

08/12/12

Geography-Revised)

Environmental Behaviourism, Humanism, Slope development, -

V.P.GAUTHAM IAS ①

- Channel Morphology

Behaviourism

subjective (cognitive)

decision making behavior mediates the spatial relationship
b/w environment and spatial to man.

Geography \Rightarrow same

↓ subjective knowledge of man;
but different for different persons

e.g.: Pygmies in equatorial forest \Rightarrow believes that environment
is supreme

Europeans \Rightarrow believe that man is supreme

Image of the environment depends on the
view point of the observer.

Major points

1) Alternative model for quantitative revolution.
To define cognitive (subjective) environ, which determines
the decision making process

2) To unfold the spatial dimension of psychological
& social theories of human behaviour.

3) To generate primary data to study human beh

4) To analyse the spatial variation in the decision
making process.

Assumptions

1) Ppl have an environmental image - This image can be identified by the researcher.

2) There is a strong relationship b/w the environ. mage & decision-making

So, rather than a universal generalization using quantitative methods, an individual-level approach uses qualitative methods to include human behaviour, social & psychological dimensions.

Humanism

Man is the centre of the environment. Humanism gives a central & active role to human awareness, conscience.

To study earth as home of the man

Gives methodology to study human experience.

Provides a historical perspective of man.

It recommends participatory approach.

without { To live with the community as a member, revealing the identity of the research.
To get the actual meaning behind man's behaviour.

(man)

(en)

Applicability

1. L
2. T
3. Cr
4. Lin
5. Rel

Basis

1. +

knowledge -
geo knowledge

So, try to
then imposing

2. Every

eg:-

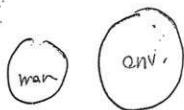
* 3. Every

4. ~~en~~
environment

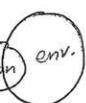
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(3)

Radicalism



Behaviourism



Applicability of humanistic approach

1. Geographical knowledge
2. Territory & place
3. Crowding & privacy
4. Livelihood & economics
5. Religion.

Basis of humanism

1. Every human has an inherent geographical knowledge - (even a migratory bird has its own geo. knowledge \Rightarrow track route from Siberia to Rajasthan). So, try to study this geo. knowledge of man, rather than imposing external knowledge.
2. Every human has his own territorial consciousness
eg:- even a dog has its own territory. Does NOT cross
3. Every human wants his own sphere of privacy.
4. ~~Geographical~~ Livelihood determines man's relationship with environment.
eg:- Poverty \Rightarrow man resorts to exploitation of nature.

5) Religion determines man's behaviors w.r.t environment, since religion itself originated initially as a faith of nature.

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e.g.: - eating mutton (goat) is accepted in Hinduism.

Killing cows is considered unholy.

Hinduism bars cutting down of banyan tree.

Protestant religion \Rightarrow advocates economic growth.
allows exploitation of nature.

Slope

Ang

s

Hill sh

Summit

Rectilinear

Rectilinear

Concave

Get notes for 'Gene pool', 'Vitellary classification'
from sir;

v. to
naturally ↘

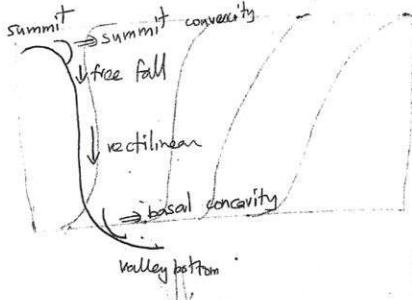
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Slope Development

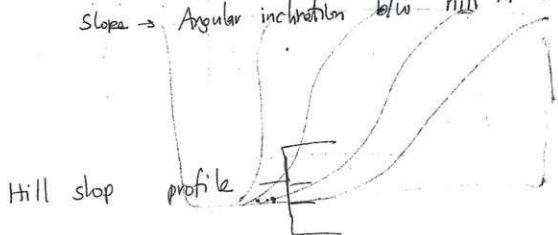
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Slope

Angle between summit & valley bottom.



Slope → Angular inclination b/w hill top and

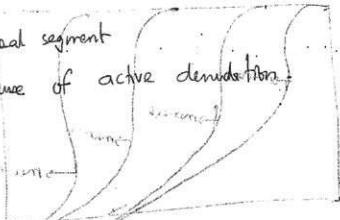


Summit convexity

Rectilinear free face \Rightarrow wall-like slope;

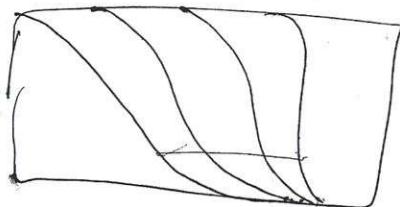
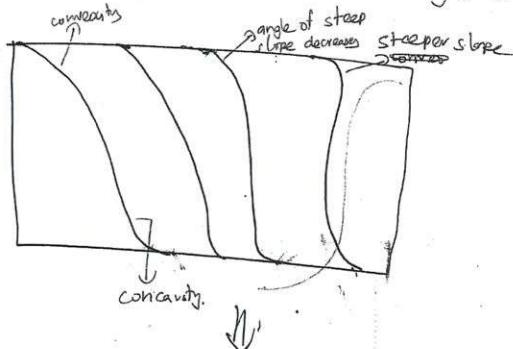
Rectilinear \Rightarrow linear segment b/w upper free surface & basal concavity.

Concave \Rightarrow basal segment
because of active denudation



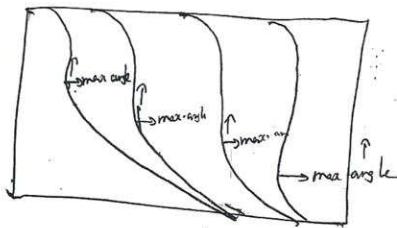
Slope decline

Steepest part of the slope progressively decreases in angle accompanied by development of convexity & concavity.



Slope replacement

Maximum angle decrease through replacement from below by gentle slope



Paralleled

N
length of
remaining
place

increased in
slope
concavity.

Parallel retreat

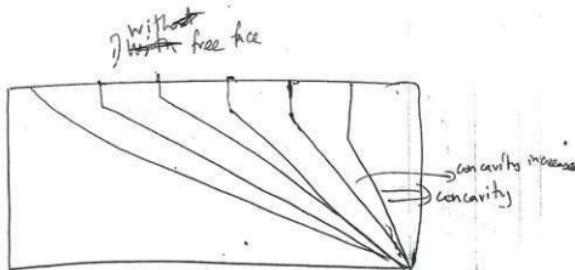
- with free face
- without free face

(7)

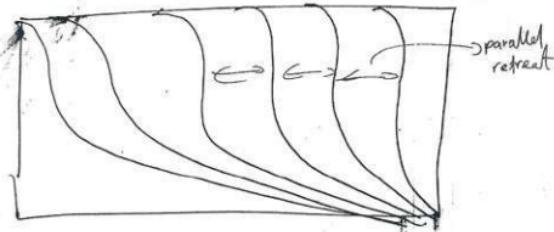
Maximum angle remains constant. The absolute length of all parts of the slope except the concavity remains constant. ~~as~~ ^{Concavity} increases in length and it takes place ~~always~~ always. \Downarrow

∴ Overall length increases

But ^{abs.} height remains constant.



i) ~~With~~ free space



it from

Wastur sheet \Rightarrow weathered materials existing on slope profile.

Penck

Davis \Rightarrow slope decline.

include

Youth state \Rightarrow high slope

Processes

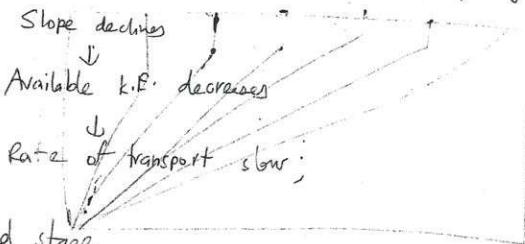
1. Reduction

Available kinfic energy $>$ work to be done

fa

Debris transported & removed quickly:

3. Renewal



balance b/w supply & removal of debris

Graded slope profile develops

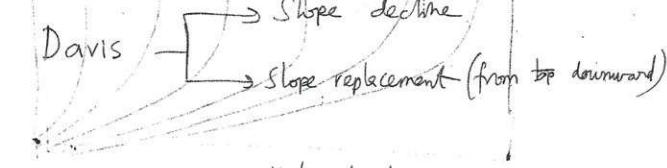
L.C.K

process

1. F

2.

factors



Penck

parallel retreat

Slope replacement (from below upward)

Pediplan

Twin pr

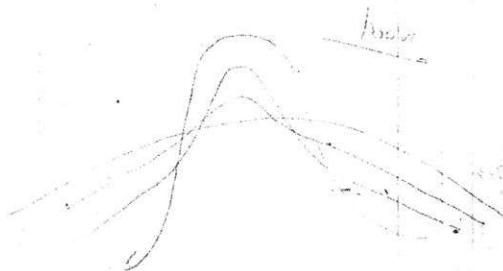
Pencil's

(9)

include parallel retreat dry.

Processes

1. Reduction \Rightarrow breaking regolith into finer particles by weathering.
 O, A, E, B, C (includes solutum + parent rock)
~~weathering~~
2. Denudation \Rightarrow removal of regolith material down-slope.
 factors:- Rate of weathering, mobility & climate.
3. Renewal of exposure \Rightarrow uncovering of parent rock material.



L-C. kmg

processes

1. Fluvial process (water erosion):-
2. Mass movement (due to gravity)

factors \Rightarrow local conditions
 resistant & strong bed rock
 bold, sufficient relief.

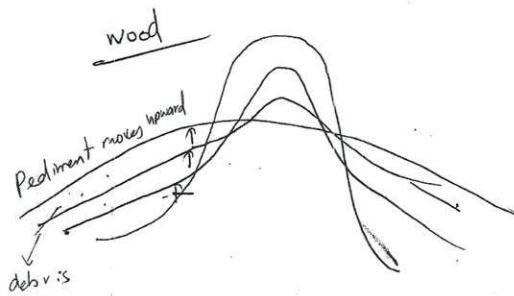
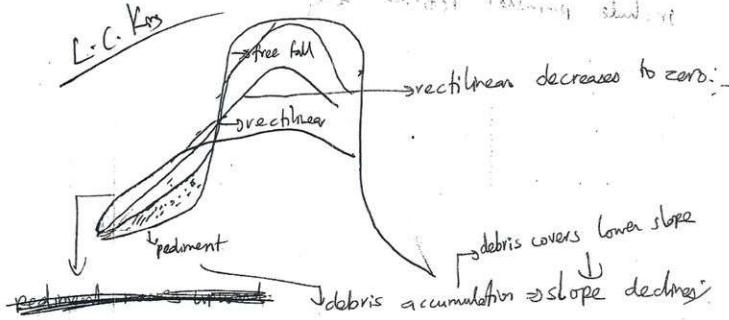
Pediplanation cycle

Twin process of scrap, retreat & re-deposition;

in top downward)

downward)

Pediplanation



Debris deposits on foot. ~~Pediment~~

- debris removal \leftarrow debris accumulation
- pediment moves upward at the cost of free face & rectilinear.

Free face & rectilinear disappears.

Debris covers the whole mountain

creates a plain-like structure

↓ drift

Concept
↓
NOT

eg:-

Nernst

Sc



Gentle
slope

16/12/12 1st test

23/12/12 2nd t

30/12/12 3rd t

6/01/12 4th t

Concept of Savigne

(11)

NOT theory; based on practical field observation.

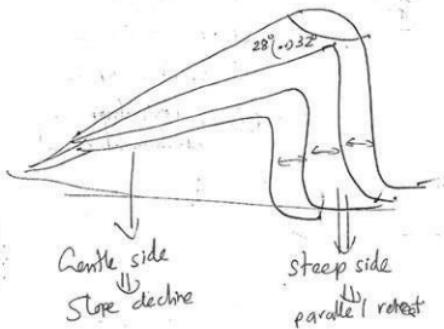
e.g.: Why is the steep cliff on Australian coast remain steep for more than 100 yrs?

Why no slope degradation?

Savigne

slope retreat decline on gentle side

parallel retreat on steep slope



16/12/12 1st test → Physical setting, agri & resources

23/12/12 2nd test → Industry, transport, cultural setting

30/12/12 3rd test ⇒ Population, Settlement

6/01/12 4th test ⇒ Soil science, environ, contemporary issues

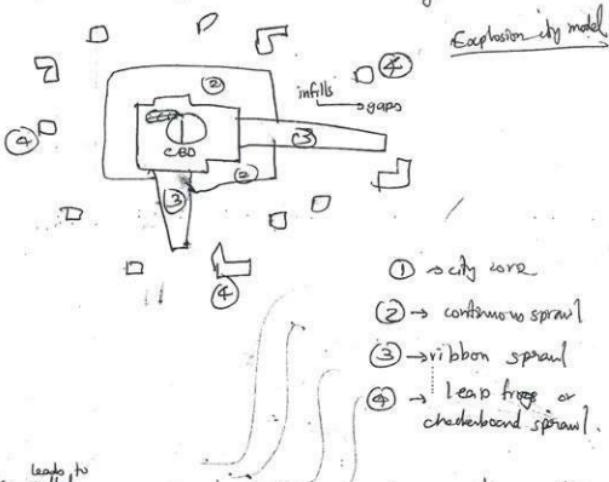
Urban Sprawl

Eg. of a met.

i) Eastern

- Areal expansion of rapidly growing cities
 - ↳ push factors (no space in the city, high rents)
 - either due to low class SQUATTER SETTLEMENTS or HIGHER CLASS SETTLEMENTS.
 - for big mansions, nice free environment (pull factor)

- Usually, expands linearly outward, along the roadways



Also leads to peri-urbanisation \Rightarrow dispersive urban growth \Rightarrow creates hybrid landscape \Rightarrow rural-urban fringes.

Also leads to suburbs, conurbation & formation of megacities.

It usually causes

1) Dispersion (less population density : e.g. higher classes build houses with lawns, etc. on huge tracts of land)

2) Discontinuity (leap-frog sprawl, no street in fig.)

3) Segregation of island-zones (a residential area, separated from the CBD by green spaces)

This encourages car-dependency (for higher classes) \rightarrow more emissions \rightarrow more obesity & NCDs.
 \rightarrow leads to fatal accidents.

Negative off

i) Sprawl :

1) Agri. l.

2) Can-depr.

3) Job st.

the city & working class now have

eg:- 50

5) lack of pr.

6) speculative but

* how to cont.

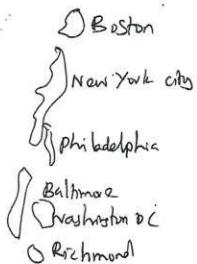
i) Smart g.

ii) Compact

a G

Eg. of a megalopolis formed by URBAN SPRAWL.

1) Eastern Seaboard of USA



INDIA
NCR Delhi

2) Tokyo, Nagoya, Osaka

3) Black country of UK → Birmingham, Wolverhampton, Bromwich, Wednesfield
(Can area of industrial bombing dept.).

Negative effects

- 1) Sprawl is essentially a 'low density zone' ⇒ consumes more land per capita
- 2) Agri. lands are converted for urban use → threat to food security
- 3) Car-dependent communities → obesity, emissions, accidents -
- 4) Job SPRAWL & SPATIAL MISMATCH

Many factories & malls which require huge land move out of the city & locate themselves in the sprawl. This adversely affects the workers, who live close to the CBD in the city-slums. They now have to REVERSE -~~REVERSE~~ COMMUTE - spending more on transport.

e.g. - 50% Black Americans in US slums suffer from SPATIAL MISMATCH (B/w CBD & new factories) due to slums

- 5) Lack of public goods/service access to those in sprawl.
- 6) Speculative builders are willing to build profit-makers ~~new~~ high class buildings, but not for low class affordable houses.

How to control?

↳ Urban planning & transport theory that concentrates growth in compact WALKABLE areas

- 1) Smart Growth → USA → Kentucky, Portland... centres to prevent sprawl.

- 2) Compact city (or) Urban intensification → and ⇒

↳ a GREEN BELT policy, that restricts new building outside cities

Some facts on cities - UNEP (Rio summit - 'future we want')

- 50% of humanity (3.5 b ppl) live in cities.
- By 2030, 60% of humanity will live in cities.
- In the next decade, 95% of urban expansion will take place in developing countries.
- 800 m ppl live in cities^{sheds} today (MDG 7 :- Rehabilitate at least 200 m slum ppl).
- Cities occupy just 2% of earth's land, but support 50% of population; account for 70% energy consumption & 75% carbon emissions.
- High density cities can bring efficiency gains & tech. innovation while reducing energy & resource consumption.

SUSTAINABLE CITIES

UN habitat \Rightarrow Prosperous Cities, 2012

New Delhi \rightarrow 53rd rank
Mumbai \rightarrow 58th rank } Medium performance.

Dimensions taken

- 1) Productivity \rightarrow job creation
- 2) Quality of life \rightarrow clean drinking water, health, edu.
- 3) Infrastructure \rightarrow transport, comm.
- 4) Equity \rightarrow Gini coefficient
- 5) Environmental sustainability \rightarrow emissions

What all makes a city sustainable?

- 1) Accessible public goods & services to all.
- 2) Cultural & social amenities are accessible to all.
- 3) Low cost, affordable houses.
- 4) Community links are strong & work together to deal with issues such as crime & security. (VIBRANT & COHESIVE CITY)
- 5) Areas of open space (parks, etc.) are safe, accessible & enjoyable.
- 6) Energy efficient homes.

- 7) Waste
- 8) Walkability
- 9) Safe &
- 10) Public
- 11) Shared
- 12) Limiting
- 13) Infra (
- 14) Renewa
- 15) Safet
- 16) Xeriscap
- 17) Green

(\Rightarrow - Mixed
Wholes)

(\Rightarrow - Au

what we want)

take place in

habitate at
a small pop.)

support

- carbon emissions

& tech.

- 7) Waste is seen as a resource and is recycled. (15)
- 8) Walkability & cyclability.
- 9) Safe & reliable public transport -
- 10) Public transport is seen as a viable alternative to cars.
- 11) Increased investment is made to the CBD
- 12) Limiting the city size, increasing its density, preventing sprawl.
- 13) Infra (roads, telecom, power)
- 14) Renewable energy.
- 15) Safe & clean drinking water.
- 16) Xeriscaping → garden & landscape design for water conservation.
↳ - Masdar City in Abu Dhabi;
Whitewall Burton in UK;
- 17) Green buildings (LEED → Leadership in Energy & Envir. design certification)
- ↳ - Auroville in India

issues

(15x)

enjoyable

4) Trade

FUNCTIONAL CLASSIFICATION OF CITIES

based on CITY-FORMING & CITY SERVING FUNCTIONS
economic activities

→ Ashok Mitra, Registrar of Census of India.

1) Manufacturing towns → near raw material sites; on transport lines.

→ segregation of business & houses.

• officers' quarters & labourers' dwellings are separate.

e.g.: - Jamshedpur, Bhilai, Rourkela, Bokaro, Durgapur, Chittaranjan,
Coimbatore → Mysore, Paper Nagar.

2) Admin. towns:

• national or provincial or district H.Q.

• imp. political establishments (Supreme Court, Parliament) located here.

e.g.: - New Delhi, Mumbai, Patna, Kolkata, Bhopal

3) Collection centres:

① Mining towns: metallic, non-metallic, precious stones or energy resources.

• Mining equipments & spcl. clothes & accessories needed for miners.

e.g.: - Digboi, Bailadila, Koyali (Gujarat), Jharia, Raniganj,
Zawar (Rajasthan).

→ ② fishing ports:

• used as base for boats, ships

• facilities for sorting, drying, freezing, canning fish.

• boat building, repair of nets, fishing equipments.

→ ③ Lumbering towns:

• collect & process wood.

• have saw-mills & joinery.

• paper mills.

• tree/plant nurseries & research centres.

e.g.: - Kathgodam, Kotdwara, Haldwani (Uttarakhand), Dimapur (Nagaland)

eg :- 1

Dehradun

5) Culture

6) Resort

7) Tourism

4) Trade centres :-

- Historically imp. trading routes.
- Specialization in trade.
- esp. in desert crossings, mountain passes, river crossings
silk road (longitudinal)
dunes Karakoram

eg:- Okha, Kandla (Gujarat), Kathar (Bikaner) → Agartala (Tripura)
Dehradun (Uttarakhand).

5) Cultural centre → education, religion

Shanti Niketan, Varanasi

↳ Resort town

↳ Financial town

-) located here.

tonic or energy
resources

for miners.

↳ Ramgarh

↳ fish -

rents -

Nagaland

10/10/13

ESSAY

introduction (1)

1) Whether
Where is
Read

- Choose a topic which you understand deeply.
- Do NOT choose a complicated topic, just for the sake being different. ⇒ Spend 15 mins for understanding it.
- Once chosen, spend 1 hour for brainstorming.
Content on
- ① Just jot down all points that comes to your mind.
(Don't keep any subheadings in mind)
- ② Now write down subheadings & split the above pts - into the subheadings.
- ③ Intro; Conclusion → in rough page; clarify it, weed it, clean it & prepare an attractive note.
- ④ Don't quote too many examples.
- ⑤ The no. of pages you write does NOT matter. Do NOT stretch the essay, without points.
- ⑥ Do NOT restrict to a particular subject.
 - Write broadly.
- ⑦ You can start with a story, depends on the topic.
- ⑧ Engage in course correction as & when you write the essay... Try to see if you go in the right direction.

I expect these essays

- Ethics
- Globalisation & homogenization;
- PDI → threat to the local industry.
- New media & national security.
- Unsafe women in globalised era.
- Gender is man-made.

→ Indian
→ Religion
→ Ration
→ New
→ Your
→ we ha

start (1)

the sake of
it.

our mind.
into the sub-headings
and its clean

. Do NOT

rite the
- direction .

19
'Whether Indian democracy?'
Where is Indian democracy upto?
→ Read every word carefully.

→ Don't choose a topic by your emotional attraction to it. Choose a topic based on your familiarity.

→ Try to see everything from a Mohenjo Daro perspective (earliest history).

→ Try to have a panoramic view (a global view).

→ Preamble → geographically, historically, socially, politically,
worldwide view economically, environmentally.

- Indian political parties don't have ideology.
- Religion & Capitalism are not same.
- Capitalism & religion.
- New World Economic order (NWO)
- Your vision of India in 2000.
- We have literates, but not educated.

→ Globalisation has destroyed Indian traditional society.

→ If I am the God.

→ Media activism.

→ Science & human values have negative correlate.

Globalisation → NOT a new phenomenon; Age old.

No! It has NOT destroyed.

• Globalisation → people, culture, business, finance, labour.

• Globalisation → adapted to our culture → for ex: veg KFC; KFC in diff. ateables
"beef";

• Homogenisation → McDonaldisation.

• IVC tree → ancient silk road

Chinese, Mesopotamian, Persian civilisations. Indo-Greeks
Parthians, S. Indians

Before our colonial rule

• Assimilation → Mughals, Akbar, Babur → Indianised

• Islam, Brighami, Chandigarh

• family system changes.

• Resilient kinship & community life.

• Globalisation & religion → worship has increased & diversified;

Pittsburgh ~~Messiah~~ Krishna temple.

Theosophical society: ~~Singapore~~ Malaysia, Manila

• Globalisation of Music → A.R.R., Pandit Ravi Shankar
Indian music thrives.

• Globalisation → global citizen at physique,
Indian citizen at heart.

• ~~phones~~ Iphones, KFC, chicken
↓ families dining together
people far beings close
at heart

• Globalisation of religion
Hindus, Muslims, Christians → but still the same principles
(Indrapuri culture) no much understanding
variation except the place of worship (parts of body)
Sikhism, Jainism, Islam, Christianity

• Some

• Globalisation

• Globalisation

remi

• Globalisation

• Glob

• Religion

• If

society

- Some aspects which have been destroyed
 - . traditional culture; varying tastes.
- Globalisation of business
 - . The craze for Indian cotton, tea.
- Globalisation of pol → Indian diaspora ⇒ more Indian even more remittances;
 - . than natives
 - . spread of culture.
- Globalisation of cinema → fans for SRK, AR abroad
- Globalisation vs. Americanisation;
 - . homogenisation
- Religion & Caste still predominant
 - . globalisation of caste & oppression ⇒ eg. - Bk Patel - Equality act.
 - . Globalisation & violence against women;
 - . remain conserved even today ...
 - . If Indian tradition Marriage - endogamy;

ed diversified

bvishukan
music theorist

1. Traditional
2. Modifications
3. Development
4. Contemporary
5. Social
6. Political
7. Cultural
8. Artistic

- X101
- Cou
 - Econ
 - (d)
 - His
 - Pop
 - . Indi
 - . Mir
 - . Fre
 - . Con
 - . Bill

- Intro
- 1) Globalisation vs. Americanisation
 - 2) McDonaldization & homogenization
 - 3) Indian society \rightarrow Globalised since 3000 BC.
 - 4) Globalisation \rightarrow Global + local \rightarrow KFC chicken;
 - 5) Indigenisation \rightarrow Akbar, Indo Greek, Partisans.
"hand of an Indian meets of Greek"
 - 6) Globalisation of ppl \rightarrow diaspora \rightarrow Indian culture spreads abroad
food, festivals
 - 7) Global citizen @ physique, Indian @ heart
 - 8) Globalisation of Music \rightarrow f. RauShana, AR Rahman
 - 9) Religion
 - more attendance @ temples
 - 2. same culture, rats looks are diff.
 - 10) ~~Globalisation of caste~~
 - 11) Family institutions & resilience
 - 12) Globalisation of media.

Polity

Traditional society

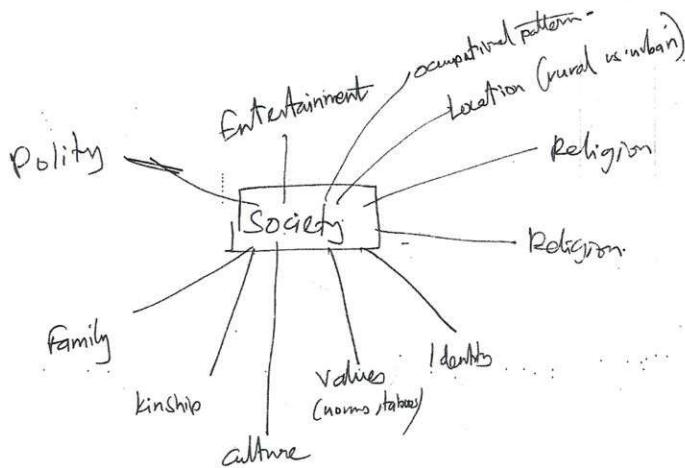
family;

Family

- . Individual
- . Skills
- . Knowledge
- . Attitude
- . Adaptive
- . Emotion

Xeo! Coco colonisation :-

- Consumerism.
- Identity crisis
- Homogenization;
- Pop culture
- Individualism
- Minimal role of state
- Food, dress.
- Community life;
- Bilingualism (Languages)



Individualism (relation b/w individual & society).

- Skills
- Knowledge
- Attitude
- Adaptability
- Emotional attachment

If I

Yes!

- Crimes against women.
- Joint family → nuclear family
(lack of adaptability, adjustability)
as: ~~increasingly~~ increasing rate of divorce.
- Values ^{ancestor worship} → respect for elderly → old age homes
- Time → children security → creches.
- Religion → self-styled Godmen; religion as a business tactic
e.g.: Akshay Tripathi.
- Family → marriage systems, gay marriage, live-in relationships
- Knowledge, info.; but NO values.

TV, print, social
Media

People
Bene
Public
Buss
politi
Secu
Priva
Love
Judi
Buss
Me

If I am God

(25)

I establish
of divorce.

- Interests, undiscovered
 - 1) Babic's thought process
 - 2) ~~for~~ Mind vs. heart

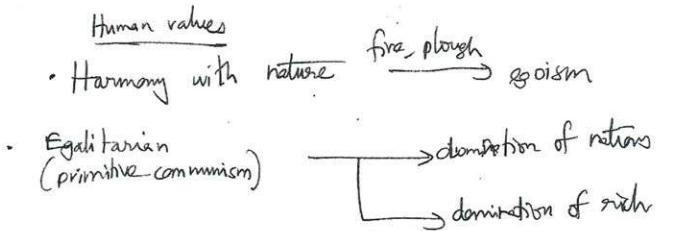
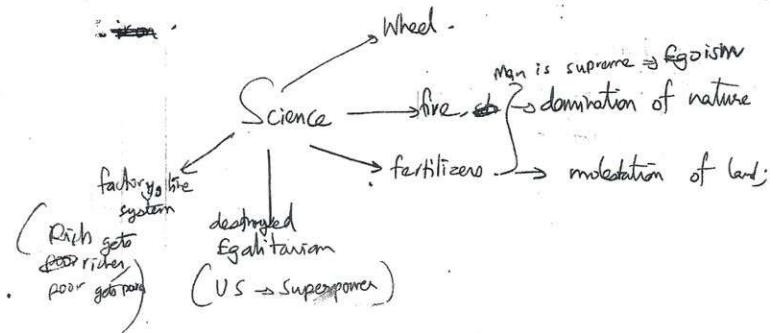
as tactic
Triage.
relationships

TV, print, social media



- People
- Benefits to media
- Public opinion
- Business & media
- Politics & media
- Security
- Privacy
- Sovereignty
- Judiciary
- Business & politicians
- Media in Nation

→ Advancement of science & human values have negative correlation.



Boundaries

1. Lines demarcating the outer limits of territory under the sovereign jurisdiction of a nation-state.
2. Inner oriented. The state tries to protect territory within its boundaries.
3. Centripetal
4. Separative factor
5. Political.
6. Linear
7. Artificial (man-made)
8. A phenomenon of the present (modern nation-states function on the basis of boundary)
9. It is artificial & hence can be moved (by a bilateral agreement)

Frontiers

(27)

Zones of varying width, separating the acmens of a given pair of states. These are sparsely populated & of little utility so the states on either side may not feel the need to define its limit precisely.

Outer-oriented. The states try to expand outer into the frontier.

Centrifugal

Integrating factor (it is a zone which has a particular way of life.) eg:- Nagas a communities in Indo-Myanmar frontier region.

Geographical.

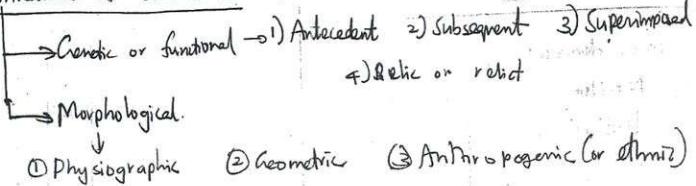
Areal (these are zones).

Natural.

A phenomenon of the past. (when there were ethnic communities who self-ruled).

It is natural -- geographic, linguistic, cultural or religious -- & cannot be moved.

Classification of boundaries



Genetic or functional

1. Antecedent → Boundaries predate the evolution of natural landscape.
 (at the time of exploration)
 eg:- USA, Canada ; Africa → Berlin conf. (1884)
 (both parallel)

2. Subsequent → boundaries evolve with the society & cultural landscape.
 eg:- nation-states in Europe, Indo-Pak ;

3. Superimposed → a type of subsequent boundary (boundaries formed after evolution of cultural landscape), but cultural division does NOT coincide with the boundary. The boundary is imposed by an external power or by the dominant of the 2 states.

eg:- Liberia, Nigeria, Togo, Somalia ⇒ imposed by colonial powers

4. Relic or Relict ⇒ They have lost their political function, but it is still noticeable in the cultural landscape. It results from smaller states are subsumed by larger states, or when old boundaries are redrawn.

eg:- Spanish America & Anglo-America (Canada & US), East & West Germany,

Morphological

1) Physiographic → follows some feature of the landscape

(a) Mountain → eg:- Indo-China, Chile-Argentina
 (Himalayas) (Andes)

Add:- 1) Stable 2) High & defensive 3) firmly fixed

Discusses:-
 1) No well defined crest (peak, which separates).
 2) No coincidence b/w crest & water divide.
 3) Presence of transverse valleys & passes.
 4) Dpt. of sky as a highway (air transport)



b) Rivers
 Ar

Discusses
 D

c) Lake



Milwaukee
 ch

son

2) GEOMETRY

- str.

eg:-

3) ANTHRO

- se

~~superimposed~~

3) Superimposed

mix (or ethnics)

natural landscape
Im conf. (1884)

atural landscape.

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imposed by an

colonial powers

inition, but it
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, or when

), East & West
Germany,

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notes)-

Q.

report)

b) Rivers → e.g.: Rio Grande (US-Mexico); Ganga (UP-Bihar)

Adv: -
1) Clearly fixed on map.

2) More linear than mountain (which has a width)

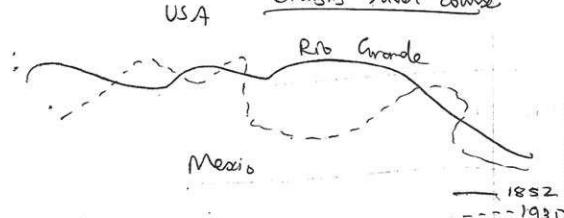
3) Wide streams can act as effective buffers.

Disadv: -

1) Drainage basin act as unifying rather than separating factor.
e.g.: Indo-Pak; Indo-B'desh

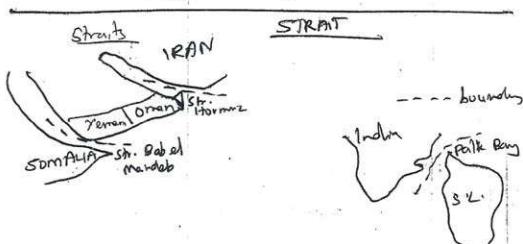
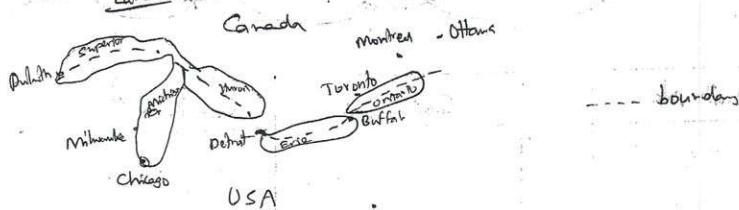
2) Rivers shifting courses, make admin & crime control difficult.
e.g.: Rio Grande

Changes river course



c) Lakes & Straits

- Divided exactly across the middle



2) GEOMETRIC

- straight line boundaries, following latitude & longitude.

e.g.: 49° parallel → US-Canada; 38° parallel → N. S. Korea

3) ANTHROPOGRAPHIC

- Separates political communities, based on nationality.

e.g.: most nation states in W-Europe.

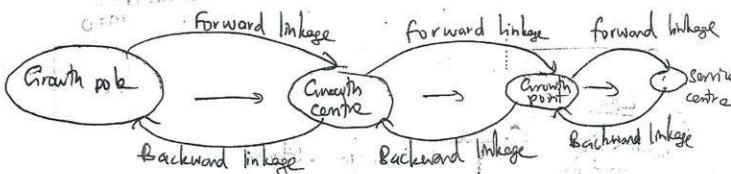
Growth pole

Growth is NOT ubiquitous, rather it occurs at poles centres & points with varying intensities and spreads through diverse channels and has varying terminal effects for the whole of the economy.

The variation in growth rate is due to variation in

- 1) Entrepreneurial innovations
- 2) Availability of resources

The inter-regional disparities in growth are bridged by diffusion of growth to surrounding areas of growth poles, via forward & backward linkages.



Growth pole	Growth centre	Growth point
1) Population \rightarrow 5-25 lakh	1 to 5 lakh (Tier-II)	< 1 lakh (developing country) $< 10,000$ (dwpd.)
2) Has a BASIC industry (capital goods industry) initially.	No capital goods ind. only light goods (consumer goods) & services	FOOD PROCESSING & consumer goods
3) Dominance of Z&S. eg:- financial, edm, cultural, medical, industrial, technological sectors.	Dominance of Z&S. eg:- grain, fruit & veg. markets, storage facilities for agri. goods, agri. inputs like fertilizers, pesticides, edm, cult. and medical facilities.	TV station, financial sector
eg:- Bokaro, Bhilai, Jamshedpur.	eg:- Faridabad, Gurugram, Sonipat, Panipat.	

Criticism

- 1) Difficult
- 2) Growth by arbitra
- 3) Politically
- 4) Growth p
- 5) "Islands"
- 6) Each
- 7) Threshold
- 8) Sectoral
- 9) Problem

RURA

- Zone e suburban area around hint
- Area where full c point when

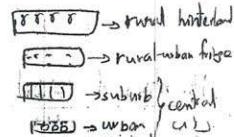
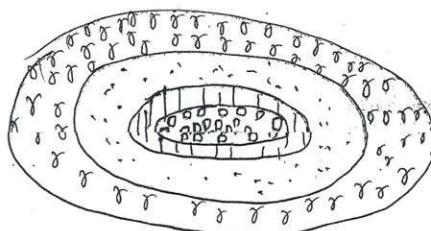
Criticism

- 1) Difficult to identify a growth pole
- 2) Growth poles develop due to some geographical advantage, not by arbitrary govt. selection.
- 3) Politically motivated selection → failure
eg:- Borgaigaon & Baruni.
- 4) Growth poles may not diffuse growth to surrounding areas.
eg:- Bhilai > Rourkela ⇒ no growth to Chhattis & Orissa.
⇒ "Islands of prosperity amidst oceans of poverty".
- 5) Each growth pole has a unique socio-economic-ecological problem.
- 6) Threshold overlaps (more than one growth pole serve area).
- 7) Sectoral composition of a growth pole differs.
- 8) Problem of social acceptability.

RURAL - URBAN FRINGE

Zone of transition between the continuously built-up urban & suburban areas ~~and~~ of the central city and the rural hinterland.

Area of mixed urban & rural land use between the point where full city services cease to be available and the point where agric. land use predominates.



Characteristics of rural urban fringe

- 1) Mix of land use.
- 2) Neither truly urban nor truly rural.
- 3) Mixed social & demographic character.
- 4) Land use → airports, golf course, horse race course, sewage treatment plants, large-sized godowns, farm house.
- 5) Agri. + INTENSIVE, and mainly grows PERISHABLE commodities.
eg:- fruits, vegetables, flowers, dairy products.
- 6) Encroachment by residential & industrial estates.
- 7) Size of landholdings is small. (due to Von Thunen's high rent).
- 8) Social amenities & public utility facilities are inadequate.
- 9) Constant change in land use. The land shifts from agri. to 2nd & 3rd activities.
- 10) It is also called GREEN BELT.
- 11) Ppl living in the fringe areas commute daily to their place of work in the city.
- 12) It is a problem area from the point of view of ADMINISTRATION, due to overlapping of jursis (b/w Panchayat & Municipalities).
The criminals escape the admin. boundaries after committing a crime in the neighbouring admin. areas.
- 13) Attracts middle class urban ppl for residential purpose.

Advantages of rural urban fringes

- 1) Creation of jobs in 2nd & 3rd industry for rural ppl due to relocable industry.
- 2) Better market for agri. produce (dairy products, horticulture).
- 3) Greater interaction b/w rural & urban ppl bridges rural-urban divide.

Problems o

- 1) Obnoxious

• Sar

• All

the urban
garbage ↗

This

generates

- 2) Diversion

• The

- 3) Exploitation

E

The village
economic

- 4) Land deg

• Ma

- 5) Social c

- Co

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- 6) Real est

- G

• SPE

- 7) Slums

- C

the fringe

- 8) Lack of

-

- 9) Crime rate

C

the police

Problems of urban-rural fringes

(33)

1) Obnoxious land use

- Serves as GARBAGE & SEWAGE dump of the city.
- All obnoxious land uses of the city are pushed to the urban-rural fringes e.g.: - sewage disposal tanks, garbage dumps, burial & cremation grounds, brick kilns.

This generates poisonous gases (by incineration) & generates chemical effluents.

2) Diversion of agri-land for non-agri-use:

- Threatens food security.

3) Exploitation of rural ppl.

Encroachment by urbanites - both poor & elite, as the villages do NOT have any admin. or political or economic clout to resist this oppression.

4) Land degradation

- Mixed land use → industries adjacent to agri fields degrade agri.

5) Social conflict

- Contradictory lifestyle of urbanites & villagers leads to a degradation of community feelings.

6) Real estate & land speculation:

- conc. of ownership (by illegal acquisition & encroachment).
- speculation & rising land values.

7) Slums

• Slums, which are uprooted from the city, relocate to the fringes. (e.g.: Jhuggi-jopra in Delhi).

8) Lack of social amenities

- Piped water, drainage - garbage dumps
- due to lack of overlap of admin. jurisdictions

9) Crime rate

Criminals perpetrating crime here can escape by crossing the police dist. boundaries.

National Urbanization Policy

- Main objective : To Develop a rural-urban continuum rather than a rural urban dichotomy.

• First priority to LOW COST URBAN HOUSING → both pvt. & public sector participation.

- Improvement of slums, rather than their removal or demolition.
eg:- Slum beautification programmes

• Urban Land Ceiling Act, 1976 → state govt. & local bodies given the right to acquire any private property for public use.

• SMALL & MEDIUM SIZED TOWNS

a) development of infrastructure.

b) incentives to entrepreneurs to est. industries.

↓
tax rebates, low cost lands, infra. facilities free of cost.

c) obligatory even for small (medium) towns to start preparing their master plans.

• Management of all cities/towns is given to the resp. state govt.

• Research & urban policy formulation on urban devt.

Principles of urban planning

1) Urban decentralisation (to bring down over拥挤ness by developing new suburbs).

2) Green belts, open spaces, garden suburbs.

3) New towns → satellite towns → well planned. eg:- Noida, Ghaziabad.

4) Expanded towns → rural-urban continuum.

5) Urban Renewal

6) Slum improvement

7) Rehab & redevelopment

8) Traffic segregation

9) City centric redevelopment 10) Planning for future cities

Vertical Mechanisms

1. Incoming solar
(insolation)
↓
UV

2. Long wave
↓
Infrared

3. Sensible heat
(by conduction)

4. Latent heat
(by evapo-

conduction
(sensible heat transfer)

- 4000 J.

- Oceans

Factors

1) Insolation -

→

2) Long wave IR radiation

3) Latent heat

4) Sensible heat

Ocean Heat Budget

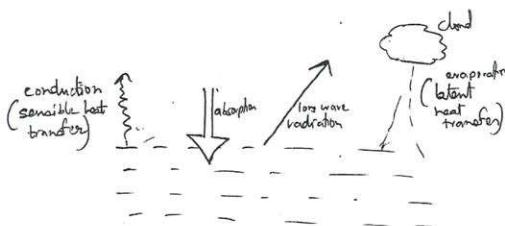
(35)

Vertical Mechanisms

1. Incoming solar radiation (51%)
 (insolation) \downarrow
 UV absorbed by ocean surface
2. Long wave ^{ocean} surface re-radiation
 Infra-red reflection $\Rightarrow 21\%$.
3. Sensible heat transfer $\Rightarrow 7\%$.
 (by conduction to atmosphere)
4. Latent heat transfer
 (by evaporation) $\Rightarrow 23\%$.

Horizontal

1. Advection (by winds)
 - piling up the warm water;
 - upswelling of cold water.
2. Ocean currents
3. Gyral formations



• 4000 Joules of energy is reqd. to heat 1 kg of seawater by 1°C .

• Oceans store & release much more heat than the land.

$$\Delta E_{\text{ocean}} = 100 \times \Delta E_{\text{land}}$$

factors

- 1) Insolation \rightarrow latitude, time of day, clouds, aerosols, dust, reflectivity \rightarrow roughness of sea surface
- 2) Long wave IR radiation \rightarrow Cloud \rightarrow lesser IR; Atmospheric humidity \rightarrow less IR; Water temp \rightarrow high IR; Ice cover on sea \rightarrow high IR.
- 3) Latent heat transfer \rightarrow wind speed (high latent heat trans), humidity (dry \rightarrow high heat trans)
- 4) Sensible heat \rightarrow heat diff. b/w sea & atmos

CONTRACT FARMING

Defn:-

Agricultural production carried out according to an agreement between a buyer & farmers, which establishes conditions for the production and marketing of farm products.

Typical clauses in a contract

- 1) General reciprocal obligations: the overall responsibilities of the contracting partners.
- 2) Specification of the agri. product to be produced, production technology to be used, plant/animal disease controls, transportation procedures, storage & quality standards.
- 3) Conditions for purchase, payment obligations, timing & modality of delivery.
- 4) Choice of jurisdiction to govern the contract.
- 5) Reference to a dispute settlement mechanism
- 6) The buyer may also commit to ~~support~~ supply of farm inputs, land preparation, provide technical advice & arrange transport of produce to the buyer's premises.

Benefits

- 1) Assured markets & prices.
- 2) Enhanced farmer access to production inputs, mechanisation, transport services & extension advice.
- 3) Assured quality & timeliness in delivery of farmers' produce.
- 4) Improved local infra., such as roads & irrigation facilities in sugar outgrower areas, tea roads, dairy workers / collection centres.
- 5) Access to credit (contract can be kept as collateral).

Types of

- 1) Centr
- 2) Nati
- 3) Mult
- 4) Infr
- 5) Inter

Problems in

- 1) Side
- 2) Input
- 3) Each farmer
- 4) Lack
- 5) Prob
- 6) Reduc
- 7) Over-
- 8) Soci.

a) Uniquita
The crop s

Benefits

- 5) Est. b
- 6) Assure
- 7) Only rec as MNC
- 8) Skill imp
fixed schedul

Types of contract farms

(37)

- 1) Centralized model
- 2) Nucleus estate model
- 3) Multipartite model
- 4) Informal model
- 5) Intermediary model

Problems in contract farming

- 1) Side sellers or extra-constitutional marketing by farmers (^{In case of price rise})
- 2) Input diversion by farmers. (if excess inputs are provided)
- 3) Exclusion of small-scale farmers (80% of Indian farmers have less than 2 acres; 66% have less than 1 acre).
Most cos. go for land of at least 5 acres, to attain a standardisation of product.
- 4) Lack of an exclusive legislation for agri. contracts.
- 5) Probability of monopoly of cos.
- 6) Reduced payments by cos., citing lack of quality.
- 7) Over-pricing for inputs & transport provided by the cos.
- 8) Social & cultural constraints \Rightarrow schedule of harvest coinciding with festive season or non-traditional seasons.
a) Unsuitable technology & crop incompatibility
(The crop should n't be farmers' traditional farm crops regime).

Benefits e.g.: Philippines \rightarrow farm feed cos; pig & poultry contract \rightarrow farm feed as input.

- 5) Est. backward & forward linkage b/w farms & the market.
- 6) Assure full capacity utilisation for processing cos.
- 7) Only resort for MNCs which require assured & timely supply as MNCs are NOT allowed to own land due to LAND TENURE ACT.
- 8) Skill impartis: - improves the efficiency of the farmer, by giving a better link between him & the market effectively; give knowledge about quality, cost reduction

Types of products under contract farming

• Non-traditional products.

• Those prone to market fluctuations (eg: sugar)

• Those not covered by MSP (unlike rice, wheat)

• perishable products (dairy, eggs, vegetables, fruits).

• Tree crops

Growth path

Temporal

Growth

Natural
death

• 10,000 y

• 2000

• upto

• 1750-60

• After

1)

• 1808

• 192

• 1961

• 1974

• 1988

• 2002

Evolution of contract farming

• Colonial period → indigo plantations

• 1960s → seed production cos.

• 1990 → Pepsi co. → tomato growing in Punjab → for tomato paste.

• Virginia tobacco → Andhra.

• Sikkim (outgrowers).

Suggestions

1) Collectivisation of farmers → 10 to 15 ^{small} farmers coming together and signing group contract with cos. (eg:- Thailand)

2) A strong legal framework to govern agri. contracts.

3) More transparent contracts.

4) Compulsory provisions of insurance & risk cover for crops.

5m-10m

8000 BC

↓

settled
agri.

Spots

1750 → 1

1930s

1950

Developed

1750

Developing

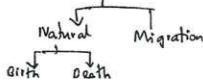
Population

(39)

Growth patterns

Jem福德

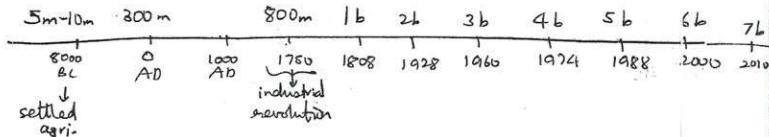
Growth → increase in population b/w 2 diff. points in time.



- 10,000 yrs ago (before settled agr.) → 5 m to 10m
- 2000 yrs ago → 300m
- upto 1000 AD → not much growth → due to epidemics - disasters, mortality famine
- 1750 → beginning of indu. revolution → 800m;
- After 1750 → high growth in western countries b/cz
 - 1) Improved std. of living
 - 2) Improved transport (to escape from famine disasters, ~~loss~~ epidemic)
 - 3) Health advancement → decline in mortality rate.
 - 4) Increase in agr. productivity

- 1808 → 1 b population
- 1928 → 2 b
- 1960 → 3 b
- 1974 → 4 b
- 1988 → 5 b
- 2000 → 6 b

Timeline



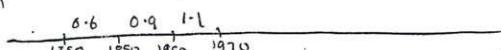
Statistical

1750 → 1900 → rapid growth in western countries.

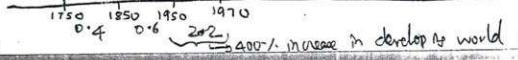
1930s → intro. of health tech. in Asia, Africa, Latin America → growth in population in South.

1950 → population stabilized in western countries.
growth rates

Developed



Developing



for home page.

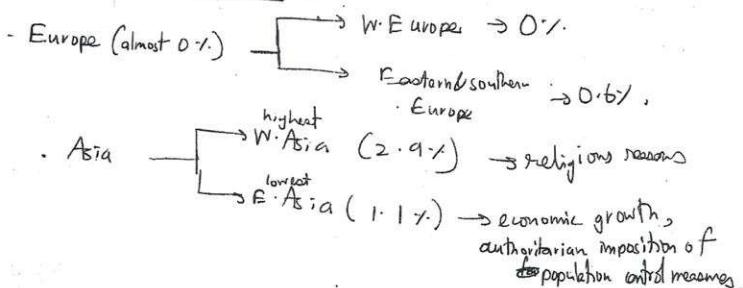
my together
Thailand)

Growth rate in various continents

- Europe → only continent with a negative annual growth of population.
- Africa → highest annual growth → 2% (e.g. Nigeria → 2.7%)
most population in Africa.
- S. America, Asia, Oceania, N. America ⇒ 1-2%.

Low density

Growth rate in specific regions



Factors

1) Climate

4) Mineral

Population distribution

Spacial

Hemispherical

Latitudinal

Altitude → 80% population live ^{N. Africa} 500m above sea level.

highest S. America (> 644m sea level)

lowest Asia (< 95 msl)

Resource

Resource ↑

Hig —

Lou —

High density regions

with of population

~~there less
→ 2.71.)~~

less in Africa.

by,

no reasons

growth,
imposition of
non control measures.

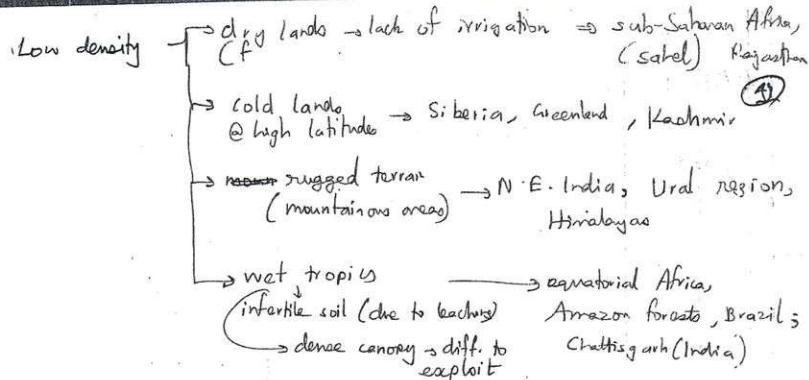
more (land) area
N. hemi -)

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gri - Threshent
, employment,
is, ranching,
inote

well.

→ S. Asia

(gives, Holland).
Philed, Boston, Richmond



Factors influencing population

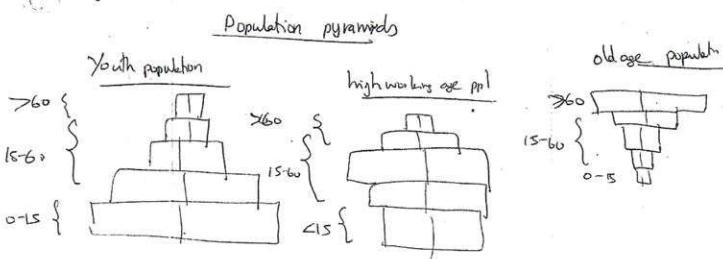
- 1) Climate
- 2) Topography
- 3) Agric. land
- 4) Mineral resources
- 5) Industry
- 6) Transport.

Resource & population ⇒ correlation

Resource	Population	
	High	Low
High	Crassotic plains (fertile soil) N.E. America (Appalachian cool) W. Europe (Ruhr and fields)	Equatorial Africa E. Russia Alaska
Low	Japan Singapore T.N. S.E. Asia	C. Australia Sahara Rajasthan

Demographic attributes (Structural features of population)

i) Age structure



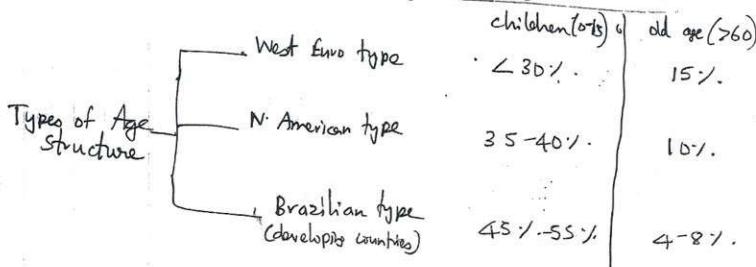
Age structure → no. of ppl in diff. age groups.

15-59 yrs → working age population

<15; >60 → dependent population.

more % of ppl <15 ⇒ demographic dividend (profit)

They'll constitute a huge workforce in
the future.



Age composition → fn (fertility rate, death rate).

high TFR → ~~broad base~~ broad base in population pyramid.

low death rate → broad apex in the pyramid.
low TFR;

TFR → Total Fertility Rate ⇒

TFR →
woman c
i) if
Specific fe
ii) if she
reprod

(latent).

population



(profit)

workforce n

old age (>60)

15%.

10%.

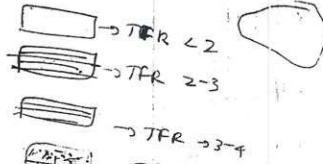
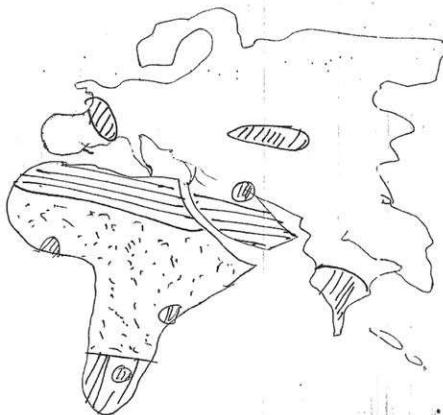
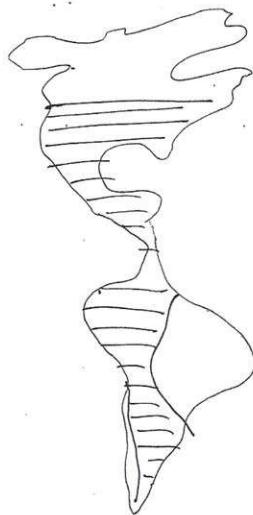
4-8%.

pyramid.

1.

TFR distribution

(43)



TFR → Avg. no. of children that would be born to a woman over her lifetime

- i) if she were to experience the exact current ASFR (Age Specific Fertility Rate) through her lifetime
- ii) if she were to survive from birth through the end of her reproductive life

TFR → 2.1 → Replacement level of fertility

to replace the 2 parents

to account for unforeseen mortality.

2) Sex composition

$$\text{Sex ratio} = \frac{\text{No. of females}}{\text{No. of males}} \times 1000$$

↓
important indicator of gender equality.

Factors influencing sex ratio

- 1) Differentiation in mortality → high MMR;
- 2) Sex ratio at birth (usually given by Child Sex Ratio (0-6 yrs))
↳ female foeticide
- 3) Sex selective migration.
↳ 50% of agri. labour are women.
Developing countries → males migrate to urban areas
(as sex ratio in cities is low)
- 4) Latitude → countries near equator produce more females than those near poles.
↳ not much female participation in agri & Brazil

Typical sex ratio @ birth → 105 males / 100 females
(more males are born than women).

However, male experience higher mortality (due to less immunity, unsafe workplace, crime) than female.

Sex ratio → female > male
1055 / 1000 males

- 5) Paternal & maternal age
- avg. sex ratio in the world.
- order of birth.

India → an anomaly

Sex ratio: 940 / 1000

Child sex ratio: 914 / 1000

Reasons
1) High MMR 2) Female foeticide (due to ~~sex~~)

3) Preference for male 4) Patriarchy, patri linea, patrilocal

5) Neglect of girl child → malnutrition

6) Child marriage → high MMR 7) Dowry

Highest sex ratios → Russia, USA, UK, Brazil, Bangladesh, SL
(1162/1000), (1030), (1020), (1020), (1025), (1030)

Lowest sex ratios → UAE, Kuwait, India, China
(456/1000), (649/1000), (940/1000), (954/1000)

Pak (917/1000), Bahrain (806/1000), Saudi (847/1000)

Rural - urb

• 50%.

• There w

• 80%.

Urban growth pattern
Hierachy

53%.

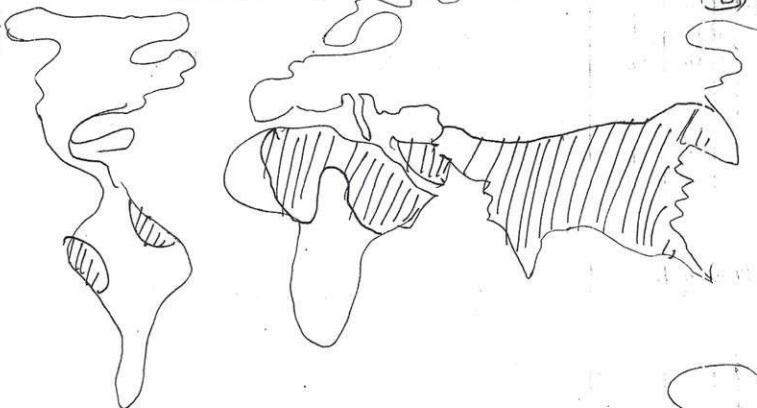
X
250,000

• Not

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• Every

Sex ratio



sex Ratio (at 6 yrs)

m are women.
urban areas
cities is low)

an areas.

population M aggr

emales

) .

, immunito,

→ more males than females
→ more females than males.

Rural-urban composition

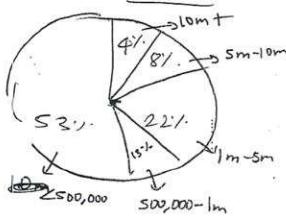
, 50% of world's population live in cities

• There will be 8 b city dwellers by 2030.

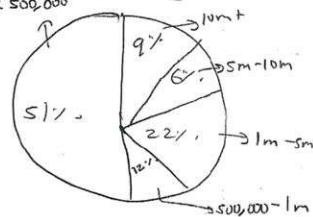
• 80% of city dwellers will be in developing countries, by 2030.

Urban growth pattern Hierarchy of cities

© 1925



© 2005



- Not all cities are becoming big.
- The distribution of world's urban population is characterized by continuity rather than a pattern of change.
- Every second, 2 ppl are added to urban population.

• (due to
urban sprawl size)

urbaN, Radial, linear,
patrilocal

richness:

7) Douring

(1975) (1980)
@ last, SL

China
(950/1000)
Sandwich (847/1000)

Urban change

Developed (N Amer, W Europe)	Developing (Asia, Latin America)	Africa
• Half of cities witnessed decline in population (-1% growth)	• Pace of urbanization decreases. 1950 → 3.8% → 2% 1980 2015	• Highest growth → 3-3%. • More primate cities.

New cycle starting to unfold in the South (Developing countries)?

• There is an assumption that all cities can achieve growth. This is wrong. Urban growth & decay are two sides of the same coin.

Region	Declining cities
Africa	11
Latin America	46
Asia	87
India	11
China	50

• Smart planning for cities should include smart planning for growth as well as decline.

Reasons for decline of cities

1) Suburbanization → movement of population to neighbouring cities with diff. politico-admin. structures.
Ex:- Jakarta, La Paz, Seoul.

2) Economic Decline → due to structural crisis, recession, single industrial base, poor recovery capacity.

Detroit (USA)

3) Selective decline → new admin. changes & settlement definitions, cities divided into smaller urban areas, reducing their physical space & no. of inhabitants.

4) Selective

a) Loss

b) Loca

c) Poor

Drivers of

1) Design

eg:-

S

2) Inves

Ch

3) Invest

- Fi

- Re

- I

4) Change

Cs

Transfe

Growth in

4) Selective decline (local reasons)

(47)

a) Loss of political importance

b) Local conflicts → Aleppo (Syria)

c) Poor envir conditions → Sizoramli (India).

Drivers of city growth

1) Reservation of economic zones.

• custom warehouses, EPZ, SEZ, FTA.

e.g.: - Shenzhen (China), Nashik, Hyderabad (IT friendly pols),

S. Korea → corporate city concept

2) Investment in transport infra

• roads, rail, ports, airports.

China → growth of eastern & central cities.

3) Investment in communication service & trade

• Financial trade → Hong Kong, Singapore, Kuala Lumpur.

• Real estate → Dubai, Doha

• IT cities → Hyderabad, Bangalore, Gumi (Korean silicon valley)

4) Change in city status

(size of city, boundary, legal status).

Transfer of capital city → Ankara (Turkey), Dodoma, Brasilia (Tanzania)

Growth in urbanization = Growth in slum population

↑ growth → 3-3%
intra cities.

↓?
new growth.
- sides of

at planning

to neighbouring

cession,
city.

↓ definitions
areas, reducing

Cities & natural hazards

- Most common natural hazards in cities (by decreasing preva-

- 1) Flood → infra to prevent ⇒ dams, dikes, flood retention area
↳ 30/63 cities
- 2) Cyclones → 2/3 of cities are located on coast
↳ 10/63 cities
- 3) Drought → 9/63 cities
- 4) Earthquakes → 6/63 cities
- 5) Volcano
- 6) Landslides.

disasters

- Tokyo → cyclone, earthquake, flood
- Delhi → drought, flood.
- New York → cyclone (hurricane), flood.
- Rio → floods.
- Shanghai → floods.

3 risks (multiple hazard)

- Philippines Manila → flood, cyclone, earthquake.
Indonesia Jakarta → landslides
- Guatemala { → drought, earthquake, flood
- Chile Santiago → also volcano & landslides.
- Quito (Ecuador) → also volcano & landslides.
Pacific-Andes

Regional

Country
US
Canada
India
China
Russia
Brazil
Mexico

Trends

- Increase
- USA's
- Russia

Why?

- 1) Oil

Measures

- 1)

- 2)

- 3)

Approach

Comp

Regional disparity → short & planning

(49)

- Regional disparity → disunity → disintegration

Regional disparity in selected countries
Weighted Gini index

Country	Weighted Gini index
USA	0.089
Canada	0.067
India	0.227
China	0.250
Russia	0.280
Brazil	0.267
Mexico	0.301

increasing
regional
disparity

Trends in disparity

- India → dramatic rise in inequality post 1992 (liberalization).
- USA's inequality is declining.
- Russia's inequality dramatically rises after 1991 (collapse of USSR)

Why regional disparity?

- 1) Differences in infra. & institutions (financial, political)
port, road, rail, airport, highways.

Measures to reduce inequality

- 1) Central intervention (CSS, Pfin. Commission transfers, Shadgil-Mukherjee formula, Planning Commission transfers)
- 2) Common market (economic union; greater inter-state flow of goods, services, capital & investment)
- 3) fiscal equalization

Approaches to equality

- Outcome → CSS, grant-in-aid.
- Opportunity → infra. & institutions
- Capacity → fiscal equalization (CSS)

Comparative Advantage
Deficit

→ Comparative Strengths/Advantages following

Differences in Infra (12th F.C. Report)

High → Haryana, M.P., Punjab

High moderate → G.J., T.N., Kerala, Haryana

Moderate → Andhra, Karnataka

Lower middle → H.P., M.P., W.B., U.P., Orissa

Low → N.E., J&K, Bihar, Rajasthan

Business climate (Doing Business report → WB)

- Time to start a business → 80 days in Orissa
57 days in Karnataka & Punjab.

- Time to close a business → 15 yrs in U.P.
8 yrs in Karnataka.

- Time to enforce a contract → 1000 days in U.P.
500 days in M.P.

- Time to register a property → high in power states.

Backwardness index (Raghuram Rajan) → to distribute plan funds through C.S.I.

10 indicators → equal weightage

1) Monthly per capita expen. 2) Education 3) Health 4) Household amenities

5) Poverty rate 6) Female literacy 7) % of SC/ST 8) Urbanisation rate

9) Fin. inclusion 10) Physical connectivity.

Out of 10
→ 0-6 → least devpd. → Odisha, Bihar, M.P., U.P.

0.4-0.6 → less developed → Gujarat

< 0.4 → relatively devpd. → Goa, Kerala, T.N.

100% → 28 states × 0.3 = 8.4%. → equally shared
→ remains 91.6%. → $\frac{3}{4}$ → based on needs
→ $\frac{1}{4}$ → based on performance

No 'spli' category state,

Gadgil-Mukherjee formula,
 ① Population (60%) ② Per capita income (25%)
 ③ Performance (7.5%) ④ Spl. problems (2.5%)
 tax fiscal discipline

Language

1) Indo-Euro

- Hindi

Haryanvi

Kacchi

2) Dravidic

- 2

- 7

Tribal

minor

3) Austr

A) Singh

- 6

- A

- As

Unifigre inst

- U

- Sc

- a

Deviation → 20%
Distance → 55%

Languages of India

(5)

1) Indo-European (Aryan) → Gangetic plains

- Hindi, Sanskrit, Bengali, Oriya, Assamese, Brijbasha, Marathi, Haryanvi, Awadhi, Bajpuri, Nepali, Maithili, Marathi, Kacchi, Sindhi, Pahari, Dogri, 73% of population.
- eastern
Himalayan.

2) Dravidian → peninsular.

- 20% of population.
- . Telugu, Tamil, Malayalam, Kannada.

Tribal → Gond, Baiga.

minor languages → Tulu, Khond, Kui, Parji

3) Austric (Nishada)

1.38% of population.

- Tribals of C. India → Santhals (50% of Austric language)
- Khasi, Jhantia, Nicobari.

4) Sino-Tibetan (Kirata)

- Himalayan → Tibetan, Ladakh, Lahuli, Lepcha, Bhutia
- Arunachal → Aka, Dele, Abor, Miri, Mishmi.
- Assam-Myanmar → Bodoland, Garo, Manipuri, Lushai.

Unifying influences

. Urdu → Sanskrit + Hindi
in

. Sanskrit, Persian, English → unifying role.
ancient medieval modern

Deviation → 20%
Distance → 25%
one (25%)
Bengali (2-5%)

Factors influencing rural settlements

- 1) Nature of topography → undulating, plain, hills
 dispersed, compact, dispersed
- 2) Local weather conditions → arid areas, cold deserts, semi-arid, moderate
 dispersed, semi-dispersed, compact
- 3) Quality of soil → very fertile
 compact
- 4) Nature of surface & ground water → compact settlements near oasis.
- 5) Pattern of Landholding → extensive, intensive small farms
 dispersed, compact
- 6) Social organisation → a strong community feeling → compact settlement (eg: Red Indians - USA)
 ↓
 caste-based → upper caste near the temples, lower caste far away.
- 7) Economic conditions

Rural settlement types

- 1) Strong point settlements
 - Security concerns → on a hillock, island, meander, fortress
 eg:- Durham (England).
- 2) Sprinkler settlement → natural springs → contact of permeable & impermeable rock
 ↓
 eg:- in J&K, in Dover (England)
- 3) Wet point settlements → around water bodies ; eg:- oases, lakes, ponds
- 4) Dry point settlements → to escape from floods (stilt houses, high land areas)
 ↓
 coastal areas of Kerala.
- 5) Pilgrim settlement → eg:- Tiruvarkkudal (TN)
- 6) Market settlements → weekly, biweekly markets.
- 7) Foothill settlements → Himalayan foothills
- 8) Transplanted settlements
- 9) Abandoned settlements

Rural
 Pattern →
 ↓
 fn (re)
 Patterns []

Cities

- Class I
- Class II
- Class III
- Class IV
- Class V
- Class VI

Cities →
 1) B
 2) I:

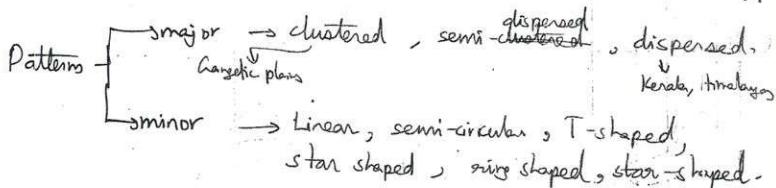
Cities =
 1) Industrial
 2) Sanitary
 3) Defence
 4) Migrant
 5) Ambulatory
 6) Transient

Rural settlement patterns

(53)

Pattern → spatial arrangement of settlements in relation to one another

fn (relief, climate, social factors, water supply, fertility, land usage)



not, moderate
permed compact

near basic

ll farms

T

ut (eg: Andhra-USA)

far away.

trees

stable & impermeable
soil

res, bleu, ponds

use, highland areas

Cities → hierarchical classification

	Population	% of urban pop
Class I	> 1 lakh	58%
Class II	50,000 - 1 lakh	12%
Class III	20,000 - 49,999	15%
Class IV	10,000 - 19,999	8%
Class V	5,000 - 9,999	5%
Class VI	< 5,000	2%

Cities → morphological classification

- 1) Hindu town ^{modest} _{old} ^{Chennai, Mumbai}
- 2) British town ^{modern} _{new} ^{Chennai, Mumbai}
- 2) Islamic town ^{old} _{old} ^{Middle East}
- 4) Modern planned town ^{modern} _{new} ^{Chandigarh}

Cities → functional classification (economic classification)

- 1) Industrial ^{factories} _{Jamshedpur, Bokaro}
- 2) Commercial / Market ^{shops} _{Ahmedabad}
- 3) Cultural ^{museums, theatres} _{Varanasi, Hyderabad}
- 4) Resort ^{hotels, spas} _{Shimla, Ooty}
- 5) Defence ^{military bases} _{Mumbai, Ambala, Visakhapatnam, Krishnagiri}
- 6) Administrative ^{govt offices} _{Bhopal, Chennai, Delhi}
- 7) Collection centres ^{markets, fairs} _{Varanasi, Hyderabad}
- 8) Transport towns ^{railways, ports} _{Mysore, Coromandel Coast, Okha, Kandla}

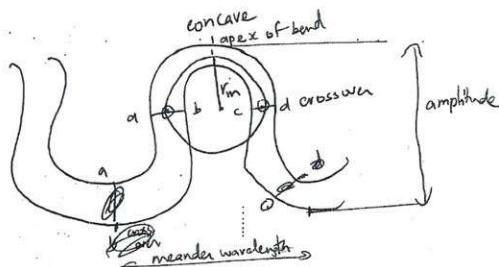
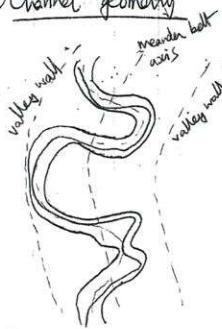
Mining
Fishing
Lumbering
Diamond, Sikkim,

04/11/13

Channel morphology

- 1) Channel geometry
- 2) Channel fluid dynamics & Hydraulic Geometry
- 3) Channel bed topography
- 4) Channel types
- 5) Channel patterns -

① Channel geometry



→ Thalweg

• Channel length, Channel depth, Thalweg → line joining points of max. depth.
line joining all midpoints across the channel, from source to mouth

- Sinuosity → deviation of actual channel path from theoretical (straight line) path.
- r_m → radius of curvature of a circle drawn through the apex of the bend and the two cross-over midpoints.
- Cross-over → straight line joining two points across the channel.
- Channel gradient → gradient (slope) of channel in downstream direction.
- Channel width → straight trans-sectional distance of channel.

② Hydraulic geometry & channel fluid dynamics

- ① Fluid dynamics
- ② Bed & bank materials
- ③ Sediment load

① FLUID DYNAMICS

$$\text{Discharge}, Q = W \times d \times V \rightarrow \text{average velocity.}$$

\downarrow
 $w \rightarrow \text{channel width}; d \rightarrow \text{channel depth}$

$$\text{Leopold & Maddock} \quad W = aQ^b; \quad d = cQ^f; \quad V = kQ^m;$$

$$a, c, k \rightarrow \text{constants}; \quad b, f, m \rightarrow \text{exponents}$$

$$a \times c \times k = 1; \quad b + f + m = 1$$

i) At - a - s

Re

(width, de)

$b = 0.2$

$b = 1$

$Q \rightarrow \text{discharge}$

width

ii) Downr

- relat

downstream

As

also incre
Wh

seem wi
torrent
backward

~~increases~~

∴ Wh

increases ↗

③ Bid.

↑

... for

Erodibility

④ Sedim

Sediment →
load

55

i) At-a-station relationships:

Relationship b/w discharge and channel variables (width, depth, velocity) at a particular point (gauge station) on channel.

$$b = 0.26; f = 0.40; m = 0.34$$

$$b + f + m = 1.0$$

$$W = a Q^{0.26} \Rightarrow \text{width} \propto (\text{discharge})^{0.26}$$

$$d = c Q^{0.40} \Rightarrow \text{depth} \propto \sqrt{\text{discharge}}$$

$$v = k Q^{0.34} \Rightarrow \text{velocity} \propto \sqrt[3]{\text{discharge}}$$

Q → discharge at gauge station

$$\text{width} \propto d$$

ii) Downstream variation in channel forms

$$b = 0.5; f = 0.4; m = 0.1$$

- relationship between discharge & channel variables in the downstream reaches of a channel (at successive gauge stations).

$$V \propto Q^{0.1}$$

As discharge increases, current velocity downstream

also increases.

While the velocity in the upper reaches of mountains may seem wild, actual velocity there is low as the mountain torrent flows in circular eddies with almost as much backward as forward motion.

$$\cancel{b > f > m} \rightarrow \cancel{\cancel{\cancel{\rightarrow}}}$$

∴ With downstream increase in discharge, the channel width increases most rapidly downstream, followed by depth & velocity.

③ Bed & bank materials

• Resistant & cohesive bank \Rightarrow restricts corrosion & lateral erosion
 \downarrow
 increases velocity \downarrow no channel widening

• ~~coarse & cohesive bed~~ \Rightarrow no bed erosion \Rightarrow no channel deepening

∴ Low 'W' & 'd', but high 'v'.

∴ b & f are low, while 'm' is high.

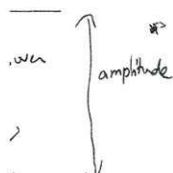
Erodibility of bank & bed \Rightarrow fn (cementation, pack of grains, vegetation, chemical bond).

④ Sediment load

Sediment load \rightarrow suspended sediment \Rightarrow narrow, deep channels (high velocity)

Sediment load \rightarrow bed material load \Rightarrow wide, shallow channels (high turbulence) \Rightarrow hydraulic lift - bed shear

try
Mens -



to of max. depth.

↓ (straight line) path.

xx of the bend

incl.

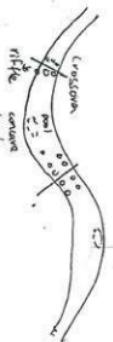
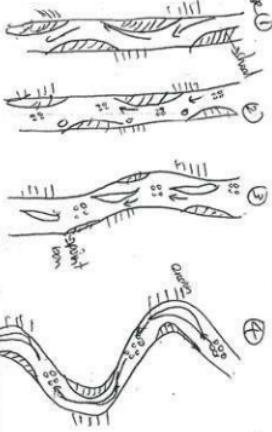
direction:

el.

ad.

③ Channel bed topography → riffles, pools, shoals, sand bars

Riffles



5-stage model (Keller)

① channel is straight; no pools & riffles; sand is arranged as asymmetric shoals.

② small-sized pools & riffles; spans = 3-5 times width; shoals still present.

③ fully developed pools & riffles; spans = 5-7 X width; length of pool = 1-5 length of riffle.

River banks develop a SINUOUS course; point bars develop

④ sinuous course; pool length $> 1.5 \times$ riffle length; spans $\Rightarrow 5-7 \times$ width.

⑤ new sets of pools & riffles; model spans $\Rightarrow 3-7 \times$ width.

Stage ①

Stage ②

Stage ③

Stage ④

Stage ⑤

④ Channel

Bedrock

① Bedrock

• with surface slope steeper than mean stream gradient.

• coarse bed material.

• Present at concave bank

• cross-section is symmetrical

• Present at convex bank

• Asymmetrical cross section.

→ color

→ may TD

→ Hy

→ thick

• Degrade

• sinuo

• bed top

• deposit

① Transverse bar shift

② Avulsion

• Alluvial ch

(2) Channel types

- (1) Bedrock channels (erosional channels or rock channels) (2) Alluvial channels (sedimentation channels).

① Bedrock channels (erosional).

- Developed on well consolidated bedrocks; straight line, less sinuous; nick points \rightarrow rapids.
- Rate of removal (erosion) exceeds sediment supply.
eg:- Colorado river \rightarrow Grand Canyon.

Types of erosion

- \rightarrow Corrasion or solution \rightarrow dissolution of soluble materials (carbonates)
- \rightarrow Corrasion or abrasion \rightarrow removal of loosened materials using tools of erosion (boulders, cobbles, pebbles)
- \rightarrow Hydraulic action \rightarrow breakdown of rocks by impact of water currents.

(2) ALLUVIAL CHANNELS (sedimentation)

eg:- Ganga - Yamuna plain;

- Thick sediments of mostly fluvial (river) origin are deposited.
- Degradation (erosion) \rightarrow aggradation (deposition) \rightarrow degradation.
- sinuous, meandering or braided.
- bed topography \rightarrow riffles, pools, sand bars, shoals;
- deposited alluvium \rightarrow highly erodible \rightarrow so, changes positions



(3) Avulsion (rapid channel diversion)



Alluvial channels \rightarrow stable \rightarrow straight channels

\rightarrow braided \rightarrow frequent changes in positions of sand bars / islands and even disappearance.

Channel pattern

usually associated with alluvial channels.

based on i) Simosity & ii) channel multiplicity

$$\text{Simosity Index} = \frac{L_c}{L_v} = \frac{\text{Channel Thwgs. length}}{\text{Valley length}} \quad \text{or} \quad \frac{\text{Channel length}}{\text{Length of meander belt axis}}$$

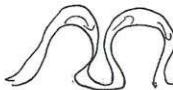
Braided Parameter = No. of braids in one meander wavelength.
(BP)

- ① Straight
- ② Meandering
- ③ Braided
- ④ Anastomosing
- ⑤ Anabranching

① STRAIGHT $\Rightarrow S\cdot I < 1.5$



② MEANDERING $\Rightarrow S\cdot I > 1.5$; pools & riffles.



③ BRAIDED $\Rightarrow BP > 1$; multiple channels divided by bars islands.

① longitudinal ② transverse.

frequent change in banks & bedways.

1 wavelength

high W/d

fluctuation in discharge

erodible banks.



④ Anastomosing channel pattern

A ~~special~~ - Stable braided channel.
bars islands do not shift



⑤ Anabranching \Rightarrow anabranches (offsets) \rightarrow rejoin the original trunk shortly



Slope

. Slope

& valley bi

factors to

. Slope

Genetic

j) Tc

Quantitative

- Gen

Approach

i) Theoretica

① Slope

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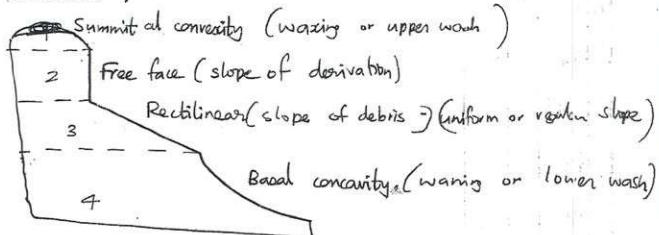
(i)

Slope development

(53)

- Slope → angular inclination of terrain between hill tops (crests) & valley bottoms, resulting from combinations of many causative factors like geological structure, climate, vegetation, drainage, etc.
- Slope → angular inclination
Slope profile → inclined surface,

Slope elements



Categoric classification → based on origin & drpt.

- 1) Tectonic slope 2) Erosional slope 3) Slope of accumulation.

Quantitative classification

- Gentle slope $\Rightarrow 0 - 5^\circ$; moderate slope $\Rightarrow 5 - 10^\circ$; Steep $\Rightarrow 10^\circ - 30^\circ$.

Approaches to study of slope drpt.

- 1) Theoretical 2) Experimental (lab) 3) Field (empirical)

① Slope evolution approach (Davisian)

- study of historical drpt. of slope.
- uniformitarianism → processes operating today have operated in the past, throughout the geological time, but with varying intensity & direction.

• Time dependent model.

- Original form (structure) is assumed → speculative to be free face (cliff).

• Presupposes continuous, uninterrupted slope decline.

- Rejuvenation or polygenic landforms not considered.

steep (youth)	moderate (mature)	gentle slope (old)
------------------	----------------------	-----------------------

FENNEMA

- con
- of rain
- 'Crest

- Base

Criticism

- 1. Fenn

into perme

. Mor

GILBERT

• conv

CREEP

• He c

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- Base

Criticism

- i) Slo

- ii) Does

LAWSBY

• convex

: Crest -
(Zone of EROS)

Base →
(ZONE OF
AGGRADATION)

2) Process-form approach

↓
degradation agent
(rain, wind)
(~~Creep & wash~~)

slope type

<u>Process</u>	<u>form</u>
• Pluvial (wash)	→ limestone <u>creep</u> → convex slope
• Fluvial (wash)	→ clay <u>rainwash</u> concave slope.

• Time-independent

Criticism

1) Slope drpt. is not controlled by a unique factor (process)

but also by climate, vegetation, etc.

2) Processes are slow and very difficult to observe & study.

3) All processes are not involved in slope drpt. It is difficult to isolate such processes.

4) This approach says slope drpt. is due to form & present day processes. But, the present day slopes are due to historical processes.

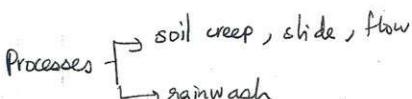
5) Climate controls slope forms & processes.

∴ Humid climate → fine debris. (process form) (chemical weathering)

Arid climate → coarse debris. (mechanical weathering)

But, L.C. King proposes 'climatological uniformitarianism'

all slope forms are found in all climates.



i) Monoprocess concept

A particular process only acts on the slope & produces a form.

e.g.:— creep → convex slope.

rainwash → concavity.

LAWSBY

• convex

: Crest -
(Zone of EROS)

Base →
(ZONE OF
AGGRADATION)

FENNNMAN

(61)

- convexo-concave slopes are due to differential actions of rainwash. (surface run-off)

- Crest (peak) \Rightarrow limited amt. of water, limited erosion tools (less sedimentary load) \Rightarrow less erosion only \downarrow smoothens the slope convex.
- Base \Rightarrow huge volume of water, erosion tools (pebbles, rubble) \Rightarrow maximum erosion \Rightarrow concave slope.

Criticism

- i) Fennman does NOT accomodate 'Creep' (infiltration of water into permeable rock) process, which is dominant in humid areas.
- More infiltration \rightarrow more creep

\hookrightarrow reduced surface runoff \rightarrow less rainwash.

GILBERT

- 
- The diagram shows a cross-section of a hillside with a 'soil layer' on top and 'initial slope profile' below. Arrows indicate infiltration paths from the surface down through the soil layer into the underlying rock, labeled 'final slope profile'.
- convexo-concave slopes are due to differential actions of CRBEP (infiltration) \Rightarrow water soaked soil flows downwardslope.
 - He considers a slope covered with soil:
 - Crest \Rightarrow infiltration \Rightarrow soil flow downwardslope \rightarrow min. soil cover \Rightarrow convex to facilitate \downarrow flow of soil.
 - Base \Rightarrow huge soil flow from up slope \Rightarrow deposition \rightarrow concave shape.

Criticism

- Soil layer on hills is Not always mobile.
- Does NOT talk about rainwash.

LAWSON

- convexo-concave slope is formed by erosion of rainwash.
- Crest \rightarrow water carries less load \Rightarrow so more energy \Rightarrow slope is eroded well \Rightarrow convex & rounded
- Base \Rightarrow eroded material from (zone of saturation) up slope is deposited \Rightarrow concave

Theories

i) Davis

(youth)

• convex

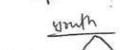
• valley deepening

• slope angle increases

• steep slope

• V-shaped v

• Creep down



Base level of erosion

Time

• weathered debris

• Graded with

on slope area
of the tran-

• De

Youth stage

Old stage

ii) Penck

• 1

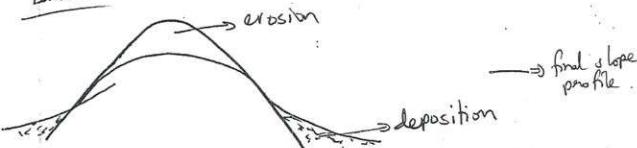
Properties

① Feature

② Thickness

③ Climate

Lawson



ii) POLYPROCESS

more than one process acts to give a convexo-concave slope.

- Crest \rightarrow creep \rightarrow summited convexity.

- Base \rightarrow ravinewash \rightarrow concavity.

Overtime, creep becomes sluggish but ravinewash continues.

So, length of concave segment increases & spreads over entire hillslope.

Models of slope evolution

1) Slope decline \Rightarrow steepest part of the slope progressively declines in angle, accompanied by development of convexity & concavity.

2) Slope replacement \Rightarrow The maximum angle decreases, as the steepest segment is replaced by gentle slopes from below. Finally, concavity spreads over the entire slope.

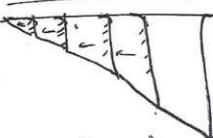
3) Parallel retreat \Rightarrow The maximum angle remains constant; absolute length of all slope segments except concavity remains constant. Concavity alone increases in length.

slope decline



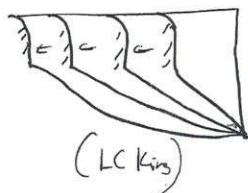
(Davis)

slope replacement



(Penck)

parallel retreat



(L C King)

Theories of slope evolution

(63)

→ find slope profile.

- concave slope *

sh continues.
the hillslope

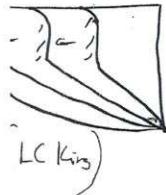
→ progressively
ity & concavity.

as the
from below.

is constant;

by remains

alluvial retreat



LC King

i) Davis → Slope decline.

(youth)
convex

(mature)
rectilinear

(old)
concave

- valley deepening

- increase in

slope angle.

(steep slope)

v shaped valley

U-shaped
valley

- valley deepening

& lateral erosion.

- lateral erosion

- slope angle decreases.

- Rainwash dominancy.

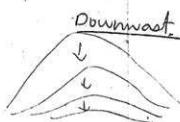
- Creep dominates

youth

Base level of
erosion

mature

old



. Time-dependent model.

- weathered material on slope ⇒ waste sheet.

- Graded waste sheet ⇒ ~~waste~~ the debris (weathered material) thickness on slope remains constant; this is because the transporting capacity of the transporting agent = energy reqd. to move the debris.

∴ Debris supplied = Debris removed ⇒ equilibrium state.

Youth stage ⇒ Graded slope profile has steep & debris is coarse gradient

Old stage ⇒ Graded slope profile has gentle & debris is fine gradient

ii) Penck → slope replacement.

- Morphological classification ⇒ based on present day form process - form.

Properties of forms

① ~~Teatral~~ (degree of) of regolith ② Mobility of regolith

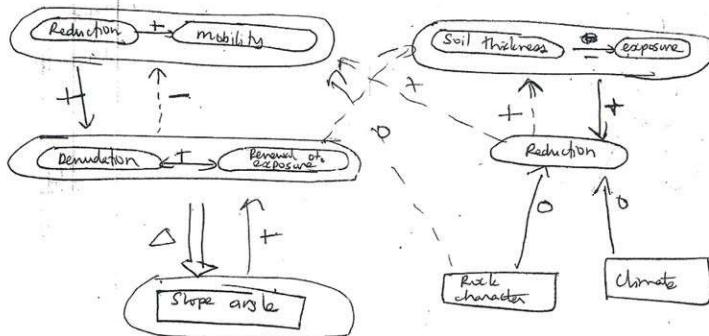
③ Thickness of regolith (wasteshell) ④ Exposure of slope surface

⑤ Climate ⑥ Slope angle ⑦ Rock property

Properties of processes

- ① Reduction (weathering)
- ② Denudation (transport)
- ③ Renewal of exposure

Young's process-response model based on Penck's



→ short-term effect
 → medium term effect
 \Rightarrow long-term effect
 (10,000-100,000 yrs)

+ ⇒ direct relation
 - ⇒ inverse
 o ⇒ n.n. parabolic
 △ ⇒ differential

[] ⇒ independent variable
 () ⇒ dependent variable

eg :- Bl

Nodd's r

i) parallel
 (slope)

initial

weatherhead
 accum

free
 repla

Assumptions

1. Form $\Rightarrow f_n$ (rate of vertical erosion, rate of denudation)
2. denudational process \rightarrow transports debris & exposes slope for weathering.
3. Parallel retreat \propto Slope.
4. steep slope is replaced by gentle slope from below.
5. flattening of slope takes place from below upward.
6. 3 rates of erosion
 - Accelerated
 - constant
 - decelerating
 → convex (waxing)
 → rectilinear
 → concave (waning)
7. Rate of weathering is uniform.
8. When steep mobility is attained, Rate of denudation = Rate of weathering.

val of exposure.

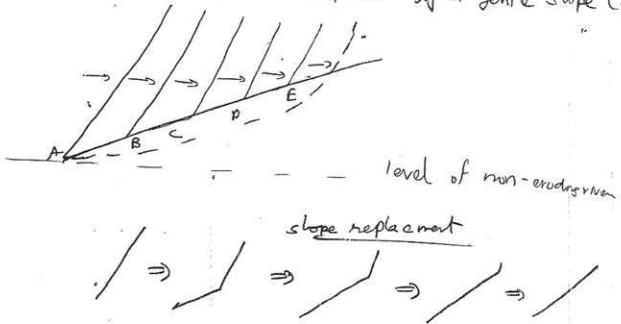
- Slope face except the lowest segment undergoes parallel retreat, since rate of weathering = rate of denudation.

- Lowest segment \Rightarrow not attained required mobility

so, rate of denudation $<$ rate of weathering

so, no parallel retreat

- So, the lowest segment is replaced by a gentle slope (slope replacement)



e.g.: - Shandur plateau (m.p.).

Wool's model

- i) parallel retreat
- ii) adjustment b/w rate of weathering & rate of transportation.

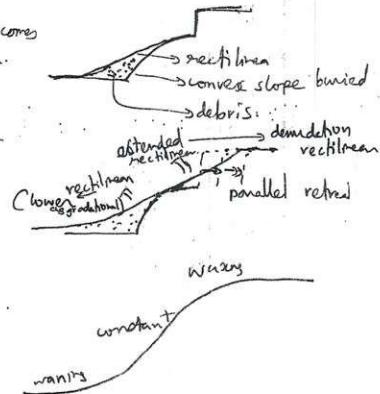
Initial \Rightarrow free face - convex



- weathered debris accumulation down slope \Rightarrow convex becomes rectilinear.



- free face undergoes parallel retreat
 \downarrow
replaced by rectilinear slope
 \downarrow
extended rectilinear



L.C. King (True parallel retreat) Pediplanation
empirical study (based on field observation)

- strahlen
- Pa
- . F
- . Carefully s
- geological
- . Max
- measured
- . It is
- . So, i
- segments) h
- ii) All
- rebreast
- iii) it
- iv) The
- is
- Chan

'Normal' hill \rightarrow cliff \rightarrow concave - rectilinear - concave

most 'Normal' climate \rightarrow humid

• Climatic uniformitarianism

PEDIPLANATION

i) Parallel retreat

- The free face undergoes retreat by backward.
- cannot be replaced by debris from below (as rate of weathering = rate of transport).

ii) Pedimentation

concave, triangular sedimentation formed at base

This gradually extends upward at the cost of rectilinear (debris slope) & free face.

extensive concave slope \rightarrow pediplan.



Savigear

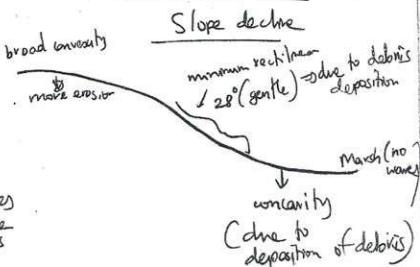
based on field evidence (Carmarthen Bay \Rightarrow South Wales)

Both i) parallel retreat & ii) slope decline can occur together in a single region of uniform climatic condition



e.g.: Rhana (parallel retreat).
Shortspur hill (slope decline)

western part of Carmarthen bay



Strahler

- Parallel retreat.

. Field study (slope angle measurement).

. Carefully selected areas of uniform conditions in terms of geological structure, lithology, climate, vegetation, soil, etc.

. Max. slope angles of all such slopes in that area is measured and the Mean max. slope angle is taken.

. It is found that each max. angle is almost equal to mean.

. So, i) in any one locality, all retreating slopes (steepest segments) have a similar max. slope angle.

ii) All these slopes, having max. slope angles, undergo parallel retreat, NOT slope decline.

iii) it is not necessary that all such slopes are of same age.

iv) The max. slope angle has developed such that the debris is transported easily (equilibrium \Rightarrow rate of slope $=$ rate of weathering $=$ rate of transport).

. Channel slope (hill slope) \propto Valley slope (ground slope).

If valley is steep, debris accumulated at ground can be removed easily. So, there is parallel retreat and hill slope is steep so as to equal the rate of removal.

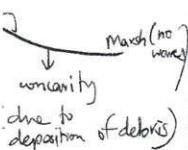
If valley is gentle, debris accumulates. So, slope of hill is gentle so as to maintain equilibrium \Rightarrow slope decline

Thus, it is similar to Saygar's theory.

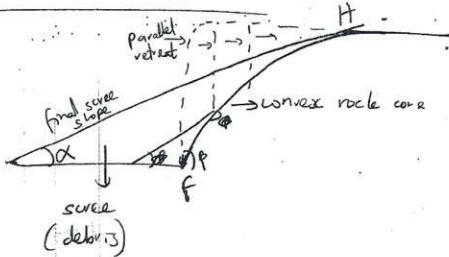
Carrathor

decline

in retreating
(gentle) \rightarrow due to debris deposition


Marsh (no waves)
worn away
due to deposition of debris)

Fisher-Lohmann model



Demudation

Denudation

given are
by "not
developed

H

Palaeo
geomorph

- cliff face undergoes parallel retreat
- Scree is accumulated at the base
- This scree buries the convex rock core.
- The lowest point of convex rock core is tangential to initial cliff angle (β).
- When parallel retreat is complete & the entire rock core is removed, the highest point of convex rock core becomes tangential to scree angle α' .
- Change in cliff angle (β) does not affect rock core.
- Change in scree angle (α) has a great effect on rock core.
 - Higher the scree slope angle, steepness of rock core increases.
 - Steepness of rock core depends on steepness of initial cliff angle (β).

Here $\beta = 90^\circ \Rightarrow$ so, convex rock core is very steep.
initial cliff angle -

- i) rejuven
- ii) preser
- iii) Glaci
- iv) Drain
- v) Relic
- vi) Fault
- vii) Lava

Criticism
This

- i) geolog
- ii) past

Erosion

- Plain
- * remnant
- They
- It
- old stock
- Provid
- Type

Denudation chronology. (Upliftment, denudation, stream rejuvenation, gleration, knick points, etc.) (69)

Denudation chronology → construction of denudational history of a given region. It is a historical approach of landform study by "identifying, interpreting & dating the planation (erosion) surfaces developed in past cycles of erosion".

It is based on cyclic concept of Davis

- 2) uniformitarianism
- 3) present is key to the past

Palimpsest topography → A surface which bears the imprint of geomorphological processes during past geological periods.

It is based on evidences of

- i) rejuvenation (knick points, incised meanders)
- ii) preservation of past landforms by sedimentary deposits (unconformities)
- iii) Glaciation (glacial tillites, glacial boulders) → vindhyas, carboniferous, pleistocene
- iv) Drainage patterns (fluvial processes) → denudation
- v) Relic surfaces
- vi) Faults → past tectonic events → upliftment
- vii) Lava flows → pre-Dalma, Gondwana (Gondwana), devian ~~trap~~ trap

Criticism

This approach is highly deductive & speculative since

- i) geological evidences are not available.
- ii) past landforms are destroyed by recent erosion.

Erosion surface (planation surface)

Plain topographic features having undulating ground surface and remnant low reliefs caused by denudational processes.

They cut across various geological formations & structures.

• It is nearly flat, very close to base level and almost in old stage.

• Provide an important clue for reconstruction & denudation chronology.

• Types of erosion surfaces → peneplain, pampains, pediplains, etc., plains, marineplains, cryoplains (by periglaciation)

Factors

- Erosion surfaces are formed due to erosion of different rock types (soft & hard) and different geological structures (folded, faulted, univariant, etc.) alike.

- In simple words, all parts of land surface that are not directly depositional in origin are erosion surfaces.

Identification of erosion surfaces

Since a long geological period is reqd. for complete denudation to base level, there are no post-Tertiary erosion surface.

Erosion surfaces are not present near the theoretical base level (as they should have been) - since they may have been uplifted (e.g.- Chatarpur). So, their identification becomes difficult.

Identification techniques

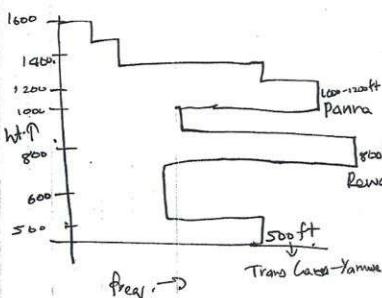
- Altimetric frequency histogram } \Rightarrow frequency maxima are found
- Altimetric frequency curve } \downarrow
- Superimposed profiles

these frequency maxima indicate a 'surface'

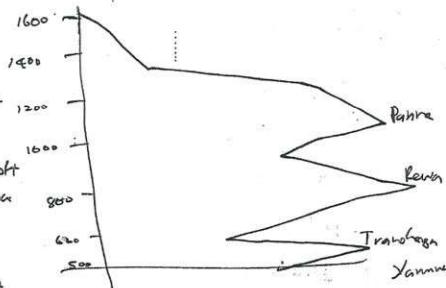
whether these surfaces are 'structural' or 'erosional' can be found using FIELD CHECKS.

Bihar basin

Altimetric frequency histogram



Altimetric Frequency curve



Dating

i) Height

HEIGHT

and
above

• It

formation

Disad : - The

2) GEOLOGI

- E

hence, they

Disad:

i) The

is resourc

3) Radiod

- b

Disad

f different
structures

are not

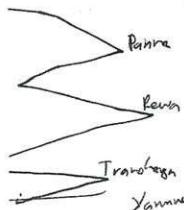
ste denudation
surface.

ical base level
led (e.g.: Chittagong).

axima are found

indicate a 'surface'

ubord' or
o CHECKS -



Factors which modify erosion surfaces.

(7)

- i) Age \rightarrow more age \rightarrow more denudation.
- ii) Thickness of \Rightarrow sedimentary deposits \Rightarrow protect the surface from changes.
- iii) Hardness of rock \Rightarrow hard rock \rightarrow more resistant to erosion.
- iv) Streams \Rightarrow high stream frequency & density \Rightarrow more changes

Dating of erosion surfaces

- 1) Height correlation
- 2) Geological unconformity
- 3) Radio-carbon dating.

1) HEIGHT CORRELATION \rightarrow correlation of the concerned surface with another erosion surface at another place, the age of which is already known.

• It is believed that the entire erosion surface at the time of formation will be of uniform elevation everywhere & is continuous.
Disad: - The original surface might be deformed due to tectonic movements, folding etc.: - Parcels plates wrinkles.

2) GEOLOGICAL UNCONFORMITY

• Erosion surfaces are protected by sedimentary cover; hence, they are preserved & their age can be estimated from age of deposit.

Disad.

- i) There might be missing of old & new deposits.
- ii) The sedimentary cover may be removed & buried surface is resurrected & undergoes modification.
 \rightarrow e.g.: - Hondwana Rediplain in S-Africa
(wrongly predicted as Tertiary as it carried Miocene sediments)

3) Radio-carbon dating.

- Absolute age of erosion surface can be found.
- based on amount of C-14 isotope in fossils in the stratigraphy.

Disad: Not useful to predict surfaces formed before evolution of life.

Denudation chronology & erosion surfaces of Chotanagpur highlands

- 1) Pre-Dalma
- 2) Pre-Cambrian
- 3) Carboniferous
- 4) Permian-Triassic
- 5) Gondwana
- 6) Tertiary

1) Pre-Dalma erosion surface

- Upliftment in Archean period.
 - uplifted landmass was reemplaced in the cycle of erosion.
 - lava flow in Dalma period.
 - Dalma lava sheet has preserved some erosional surfaces (unconformities)
- Ex:- Dhenjori highlands (preserved by sandstone - conglomerate),

2) Pre-Cambrian erosion surface

- Fluvial process \rightarrow denudation \rightarrow granite-grass base exposed.
- Erosional unconformity \rightarrow Kolhan highland (preserved by sandstone - conglomerate).

3) Carboniferous

- Carboniferous GLACIATION \rightarrow entire Gondwanaland is covered by ice sheet
(S. Africa, S. India, And., S. America)
- evidence for glaciation - glacial boulders found in Taticher coal mines of Orissa. (Chotanagpur).
- interglacial period \rightarrow ice sheets retreat \Rightarrow mashas, swamps, lakes formed.

4) Permian-Triassic

- carboniferous ice sheet completely retreated
- exposed highlands are denuded.
- reupliftment in Triassic period.
- This reupliftment is then completely denuded,

5) Gondwana

• Perm

Cretaceous

• Creta

• Monso

• Su

in other

• Gond

• This

• Gond

6) Tertiary

3

1st up

2nd up

3rd up

Ti

Thus,

& is a

Geological time scale

Primary or
1^o (Paleozoic)

2^o (Mesozoic)

3^o (Tertiary)

Archaean \rightarrow Dalma \rightarrow Pre-Cambrian \rightarrow Cambrian O S D C P \rightarrow Triassic Jurassic (reducing) \rightarrow PEOMP

\downarrow
Carboniferous
Permian

\downarrow
Quaternary
Pleistocene, Holocene

highlands

ic

nonconformities
exist).

sandstone -
calcareous).

covered by ice sheet
meria).

oil mines
pm).

napped blds formed.

5) Gondwana surface.

- Permian-Triassic cycle of erosion is interrupted by Cretaceous volcanic flow.
- Cretaceous period \rightarrow peninsular India is separated from Gondwanaland.
- Monsoon climate originates \rightarrow heavy rain \rightarrow rapid fluvial erosion.
 (Gondwana cycle,
 denudation
 Gondwana surface)
- Such contemporary & identical Gondwana surfaces are found in other parts of Gondwanaland (e.g. America, Africa, Asia) also.
- Gondwana cycle is also called Pre-tectonic cycle in India.
- This cycle of erosion is interrupted by Deccan lava flow.
- Gondwana surface \rightarrow escarpments, undulations below in elevation, sloped eastward.

6) Tertiary period.

- 3 phases of upliftment in Chotanagpur (as a result of Himalayan orogeny).
 - 1st upliftment \rightarrow Miocene period \Rightarrow 305 m;
 - 2nd upliftment \rightarrow Pliocene \rightarrow western part of Chotanagpur uplifted by 305 m;
 - 3rd phase \rightarrow 305 m.
- Total upliftment of S.W. Chotanagpur \Rightarrow $305 + 305 + 305 = 915m$
 (partland).

Thus, Chotanagpur plateau is polygenic in origin
 (\downarrow
 multiple cycles of erosion)
 & is a true palimpsest topography.

20000 ft) 30 (Tertiary)
 Jurassic Cretaceous \rightarrow Pliocene
 \downarrow
 Quaternary
 Pliocene & Holocene

Applied Geomorphology

1) Regional planning:

Planning objectives

1) Achieving growth of society

2) removing socio-economic disparities by exploiting natural/human resources.

Spatial unit of planning \Rightarrow administrative unit to watershed as an unit (DRAINAGE BASIN)
 cross-cutting physiographic units; diff. resources, diff. problems.
 uniform planning not possible

DRAINAGE BASIN \Rightarrow an ideal geomorphological unit characterized by relationships b/w basin reliefs, fluvial processes & man.

Geoenvironmental & human problems are almost the same throughout the basin bcoz of geomorphic and hydrologic uniformity.

eg:- Chambal drainage basin (MP & UP) \Rightarrow geoenvironmental problem: gravitation, rill/gully erosion, land degradation
 human problem: dacoity; ravines as hide-outs; degraded land \rightarrow no agri; dacoity
 construction of levee

Planning units drainage basin as a unit \Rightarrow Tennessee Valley Authority, Damodar Valley Corp.

understanding channel drainage, channel geometry & flow, sedimentation load
 helps to control erosion

2) Hazard management

. Hazard (process) & disaster (end)

. Hazards (climate change \rightarrow change in hydrology, change in vegetation cover, diastrophic earth movements (fault, fold))

. Disasters \rightarrow sudden earth movements (volcano, earthquake)

- mass movements (landslide, avalanche)

. floods

. Geomorph

VOLCANO

EARTHQ

prev

FLOOD

prev

③ Urbaniza

pre - Field su
post

effect of

eg:- A1

urban expansi

water

future

sound an

Geomorphic knowledge → identifying, prediction & management of hazards

(75)

VOLCANO → i) change in temp. of crater lakes, geysers, hot springs.

ii) monitoring gases from "

iii) histories of eruption → predicting future eruption

iv) path of lava flows (lava) → by assessing topography & possible eruption points.

EARTHQUAKE → i) regular measurement of seismic movements & tremors.

ii) regular measurement of earth surface tilt by tiltmeters.

iii) measurement of local gravity & magnetic fields.

iv) avoid construction on fault zones, fragile slopes.

FLOODS → by understanding channel geometry, morphology & pattern

bed sedimentary load, erodibility of banks

prevention rate of erosion at upper catchment

i) divert flow of water (through diversion channels)

ii) hasten discharge of water (by straightening meanders)

iii) protective embankments & levees.

iv) flood plain zoning

construction
of levees

→ confines flood water

high rate of erosion
in catchment

Sedimentation → river bed increases → levee is breached

3) Urbanization

vegetation load

pre - Field survey, terrain classification, selection of alternative location.

post effect of urban community on natural processes & vice versa.

e.g.: - Allahabad (in the lap of Ganges Yamuna).

urban expansion into the geomorphologically unsuitable lowland (KACHA).

waterlogging (no drainage), floods, weak foundation, slope collapse.

Future physical growth should be oriented towards geomorphically sound areas of Jhusi & Phaphamau.

spacities by
resources.

RAINFOREST BASIN
treated as an
unit

characterized by
processes & math.

at the same
geographic uniformity.

human problem
decreased; ravines
are hide onto;
graded land → no agri
↓
decreased

vegetation load

vegetation cover
)
ke)

4) Engineering:-

Dams

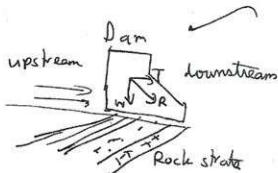
- Porous, permeable rocks \rightarrow leakage of water \rightarrow percolation & seepage.
(e.g.: Limestone), ~~compaction~~

- Shale
 - \rightarrow cementation shale ✓
 - \rightarrow compaction shale X
swells.

- Strata dipping ~~downward~~ upstream ✓

i) prevents percolation

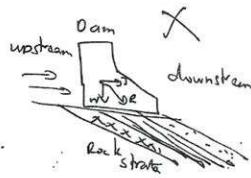
ii) perpendicular to 'R' \Rightarrow good foundation



- Strata dipping downstream X

i) allows water seepage

ii) parallel to 'R' \Rightarrow cause dislocation.

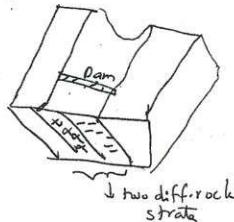


- Fault zones & fractures X
esp across the length of the dam

- Dams across rock strata X

diff. \downarrow
rocks

diff. properties \rightarrow unequal settlement



Bridges

i) Nature of rock \Rightarrow strong & durable; no joint, fault, fracture;

ii) Structure of rock \Rightarrow along strike, strata dipping upstream.

iii) River channel \rightarrow sedimentary load, channel pattern
bending river \rightarrow max. velocity at concave bank.

Tunnels

i) SWA

ii) Fan

iii) N

iv) Fo



Presar.
water

Roads

i) Presae

and for

e

2) C

3) Strat

4) Stee

Air strip

i) flat

ii) leve

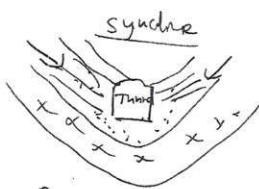
iii) fr

iv) ab

Tunnels

(7)

- swelling rocks (shale) X \Rightarrow absorb moisture & swell displacement.
- Fault zones X \Rightarrow if it is not possible to avoid, tunnel should be driven at right angles to fault (minimum reaction).
- Waterbearing rock (aquifers) X \Rightarrow makes construction difficult (causes floods)
- Folded rocks: Anticline \checkmark
Syncline X



Roads

- presence of permafrost in periglacial region X
 - one vegetation is removed, permafrost melts (thaws) and forms thermokarst lakes \Rightarrow collapse of surface
 - Trans-Siberian railway.

2) Carbonate rocks & karst topo X
underground caverns, swallow holes \Rightarrow collapse.

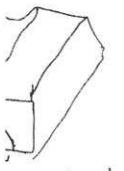
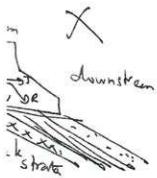
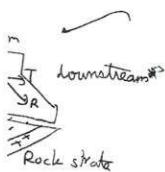
3) Stratigraphy \rightarrow buried lakes (paleo lakes), X ? by denudation high water table aquifers X } chronology

4) Steep slopes X, prone to slope failure X.

Air strips

- flat terrain with resistant rock.
- level slope
- free from flood
- absence of fog

seepage



two diff. rock strata

fractures upstream.

erosion
narrow bank.

(B) Hydrology

- porosity & permeability
- artesian wells.
- limestone capped by sandstone → filters (pure water)
good porosity
- karst topo \Rightarrow swallow hole \rightarrow no filtration \rightarrow impure water
- Buried periglacial (denudation chronology) interglacial valleys ✓
- Alluvial sand ✓ (eg: Great Plains of N. Amer.)

Age c
1) Ocean s
4) Radio

Geophysics

i) Lith.
Kober's
- con.
- ori.
- ren

(C) Mineral exploration

i) Ridges $\xrightarrow{\text{(positive topographic expression)}}$ veins

quartz, lead, zinc

2) Weathering \rightarrow Al, Mn, Ni \rightarrow bauxite (weathered kaolinite bauxite)

es:- Ranchi, Palaman (pallards):

elimination of 'Al' due to rainfall;

elimination at bottom \rightarrow forms bauxite.

3) Placers \rightarrow mixtures of heavy metals; aggregates of chemically weathering & erosion.

Residual placer X

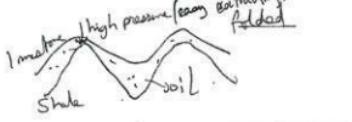
Alluvial placer \rightarrow platinum

Colluvium placers \rightarrow gold

4) Mineral oil

porous & permeable rock (sandstone, limestone) ✓

limestone (permeable)
(oil) \parallel \parallel shale (impermeable)



Draughts

Age of earth

(79)

- 1) Ocean salinity
- 2) Rate of sedimentation
- 3) Rate of erosion
- 4) Radioactivity
- 5) Tidal force
- 6) *

(pure water)

pure water

-

dr.)

Geosyncline → Hall & Dana; Heng;

- 1) Lithogenesis 2) Orogenesis 3) Erosion

Kober's theory → Geosynclinal mountain building.

contraction of earth → compressive force

- orogen → mobile water zone; kryptogen → nuclei (rigid continental mass)

- Rennaketten → marginal mt.; median mass:

init.)

reute

tes f

Drainage systems

{
 ↳ Seguent → consequent, subsequent, deseguent, resequent.
 ↳ Insequent → antecedent, superimposed.

✓