Constraints of Using Data in France

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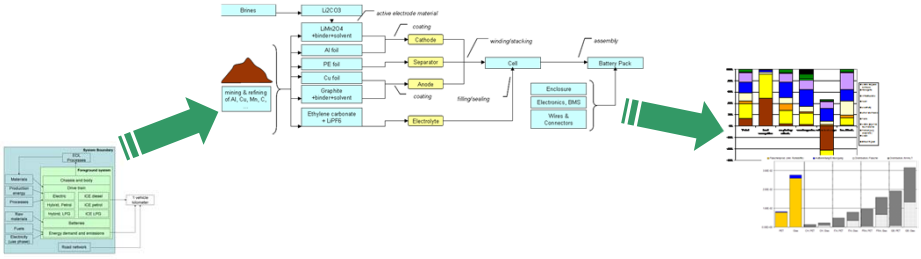
the ecoinvent database in the context of Photovoltaics in France

Content

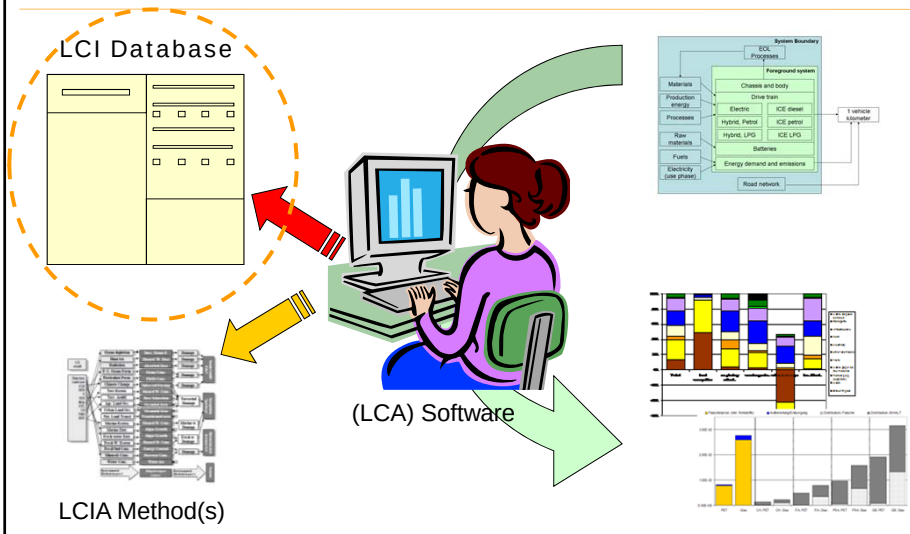
- Introduction
- **ecoinvent data v2 – a short overview**
- **Photovoltaics data in ecoinvent**
- **Use of ecoinvent in the French context**
- **ecoinvent data v3**
- Conclusion

Introduction: what is LCA ?

- **Defines a system, relating to a function**
- **Compiles material and energy flows related to the function**
- **Assesses exchanges from and to nature**



Introduction



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ecoinvent v2

the most comprehensive public LCI database

ecoinvent – that is …

- ... an **Online** database with **fully interlinked** datasets;
- a **simultaneous calculation** of about **4'000** product systems;
- an **Independent quality assurance** mechanism;
- a **Linkage** of inventory with **major LCIA methods**;
- full access to **unit process** data and **rolled-up** data;
- all Multioutput datasets with the **unallocated data provided**;
- using an **ISO-compatible format in XML technology**:
  - easy data exchange with **all major LCA software**
  - one data format for LCI and LCIA
  - **working**, widely applied and **accepted**

Unit process data …

… indispensible for relevant LCA research and consulting

e.g. **European Technology Assessment:**

- long time horizon

→ need to adapt existing data to future situations

- supply mixes change over time

e.g. **Regional background databases:**

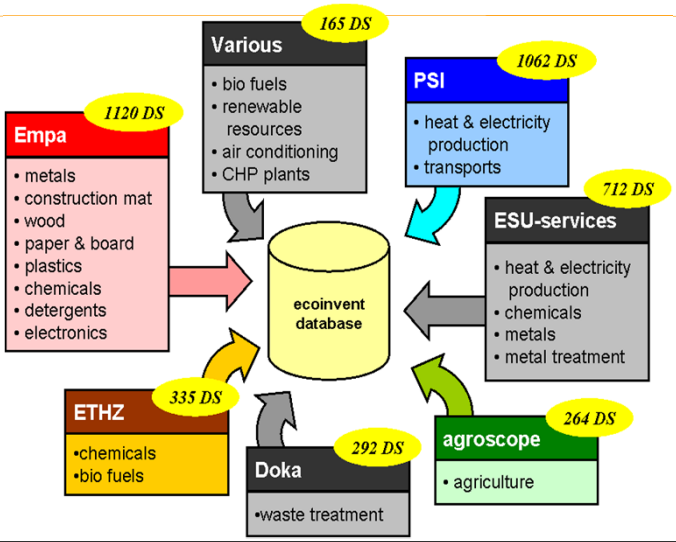
- different environmental legislation

→ need to adapt existing data to regional situations

- supply mixes

e.g. **Case-dependent** Data Quality Assessment

content



ecoinvent – a global success story!

- **more than** 2'000 customers **use ecoinvent data in** more than 40 countries all over the world;
- **data are embedded and/or importable in** all major LCA software tools**;**

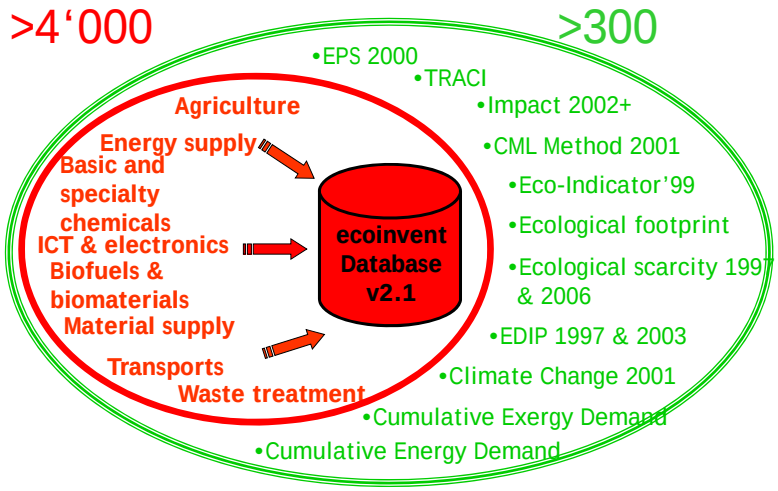
	umberto	GaBi Software	openLCA
REGIS	Green-E		KCL-ECO
	TEAM™	CMLCA Chain Management by Life Cycle Assessment	

… used in more than just LCA tools!

- **Waste management policy in communities:**
  Wrate (**Environment Agency, United Kingdom)**
- **Environmental assessment of products:**
  BilanProduit **(ADEME, France)**
- **Environmental assessment of buildings:**
  LEGEP**, Germany**
  OGIP**, Germany**
  ECO-BAT**, Switzerland**
  VITRUVIUS**, Switzerland**

ecoinvent – more than a Swiss DB …

and more than just Inventory data …



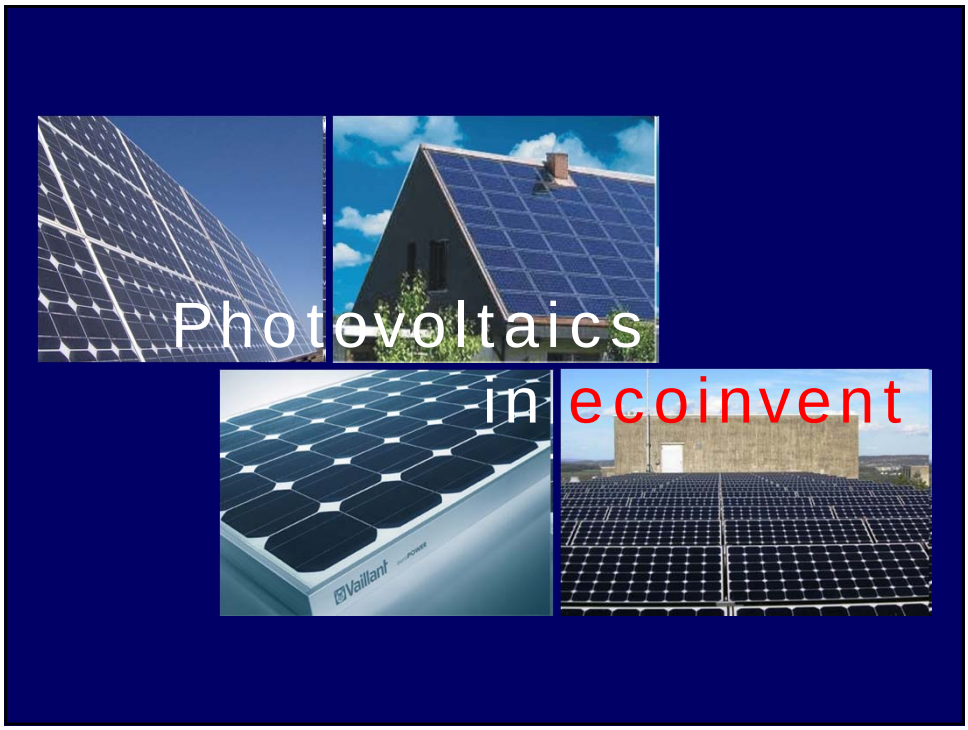
(direct) link to Impact Assessment

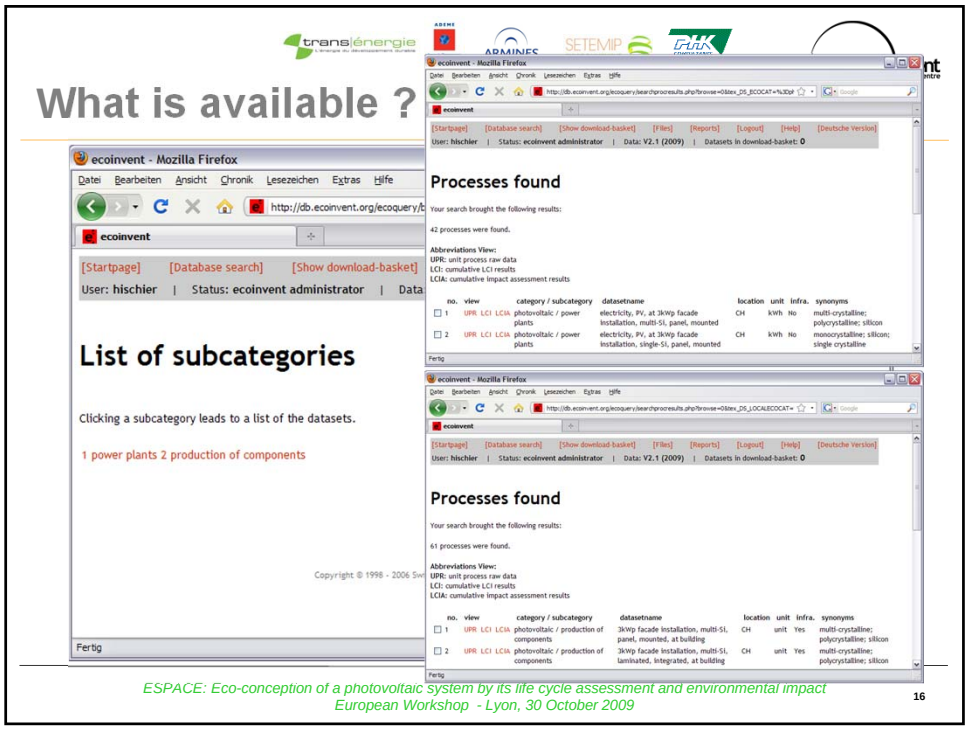
				ammonia, liquid, at regional storehouse
			Name	
			Location	RER
			Unit	kg
			Infrastructu	0
			Ecocat	chemicals
			Ecosubcat	inorganics
Name	Unit	Ecocat	Ecosubcat	MeanValue
Acenaphthene	kg	air	high popula	2.4741E-13
Acetaldehyde	kg	air	high popula	1.8961E-06
Acetaldehyde	kg	air	unspecified	
Acetic acid	kg	air		
Acetic acid				
Acetone				
Acete				

CML 2001 photochemical oxidation (summer smog)
high NOx POCP
RER
kg ethylene-Eq
6.41E-1
6.41E-1

cumulative inventory result x impact factors = cumulative LCIA result

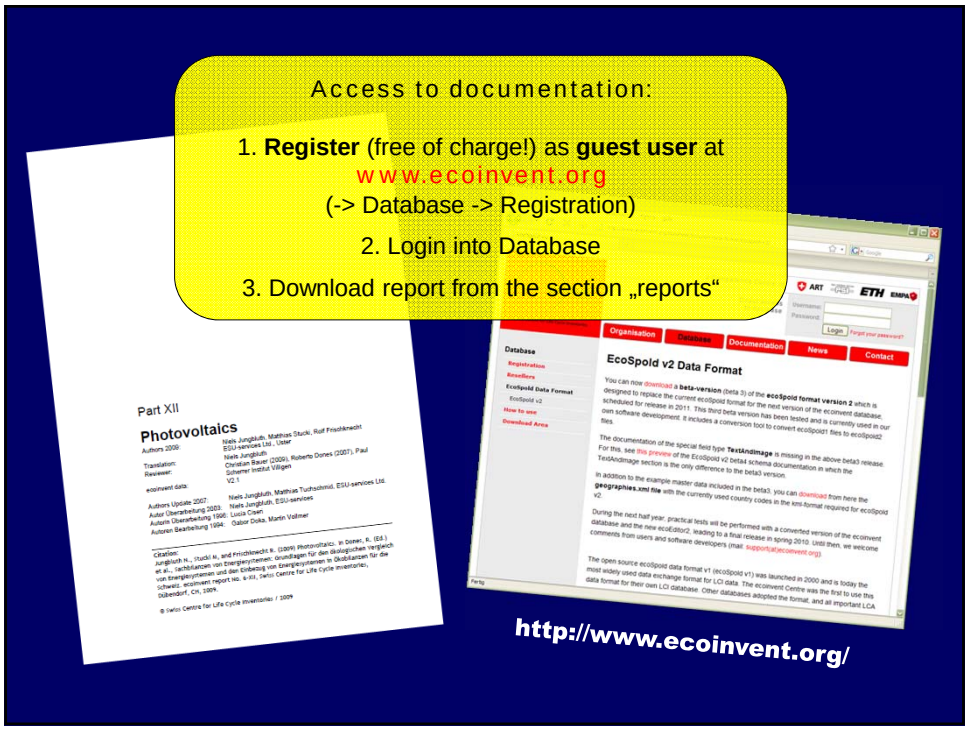
			high NOx POCP
			RER
			kg ethylene-Eq
			CML 2001 photochemical ox
Name	Local	Unit	MeanValue
electricity, production mix AT	AT	kWh	0.000018146
electricity, production mix BA	BA	kWh	0.00057536
electricity, production mix BE	BE	kWh	0.000051191
electricity, production mix CENTREL	CEN	kWh	0.00027911
electricity, production mix CH	CH	kWh	3.2967E-06
electricity, production mix CS	CS	kWh	0.00051039


Photovoltaics
in ecoinvent


What is available ?
ecoinvent - Mozilla Firefox
List of subcategories
Clicking a subcategory leads to a list of the datasets.
1 power plants 2 production of components
Processes found
42 processes were found.
61 processes were found.
ESPACE: Eco-conception of a photovoltaic system by its life cycle assessment and environmental impact
European Workshop - Lyon, 30 October 2009
16

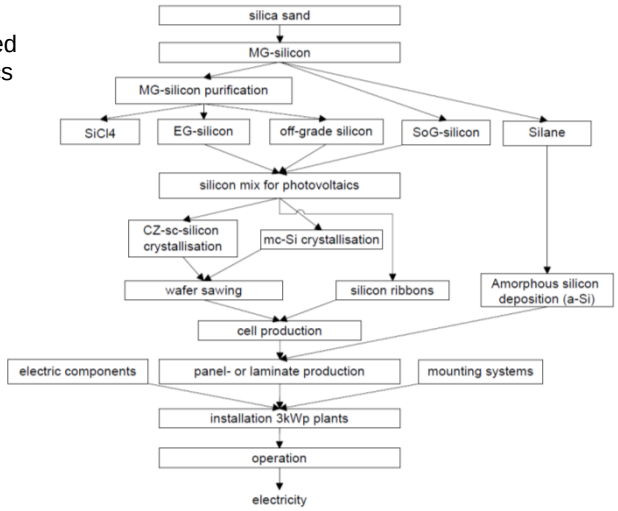
Inventory data

- Update of all process stages for grid-connected PV in Switzerland for the year 2005
- Data collected in a close collaboration with industry & research projects
- Wafers, cells and modules are modelled per m^2 in order to facilitate the use of the datasets
- Photovoltaic electricity mixes for 25 countries
- New datasets for fine chemicals used in PV production
- New datasets for coating metals used in thin film cells
- Extensive documentation in English



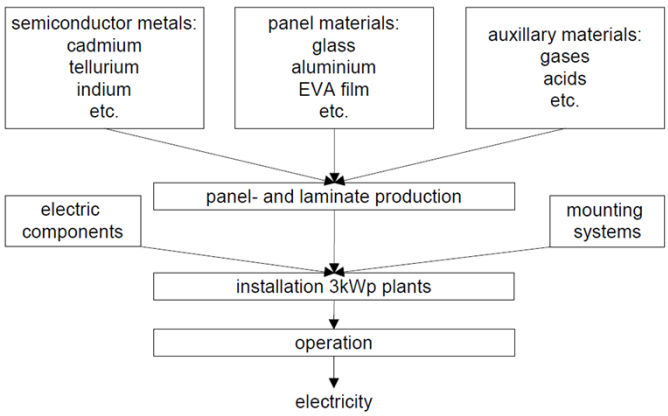
System outline

Silicon-based photovoltaics



System outline (II)

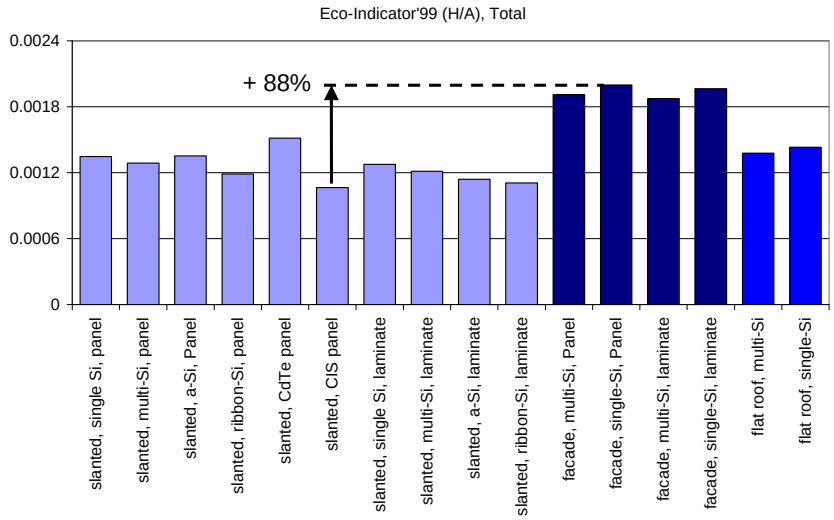
thin-film photovoltaics



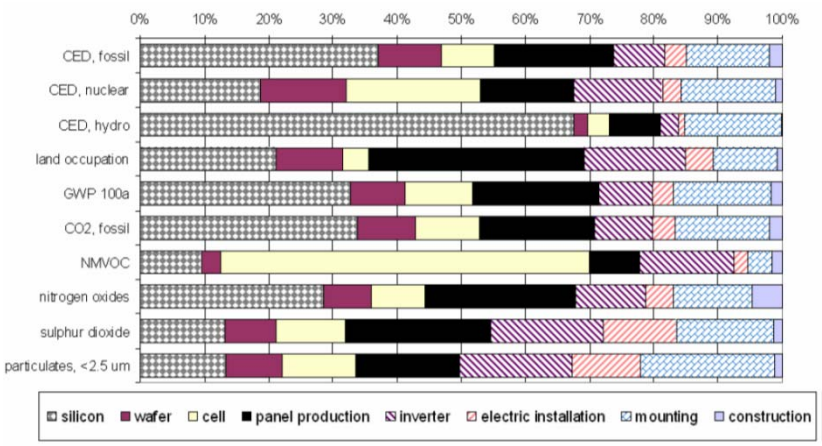
Available 3 kW_p installations

Installation	Cell type	Panel type [1)]	Share in Swiss PV mix	Share in other PV mixes
Slanted roof	sc-Si	Panel	26.9%	25.0%
	mc-Si	Panel	36.6%	34.0%
	a-Si	Panel	4.4%	4.5%
	ribbon-Si	Panel	2.7%	2.8%
	CdTe	Panel	1.4%	1.4%
	CIS	Panel	0.2%	0.2%
	sc-Si	Laminate	1.9%	1.0%
	mc-Si	Laminate	2.6%	1.3%
	a-Si	Laminate	0.3%	0.2%
	ribbon-Si	Laminate	0.2%	0.1%
Flat roof	sc-Si	Panel	5.8%	7.7%
	mc-Si	Panel	7.9%	10.5%
Façade	sc-Si	Panel	1.9%	3.8%
	mc-Si	Panel	2.6%	5.2%
	sc-Si	Laminate	1.9%	1.0%
	mc-Si	Laminate	2.6%	1.3%

Environmental Impact



multi-Si panel – its details …



Electricity production in Switzerland

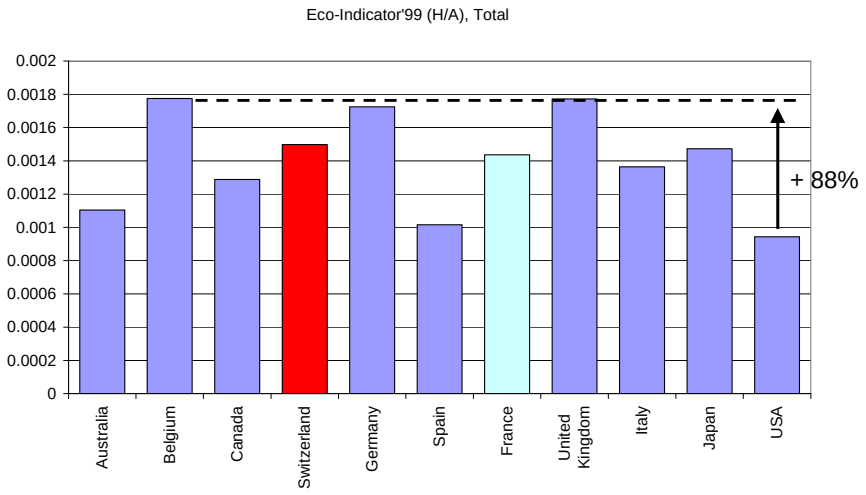
- Irradiation in Switzerland about 1100 kWh/m2 which is representative also for global weighted average
- Electricity yields are quite important for performance
- Factor 3 variation in observed and calculated yields
- Technology specific yields are based on optimum installation in Switzerland
- Yields adaptable by the user for assessments in other locations

	This study	minimum	average 2000-2005	median	build in 2006	state of the art	optimum
average	*820*		*820*	850	*892*		
Roof-Top	*922*		*848*	*880*	922	950	1200
Facade	*620*	400	*568*	*580*	620		
		Hostettler 2006	*own calculation*	*Hostettler 2006*	*Gaiddon 2006*	*Nowak 2007*	*Hostettler 2006*

… and in other countries

		Global horizontal irradiation kWh/m2	Annual output, Roof-Top kWh/kWp	Annual output, Facade kWh/kWp	Performance ration Roof-Top	Performance ratio Facade	Annual output, Roof-Top, corrected kWh/kWp	Annual output, Facade, corrected kWh/kWp
Austria	AT	1'108	906	598	82%	54%	833	550
Belgium	BE	946	788	539	83%	57%	725	496
Czech Republic	CZ	1'000	818	548	82%	55%	752	504
Denmark	DK	985	850	613	86%	62%	782	564
Finland	FI	956	825	602	86%	63%	759	554
France	FR	1'204	984	632	82%	52%	905	581
Germany	DE	972	809	561	83%	58%	744	516
Greece	GR	1'563	1'278	774	82%	50%	1'175	712
Hungary	HU	1'198	988	656	82%	55%	908	603
Ireland	IE	948	811	583	86%	61%	746	536
Italy	IT	1'251	1'032	676	82%	54%	949	622
Japan	JP	1'168	955	631	82%	54%	878	580
Luxembourg	LU	1'035	862	582	83%	56%	793	535
Netherlands	NL	1'045	886	611	85%	58%	815	562
Norway	NO	967	870	674	90%	70%	800	620
Portugal	PT	1'682	1'388	858	83%	51%	1'276	789
Spain	ES	1'660	1'394	884	84%	53%	1'282	813
Sweden	SE	980	860	639	88%	65%	791	588
Switzerland	CH	1'117	922	620	83%	56%	848	570
United Kingdom	GB	955	788	544	83%	57%	725	500
United States	US	1'816	1'512	913	83%	50%	1'390	839
Australia	AU	1'686	1'315	721	78%	43%	1'209	663
Canada	CA	1'273	1'088	735	85%	58%	1'000	676
Korea, Republic Of	KR	1'215	1'002	674	82%	55%	921	620
New Zealand	NZ	1'412	1'175	762	83%	54%	1'080	701
Turkey	TR	1'697	1'400	840	82%	49%	1'287	772

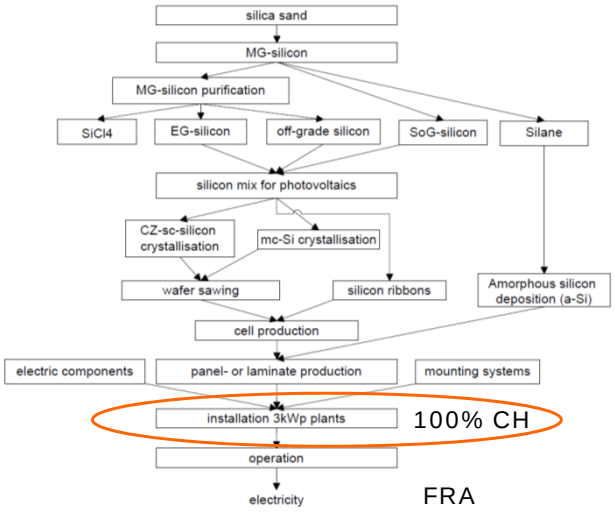
Environmental Impact



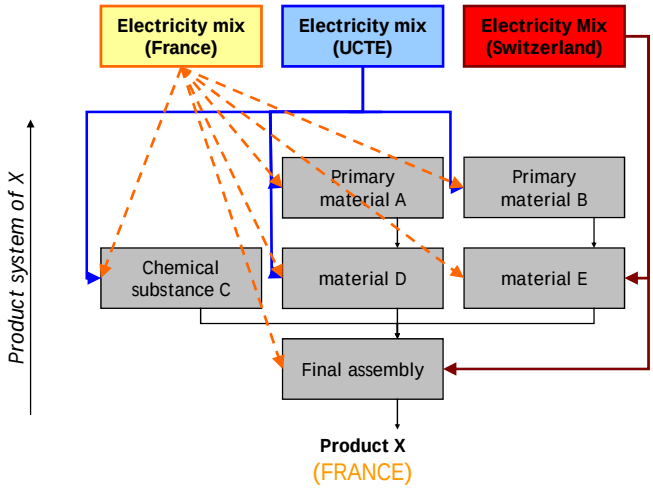
Conclusions

- All major types of PV technologies are investigated in a consistent and transparent way;
- Representative data for the situation in Switzerland & in Europe for the year 2005;
- Rapid development makes it necessary to use only most recent data & to update these data in a regular manner (e.g. update of CdTe technology in version v2.1);
- Based on a mix of company data, literature data and own models

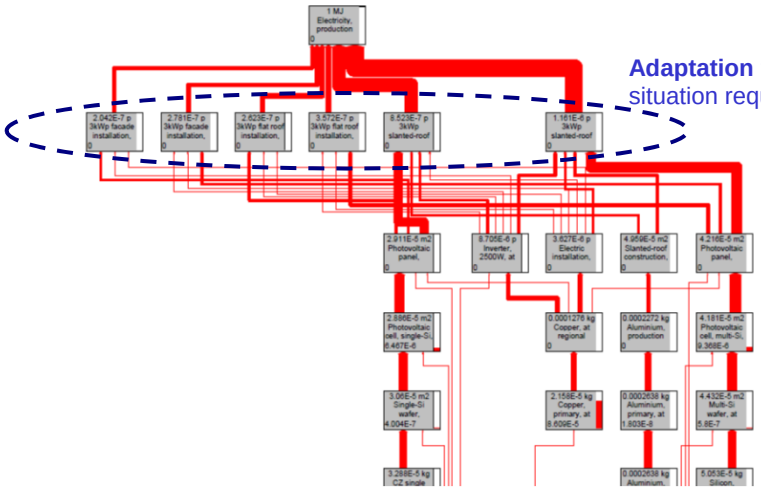
Current situation



Procedure for adaptation …



… its consequences

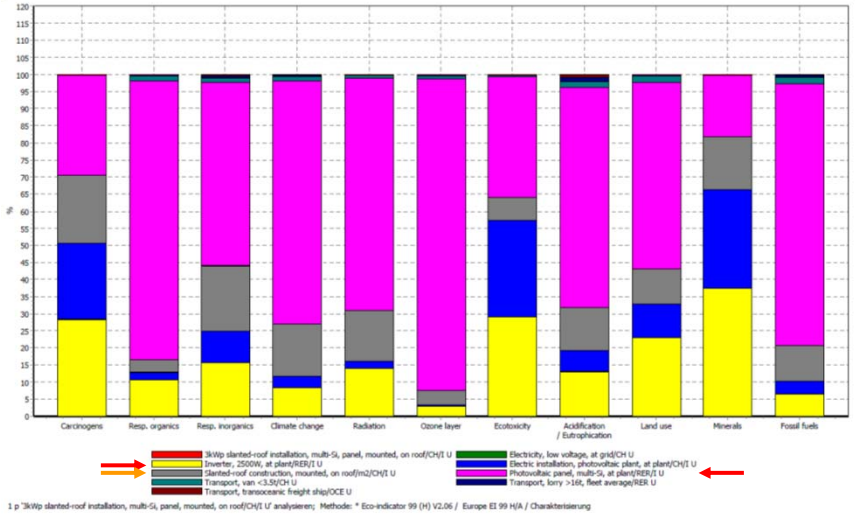


Adaptation to French situation requested !

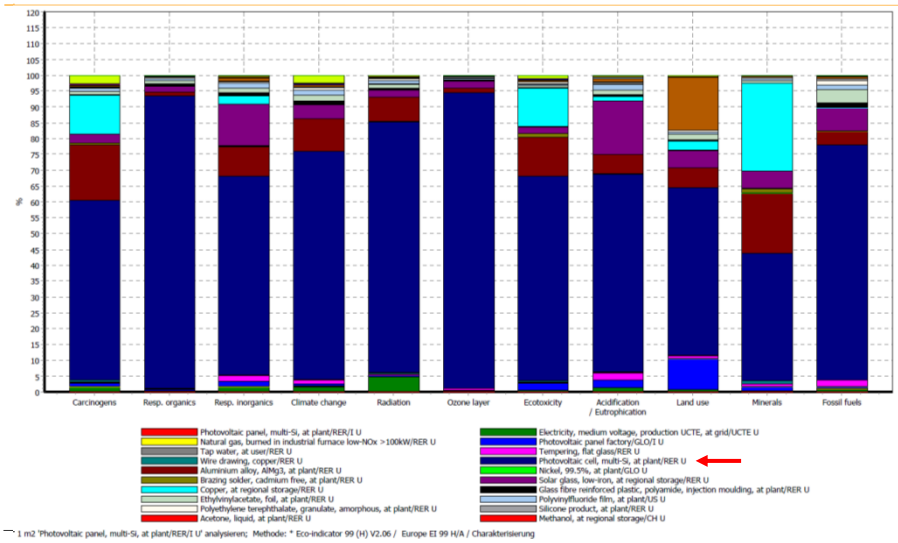
… its consequences

	Name	Location	InfrastructureProcess	Unit	3kWp facade installation, single-Si, laminated, integrated, at building	3kWp facade installation, single-Si, panel, mounted, at building	3kWp flat roof installation, single-Si, on roof	3kWp slanted-roof installation, single-Si, laminated, integrated, on roof
	Location				CH	CH	CH	CH
	InfrastructureProcess				1	1	1	1
	Unit				unit	unit	unit	unit
technosphere	electricity, low voltage, at grid	CH	0	kWh	4.00E-2	4.00E-2	1.02E+0	2.30E-1
	inverter, 2500W, at plant	RER	1	unit	2.40E+0	2.40E+0	2.40E+0	2.40E+0
	electric installation, photovoltaic plant, at plant	CH	1	unit	1.00E+0	1.00E+0	1.00E+0	1.00E+0
	facade construction, mounted, at building	CH	1	m2	-	2.14E+1	-	-
	facade construction, integrated, at building	CH	1	m2	2.14E+1	-	-	-
	flat roof construction, on roof	CH	1	m2	-	-	2.14E+1	-
	slanted-roof construction, mounted, on roof	CH	1	m2	-	-	-	-
	slanted-roof construction, integrated, on roof	CH	1	m2	-	-	-	2.14E+1
	photovoltaic laminate, single-Si, at plant	RER	1	m2	2.21E+1	-	-	2.21E+1
	photovoltaic panel, single-Si, at plant	RER	1	m2	-	2.21E+1	2.21E+1	-
	operation, lorry 20-28t, empty, fleet average	CH	0	vkm	-	-	8.00E+1	-
	transport, van <3.5t	CH	0	tkm	3.45E+1	4.03E+1	4.03E+1	3.45E+1
	transport, lorry >16t, fleet average	RER	0	tkm	1.33E+2	1.62E+2	1.62E+2	1.33E+2
	transport, transoceanic freight ship	OCE	0	tkm	5.30E+2	6.46E+2	6.46E+2	5.30E+2
emission air	Heat, waste	-	-	MJ	1.44E-1	1.44E-1	3.67E+0	8.28E-1

… its consequences



… its consequences



Conclusions

- ecoinvent Database can be used in France;
- However, have to take into account that not all data are representative for the French situation;
- Transparent unit-process based construction of the database allows – with a LCA software tool – an easy adaptation of such datasets to the French situation;
- A calculation with original data shows how important adaptation is – e.g. case photovoltaics only of **minor** importance !

Swiss Centre for Life Cycle Inventories

ecoinvent v3
an outlook ...

strategy for v3 → *"more internationalisation " …*

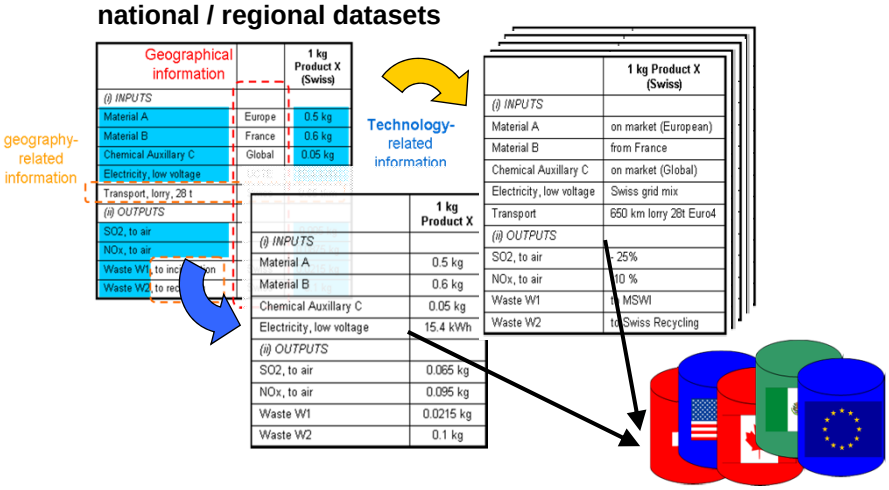
- **Co-operation with national database initiatives**
- **More detail, more technologies, more completeness:**
  - International editorial board and broader supplier base
  - Parameterization (geography, time, technologies, markets)
  - New data structure based on supply-use framework, allowing easier production of national versions
  - New indicators
- **Depending on sponsor funding: Open access to more database facilities – initially limited to specific customer groups**
- **…**

Co-operation with NDI

- **The national initiative** is responsible for its own local data collection programme, and retains the right to license these collected data to third parties, while providing the collected data for publication in the ecoinvent database.
- **ecoinvent** provides the necessary infrastructure for validation and publishing of the data as part of the ecoinvent database;
- … provides free licenses to all active in the national initiative; and
- … supports the national database initiative with an annual financial contribution [subject of negotiation].
- **Either side** can terminate the co-operation by giving one year's notice to the end of a calendar year.

Parametrisation in ecoinvent v3

- **Parent-child relationship allows calculation of specific, national / regional datasets**



„parent-child relationship“

… consequences for National Database Initiatives (NDI):

- **NDI** can …
  - … concentrate data collection activities on those areas, where a DIFFERENT technology is used in own country;
  - … define „default“ information for own country (e.g. means & distances of transport of goods, waste treatment situation, …) for an automatical application in case no specific data are collected

→ Allows calculation of a **first, approximated version** of national, easily updateable database **everywhere in the world** !

Supply-use table

Principle / how to use this here ?

- All economic activities in society are covered, i.e. the sum of all activities (= national output !) is included here.

1. Can use the national supply-use tables to get an overview of which processes are important in the particular country, and
   make a dedicated data collection effort for these datasets.
2. Most countries produce monetary supply-use tables annually, which can serve as a basis for consistent national versions of the core ecoinvent database;
   often, national reporting of emissions follow the same framework;
   this may then be supplemented by specific national process data.

Conclusion

- ecoinvent is open for international collaboration;
- ecoinvent offers its expertise, its technical development so far done in LCI DB development & maintenance;
- transparent, unit-process based database allows easy adaptation to other national situations;
- the strategy for ecoinvent data v3 goes in a even more simple, stepwise cooperation between ecoinvent and NDIs all over the world.

… allowing fast development of transparent & consistent LCI data everywhere in the world …!

Thank you!

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