


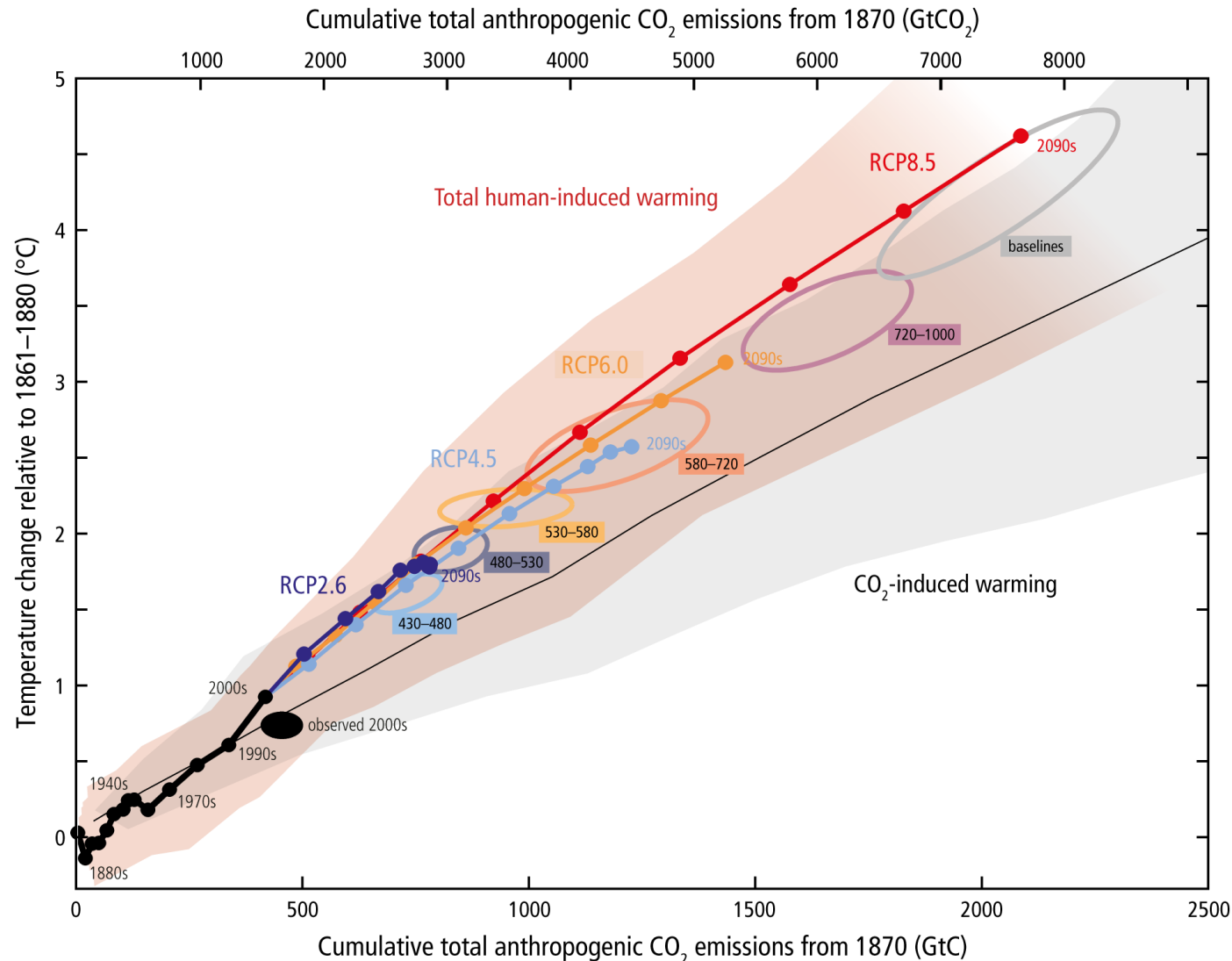
# **Fair and Equitable Distribution of the Global Carbon Budget**

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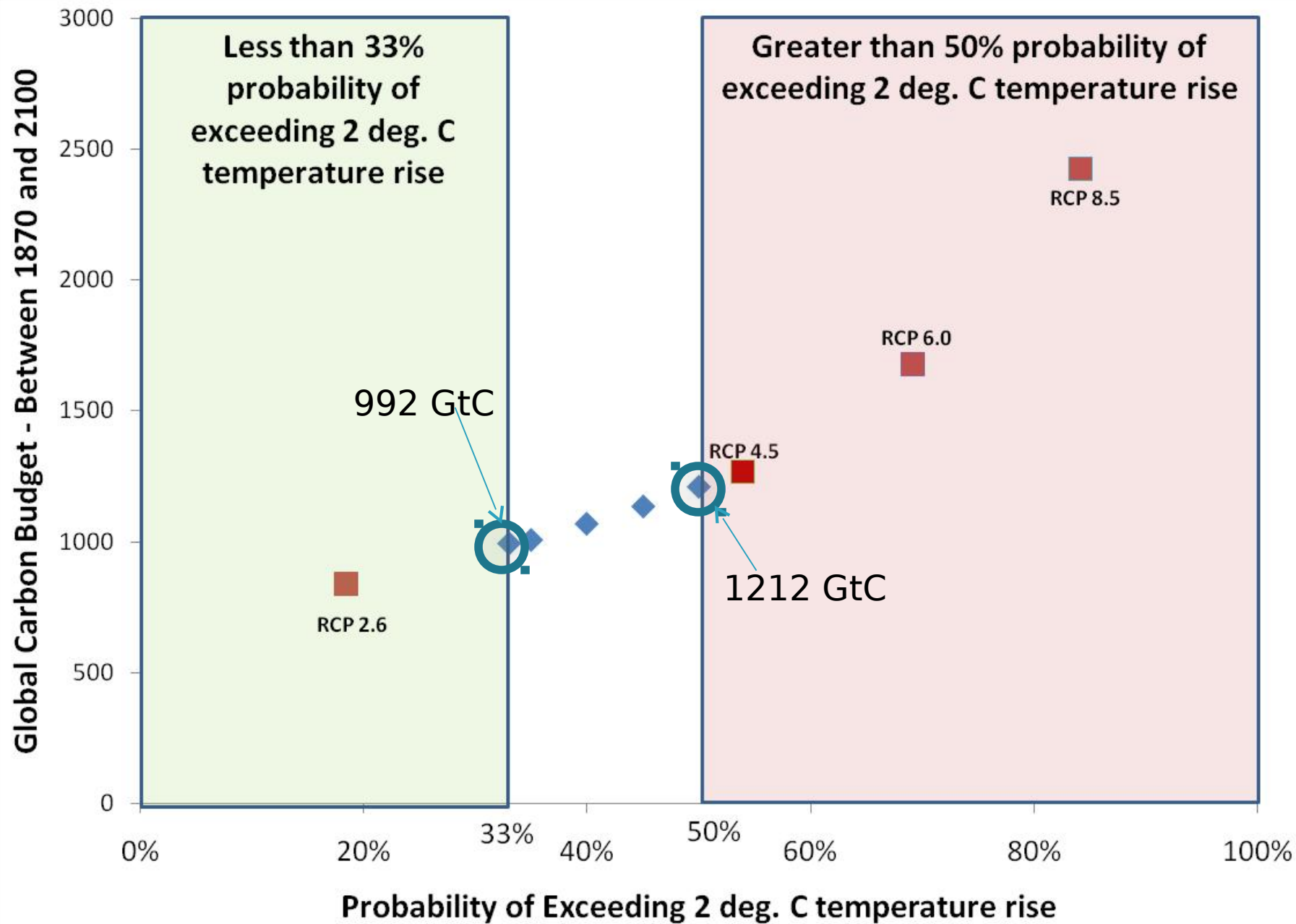
# Lessons from Climate Science

- Global temperature increase approximately proportional to cumulative emissions of greenhouse gases



# Probability of exceeding 2 deg C and the carbon budget

- ▶ For a greater probability of exceeding 2 deg. C – a greater '**Global Carbon Budget**' is available.
- ▶ Physical limit on emissions that is not determined by energy costs, carbon price or feasible low carbon pathways – Least economic and policy uncertainty
- ▶ What is the quantum of the budget?



# Range for the Carbon Budget

- ▶ 67% (high) to 50% (low) probability of limiting temperature rise to 2 deg. C
- ▶ 992 to 1212 GtC between 1870 and 2100
- ▶ 325 to 545 GtC between 2012 and 2100
  - 667GtC already emitted (including estimated 152 GtC of non - CO2 emissions)
- ▶ How is this to be divided among all parties?  
(Sharing the global commons)

# Entitlements – Benchmark for Equity

1870-2100 (%)	Simple Per Capita Entitlements	Per Capita Entitlements - weighted by GDP	Per Capita Entitlements - weighted by HDI
Developed Countries (Annex-I)	19%	17%	14%
Emerging Economies	52%	53%	54%
Least Developed Coountries	29%	30%	32%

Based on population figures for 2011



# Entitlements in GtC

1870 -2100 (GtC)	Simple Per Capita Entitlements	Per Capita Entitlements - weighted by GDP	Per Capita Entitlements - weighted by HDI
Developed Countries (Annex-I)	184 - 225	173 - 211	139 - 170
Emerging Economies	518 - 633	521 - 637	533 - 651
Least Developed Countries	290 - 355	298 - 364	320 - 391

# Annex-I Over-occupation

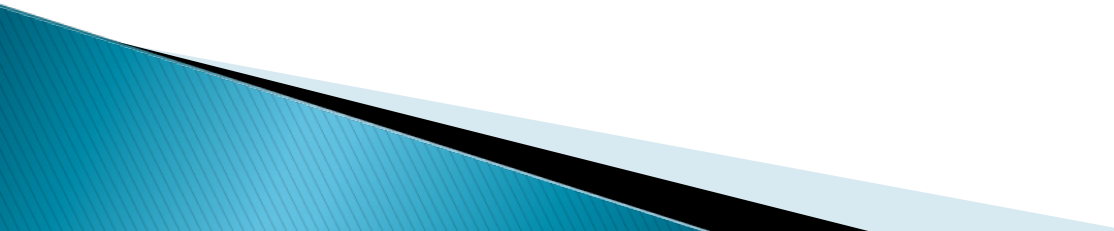
- ▶ Annex-I countries currently over-occupy carbon space

GtC	Simple Per Capita Entitlements	Per Capita Entitlements - weighted by GDP	Per Capita Entitlements - weighted by HDI
Entitlements	184 - 225	173 - 211	139 - 170
Actual Past Emissions	492		
Extent of Overdrawal of Carbon Space	267 - 308	281 - 319	322 - 353

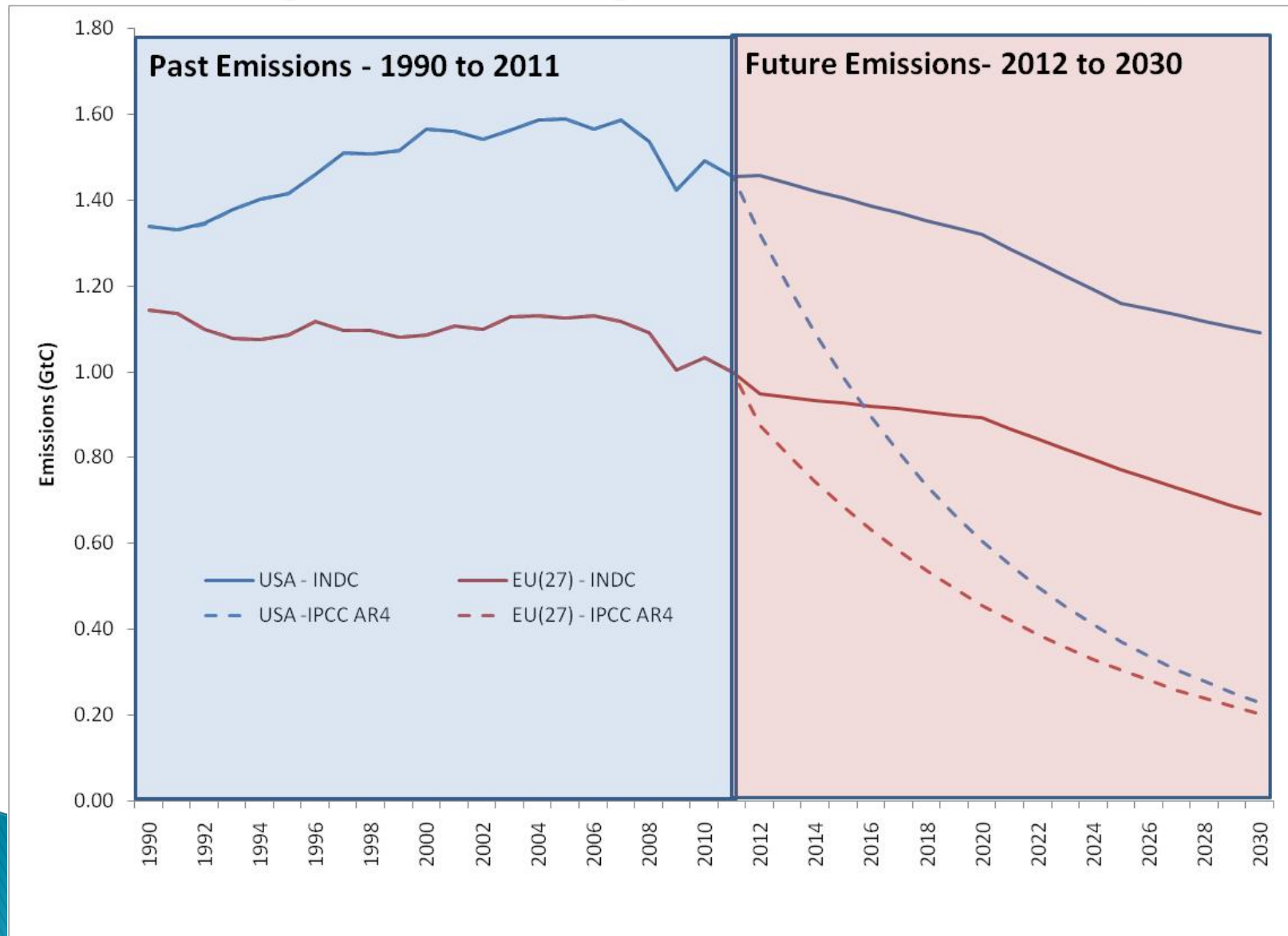
- ▶ This over-occupation cannot be undone in



# Differentiation and Carbon Space Occupation

- ▶ Annex – I and Non – Annex I differentiation clearly reflected in the over-occupation of carbon space, well beyond fair share.
  - ▶ Non-Annex I parties have not occupied beyond fair share – Few exceptions amounting to less than 20 GtC!!
  - ▶ Also reflects the variations in national situation within this binary division.
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# Existing INDCs grossly inadequate



# UNFCCC Synthesis Report on the aggregate effect of the INDCs

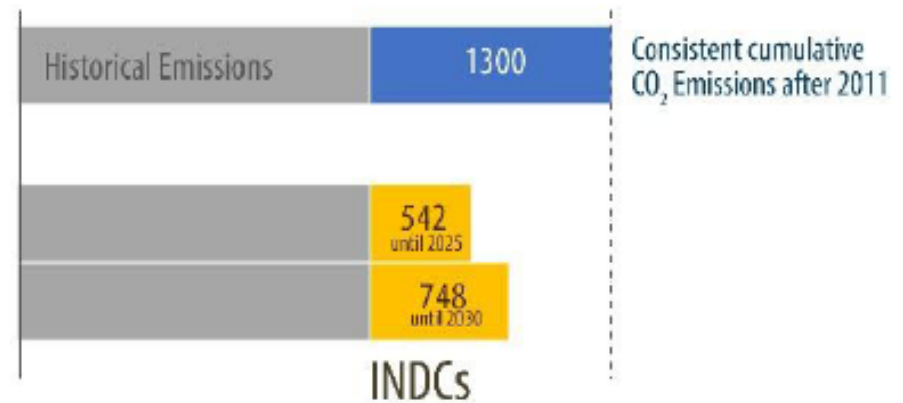
Figure 13

## Cumulative CO<sub>2</sub> emissions

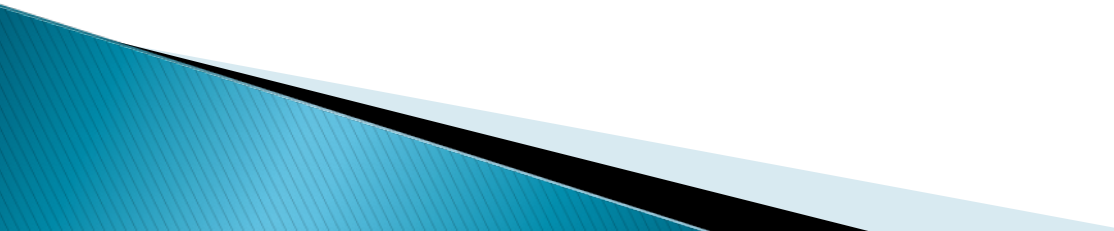
Staying below 2 °C with 66% probability



Staying below 2 °C with 50% probability



*Abbreviation:* INDC = intended nationally determined contribution.

- ▶ What is available for the future (in physical terms)
    - 325 to 545 GtC
  - ▶ Current INDCs – 204 GtC exhausted by 2030
    - UNFCCC Synthesis Report
  - ▶ Very little left for the future beyond 2030
  - ▶ Late developers will have no carbon space left!!
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# Claims on Carbon Budgets – 2012–2030

	Cumulative Emissions (GtC) 2012- 2030 Implied by INDCs	Remarks
USA	19	Cumulative Emissions till 2025 as implied by INDC as it extends only till 2025
EU (28)	16	
Russian Federation	7	
India	18	@ 7% GDP growth per annum
China	64	@ 8% GDP growth per annum

# Claims on Carbon Budget vs. Remaining Fair Share

	Cumulative Emissions 2012 and 2030 Implied by INDCs	Remaining Fair Share 2030-2100 (Total Budget 992 GtC - 67% pro)
USA	19	-165
EU (28)	16	-119
Russian Federation	7	-41
India	18	138
China	64	59

	Cumulative Emissions between 2012 and 2030 Implied by INDCs	Remaining Fair Share 2012-2100 (Total Budget of 992 GtC - 67% Prob)	What remains of share if only future emissions (2012-2100) are Divided on Per Capita Basis (Minus what is implied by INDCs) - 2030-2100
USA	19	-165	-4
EU (28)	16	-119	7
Russian Federation	7	-41	0
India	18	138	39
China	64	59	-1

# India's Fair Share – Illustrative


- ▶ Take the lower budget limit → 67% probability of limiting temperature rise to 2 deg. C →
  - ▶ → 992 GtC from 1870 -2100
  - ▶ → 325 GtC from 2012-2100
- ▶ India's fair share → Total entitlement (1870-2100) – past emissions (1870-2011)
  - ▶ → 157 GtC
- ▶ India's share if only available space is divided equally → 57 GtC



# India's Fair Share – for a range of budgets

Probability of temperature not exceeding 2 deg. C	Total Carbon Budget (1870-2100)	Carbon Space Available for the Future (2012-2100)	India's Fair Share (2012-2100) - Per Capita Entitlement (minus past emissions)	India's Share if Future Carbon Space is divided on a per capita basis (2012-2100)
82% - RCP2.6	839	172	130	30
<b>67%</b>	<b>992</b>	<b>325</b>	<b>157</b>	<b>57</b>
<b>50%</b>	<b>1212</b>	<b>545</b>	<b>170</b>	<b>96</b>
46% - RCP 4.5	1266	599	182	105

# Conclusions

- ▶ Global carbon budget and access to an equitable share of the global carbon budget is a rigorous, science-based approach to equity
  - ▶ It demonstrates that the differentiation of the Annexes is empirically and scientifically valid
  - ▶ Annex-I countries have grossly overoccupied carbon space
  - ▶ Available future carbon space not sufficient to satisfy equity concerns in physical terms.
  - ▶ Fair share of future carbon space must be accompanied by finance and technology transfer based on unaccessible carbon space.
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# 1870 and 1970 Basis Comparative

## Table

For a Total  
Budget of 992  
GtC - 67%  
Probability of  
Limiting  
temperature rise  
to 2 deg. C

Per Capita  
Entitlement  
s (%)  
Based on  
2010  
Population

Past Emissions  
(%) of total past  
emissions

Future Share of  
Entitlement  
Remaining - 2012-  
2100 (GtC)

Future Share of  
Entitlement Remaining  
after accounting for  
INDCs - 2031-2100  
(GtC)

		1870- 2011	1970- 2011	1870 Basis	1970 Basis	1870 Basis	1970 Basis
USA	5%	29%	24%	-147	-60	-165	-78
EU (28)	7%	26%	21%	-103	-28	-119	-44
Russian Federation	2%	8%	9%	-34	-20	-41	-26
India	18%	3%	3%	156	112	138	94
China	20%	11%	13%	123	87	59	23

	Entitlements	Past Emissions (1870-2011)	Past Emissions (1970-2100)	Remaining Share of Entitlements for period 2012-2100 after accounting for past Emissions (GtC) - 1870 Basis	Remaining Share of Entitlements for period 2012-2100 after accounting for past Emissions (GtC) - 1970 Basis
USA	5%	29%	24%	-147	-60
EU(28)	7%	26%	21%	-103	-28
Russian Federation	2%	8%	9%	-34	-20
Japan	2%	4%	5%	-9	-6
Australia	0%	1%	1%	-5	-3
Canada	0%	2%	2%	-10	-5
Other Annex-I	2%	4%	3%	-2	4
China	20%	11%	13%	123	87
India	18%	3%	3%	156	112
Brazil	3%	1%	1%	22	16
South Africa	1%	1%	1%	-1	0
Indonesia	3%	1%	1%	29	21
Mexico	2%	1%	1%	9	6
South Korea	1%	1%	1%	0	0
Other Emerging Economies	6%	4%	6%	31	19
Rest of World	1%	1%	1%	1	1