

Inclusive Green Growth in India's Aspirational Democracy

Kirit S. Parikh

Chairman

**Integrated Research and Action for
Development (IRADe) New Delhi**

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India's Growth Imperative

Many poor with low levels of well being indicators

Well-being Indicator	India	Very HDI Countries
HDI	0.554	0.905
LEB	65.8	80.1
IMR	48	5
Mean years of schooling ^a	5.48	11.5
Access to water	90.5	100
Improved sanitation	47.2	100
Clean cooking fuels - Rural	11.9	100
Clean cooking fuels - Urban	65.5	100
Durable hous - urban	68	100
Access to electricity - Rural	55.3	100
Access to electricity - Urban	92.7	100
Poverty headcount ratio ^b	29.8	0

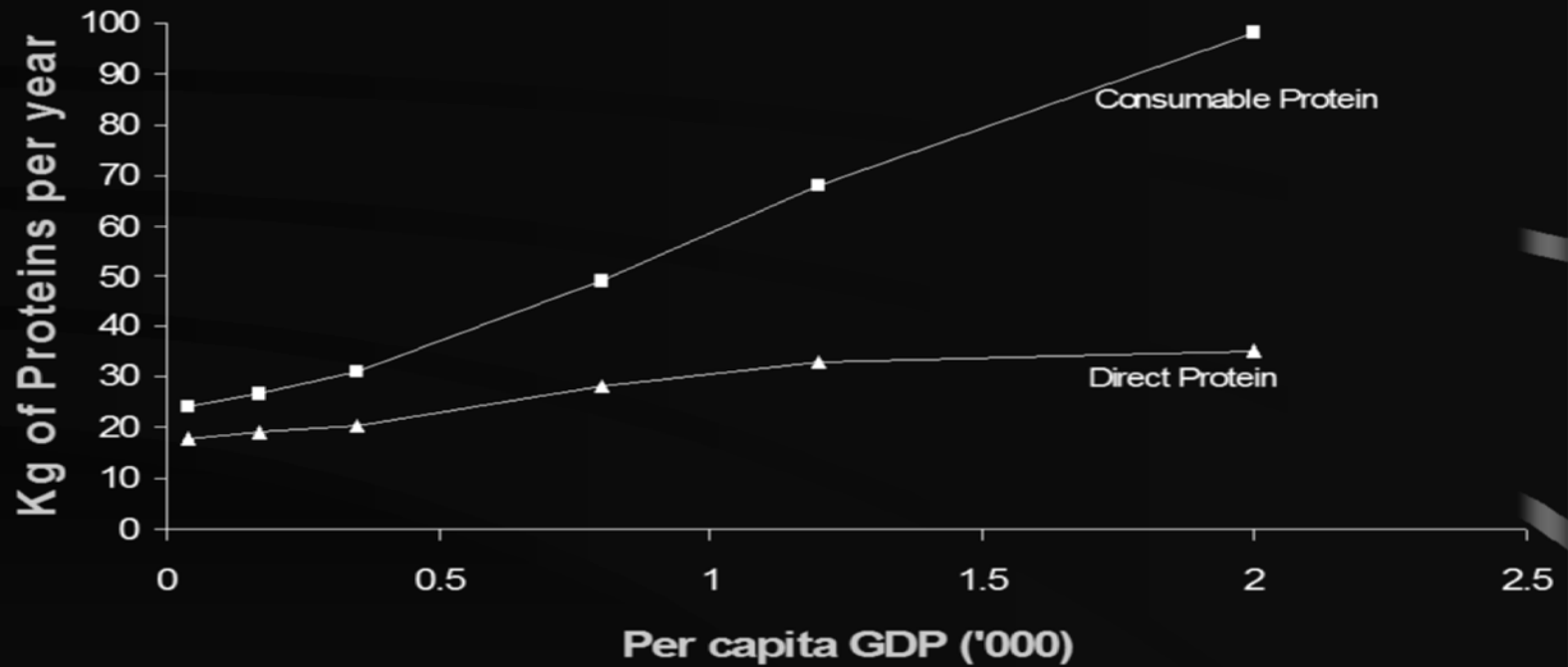
Green Growth Needed

- Rising Population
- Rising Income
- Resource scarcity – Energy Imports rising
- Stress Environment
 - Air pollution does not meet WHO std
 - Water in many rivers not fit to bathe let alone drink
 - Land degradation

Is Consumption Growth Needed for Well Being?

- Most religions say no
- Contentment is the thing
- Consumption desire is insatiable
- Even the demand for food keeps growing even though stomach capacity is limited.

Protein Intakes (Direct and Indirect) and Per capita GDP



Industrial Revolution

- Industrial Society has made abundant mass consumption possible
- It is not just American dream, I believe it is also the Indian dream, the Chinese dream and the African dream.

Can Environment Bear This?

Is there a conflict between sustainable development and the growing aspirations?

Green Growth Promises All

- No need to limit wants
- Technology will take care of all problems
- New Industrial Revolution and ICT has created opportunities for small start ups.
- It will unleash the creativity of millions who now can enter market and create new ones.

But Will It? What are the challenges?

Can India Make a Transition to Green Growth?

- India's 12th Plan Emphasizes Faster and More Inclusive Sustainable Growth
- Targets set for
 - Growth, Employment and Poverty
 - Education and Health
 - Rural Infrastructure
 - Access to Electricity, Clean Fuels, Water, Sanitation
 - Banking service to 90 %
 - Environmental sustainability

12th Plan Environmental Targets

- Increase green cover by 5 million hectares
- Add 30,000 MW of renewable energy capacity
- Reduce emission intensity by 20 to 25 per cent over 2005 levels by 2020.

Low Carbon Strategy for Inclusive Growth

- Energy efficiency
- Lighting, Labeling of Appliances
- Buildings ECBC
- Industrial targets – Perform, Achieve and Trade (PAT scheme)
- Freight shift to Railways
- Vehicle Fleet Fuel Efficiency Norms
- Mass Transport
- Green India Mission
- Renewable power

Emissions in 2020 with 8 % growth rate as per 2005 intensity and Reductions in MT CO₂ and per cent

Sectors	Emissions as per 2005 norm	Determined effort MT CO₂	Percent	Aggressive effort MT CO₂	Percent
Power	1609				
DSM		96	6	201	13
Supply side		85	5	145	9
Transport	476				
Freight modal shift		14	3	22	5
Passenger modal shift		17	4	24	5
Vehicle fuel efficiency		11	2	17	4

Table Continued on the next slide....

Industry	Emissions as per 2005 norm	Determined effort MT CO₂	Percent	Aggressive effort MT CO₂	Percent
Iron & Steel	442	36	8	82	19
Cement	393.5	57.5	15	100	25
Oil & Gas	154	29	19	39	25
Other Industries	285	40	14	100	35
Buildings					
Commercial	610	60	10	122	20
Other Household Energy	270	15	6	41	15
Waste Management	150	15	10	32	21
Miscellaneous	155	16	10	33	21

Projected Emission Intensity Reduction over 2005 levels

Growth Scenarios:2020		8% growth		9% growth	
Higher and Lower Ends of the Range	2005 Emissions	DE	AE	DE	AE
Emission Intensity (grams CO ₂ eq/Rs GDP)	56.21	42.47	36.87	42.79	37.51
(%) Reduction in Emission Intensity		24.44%	34.40%	23.88%	33.27%

- Emission intensity reduction of around 24.44 % with determined effort and 34.4 % with aggressive effort compared to 2005.
- Emission intensity reduction of around 23.88 % with determined effort and 33.27 % with aggressive effort compared to 2005.

Long Term Projections

- Limiting Emissions is Different from Reducing Intensity
- What would be the implications?
- Use a Multi-sectoral, inter-temporal bottom-up top-down optimizing model developed at IRADe
 - 29 commodities, 41 activities, 20 consumer expenditure classes with LES for each, endogenous Consumption distribution
 - Covers 2005 to 2050, maximizes PDV of consumption

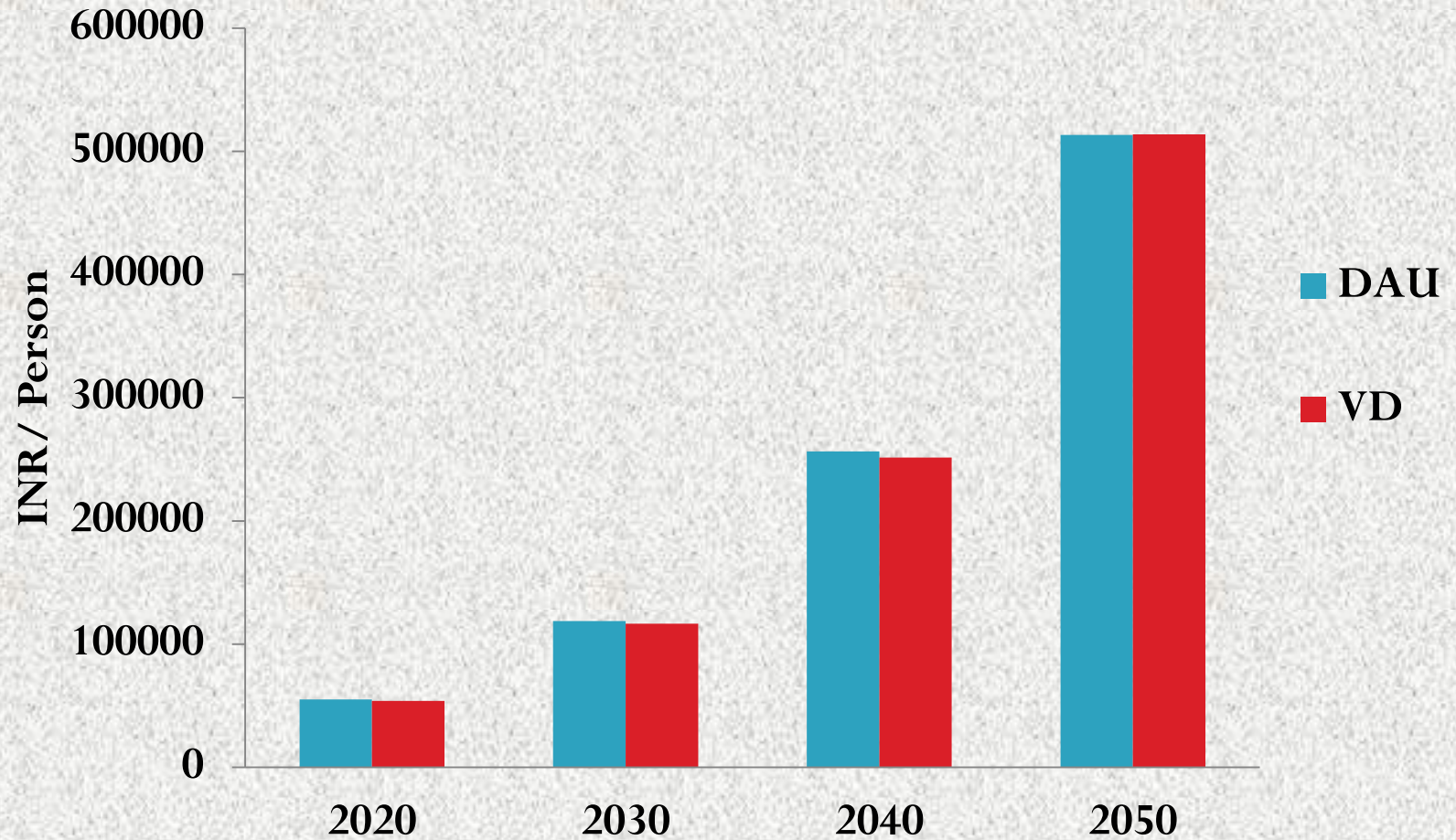
Accelerated Visionary Development (VD)

- Clean drinking water and sanitation
- **Better health services and education**
- Level of education
- **Access to electricity**
- Access to clean cooking fuel
- **Housing for all**
- Cash transfer to the poor

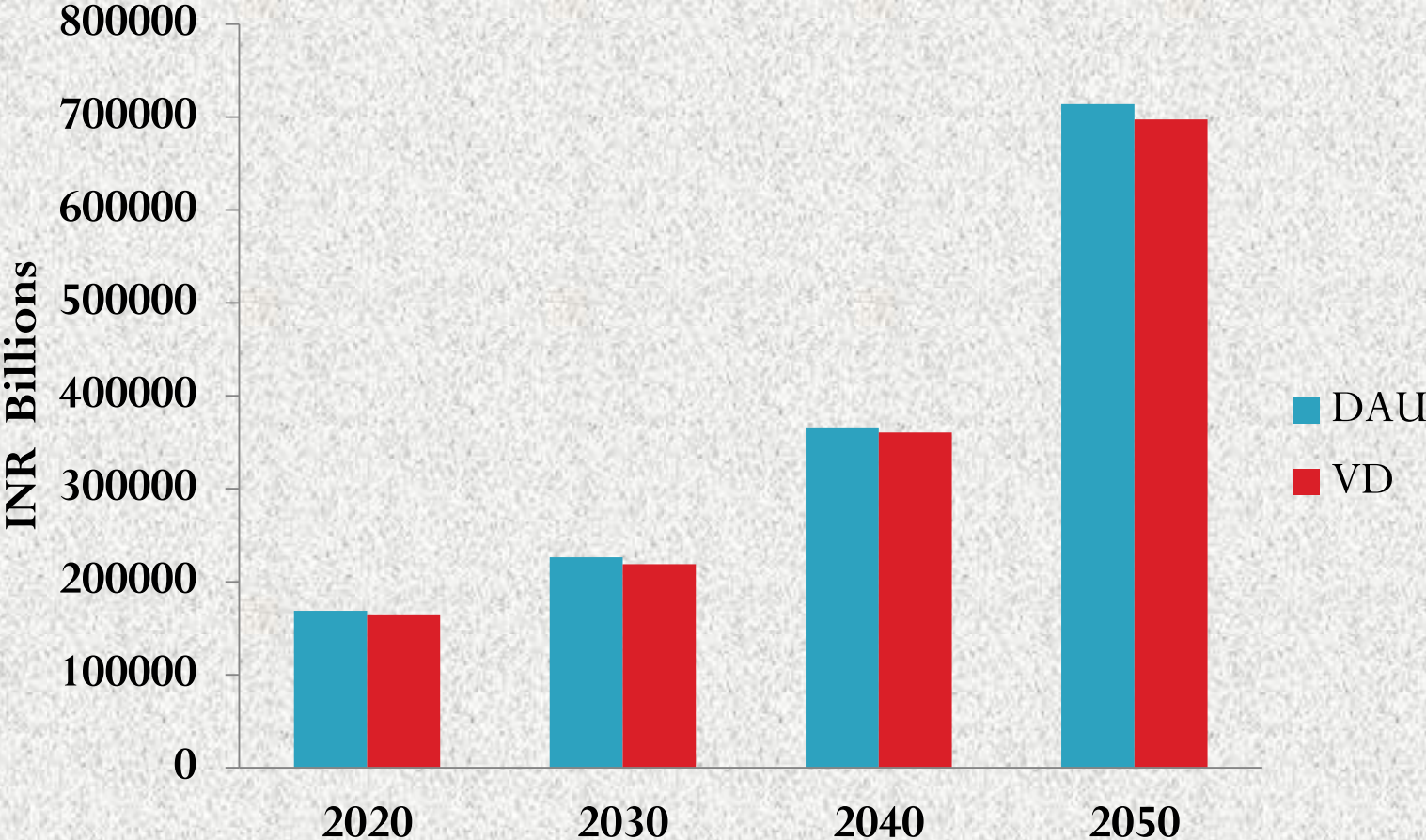
Welfare Indicators in VD

Indicator	2020	2030	2040	2050
LEB (Female) – years	73	78	80	80
LEB (Male) - years	70	74	76	76
IMR per 1000 live births	25	7	2	2
Mean years of Schooling	6.27	8.68	10.7	12.1
Millions poor - Rural	25	4	0	0
Millions poor - Urban	1	0	0	0

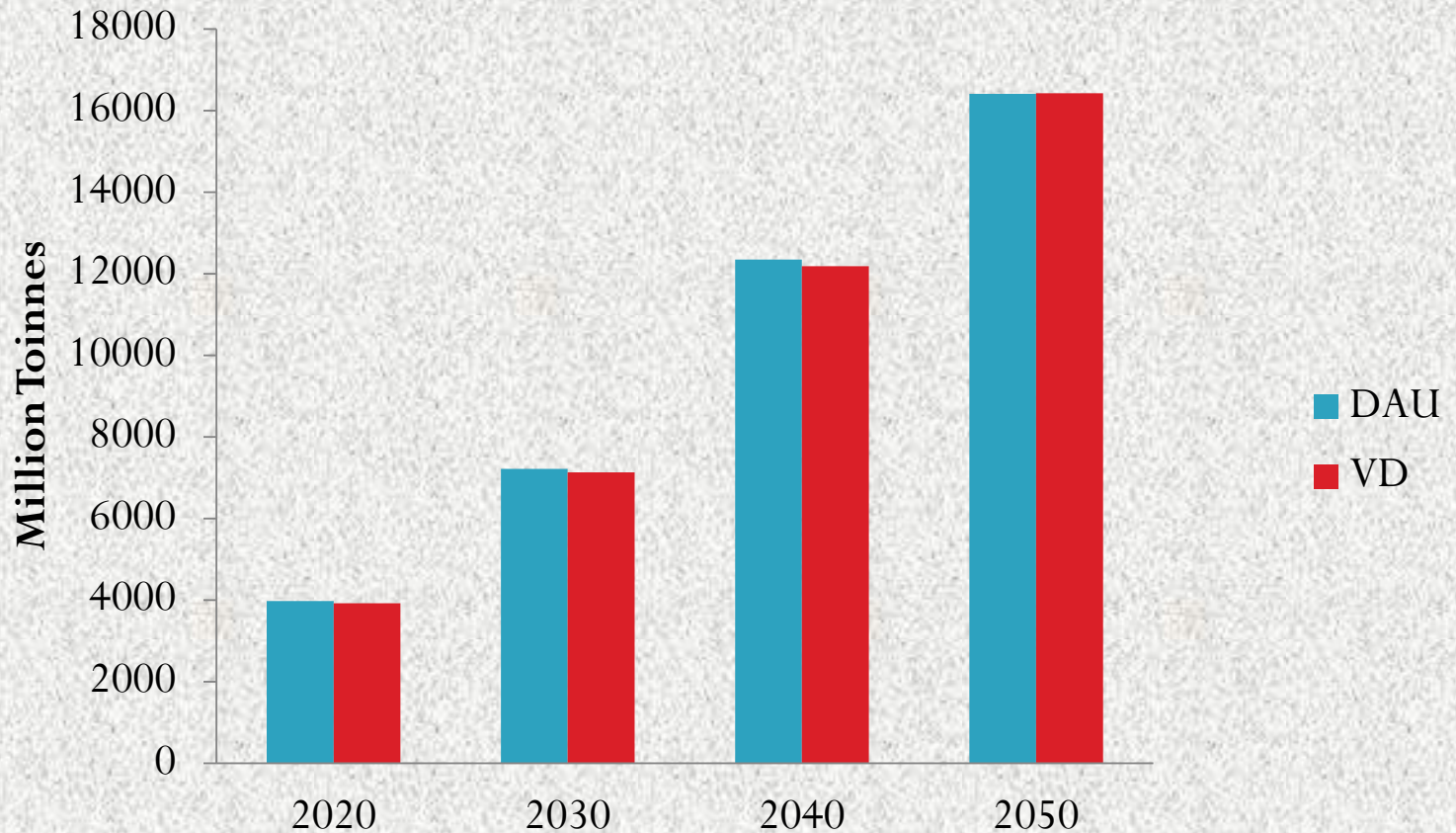
Per Capita Consumption Expenditure in DAU and VD (2003-04 prices)



GDP in DAU and VD (2003-04 Prices)



CO2 Emissions Per Year

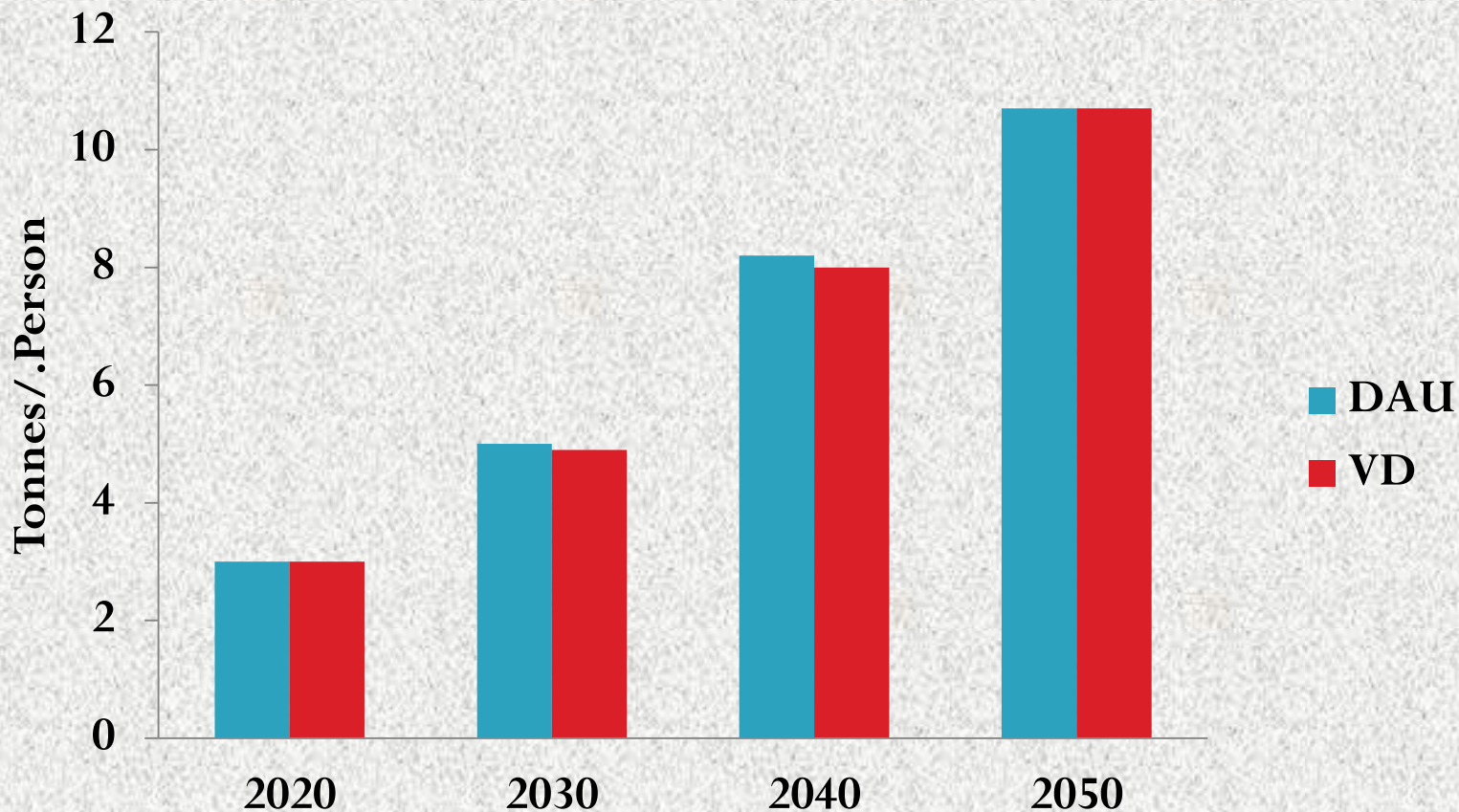


VD is Attainable

- With Little cost
- Effectively implemented policies
- We had assumed 100% targeting effectiveness for cash transfer
- No particular efficiency improvement assumed in other welfare schemes

However, the CO₂ emissions are high, What if we were to limit carbon emissions?

Per Capita CO2 Emissions



LCIG Path with Carbon Budget

- Global carbon space allocated on a per capita basis on base year population.
- 1990 to 2050 will give India a share of cumulative emissions of **156 GT over 2010 to 2050 (LC1)**
- 2010 to 2050 will give India a share of cumulative emissions of **133 GT over 2010 to 2050 (LC2)**
- **This is not strictly equitable. Equity would require allocating GT-years of space**

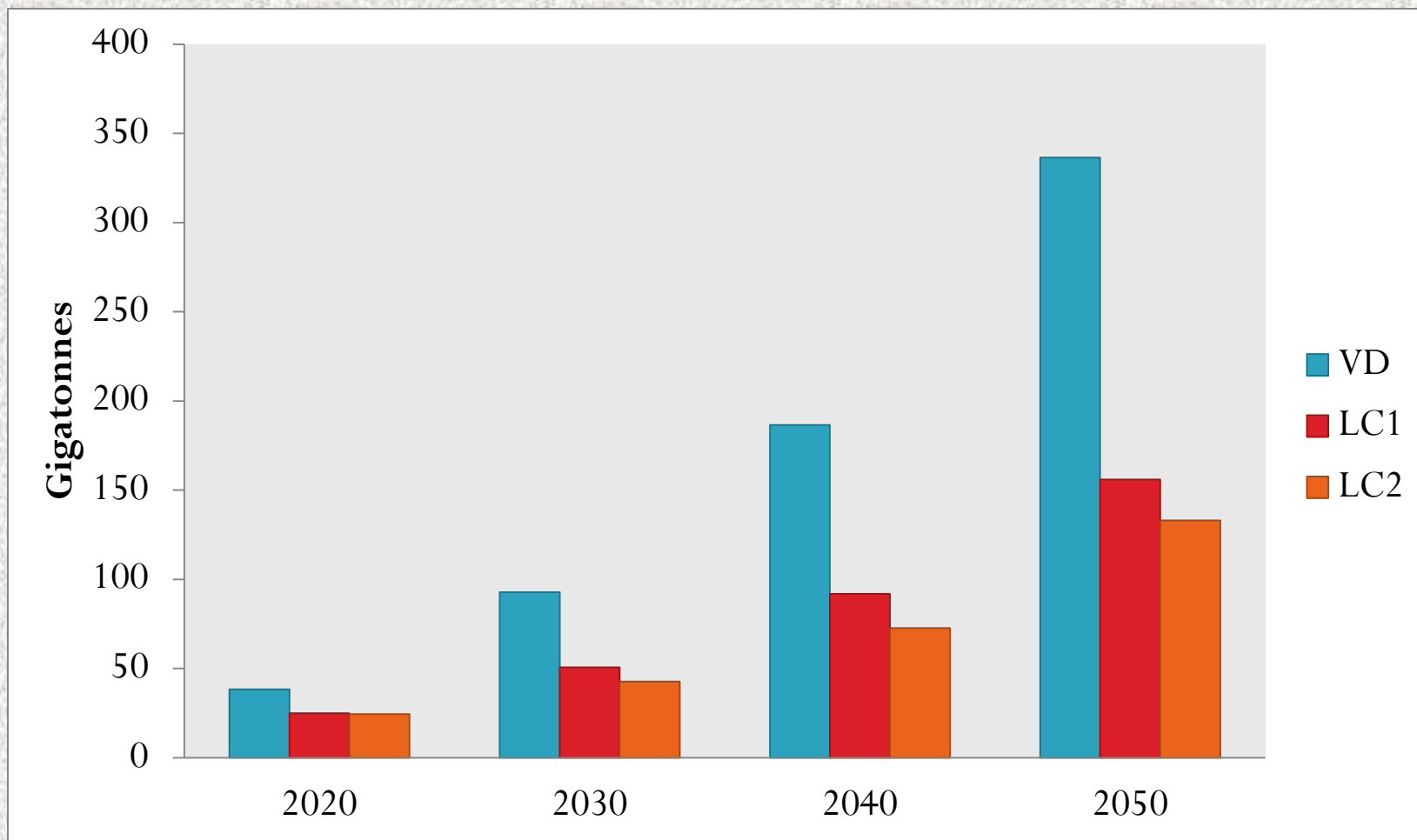
Low Carbon Policies

- **AEEI rate increased**
- **New Renewable technologies, Ultra super critical coal**
- **TFPG at trend rate but higher for solar & wind**
- **Nuclear restricted to 11000 MW**
- **Minimum penetration rate of renewables**
- **Rail share in freight increased to 67% from 35%**
- **Double Fuel Efficiency of Motorized vehicles**
- **Mass transport and walking, cycling reduces private fuel demand**

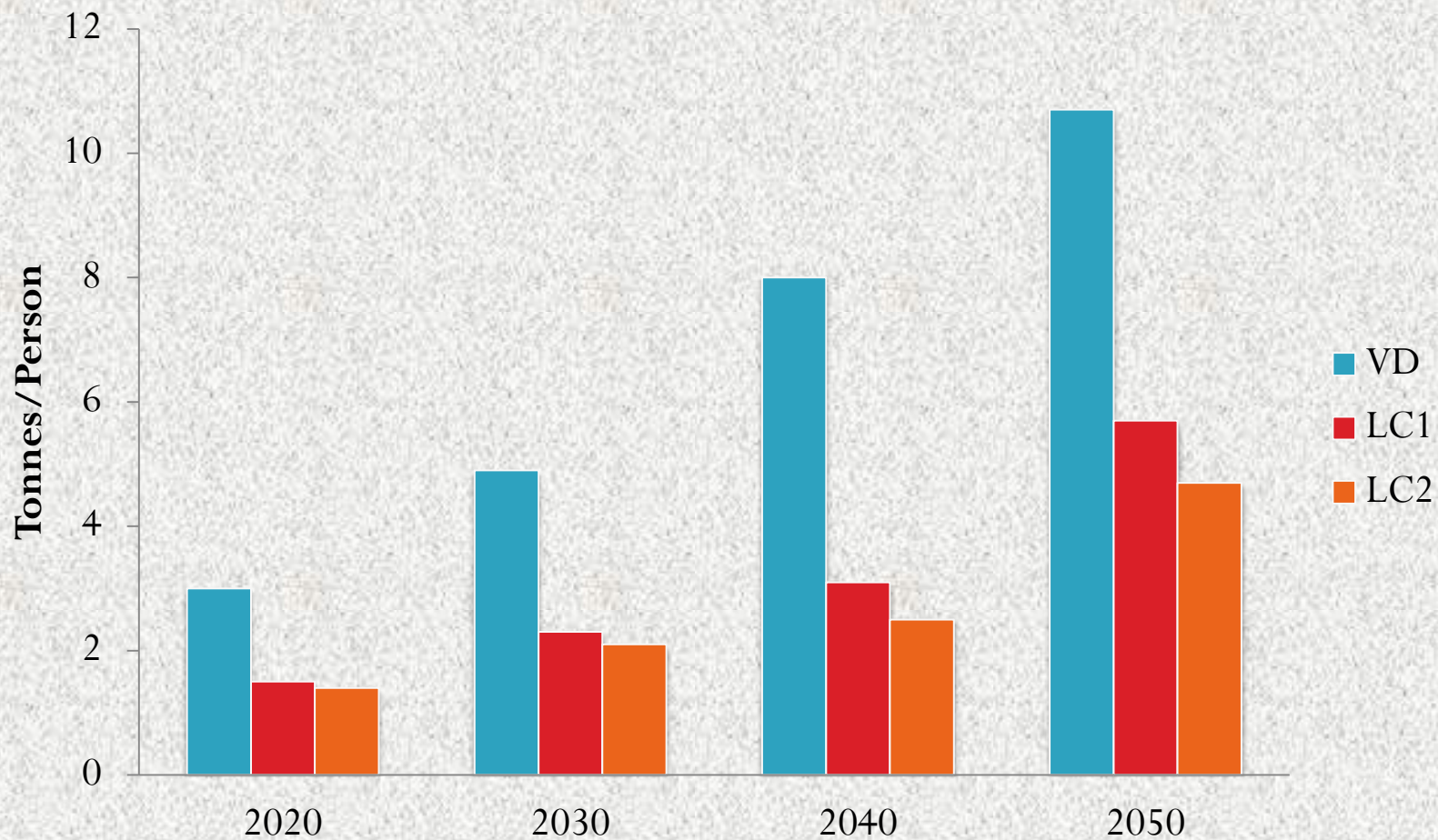
Low Carbon Policies (contd)

- **Alternative transport fuel – gas and electricity-
reduce petro prod demand by 2% per year**
- **Higher energy efficiency of commercial building**
- **Increase green cover faster to increase sequestration**
- **Energy efficient appliances**

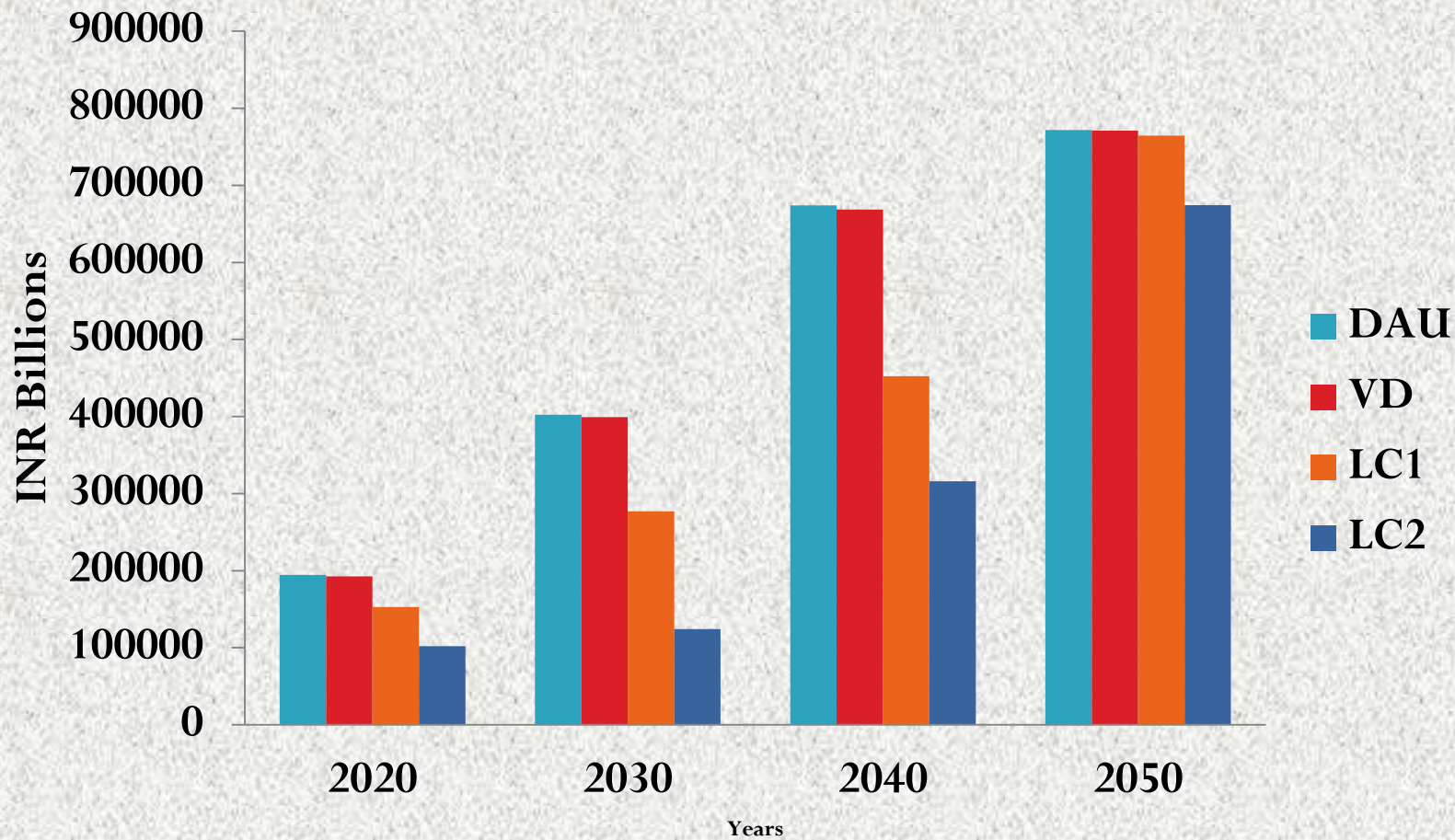
Cumulative Carbon Emissions



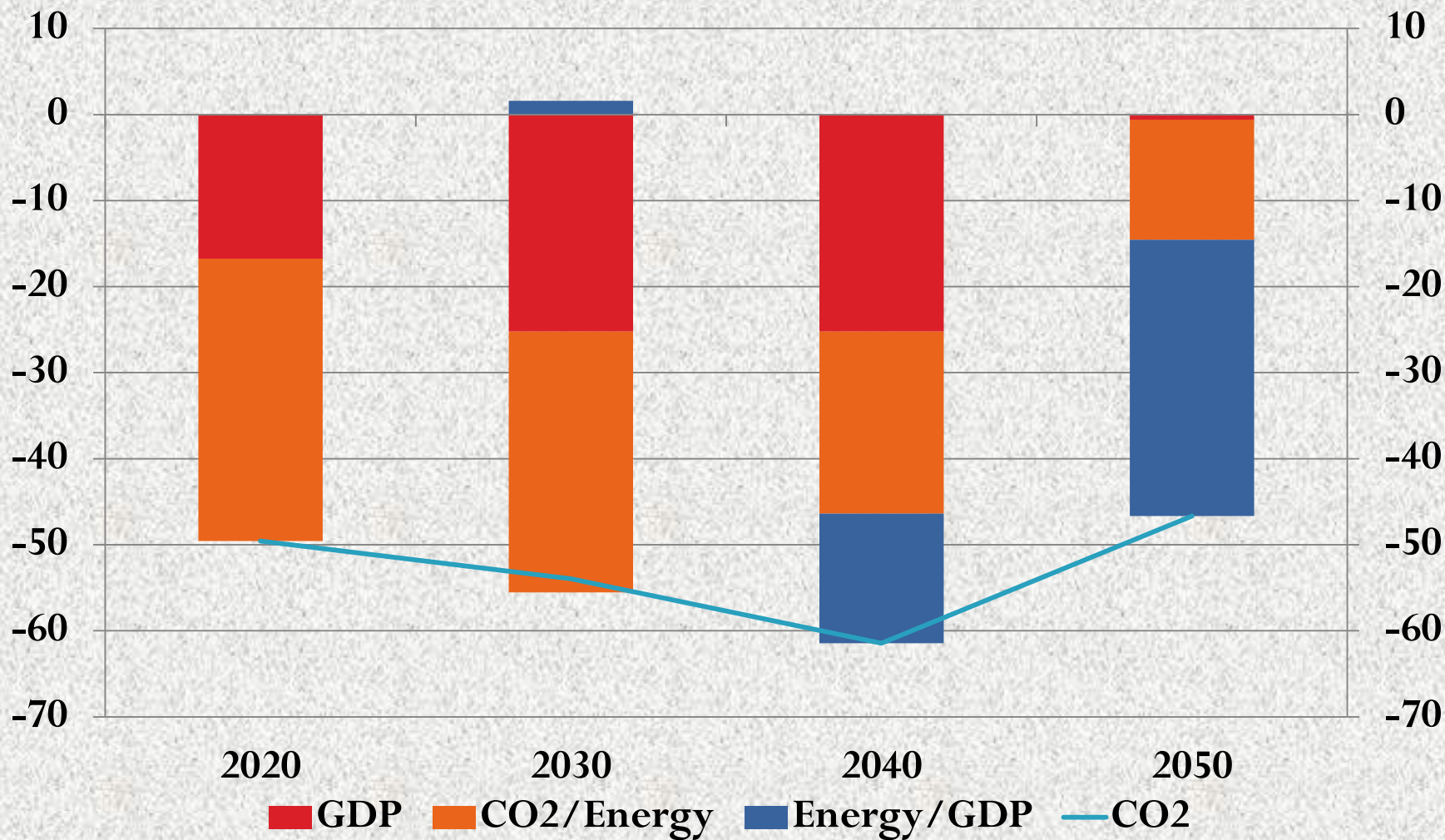
Per capita Emissions of CO2



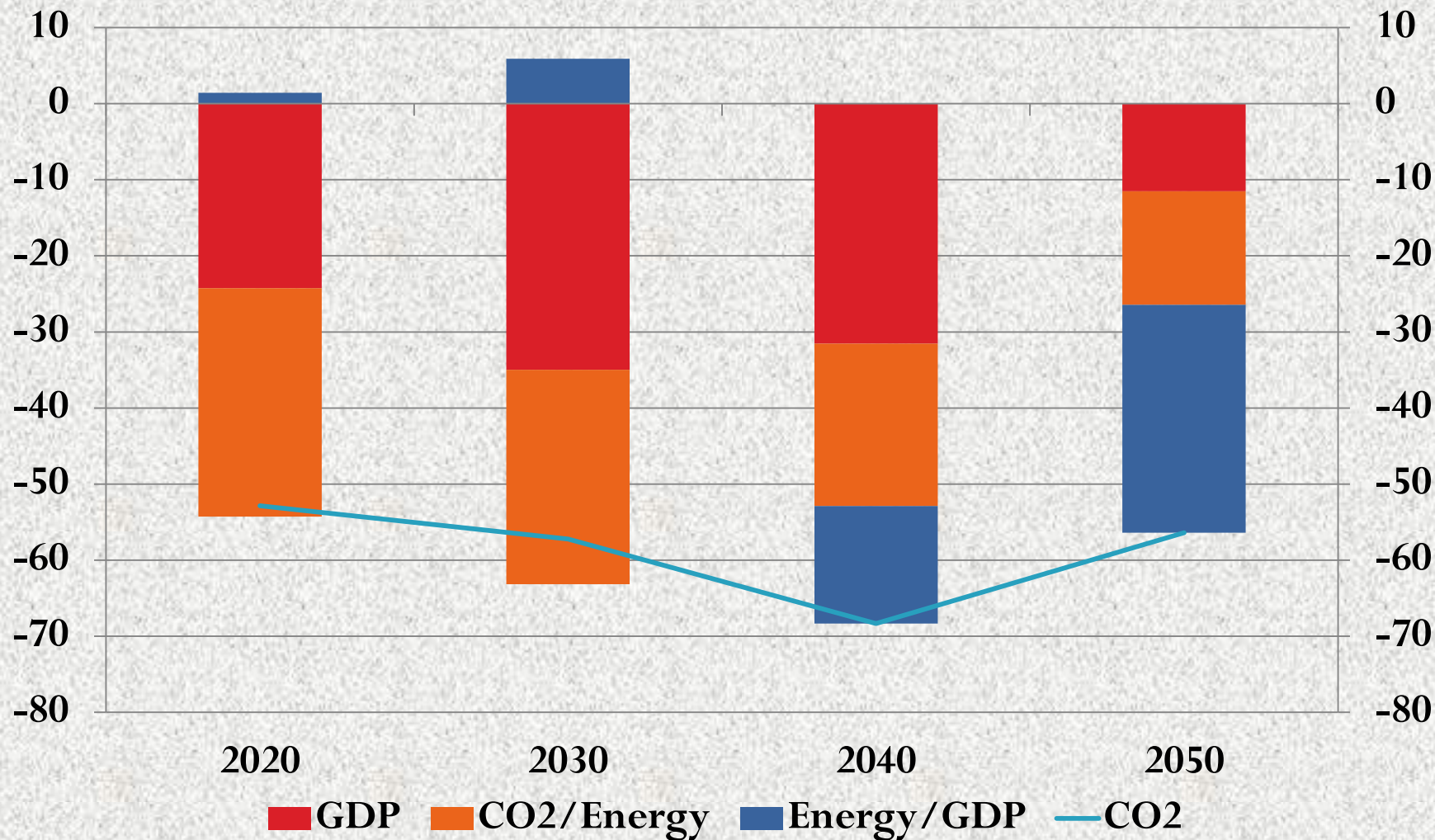
GDP in DAU, VD, LC1 and LC2



Decomposition of CO2 Reduction In LC1 Compared With VD



Decomposition of CO2 Reduction In LC2 Compared With VD



Emission Reduction Compared to VD: Per cent Contribution

	LC1-VD			
Year	CO ₂	GDP	CO ₂ /Energy	Energy/GDP
2010	-19.3	7.23	-18.9	-7.64
2020	-49.6	-16.74	-32.81	0
2030	-54	-25.24	-30.31	1.59
2040	-61.5	-25.21	-21.17	-15.07
2050	-46.7	-0.61	-13.93	-32.12

Emission Reduction Compared to VD: Per cent Contribution

	LC2-VD			
Year	CO ₂	GDP	CO ₂ /Energy	Energy/GDP
2010	-21.4	6.9	-20.7	-7.6
2020	-52.9	-24.3	-30	1.4
2030	-57.2	-35	-28.2	5.9
2040	-68.3	-31.5	-21.3	-15.5
2050	-56.4	-11.5	-14.9	-30

Conclusion

- Possible to live within a carbon Budget
- At high cost
- PDV of GDP difference ranges from US\$8000 to US\$ 10000 billions over 2010 to 2050
- CO₂/energy is limited as CCS not introduced
- Also nuclear restricted
- Need to make renewables more cost efficient
- Technology should be made globally available

Green Growth Beyond Climate Change

- Not just energy, other material inputs have to be renewable
- Buildings and furniture
- Personal motorized vehicles
- Personalized mass transport system
- Metals replaced by carbon fibre organic renewable materials
- Second generation ethanol can provide carbon fibre too
- IPR that rewards innovation without monopoly profit
- Reduce wants at least of material goods. “Spiritual India “is not yet ready for it.

Thank You