The “three ages” of Nationally Determined Contributions

or NDCs as a tool for a Pragmatic Enlighted Model of climate policy-making*

**(O. Edenhofer)*

The “three ages” of Nationally Determined Contributions

1. Before COP21: INDCs and the change of paradigm in climate negotiation
2. The Paris Agreement: INDCs and the measure of the ambitions
3. After COP21: NDCs, Energy Transition Monitoring and the *Pragmatic Enlighted Model*

From Kyoto to Copenhagen and Paris: a paradigm shift

- Kyoto Protocol (1997, COP3) :
  - Industrialized countries (ANNEX B) signed a protocol for reducing GHG emissions by at least 5% between 2008 and 2012, compared to 1990
- From Kyoto to Copenhagen (2009, COP15) :
  - A "top-down approach" to international negotiation, based on economic modelling and with the view that economic instruments should be the drivers of change

    "global cap + burden sharing + emission trading"
  - Negotiations failed on a global agreement, except on two points (the 2°C target and the Green Climate Fund and finance issue)
  - Copenhagen was both a failure and a fresh start…

From Kyoto to Copenhagen and Paris: a paradigm shift

- From Copenhagen to Paris (2015, COP21), towards a new era:
  - A "bottom-up approach" initially based on a "national pledge and review" system and eventually on the INDCs, proposed by every Party
  - INDCs provide the basis for the agreement, together with the solutions to ease the situation of less advanced countries, in terms of financing of the mitigation and adaptation effort

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Groupe Interdisciplinaire sur les Contributions Nationales: the INDC counter (2015)

- Difficulty: **no precise definition** of what should be included in INDCs. Each party is free to define the object (type of GHG), the variable (absolute, baseline, intensity), the dates, the economic sectors concerned…
- In the GICN study, we consider four country groupings:
  - The Triad (US, Europe, China) representing 43 % of GHG emissions in 2012
  - 10 major emitters from the Deep Decarbonization Pathways Project (DDPP), 28% of emissions in 2012
  - 10 major emitters non-DDPP, 10% of emissions in 2012
  - Rest of World, 19% of emissions in 2012: Annex I countries, emerging countries, oil exporters and rest.
- All-GHG emissions (EDGAR without Land Use) and Land Use emissions (FAO): 1990-2012
- Available INDCs are translated into all-GHG emissions in 2030, with reasoned assumptions for a limited number of countries/regions

Result of the GICN INDC counter

- With a careful consideration of conditional/non conditional INDCs, uncertainties regarding GDP for “intensity targets” and influence of LULUCF,
  we estimate total GHG emissions between 55.1 and 63.8 $GtCO_2eq$ in 2030

INDCs									2030		2030/référence				2030/2012	
MtCO2e GHG		1990	1995	2000	2005	2010	2012	INDC	inconditionnel/ min	conditionnel/ max	inconditionnel /min	conditionnel /max	référence	economic growth (%/yr, 2012-2030)	incondition nel/min	conditionnel /max
	USA	5 539	5 778	6 451	6 352	5 917	5 268		4 477	4 356	-30%	-32%	/2005		-15%	-17%
	EU	5 466	4 934	4 842	4 900	4 595	4 342		3 280	3 280	-40%	-40%	/1990		-24%	-24%
	China	3 678	4 491	4 611	7 108	10 243	12 625		15 219	12 774				7 to 5 or 7	21%	1%
44%	**Triad**	14 683	15 203	15 904	18 360	20 755	22 234		22 975	20 410					3%	-8%
	Canada	596	767	694	898	810	778		613	613	-30%	-30%	/2005		-21%	-21%
	Mexico	497	501	558	611	652	691		759	623	-22,0%	-36%	/BAU		10%	-10%
	Brazil	1 732	1 833	1 905	2 301	1 902	2 003		1312	1 312	-43%	-43%	/2005		-35%	-35%
	South Africa	350	370	394	453	421	418		614	398	PPD	PPD	/PPD		47%	-5%
	Russia	3 315	2 383	2 154	2 097	1 996	2 249		2 806	2 638	-25%	-30%	/1990		25%	17%
	Japan	1 221	1 336	1 333	1 341	1 229	1 506		1 000	1 006	-25%	-25%	/2005		-34%	-33%
	South Korea	274	427	486	531	620	676		536	536	-37%	-37%	/BAU		-21%	-21%
	Australia	475	480	576	654	647	597		484	471	-26%	-28%	/2005		-19%	-21%
	India	1 323	1 568	1 801	1 945	2 518	2 955		6643	5972				6,5 to 5 or	125%	102%
	Indonesia	1 092	1 240	1 375	1 785	1 980	2 026	1800 in 2005	2046	1700	-29%	-41%	/BAU		1%	-16%
27%	**DDPP-10**	10 875	10 907	11 276	12 616	12 774	13 898		16 813	15 268					21%	10%
	United Arab Emirates	72	93	114	144	205	240		312	312	30%	30%	/2012		30%	30%
	Egypt	139	155	186	246	274	319		415	415	30%	30%	/2012		30%	30%
	Iran	283	370	449	574	523	552		717	717	30%	30%	/2012		30%	30%
	Saudi Arabia	205	262	312	388	493	601		781	781	30%	30%	/2012		30%	30%
	Kazakhstan	357	244	194	263	317	349		303	267	-15%	-25%	/1990		-13%	-23%
	Malaysia	-151	-102	-55	407	398	438		503	503	15%	15%	/2012		15%	15%
	Taiwan	137	185	249	290	296	283		326	326	15%	15%	/2012		15%	15%
	Turkey	218	240	297	321	391	462	440 in 2012	928	928	-21%	-21%	/BAU		101%	101%
	Thailand	214	279	286	342	374	425	env. 378 in 2012 (p	444	416	-20%	-25%	/BAU		4%	-2%
	Ukraine	945	545	427	421	368	387		567	567	-40%	-40%	/1990		46%	46%
	International Aviation	299	314	361	429	491	524		1200	906			/BAU		129%	73%
	International Shipping	378	428	477	533	626	669		866	736	0%	-15%	/BAU		30%	10%
10%	**Sup400-2012**	3 098	3 012	3 297	4 356	4 758	5 249		7 362	6 875					40%	31%
	Other Annex 1 countries	329	235	241	242	283	277		230	230					-17%	-17%
	Other emerging countries	312	281	364	486	594	658		1 378	1 083					109%	65%
	Other high income oil exporters	83	110	131	176	208	244		338	290					38%	20%
19%	Rest of World	6 802	6 529	6 887	7 314	8 064	8 365								75%	31%
	Total (bottom-up)	**36 182**	**36 277**	**38 100**	**43 551**	**47 436**	**50 926**		**63 750**	**55 130**					25%	8%

Summing up INDC assessment studies

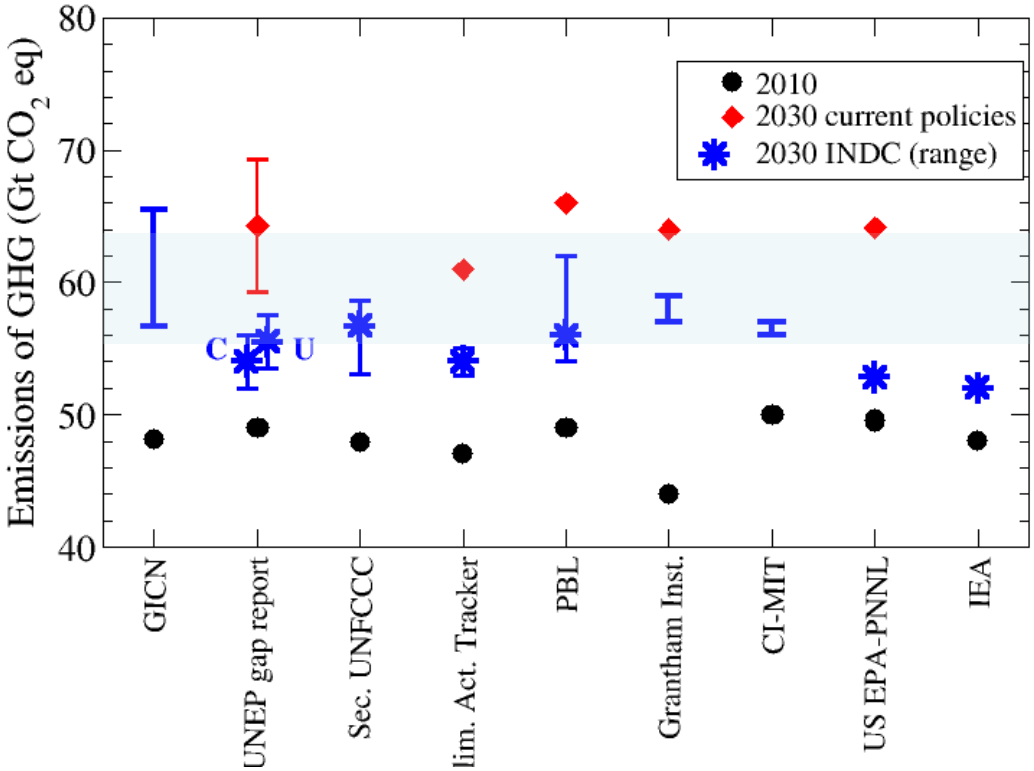
Differences in treatment of:

- baseline 2010 emissions
- land use emissions
- C intensity targets
- aviation & shipping
- small countries

⇒ MRV paramount

⇒ Land use & sectors

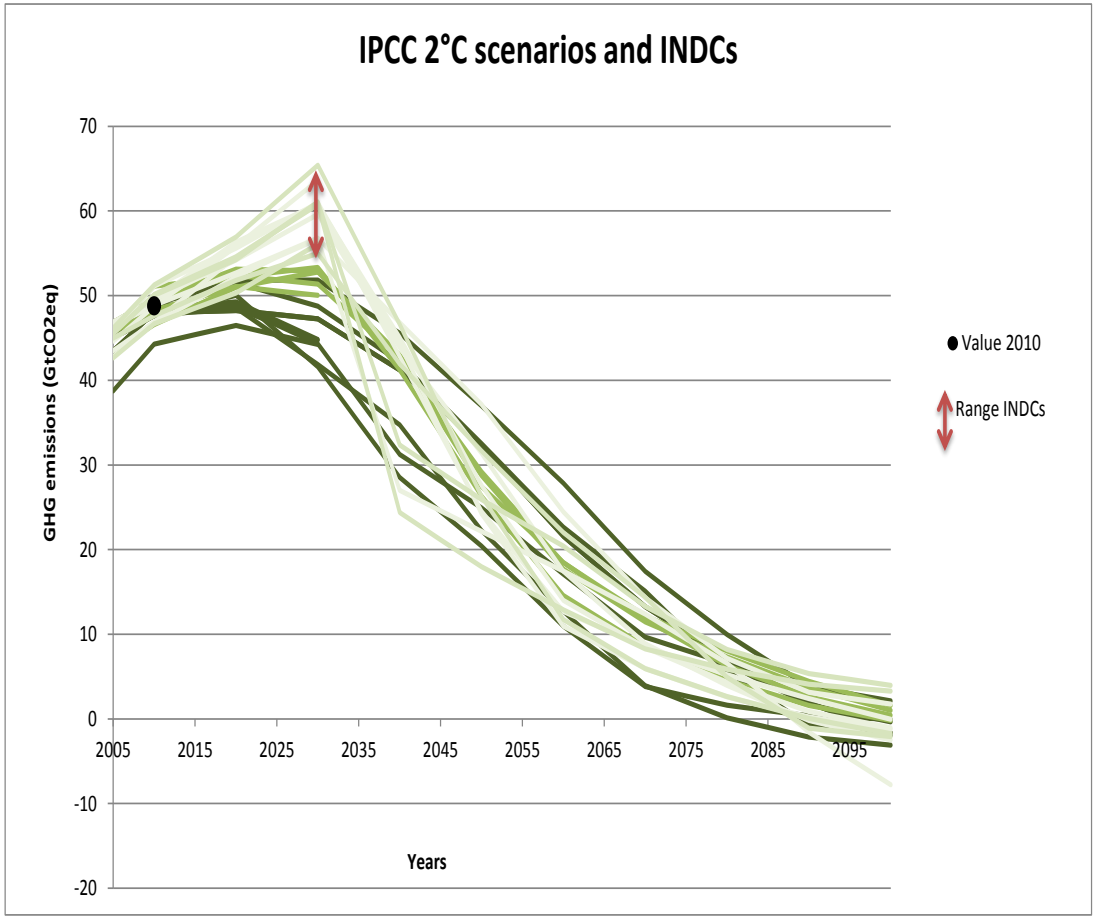
⇒ Contributions from RoW is uncertain



INDCs compared to IPCC 2°C pathways

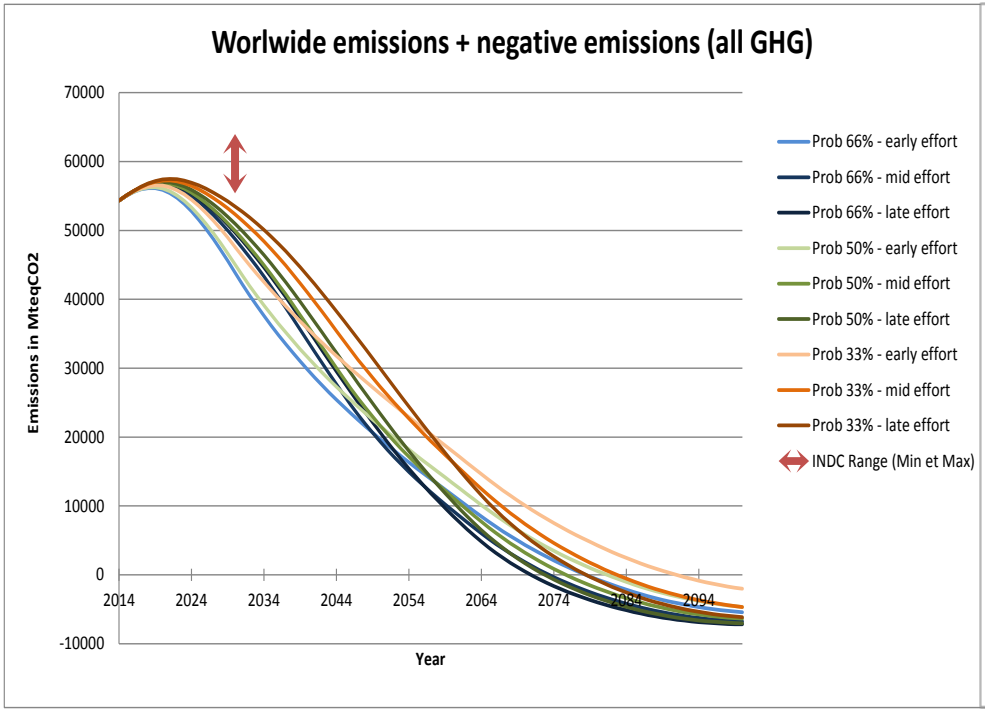
The range of consolidated INDCs as computed by GICN is compatible only with those IPCC AR5 trajectories that correspond to:

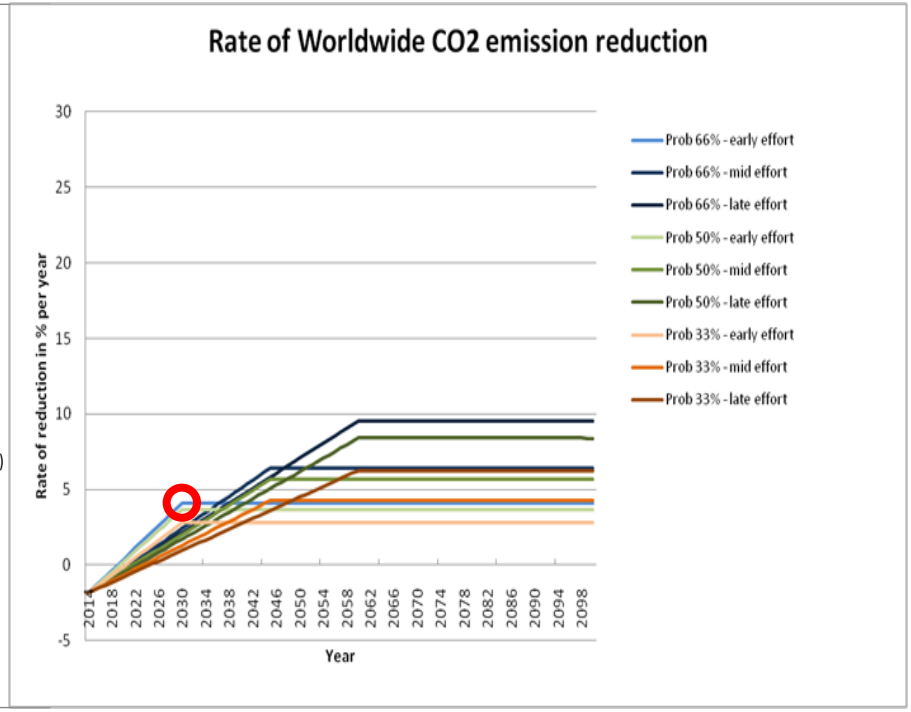
1. a delayed action
2. a sharp downturn in 2030
3. negative emissions by the end of the century



Source: IPCC WG3 AR5 SPM, 2014; GICN, 2015

INDCs compared to REDEM (GICN) 2°C pathways with negative emissions





Trajectories **with negative CO_2 emissions (500 $GtCO_2eq$)** for different probabilities of reaching the 2°C target and different maximum effort dates, against aggregated INDCs.

The future of NDCs

- By all measures, the Paris INDCs fail to meet the 2°C – not to say 1,5°C – target
- This is why the Paris Agreement foresees further steps for raising the ambition:
  - 2018 Facilitative Dialogue
  - 2022 Global Stocktake

Global Stocktake	2018 Facilitative Dialogue
• Agenda Item under APA	• No dedicated space to discuss it
• Comprehensive scope: mitigation adaptation, support	• Limited scope: mitigation
• Guidance: science, equity	• No specific guidance
• **Nature: facilitative**	• **Nature: facilitative**
• Inputs specified: ✓ Latest IPCC Reports (s) ✓ Info on support, adaptation, NDCs ✓ Info from SBs	Inputs specified: ✓ IPCC Special Report on 1.5 degree C
• **Modalities: not specified**	• **Modalities: not specified**
• Degree of experience/maturity: **build from experience of 2016 FD**, 2018 FD, more national reports (MRV)	• Degree of experience/maturity: **build from experience of 2016 FD**
• **Outcome: not specified**	• **Outcome: not specified**

Source: WRI

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What is the *Pragmatic Enlighted Model* (Edenhofer and Kowarsch, 2015) ?

- According to Edenhofer and Kowarsch, there is an alternative to the i. technocratic, ii. decisionist and iii. relativist models of policy making: the *Pragmatic Enlighted Model* is based on John Deweys' theory of the "scientific enquiry" and promotes a continuous democratic deliberative decision process:

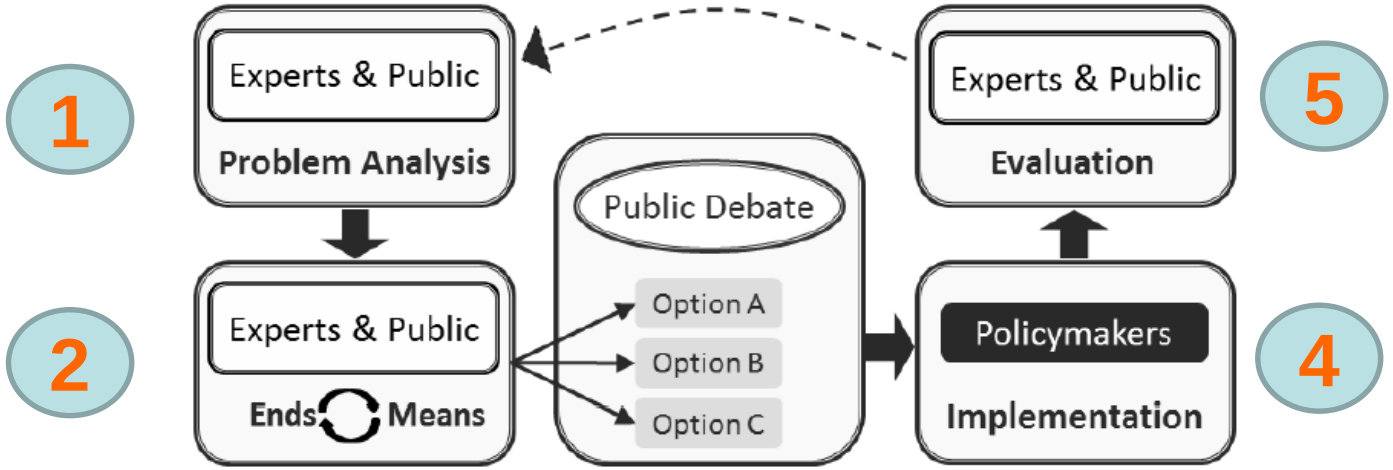


Fig. 4 The PEM suggests that problem frami and means (in their interrelation) are explored by scientists and the public jointly ere is a public debate on alternative policy options. Policy outcomes are evaluated jointly the implementation by policymakers

From NDCs to ENERgy TRAnsition Monitoring indicators

- The new paradigm of climate policies is no more based on the search of a global economic effectiveness through the implementation of economic instruments and the sole role of carbon prices

- It is rather based on nationally determined Deep Decarbonization Pathways with scenarios, sectoral operational targets and adequate Policies and Measures

- In the implementation process of the national DDP, what turns out to be of paramount importance are indicators and dashboards for the guidance of sectoral policies…

Monitoring indicators: Germany

ENERGY OF THE FUTURE
Commission on the Monitoring Process

Monitoring Indicators

Energy supply
- Primary energy consumption by energy source
- Final energy consumption by energy source
- Final energy consumption by sectors
- Gross electricity consumption
- Net electricity consumption by sectors
- Gross electricity generation by energy source

Energy efficiency
- Primary energy productivity and final energy productivity (total economy)
- Temperature-adjusted primary energy productivity and final energy productivity (total economy)
- Electricity productivity (total economy)
- Final energy productivity (industry)
- Final energy productivity (commerce, trade, services)

Renewables
- Share of RES in gross final energy consumption and gross electricity consumption
- Electricity generation, final energy supply and heat supply from RES
- Special equalisation scheme
- EEG levy by technology
- Sum of power exchange price and EEG levy
- Merit order effect

Plants
- Capacity of German power plants
- Capacity of RE power plants
- Share of CHP electricity generation in net (total) electricity generation
- Power plants by federal states
- Construction and planning of conventional power plants
- Pumped-storage power plants
- Market share of the largest utilities

Grids
- Circuit length, extra high voltage and high voltage
- Grid investments
- Average network charges
- Costs of system services
- SAIDI (electricity)
- Investments in smart grids and smart meters
- Physical electricity flows through cross-border capacities

Buildings
- Primary energy demand
- Heating energy demand
- Renovation rate
- Final energy consumption in buildings
- Specific final energy consumption for space heating in private households
- Building space
- Investments in buildings

Transport
- Final energy consumption in transport
- Number of electric vehicles
- Number of fuel cell vehicles
- Fuel consumption of newly registered passenger cars
- Volume of passenger and freight transport

Greenhouse gas emissions
- Greenhouse gas emissions
- Greenhouse gas emissions by source
- Energy-related CO_2 emissions
- CO_2 emissions of electricity generation
- Greenhouse gas emissions per capita and per GDP
- Avoided greenhouse gas emissions due to RES

Energy prices and costs
- Price development of energy raw materials
- CO_2 prices
- Natural gas and electricity prices by user type (incl. European comparison)
- Crude oil prices
- Compensation schemes for industries
- Energy costs by target groups and shares of energy costs in income
- Energy costs in selected industries
- Share of electricity costs in GDP

Macroeconomic effects
- Investments in RES
- Reduction of imported fossil fuels induced by RES and energy efficiency
- Employment effects induced by RES
- Employment effects induced by energy efficiency measures
- Gross employment in the conventional energy sector
- Expenditure of the Federal Government in the context of the Energy Research Programme

27.02.2017 Indicators in red are quantitative targets in the Energy Concept and are regarded as headline indicators by the Federal Government. 12

Source: Expertenkommission zum Monitoring "Energie der Zukunft"

Monitoring indicators: United Kingdom

- Supply: Heat networks, heat pumps, hydrogen & biofuels
- Demand: Insulation, efficiency & behaviour change
- By 2030s: low carbon heat in 1/7 homes, 50% comm'l. buildings

- Supply: conventional fuel efficiency improvement & EVs
- Demand: mobility choices, driving styles
- By 2030: around 60% new cars & vans electric (hybrid or full)

- Supply: wind, nuclear, CCS, interconnection, gas, storage etc
- Demand: smart meters & tech.
- By 2030s: <100 gCO2/kWh, smart demand

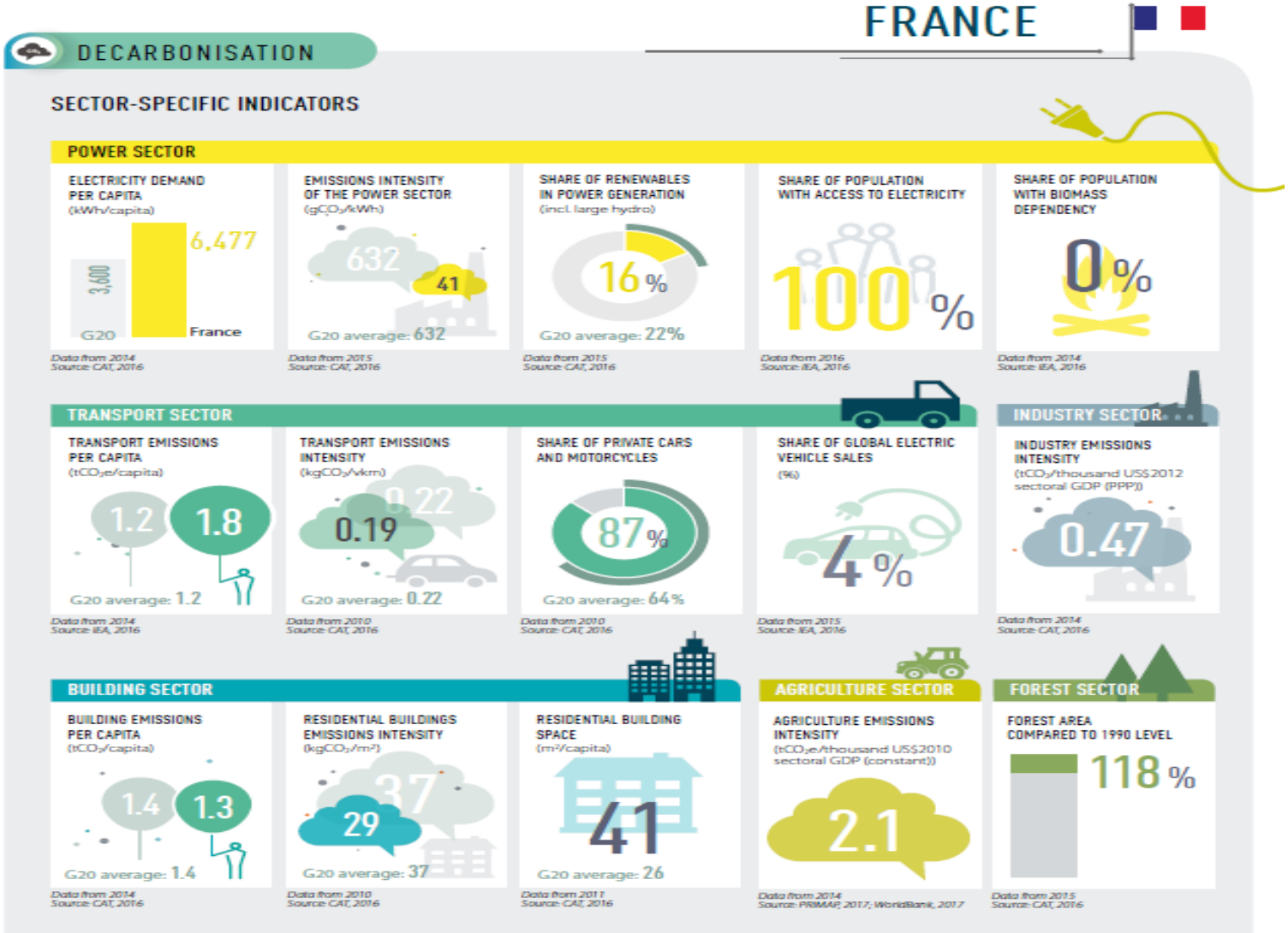
- Supply: processes & energy efficiency, heat recovery & CCS
- Demand: new materials
- Through 2020s: apprx. 1%/yr fall emissions from measures

- Supply: fertiliser use, animal diets, breeding, fuel efficiency
- Demand: labelling, diet
- Through 2020s: apprx. 1%/yr decrease emissions

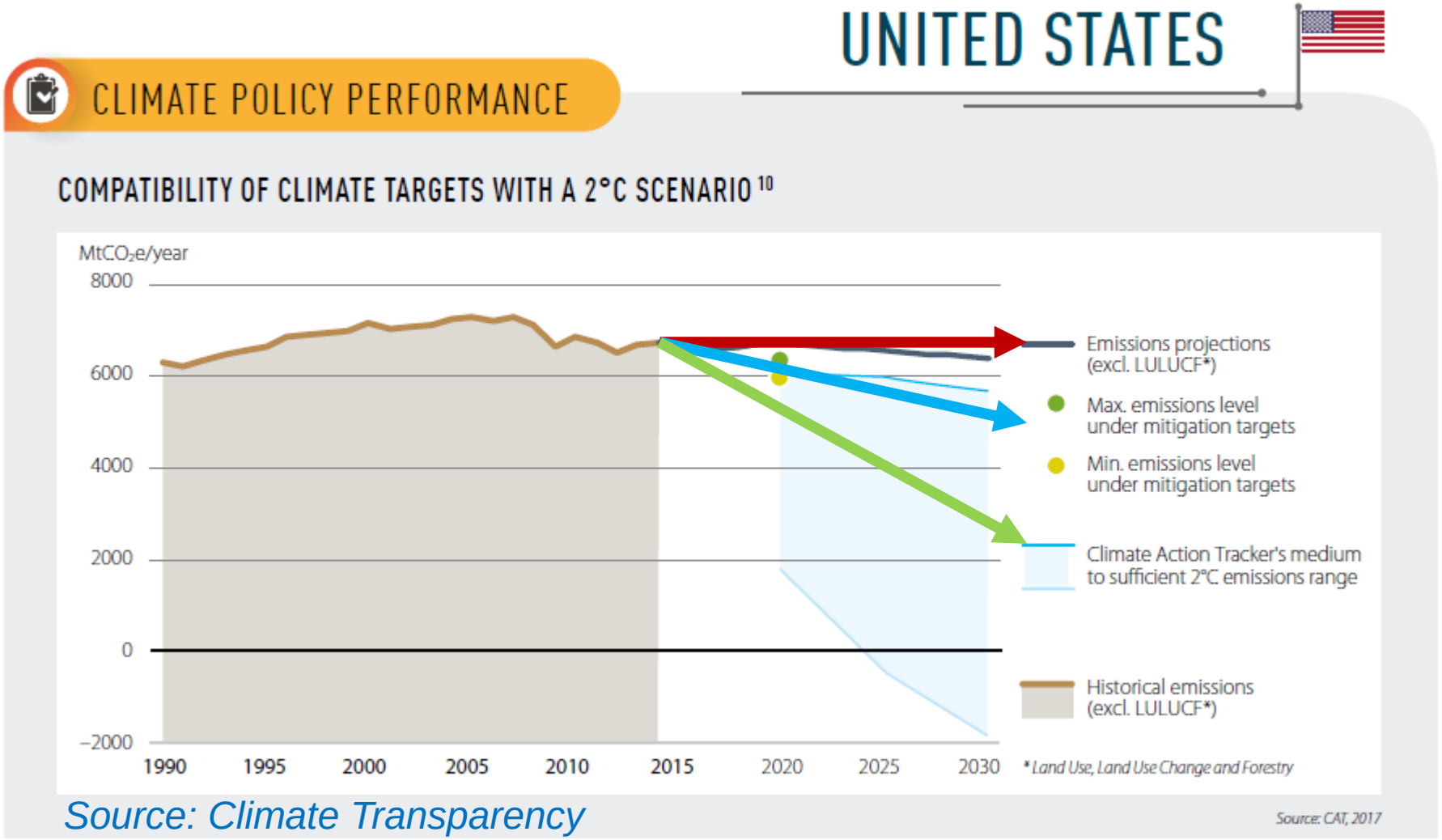
- Supply & demand: reduce & re-use, all main biodegradable waste diverted from landfill, alternatives to F-gases
- By 2030s: apprx. 50% decrease emissions from today

Source: UK – Climate Change Committee

The *Climate Transparency* sectoral dashboard for the G20



ENERDATA's Enertram project aims at identifying the "double gap" between: 1/ trends and commitments 2/ commitments and 2°C requirements



Source: Climate Transparency

Monitoring indicators: F-LTECV

- **Objectifs atteignables (>66%)** : émissions de GES, consommation primaire et conso. d'énergies fossiles

  NB: objectifs en valeur absolue – risque de dérive si la croissance économique repart à la hausse ?

- **En retard (33%<>66%)** : part des renouvelables dans la production d'électricité et dans la production de chaleur, réhabilitation thermique des logements
- **Très décalés (<33%)** : part des renouvelables dans la consommation totale et part de l'énergie nucléaire

	Monitoring LTECV	Référence		Données		LTECV	Indicateurs (R<0,33 O<0,67 V>0,67)		
Loi TECV		Année	Niveau	2005	2016	2030	*Points de % 2005-2016*	*Points de % 2016-2030*	*Indicateur*
Priorités stratégiques	Emissions de gaz à effet de serre, hors UTCATF (MtCO2)	1990	392	410	339				
	idem %		0%	5%	-13%	-40%	*-1,64*	*-1,90*	*0,87*
	Consommation d'énergie primaire (Mtep)	2012	252	271	243				
	idem %		0%	7%	-4%	-20%	*-1,02*	*-1,16*	*0,88*
	Part des renouvelables dans conso. totale (%)			6,1%	9,6%	32%	*0,31*	*1,60*	*0,20*
	Part du nucléaire dans production d'électricité (%)			78,4%	72,9%	50%	*-0,50*	*-1,64*	*0,30*
Objectifs sectoriels	Part des renouvelables dans l'électricité (%)			10,8%	18,4%	40%	*0,69*	*1,54*	*0,45*
	Part des renouvelables dans le vecteur gaz (%)					10%	*0,00*	*0,71*	*0,00*
	Part des renouvelables dans les carburants (%)			1,4%	7,1%	15%	*0,52*	*0,56*	*0,93*
	Part des renouvelables dans la chaleur (%)			12,2%	*20%*	38%	*0,71*	*1,29*	*0,55*
	Consommation d'énergie fossile (Mtep)	2012	123	142	118				
	idem %		0%	15%	-4%	-30%	*-1,77*	*-1,84*	*0,96*
	Nombre réhabilitations thermiques logements				*(150 000)*	500 000			
	Nombre points de charge VEL				78 000	7 000 000			*0,00*

ENERDATA: Bilan énergétique mondial - Edition 2017

Monitoring indicators: F-PPE

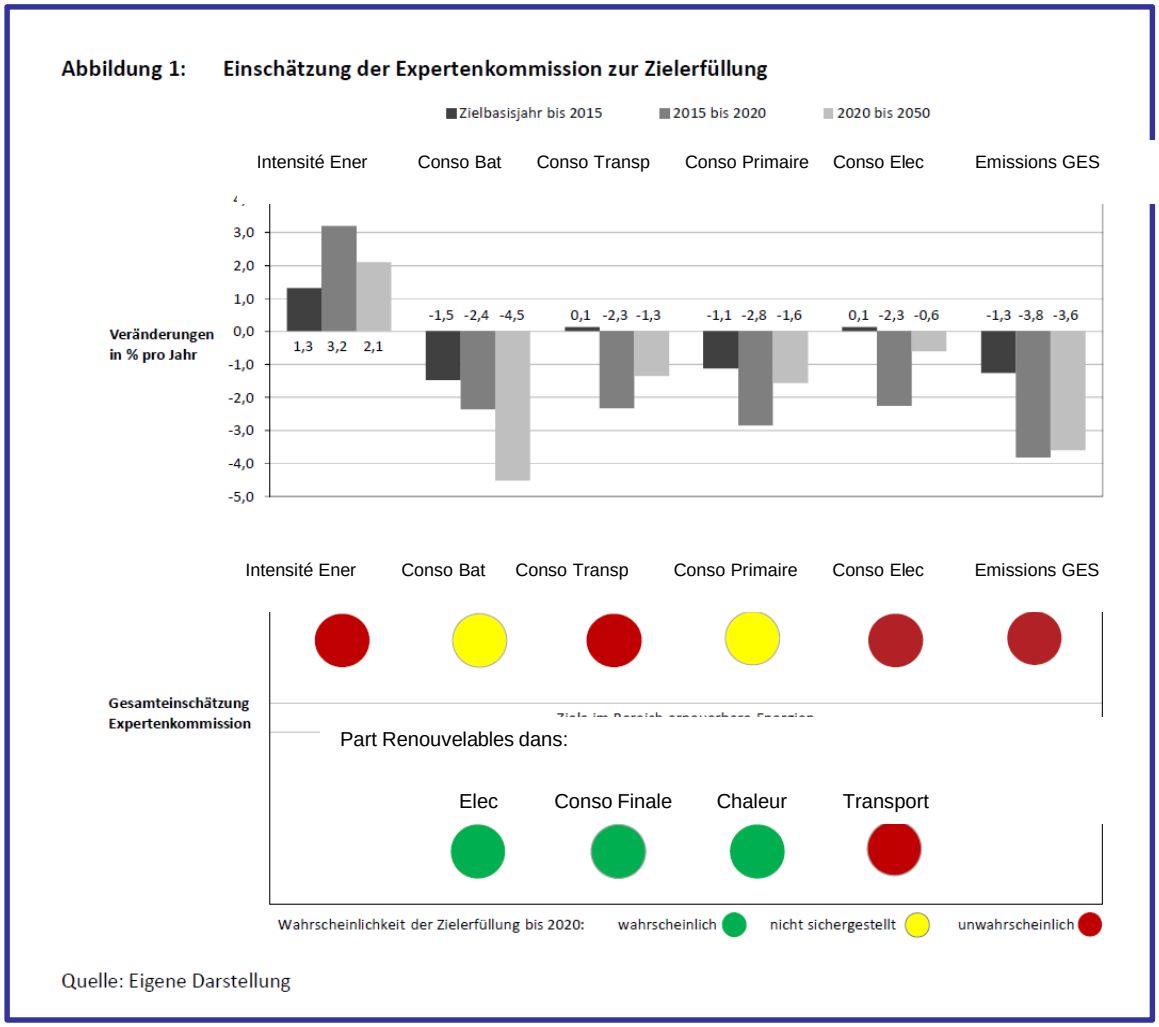
- **Objectifs atteignables** : éolien terrestre (hydroélectricité et biogaz de déchets)
- **En retard** : solaire photovoltaïque, bois énergie (électrique) et méthanisation
- **Très décalés** : éolien offshore, énergies marines et géothermie électrique

Monitoring PPE	Données		PPE	Indicateurs (R<0,33 O<0,67 V>0,67)		
Capacités installées, en MW	2005	2016	2023 Bas	*MW annuels 2005-2016*	*MW annuels 2016-2023B*	*I/J*
Eolien terrestre	752	11 670	21 800	*993*	*1 447*	*0,69*
Solaire PV	33	6 772	18 200	*613*	*1 633*	*0,38*
Hydoélectricité	25 108	25 482	25 800	*34*	*46*	*0,75*
Eolien en mer posé	0	0	3 000	*0*	*429*	
Energie marines	240	240	340	*0*	*14*	*0,00*
Géothermie électrique	0	***2***	53	*0*	*7*	*0,02*
Bois énergie électrique	0	***357***	790	*32*	*62*	*0,52*
Méthanisation	0	***85***	237	*8*	*22*	*0,36*
Déchets biogaz de décharge et épuration	0	***1 200***	1 500	*109*	*43*	*2,55*

ENERDATA: Bilan énergétique mondial - Edition 2017

German Expert Commission: the 5th report

- 2 images inversées:
  - En **France**, les résultats sur les émissions et la consommation sont plutôt satisfaisants, alors que ceux relatifs aux énergies renouvelables sont insuffisants
  - En **Allemagne**, les résultats sont au rouge ou à l'orange pour les indicateurs de consommation et d'émissions, alors qu'ils sont très satisfaisants pour les renouvelables…
- Ce constat témoigne des spécificités et des ambigüités de la transition dans chacun des deux pays



Source: Expertenkommission zum Monitoring "Energie der Zukunft" 2016

Dynamic Management of Transitions

- The dynamic management of transitions, in the *Pragmatic Enlighted Model,* supposes:

  1. Identification of LT goals and strategies, i.e. ex ante monitoring
  2. Identification of targets for strategic variables and of Policies & Measures, i.e. conventional policy making
  3. Measurement of the gap between observed strategic variables and chosen targets, i.e. ex post monitoring
  4. Realigning and redesigning of policies:
     i. “More of the same” P&M
     ii. New instruments or new P&M
     iii. Hybridation with alternative strategy
     iv. Full change to alternative strategy…

Conclusions

- INDCs have played a crucial role in the making of the Paris Agreement
- They correspond to a focus shift:
  - from hypothetical global solutions based on economic instruments, whether carbon tax or cap and trade
  - to the practical definition and implementation of national decarbonisation strategies and policies
- In the future one can expect:
  - a more precise, more ambitious and longer term definition of NDCs at the international level **(Deep Decarbonization Pathways)**
  - the declination of NDCs into sectoral targets and Policies and Measures, with adequate indicators and monitoring processes
- The question of economic efficiency and price instruments remains, but it is no more the starting point