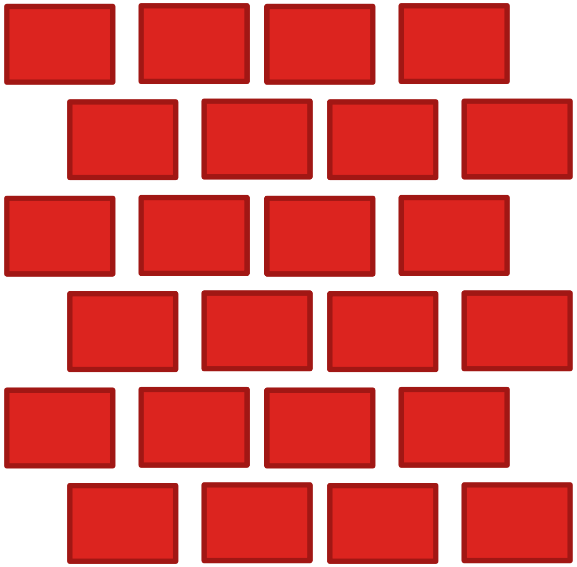
The world's most
consistent and
transparent Life Cycle
Inventory database

Customized versions of consequential system models to be applied to databases like ecoinvent

Chris Mutel (PSI), Pascal Lesage (CIRAIG), Guillaume Bourgault (ecoinvent), Gregor Wernet (ecoinvent)

ecoinvent and system models



Unallocated datasets, as provided…

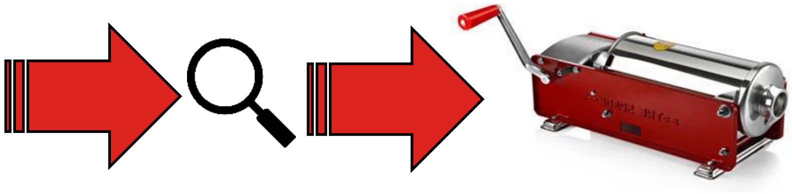
Initializing...

ecoEditor for ecoinvent version 3

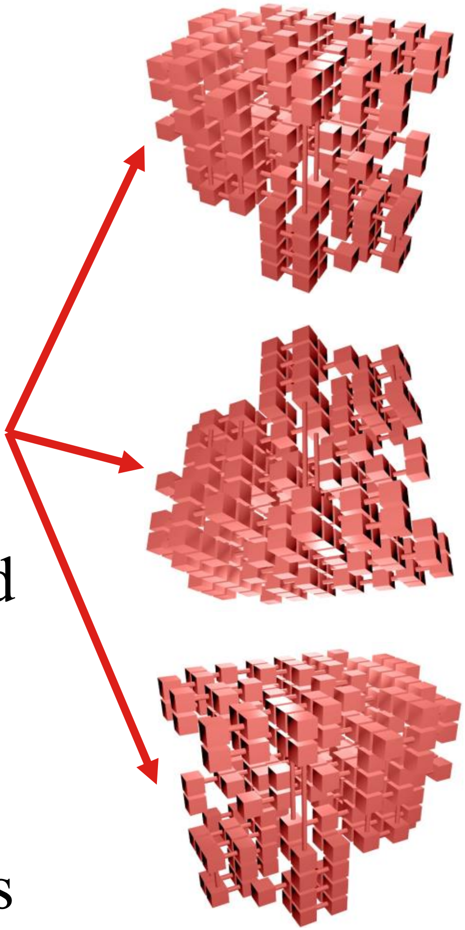
ifu Hamburg GmbH

3.3.65.10874

…are validated and reviewed…



…and then processed into independent databases based on different system modelling algorithms



ecoinvent and system models

System models:

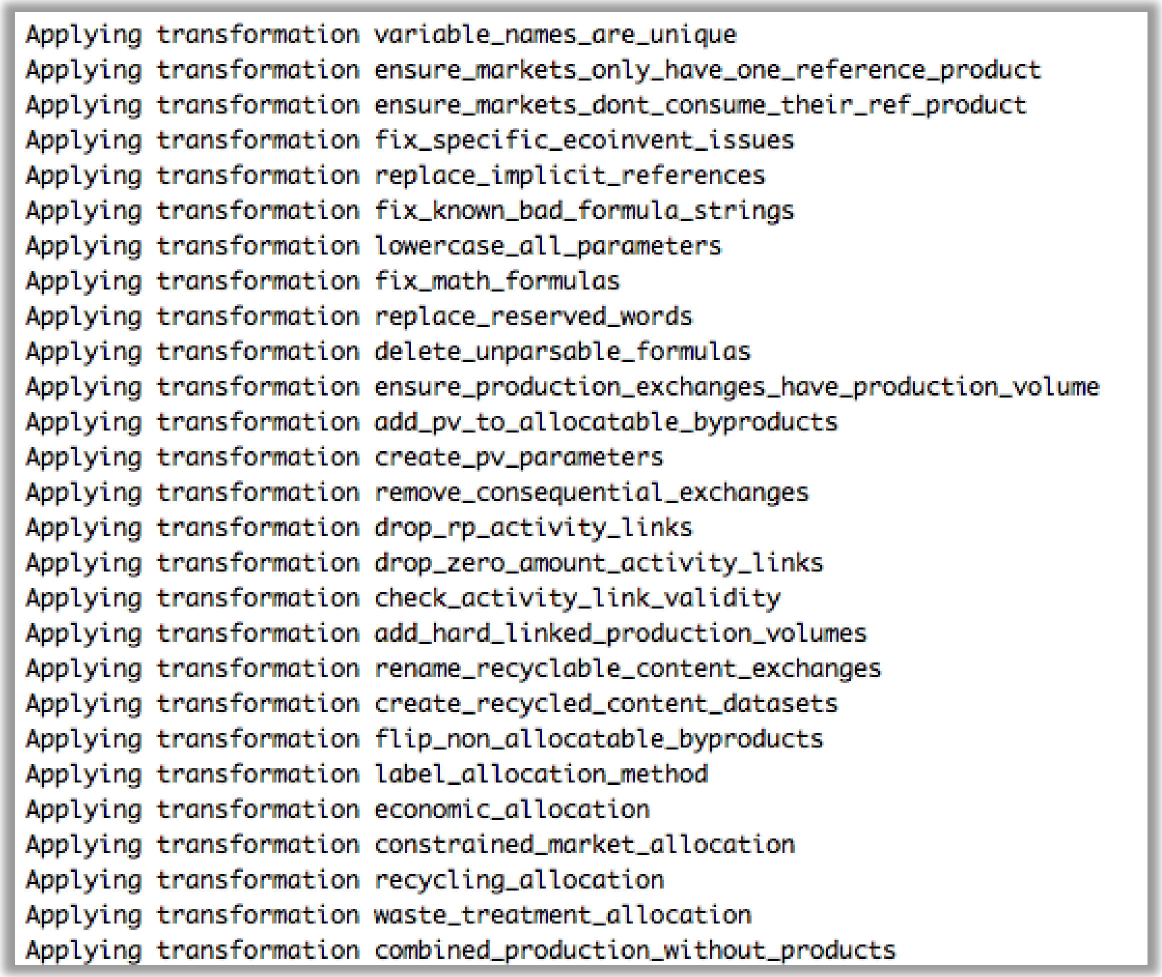
- For ecoinvent: three system models
- Current implementation grew over time and has been adapted to reflect the evolution of the system
- Implementation (code) not public due to licensing rights

Ocelot

- Joint effort by the Paul Scherrer Institut and ecoinvent to build an open source library for applying system models in life cycle assessment
- Open source means system modelling rules:
  - are **fully transparent** and (hopefully) **understandable**
  - are **customizable** for independent users (e.g. following the PEF 50:50 EoL formula in ecoinvent could be an option)
  - Can be used to **test the sensitivity** of assumptions and system modelling rules
  - Useful for implementation of **research** ideas
- Current focus on ecoinvent, but can be applied to any data provided in a suitable format

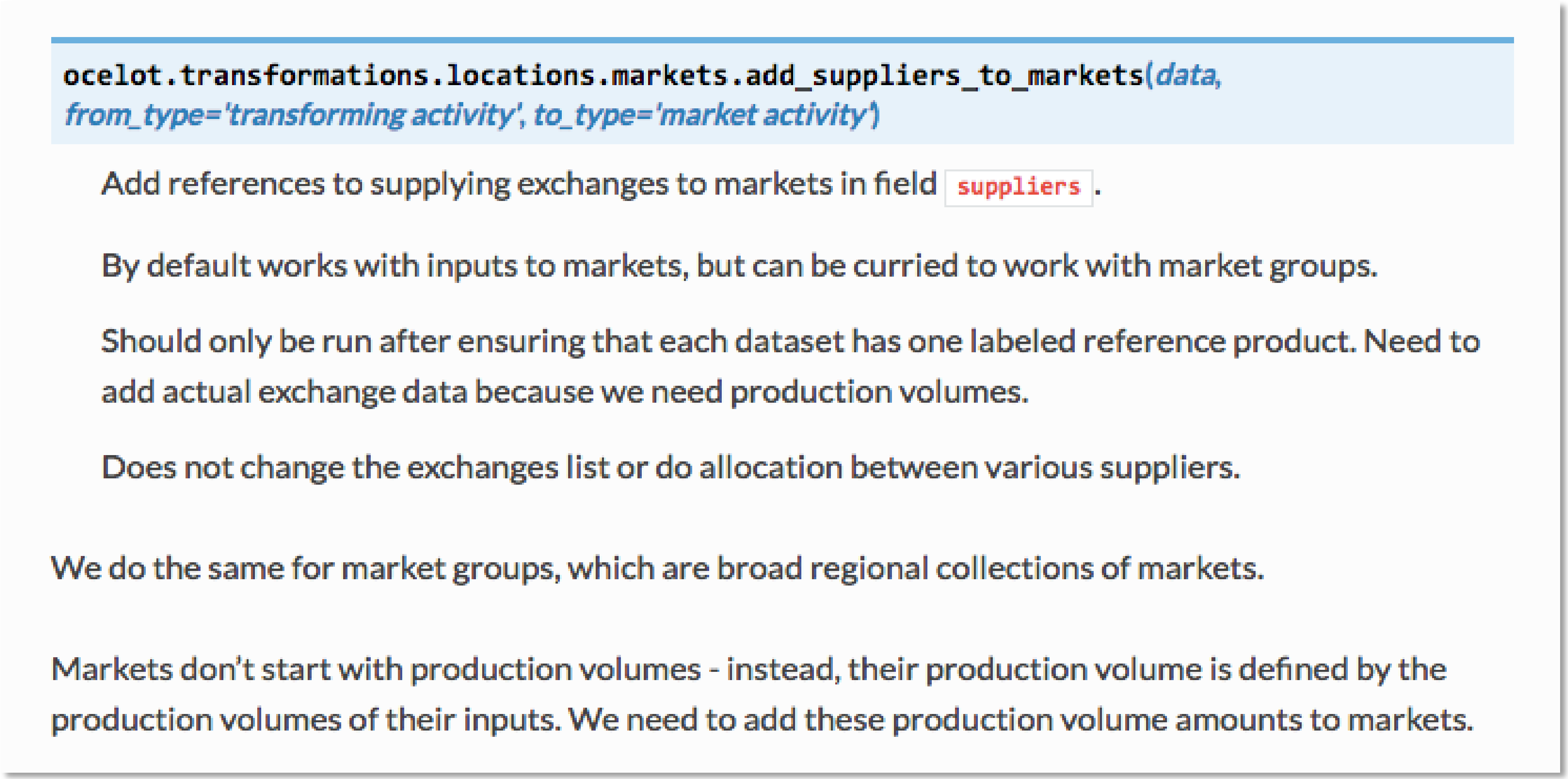
Philosophy of code

- Break down system model into many small transformation functions
- Twice as much documentation as code
- Twice as much testing as documentation



```
Applying transformation variable_names_are_unique
Applying transformation ensure_markets_only_have_one_reference_product
Applying transformation ensure_markets_dont_consume_their_ref_product
Applying transformation fix_specific_ecoinvent_issues
Applying transformation replace_implicit_references
Applying transformation fix_known_bad_formula_strings
Applying transformation lowercase_all_parameters
Applying transformation fix_math_formulas
Applying transformation replace_reserved_words
Applying transformation delete_unparsable_formulas
Applying transformation ensure_production_exchanges_have_production_volume
Applying transformation add_pv_to_allocatable_byproducts
Applying transformation create_pv_parameters
Applying transformation remove_consequential_exchanges
Applying transformation drop_rp_activity_links
Applying transformation drop_zero_amount_activity_links
Applying transformation check_activity_link_validity
Applying transformation add_hard_linked_production_volumes
Applying transformation rename_recyclable_content_exchanges
Applying transformation create_recycled_content_datasets
Applying transformation flip_non_allocatable_byproducts
Applying transformation label_allocation_method
Applying transformation economic_allocation
Applying transformation constrained_market_allocation
Applying transformation recycling_allocation
Applying transformation waste_treatment_allocation
Applying transformation combined_production_without_products
```

Documentation



```
ocelot.transformations.locations.markets.add_suppliers_to_markets(data, from_type='transforming activity', to_type='market activity')
```

Add references to supplying exchanges to markets in field `suppliers`.

By default works with inputs to markets, but can be curried to work with market groups.

Should only be run after ensuring that each dataset has one labeled reference product. Need to add actual exchange data because we need production volumes.

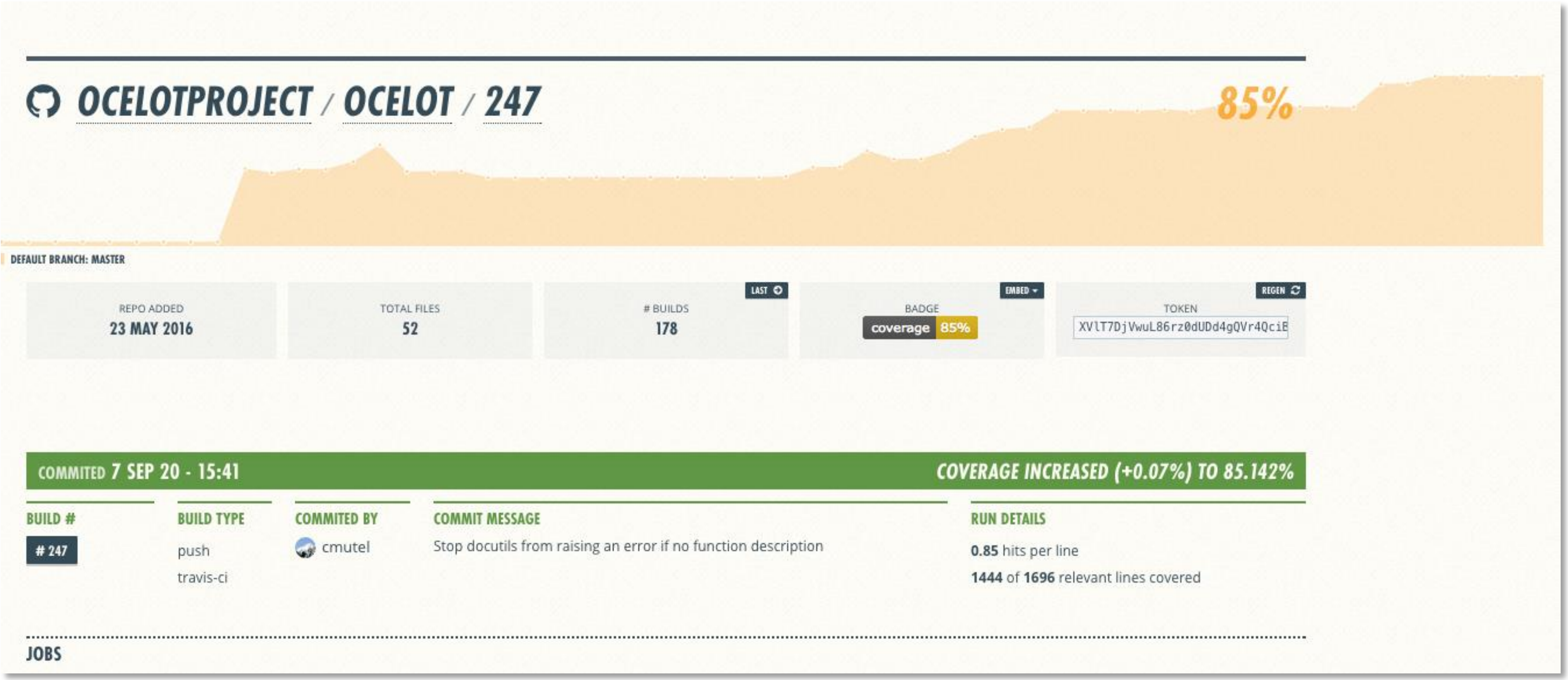
Does not change the exchanges list or do allocation between various suppliers.

We do the same for market groups, which are broad regional collections of markets.

Markets don't start with production volumes - instead, their production volume is defined by the production volumes of their inputs. We need to add these production volume amounts to markets.

docs.ocelot.space

Test coverage



OCELOTPROJECT / OCELOT / 247

85%

DEFAULT BRANCH: MASTER

REPO ADDED	TOTAL FILES	# BUILDS	BADGE	TOKEN
23 MAY 2016	52	178	coverage 85%	XVlT7DjVwuL86rz0dUDd4gQVr4QciE

COMMITED 7 SEP 20 - 15:41 COVERAGE INCREASED (+0.07%) TO 85.142%

BUILD #	BUILD TYPE	COMMITED BY	COMMIT MESSAGE	RUN DETAILS
# 247	push travis-ci	cmutel	Stop docutils from raising an error if no function description	0.85 hits per line 1444 of 1696 relevant lines covered

JOBS

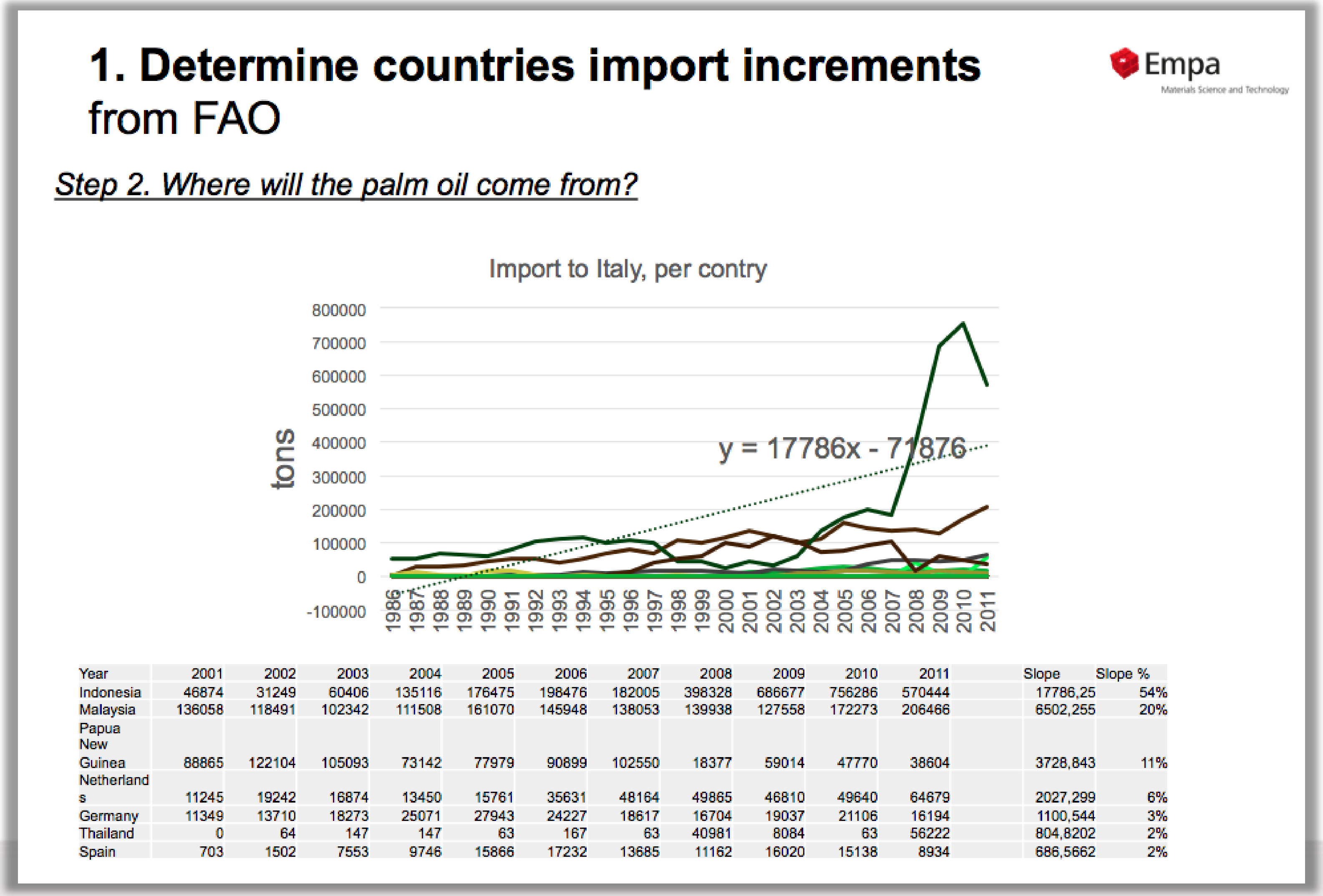
Not just talk - action!

- This week: Ocelot summer school in Grosshöchstetten (CH)
  - 22 PhD students and postdocs **coding new system models** using Ocelot
  - **Code structure** allows surgical modifications to existing system models or significant overhauls to linking algorithms, all in relatively little time

Projects underway at the summer school

- **Implementation of the consequential system model**, as described in ecoinvent Data Quality Guidelines
- Improvement of **identification of marginal suppliers** in the palm oil production sector, based on direct use of FAO data by linking algorithm
- Modelling of ecoinvent databases based on **future energy scenarios**
- **Regionalization/disaggregation** of data using FAO data
- Changes to **allocation** algorithms and sensitivity testing

Marginal imports based on trends in trade data



1. Determine countries import increments from FAO

Step 2. Where will the palm oil come from?

Year	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011		Slope	Slope %
Indonesia	46874	31249	60406	135116	176475	198476	182005	398328	686677	756286	570444		17786,25	54%
Malaysia	136058	118491	102342	111508	161070	145948	138053	139938	127558	172273	206466		6502,255	20%
Papua New Guinea	88865	122104	105093	73142	77979	90899	102550	18377	59014	47770	38604		3728,843	11%
Netherlands	11245	19242	16874	13450	15761	35631	48164	49865	46810	49640	64679		2027,299	6%
Germany	11349	13710	18273	25071	27943	24227	18617	16704	19037	21106	16194		1100,544	3%
Thailand	0	64	147	147	63	167	63	40981	8084	63	56222		804,8202	2%
Spain	703	1502	7553	9746	15866	17232	13685	11162	16020	15138	8934		686,5662	2%

Projects underway at the summer school

- Student project themes

Topic	Number of projects
Consequential modelling	2
Alternative allocation schemes	2
Regionalization	2
Use of outside data in linking	2
Uncertainty analysis	1

Current status: Beta

- “Cut-off, by classification” beta model functioning
- “Consequential, long-term” beta model functioning
- Suite of functions and formats allowing simple and transparent creation/adaptation of system models
- All code and documentation available:

GitHub https://github.com/OcelotProject

https://ocelot.space/ Ocelot

Future plans

- Finish consequential and cutoff system models in first project phase
- Codebase improvements for more power, simplicity, and beauty
  - Reorganization to make things easier to find
  - Make it more natural to define custom system models
  - Make it easier to include outside data
- Guides on use of Ocelot
- Sensitivity testing of key choices in both system models
- New system models, both in existing standards and mixes of different ideas