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Universidad del País Vasco
Euskal Herriko Unibertsitatea

FACULTY OF ENGINEERING VITORIA-GASTEIZ
UNIVERSITY OF THE BASQUE COUNTRY

TITLE:

The roll of the Hidden Energy Debt in the Energy Transition towards the Energy Democracy

PROFESSOR:

Ortzi Akizu Gardoki
ortzi.akizu@ehu.eus

Università degli Studi di Perugia
16-21, October 2016

parte hartuz

ekologistak martxan Euskal Herria

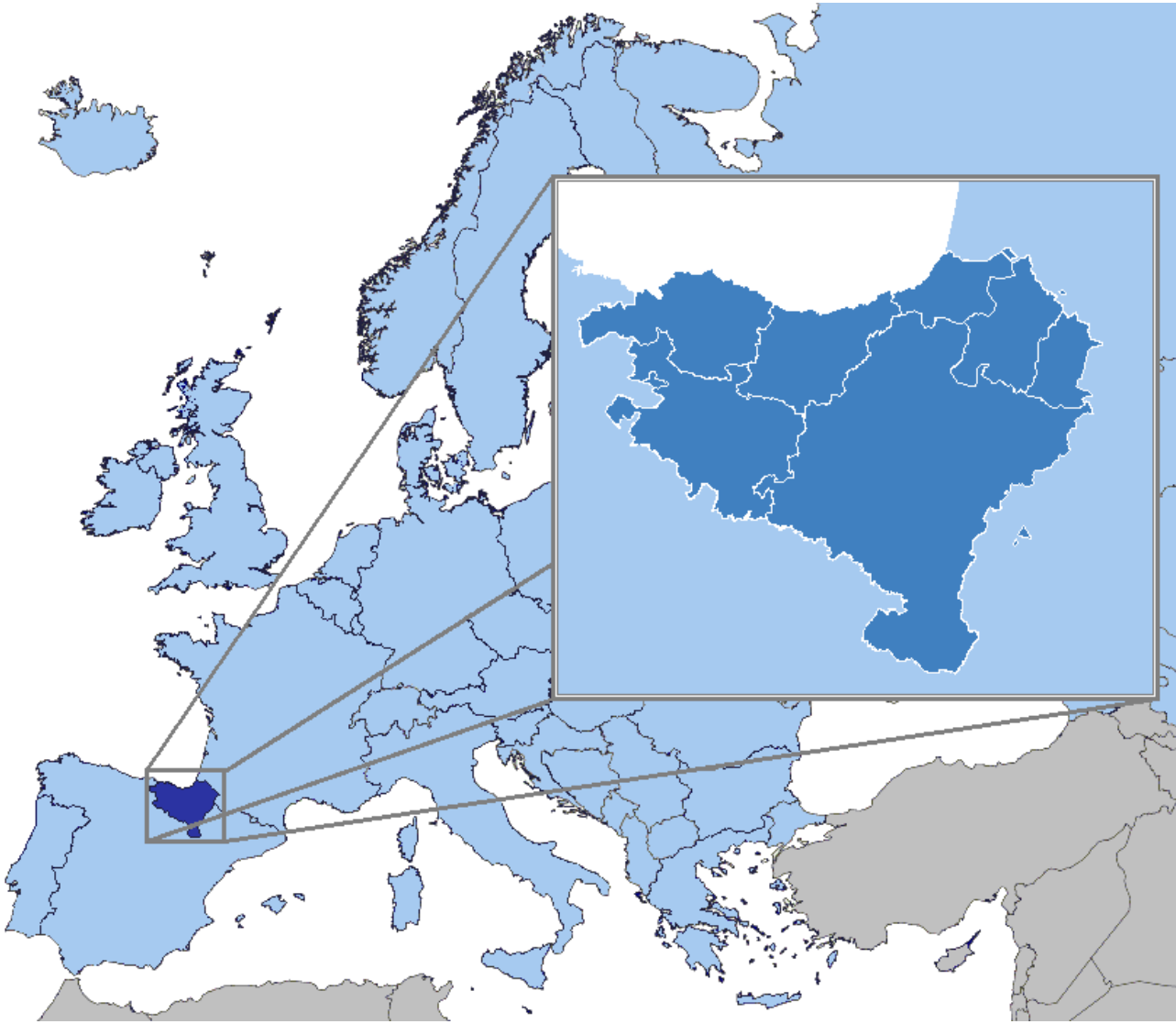
Erasmus+

ekopol

GARAPENERAKO LANKIDETZAREN EUSKAL AGENTZIA
AGENCIA VASCA DE COOPERACIÓN PARA EL DESARROLLO

BASQUE COUNTRY

BASQUE LANGUAGE
EUSKERA



3.100.000 Inhabitants (spain 46 M)
7 regions
Capital: Vitoria-Gasteiz
Clima: Atlantic - Rain: 1300 mm/y
Pre-Romanic language - Culture

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BASQUE COUNTRY

Donostia - San Sebastian

Vitoria - Gasteiz

Bilbo - Bilbao

BASQUE COUNTRY

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THE UNIVERSITY OF THE BASQUE COUNTRY

Vitoria - Gasteiz
Engineering Faculty

Bilbao/Donostia Gasteiz/Eibar UPV/EHU

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PRODUCTION MODEL vs. CONSUMPTION MODEL

Coal fueled electric generation
Bergheim (GERMANY). EFE/ Bernd Lauter

"Energy" consumption center
Commercial Center in Rome (ITALY)

Wood stove
Tantoyuca, Ver. (MÉXICO)

Wheat fields
Machulo, (PAKISTAN)

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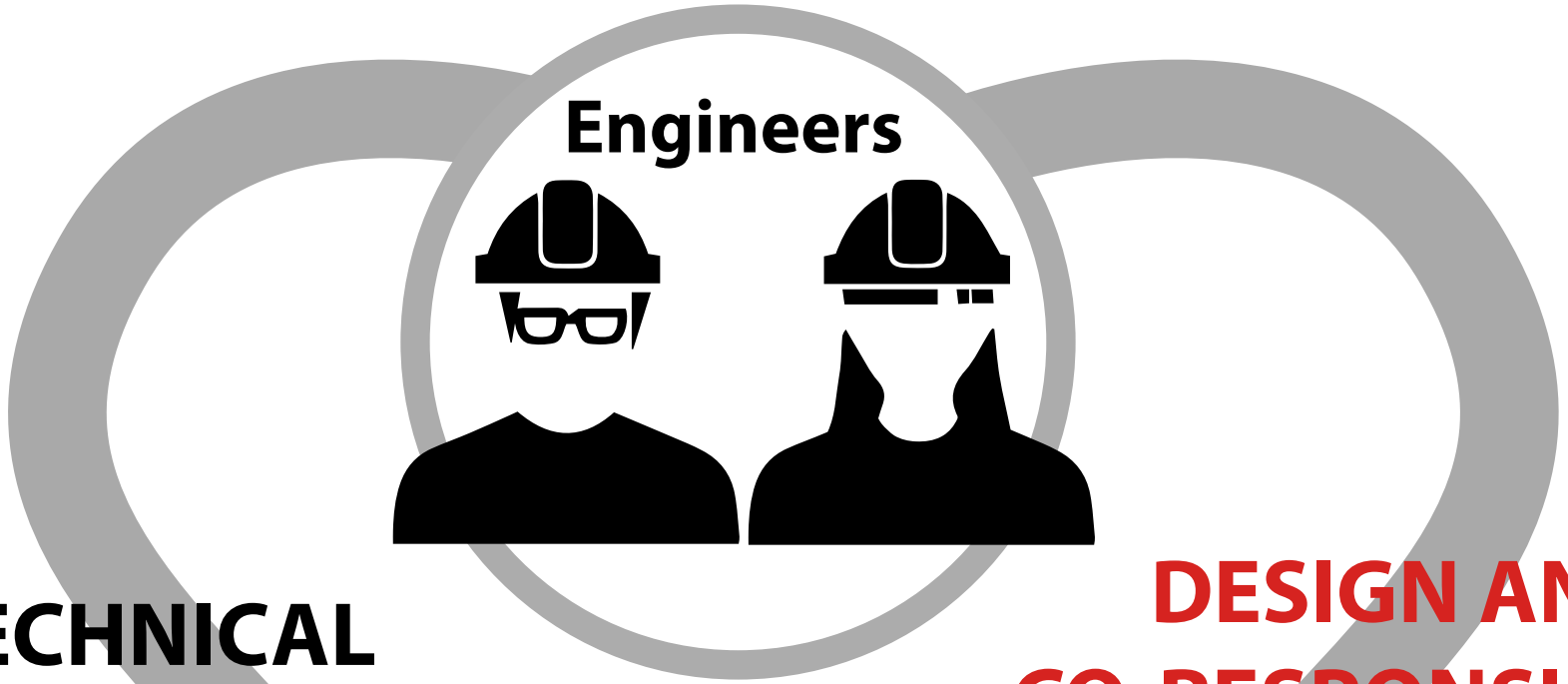
THE ROLL OF AN ENGINEER



TECHNICAL IMPLEMENTATION

DESIGN AND CO-RESPONSIBILITY

FUTURE ENERGY MODEL

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THE IMPACTS OF CONSUMPTION:

QUANTITY

QUALITY

FOOD
2000 kcal/day
2500 kcal/day

impacts
in own body

VS

complexity

Not linked
to quantity
+ with bad
live quality

Not linked
to quanlity
nuclear, solar,...

ENERGY
X.XXX kWh/day

FAR in
space

FAR in
social
class

FAR in
time...

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ENERGY CONSUMPTION

year 1750 [2] (Smil, 2010)

10 EJ/year
(10^{18})

4000 %
150 years

year 2000

400 EJ/year
(10^{18})

12.6 GJ/year
(10^{9})

791M

600 %
150 years

65.2 GJ/year
(10^{9})

6,127M

(if we analyze resouse consumption per capita: 1 to 100, Serge Latouche 2009)

unfair between:

different countries [4] (Arto et al., 2016)

different social classes of the same country [5] (Li et al., 2014)

not development

new indicators (HDI) : causal relationship ENERGY - DEVELOPMENT ceases (Arto et al., 2016)

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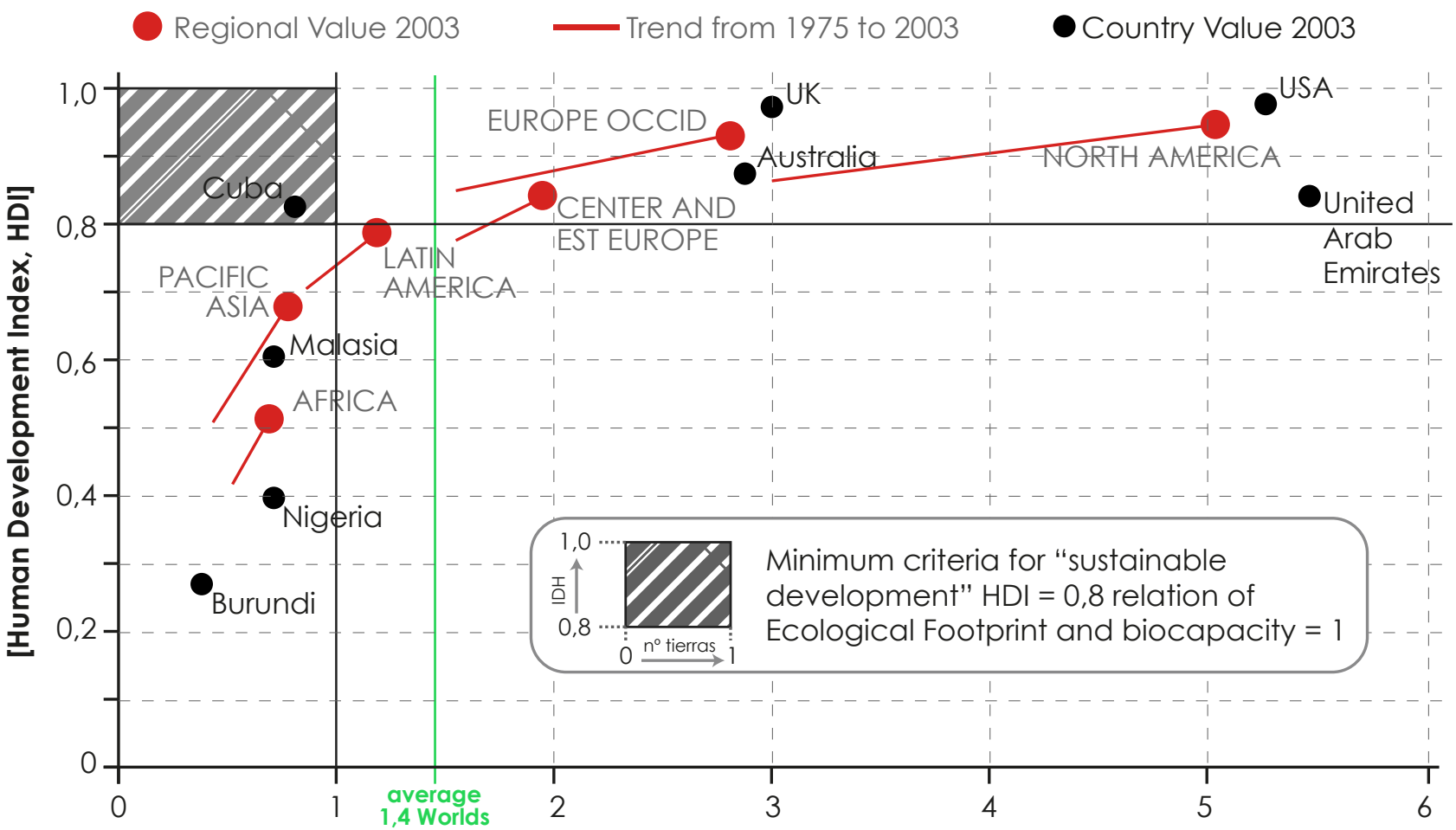
PHYSICAL LIMITS



WWF, 2006

PHYSICAL LIMITS: PEAK OIL

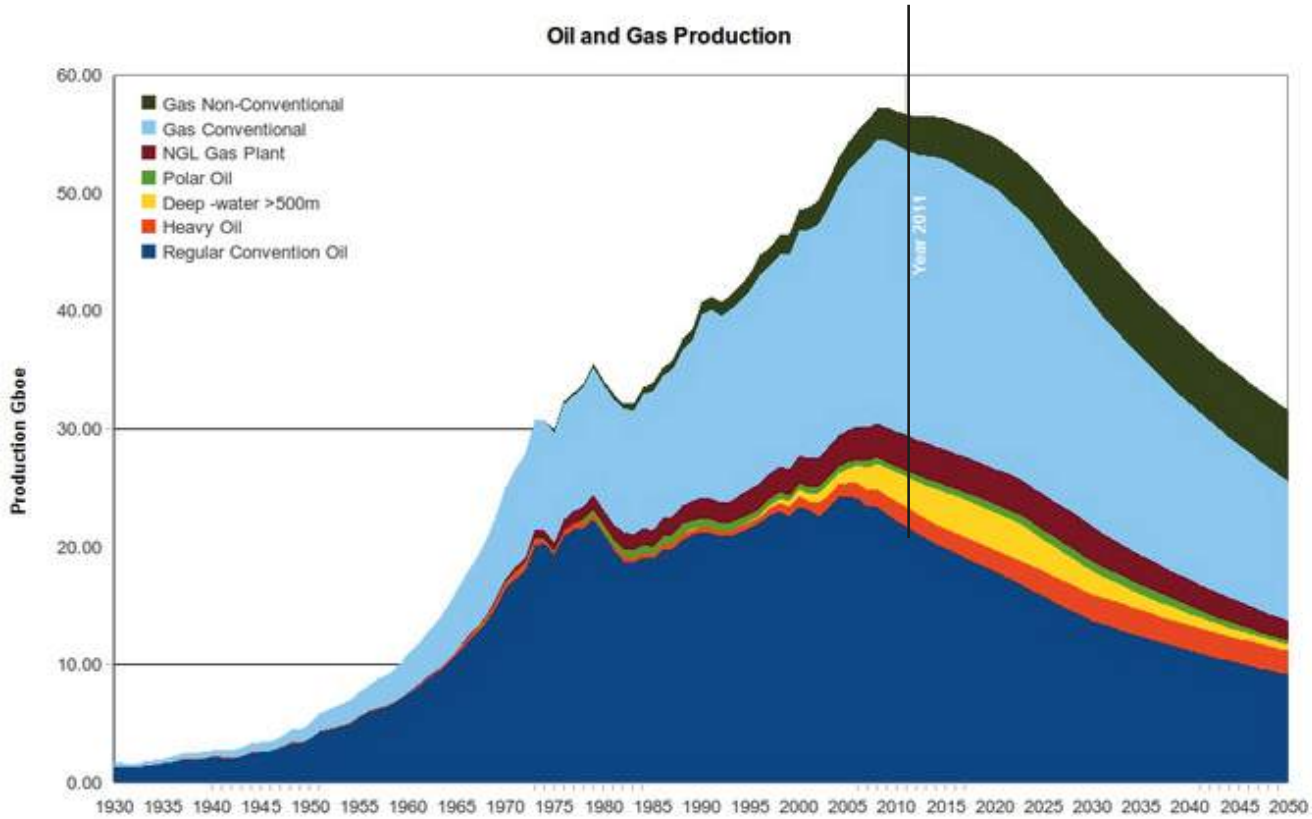
Peak Coal, Peak Gas, Peak Uranium,... PEAK ALL

HUBBERT - USA:1965-71 --> 1973

PEAK OIL-GAS
2011

PEAK OIL-GAS WORLD

HUBBERT - 2000
ASPO (Colin Campbell) - 2011
USGS - 2037/47
IEA - 2037



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PHYSICAL LIMITS: ERoEI

Energy Returned on Energy Invested $= (EROEI) = \dfrac{\text{Energy Delivered}}{\text{Energy Required to Deliver that Energy}} > 1$

Pedro Prieto
(ASPO Association for the Study of Peak Oil **)**

hunt energy
vs.
eat energy

6000 kcal/day

150 kg x 1500 kcal/kg
225,000 kcal

37.5

2 kg x 1500 kcal/kg
3000 kcal

0.5
x2

88 g x 1200 kcal/kg
106 kcal

0.02
x50

3 mg x 1400 kcal/kg
4 cal

6×10^{-7}
x1.6M

"EROI of different fuels and the implications for society"
"A Review of the Past and Current State of EROI Data"
Charles A.S. Hall, Jessica G. Lambert, Stephen B. Balogh

ERoEI	CONVENTIONAL FOSSIL FUELS
35.0	Oil-Gas imports 1990
18.0	Oil-Gas imports 2005
12.0	Oil-Gas imports 2007
12.0	Coal
15.0	Nuclear

ERoEI	RENEWABLE ENERGY
83.0	Hydro
20.0	Wind
11.0	Photovoltaic
9.0	Geothermal CHP

ERoEI	CURRENT F.F.
<1	Oil-Gas 2037
1-3	Bituminous coal
1-30	Hydro Fracturing
1.3	Biodiesel
1.3	Ethanol Corn

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ENERGY IN THE WORLD

GLOBAL SOUTH

GLOBAL NORTH

The Organisation for Economic Co-operation and Development (OECD)

Non OECD, in AMERICA

10.881 kWh
70,70 % Fossil
(20 % in electricity)
0 % Hidden Energy Dept

OECD in EUROPE

31.809 kWh
87,12% Fossil
(20 % in electricity)
+ 140 % Hidden Energy Dept

10.801 kWh ***-76 %*** ***44.802 kWh***

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CONSUMERS AND CONSUMED PEOPLE

COOPERATION: a <u>together done research</u> for: "NEW LIFE STILES" -> New Consumption (Energy) Model

SOUTH

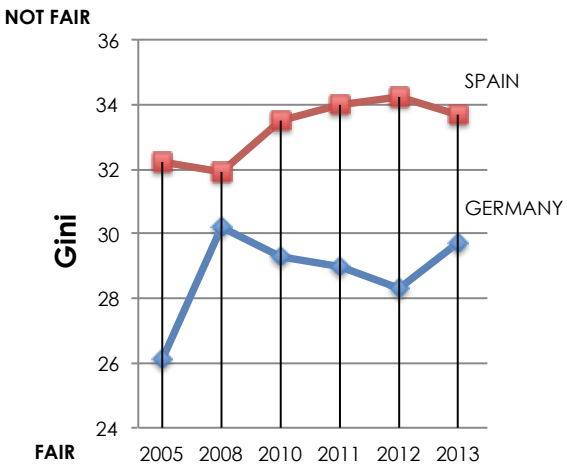
NORTH

(e.i. ELECTRIC SUPPLY CUTS
500.000 SPAIN)

NEW SOUTHs APPEARING IN THE NORTH

December 2011: 1/4 of households England and Wales -> "energetically Poor"
When electricity bill overcomes 10% of revenues (in 2010 more than 1/5th)

European Union: between 50-125 million people are "energetically Poor"
(Hildyard, N., Lohmann, L., eta Sexton, S. 2012)



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HOW TO CREATE ENERGY DEMOCRACY?

1

2

PRODUCTION CONTROL
UPSTREAM
ECONOMY

KNOWLEDGE

FREDOWN FROM CONSUMTION
DOWNSTREAM
VALUES

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PUBLIC vs. PRIVATE

Interests vs. Eficiency?

REPSOL

Firts 9 months of 2015
net profit: 1.646 M€
27,9 % more than previous year

IBERDROLA

Firts 6 months of 2015
net profit: 1.506 M€
7,4 % more than previous year

endesa

Year 2014
net profit: 3.337 M€
77,6 % more than previous year

gasNatural fenosa

Year 2014
net profit: 1.462 M€
1,3 % more than previous year

If "they" earn WHO DOES LOSE?

- Ze estatutatik erosten dira baliabideak?
- Nola burutzen dira nazioarteko tratuak?
- Zeinek adosten du energiaren (petroleoa) balio ekonomikoa?
- ...

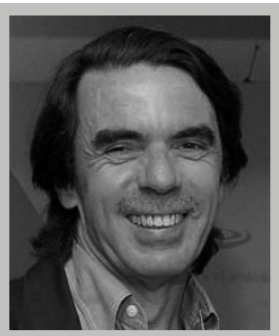
REVOLVING DOORS

Current energy democracy

Personal or Social Benefits?

Felipe González
PSOE former president
Independent Counselor
Gas Natural and Endesa

José María Aznar
PP former president
External Consultant
Gas Natural and Endesa



Elena Salgado
Exministra,
Counselor in
Endesa group company

Luis de Guindos
Consultant in
Endesa Group
Economy Minister

+ THE LOBBY

Josu Jon Imaz
Former Director of PNV-EAJ
Director of Petronor
Adviser in Repsol

Javier Balza
Minister of Interior
Secretary in Iberdrola
Adviser in Petronor

Mario Fernández
Former Director of PNV-EAJ
Adviser in Repsol and Iberdrola
Director of Kutxabank

Juan Mari Atutxa
Former President of Basque Parliament
Consultant in Bahía de Bizkaia Gas
Adviser in Iberdrola

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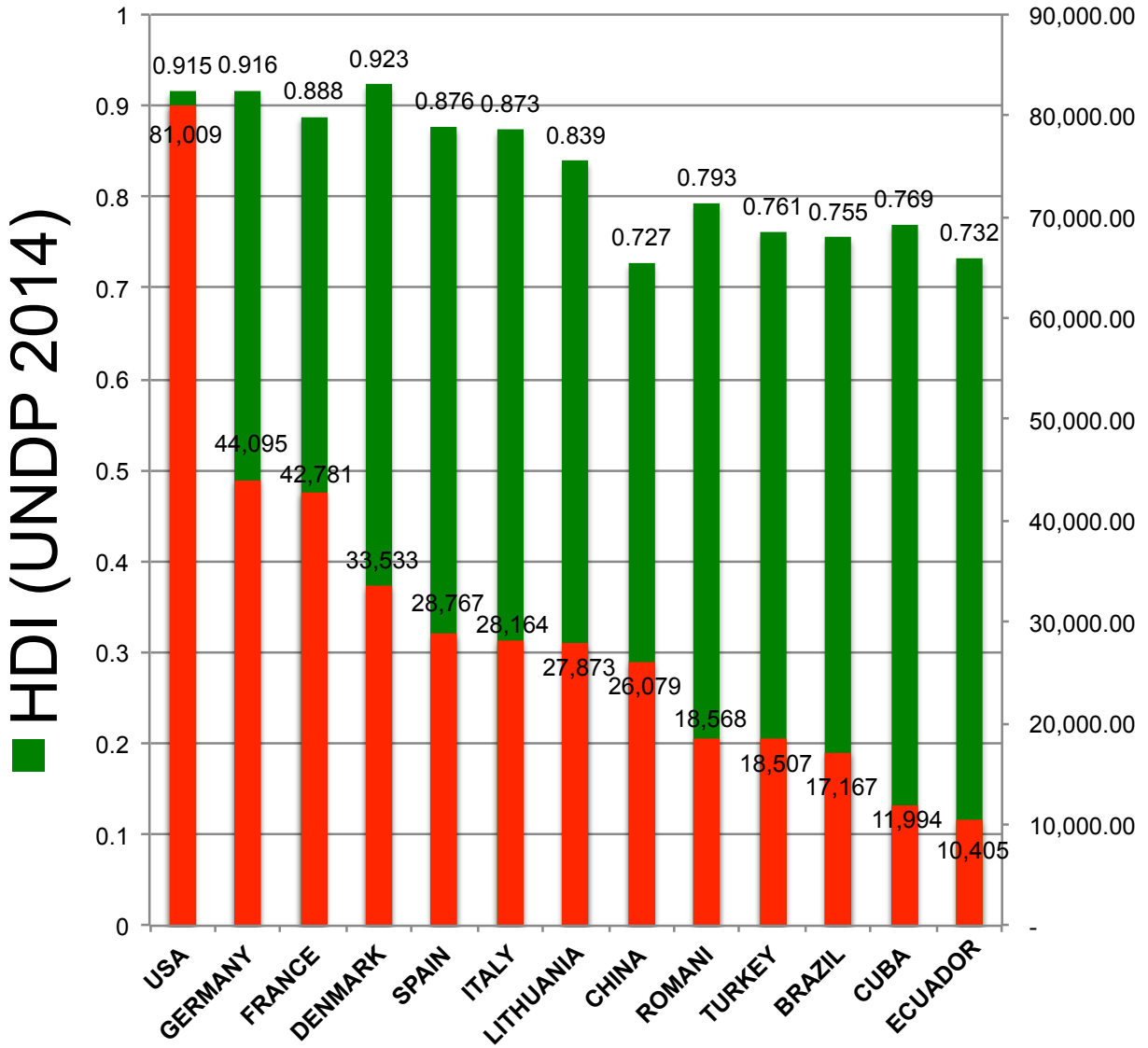
HOW MUCH WE CONSUME?

EDUCATION

GDP

HEALTH



PRIMARY ENERGY SUPPLY (According to IEA)

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WHY CONSUME?

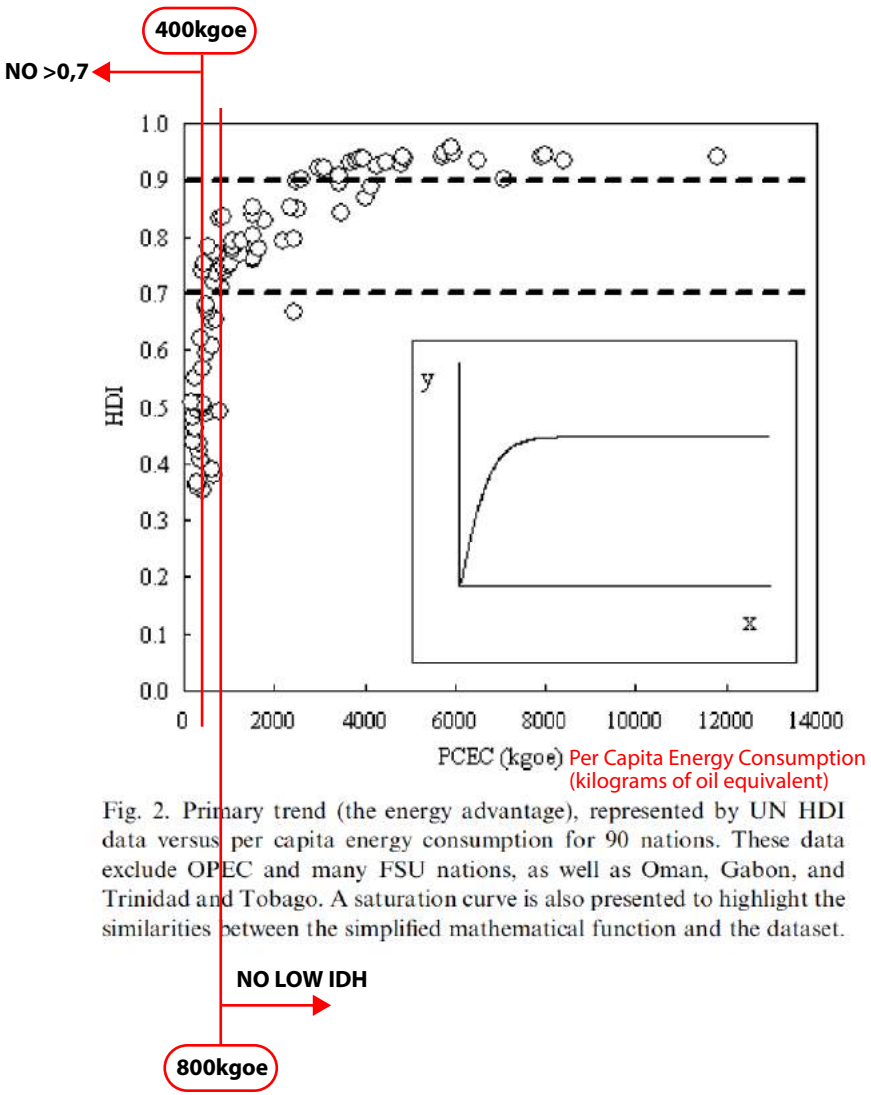


Fig. 2. Primary trend (the energy advantage), represented by UN HDI data versus per capita energy consumption for 90 nations. These data exclude OPEC and many FSU nations, as well as Oman, Gabon, and Trinidad and Tobago. A saturation curve is also presented to highlight the similarities between the simplified mathematical function and the dataset.

NEEDS

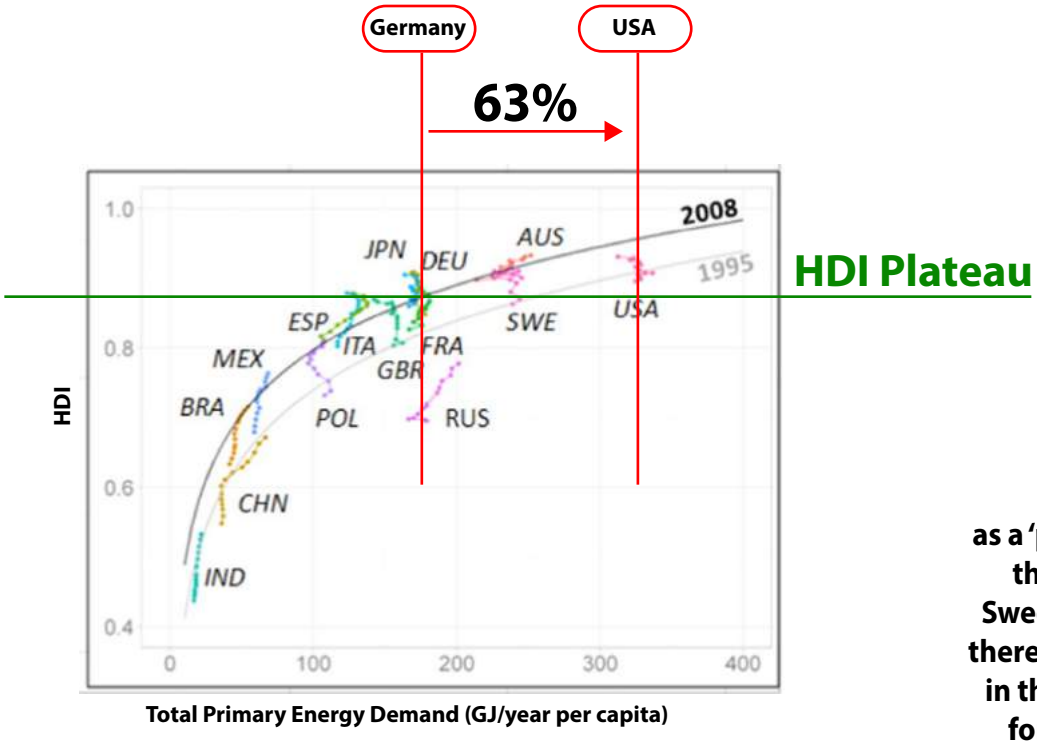
HDI index

Education
Health
Economy (GPP)

"No country has extremely low HDI with PCEC above 800 kgoe [33,5 GJ] and no country has an HDI above .7 with a PCEC below 400 kgoe [16,7 GJ]."

(Martínez and Ebenhack, 2008)

HOW MUCH CONSUME?



HDI Plateau

Life stile

Not needs

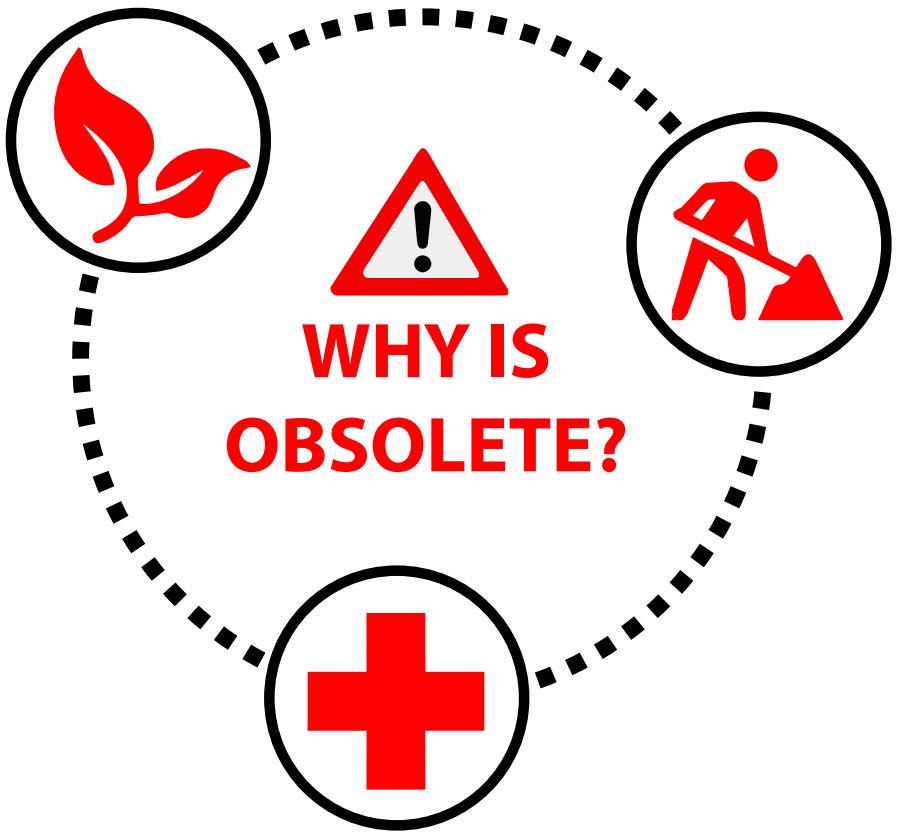
Education
Health
Economy (GPP)

"This phenomenon is referred in the literature as a 'plateau' [...] The observation of paths at the country level reveals that for some high-developed economies (e.g. Germany, Japan, Sweden, the United Kingdom or the United States of America (USA)) there is not a strong positive relation between changes in the HDI and in the TPED, furthermore, in some cases the relation is negative. [...] for example, in2008, both USA and Germany had a HDI over 0.9, but the TPED of the USA was 63% higher."

(Arto et al., 2016)

LIMITS OF CONSUMPTION

Energy Transition is Compulsory



Environmental (devastating)

IPCCs 'Climate Change 2014 Report'; "Surface temperature is projected to rise over the 21st century under all assessed emission scenarios. The ocean will continue to warm and acidify, and global mean sea level to rise."

Social (unfair)

Inequitable distribution of energy resources: masive dams [7], oil spills [8], new electricity grids in remote regions [9], oil extraction impact [10], deforested and degraded land due to biofuels [11], the impact of pipe lines [12], or the energy poverty arising from inequalities in the energy distribution process [13].

Values (rooted in old productivism)

Crisis of values derived from the emphasis on productivity in a system in which growth is the center of all well-being. Cares are not recognized (elder care, child playtime, rest time,...)

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LIMITS OF CONSUMPTION

Social

Oil and Gas Wars:
Gulf War. IRAK WAR. UKRAINE...

Oil spill in Amazonas, in Bagua, January 2016. 240 People affected

Environmental

Flooding from powerful rains in Jammu, India. (AP/Channi Anand)

2014 photo, empty Itaim dam, Sao Paulo water supply worst drought in more than eight decades. (AP Photo/Andre Penner)

Values

Left overs from our efficient productive energy model, in Africa.
(Peter Nicholls) Ghana 2009

Elder people has not place in the productive world, they become just consumers.

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GOAL

To identify how different countries could proceed to create a:

NEW ENERGY MODEL

- **Low Carbon**
- **Democratic**
- **Reproductive**

Energy Transition: SUPERFICIAL vs. real ROOT CHANGES of system

Where and how society could act?

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METHODOLOGY

1. **HOW DATA COULD BE DIFFERENT**

2. **LEARNING FROM EXAMPLES**

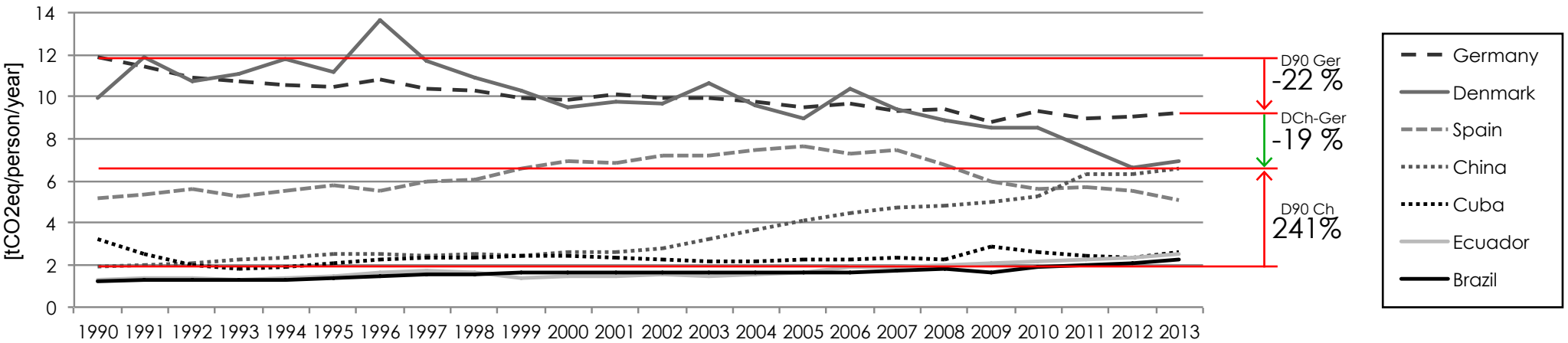
ENERGY DATA PERCEPTION

CO2eq emissions (per capita data, yearly) derived from fossil fuels in the energy supply (selected countries)

"northern countries like Germany thanks to their energy efficiency policies have reduced their emissions since 1990, Germany has reduced by 22% and Denmark by 30%, whereas, southern countries like China, Ecuador or Brazil have increased their emissions by 241%, 90% and 84% respectively"

VS

"in 2013, German emissions are some of the highest in the world, behind are the emissions of China, emitting 19% less, Ecuador, emitting 73% less, or Brazil 76% emissions less per inhabitant."



20/20/20 strategy Europe

to perpetuate the differences easier for big polluters exporting industry trick

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HIDDEN ENERGY DEBT

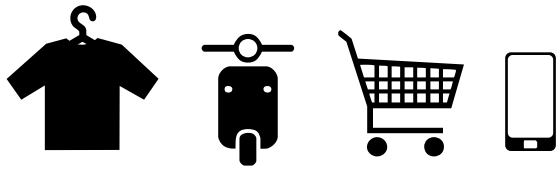
INTERNATIONAL ENERGY AGENCY:

data by country

kWh

$tCO_2eq/p.$

+



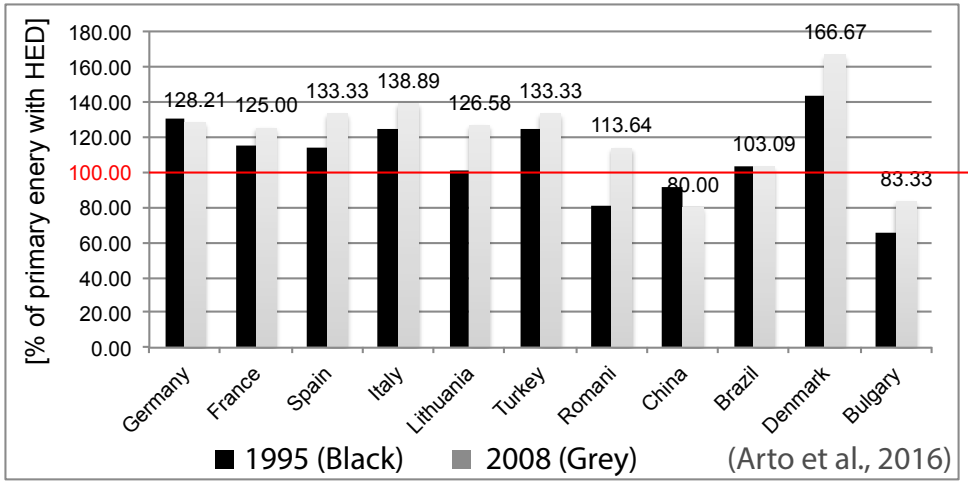
energy consumed in other countries due to the outsourcing of industrial consumer product manufacturing
(specially northern countries in southern countries)

More primary energy consumed than declared:
Germany: + 28.21%
Spain: + 33.33%
Italy: + 38.89%

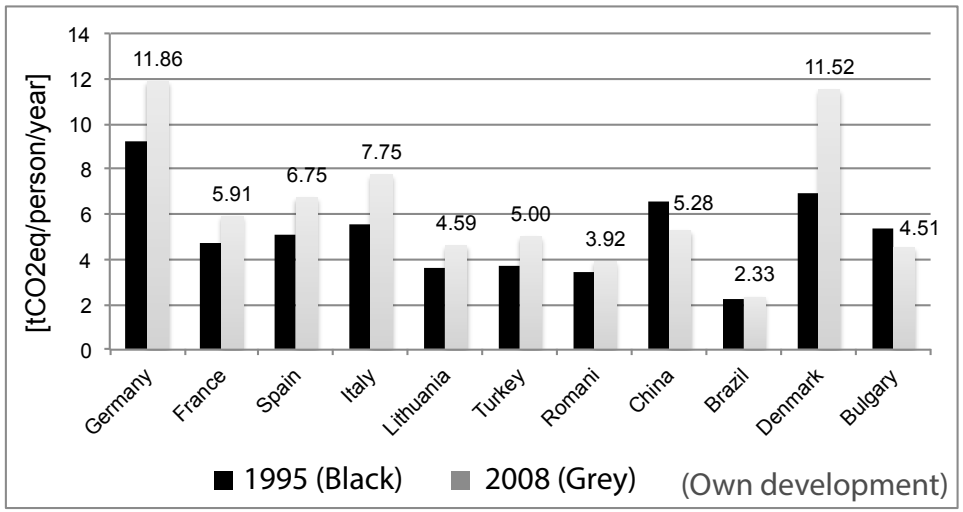
(Arto et al., 2016)

More emissions than the directly declared ones!

HIDDEN ENERGY DEBT (HED)



IEA DATA



ENERGY EMISSIONS [$tCO_2eq/per./year$]

	DECLARED	REAL (+HED)*
Denmark	6.91	11.52
China	6.60	5.28

5%

218%

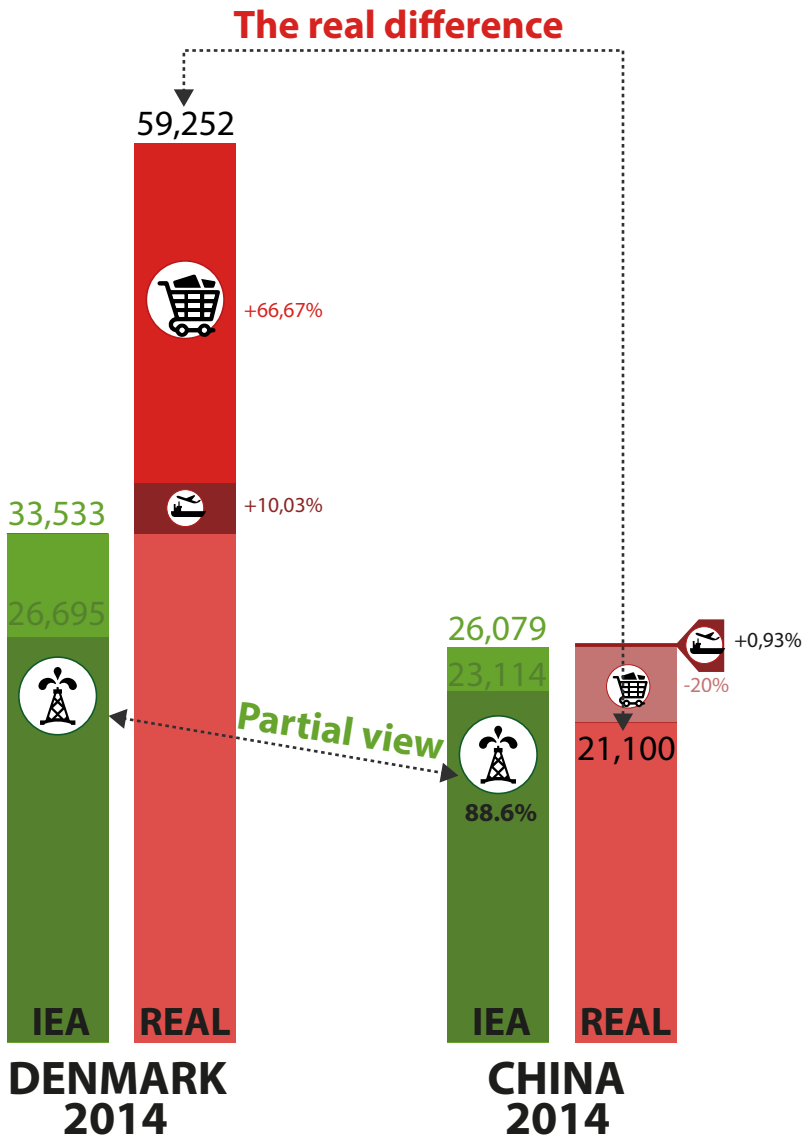
According to IEA just 5% more emissions

***It has been considered that energy consumed in a hidden way has the same CO2 emission rate**

HIDDEN ENERGY DEBT (HED)

33,533
kwh/person/year
79.6% DIRTY

59,252
kwh/person/year
26,695 DIRTY



26,079
kwh/person/year
88.6% DIRTY

21,100
kwh/person/year
23,114 DIRTY

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IDENTIFYING CONSUMPTION

NORTHERN coutries REDUCE ENERGY

citizens awareness

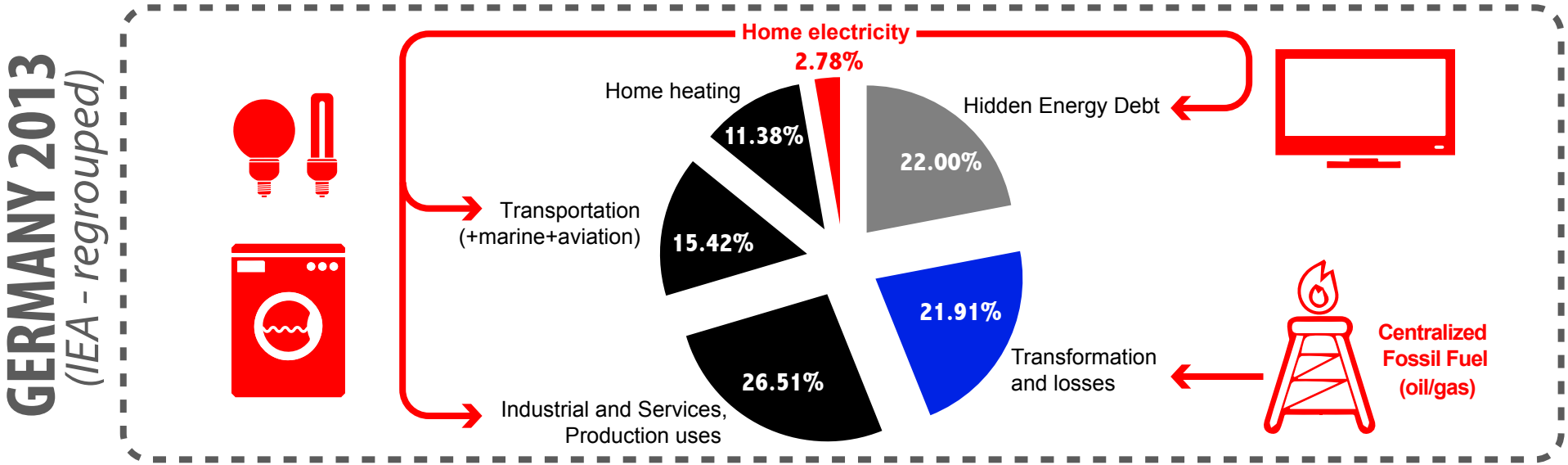
Consciusness of reduction?

How to act?

Confussion:

1- Mixing the terms: electricity and energy. Consumed electricity constitutes just a small percentage of the primary energy supply, e.g. in Germany 13.57%, Spain 15.65%, Cuba 10.95%, Brazil 14.00% and Ecuador 10.89%.

2- Acting at home level with electric improvements, mixing the BILL reduction with ENERGY reduction.



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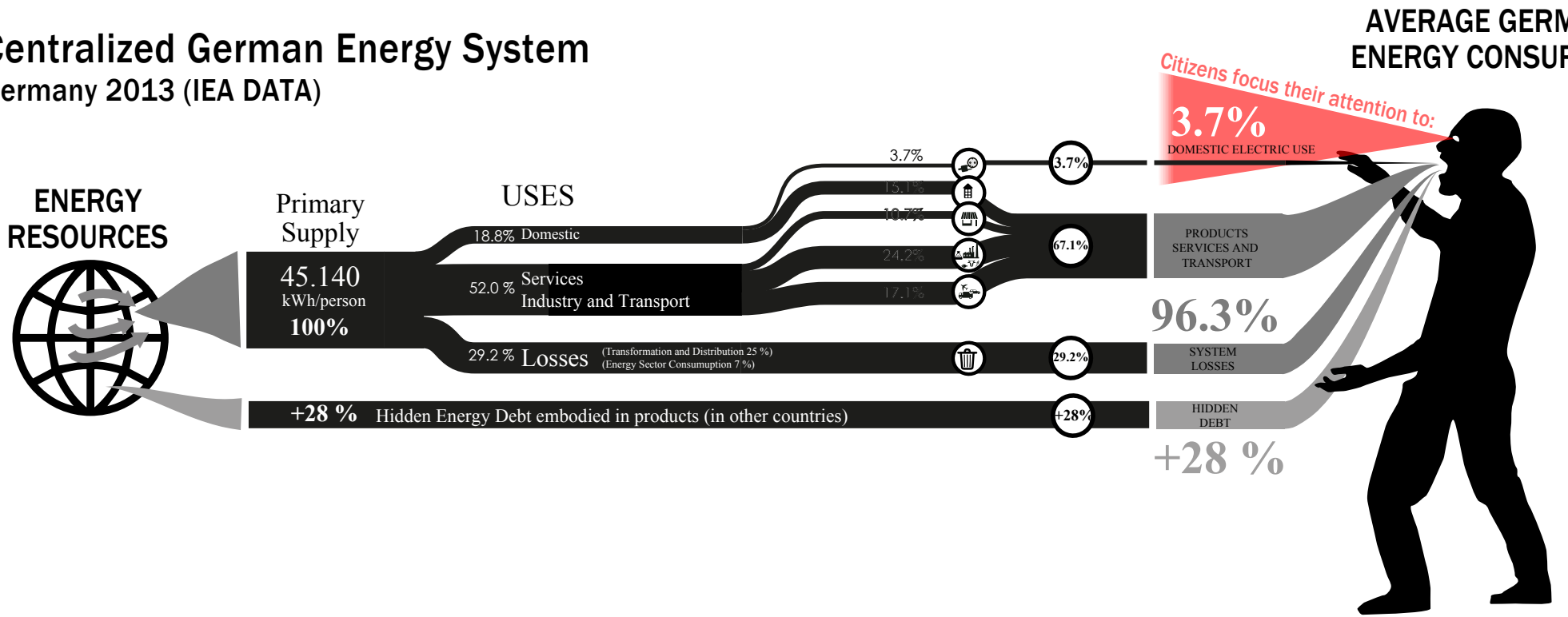
HIDDEN ENERGY DEBT (HED)

Centralized German Energy System

Germany 2013 (IEA DATA)



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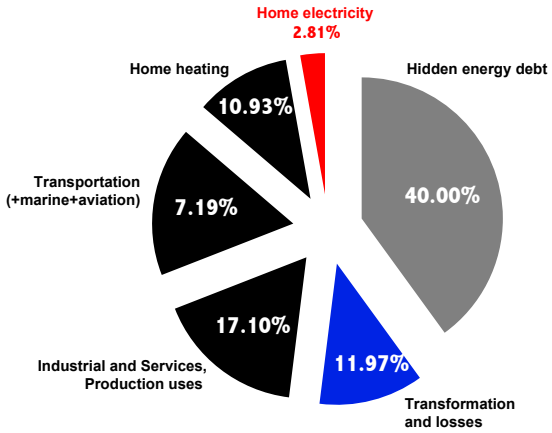
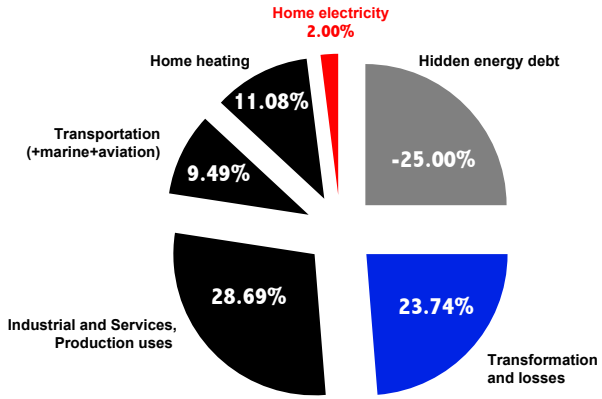
IDENTIFYING CONSUMPTION

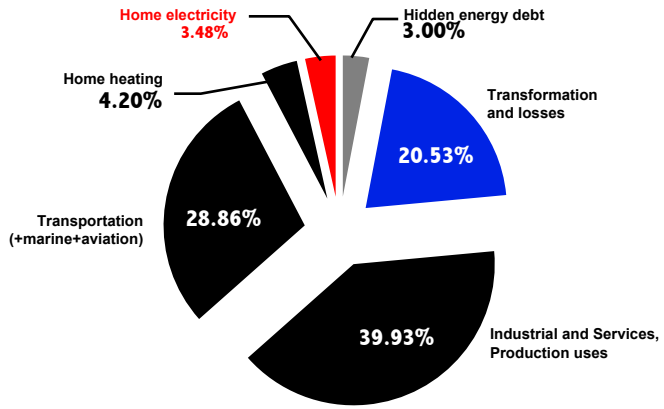
DENMARK



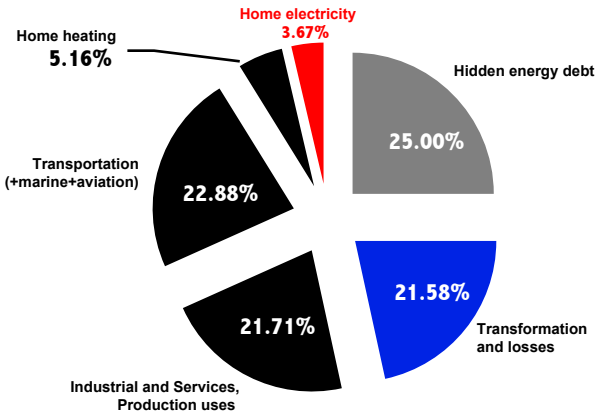
CHINA



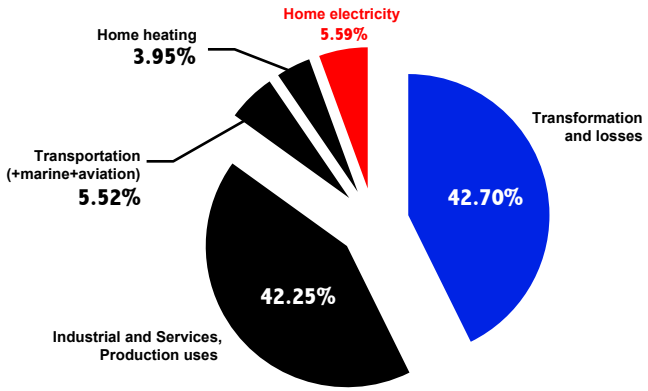
BRAZIL



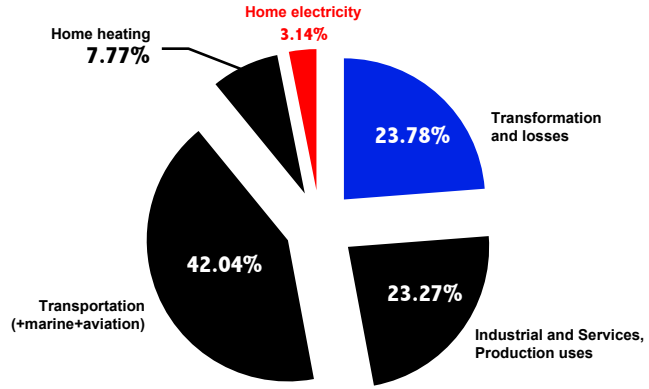
SPAIN



CUBA



ECUADOR



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CASES

	Country	Subject	Object
SOUTH	**Brazil**	Movement of People Affected by Dams (MAB)	"Energy for what and for whom?"
	Cuba	Cubasolar	"How Cuba Survives Peak Oil"
	Ecuador	Yasunidos	"Oil under the Soil"
NORTH	**Germany**	Feldheim // Sieben Linden // Rosa Luxemburg // Solar Settlement	"Renewable Economy"/ "Communities" "Public Management" / "Plus Energy"
	Spain	Som Energia // Goiener	"Energy Cooperatives"

The global
SOUTH

The global
NORTH

Case 1: BRAZIL

AMAZON JUNGLE,
Construction process of Bello Monte dam
(Photograph: Lalo de Almeida)

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Case 1: BRAZIL

Hydroelectric (70%)

34,000 km^2 of fertile land flooded

People (700,000 only in Baixo Iguaçu)

Movement of People Affected by Dams
(Movimento dos Atingidos por Barragens, MAB)

a "just compensation"

"water and energy are not commodities"
but a basic need of citizens

Workers and Peasants Energy Platform was created
(Plataforma Operária e Camponesa para Energia, POCE)

[tCO2eq/person/year]

Current energy model and policy aims to respond to market demand, the greed of corporations and increased productivity and consumption levels with the only goal of generating the largest amount of private profit possible

Energy for whom and fro what?

"feminism" + cares

not all renewable are "good" by definition

Case 2: CUBA

IS POSIBLE TO OVERCOME THE PEAK OIL
(Richard Heinberg)

The chaf, rest of the shugar reed, is the fuel for the Cuban energy potencial (Photograph: Bioenergy Crops Ltd)

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Case 2: CUBA

"Cuba survived an energy famine during the 1990s, and how it did so constitutes one of the most important and hopeful stories of the past few decades. It is a story not just of individual achievement, but of the collective mobilization of an entire society to meet an enormous challenge"

Richard Heinberg (2006)

"peak oil" could be faced and overcome in a collective way

the only sustainable country in the world

0.8 HDI + 1.5 ha/people biosphere resource

Is it voluntary?

87.34% fossil fuels (oil)

Primary energy supply in Cuba

an average Cuban citizen

- **71.07%** fossil fuels than a German citizen
- **59.48%** less than a Danish citizen

without taking into account the hidden energy debt.

How to do it democratically?

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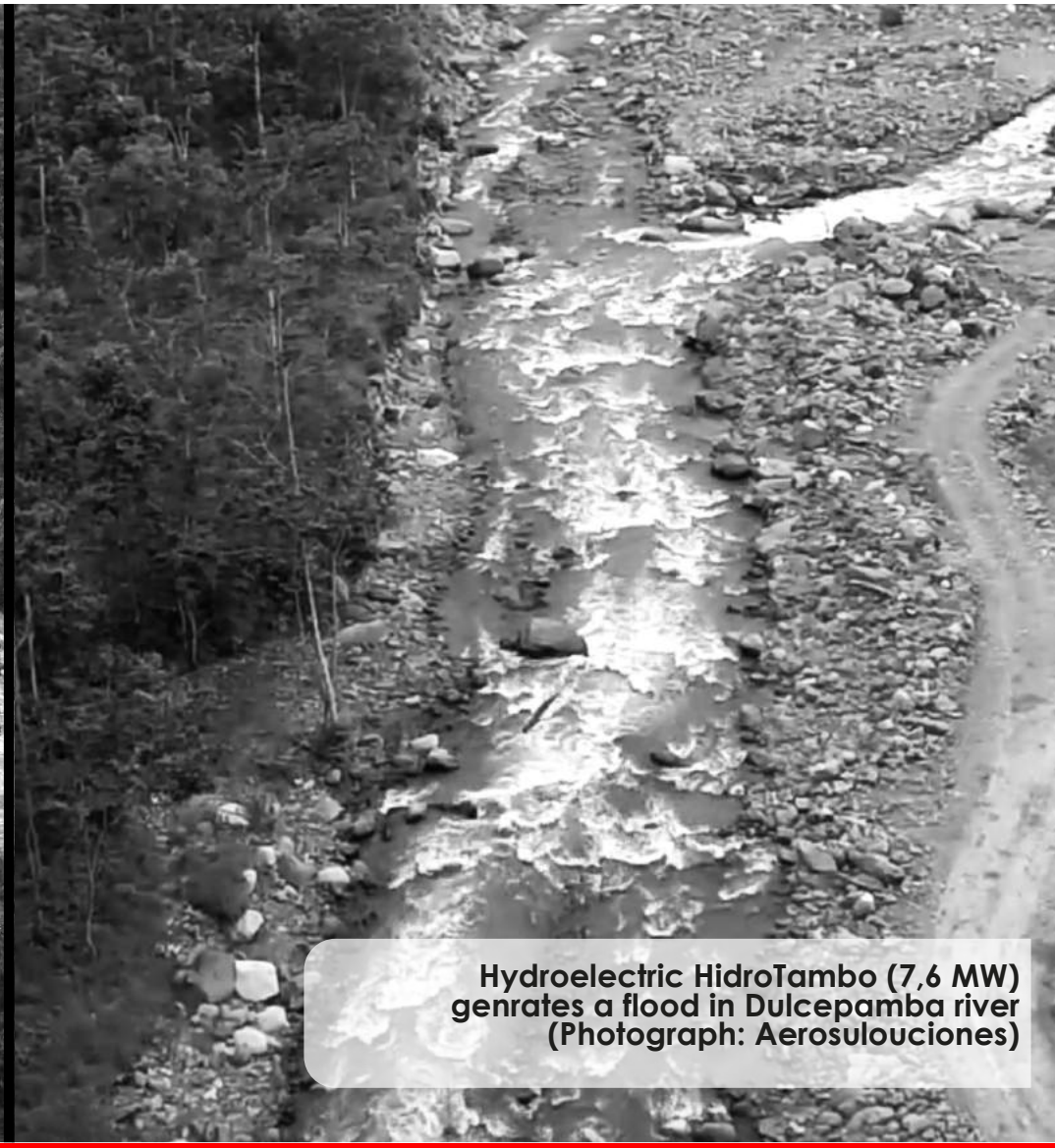
Case 3: ECUADOR



Hydroelectric HidroTambo (7,6 MW) genrates a flood in Dulcepamba river (Photograph: Aerosulouciones)

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Case 3: ECUADOR

Yasuní Park

3,600 million dollars
920 millions of barrels
20 % of ecuador oil

$

- 1Mhec. of rainforest (water - soil)
- 150 species of amphibians
- 121 species of reptiles
- 598 species of birds
- 204 species of mammals
- 3100 species of flora
- **Tagaeri and Taromenane indigenous comunities in voluntary isolation**

how to face global resources locally? $

wasn't enough international financial support for Ecuador and the initiative has been abandoned

"Leave the oil under the soil"
"Sumak Kawsay" (good living)

International Help
Rafael Correa (2007–2013)

Case 4: GERMANY

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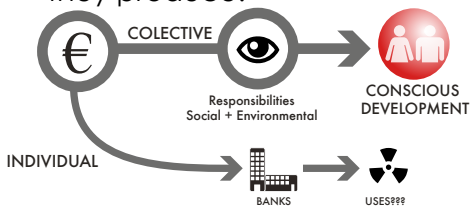
Case 4: GERMANY

From national transition to local transitions

Feldheim Village

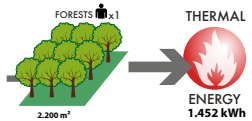
Cooperative economic project to invest savings in renewable power generation and become energy self-sufficient. New energy models can be economically viable, where they just consume 0.47% of the electricity that they produce.



Sieben Linden

Eco-village: energy transition through the creation of an austere community changing the values of the material consumption patterns. New community life patterns like common dining, shared spaces, services and objects...

- 77% of the primary energy supply of German average.



Solar Settlement

Neighborhood in the Vauban district of Freiburg: energy transition through a change in architecture and urbanism. Where they have reduced energy consumption by 66% compared to the average national electricity consumption and they have integrated into their homes the plus energy and passive house energy concepts.

Rosa Luxemburg

based in Berlin whose aim is to achieve a publicly managed democratic energy system.

SELF-INVESTMENT

181,8 GWh
PRODUCTION

856 MWh
CONSUMPTON

0,47%

PRIMARY SUPPLY

46.339 kWh
GERMANY

10.650 kWh
SIEBEN LINDEN

-76%

PLUS ENERGY

2.598 kWh
ELECTRIC CONSUMPTION

2.821 kWh
THERMAL CONSUMPTION

6.280 kWh
PHOTOVOLTAIC PRODUCTION

-14%

DEMOCRACY

Energy
Production/Consumption

Social
Public

Environment
Renewable

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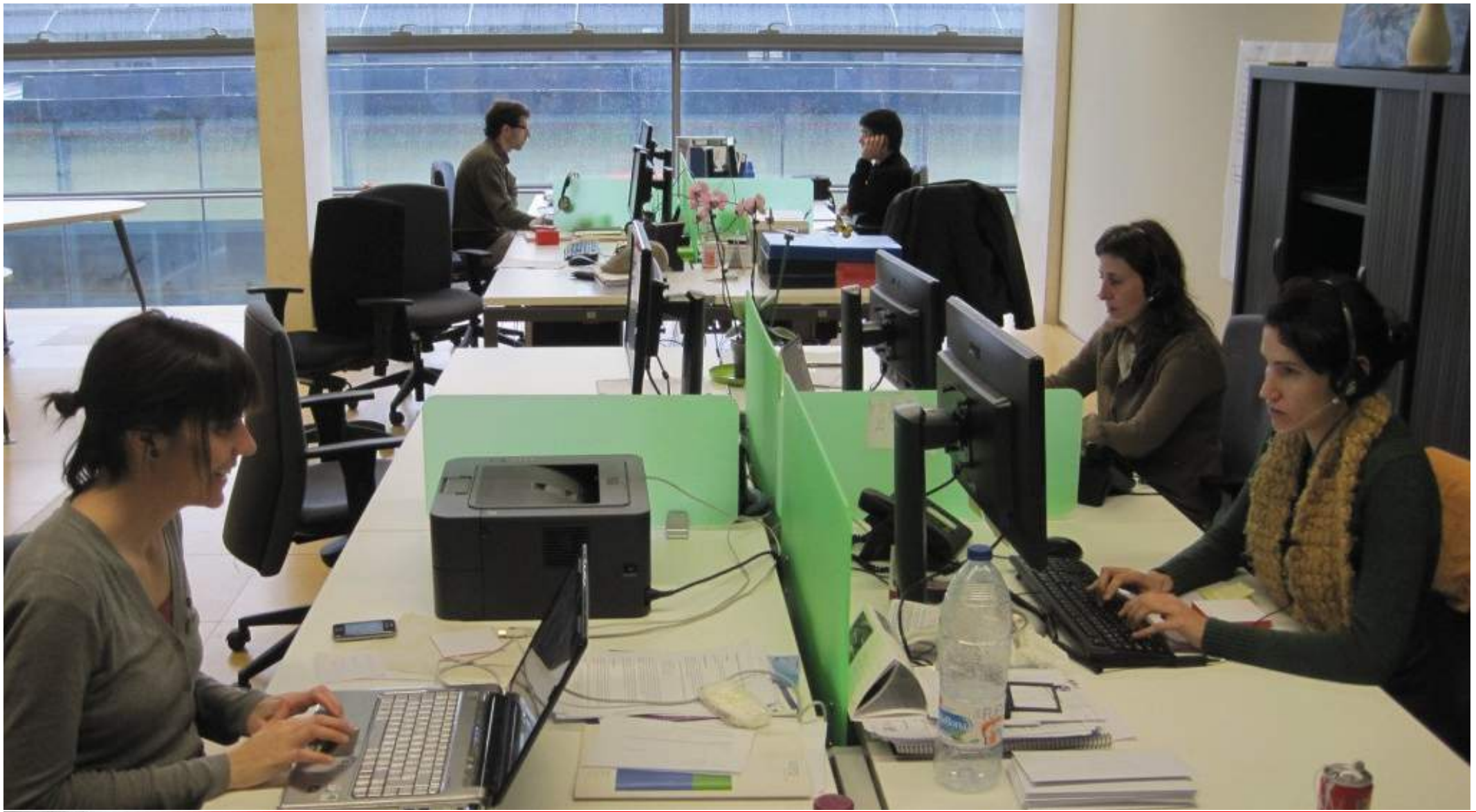
Case_5: SPAIN



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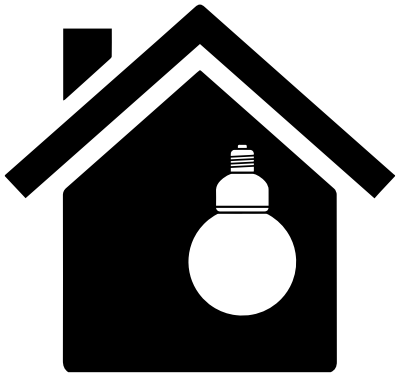
Case 5: SPAIN

although...



5.16%

Spain 2013
without HED

More than 50 politicians have been detected in the Revolving doors initiative

Felipe Gonzalez
PSOE former president
Independent Counselor
Gas Natural and Endesa

Jose Maria Aznar
PP former president
External Consultant
Gas Natural and Endesa

Elena Salgado
Exministra,
Counselor in
Endesa group company

Luis de Guindos
Consultant in
Endesa Group
Economy Minister

+ THE LOBBY

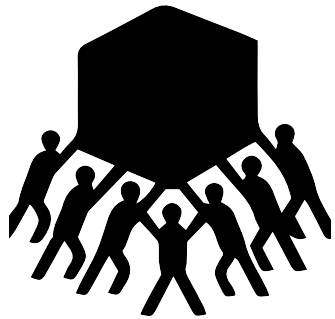
Josu Jon Imaz
Former Director of PNV-EAJ
Director of Petronor
Adviser in Repsol

Javier Balza
Minister of Interior
Secretary in Iberdrola
Adviser in Petronor

Mario Fernández
Former Director of PNV-EAJ
Adviser in Repsol and Iberdrola
Director of Kutxabank

Juan Mari Atutxa
Former President Parliament
Consultant in Bahía de B. Gas
Adviser in Iberdrola

Personal or Social Benefits?



Som Energia Cooperative was chosen. It aims to achieve a model 100% renewable and energy sovereignty, i.e. a democratic system serving the interests of citizens and not a few companies. In order to promote energy sovereignty, the cooperative Som Energia bases its internal operation on the assembly meetings: anyone can join by contributing 100 euros to the cooperative, partners have the right to participate and vote at the annual meeting.

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CONCLUSIONS

Current energy system is **obsolete**, **corrupt** and based on **inequitable** consumption

The change to a democratic low impact energy model made **from the roots** and **not** in a **superficial** way.

Energy literacy + Values based on care

BRAZIL: energy shouldn't be used as a commodity where the private sector could speculate.
CUBA: peak oil could be faced and overcome in a successful way.
ECUADOR: fossil fuels could be left under the soil when social values wins the economic ones.
GERMANY: comon investments, comunity, low energy to mantain high HDI level, public management.
SPAIN: political corruption in the electric energy field could be avoided with cooperatives.

THE CHANGE...

DEMOCRACY → **TRANSITION**

Responsibility → **OPPORTUNITIES**

We are electric slaves (power and values),
ITS NOT OUR FAULT, BUT THE CHANGE DEPENS ONLY ON US.

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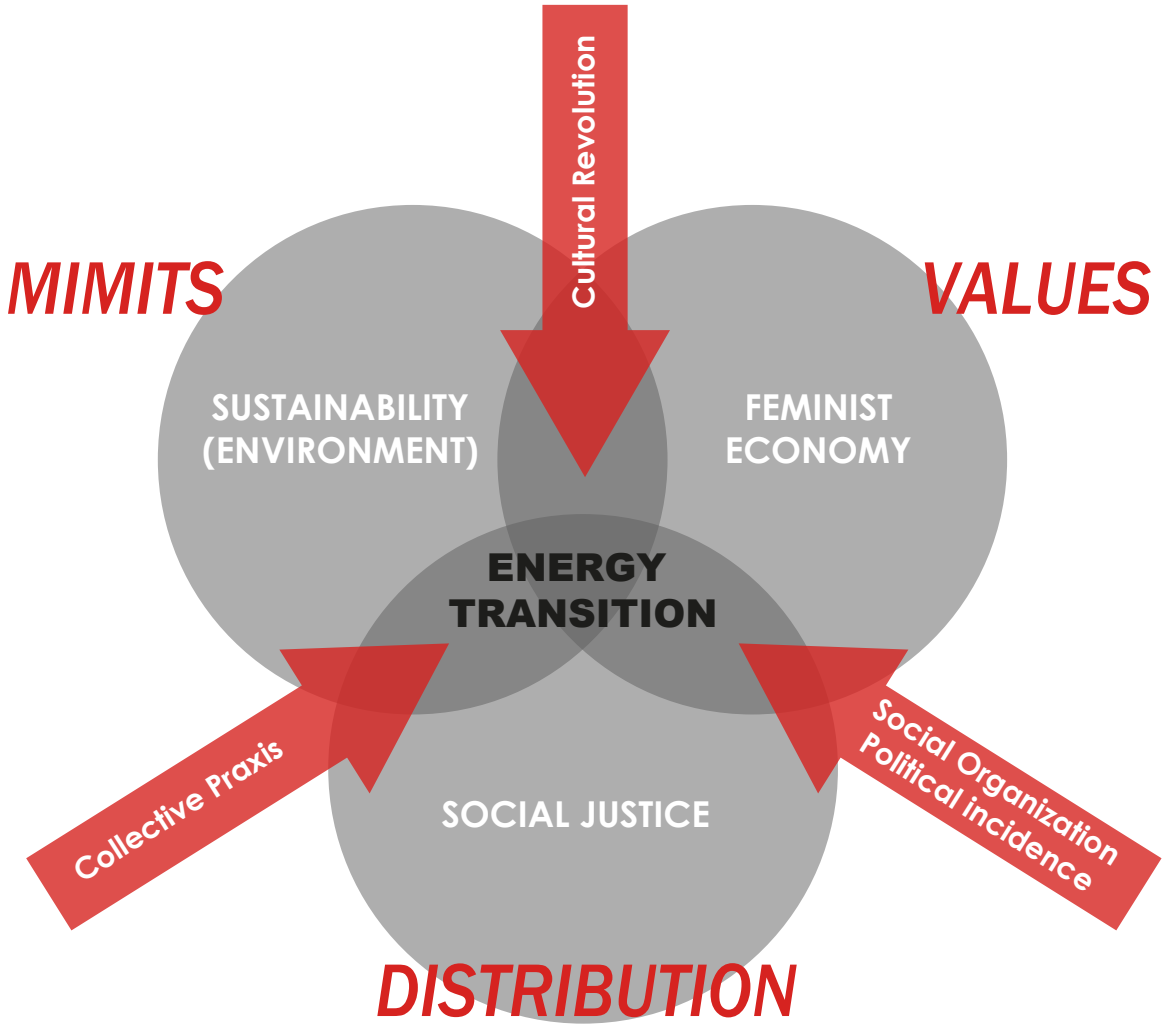
HOW TO ACT


Cultural Revolution
MIMITS
VALUES
SUSTAINABILITY (ENVIRONMENT)
FEMINIST ECONOMY
ENERGY TRANSITION
SOCIAL JUSTICE
Collective Praxis
Social Organization
Political incidence
DISTRIBUTION

THE LIMITS

SOUTH + NORTH

STABLISH HOW MUCH kWh/person IS HEALTHY

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ACTIVITY

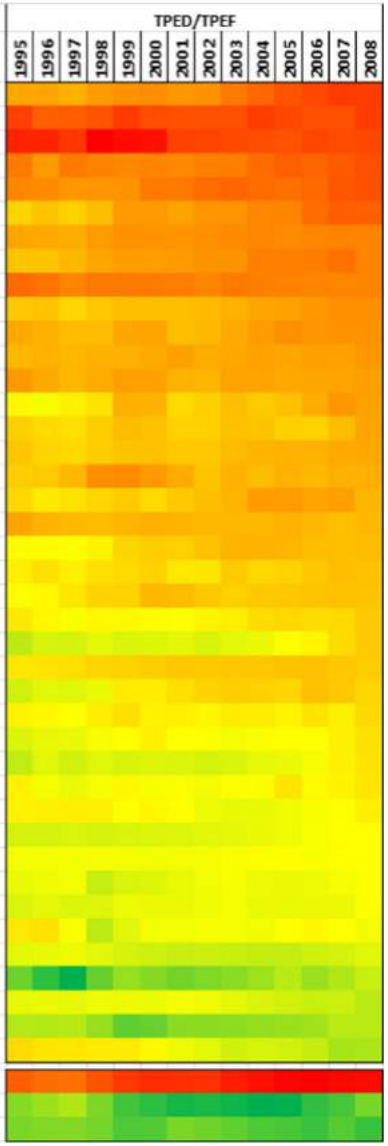
HOW MUCH IS YOUR COUNTRY ENERGY DEBT?

MAKE A COMPARATIVE TABLE

https://docs.google.com/spreadsheets/d/1fLRV89dTieUprMU7NHfhnpDU5PwuLFLmOzhaZSU7NN4/edit?usp=sharing

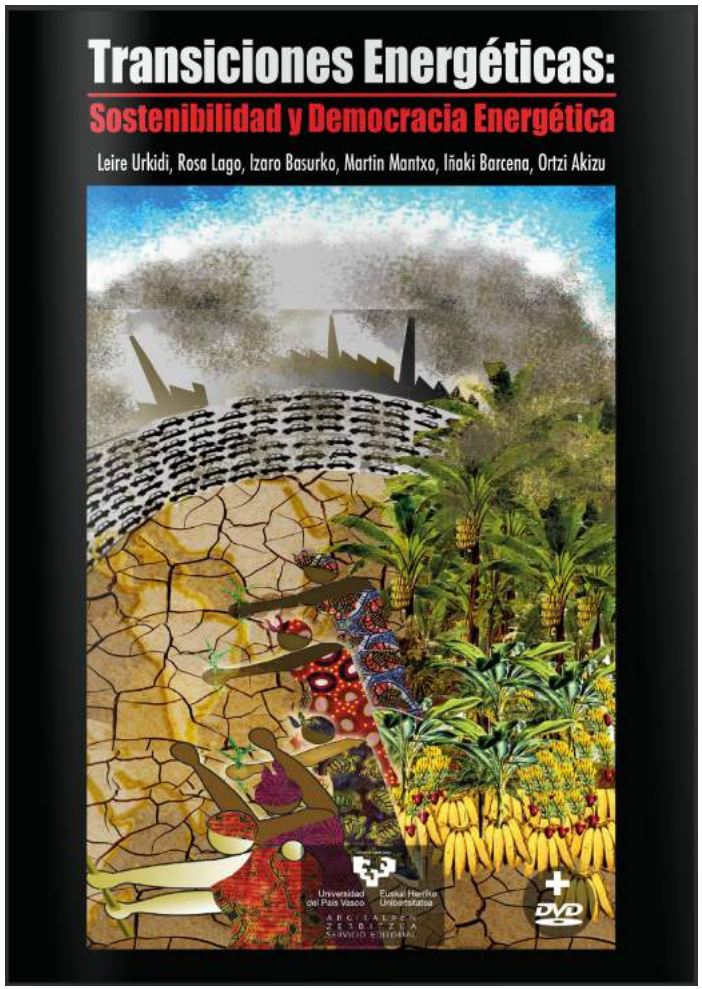
ARTO ET AL. 2016

	HDI			TPED/TPEF		
	1995	2008	2008-1995	1995	2008	2008-1995
IRL	0.824	0.919	0.095	80%	56%	-25%
CYP	0.795	0.835	0.040	57%	56%	-1%
MLT	0.773	0.834	0.062	50%	59%	9%
DNK	0.840	0.898	0.058	70%	60%	-10%
GRC	0.783	0.866	0.084	73%	61%	-12%
LVA	0.680	0.812	0.132	90%	64%	-27%
ITA	0.803	0.879	0.076	80%	72%	-8%
GBR	0.804	0.870	0.067	87%	72%	-15%
AUT	0.821	0.885	0.064	66%	72%	6%
ESP	0.808	0.878	0.070	88%	75%	-13%
TUR	0.598	0.704	0.106	80%	75%	-5%
PRT	0.757	0.811	0.054	84%	77%	-7%
DEU	0.842	0.909	0.066	77%	78%	1%
LTU	0.702	0.813	0.110	99%	79%	-20%
SVN	0.800	0.892	0.092	89%	79%	-10%
FRA	0.826	0.887	0.061	87%	80%	-7%
LUX	0.818	0.877	0.059	89%	82%	-7%
AUS	0.897	0.933	0.036	91%	83%	-8%
JPN	0.860	0.905	0.045	79%	84%	5%
HUN	0.750	0.828	0.079	99%	85%	-14%
SWE	0.863	0.910	0.047	96%	86%	-10%
MEX	0.679	0.764	0.085	99%	87%	-13%
BEL	0.860	0.894	0.033	95%	88%	-6%
ROM	0.694	0.784	0.089	124%	88%	-36%
USA	0.896	0.931	0.035	94%	89%	-6%
EST	0.725	0.842	0.116	117%	91%	-27%
NLD	0.874	0.914	0.040	97%	91%	-6%
POL	0.732	0.811	0.079	114%	93%	-21%
SVK	0.759	0.833	0.074	123%	94%	-29%
FIN	0.830	0.891	0.061	97%	94%	-3%
BRA	0.633	0.716	0.082	97%	97%	-1%
CAN	0.878	0.909	0.032	116%	101%	-15%
IND	0.438	0.533	0.095	104%	101%	-3%
IDN	0.525	0.601	0.077	108%	101%	-7%
CZE	0.795	0.873	0.079	114%	102%	-12%
KOR	0.800	0.895	0.094	95%	105%	10%
RoW	0.637	0.665	0.029	110%	112%	1%
BGR	0.705	0.773	0.068	153%	120%	-33%
CHN	0.548	0.672	0.124	109%	125%	16%
RUS	0.695	0.778	0.082	127%	126%	-2%
TWN	0.799	0.880	0.081	92%	131%	40%
Developed	0.838	0.896	0.058	91%	86%	-5%
RoW	0.637	0.665	0.029	110%	112%	1%
BRIIC	0.520	0.620	0.100	112%	117%	6%



BOOK AND DVD

www.issuu.com/ekologistakmartxanboletina/docs/tradebu



BOOK and DVD

ENERGY TRANSITIONS, TURN ON THE CHANGE!
www.vimeo.com/irudikate/tradebu-eng

CONTACT:
Ortzi Akizu: ortzi.akizu@ehu.eus

eman ta zabal zazu
Universidad del País Vasco
Euskal Herriko Unibertsitatea
FACULTY OF ENGINEERING VITORIA-GASTEIZ
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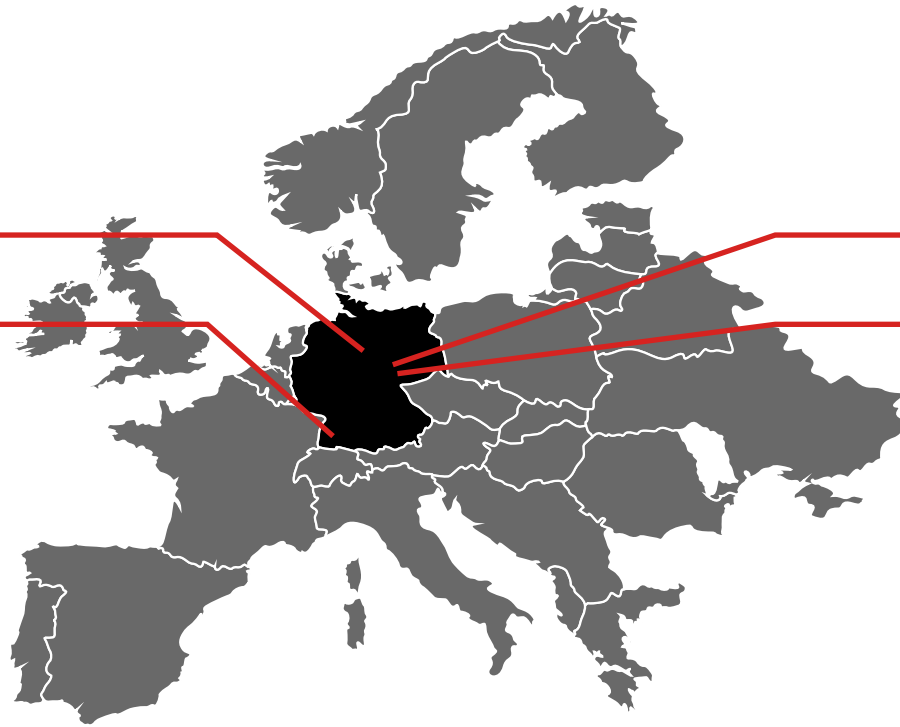
GERMANY

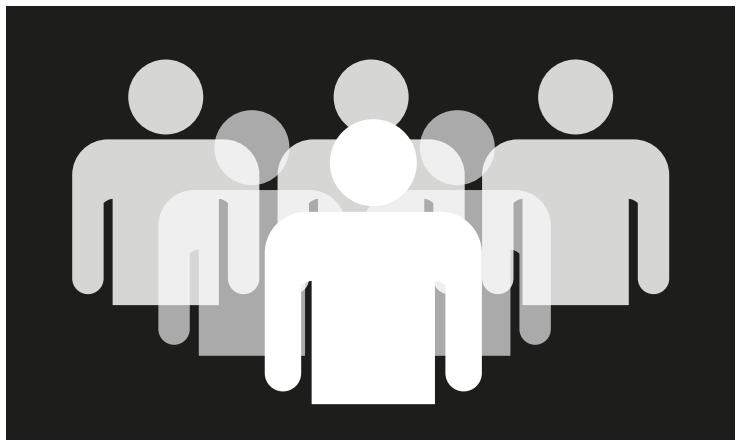
Sieben Linden

Vauban Solar Settlement



Rosa Luxemburg Foundation

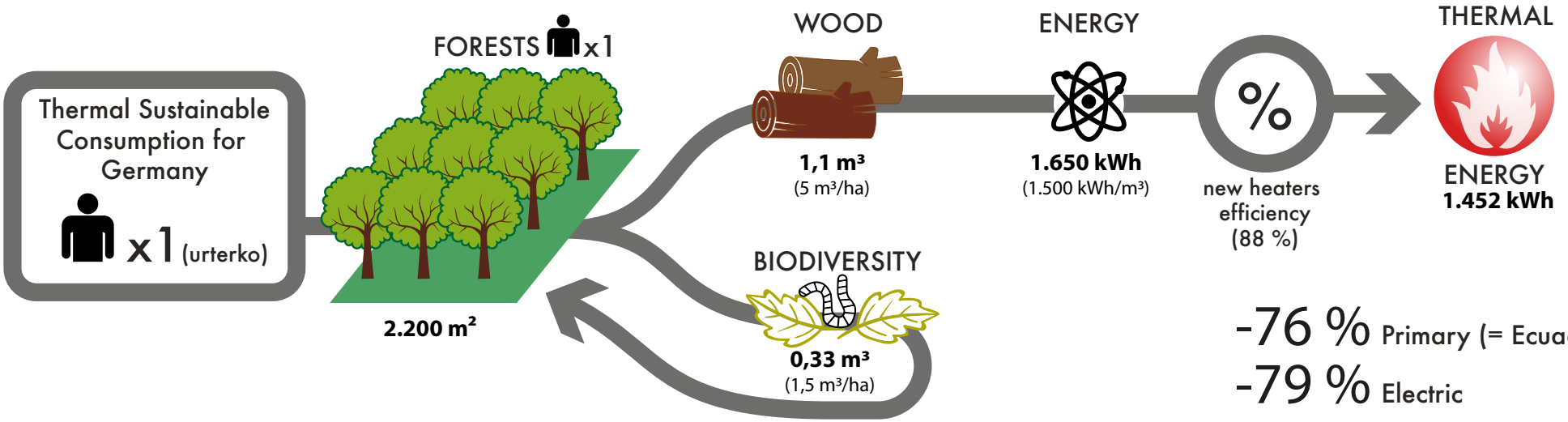
Feldheim



CREATE AND MESURE NEW ENERGY MODELS BASED IN A WELFARE

Energy Democracy

Community Energy Consciousness | SIEBEN LINDEN



-76 % Primary (= Ecuador)
-79 % Electric
- 43 % Thermal

SELFSUFICIENCY

1,1 m³ wood
CO2 = 0
Slow "time"

MINIMUM SPACES

Private: 9-16 m²
Public: 16 m²
"Merry austerity"

PASIVE HAUSS

15 kWh/m²
Local Materials
Participatory Design
Expert people

COMMUNITY

Shop, restaurant
vehicles, veggie gardens
machines, cloths
hobbies

FELDHEIM

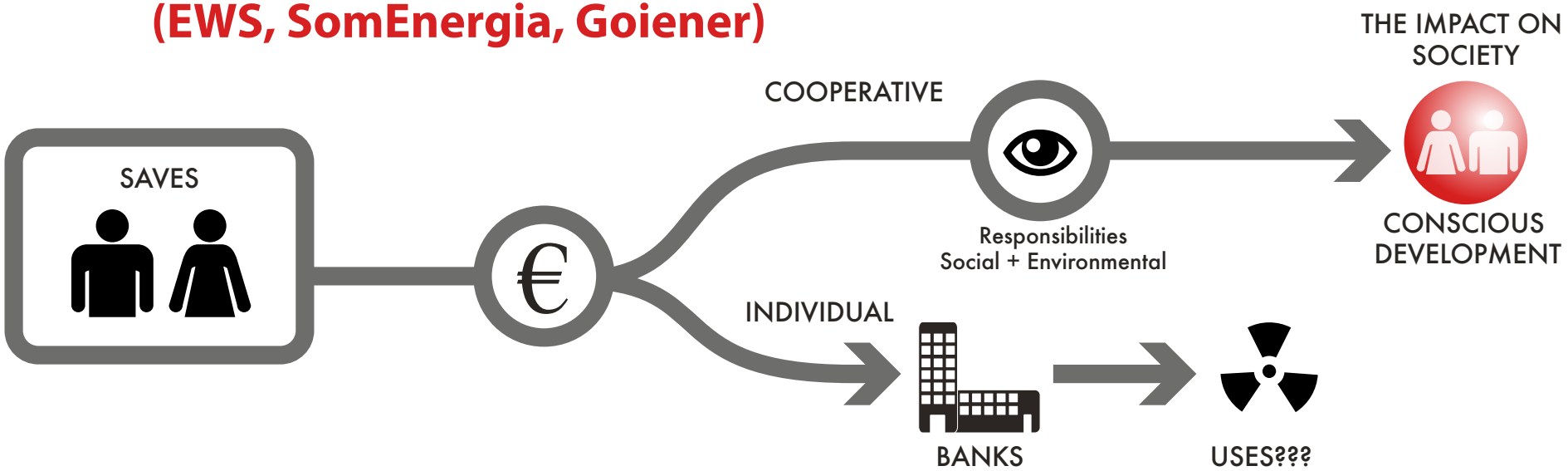
ELECTRIC ENERGY

181,8 GWh
PRODUCTION

856 MWh
CONSUMPTON

0,47%

Energiequelle (Cooperative)
(EWS, SomEnergia, Goiener)



SUN	BIOGAS	WIND	OTHERS
2,7 GWh/year	4,0 GWh/year Electric 4,3 GWh/year Thermic (District Heating)	175,1 GWh/year	Emergency = BIOMAS Battery research Education and Tourism Work and Values

VAUBAN

PLUS ENERGY

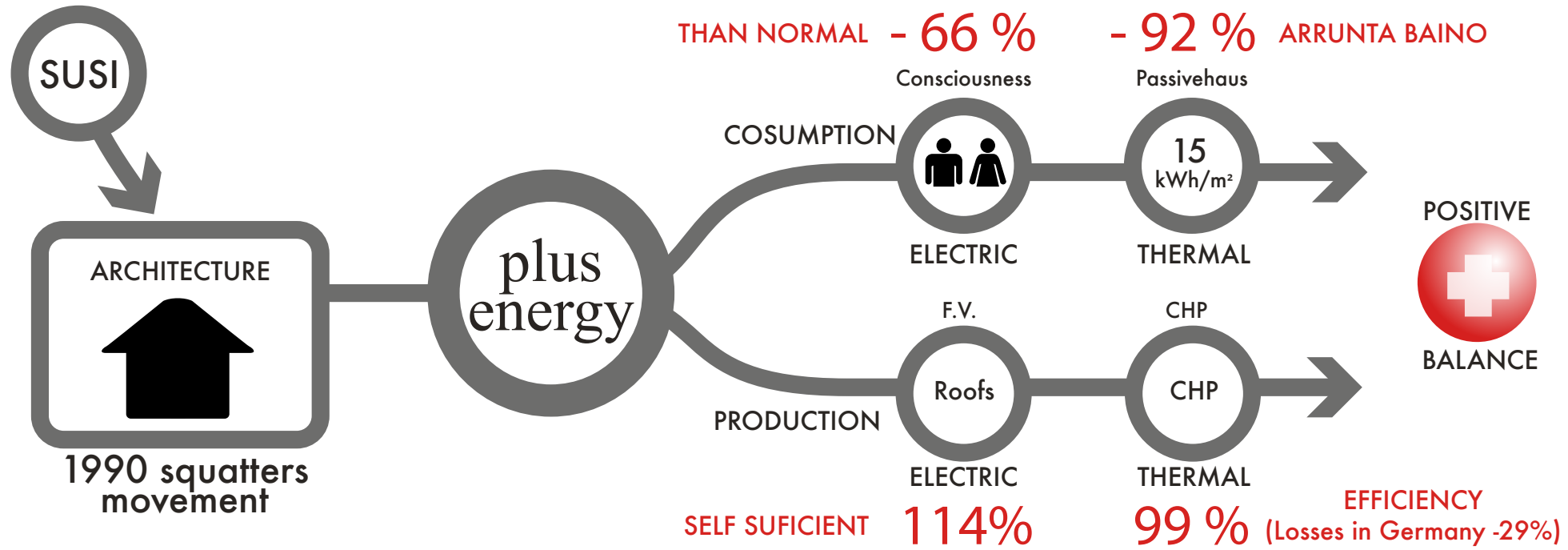
2.598 kWh
ELECTRIC CONSUMPTION

2.821 kWh
THERMAL CONSUMPTION

6.280 kWh
PHOTOVOLTAIC PRODUCTION

-14%

HIRIETAKO DISEINU AKTIBOA | VAUBAN



CHP

99 % efficiency Diesel neighbourhod CHP
5kW systems

Aesthetics Practice

Estetika berri eta atsegin baten sortzea eta balorizatzea

Origins

Self- governed
Independent
Shelter Initiative

Interaction

Transport
Urbanism
Food
Community (Haus 33)

Rosa Luxemburg
Foundation

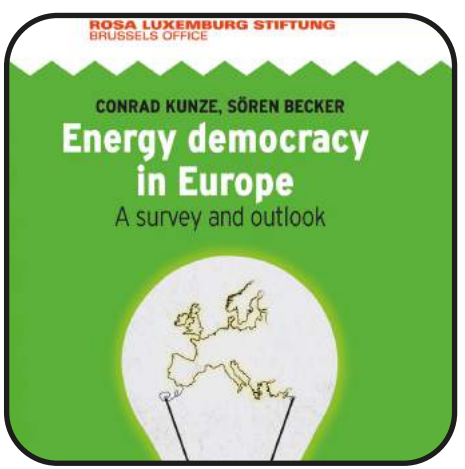
DEMOCRACY

Energy
Production/Consumption

Social
Public

Environment
Renewable

PUBLIC ⟵ ○ ⟶ PRIVATE



NO NUCLEARS!

Bonn 1979

H2O

2011 Referendum-a
"2012, Berlin Water back
in Public Hands"

ELECTRICITY

2013, citizens
lack of will
in the referendum?

RESEARCH

Theoretical models
examples in Europe