source EUROSTAT

# IO Table as an integrated data framework

## Ex. Germany

**INPUT-OUTPUT TABLE (Billions of Euro)**

| | | | PRODUCTS | | | | | | FINAL USE | | | | | Total output at basic prices |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | Final consumption | | Gross fixed capital formation | Changes in inventories | Exports | |
| | | | Agricul-ture | Manufac-turing | Construc-tion | Trade, trans.and comm. | Finance and business service | Other services | Households | Governmnet | | | | |
| No. | PRODUCTS | | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) | (11) | (12) |
| (1) | Agriculture | Domestic | 3 | 20 | | | | 1 | 9 | | | 3 | 5 | 42 |
| (2) | Manufacturing | Domestic | 7 | 394 | 48 | 56 | 11 | 30 | 250 | 7 | 95 | - 58 | 611 | 1 451 |
| (3) | Construction | Domestic | 1 | 11 | 18 | 8 | 28 | 10 | 5 | | 153 | | 1 | 234 |
| (4) | Trade, transport and comm. | Domestic | 4 | 139 | 17 | 181 | 38 | 40 | 317 | 15 | 39 | 6 | 111 | 907 |
| (5) | Finance and business services | Domestic | 6 | 131 | 30 | 124 | 261 | 51 | 313 | 3 | 25 | | 66 | 1 010 |
| (6) | Other services | Domestic | | 18 | 3 | 12 | 17 | 47 | 147 | 472 | 2 | | 2 | 721 |
| (7) | Total at basic prices | | 21 | 713 | 116 | 382 | 355 | 179 | 1 041 | 497 | 314 | - 49 | 795 | 4 365 |
| (8) | Agriculture | Imported | 1 | 11 | | | | 1 | 8 | | | 1 | 2 | 23 |
| (9) | Manufacturing | Imported | 4 | 246 | 15 | 21 | 3 | 12 | 111 | 7 | 57 | 27 | 160 | 664 |
| (10) | Construction | Imported | | | | | | | 1 | | | 3 | 20 | 25 |
| (11) | Trade, transport and comm. | Imported | | 9 | 1 | 31 | 4 | 2 | | | | | | 47 |
| (12) | Finance and business services | Imported | | 16 | 1 | 6 | 24 | 5 | 8 | 2 | 4 | | 8 | 73 |
| (13) | Other services | Imported | | | | | | 1 | | | | | | 1 |
| (14) | Imports | | 5 | 283 | 17 | 58 | 31 | 21 | 128 | 9 | 61 | 31 | 189 | 833 |
| (15) | Taxes less subsidies on products | | 2 | 10 | 2 | 12 | 17 | 24 | 151 | 6 | 34 | | | 257 |
| (16) | Total at purchasers' prices | | 27 | 1 007 | 135 | 452 | 402 | 224 | 1 319 | 513 | 409 | - 18 | 984 | 5 455 |
| (17) | Compensation of employees | Value add. | 6 | 308 | 69 | 294 | 191 | 364 | | | | | | 1 232 |
| (18) | Other taxes less subsidies on production | Value add. | - 6 | - 2 | | - 1 | 5 | - 7 | | | | | | - 12 |
| (19) | Consumption of fixed capital | Value add. | 8 | 79 | 5 | 60 | 160 | 63 | | | | | | 375 |
| (20) | Net operating surplus/Net mixed income | Value add. | 7 | 60 | 25 | 101 | 252 | 77 | | | | | | 523 |
| (21) | GVA | | 15 | 445 | 99 | 454 | 608 | 497 | | | | | | 2 117 |
| (22) | Total input at basic prices | | 42 | 1 451 | 234 | 907 | 1 010 | 721 | 1 319 | 513 | 409 | - 18 | 984 | |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **EMPLOYMENT (1,000 persons)** | | | | | | | | | | | |
| (29) | Wage and salary earners | 295 | 6 787 | 1 948 | 9 821 | 5 693 | 11 356 | | | | 35 900 |
| (30) | Self-employed | 359 | 275 | 463 | 1 297 | 1 017 | 1 059 | | | | 4 470 |
| (31) | Total | 654 | 7 062 | 2 411 | 11 118 | 6 710 | 12 415 | | | | 40 370 |
| **ENERGY (Petajoule)** | | | | | | | | | | | |
| (32) | Coal and coal products | | 1 714 | 1 | 1 | | 6 | 17 | - 41 | 40 | 1 738 |
| (33) | Brown coals and lignite products | | 1 617 | | | | 1 | 21 | - 9 | 24 | 1 654 |
| (34) | Crude oil | | 4 294 | | | | | | - 7 | 5 | 4 291 |
| (35) | Gasolines | 3 | 91 | 4 | 25 | 20 | 15 | 868 | 4 | 248 | 1 278 |
| (36) | Diesel fuels | 106 | 123 | 79 | 476 | 93 | 74 | 387 | | 355 | 1 693 |
| (37) | Jet fuels | | | | 434 | | 4 | | 10 | 176 | 624 |
| (38) | Heating oil, light | 25 | 188 | 14 | 87 | 26 | 85 | 514 | 13 | 100 | 1 052 |
| (39) | Fuel oil, heavy | | 336 | | 17 | | | | - 13 | 217 | 557 |
| (40) | Other petroleum products | 2 | 1 190 | 101 | 35 | 2 | 3 | 48 | - 1 | 161 | 1 540 |
| (41) | Natural gas and other gases | 12 | 1 797 | 12 | 125 | 49 | 184 | 936 | 228 | 465 | 3 808 |
| (42) | Renewable Energy | 6 | 1 178 | 5 | 45 | 7 | 6 | 299 | 1 | 18 | 1 564 |
| (43) | Electric power and other energy | 23 | 2 641 | 14 | 289 | 76 | 197 | 678 | 127 | 198 | 4 242 |
| (44) | Total | 178 | 15 167 | 230 | 1 535 | 273 | 574 | 3 767 | 311 | 2 006 | 24 043 |
| **EMISSIONS (1,000 tons)** | | | | | | | | | | | |
| (45) | Carbon dioxide (CO2) | 9 260 | 550 893 | 9 162 | 80 990 | 12 077 | 24 173 | 222 268 | | | 908 823 |
| (46) | Methane (CH4) | 1 247 | 925 | 1 | 49 | 3 | 10 | 79 | | | 2 313 |
| (47) | Nitrous oxide (N2O) | 137 | 62 | | 2 | | | 4 | | | 206 |
| (48) | Nitrogen oxides (NOx) | 153 | 538 | 46 | 398 | 33 | 45 | 314 | | | 1 526 |
| (49) | Sulfur dioxide (SO2) | 3 | 373 | 1 | 41 | 2 | 8 | 42 | | | 469 |
| (50) | Organic compounds (NMVOC) | 13 | 574 | 6 | 40 | 3 | 7 | 310 | | | 952 |
| (51) | Ammonia (NH3) | 541 | 16 | | 2 | | | 20 | | | 579 |
| (52) | Particulate matter (PM10) | 47 | 42 | 7 | 43 | 2 | 3 | 48 | | | 192 |
| (53) | Hydroflurocarbons (HFC) | | 12 | | | | | | | | 12 |
| (54) | Perflurorocarbons PFC | | | | | | | | | | |
| (55) | Sulfur hexafluoride (SF6) | | | | | | | | | | |
| (54) | Total | 11 402 | 553 435 | 9 222 | 81 565 | 12 120 | 24 246 | 223 084 | | | 915 073 |
| **GLOBAL WARMING AND ACID DEPOSITION (1,000 tons)** | | | | | | | | | | | |
| (55) | Greenhouse gases 1) | 77 990 | 589 463 | 9 232 | 82 710 | 12 195 | 24 482 | 225 115 | | | 1 021 188 |
| (56) | Acid deposition 2) | 110 | 749 | 33 | 320 | 25 | 39 | 261 | | | 1 537 |
| (57) | Tropospheric ozone formation 3) | 1 413 | 2 036 | 52 | 487 | 38 | 61 | 703 | | | 4 792 |
| **WASTE, SEWAGE AND WATER** | | | | | | | | | | | |
| (58) | Waste (1.000 tons) | 804 | 122 849 | 194 098 | 4 945 | 5 510 | 3 931 | 36 033 | | | 368 171 |
| (59) | Sewage (Mio. cbm) | 21 | 26 970 | 38 | 173 | 193 | 137 | 3 118 | | | 30 650 |
| (60) | Water from waterworks (Mio. cbm) | 136 | - 3 725 | 14 | 194 | 216 | 154 | 3 011 | | | |
| (61) | Water from nature (Mio. cbm) | 303 | 37 608 | 25 | 9 | 10 | 7 | 25 | | | 37 986 |

# Ex Zambia: Climate friendly & conventional industries

| | Classification | | A. Agriculture, fo | | A. Agriculture, fo | | B. Mining and q | | C. Manufacturin | | C. Manufacturin | | D. Electricity, ga | | D. Electricity, ga | | E. Water supply | | F. Construction | | G. Wholesale ar | | H. Transportati | | I. Accommodati | | I. Accommodati | | J. Information a | | K. Financial and | | L. Real estate ac | | M. Professional, | | N. Administrativ | | O. Public admini | | P. Education | | Q. Human healt | | R. Arts, entertai | | S. Other service | | T. Activities of h | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Formal | Informa | Formal | Informa | Formal | Informa | Formal | Informa | Formal | Informa | Formal | Informa | Formal | Informa | Formal | Informa | Formal | Informa | Formal | Informa | Formal | Informa | Formal | Informa | Formal | Informa | Formal | Informa | Formal | Informa | Formal | Informa | Formal | Informa | Formal | Informa | Formal | Informa | Formal | Informa | Formal | Informa | Formal | Informa | Formal | Informa | Formal | Informa |
| | | CPC | 2Af | 2Ai | 2AGf | 2AGi | 2Bf | 2Bi | 2Cf | 2Ci | 2CGf | 2CGi | 2Df | 2Di | 2DGf | 2DGi | 2Ef | 2Ei | 2Ff | 2Fi | 2Gf | 2Gi | 2Hf | 2Hi | 2If | 2Ii | 2IGf | 2IGi | 2Jf | 2Ji | 2Kf | 2Ki | 2Lf | 2Li | 2Mf | 2Mi | 2Nf | 2Ni | 2Of | 2Oi | 2Pf | 2Pi | 2Qf | 2Qi | 2Rf | 2Ri | 2Sf | 2Si | 2Tf | 2Ti |
| 1. Goods and Services (products) | Agriculture, fore | 1A | 436.1 | 137.9 | 32.9 | 10.4 | | | 5,668.6 | 250.4 | | | | | | | | | | | | | | | 211.2 | 10.0 | 40.7 | 1.9 | | | | | | | | | | | 18.2 | 0.0 | 30.8 | 0.0 | | | | | | | | |
| | Agriculture, fore | 1AG | 395.5 | 125.1 | 46.3 | 14.6 | | | 350.7 | 15.5 | 1,548.0 | 68.4 | | | | | | | | | | | | | 10.3 | 0.5 | 2.9 | 0.1 | | | | | | | | | | | 4.0 | 0.0 | | | | | | | | |
| | Products from m | 1B | | | | | 2,797.7 | 18.5 | 3,348.6 | 147.9 | | | | | | | | | 382.4 | 498.7 | | | | | 12.5 | 0.6 | 4.9 | 0.2 | | | | | | | | | | | | | | | | | | | | |
| | Manufactured p | 1C | 923.9 | 292.2 | 258.0 | 81.6 | 3,384.5 | 22.4 | 5,420.1 | 239.4 | 260.5 | 11.5 | 1.6 | | 141.7 | | 14.3 | | 542.1 | 707.0 | 1,246.0 | 1,101.0 | 746.5 | 666.1 | 275.6 | 13.0 | 106.8 | 5.0 | 1,095.5 | 9.2 | 3.5 | 0.0 | 164.3 | 72.2 | 1,011.6 | 1.7 | 463.2 | 6.4 | 747.8 | | 235.0 | 0.3 | 1,138.8 | 1.2 | 87.5 | 6.6 | 41.2 | 1.2 | | |
| | Manufactured p | 1CG | 281.4 | 89.0 | 79.9 | 25.3 | 1,027.4 | 6.8 | 260.9 | 11.5 | 967.1 | 42.7 | 2.9 | | 251.9 | | 24.9 | | 1,094.6 | 1,427.5 | 264.3 | 233.6 | 157.3 | 140.3 | 268.5 | 12.7 | 121.6 | 5.7 | 260.5 | 2.2 | 47.2 | 0.1 | 4.9 | 2.1 | 15.0 | 0.0 | 8.8 | 0.1 | 214.8 | | 702.6 | 1.0 | 38.2 | 0.0 | 38.6 | 2.9 | 208.8 | 5.9 | | |
| | Electricity, gas, s | 1D | | | | | | | 7.8 | 0.3 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Electricity, gas, s | 1DG | 57.3 | 18.1 | 8.3 | 2.6 | 1,347.8 | 8.9 | 357.8 | 15.8 | 66.4 | 2.9 | 0.0 | | 0.0 | | 18.0 | | 3.9 | 5.0 | 21.0 | 18.6 | 5.0 | 4.4 | 12.6 | 0.6 | 2.3 | 0.1 | 24.5 | 0.2 | 31.9 | 0.1 | 6.9 | 3.0 | 27.4 | 0.0 | 10.3 | 0.1 | 58.3 | | 14.8 | 0.0 | 14.4 | 0.0 | 1.8 | 0.1 | 4.1 | 0.1 | | |
| | Water and waste | 1E | 18.3 | 5.8 | 2.9 | 0.9 | 321.3 | 2.1 | 111.6 | 4.9 | 26.0 | 1.1 | 0.0 | | 0.3 | | 6.2 | | 1.2 | 1.6 | 46.2 | 40.8 | 22.4 | 20.0 | 4.0 | 0.2 | 1.1 | 0.1 | 1.8 | 0.0 | 1.4 | 0.0 | 2.4 | 1.1 | 3.3 | 0.0 | 12.9 | 0.2 | 11.0 | | 5.8 | 0.0 | 2.2 | 0.0 | 2.8 | 0.2 | 2.5 | 0.1 | | |
| | Construction wo | 1F | 94.7 | 29.9 | 17.0 | 5.4 | 456.7 | 3.0 | 22.3 | 1.0 | 15.9 | 0.7 | 1.0 | | 84.8 | | 34.3 | | 26.3 | 34.3 | 81.3 | 71.9 | 103.9 | 92.7 | 4.7 | 0.2 | 1.3 | 0.1 | 38.0 | 0.3 | 15.9 | 0.0 | 1,100.7 | 483.8 | 3.5 | 0.0 | 2.0 | 0.0 | 64.1 | | 45.5 | 0.1 | 22.6 | 0.0 | 13.0 | 1.0 | 208.8 | 5.9 | | |
| | Wholesale and r | 1G | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Transportation a | 1H | 98.6 | 31.2 | 4.0 | 1.3 | 731.9 | 4.8 | 289.2 | 12.8 | 83.0 | 3.7 | 0.1 | | 7.1 | | 11.1 | | 203.2 | 264.9 | 154.7 | 136.7 | 93.4 | 83.4 | 21.1 | 1.0 | 4.3 | 0.2 | 194.2 | 1.6 | 4.4 | 0.0 | 23.4 | 10.3 | 75.1 | 0.1 | 47.9 | 0.7 | 148.0 | | 42.1 | 0.1 | 79.4 | 0.1 | 4.1 | 0.3 | 314.2 | 8.9 | | |
| | Accommodation | 1I | | | 10.6 | 3.3 | 244.0 | 1.6 | 203.4 | 9.0 | 53.6 | 2.4 | 0.1 | | 10.6 | | 1.8 | | 37.6 | 49.0 | 59.8 | 52.9 | 30.9 | 27.6 | 2.8 | 0.1 | 0.9 | 0.0 | 39.8 | 0.3 | 24.3 | 0.1 | 12.4 | 5.4 | 10.3 | 0.0 | 7.8 | 0.1 | 65.1 | | 27.2 | 0.0 | 15.2 | 0.0 | 1.2 | 0.1 | 15.0 | 0.4 | | |
| | Accommodation | 1IG | 24.9 | 7.9 | 1.5 | 0.5 | 35.4 | 0.2 | 45.2 | 2.0 | 7.8 | 0.3 | 0.0 | | 1.5 | | 0.3 | | 8.4 | 10.9 | 8.7 | 7.7 | 4.5 | 4.0 | 0.6 | 0.0 | 0.2 | 0.0 | 8.8 | 0.1 | 3.5 | 0.0 | 1.8 | 0.8 | 2.3 | 0.0 | 1.7 | 0.0 | 17.4 | | 3.9 | 0.0 | 3.7 | 0.0 | 0.2 | 0.0 | 3.7 | 0.1 | | |
| | Information and | 1J | 84.5 | 26.7 | 6.6 | 2.1 | 260.7 | 1.7 | 174.2 | 7.7 | 45.8 | 2.0 | 0.1 | | 5.2 | | 4.7 | | 41.5 | 54.2 | 425.5 | 376.0 | 91.4 | 81.5 | 10.6 | 0.5 | 3.8 | 0.2 | 220.4 | 1.8 | 14.7 | 0.0 | 19.4 | 8.5 | 62.1 | 0.1 | 48.9 | 0.7 | 22.2 | | 13.4 | 0.0 | 48.1 | 0.1 | 0.8 | 0.1 | 64.5 | 1.8 | | |
| | Financial and ins | 1K | 394.0 | 124.6 | 0.4 | 0.1 | 158.8 | 1.0 | 320.6 | 14.2 | 21.9 | 1.0 | 0.5 | | 43.3 | | 7.0 | | 455.3 | 593.8 | 280.1 | 247.5 | 134.4 | 119.9 | 25.2 | 1.2 | 4.9 | 0.2 | 65.4 | 0.5 | 556.5 | 1.1 | 60.4 | 26.5 | 57.2 | 0.1 | 62.3 | 0.9 | 109.8 | | 7.6 | 0.0 | 9.1 | 0.0 | 2.7 | 0.2 | 121.4 | 3.5 | | |
| | Real estate servi | 1L | 83.6 | 26.4 | 6.6 | 2.1 | 207.7 | 1.4 | 186.3 | 8.2 | 43.5 | 1.9 | 0.1 | | 7.8 | | 5.2 | | 128.2 | 167.2 | 646.9 | 571.7 | 79.0 | 70.5 | 26.2 | 1.2 | 9.9 | 0.5 | 238.7 | 2.0 | 44.8 | 0.1 | 45.0 | 19.8 | 49.6 | 0.1 | 56.1 | 0.8 | 40.4 | | 18.1 | 0.0 | 69.7 | 0.1 | 4.0 | 0.3 | 36.8 | 1.0 | | |
| | Professional, scie | 1M | 371.6 | 117.5 | 0.8 | 0.3 | 623.7 | 4.1 | 312.5 | 13.8 | 122.9 | 5.4 | 0.9 | | 77.7 | | 62.2 | | 33.2 | 43.3 | 33.4 | 29.5 | 58.8 | 52.5 | 15.7 | 0.7 | 4.3 | 0.2 | 331.2 | 2.8 | 387.0 | 0.8 | 55.3 | 24.3 | 24.1 | 0.0 | 43.1 | 0.6 | 142.5 | | 415.7 | 0.6 | 103.3 | 0.1 | 2.0 | 0.1 | 50.1 | 1.4 | | |
| | Administrative a | 1N | 774.9 | 245.1 | 35.0 | 11.1 | 1,354.1 | 8.9 | 22.8 | 1.0 | 4.7 | 0.2 | 0.7 | | 64.7 | | 30.7 | | 44.2 | 57.6 | 77.5 | 68.5 | 57.7 | 51.5 | 1.8 | 0.1 | 0.7 | 0.0 | 26.3 | 0.2 | 278.6 | 0.6 | | | 2.1 | 0.0 | 8.2 | 0.1 | 6.8 | | | | | | | | | | | |
| | Public administr | 1O | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Education | 1P | 130.1 | 41.1 | 10.1 | 3.2 | 206.6 | 1.4 | 393.8 | 17.4 | 46.6 | 2.1 | 0.1 | | 9.4 | | 7.0 | | 83.3 | 108.6 | 48.4 | 42.7 | 31.0 | 27.6 | 6.7 | 0.3 | 2.0 | 0.1 | 58.8 | 0.5 | 23.5 | 0.0 | 11.8 | 5.2 | 25.2 | 0.0 | 18.2 | 0.3 | 87.8 | | 68.7 | 0.1 | 79.8 | 0.1 | 2.7 | 0.2 | 81.0 | 2.3 | | |
| | Human health a | 1Q | 34.8 | 11.0 | 2.7 | 0.9 | 72.4 | 0.5 | 67.7 | 3.0 | 12.5 | 0.6 | 0.0 | | 2.5 | | 1.9 | | 14.3 | 18.7 | 12.9 | 11.4 | 8.3 | 7.4 | 1.2 | 0.1 | 0.3 | 0.0 | 10.1 | 0.1 | 6.3 | 0.0 | 3.2 | 1.4 | 4.3 | 0.0 | 3.1 | 0.0 | 6.3 | | 5.4 | 0.0 | 90.3 | 0.1 | 0.3 | 0.0 | 6.1 | 0.2 | | |
| | Arts, entertainm | 1R | | | | | | | 27.3 | 1.2 | | | | | | | | | | | | | | | 3.6 | 0.2 | 1.4 | 0.1 | 0.8 | 0.0 | | | | | 4.1 | 0.0 | 6.9 | 0.1 | 15.7 | | | | | | | | | |
| | Other services | 1S | | | | | | | | | | | | | | | | | | | | | | | | | | | 28.0 | 0.2 | | | | | 143.4 | 0.2 | | | 112.1 | | | | | | 102.7 | 2.9 | | |
| | Households as e | 1T | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Compensation of employees | Manag | Form | 48.3 | 4.6 | 16.7 | 1.1 | 622.9 | | 280.8 | | 45.2 | | 0.6 | | 56.7 | | 12.0 | | 42.1 | | 80.9 | 22.0 | 23.7 | | 155.3 | 4.0 | 59.3 | 3.8 | 226.4 | | 707.1 | | | | 8.3 | | 20.6 | | 340.1 | | 224.7 | | 85.3 | | | 2.7 | 9.9 | | | |
| | | Infor | | 1.3 | | 0.3 | 0.5 | | | | | | | | | | | | | 18.2 | 16.7 | 12.2 | 1.8 | 0.6 | 2.6 | | 1.0 | | 7.8 | | | | | | | | | | | | | 30.6 | | | | | | | |
| | Profess | Form | 125.5 | | 43.3 | | 528.3 | 7.3 | 221.5 | | 35.7 | | 1.1 | | 108.4 | | 9.4 | | 24.4 | 59.9 | 91.1 | | 115.8 | | 3.4 | | 1.3 | | 79.1 | | 566.3 | | | | 163.8 | | 43.0 | | 932.9 | | 4,561.9 | 86.5 | 868.0 | | 45.9 | | 220.7 | 0.0 | | |
| | | Infor | | 0.5 | | 0.1 | 1.1 | | 27.8 | | 4.5 | | | | | | | | | | | | | | 1.3 | | 0.5 | | 13.0 | 0.0 | 7.0 | | | | 2.3 | 9.7 | | | | | 80.1 | 62.6 | 8.2 | | 2.9 | 10.6 | 35.5 | 0.0 | | |
| | Technic | Form | 68.9 | | 23.8 | | 463.2 | 0.3 | 123.8 | | 19.9 | | 0.8 | | 80.2 | | 15.4 | | 10.6 | 654.0 | 37.7 | 11.3 | 104.1 | 2.6 | 17.2 | 2.8 | 6.6 | 2.6 | 165.9 | | 99.0 | | | | 22.4 | | 5.6 | | 325.5 | | 50.3 | | 313.3 | | | 2.5 | 129.0 | | | 0.1 |
| | | Infor | | | | | 27.4 | | 4.5 | 8.2 | 0.7 | 0.9 | 0.0 | | 4.5 | | | | 4.1 | | 5.0 | 14.7 | 1.3 | | 8.0 | | 3.1 | | 18.7 | 6.7 | 14.6 | | | | | | | 0.1 | 62.0 | | | | 4.1 | | | | 20.5 | | | |
| | Clerical | Form | 16.2 | 3.4 | 5.6 | 0.8 | 30.3 | 0.6 | 16.6 | 47.2 | 2.7 | 5.4 | 0.1 | | 10.8 | | 21.5 | | 8.5 | | 7.3 | | 66.2 | | 9.8 | 2.0 | 3.7 | 1.8 | 76.4 | | 442.4 | | 194.7 | | 18.3 | | 12.0 | | 187.0 | | 22.4 | | 61.8 | | 19.2 | | 20.9 | 0.0 | | |
| | | Infor | | | | | | | | | | | | | | | | | | 102.8 | | | 1.2 | | 2.6 | 0.1 | 1.0 | 0.1 | 36.2 | | 11.6 | | | | | | | | 3.2 | | | | | | | | 4.0 | | | |
| | Service | Form | 63.3 | 5.4 | 21.9 | 1.3 | 123.1 | 1.9 | 130.5 | 6.5 | 21.0 | 0.7 | 0.1 | | 14.8 | | 4.6 | | 11.4 | 6.6 | 167.3 | 200.7 | 43.2 | 0.9 | 73.6 | 24.2 | 28.1 | 22.7 | 10.9 | 0.1 | 3.5 | | | | 5.4 | | 90.4 | 2.0 | 1,104.4 | | 50.5 | | 59.7 | | 2.2 | 0.7 | 52.3 | 0.0 | | 0.1 |
| | | Infor | 15.3 | 8.3 | 5.3 | 2.0 | 13.8 | | 12.9 | 5.0 | 2.1 | 0.6 | 0.0 | | 0.3 | | | | 6.4 | 42.9 | 106.8 | 636.7 | 43.8 | 46.1 | 28.4 | 10.2 | 10.8 | 9.5 | 6.3 | 0.1 | 25.5 | | | | | | | | 16.6 | 1.5 | 36.1 | | 3.7 | 5.3 | 8.1 | | 71.7 | 0.3 | 26.0 | 0.1 | | 0.5 |
| | Skilled | Form | 86.3 | 17.2 | 29.8 | 4.1 | 0.6 | | 0.5 | | 0.1 | | | | | | | | | | | 3.2 | | | | | | | 7.6 | | | | | | | | | | 5.3 | | | | | | | | | | |
| | | Infor | 70.2 | 131.9 | 24.2 | 31.7 | | | 4.1 | 4.7 | 0.7 | 0.5 | | | | | | | | 20.9 | 1.2 | | | | | | | | 1.2 | | | | | | | | | | | | | | | | | 0.0 | | 0.0 |
| | Craft ar | Form | 49.9 | 4.3 | 17.2 | 1.0 | 194.2 | 1.9 | 304.4 | 41.5 | 49.0 | 4.7 | 0.6 | | 64.1 | | 1.5 | | 89.0 | 482.1 | 47.5 | 62.6 | 6.1 | 7.8 | 1.3 | | 0.5 | | 9.2 | | | | | | | | 3.6 | | 76.2 | | 14.0 | | 24.2 | | 18.3 | | 2.1 | 0.0 | | |
| | | Infor | 20.9 | 4.1 | 7.2 | 1.0 | 44.2 | | 74.4 | 157.2 | 12.0 | 17.8 | 0.1 | | 5.1 | | 1.3 | | 66.5 | 3,034.0 | 27.1 | 152.8 | | | 5.0 | | 1.9 | | | | | | | | 0.1 | 2.4 | | | 9.7 | | | 0.3 | 15.3 | | | | 0.9 | 0.2 | | 0.7 |
| | Plant a | Form | 24.0 | 3.2 | 8.3 | 0.8 | 587.5 | 19.1 | 249.4 | 52.0 | 40.1 | 5.9 | 0.1 | | 10.8 | | 8.6 | | 34.6 | | 13.2 | 22.6 | 280.2 | 67.7 | | 0.6 | | 0.6 | 15.3 | | | | | | | | 1.5 | | 58.4 | | 16.3 | | 19.9 | | | | | | | |
| | | Infor | 7.0 | 1.4 | 2.4 | 0.3 | 42.9 | 0.8 | 297.3 | 6.7 | 47.8 | 0.8 | 0.0 | | 1.9 | | | | 5.3 | 72.0 | 58.4 | 113.4 | 190.1 | 194.4 | | | | | | 0.0 | 4.5 | | | | | | | 0.2 | 8.4 | | 1.6 | | | | | | 7.3 | 0.0 | | 0.0 |
| | Elemen | Form | 211.8 | 32.1 | 73.1 | 7.7 | 177.7 | 2.2 | 181.4 | 10.0 | 29.2 | 1.1 | 0.1 | | 12.0 | | 1.9 | | 21.8 | 31.5 | 23.5 | 12.4 | 13.7 | 10.1 | 10.8 | 2.9 | 4.1 | 2.7 | 5.9 | | | | | | 6.4 | | 6.9 | 1.9 | 64.1 | | 56.6 | 4.9 | 44.2 | | 25.0 | 6.6 | 28.4 | 0.0 | | 0.3 |
| | | Infor | 158.5 | 93.9 | 54.7 | 22.6 | 27.1 | 1.7 | 56.3 | 50.8 | 9.1 | 5.8 | 0.0 | | 0.4 | | 1.2 | | 33.8 | 296.4 | 31.2 | 58.8 | 23.6 | 32.6 | 13.2 | 1.3 | 5.0 | 1.2 | | 0.0 | | | | | | 3.9 | 4.9 | 0.2 | 7.6 | | 11.6 | 2.2 | 7.5 | | 16.5 | 2.9 | 34.7 | 0.1 | | 2.5 |
| | Other | Form | 4.5 | | 1.5 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | Infor | | 1.1 | | 0.3 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 6.3 | | 429.1 | | | | | | | | | |
| Gross mixed incc | | 3b | | 4,289.4 | | 1,512.6 | | 82.3 | | 427.2 | | 13.3 | | | | | | | | 4,140.1 | | 8,828.7 | | 1,537.8 | | 138.9 | | | | 31.8 | | 29.0 | | 1,591.8 | | | | 99.8 | | | 27.1 | | 16.3 | | 21.5 | | 172.5 | | |
| Gross operating | | 3c | 1,220.5 | | 351.7 | | 9,848.8 | | 4,243.0 | | 515.7 | | 13.5 | | 1,051.5 | | 607.3 | | 1,122.8 | | 6,804.7 | | 3,395.5 | | 739.0 | | 238.1 | | 859.2 | | 1,907.2 | | 1,825.1 | | 792.7 | | 1,295.3 | | 258.7 | | 1,686.6 | | 189.8 | | 39.6 | | 23.4 | | | |
| Other taxes less | | 3d | 0.9 | | 0.3 | | 5.8 | | | | | | | | | | | | | | -21.8 | | | | 0.8 | | 0.3 | | | | | | | | | | | | | | | | | | | | | |

# From statistics to simple model?
## Direct and indirect emission & employment multiplier

(14)

- Additional 11 indirect jobs in mining, manufacturing, retail etc **(1)**
- And 1 ton indirect CO2

**(22)**

- Requires 21 direct jobs in construction
- Generates 11 tons CO2

**(2)**

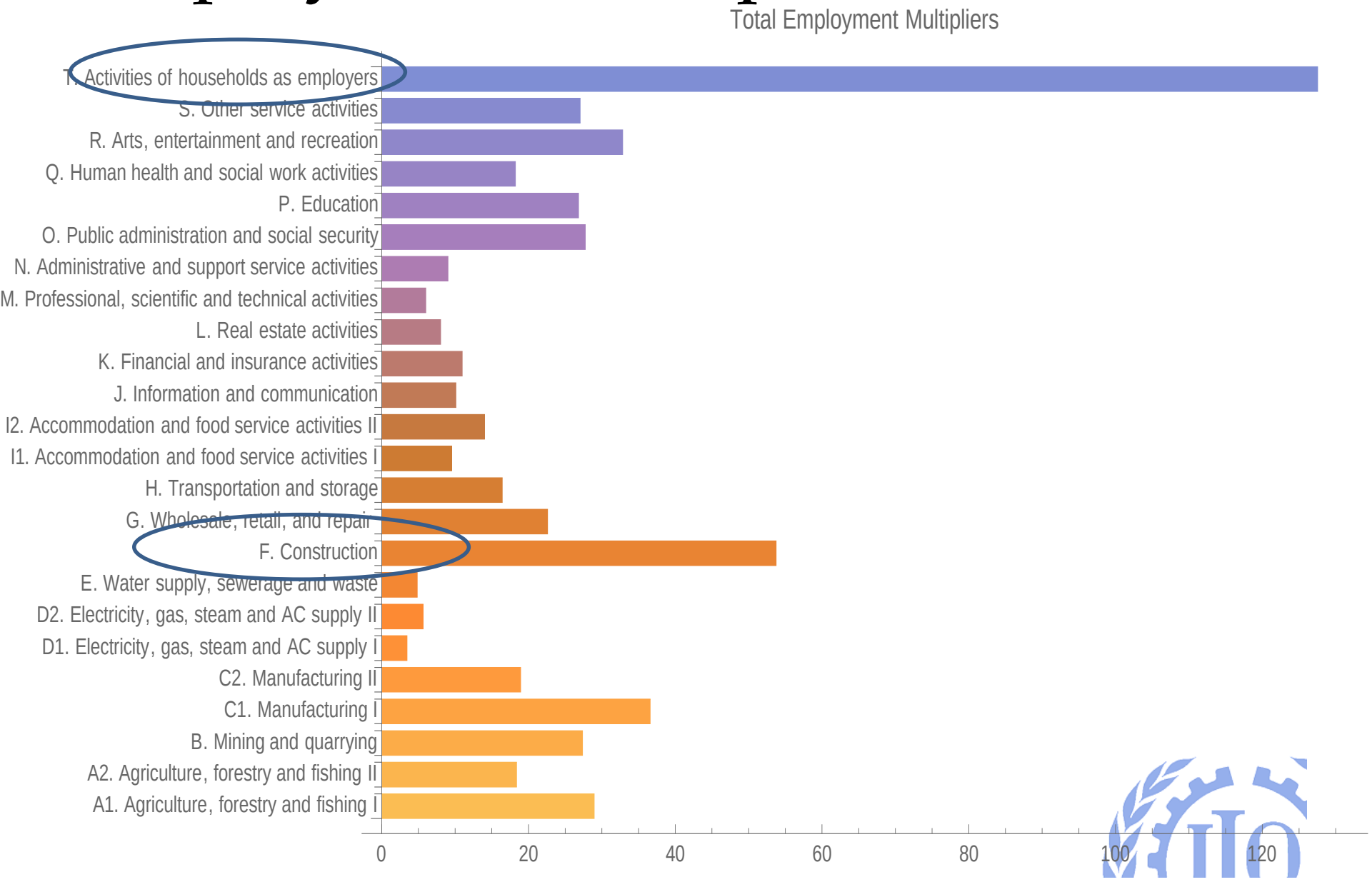
Value of (USD) 10,000

# Ex. NDC: reduce CO2 per unit GDP (in construction)

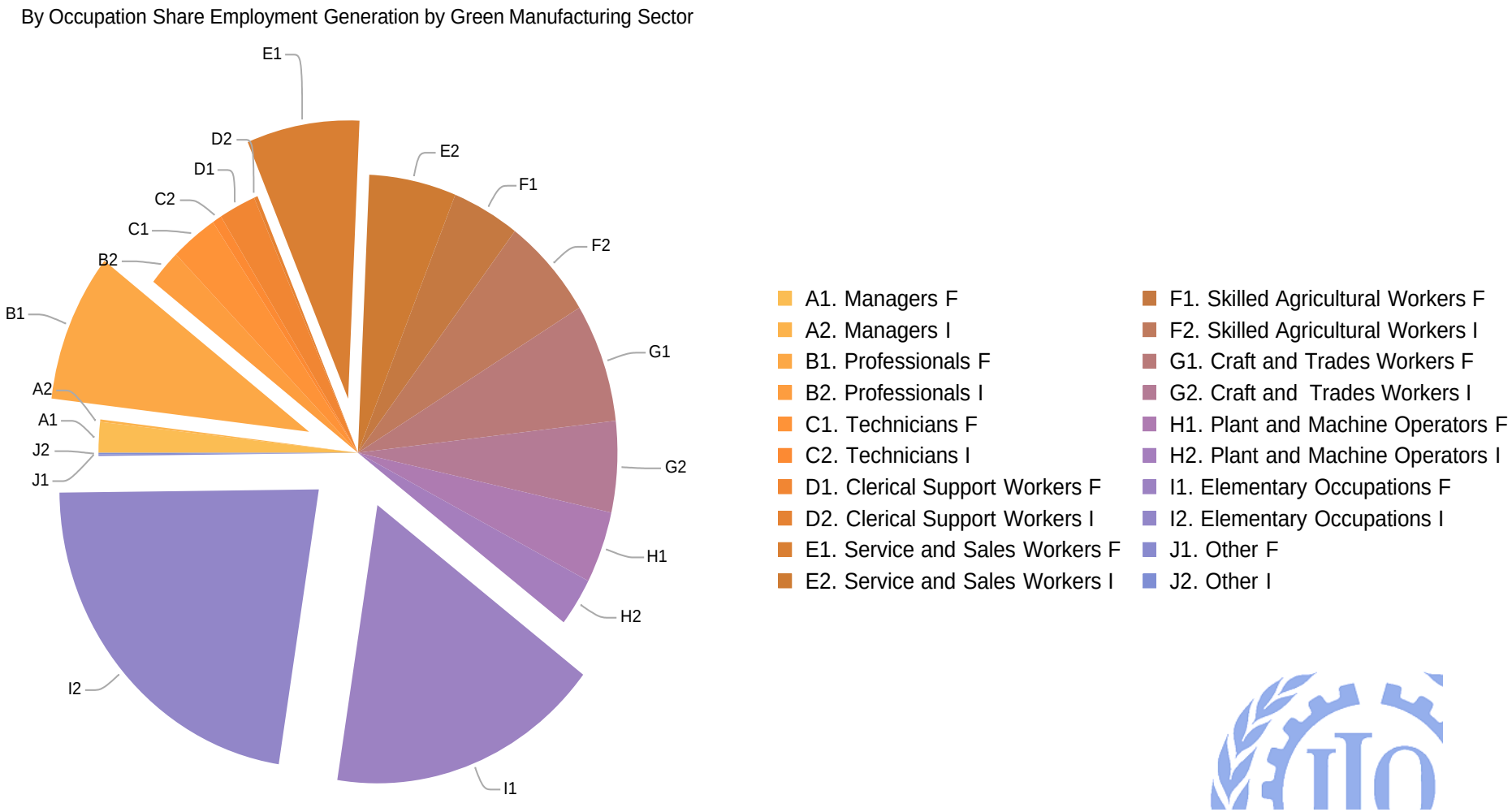
- 1 ton CO2 is associated with 9280 value in final demand (GDP) construction (and 29.8 jobs)
- In green construction 0.3 ton CO2 (33.2 jobs)
- A growth of 10,900 in green vs conventional construction would save one ton CO2 (1.34 vs 0.43) (net gain of 4 jobs)

- Total Emission Multipliers: 1000 unit value increase in final demand in construction increases MtCO2e emissions by 1.2 (and by 0.3 in green construction)

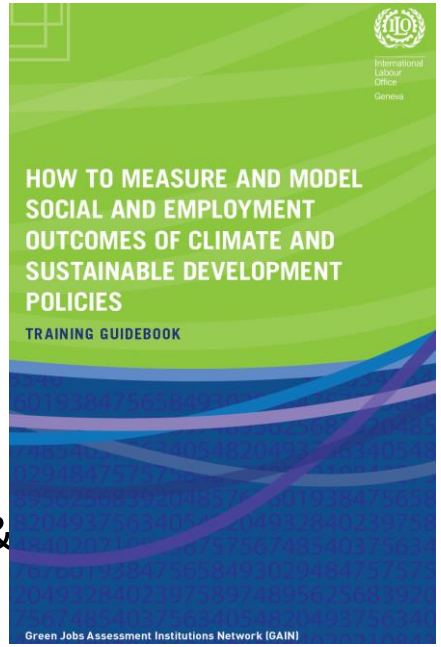
# Employment Multipliers Zambia



# Share of occupations/skills



# Green Jobs Assessment Model (GJAM)




1. Based on integrated national data framework SupplyUse-, InputOutput Tables and Social Accounting Matrix to monitor economy, environment & social outcomes


2. Based on and adapted to national needs

   Policy to guide the features of model

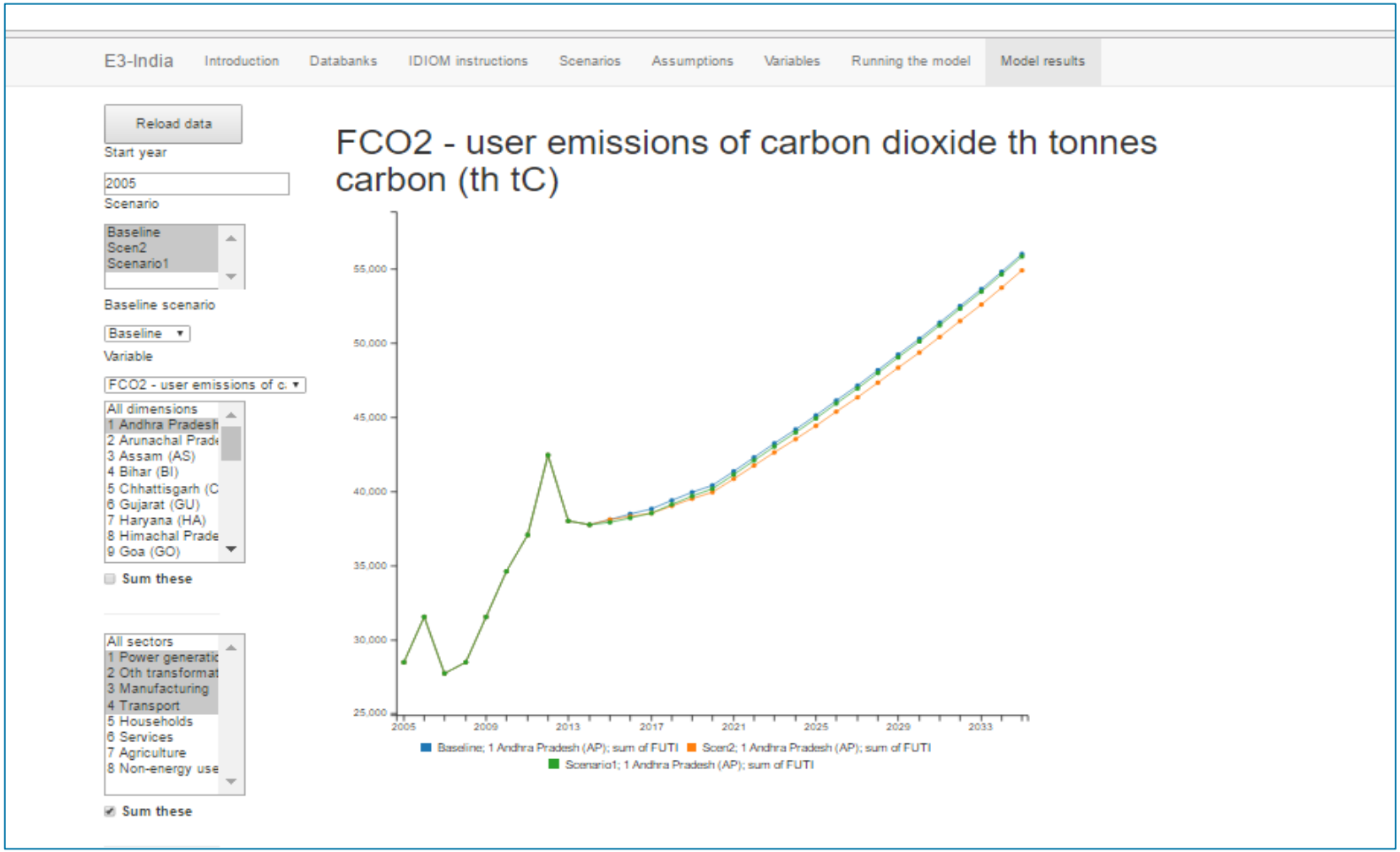
3. Based on capacity building: nationally build and owned Stepwise approach to capacity building for statisticians, researchers and policy makers ensures sustainability

# Introduction to the E3ME model

- Computer-based model of the global economy, energy system and environment
- Organised into 59 regions (incl. South Africa, Nigeria and Rest of Africa)
- Based on an input-output accounting framework coupled with a series of behavioural equations
- Designed for policy analysis
- Optimisation not assumed
- Under the right conditions it is therefore possible for regulation to increase output and employment

cambridge econometrics

# E3ME interface




cambridge econometrics

# E3ME key features

## Detailed Coverage

- 59 regions (33 European, 26 World)
- 44 economic sectors and 28 consumption categories
- 23 fuel users of 12 fuels

## Comprehensive

- whole energy, environment and economy system
- two ways feedbacks between each module
- many policy instruments

## Highly Empirical

- 1970-2014 database
- 28 stochastic equations
- relationships validated from data
- econometrics allows for short-medium and long term analysis

## Consistent

- based on system of national accounting
- input-output tables
- bilateral trade

## Forward Looking

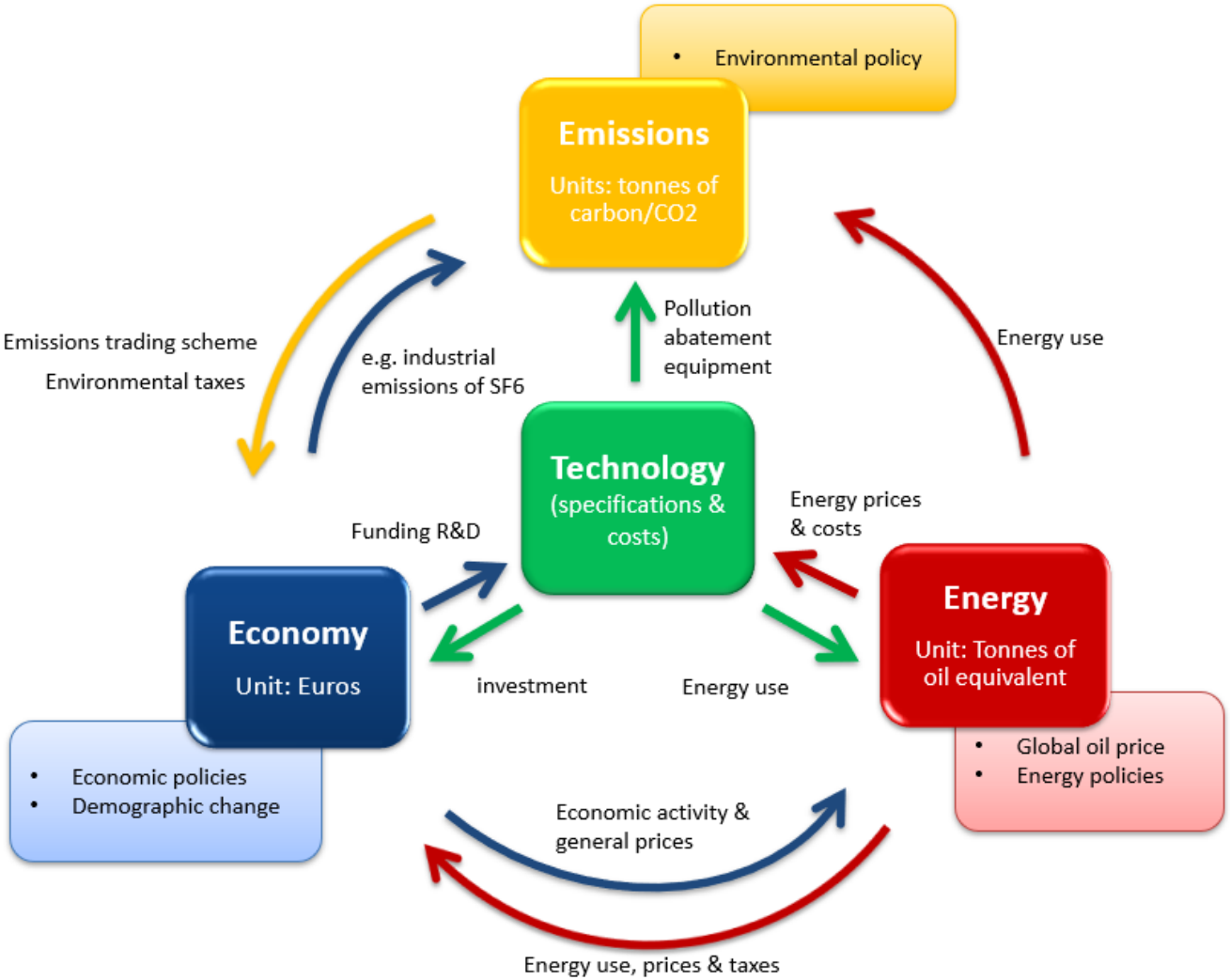
- annual projections to 2050
- behavioural equations
- ex-ante scenario analysis (ex-post is also feasible)

## Modular

- E3: Energy, Environment, Economy and material modules
- power generation sub-module

cambridge econometrics

# E3ME modules




cambridge econometrics

# E3ME applications

## Energy & Climate

- ETS/ carbon market
- carbon/energy targets
- carbon/ energy tax
- ETR
- renewable energy
- power generation mix
- green jobs
- removal of harmful subsidies
- international energy prices

## Economic/ Labour

- fiscal policies
- monetary policies
- trade agreements
- labour supply and demand forecasts
- labour market policies e.g. improving female participation rate

## Others

- sector specific studies e.g. aviation, water transport, engineering
- impacts of R&D and innovations
- resource efficiency (currently only for Europe)

cambridge econometrics

# E3ME- Typical Model Output

**Economy:**

- ✓ **GDP** and the **aggregate components** of GDP (household expenditure, investment, government expenditure and international trade)
- ✓ **sectoral** output and GVA, prices, trade and competitiveness effects
- ✓ **sectoral** bilateral trade
- ✓ **consumer prices** and **expenditures**, and implied household **distributional** effects

**Labour market:**

- ✓ **sectoral employment** by gender
- ✓ **labour force** and **participation rate** by gender and age groups
- ✓ **unemployment** rate and level
- ✓ **sectoral wage** rate
- ✓ **real income** of different **socio-economic** groups
- ✓ **GINI** coefficients

**Energy & Environment:**

- ✓ **energy demand**, by users and by fuel
- ✓ energy **prices**
- ✓ **power** sector detailed results
- ✓ **$CO_2$ emissions** by sector and by fuel
- ✓ **other** air-borne **emissions**
- ✓ **material demands**, by users and by materials

*all with **regional** dimension and **annual** results to **2050**

cambridge econometrics


# Thank you!

Please ask questions

www.ilo.org/greenjobs