



Assignment: **Introduction to systems thinking & system dynamics**
Programme: **M.A/M.Sc. in Analytics (Batch: 2021-2023)**

Topic : **Collapse of Harappan Civilisation**
Based on : <http://www.sci-news.com/archaeology/science-collapse-harappan-civilization-01705.html>
<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3866234/>
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Summary of the systems archetype(s)

The advent of INDIA (which we call our nation today) can be marked with the birth of the **INDUS Valley Civilization**, also popularly known as Harappan Civilization. The Harappan Civilization flourished around 2,500 BC in the western part of South Asia, which is now Pakistan and the part of western India. In 1920, the ASI conducted excavations in the Indus valley, wherein the ruins of Mohenjo-Daro and Harappa were unearthed. John Marshall, the then Director of the ASI in 1924, announced the discovery of a new civilization in the Indus valley. Historical records from Mesopotamia describe regular trade with 'Meluhha' (the Indus Valley) from 2400-2000 B.C. During 2600 BCE, the Harappan Civilization started entering into its mature stage. New development started appearing, large urban centers were created, and gradually people from all far-off places, even from Mesopotamian and Egyptian Civilizations, started moving to the city of Harappa, Lothal, and Mohenjo-Daro. The evidence of a gradual decline of the Indus Valley Civilization is believed to have started around 1800 BCE.

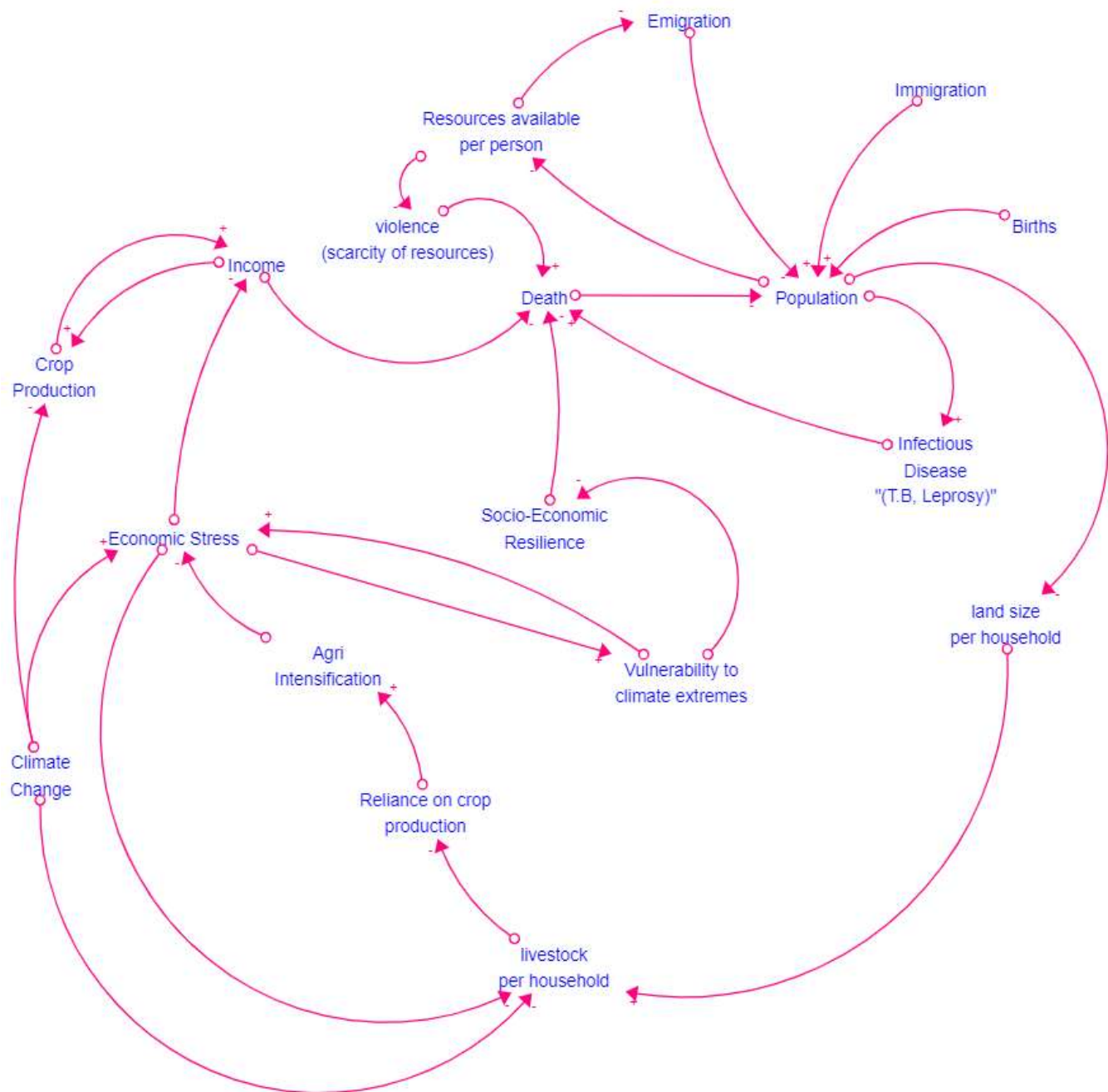
A plethora of reasons is given behind the collapse of the Harappan Civilization. One theory holds the Indo-European tribe, i.e., Aryans, responsible, claiming they first invaded and conquered Indus Valley Civilization. Another group of prudent people claims that natural factors like Drought, floods, and other natural disasters are responsible for its collapse. Another interesting theory by Dr. Gwen Robbins Schug suggests that interpersonal violence, the spread of infectious diseases, and unfavorable climate change have played a pivotal role in the demise of the mighty Harappan Civilization.

When I was in high school and during the history lectures when we used to hear a fascinating story about the Indus valley civilization, that people during that civilization were way ahead of their time, then I used to wish I could revisit Harappan cities and live there, but at the end of the lesson, I was compelled to think How did the Indus Valley Civilization decline? Why couldn't anyone anticipate and save its decline? However, if people knew about **System Thinking & System Dynamics during those days, they** could have anticipated well in advance and acted upon it.

However, as the students of Analytics, we tried using **System Thinking & System Dynamics** concepts and causal loop *diagram (CLD)* to diagnose and identify possible systemic solutions to this case.

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CAUSAL LOOP DIAGRAM



In the above **causal loop diagrams (CLD)** diagram, we have tried to inculcate all the possible parameters and reasons which could have contributed to the collapse of the Harappan Civilization. We have tried to enumerate **all possible System archetypes** prevalent in this CLD. System archetypes that are visible in this case study, "**Collapse of Harappan Civilization**" are

1. Limits to Growth
2. Success to successful
3. Tragedy of commons

Let's try to deep-dive into each of the System archetypes in detail.

1. **Limits to growth:**

Climate change and exchange relationship have increased incidents of immigration to the city of Harappa after 2200 B.C. Even the archaeological records suggest that Indus valley people adapted or tried to cope with climate change, migration, and rapid population growth for centuries before 2000 B.C. However, later with the passing of years, the resources showed a linear growth compared to the population that started growing exponentially, which eventually led to struggle and fighting over limited resources. The massive population growth had an increasingly negative impact on the city, creating an environmentally, demographically induced pressure point. Centuries of hydro-ecological stress, agro-economic problems, increasingly frequent interruptions of the exchange network, and deterioration of conditions in the city eventually led to massive depopulation around 1900 B.C. Resource scarcity, environmental uncertainty, and declining agricultural production in the face of continued population growth have resulted in starvation, violence, and exodus.

It is a case of "Limits to Growth" as in this case, growing actions initially lead to success, which encourages even more of those efforts. As the success triggers the limiting action and performance declines, the tendency is to focus even more on the initial growing actions.

2. **Success to successful:**

People suffered from increasing interpersonal violence and infection rates, particularly in marginalized communities with little protection from a weak, decentralized society. Wealthy people could afford health care and grow crops in their own fields, which led to an increase in the income of the rich. In contrast, poor people could not afford health care facilities and suffered from infectious diseases, and could not work, which led to low income of the poor and less availability of resources to them. The Paleopathological indicators suggest that risk for infection and disease was uneven among burial communities. The corresponding mortuary differences suggest that socially and economically marginalized communities were more vulnerable.

It is a case of "Success to the Successful" as in this case, one group has started to become more successful (or is historically already more successful) than the others, thereby increasing the likelihood of continued success.

3. Tragedy of commons:

The 'over-grazing' of collectively owned open lands by an unstructured group of people resulted in diminishing grazing land, which led to the decline of the livestock population. Eventually, this started increasing people's dependency on crop production for survival. So, they started cutting down trees to grow an ample quantity of crops. The deforestation activity led to climate change, which affected the productivity of the crops. This vicious cycle carries on and on, and eventually, it would have made the humans of Indus valley deprived of food.

It is a case of "Tragedy of the Commons" as in this case, individuals make use of a shared resource by pursuing actions for their own enjoyment or benefit, without concern for the collective impact of everyone's actions.