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Research Article

Study of Sustainable Innovative Practices in Ancient India

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ABSTRACT

India has been home to many innovations right from the very beginning. The ancient innovations influenced the economic status of prevailing rulers at that time. They even contributed to competitive advantage and helped in maintaining environmental sustainability. The issues such as sustainability and environment were always considered as important in the Indian history. Several rulers have initiated policies and built structures that we now call as sustainable and environment friendly. The paper is an attempt to study the ancient sustainable innovations in three categories and provide analytical study. The paper starts with the introduction about the topic highlighting the status and demographics of ancient India before 1700 A.D. It then explains sustainable innovations prevailing during this duration. Sustainable innovation is studied in three categories, i.e. water management, waste management and health management. The methodology adopted is integrative research approach. The time period under consideration is before 1700 A.D. The result presents analysis of the three detailed case studies in terms of demographics, ruler and economic impact. The paper ends with conclusion, suggesting future research implications. It also provides a roadmap of research that can be implemented in modern times where resources continue to deplete with time.

Keywords: India, Ancient History, Innovation, Sustainability, Water Management System, Ancient Ayurvedic Medicines.

1. Introduction

India has always been the birthplace of many ideas. The economic standing of the in charge monarchs at the period was influenced by the ancient innovations. They even helped maintain environmental sustainability and contributed to competitive advantage. Environmental and sustainability concerns have existed throughout Indian history. Several kings have introduced laws and constructed buildings that are now referred to as sustainable and environmentally friendly. The ancient scriptures state that Indian culture has always valued upholding a traditionally toned clean environment and coexisting peacefully with nature. Ancient kings from the Chola, Solanki, Asaf Jahi, and many more dynasties employed cutting-edge and long-lasting methods for managing the available resources. The Indus Valley civilization invented advanced irrigation and water management systems. Other instances include the 3000 BCE-old artificial reservoir at Girnar. Ancient Indian water management techniques were a result of the country's hot and arid climate. Stepwells were constructed as sophisticated water reservoirs, serving as both water storage facilities and outstanding examples of traditional Indian architectural design. Historical data illuminates the significance of water management in prehistoric India. In ancient India, there was no concept of waste. Compost and organic manure for farming were made from it. The recycling of waste items was the main emphasis of waste management practices. The recycling of waste items was the main emphasis of waste management practices. Burning wood or coal for cooking caused the carbon to be broken down below. People used to consume freshly prepared food, so there was no need for environmentally harmful packaging. To keep food fresh, freezers weren't even necessary. The value of practises like yoga and Ayurveda for managing one's health and wellbeing was also understood by the ancient Indians. Since the beginning of time, people in India have engaged in well-known practices for preserving their mental and physical health. Preventive methods were the main foundation of health practises. About 600 BCE, a surgeon by the name of Susruta who worked at a

university in Benares, India, is known to have been a zealous supporter of the tridosa idea. Literature refers to a staffed hospital that operated out of a temple during the Chola era. There was a provision for producing medications using raw materials like ghee, oil, and water. These three subcategories of sustainable innovation are illustrated by several instances in Indian history. The study emphasizes sustainable innovations of ancient India before the year 1700 A.D. Then it explains the prevalent sustainable innovations at the time. Three areas, namely water management, waste management, and health management, are examined in relation to sustainable innovation. Utilizing an integrative research strategy is the methodology chosen. Prior to 1700 A.D. is the time period under examination. The paper offers examination of the three in-depth case studies in terms of the impact on the economy, ruler, and demographics period. The paper concludes by outlining potential implications for further research.

1.1 Sustainable Innovation

The last few decades have seen a growth in the understanding of sustainable innovation among practitioners and academics alike, as evidenced by the publications Boons & Lüdeke-Freund (2013), Bos-Brouwers (2010), Saunila et al. (2018), Ukko, Saunila, et al. (2019), and Ulucak & Khan (2020). Over the past 20 years, words like "green innovation," "environmental innovation," "eco-innovation," and "sustainable innovation" have become more popular. Sustainable innovation is the development of anything new that enhances performance in the three areas of social, environmental, and economic sustainability. Such advancements can relate to changes in procedures, operational procedures, business models, ways of thinking, and organisational structures in addition to technical advancements. It is about invention of anything novel that enhances performance in the social, environmental, and economic facets of sustainable development is known as sustainable innovation. These advancements can pertain to modifications in procedures, operational procedures, business models, thinking, and business systems in addition to technical advancements (Szekely & Strebel, 2013). The modifications should be done within the boundaries that support environment and its growth. Adams, Jeanrenaud, Bessant, Denyer, and Overy (2016) define sustainability-oriented innovation as the process of altering organisational values, products, processes, and practices with the specific goal of generating and realizing social and environmental value in addition to financial gains. It is important to focus on environmental value along with the realization of the customer value.

According to Siqueira and Pitassi (2016), sustainability-oriented innovation is a broader concept than eco-innovation because it includes the social dimension and is a multilevel phenomenon that requires the development of new business models at the corporate level, government policies and actions that address the enormous risks associated with radical innovations at the company level, and cognitive shifts at the individual level. Sustainability-oriented innovation, according to Hansen, Grosse-Dunker, and Reichwald (2009), is a tool that addresses sustainability challenges as well as the inclusion of new consumer and market sectors, thereby enhancing the firm's worldwide capital. Socially, minimizing detrimental effects on the environment and society is encouraged by awareness of the advantages of using sustainable innovation techniques. Due of its potential to improve a company's financial, social, and environmental outcomes, sustainable innovation supports business sustainability. Businesses that perform better have more intensive sustainable innovation practices in place for dealing with suppliers, reducing emissions in the supply chain, replacing products with services, and interacting with stakeholders (Kneipp et al., 2019).

According to the ancient scriptures, Indian culture always believed in maintaining a traditionally toned clean atmosphere and living in peace with nature. Ancient rulers from Chola, Solanki and Asaf Jahi dynasties and many more, deployed innovative and sustainable techniques for managing available resources. Innovations include advanced irrigation and water management system created by Indus valley civilization. Other examples include artificial reservoir at Girnar that dates back to 3000 BCE. The hot and dry climate of India was the reason behind water management practices adopted in ancient India. Sophisticated water reservoirs, stepwells were built that not only preserved water but also a remarkable example of ancient Indian architecture. Historical evidence throws light on importance of water management in ancient India. Waste was never considered as a waste in ancient India. It was used as a resource for compost, organic manure used in farming. The waste management practices focused mostly on recycling of the waste products. Cooking was done by burning wood or coal, and the carbon was broken down below. People used to eat freshly cooked food, therefore there was no need for packing that would harm the environment. Even there was no need for refrigerators to keep food fresh. Ancient Indians also recognized the importance of health and wellness management, practices like yoga and Ayurveda. There were well-known practices for maintaining mental and physical well-being in India practiced by people since time immemorial. Health practices were mostly based on preventive approaches. A physician by the name of Susruta, who practiced medicine and surgery at a university in Benares, India, about the year 600 BCE, is known to have been a fervent proponent of the tridosa theory. Literature mentions a well-staffed hospital that used to function from temple during Chola reigns. There was provision for making drugs from natural resources such as ghee, oil, and water. Ayurvedic medicine, one of the four Upavedas (supplements and deductions of Vedas), progressively split into the Atreya Inner Medicine School and the Dhanvantari Surgery School between around 1500 and 1000 BC. The Caraka Samhita and the Susruta Samhita are two important texts on Ayurvedic medicine that were authored by experts in these two categories around the beginning of 100 BC. The third major text on Ayurveda

medicine, Astanga Hridaya Samhita, was produced in 500 AD and combined the theories of two Ayurvedic medical schools. As additions to the medical classics of Ayurveda, a total of sixteen significant drug monographs were published one after another between the years AD 500 and 1900. Sustainable innovation is about creation of something new that ameliorates the performance in terms of economics, environment and social context. There are several examples in Indian history that highlight these three categories of sustainable innovations. Next section presents three case studies of ancient innovative practices in India. It can be the source for sustainable innovation that organizations can adopt for better future.

1.3 Three Case Studies of Sustainable Practices/Innovation

The three case studies explain the sustainable approach used in the ancient India. The era was characterized by low resources such as water, luxury for common people, and ways to manage health. But even then, sustainable innovations were part of life in ancient India as shown in these examples. The three examples are from herbal cosmetics, ayurvedic medicines and water management system.

A. Herbal cosmetics in ancient India

Cosmetics are products intended to enhance and improve a person's look. Cosmetics and beauty are as old as civilization and humanity itself. The use of herbs and plants as cosmetics dates back thousands of years. The Egyptians thought that medicinal plants had magical abilities. Chinese herbal cosmetics are well-liked and contain biologically active ingredients. Turmeric is the most widely used herb as a cosmetic in India, where it's still utilized as part of the bridal beauty regimen. Sustainable innovations are not new in case of herbal cosmetics in case of ancient India. The ancient discipline of cosmetology is thought to have developed in Egypt and India, but the first documentation of cosmetic ingredients and their use dates back to the Indus valley civilization between 2500 and 1550 B.C (Lal, 2002). In ancient India, there is evidence of highly developed concepts of self-improvement and a wide variety of different cosmetic uses by both men and women. Numerous of these practices were intricately entwined with the seasons and daily routines. For physical beauty, various masks and cosmetics were advised for use throughout various seasons. The ingredients used in cold seasons and those in warm seasons were very dissimilar. In fact, the 1500-year-old Ayurvedic text Ashtnga Hridaya provides six separate formulations for each of the year's six seasons. For facial beauty, similar specialised cosmetic Tailams (oils) and Ghritas (clarified butter or ghee) were employed. Special ingredients were used for hair washes. Many remedies have been indicated for hair growth, prevention of falling hair and premature graying. Hair dyes, fragrant hair rinses and fumigants were also in use. Fragrant bath powders and body deodorants also find frequent mention. Oral hygiene in the form of care of teeth, mouth deodorants and coloring of lips were daily chores to be religiously pursued. It appears that the whole range of modern cosmetic usage was conceived by the ancient Indians and was practiced with the help of natural resources then available.

Experiments by Raja Serfoji in Tanjore

In 1788 AD, Raja Serfoji came to power in Tanjore (Thanjavur in Tamil Nadu State, South India), where he reigned till 1832 AD. He designed Tanjore's enormous library known as Serfoji's Saraswati Mahl. The Raja had a keen interest in medical advancements and study. He put many of his formulations to the test by administering them to real patients and having British doctors record patient case histories. He founded the "Dhanvantari Mahl" Institute of Medical Research, where studies were carried out, and he chose a small number of thousands of effective recipes after really trying them. They are named as *Anubhoga Vaidya Bhāga*. *Several* ancient families in Tanjore still have medicines that are prepared in the Dhanvantari Mahāl. It bears the original seals showing date of its preparation (Rao, 1952). There was a practice known as Kayakalpa, a very popular rejuvenation method. The word's definition includes making someone look young, altering skin tone and hair colour, enhancing eyesight, and other things (Patkar, 2008).

The ancient knowledge is available in the scriptures and is considered sustainable as they are based on natural ingredients and is used by both men and women since time immemorial. The details such as quantity, and process of usage is also mentioned in the scriptures. One such example is application of equal quantity of Vata leaves, Kanchanparni, Madhuka, Priyangu, Sahadevi, Harichandana, etc. when mixed with water, produces remarkable skin (Patkar and Bole, 1997).

Social-Economic Benefit – Easy way to maintain beauty, Easily available ingredients at home at less cost.
Environment Benefit – No use of chemical/no chemical disposal.

B. Ayurvedic Medical Practices in ancient India

One of the world's oldest medical systems is found in India. It is referred to as Ayurvedic medicine. Ayurveda is the science of life since in Sanskrit, ayur means "life" and veda means "science" or "knowledge". It has changed over thousands of years in India. Ayurveda is now regarded as Complementary and Alternative Medicine (CAM) since it uses herbs and particular diets. Body, mind, and spirit are all balanced with ayurvedic therapy. It is founded on ideas of health and illness as well as approaches to managing or treating health issues, preventing illness, and promoting wellness. Ayurveda believes that the entire universe is composed of five elements: Vayu (Air), Jala (Water), Aakash (Space or ether), Prithvi (Earth) and Teja (Fire).

In different combinations, these five elements—known in Ayurveda as Pancha Mahabhoota—are said to make up the three primary humours of the human body (Jaiswal and Williams, 2016). The Vata, Pitta, and Kapha doshas—collectively known as the "Tridoshas"—are the three humours that govern the body's fundamental physiological processes (Jaiswal and Williams, 2016).

A balance between the three doshas and other elements should be kept for good health. Any unbalance between the three results in a diseased or unhealthy state (Ravishankar and Shukla, 2007). According to Ayurveda, a healthy condition of living can be achieved by adhering to the precepts of divine wisdom and maintaining a perfect balance between the elements of nature and the Tridoshas of the human body (Lad, 2002). The term "Sapta Dhatus" refers to the seven different types of tissues that make up the human body. The efficient physiological operation of the human body depends on the cooperation of these seven tissues. The Rakta Dhatu, which resembles blood, controls the movement of blood cells and the delivery of blood constituents to the body. Ayurveda offers a variety of therapeutic options for boosting health in individuals by taking into account a person's physical makeup, pathological history, dosha traits, lifestyle, and environmental factors in their daily lives (Ayush, 2015; Hankey, 2001).

There are also popular complementary or alternative products for people include herbal medicines and dietary supplements. These are the dietary supplements that contain one or more dietary elements (such as vitamins, minerals, herbs or other botanicals, amino acids, and other substances) or their constituents and are meant to supplement the diet. These are identified as dietary supplements on the front panel and are meant to be consumed orally as pills, capsules, tablets, or liquids. These items might include everything from isolated nutrients to diets, dietary supplements, and herbal remedies. They can also include processed foods like cereals, soups, and drinks as well as genetically modified "designer" foods (Pandey et al., 2013).
Another famous example of ancient ayurveda practices is that if Sushruta, or Suśruta. He is the author of the Sushruta Samhita (Sushruta's Compendium). It is considered as one of the most important surviving ancient scripture on medicine. It is considered as a foundational text of Ayurveda. Several writers have dated him to 400 BC. His fame rests on the famous compilation of *Susruta-samhita* (The Collection of Susruta). This work is mainly devoted to surgery but it also includes medicine, pathology, anatomy, midwifery, biology, ophthalmology, hygiene, and psychology. Susruta attempted to systematically arrange experiences of older surgeons and collect scattered facts about medicine into a workable series of lectures and manuscripts. Susruta is thought to have invented the technique for rhinoplasty, and Indian physicians became masters of the procedure. Plastic surgeons currently use this method frequently; it is referred to as the "nose job." Many people today have rhinoplasty in order to meet modern standards of beauty (Hajar, 2013). Susruta gives extensive data on wounds, the details of their pains, the colours thereof along with the diagnostic possibilities based on a medical condition. There also occurs a well stipulated regimen of six stages in treatment or *kriyas kalas*. He also gives an indication of possible hospital services especially for the surgical patients. Surgery was defined as a removal of any foreign body or an unwanted issue that pains sharply and locally like a *shalya* or a *lance*. The science of surgery was called *Shalya tantra*.This was done by 3 means, burning or cauterization , cutting or *sastra kriya* using surgical prepared corrosives or *ksheera,* mainly alkalies. Three distinct stages of surgeries , *purva, karma,* pre-operative procedures preparing the patient, pradhana karma, surgery proper and pashchast karma, post-operative measures are described clearly. The details vary in terms of the pathology concerned. Sushruta mentions eight types of operations: excision, incision, scarification, puncturing, probing, extraction, draining and suturing.
Even the characteristics of a good surgeon are defined in Sushruta Samhita. They are boldness, quickness, immediacy, inaction, sharpness of the instrument, non-sweating, non-trembling, unconfused. Surgical treatment involves three steps. They are pre-operative procedures, operation proper and post operative care. It also defines procedure of plastic surgery. Sushruta has given detailed description of plastic surgery. In his words- “I shall tell you exactly the method of joining of a nose that has been cut off. Take a tree leaf of the same size as that of the nose concerned. Place it on the patient’s cheek in such a way it stays supported – evalambi - while you trace ullikya- the portion of the nose (to be regrown) precisely on it. Remove (now) a portion of the skin as per this tracing from the cheek (nearby) by slicing (uteriya) and do so in such a way that a small part of it remains (still) attached –nibaddha – to the cheek (otherwise there will be tissue rejection or even slow healing). Place this deflected portion of the skin on the injured nose and then suture it quickly on any pattern that is suitable (saadhu) to the case concerned, with all the possible care (apremattah). Then raise (the area around the nares) by inserting two sticks of castor plant (a disinfectant and a healer) and see that the final form of the nose would thus (i.e. by your rising) look sharply and natural (samyog and also help in breathing till the healing is completed otherwise the area will collapse). Then tie and dress by the healing powder of starya and the anjana (colyrilum) of yasti and madhuka. In fact, this forehead skin flap method is still used in modern days with little modification (ss.scl.16.27-30) .
Social Economic Benefit – Easy to use, Easily available ingredients at home at less cost, no side effects.
Environment Benefit – No use of chemical/no chemical disposal/no side effects.

C. Pancahkki, Aurangabad,Maharashtra – Sustainable Water management system

Panchakki, a water mill, is situated in Aurangabad, Maharashtra. It is an example of a scientific architecture in the medieval India. The panchakki was designed to produce energy via water that was brought down from a spring on a mountain. The building, attached to the dargah of Baba Shah Musafir, a Sufi saint, is located in a garden near the Mahmud Darvaza. It consists of a mosque, a madrassa, a kacheri, a minister's house, a sarai and couple of houses. The buildings in the dargah complex that includes Panchakki also, were built by Turktaz Khan, a noble on the staff of Nizam-ul-Mulk Asaf Jah in about 1695 A. D. In front of the mosque, there is an oblong reservoir with fountains that Jamil Beg Khan erected 20 years later. The massive grinding stones of the grain mill were meant to be turned by the water mill, which was constructed to harness the power of running water from a nearby spring. The watermill was used to grind grain for the pilgrims and disciples of saints as well as for the troops of the garrison.

In this, mill is used to grind grain for the pilgrims who visit this monument. There is a scientific process that was used in medieval Indian architecture. In this water mill, energy is generated through water that is brought down from a spring on a mountain. The water-mill gets water by an underground channel that starts from a well just above junction of river, called Harsul with a tributary stream 8 km away. The water pipe proceeds to the Panchakki. The water falls on the cistern of Panchakki from quiet a height. This generates the required power to drive the mill. The bottom of cistern forms the roof of spacious hall that remains cool during scorching summers. The extra water is let in the Kham River.

(Ministry of Tourism, GOI, 2020)

Its underground water route, which travels more than 8 kilometres to reach its source in the highlands, is what makes this fascinating water mill famous. The waterfall that powers the mill is the channel's captivating 'artificial' climax. The entire water channel is constructed of precisely spaced earthen pipes, and at proper intervals, masonry pillars are built to act as natural suction pumps to force water through the pipes over an 8 km distance. A beautiful 'Water Fall' is created when the water flows smoothly up to a large elevated masonry pillar and then plunges down into the main tank.

Climatic Condition of Aurangabad

The climatic conditions of Aurangabad can be seen as a reason behind this sustainable practice. Even now in the modern times, several ‘Nehars’ are active where water flows underground

The climate of the district is characterized by a hot summer and general dryness throughout the year except during the southwest monsoon season. On an average there are 46 rainy days (i.e., days with rainfall of 2.5 mm-10 cents-or more) in a year at Aurangabad (**Aurangabad District Gazetteer, 1977)**. The water flows down ceramic pipelines, pooling in hidden cisterns and rising and falling through pressure-locks. Aurangabad and the Marathwada region have enduringly difficult summer. This sustainable innovation fulfills the water need of the region.

Social-Economic Benefit – Food for the pilgrims/Disciples and for the troops

Environment Benefit - No use of electricity, use of natural resource (water) to run the pancahkki.

2. Methodology

The Whittemore and Knafl methodology was used in this integrative review. Whittemore and Knafl have suggested a five-step strategy to improve the rigor of this method in nursing since the integrative review method has been criticized for lacking rigor and its potential for bias. They claim that the steps involved in conducting an integrative review are formulation of the issue under investigation, completion of a focused literature search, assessment of the data's quality, analysis of the data, and presentation of findings (Whittemore and Knafl, 2005). The problem that the review is trying to solve and its goal must be clearly identified as the first stage. Clear explanations of topics such search terms, databases used, additional search techniques, and inclusion and exclusion criteria for relevant primary sources should be included in literature searches. There is no best standard available for analyzing the quality of studies that are part of the study (Whittemore and Knafl, 2005). The methodology is also supported by PRISMA 2020, which is designed for use in systematic reviews (Page et al. 2021). Original or revised systematic reviews can be used with PRISMA 2020 (Moher et al., 2009;Page, 2021). Sixteen journals, four books, ten websites have been searched. Journal of Traditional and Complementary Alternative Medicine and Journal of Cleaner Production have been searched three times as compared to other documents.

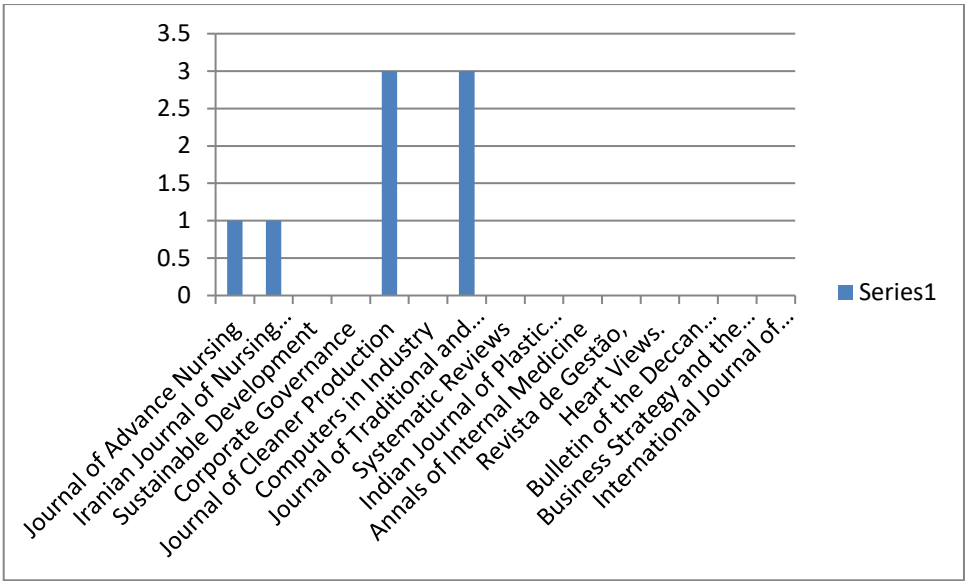

Figure 1 Selection of Journals

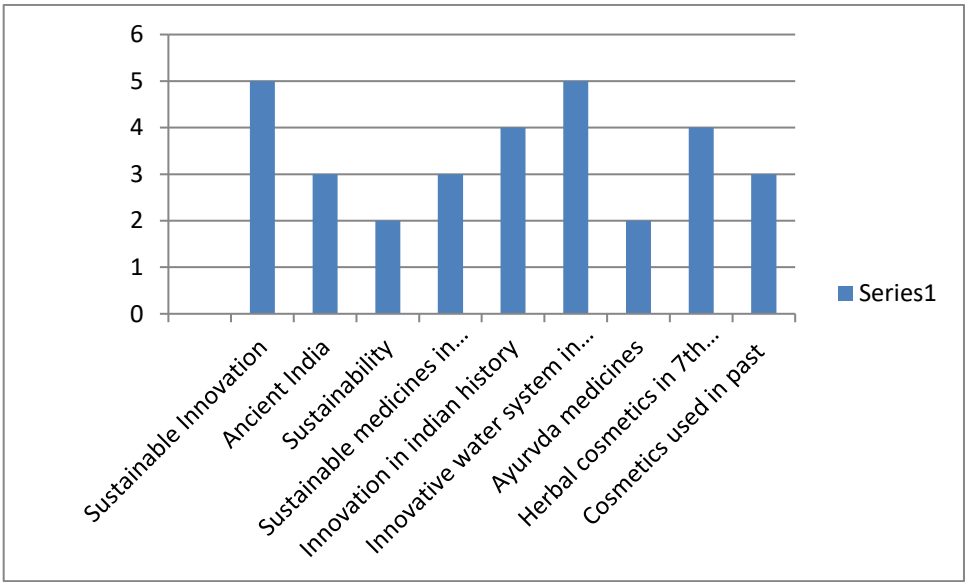

Figure 2 Selection of Keywords

Table 1 presents PRISMA abstract checklist summarizing the nature and structure of the paper.

Table 1: PRISMA abstract checklist

Title	Systematic review
Background	*Objectives*: Systematic analysis of the literature review to analyse the sustainable innovation and practices of ancient India.
Methods	*Eligibility criteria*: Time period – 16th- 17th Century, keywords –'sustainable innovation' , sustainable practices in ancient India', 'demographics of ancient India', 'Ayurveda' , 'cosmetic in ancient India', 'ancient medicines in India, 'water management system', 'work by Sushruta;, 'ancient sustainable practices in India', 'social benefits of innovation in ancient India', Economic benefit in ancient India', Demographics of 17th century, 'history of Aurangabad', Maharashtra, history of innovations, history of ayurveda, medicines used in ancient India, water management system in history, history of cosmetics market in India, surgical innovations by Sushruta, *Information sources*: DULS and open google source is used for the search. Totally ten research papers from six peer-reviewed journals, three reports by Mckinsey and four documents from online sources, i.e. ILO, OECD, Deloitte and WEF. *Risk of bias*: Sources other than DULS and open google source may have other results that are not included in the paper.
Synthesis of results	Qualitative analysis supported by PRISMA 2020.
Result	*Included studies*: Total thirty documents studied.

	Synthesis of results: The sustainable innovation and practices of ancient India show the resilience power of our country. Even with limited resources and social, political challenges etc, there existed sustainable practices and innovations that provided better value, relief to people.
Discussion	*Limitation of evidence*: The study is limited by secondary analysis of literature available on DULS and online google source. We might have missed including other relevant studies in this context. *Interpretation*: Sustainable innovations give a ray of hope amidst depleting resources. This has been a practice since time immemorial. But they have been forgotton in the race of growth. Awareness of such innovations can provide a new direction where they can be implemented in society and also supported by government. Thus putting less burden on society and also result in sustainable environment.

Delhi University e-library system and open google source is searched for topics related with the study. Total 21053 documents with the selected key words are found on IndiaJournals.com section of DULS (Delhi University Library System) subject portal. Research documents available in English language are considered. The excluded documents are related to issues such as nano-particles, educational innovation, general scientific innovations, non-sustainable innovations, modern day sustainable practices. Exclusion criteria provides with 100 documents that are selected for further study. After removing non-relevant documents including duplicates, very specific twenty, 80 articles are read and reviewed thoroughly. Thirty studies meet the inclusion criteria while fifty are excluded further as they are extremely out of the context. Figure 3 shows the flowchart representing selection of documents for the study.
Exclusion criteria provides with 100 documents that are selected for further study. After removing non-relevant documents including duplicates, very specific twenty, 80 articles are read and reviewed thoroughly. Thirty studies meet the inclusion criteria while fifty are excluded further as they are extremely out of the context. Figure 3ure 3 shows the flowchart representing selection of documents for the study.

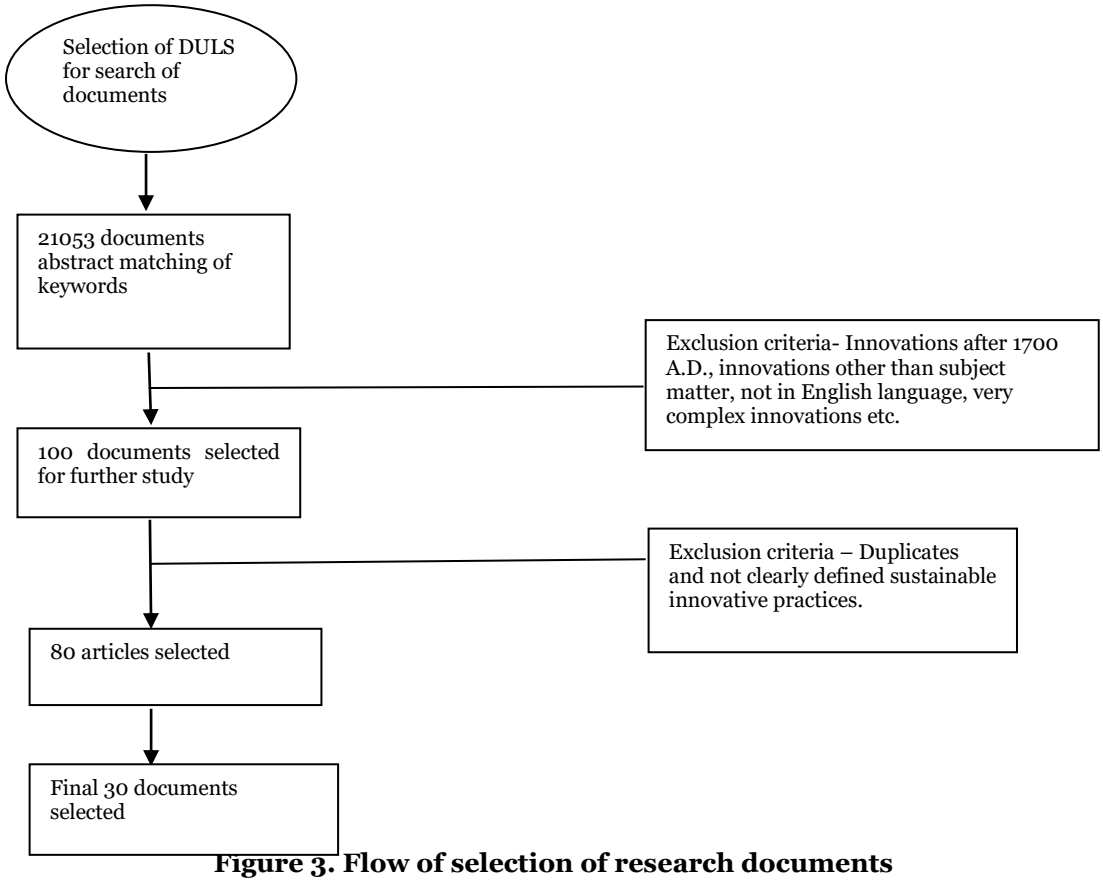

Figure 3. Flow of selection of research documents

3. Results

This section presents three examples of sustainable innovation and practices from ancient India.They are field of herbal cosmetics, ayurvedic medicines and water management system. The three examples are a proof that people in ancient India could find a sustainable way to live life comfortably even amidst low resources. The herbal cosmetics gave a affordable, reasonable, safe and environment friendly way to beautify oneself. Many users could make use of products. Ayurveda medicines provided a safe alternative to heal oneself

without any side effects and at a less cost. A unique water management system was the solution to manage arid climatic in various regions of India. These examples are a proof that even with low resources, sustainable innovative practices can be adopted to provide solutions to the problems. Total 21053 documents with the selected key words such as sustainable innovative practices, ayurvedic medicines, water management system and herbal cosmetics, ancient India have been searched. The documents are found in IndiaJournals.com section of Delhi University e-library system (DULS). Applying the exclusion criteria, finally, thirty documents have been selected from Delhi University e-library system (DULS) and open google source.

Table 2. Socio-Economic Benefit of Sustainable Innovative Practices

Category	Socio-Economic Benefit
Herbal Cosmetics	Easy way to maintain beauty, Easily available ingredients at home at less cost. No use of chemical/no chemical disposal.
Ayurveda Medicines	Easy to use, Easily available ingredients at home at less cost, no side effects.No use of chemical/no chemical disposal/no side effects.
Water management - Panchakki	Food for the pilgrims/Disciples and for the troops, No requirement of electricity to water mill, use of natural resource (water) to run the pancahkki.

4. Discussion

India has always been the birthplace of many ideas. The economic standing of the in charge monarchs at the period was influenced by the ancient innovations. They even helped maintain environmental sustainability and contributed to competitive advantage. Environmental and sustainability concerns have existed throughout Indian history. Several kings have introduced laws and constructed buildings that are now referred to as sustainable and environmentally friendly. The report makes an effort to examine three types of historical sustainable innovations and offer an analytical analysis. The invention of anything new that improves performance in terms of economics, the environment, and the social context is what is meant by sustainable innovation. The ancient scriptures state that Indian culture has always valued upholding a traditionally toned clean environment and coexisting peacefully with nature. Ancient kings from the Chola, Solanki, Asaf Jahi, and many more dynasties employed cutting-edge and long-lasting methods for managing the available resources. The Indus Valley civilization invented advanced irrigation and water management systems. Other instances include the 3000 BCE-old artificial reservoir at Girnar. Ancient Indian water management techniques were a result of the country's hot and arid climate. Stepwells were constructed as sophisticated water reservoirs, serving as both water storage facilities and outstanding examples of traditional Indian architectural design.

The three examples of sustainable innovations of ancient India are presented in the study. They are ayurveda system, cosmetics in ancient India and Panchakki, a famous water management system that runs a mill.

a. Different masks and cosmetics were suggested for usage throughout the seasons to enhance physical appearance. In the cold seasons, different components were used than in the warm seasons. In fact, for each of the six seasons of the year, the 1500-year-old Ayurvedic treatise Ashtnga Hridaya offers six unique formulations. Similar specialized cosmetic oils and ghritas (clarified butter or ghee) were used for facial beauty. For hair shampoos, special substances were utilized. Numerous treatments have been suggested for hair development, stopping hair from falling out, and preventing early graying. In India, cosmetics have been used since the Vedic and Puranic eras. The demand for cosmetics is rising as a result of consumers' growing awareness of beauty, and this leads to the expansion of the cosmetics sector.

b.The concept of ayurveda provides a balance between elements for good health. A healthy condition of life is achieved by adhering to these sustainable practices of maintaining a perfect balance between the elements of nature and the Tridoshas of the human body. By taking into account a person's physical make-up, pathological history, dosha features, lifestyle, and environmental circumstances in their everyday lives, ayurveda offers a number of therapeutic choices for enhancing health in individuals. It is sustainable as there are no side effects on body and it is also cost effective.

c. The amazing water mill, ‘Panchakki’ is known for its underground water channel, which travels more than 8 kilometers to reach its source in the highlands. The compelling 'artificial' conclusion of the channel is the waterfall that drives the mill. The entire 8 km length of the water channel is made up of properly spaced earthen pipes, and at appropriate intervals, masonry pillars are built to serve as natural suction pumps to push water through the pipes. When water runs smoothly up to a sizable elevated masonry pillar before plunging into the main tank, it creates a stunning "Water Fall." It used to provide food for the pilgrims/disciples and for the troops and also had environmental benefits as it didn’t use electricity to chakki.

The case studied mentioned in the paper provide an example of sustainable practices that can pave way for future sustainable practices that organizations can adopt. They do not burden environment and can be applied in continuous manner. They also can provide fresh thinking to the policy makers in creating and supporting sustainable world.

5. Conclusion

India has always been the originator of many innovations. The economic standing of the ruling class at the time was impacted by the antiquated inventions. Indian history has rich heritage of examples of environmental sustainability that gave businesses a competitive edge. Environmental and sustainability-related concerns have long been seen as significant in Indian history. A number of leaders have enacted laws and constructed buildings that are today referred to as environmentally friendly and sustainable. This research aimed at conducting an analytical assessment of three kinds of ancient sustainable innovations. They explain sustainable innovative practices adopted by people in the ancient India. This integrative review used the methods proposed by Whittemore and Knafl. Since the integrative review technique has been criticized for being too lenient and having the potential to be biased, Whittemore and Knafl have proposed a five-step strategy to increase the rigor of this method in nursing. We search open Google sources and the Delhi University e-library system for study-related topics. The DULS (Delhi University Library System) topic portal's IndiaJournals.com area contains a total of 21053 papers that include the chosen key words. English-language research publications are taken into consideration. The documents that have been excluded pertain to many topics, including but not limited to nanoparticles, educational innovation, non-sustainable innovations, and contemporary sustainable practices. The selection criteria yields a set of 100 documents for additional analysis.

Three examples of sustainable innovative practices have been discussed from ancient India. Different materials were used during the colder months than during the warmer ones. In fact, the 1500-year-old Ayurvedic treatise Ashtnga Hridaya gives six distinct formulations for each of the six seasons of the year. The ayurvedic approach offers a harmony of ingredients necessary for optimal health. Ayurveda provides a variety of treatment options for improving well-being in individuals by considering their physical composition, pathological history, dosha traits, lifestyle, and daily conditions. Because it is inexpensive and has no negative effects on the body, it is sustainable. The remarkable "Panchakki" water mill is well-known for its underground water route, which winds over eight kilometers back to the source in the highlands. The waterfall that powers the mill is the captivating 'artificial' end of the waterway. These sustainable innovative practices resulted in socio-economic benefits to society. They act as a direction to work on in the modern times where resources continue to deplete with times. Such examples of sustainable innovative practices can be used by government and policy makers to make policies to promote sustainable innovative practices for developing sustainable environment in the modern times.

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