

# Minerals Short Notes

MUDIT JAIN

Mica monopoly.

## Coal

Industrial  
(steaming coal)

$Fe_2O_3 + C \rightarrow Fe + CO_2$   
Imported. (Aus.)

Thermal

(inferior)

(used in thermal processes)

(domestic)

60% energy production.

Jharia dhanbad

Ind has 25% good quality thermite.

(Magnetite best)

chromium

Bauxite

due to laterite leaching

halco

hindalco

Wghat

Eghat

sattpara

aravali

Monazite → thorium (Keral)

Uranium (AP)

Delineate  
Mineral  
Zones/Regions  
action =

## Mineral Resources & physiography

### ① Shield Areas

exposed batholiths (old) (Precambrian)  
(basement platform rocks)

Chotanagpur

Dharwad

Orissa

Jharkhand

Chhattis

WB

Karnataka

AP

Maha.

Shield areas have

(Fe, Mn, Co)

### ② Rifting areas

activation of faults.

(Mesozoic)

Gondwana time → coal formed due to  
carboniferous, Permian. → Gondwana coal

not oldest coal ∴ not best.

480% coal output.

99% production.

Damodar, son, Mahanadi, Godavari, Narmada.

### ③ Folding areas

Sedimentary rocks, marine origin. sandstone, limestone,

shale, shist, phyllite

building materials.

oil & gas

Ind has richest resources of shale oil.

Meghalaya, Assam have shale oil, JK Jabalpura district.

#### ④ plateau uplands

Bauxite: sotpura, ~~assam~~, nilgiri, windhyas.

↳ well distributed across India.

Marine transgression → oil & gas

coast  
gulf of cambay

offshore

Mumbai, Kutch shelf (Rawa oil shelf)

oil: { Cuttack shelf: Orissa, WB, Bangladesh }  
{ Bombay high: S. basin, barmes }

#### ⑤ Platform Reg. : area with rock of shields deposit

Sedimentary, ~~old~~ synclise. sandstone & marbles.  
building materials.

uddapah, windhya-sotpura, chat'tis.  
diamonds in golconda, panna mines (cream grade).

#### ⑥ coastal plains

Marine transgression oil

No metals

Plat. deposits → monazite → thorium → FBR.  
↳ submarephs : gold depts.

colorado river =  
death valley.

#### Mineral reg

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#### ① N & N/E (Most imp reg)

Chota Nagpur, assam, Meghalaya.

↳ mineral heart of Ind

↳ industrial reg

↳ both metals & non-metals  
from shields → from rifting → coal.

Bauxite : Orissa, chat'tis (Balaghat, chindwara)  
↳ Bauxite → Mn

Fe : Hazaribagh, Mayurbhanj, sundargarh, Keonjhar, Kendu  
(Jharkhand) (Raurkela) Orissa

rauchi, durg (bhilai) (dalli-rajhara mines), balladita  
(chhattisgarh)

Jharkhand: Hazaribagh, Singhbhum, Palamu  
(lohardaga)

Orissa: Bonai, Sukinda, Mayurbhanj, Sundargarh,  
Keonjhar.

(richest Fe ore)

Namundi Mines: Jharkhand - Orissa border.

Chai Basa: Mn + Cu

Coal

Damodar: Daltenganj, dhanbad, Bokaro, Tharia.  
↓  
Roderma (Mica, richest mine)

son, Mahanadi.

WB: Ichiganjan, Raniganj, Asansol  
(↑↑)

Bauxite: Mayurbhanj, Sundargarh, Keonjhar, Garjat, Rajmahal  
(Orissa) Bastar, Chattis

amarkantak (Madhya Pradesh)  
(Balaghat, Chhindwara, Seoni)

S. Orissa: Koraput, Nandana, damanjodi mines (Nalco, ↑↑), Pachpatmali hills, Koraput (Nandana hills)

Assam: oil: Digboi, Dibrugarh, Sibsagan, Himaibari, Mapum, Digboi, Naharkatya.

② South reg  
S. AP + TN

Kurnool: Fe, Mn, Bauxite

Nellore: Mica + Mn

Anantapur: Kudapah

Neyveli: lignite

Eghats: Palikonda, Nallamda  
Shevaroy, Javadi, Gingee  
↓  
Bauxite.

③ 170

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③ S.W reg : Dharwad plateau

Karnataka, Maharashtra, Goa, AP

[Fe] : Bababudan hills < Kudremukh, Kemangundi ] - Shimoga, Chikmagalur  
these are around  
↓ to Bhadravathi / Vishveshvaraya steel.

Sandur formation : Bellary, Hospet, Ratnagiri, Bhandara (Dehara) iron ore.  
S. Maha.

c) S. Goa

d) Chitradurga (Fe, Mn)

[Mn] : Shimoga, Chitradurga, Tumkur (Fe, Mn)  
(limestone)

Prob: NO COAL FOUND HERE → HEP.

④ N.W reg

Maha + Gujarat + S. Raj < oil offshore resources

Gulf of Kutch, Arabian Sea, Bombay High, Aliabet fields, Rajol, Ankleshwar, Barmer → (marine transgression)

S. Raj < Lead, Silver (Zawar mines)  
Zn.

Salts, gypsum (Sambhar, Didwana, Digana) [S. Raj / Guj]

N. Raj

aravallis → building materials (marble) (Jaipur district)

Khetri mines (Cu, gold, Zn)

Cu, Zn, gold, lead

HCL → Khetri project:

- Khetri (Raj)
- Malanjkhand (MP)
- Angikundala (AP)
- Talaja (Maha)

# IRON

hematite, magnetite, limonite, siderite  
(electric purpose) (china)

① Brazil → Matogrosso → Itabira mines  
Karajás "

② Russia → Kunetz or Kusbas

③ S. oral → KMA Kursk Magnetic Anomaly

④ Aus → iron knob, Widbar, Yampisand

⑤ China → Changchun, Qian, Jiushan, Shenyang, Melpedema

⑥ US ↓ dep. lake superior. Mesabi Mines, Mine Mines,  
Gogebic

## India

25 bil tonne ore. 50-60m depth.

Production: 200 MT annually. (mil) export: 90.

Wishakhapatnam → (finished steel)

## Jharkhand

Palamu, Hazaribagh, Singbhum, Ranchi, Daltenganj  
Magnetite

magnetite

mines: Dohardaga (Hazaribagh), Gua mines (IISCO Steel)

Naomundi, Kirimuru, Mahaburumines : Singbhum.

Kirimuru  
Maha

Orissa : Mayurbhanj, Sundargarh, Keonjhar.

Mines: Nuromahisani → TISCO

Bonai mines

Chadampahad

Sikinda → PUSCO, Daitari plant.

Chhattis : Durg - Whilai (Dallirajhara, Raigarh mines)

Aridongiri forman Bailadla mines

Karnataka :

Bababkudan ← Kemangundi  
Kudremukh  
Aplara mines (Kudremukh)

Sunder belt.

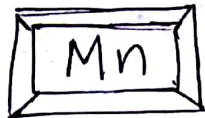
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Maha :

Ratnagiri, Phandara (Jharkhand mines)

AP : Kurnool, Anantpur, [Bajaram | Jagapeta Mines]

S. Goa : Marmagao



found in Roudurite & gondite rocks.

abundant → exported  
shield regions.

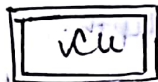
ores: Psilomelane, Pyrolusite, Braunite, Mallandite.

Jharkhand: Hazari, Singhbhum, Ranchi, Shalghara

MP: Balaghat.

Orissa: Mayurbhanj, Sundargarh, Keonjhar.

AP: Nellore, Kurnool.



low. Chalcopyrite ore.

In association with shists & phyllites as veins & nodules.

Argentina: Chuquibambilla

Africa: Katanga, Congo, Zim, Zambia

Canada: Sudbury.

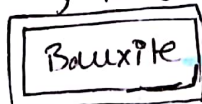
Ind

Khetri Cu complex, Jhunjhunn Raj.

Jharkhand: Rakas mines, Masabani mines ✓

AP: Kurnool, Guntur [Agungundala]

Madhya Pradesh (MP): Talaja (Maha)



Harjat, Panchmatmali, Nallamalai, Shevaroy, Javadi, Gingee,

Amankantak, Palikonda

Damanjodi mines (Nellore)

Keonjhar (Koraput Orissa)

Gandhamardan ( " )

Ratnagiri (Maha)

Kheda > Gujarat  
ambeli

largest? Aus. exports to Ind.  
Surinam, Guyana, French Guyana

# Limestone

sedimentary

Shimoga, Windhyos, aravali's, chatti's, sathpura, amarkantak, hims (chittapur)

## refractory minerals

(lining of furnaces)

gypsum

Uttaraphand (Almora, taradew)

, S. raj., samsher, didwag, algana.

## Cold

: Kolar, hatti (raichur), andampur.

## Chromite

: Orisa (95%) [Nuttack, sukunda], Ratnagiri, Shimoga

## Uranium

: Jaduguda [Jharkhand], Nalgonda (AP) tumalapalli, Meghalaya, Chitral, Peddagattu, Rohil (Sikar, Raj) 4th largest.

## Energy

[ coal oil gas ] commercial sources ⇒

use

commercial sector

(Power) (HEP)

Transport

(oil, gas, oil, PNH, CNH)

fulfill 60% of demand rest by firewood, draught, organic.

- installed capacity: 170 GW. 2050: req: 1000 GW.
- 5th largest energy consumer. need 6-7% energy growth for 10% GDP

| source  | % of commercial energy produced |
|---------|---------------------------------|
| coal    | 53                              |
| gas     | 11                              |
| oil     | 1                               |
| HEP     | 25                              |
| nuclear | 3                               |
| other   | 8                               |

= 65% (hy commercial source)

[ wind, solar, tidal, bio ]

## energy emi<sup>n</sup>, req, probs

Pop<sup>n</sup> energy ↓

energy quality

emi<sup>n</sup> maintaining manufacturing, growth.

80% of rural area get ↓ power & voltage.

↑ non ecological resources. → Pop<sup>n</sup> displacement.

↓ η

: installed: 170 GW

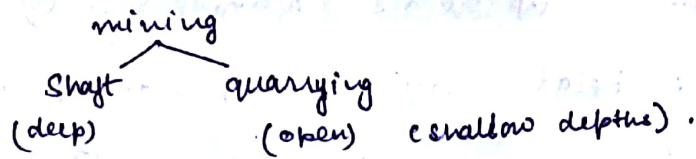
Plant load factor: 70% of the.

∴ 30% waste.

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# coal

- 1) ↑
- 2) 265 billion tonnes upto 1200 m
- 3) 70 " " 70 metres. (90% of produc<sup>n</sup> from the).



simple, wasteful due to selective mining.  
mine good coal only.

open mining → wasteful, illegal quarrying, erosion, denudation.

Gondwana coal. Late carboniferous → old → inferior. (moisture, volatile gases. ↓ calorific value)

import coking coal from aus.

found at: Jharia, Chindwara (Jhilmil coal field)

Lignite at Neyville TN, Umaras (guj), Panna (raj), Makum (assam)

Tirap, Namphek (Assam), Darjeeling [Pankhwali coal], Dalli<sup>n</sup> CF.  
Rajauri, Puch, Banamala J&K

ignite in thermal plants.

Most imp Gondwana coal are. Damuda coal (Bihar, Raniganj, Kharbati formon)

damodar valley: damodar, son, godavari, Mahanadi, Narmada.

## Jharkhand

Dhanbail, Bokaro: Jharia & Raniganj coal fields.

Hazari Bagn (Kharbati)

Palamu (daltenganj)

WB

ext<sup>n</sup> of damodar fields,

Raniganj



chitranjan

asansol

durgapur

Minor depts: Bankura, Burdwan, Midnapur, Birbhum, Darjeeling.

WB plains (alluvial) have coal due to Rajmahal-garo gap subsidence.

Orissa

(JISHT)

Mahanadi col ltd. (MCL)

Jalkher, ib, sonath, Tel, Hasdeo.

Chatis + MP

Narmada

son

Tawa valley

Korba

Kaman

Peren

S.E MP:

wardha (Nagpur)

godavari

wardha

singreni

panagundam plant

rothagundam

Minors

Maha

wardha exten<sup>n</sup>

empty fields.

JK has anthracite at Kalakot.  
(95% pure)

Total mine / yr: 450 MT [40 MT lignite].

### oil & gas

> imp for transport<sup>n</sup> thn commercial.  
(75% used here)

domestic production =  $\frac{1}{4}$  demand POL.

Marine transgre<sup>n</sup> areas:

kh offshore, Muttarak valley, Shiwoy valley

in Bombay Gujarat.

Daman

### Upper assam

dibboi (oldest), rudrasagar (dibrugarh, sibsagar), Surma valley

Barak river trib of Meghna → surma in Bangladesh.

Refineries . naharkatiya [Hippom sand reg], dibboi,

Numaligarh (Golaghat), noonmati (Guwahati), Bongaigaon.

Most of dibboi oil to bonani in patna [Mkt based refinery]

Ushatinda Mathura Panipat

### Gujarat Cambay

ankleshwar (Baruch), Koyali refinery

(Mehsana, Kalol, Kheda) : ahmedabad

Sanand, Nawagam  
(Nand)

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offshore oil wells along w. coast

most imp & productive

Neelam field at bombay wgh 65% of production

S. basin, aliabet (bhavnagar), chandhar (reg'd at Bombay)  
(near aliabet)

Kh offshore

Rawa oil fields (bavnagar (Raj)) =

Production

3.14 mil km<sup>2</sup> : sedimentary basins.

30 billion tonnes : reserves.

718 " " : deep offshore (1/4 of total, unexploited)

Production : 34 mil tonnes . 20-25 % of demand.

By 2030 : imports : 90%.

import from Iran.

hydrocarbon mission 2020 :

(a) diversify energy resource to renewable / non-conventional.  
(wind & solar)

nuclear is not renewable now.

(b) inside entry : Kh, kaveri, Raj. by ONGC & pvt sec.

(c) NELP : oil acreages abroad : Nigeria, Somalia, Iran,  
sahelina (Russia) by OVL (once wish std)

(d) have equity in Petronas, agip, esso, BP, Vally Verton.

(e) develop oil reserves (45 days) . Present : 18 days.

(f) Improve  $\eta$  in transport. [Dehenat - 4].

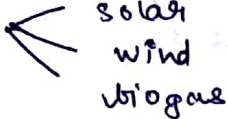
(g) bio diesels :   
oil seeds : (Jatropha)  
blend with ethanol : gasohol in Brazil  
TAPI pipeline.

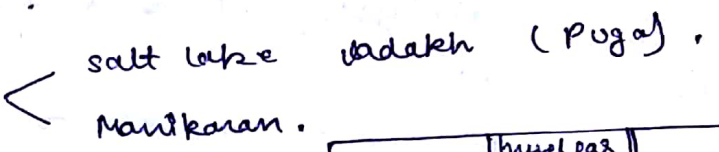
Ratar, Russia.

## gas

Sui, Mira in Pak. exclusive oil fields. And gas found with oil.  
In, And 90% gas burn / flared due to ↓ tech.  
CNG expensive. need subsidy. / distrib<sup>n</sup> / upo.

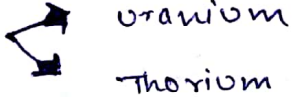
2 natural thermal plants: dhurvan (guj), namrup (assam).  
(dibrugarh)

Renewable 

geothermal energy projects 

Tidal: Guy, A & N.

Wave: Wizingham.

Nuclear <sub>3%</sub> : 

NSR: (aus)

FBR:

### nuclear

Narora: Bulandshahr, deli  
Rawatbhata: Kota.

Kaparpur: gujarat

Tarapur, Jaitapur: Maha

Raiga: karnataka

Kalpakkam: chennai

Kudankulam: TN

-res of MPVVP (dams)

## Rare earths

17 elements

lanthanoids

called so bcz of rarity of mineral they were 1st explored for  
But they exist in abundance.

uses: tech devices, semi-conductors, magnets, batteries,  
catalysts, hybrid car components. In lasers  
tech

With other metals to improve their props

TV, optical fiber

electronics, manu, medical, tech, renewable, defence

Ind: 2% share of output  
2nd largest producer  
Ker, Orissa, TN = 95%.

3.1 mt home reserves  
deal with Japan  
to counter china.

## Methane Hydrates

- ① Fire ice crystal
- ② 1L = 165L of  $CH_4$
- ③ Mix of  $CH_4$  +  $H_2O$  → ice crystal due to  $\uparrow P, \downarrow T$  subseq.
- ④ Also in Russian / Canadian permafrost.
- ⑤ Global reserves >>> conventional.
- ⑥ Ind reserves =  $\approx 2000$  trillion cu.m.
- ⑦ Indo-US research → Kerala-Konkan, KG, Mahanadi, 2006. A&N.  
KG is 1 of richest in world.

⑧ Challenges:- env, eco, tech  
[leak → CC]

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## Marine Ecosystem

Marine Living assessed by CMLRE, Kochi. [Prog Assessment of MLR, 1997]

- ① Coral    ② Mangrove    ③ Estuary ecosystem  
④ Seagrass & seaweed    ⑤ Pelagic & Benthic

Threats: coral mining, deforestation, sewage, over-exploitation, habitat alteration.

## Marine non-living

PMN [India, pioneer (1987) in C/I/O basin] = Co, Mn, Co.

Gas hydrates [ice like minerals, Bathymetry survey].

Ferro silicates. sulphates, cobalt minerals.

- COMAPS [coastal ocean mapping & prediction system prog]
- Integrated marine & coastal area mgmt [shoreline mgmt, tidal inlets mgmt, ecosystem modelling, marine ecotoxicology, ocean colour monitoring, ICMAM]
- "Dev of potential drugs 4m ocean" project 1990. [Anti-cancer fungal, protozoal, bacterial etc].

terms: near shore dynamics, algal blooms in EEZ, productivity patterns in EEZ, deep-sea fishery assessment, Benthic fauna on shelf/slope.

ocean renewable = wave + tidal + ocean thermal + offshore wind.

## Biotic Resources

obtained 4m diving & organic material.  
Forests, Fish, coal, CBM, oil, NG

## India's energy crisis

- ①  $\approx 1/3^{\text{rd}}$  no electricity.
- ②  $\approx 1/3^{\text{rd}}$  non-commercial source. (cowdung, biomass etc).
- ③ Per cap energy consumption =  $1/3^{\text{rd}}$  of world's avg.
- ④ Energy demand-supply gap is  $\uparrow$  ng.
- ⑤  $\downarrow \eta$ ,  $\uparrow$  wastages.

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- ⑥ ↓ eco viability of renewable.
  - ⑦ ↓ awareness abt +ve of renewable on rural-dev.
  - ⑧ ↓ Storage / conservan technologies.
  - ⑨ INDC [CC]
  - ⑩ Power outages in capital, N/E
  - ⑪ Peak power shortage of 10%.
  - ⑫ High demand in summer due to climate.
  - ⑬ ↑ Pop<sup>n</sup> pressure.
  - ⑭ welfare approach → subsidy burden
  - ⑮ International treaties, bilateral [cont names]. Map [lines]
  - ⑯ Nuclear, coal import, ToT, biofuels, renewable from EU, pipeline
- tropical nation
  - CC → monsoon ↓
  - gondwana coal → poor quality
  - offshore / onshore oil (transgrow) ↓.
  - nuclear reserves
  - ↑ hydro potential.

### National water policy 2012

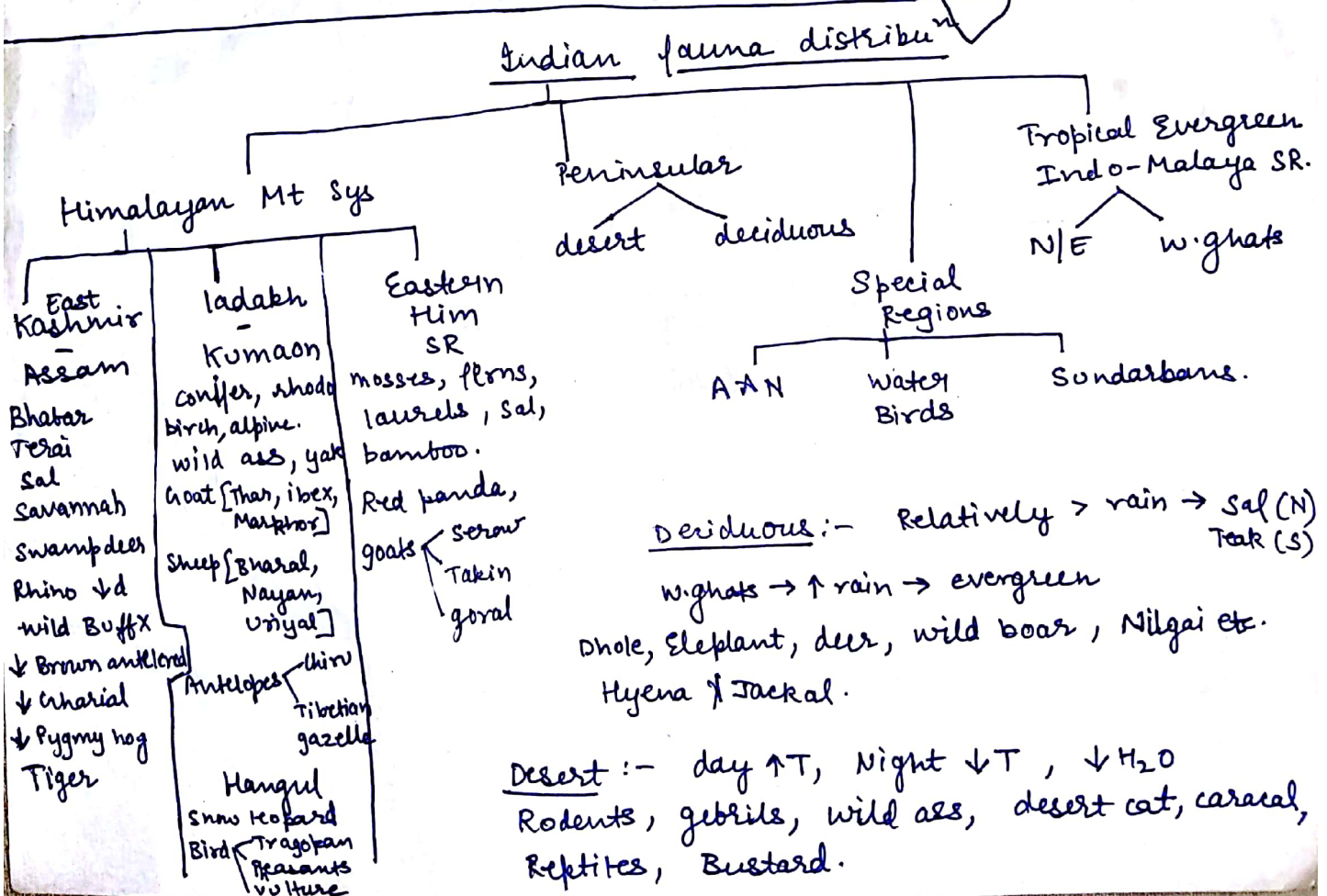
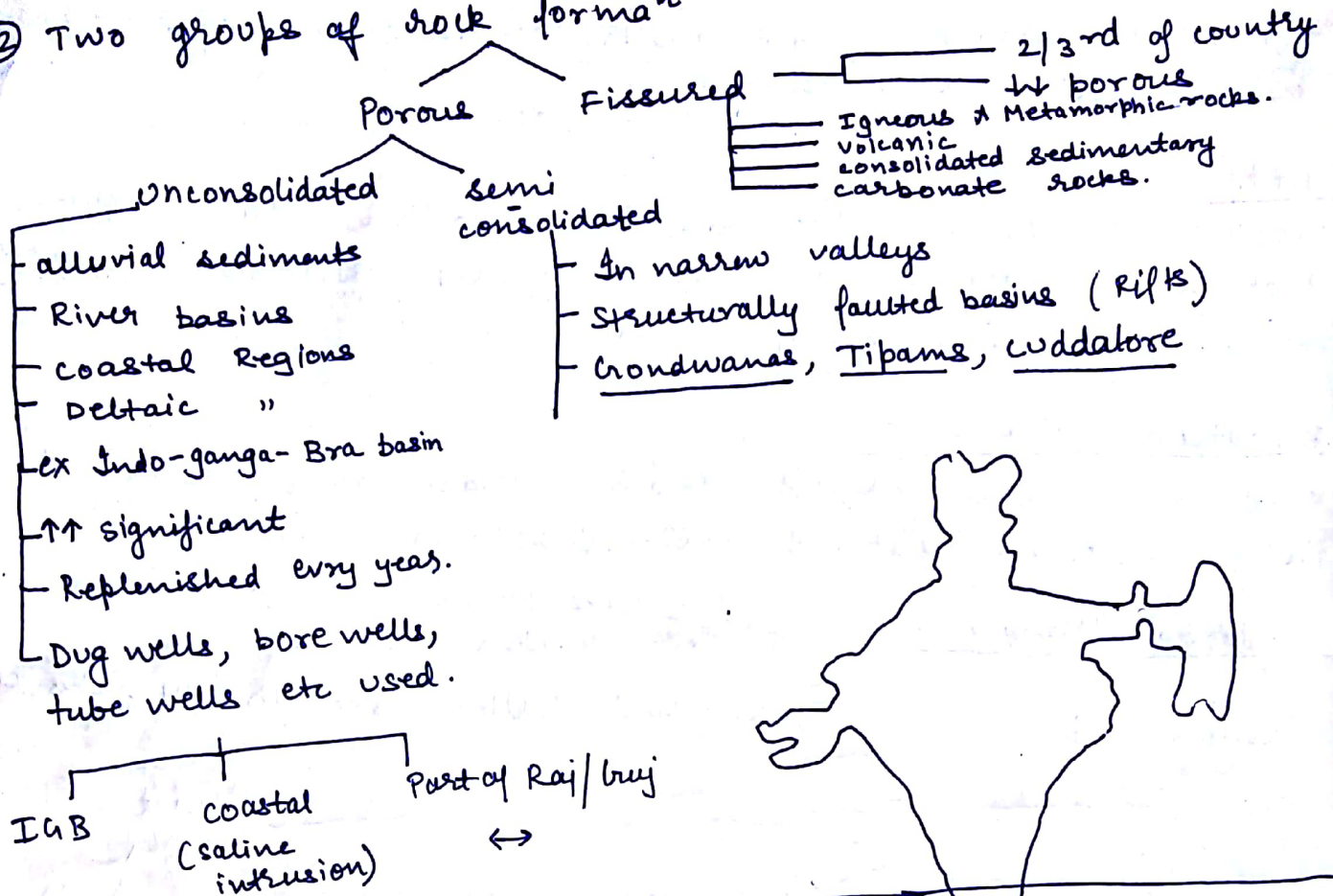
- ① To address scarcity, distribun, planning, conjunctive use of SW & GW.
  - ② concerns: water variability, disasters, GW, clean water, under utilizon of available resources, wastages.
  - ③ Principles followed: Equity, social justice, sd planning, water as economic good, river basin shud b basic hydrological unit.
- 1) ReEm: Adapta<sup>n</sup> to cc, enhancing  $\eta$ , Demand mgmt, WUA empowerment to collect charges, conservan of river corridors, flood / drought mitiga<sup>n</sup>, MIS, DSS

### Ground Water

CGWB → assess & manage GW.  
 SGWB + CGWB estimate dynamic GW resource of country.  
 Annual GW availability estimate = 399 BCM.  
 " " draft for use = 231 BCM.  $\frac{230}{400} \times 100 = 58\%$   
 contri of Rain to Replenishable GW resource = 67%.  
 other sources [canal seepage, return flow 4m irrigan, seepages].  
 Irrigan consumes 92% of GW.  
 Delhi, Haryana, Punjab, Raj, DAD, Pudu >>> GW use.

## OCCURANCE

- ① considerable lithological / chronological variations, tectonic variations, climatological variations
- ② Two groups of rock formation



## Indo Malayan SR

W.G  
N.E

Hoolock gibbon, red panda, treeshrew, giant squirrel, flying lemur.

Nilgiris: Sholas [grassy downs & tablelands interspersed with evergreen gorges].

↓  
Lion tailed macaque, Nilgiri langur, slender loris, Nilgiri Mongoose, Malabar Civet, Flying squirrel etc.

## A & N

Tropical R.F. Andaman pig, palm civet, dolphin, whale, Dugong, crab eating macaque, deer, birds [Megapode, Narcondam H., region]  
Turtles, coconut crab, reptiles.

## Bharatpur Water Birds

Freshwater swamp (Keoladeo Ghana), Kadam tree, Acacia, Birds 4m Eurasia, storks, egrets, herons, ducks, crane, pelicans etc.

## Sundarban Mangroves

 creeks  
mudflats.

Sorontians, Rhizopora, crabs (land, fiddler), Tree climbing fishes etc.

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