

Human habitats & their biotic systems

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Machu Picchu & L.A.

(1) Human settlements – historical flashback

Human settlements = history of sanitation & waste disposal

Oldest known built settlements (not just sites of human gatherings such as in caves and rock shelters):

Jericho, Palestine, in the Jordan valley – first settlement built between 10,000 and 9,000 BC; continuously lived in.

Solid dwellings with the oldest walls almost two feet thick built of brick courses laid in thick clay on stone foundations.

Jericho –
about
9,600 BC



About
8,000 BC

(1) Human settlements – historical flashback

Human settlements =
= history of sanitation and waste disposal

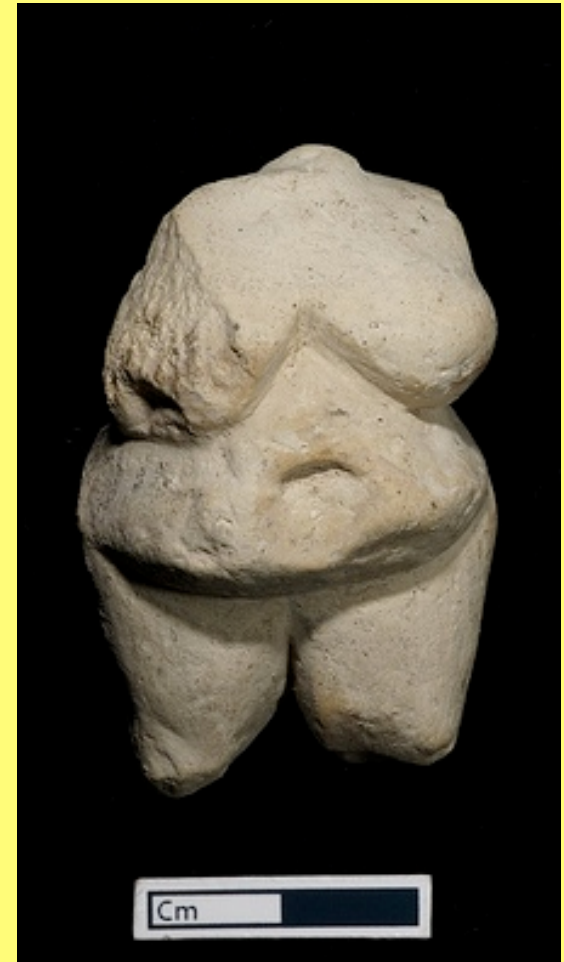
Jericho – first settlement built
between 10,000 and 9,000 BC.

Göbekli Tepe, Turkey, >9,000 BC.

Mount Sandel, (northern) Ireland,
7,900 BC, an earthen fort.

Pulli settlement, Estonia, 7,600 BC

Çatalhöyük, Turkey, 7,500 BC*



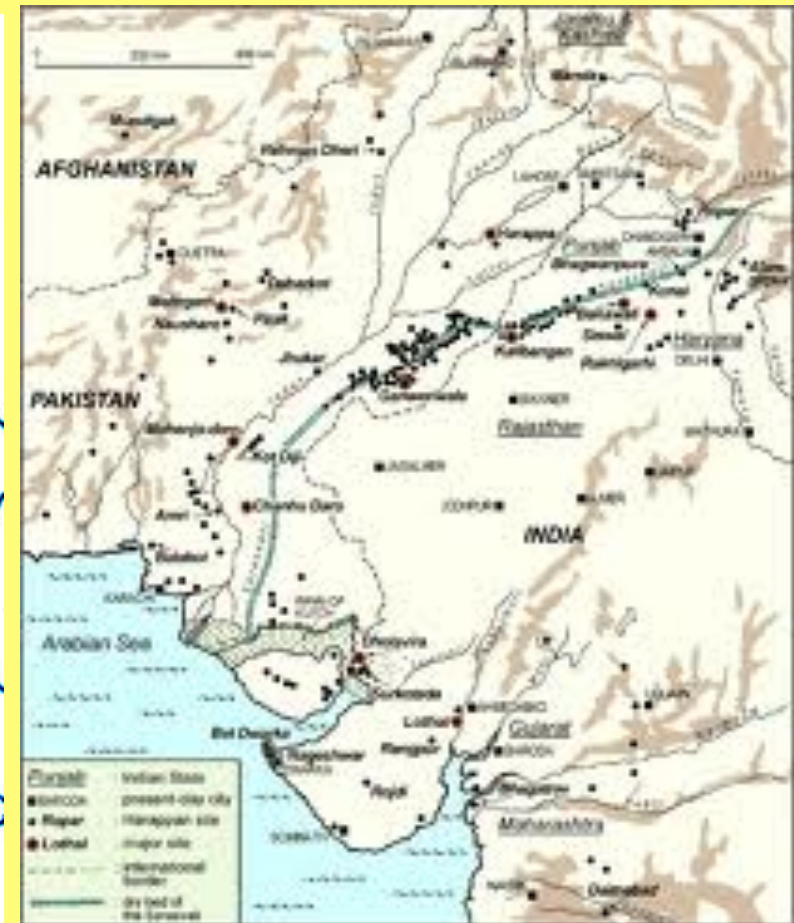
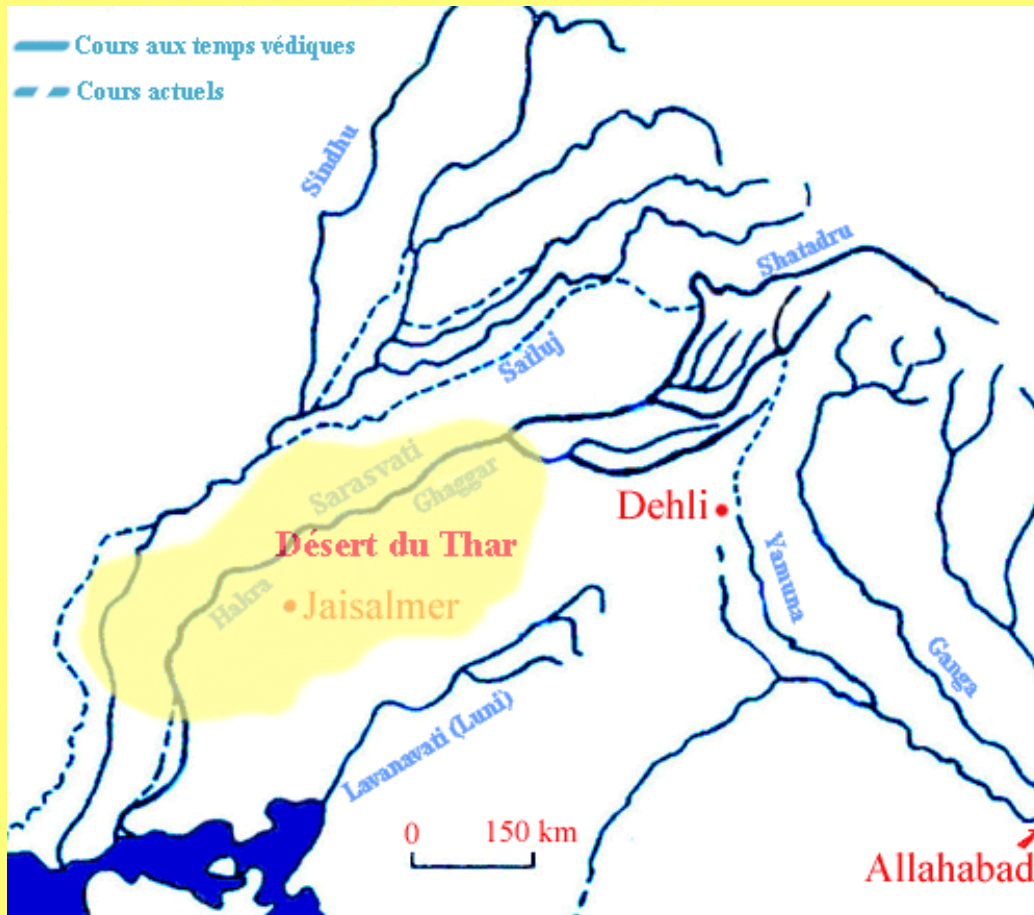
(1) Human settlements – historical flashback

Çatalhöyük, Turkey, 7,500 BC



(1) Human settlements – historical flashback

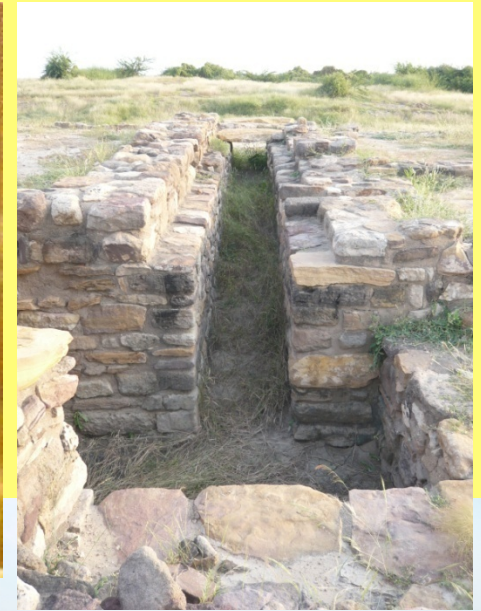
Indus valley culture, 3,500–1,400 BC – first known cycle of urbanization in India, along Indus and Saraswati, “Bronze Age”



(1) Human settlements – historical flashback

Indus valley culture, 3,500 –
1,400 BC

e.g. Mohenjodaro, Dholavira,
Lothal



(1) Human settlements – historical flashback

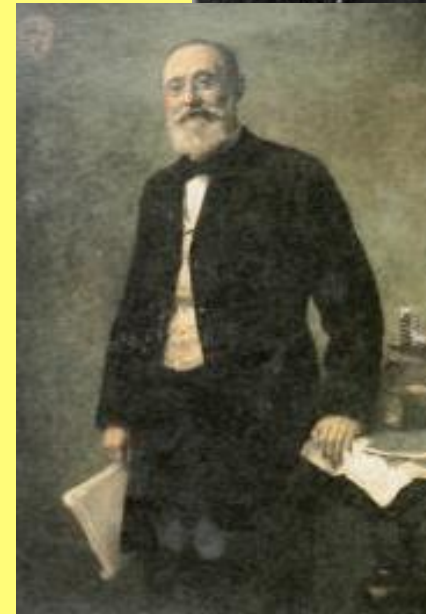
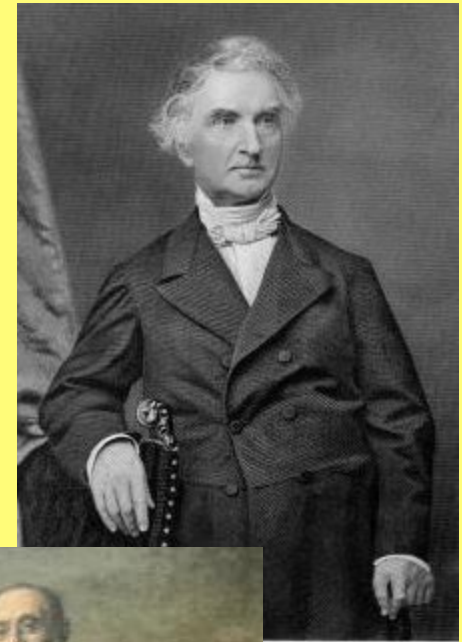
History of human settlements = history of sanitation (& waste disposal)

= history of agriculture and animal husbandry, training of the human immune system in interaction with domesticated and tamed animals...

(see Jared Diamond et al.) >>

= history of epidemics & pandemics.

In the West, conflict between public hygiene and agricultural productivity personified by Justus Liebig and Rudolf Virchow in Berlin



Justus Liebig, 1803-1873
Rudolf Virchow, 1821-1902

(1) Human settlements...

Paris in the 19th century

1835 – L' Institut de France rejected a proposal to adopt water closets and to channel excrements into the Seine, in consideration of economic losses in food production.

Ca. 1850 – a sixth of the area of Paris produced 50 kg of fresh salads, fruits, and vegetables per capita (of Paris population) p.a. For each hectare productive land, 6.5 persons were employed full time gardening and scavenging, and more people engaged in sales.

During four decades, enough new soil was produced to expand the growing area by 6% per year.



(1) Human settlements...

Paris in the 19th century

In the 1880s – urban farming (maraichage) at its maximum sophistication:
 Inter- & succession-cropping giving up to six harvests a year;
 winter crops made possible with help of heat-fermentation of manure, bell-shaped glass cloches, special straw mats, seven-foot-high walls surrounding the inner-city smallholdings.

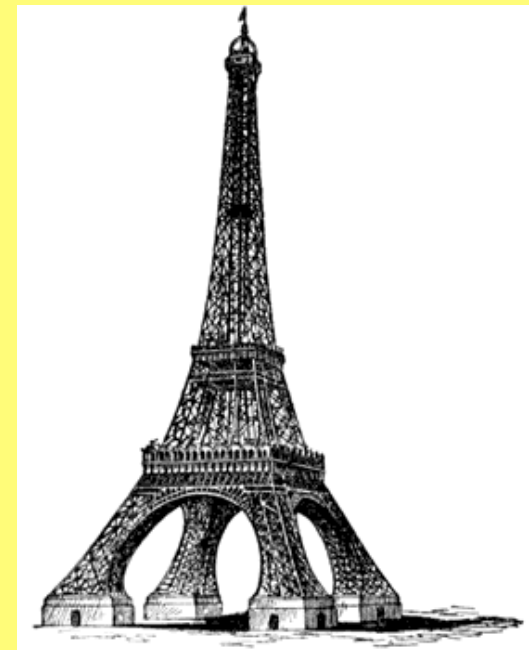
1850-1914 – 1,400 ha, fertilized with 1 million tons manure (mainly from horses) p.a.

1899 – It was claimed that Paris could feed Paris plus London. Humus was available for export.

1865 – An 81km long aqueduct was built to supply Paris with fresh water.

1871 – Another 106km long aqueduct was built.

1889 – Inauguration of Eiffel Tower.*

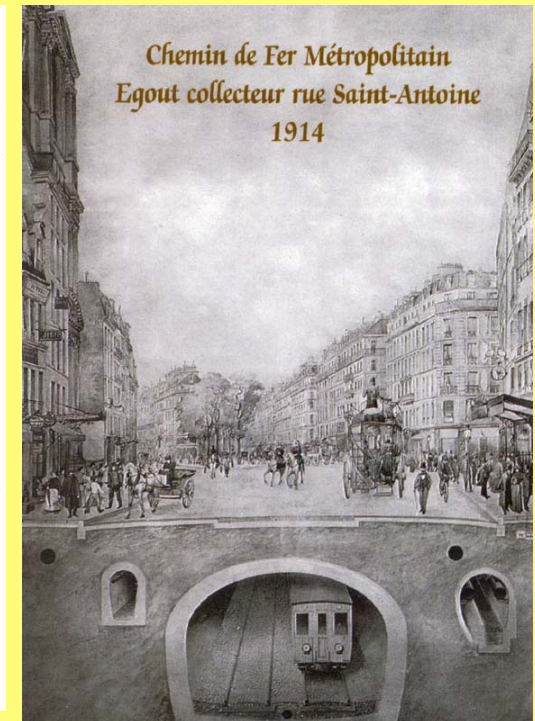
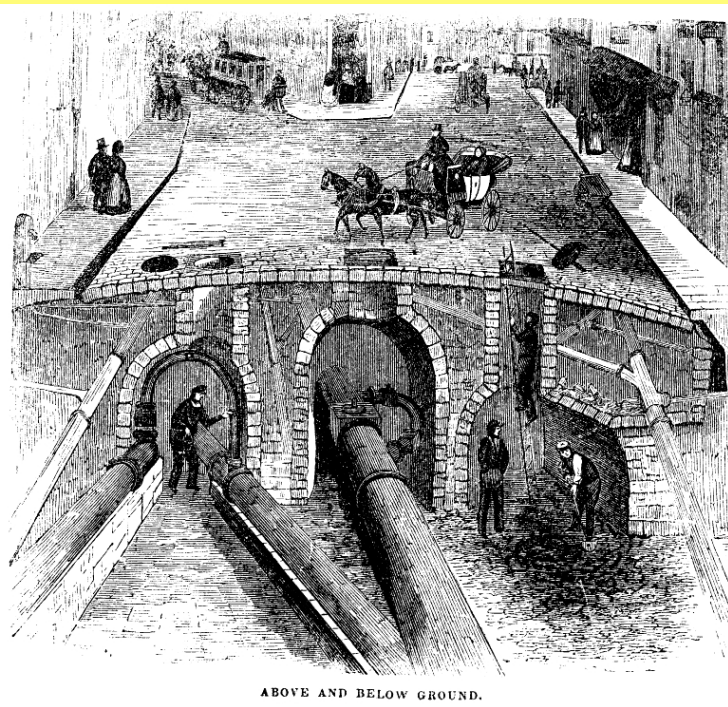


(1) Human settlements...

Paris:

From 1840 onwards a complex system of sewers ("Les égouts") was designed by Eugène Belguard.

Construction of sewerage from 1850 to 1930.



Paris - 1820 - 1854 - 1914

(1) Human settlements...

Modern Paris: sewer museum, a movie & auto-control toilets



(1) Human settlements

Definition of development, of business success, and of national wealth (GDP):

- increased production &
- increased consumption.

Forgotten implications:

- increased extraction (of natural resources) &
- increased excretion (liquid and solid wastes and air pollutants)



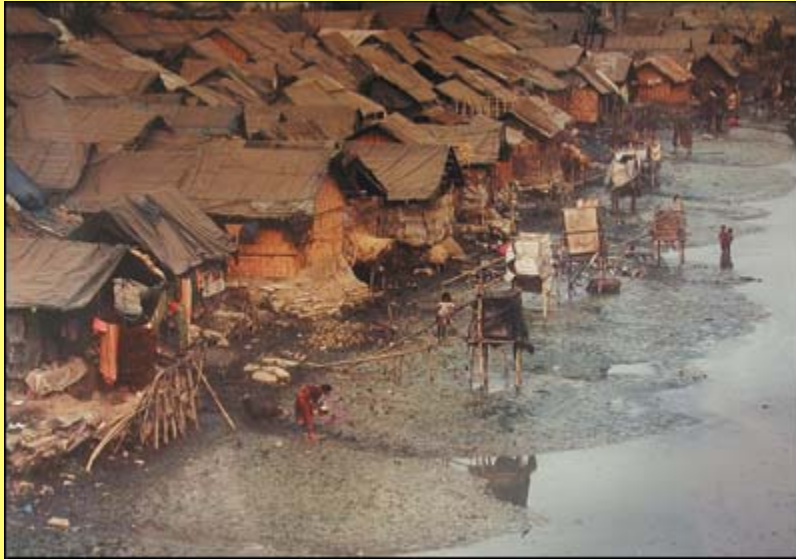
(1) Human settlements

The same is true for biological resources – the present reality of cities (not only in India):

Excreta & waste, bio-waste
liquid & solid: litter, stink,
pathogens, disease



(1) Human settlements



(2) Urban biotic streams

- Organic materials imported & produced:

food (vegetal and animal) into town,
food crops from urban gardens

- Organic materials excreted & exported:

Residues of food processing, wasted food, organic materials wasted (cotton t-shirt), garden waste, organic waste from parks and alleys, wastewater & effluents, excreta of pet animals, farm animals, and humans.



(2) Urban biotic streams

In terms of municipal waste & wastewater management:

- SWM for solid bio-waste
- Disposal & treatment of ww and sewage, of “grey water” and “black water”

(Industrial residues and effluents with inorganic or non-biodegradable residues not addressed here)



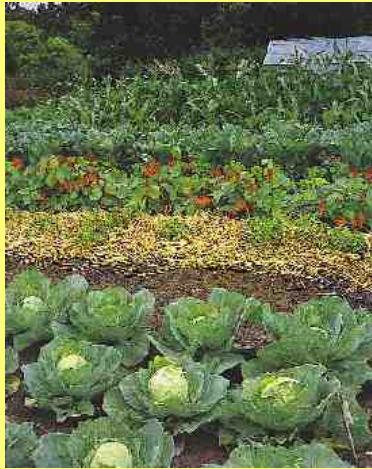
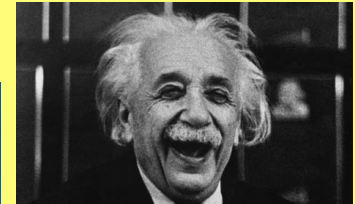
(3) Resource management suggested

- Nature knows no waste, Nature is resources.
- Nature does not save in carbon footprint, Nature does not try to be sustainable, Nature works from cradle to cradle,
- Nature ticks in cycles, Nature reincarnates.



(3) Resource management suggested

Nature ticks in cycles.



(3) Resource management

Considerations for on-site management of **water resources**:

- (rain)water percolation;
- protection of groundwater;
- surface water drainage and (urban) landscaping / city-scaping;
- rainwater collection and storage.



(3) Resource management

Identified needs:

Management of rainwater & storm water;
Protection and recharge of groundwater aquifers;

Management of urban water bodies & urban land-use (planning);

“Disposal” of human excreta;

Management of grey water and black water;

Management of biological solid waste;

Implications in change of software / mind-set:

Change of definitions of “civilization” & standards of living & economic wealth.



(3) Resource management

Approaches suggested:

- Direct re-use of grey water
- Ecosan (UDDT, water-free urinals etc.)
- Black water treatment by dewats etc
- Composting decentralized & centralized
- Urban gardening & farming
- Rainwater percolation via roadside swales, parks & forests
- Rainwater collection in ponds and lakes
- Aquaculture (fish) against mosquito breeding



(4) The objective:

Synthesis of useful productivity
& ecology & beauty:

Productive & sustainable management
of biotic resources integrated with
urban planning and design of
cityscapes & housing.



Thank you, Lucas