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Global Methane Forum 2024

18-21 March 2024

Status and opportunities for measurement, reporting, verification of fugitive emissions from coal mining activities in India



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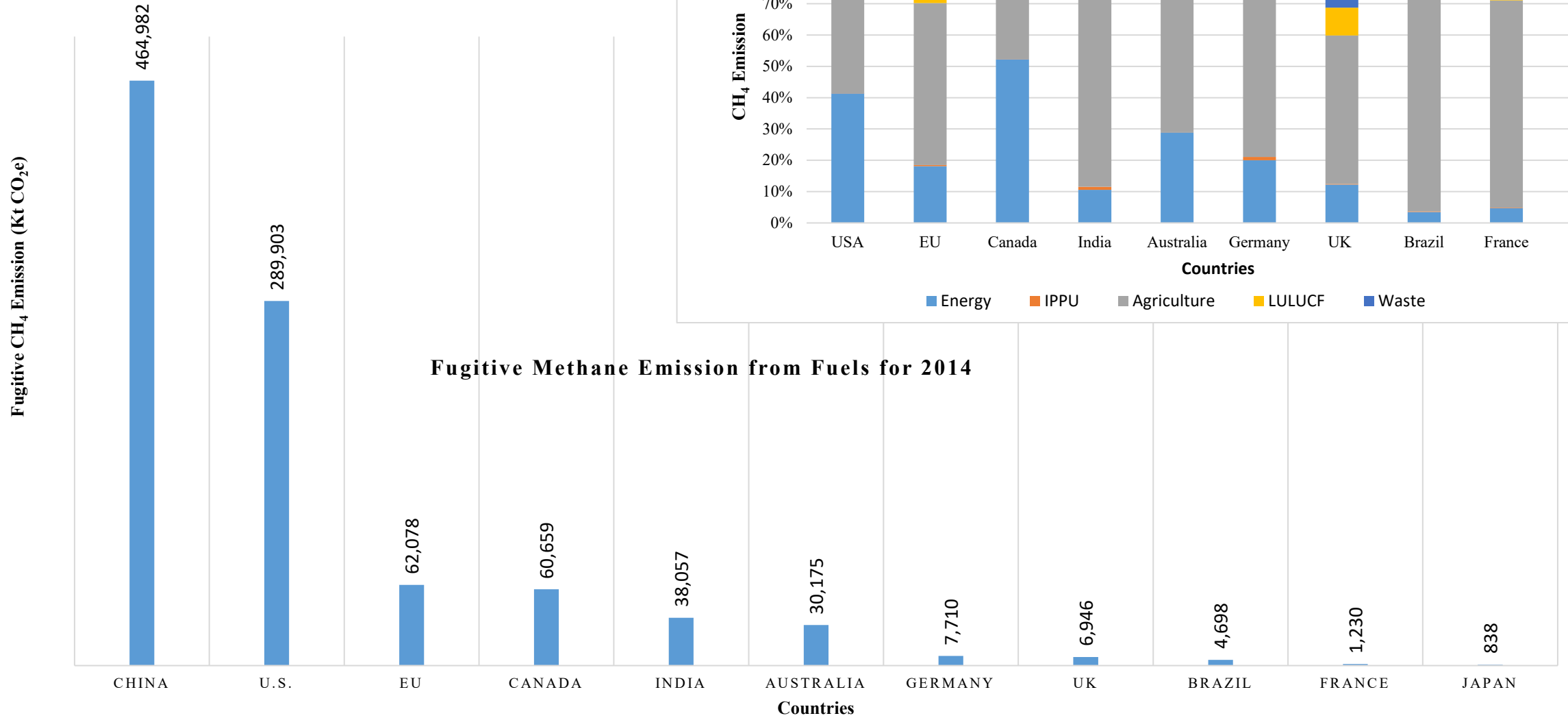
Coal Joint Technical Session

18 March 2024

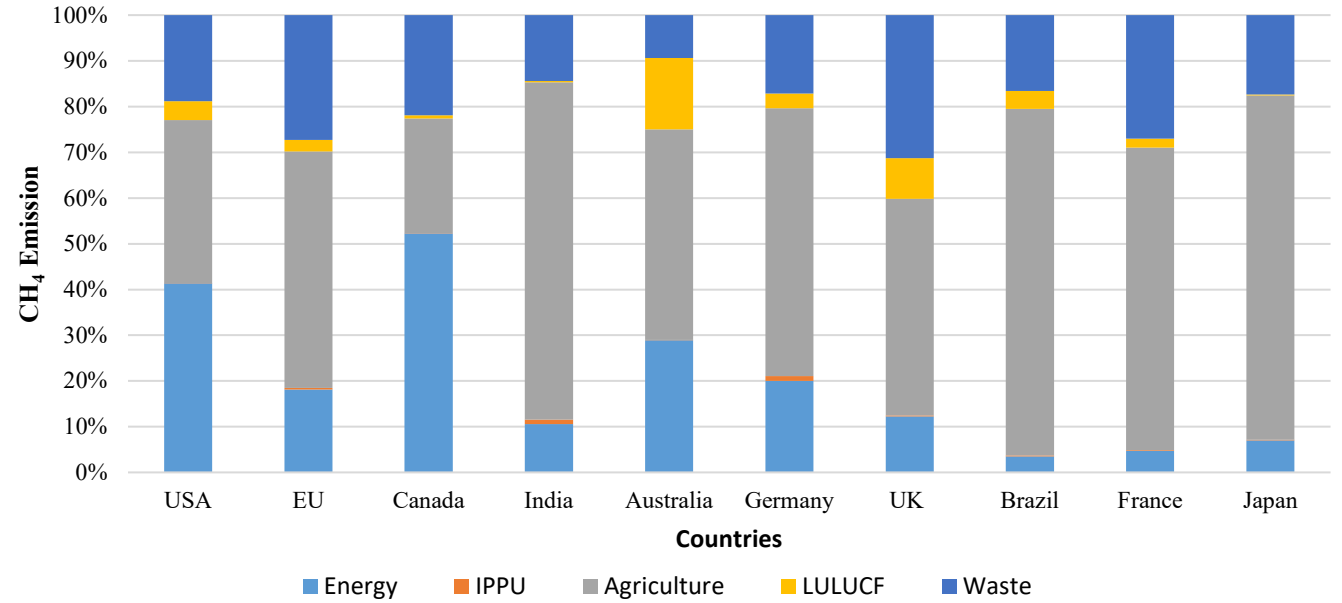


FUGITIVE EMISSIONS

are intentional or unintentional release of greenhouse gases



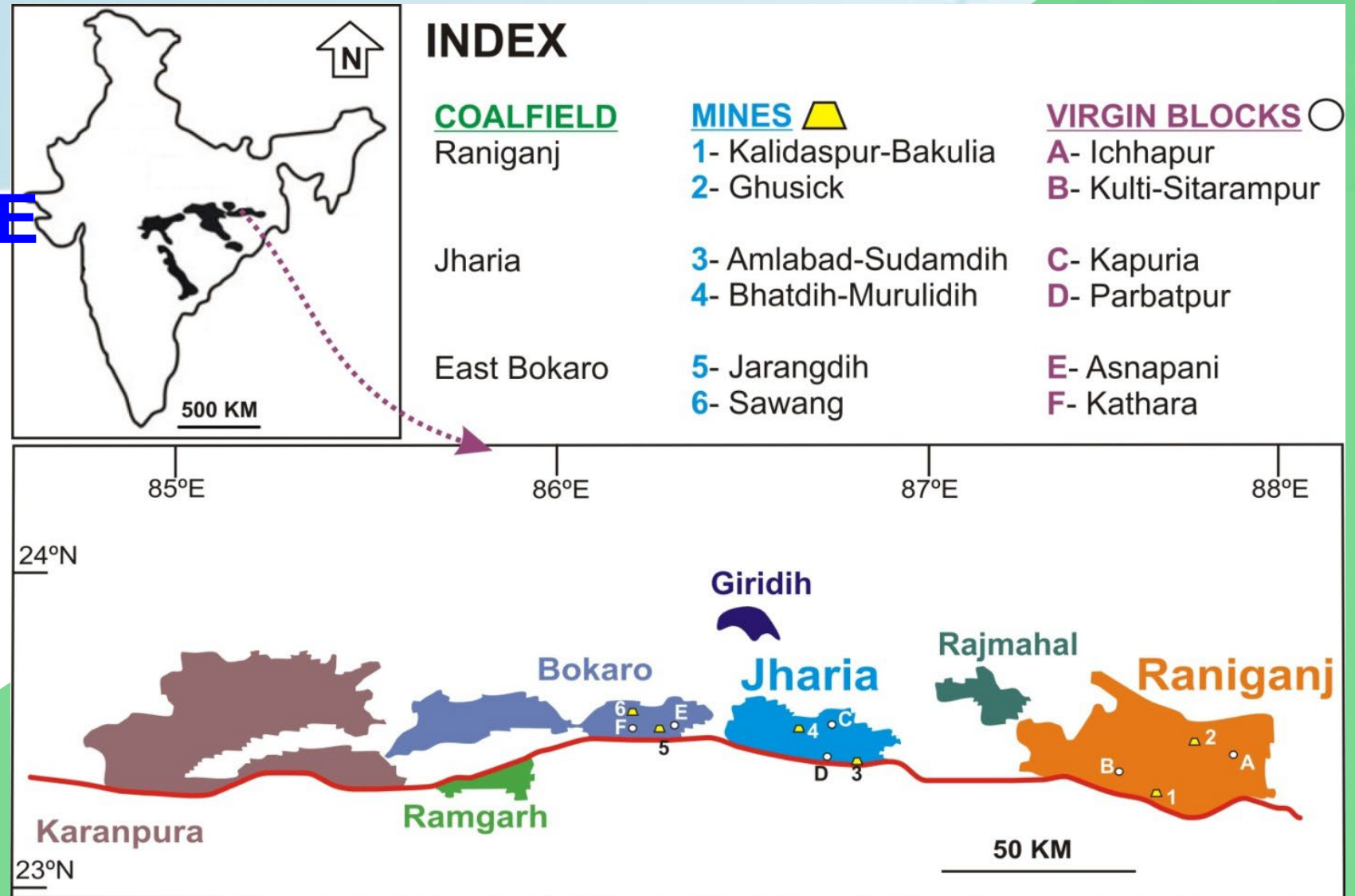
Comparison of CH₄ Emission on % basis with Countries and India from Sectors for 2016



Country	INDIA		US			AUSTRALIA	CHINA
Basin	Jharia	Raniganj	San Juan	Powder	Raton	Surat & Bowen	Ordos & Qinshui
Coal type	High volatile bituminous	high to medium volatile bituminous	Sub-bituminous	Medium-low volatile bituminous	High-medium volatile Bituminous	Low volatile bituminous & Anthracite	Lignite to anthracite
VM _{daf}	23.48-30.33	18.9		26-33	20.73-31.68	42.6-67.8	9.82-55.00
FC _{daf}	69.66 -76.51	81.1		30-41	46.68-69.43	20.2-61.7	45.0-92.0
R ₀ (%)	1.23 -2.03	1.00-1.44	0.65-1.45	0.31-0.66	0.77-1.05	0.6-3.5	0.35-4.26
Gas Content	13-16cc/g	2.07-12.41cc/g	479cc/g	45-105 cf/t	200-400 scf/ton	2.5-12.5m ³ /t	>4m ³ /t
GIP	8.78 BCM	7.7 TCF	50 TCF	30 TCF	32 TCF	43 TCF	123 TCF
Reference	Mishra et al., 1992; Karmakar et al., 2013, Kumar et al., 2015, Das et al., 2021; ONGC, 2000	Sharma et al., 2008; Panwar et al., 2017, DGH, 2019; Mohanty et al., 2019; Chattaraj et al., 2021	Kelso et al., 1988; Dudley, 1989; Scott, 1994; Dhir et al., 1991; Ayers, 2001	Blanton, 1994; Brown 2002; US Dept of Energy, 2002; ARI, 2002	Brown, 2002; Harrison, 2011	Gamson et al., 1992; Scott et al., 2007; Golding , 2011	Weihua, 2012; Wang et al., 2019; Tang et al., 2011

INDIAN COALS ARE FROM TWO AGES:

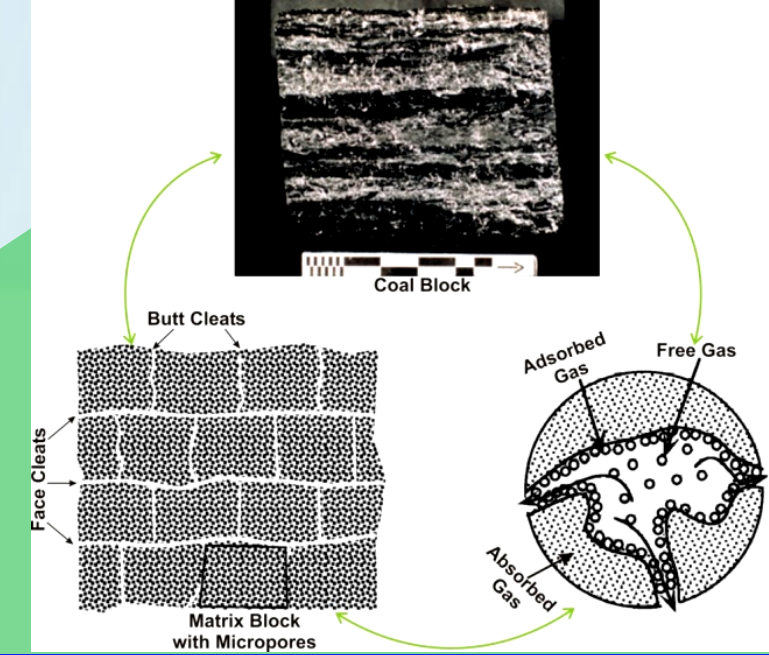
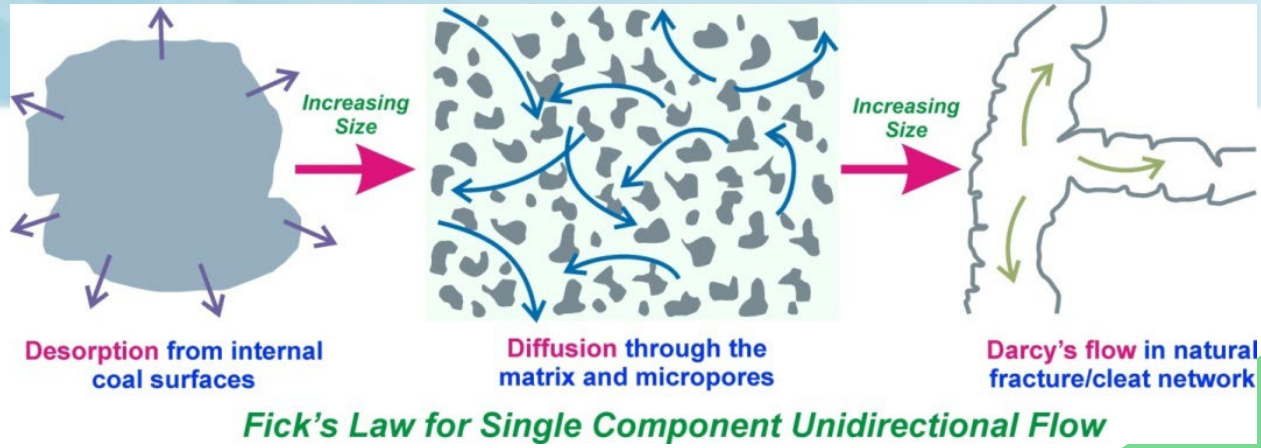
- Permian, > 95% of the reserve
- Tertiary



CMM Potentiality Study conducted by CSIR-CIMFR through US EPA funding

COAL AS A RESERVOIR AND TRAP ROCK

WHAT HAPPENS AT MICRO LEVEL?



$$\text{Total Gas, } G_t = G_{\text{lost}} + G_{\text{adsorbed}} + G_{\text{residual}}$$

Classification by DGMS based on coal seam gasiness

Gassiness degree	% of inflammable gas in general body of air	Rate of emission of gas m ³ /t of coal raised
I	below 0.1 and	below 1
II	above 0.1 and/or	1-10
III		above 10



EXISTING MINING PRACTICES

A) TECHNOLOGIES IN OPEN CAST

- SHOVEL-DUMPER
- SURFACE MINER
- DRAGLINE
- HIGH WALL MINING

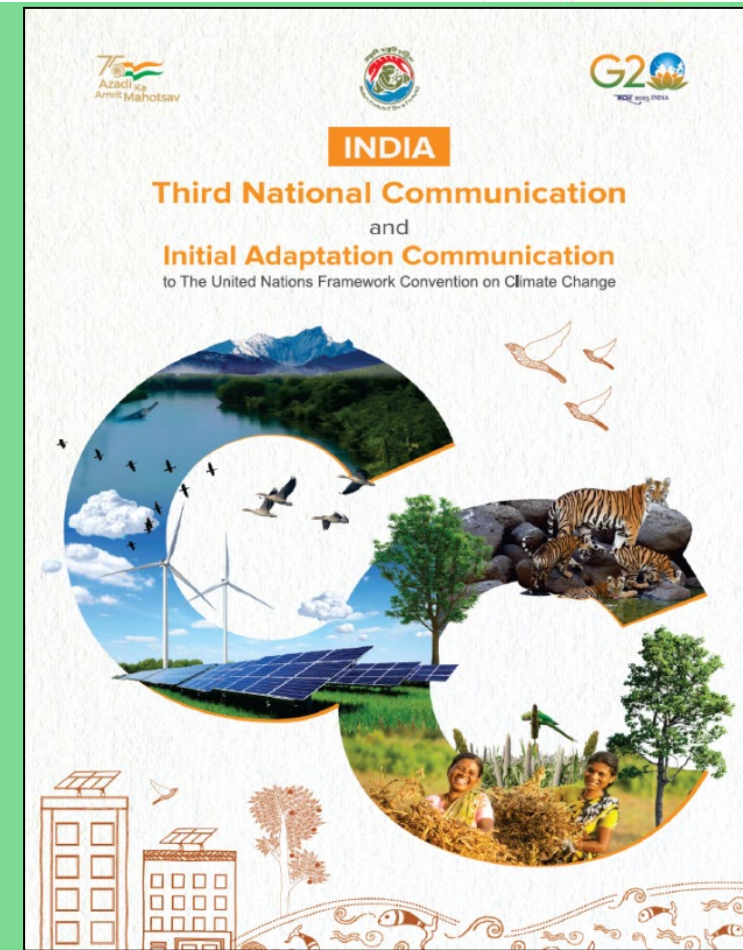
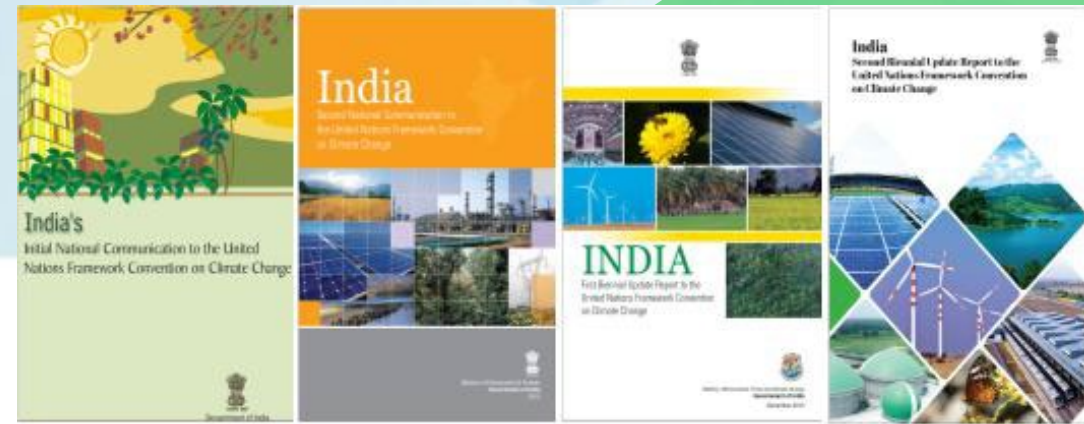
B) TECHNOLOGIES IN UNDERGROUND

- SEMI MECHANISATION: SDLs, LHDs
- MECHANIZED B&P: CONTINUOUS MINER
- LONGWALL MECHANIZATION : Shearer, etc.

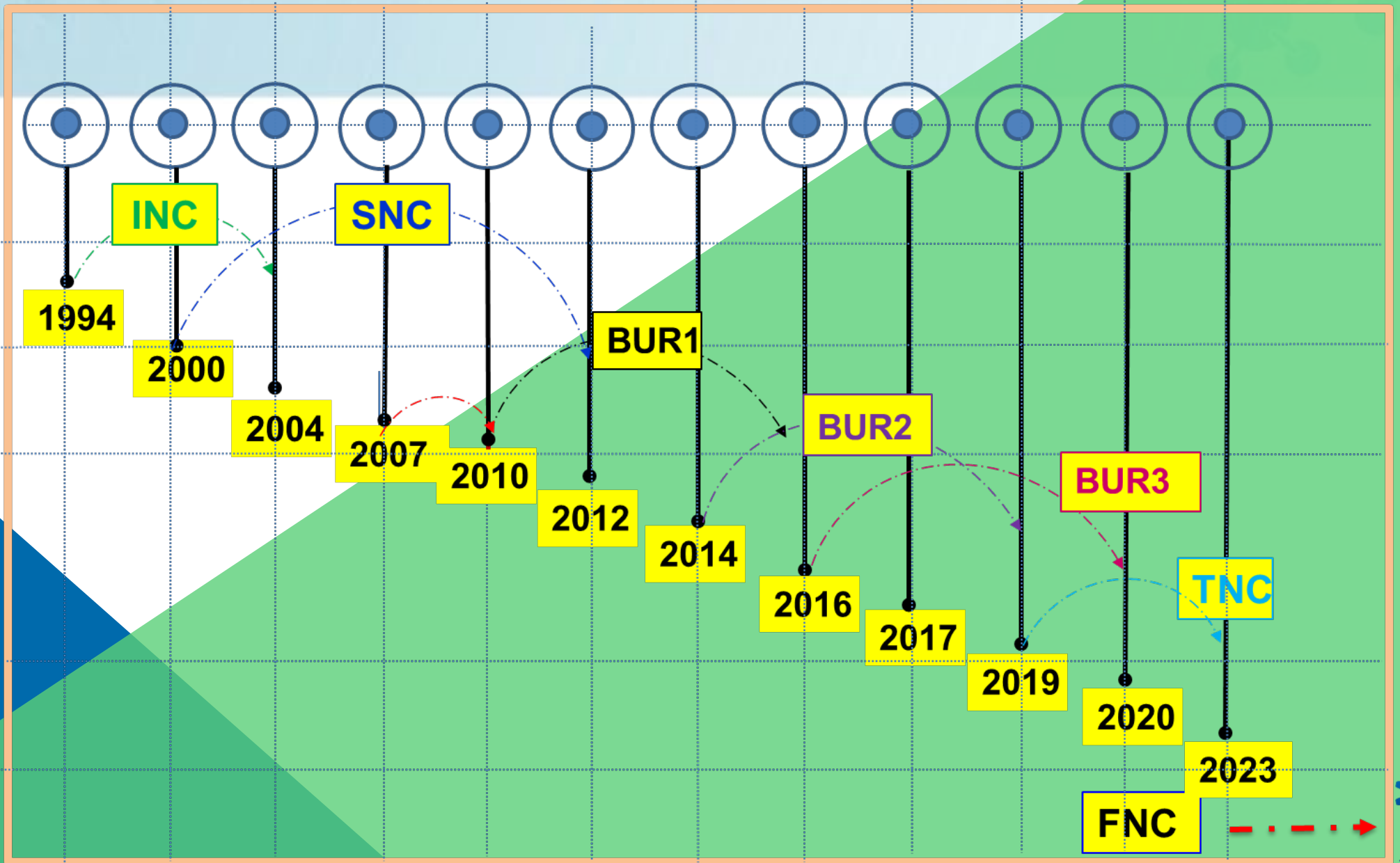


CSIR-CIMFR

- Prepares the methane emission inventory on behalf of MoEFCC
- Developed country specific emission factors for coal mining and handling activities



Chronology of India's Communications



ETF vs Existing Framework (BUR vs NC vs BTR)

Existing MRV arrangements

Enhanced Transparency Framework

Biennial update reports

National greenhouse gas inventory

Mitigation actions and their effects

Finance, technology and capacity-building needs

Cancun Agreements (1/CP.16) and Durban Outcomes (2/CP.17)

National communications

National greenhouse gas inventory

Programmes containing measures to facilitate adaptation to climate change

Programmes containing measures to mitigate climate change

Transfer of technology

Research and systematic observation

Education, training and public awareness

Capacity-building

Information and networking

Constraints and gaps, and related financial, technical and capacity-building needs

Article 4.1 and 12.1 of the Convention; decision 17/CP.8

Biennial transparency reports

National greenhouse gas inventory

Progress made in implementing and achieving NDCs

Climate change impacts and adaptation (as appropriate)

Financial, technology transfer and capacity-building support needed and received

Flexibility

Areas of improvement

Article 13 of the Paris Agreement; decisions 18/CMA.1, 5/CMA.3

REQUIREMENTS FOR ETF

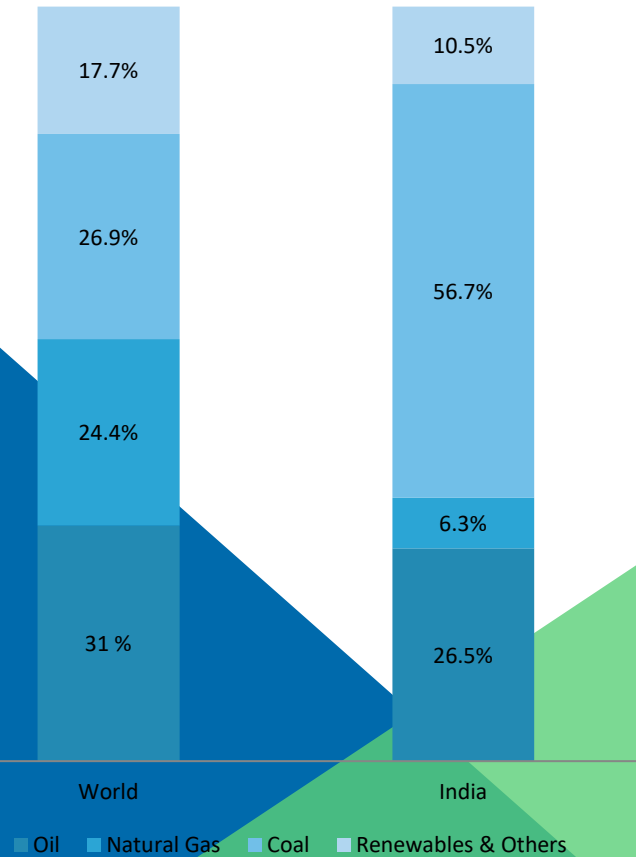
- 2006 IPPC Guidelines
- Granular information: Data required in most disaggregated form
- Optimizing time and resource for inventORIZATION
- Key Category based on – lead contributor / highest level of uncertainties - Uncertainty in Data
- Country specific emission factor

Methane Emission Estimates: Activity data * Emission Factor



India's share in global energy consumption to rise from 7% (2019) to 13-14% (2050)

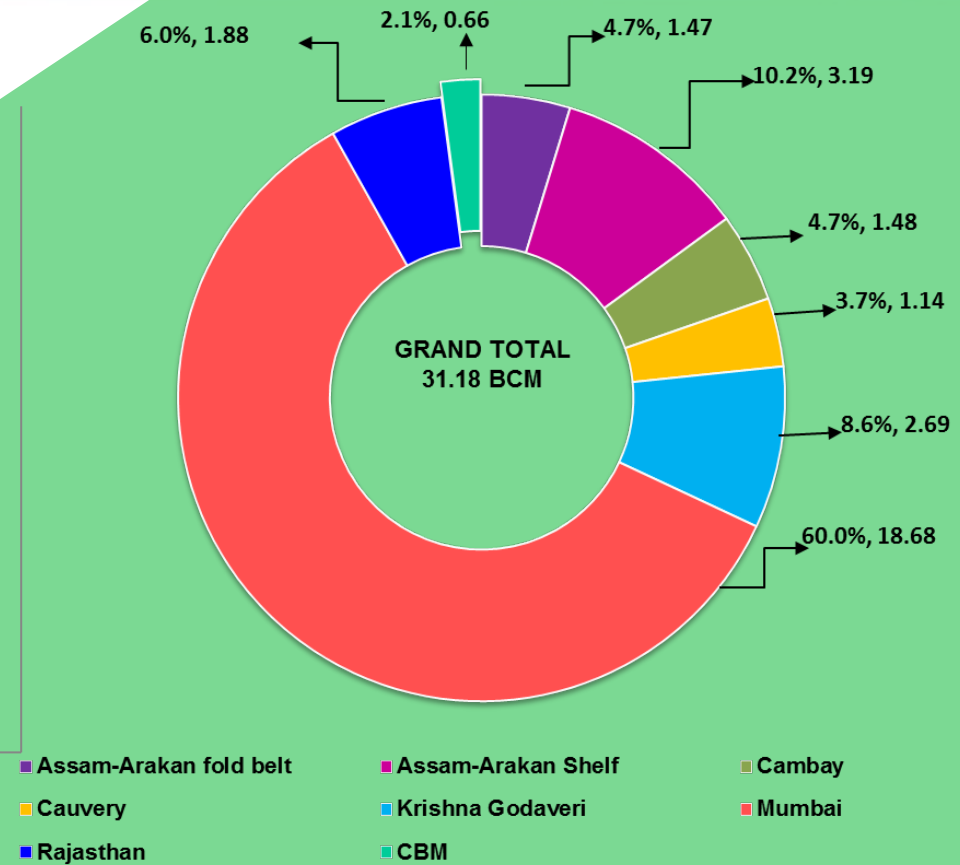
Energy Mix 2021



Energy Mix 2050



India's Basin-wise Gas Production in 2019-20 (BCM)



Others includes Solar, Wind, Hydro, Bioenergy and other renewables and new energy sources / Source- BP Stats 2022, BPEO 2022 and PPAC



STATUS OF COALBED METHANE E&P IN INDIA

Blocks under Operation (Oct 22):

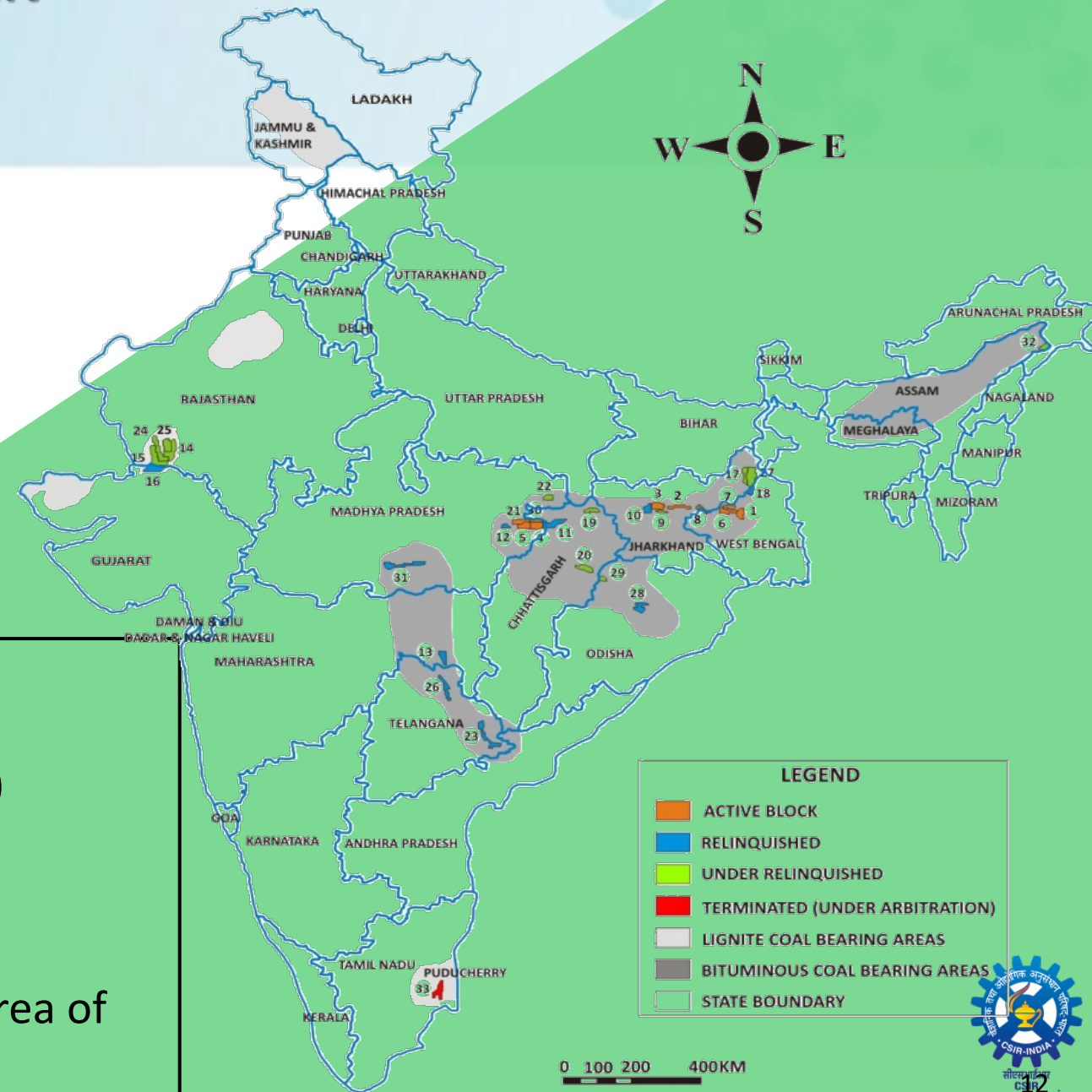
- Total 8 Blocks; West Bengal(3), Jharkhand(3) and Madhya Pradesh(2)
- Total acreage 2400 sq. km.
- Production rate 1.9 MMSCM/day
- Total Potential 280 BCM
- Investment Made: USD 2.2 Billion

Blocks awarded under SCBM-2021

- 4 Blocks; Jharkhand(1), Chhattisgarh(1), and Madhya Pradesh(2)
- Total acreage 3800 sq. km.
- Total prognosticated resource 190 BCM

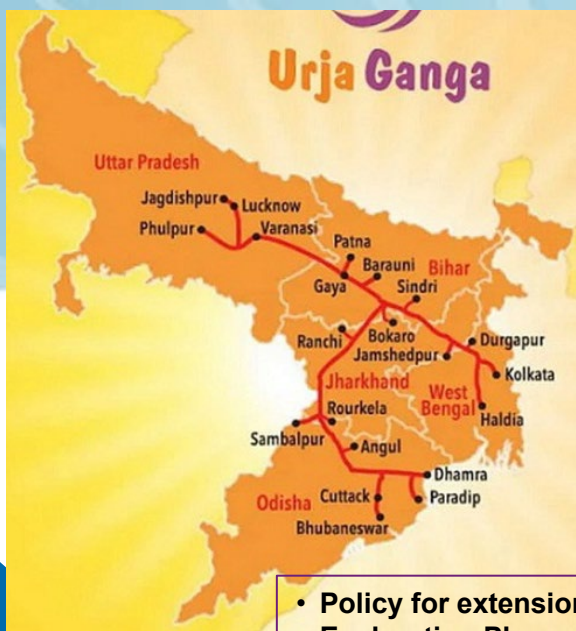
Special CBM Round-2022 (SCBM-22)

- 16 Blocks are offered in 7 states having area of 5817 sq.km.



Urja Ganga

History of CBM Development



• CBM Policy Formulation

1997

• Policy for extensions in Exploration Phases

2007

• Permission to CIL & its subsidiaries to explore CBM under CML (amended in 2018)

2015

• Hydrocarbon Exploration and Licensing Policy (HELP)

2016

• Exploration of Unconventional hydrocarbons in existing acreages under PSC, CBM & Nomination Fields
• ER Policy - Fiscal incentives to be provided from 1st day during entire production period.

2017

• National Data Repository (NDR)
• Early monetization in CBM blocks

2018

• Natural Gas Marketing Reforms

2020

• SCBM-21

2021

• Special CBM Bid Round-2022

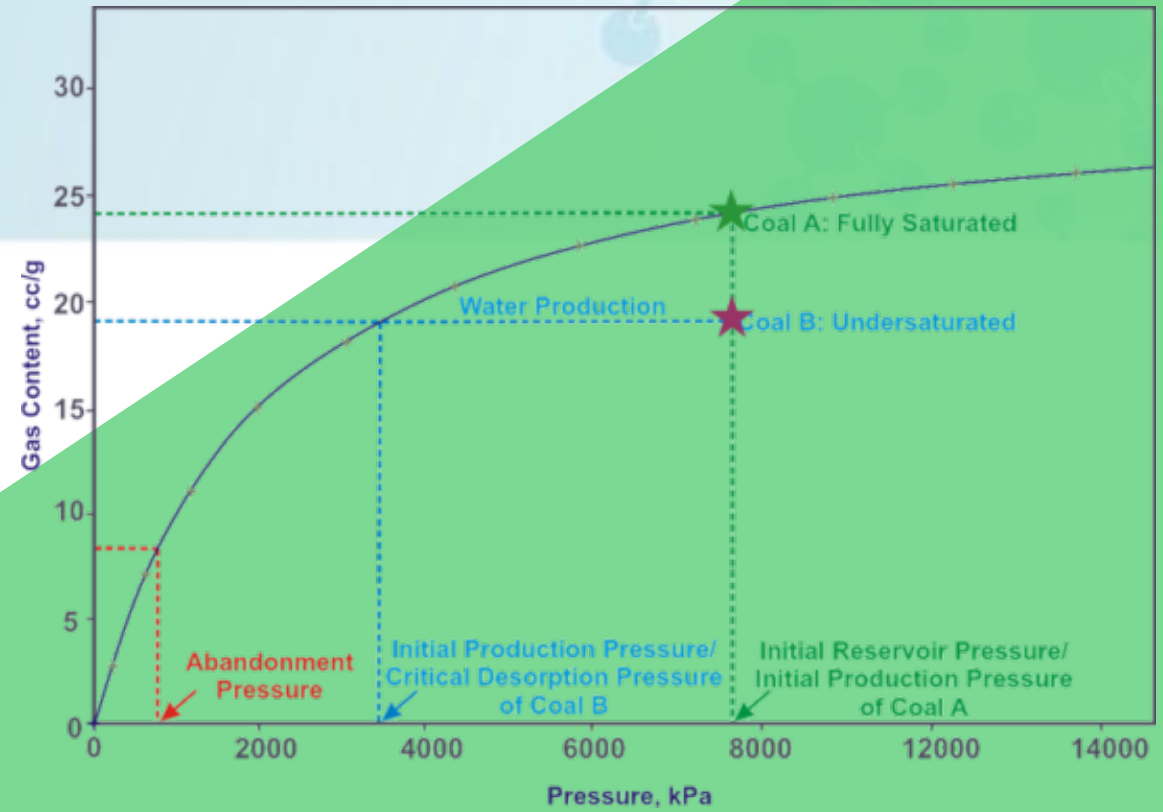
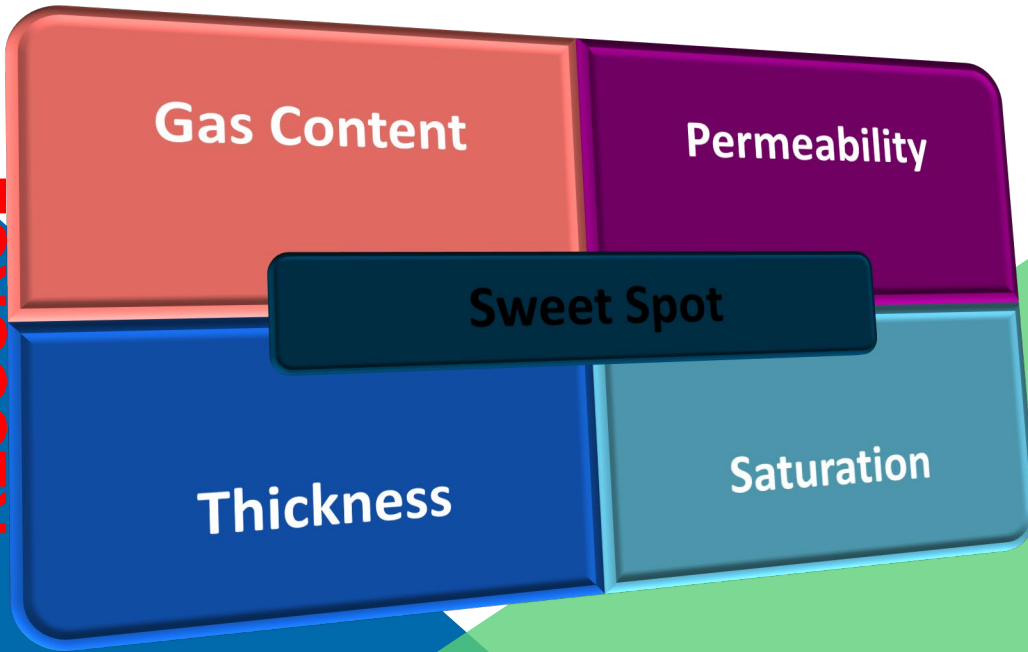
2022



EVALUATING COALBED METHANE PROSPECTS

RESOURCE

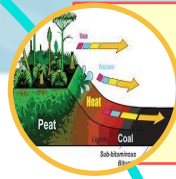
RECOVERY



AERIAL VIEW OF A CBM GAS GATHERING STATION AT JHARKHAND, INDIA



CSIR-CIMFR activities on unconventional gas resources



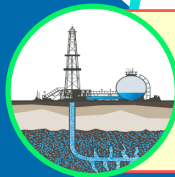
Fundamental studies in fuel science, paleodepositional environment and hydrocarbon exploration



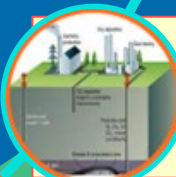
Coal seam gassiness study for mine safety and regulatory purpose



Greenhouse gas inventory preparation and carbon footprint study for fossil fuel sector



Reservoir evaluation and simulation studies for CBM, shale gas, CO₂ sequestration



Site selection, characterization and simulation studies for underground coal gasification

CONCLUDING REMARKS

- **Gas based economy may provide a seamless energy transition in Indian context: Development of CBM, CMM, Shale Gas, UCG, EOR and ECBM projects**
- **Proper reservoir characterization is key to sustained production of unconventional gas resources**
- **MRV in coal mines is at the core of planning and implementation of CMM utilisation and destruction projects**
- **Opportunities exists for technology innovations, stronger International collaborations and investments for implementation of appropriate mitigation measures and to monetise methane emission reduction**



DISCLAIMER

The views/ideas expressed are solely of the presenter

ACKNOWLEDGEMENTS

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The earth is what we all have in common...



NAMASTE



Thank You

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