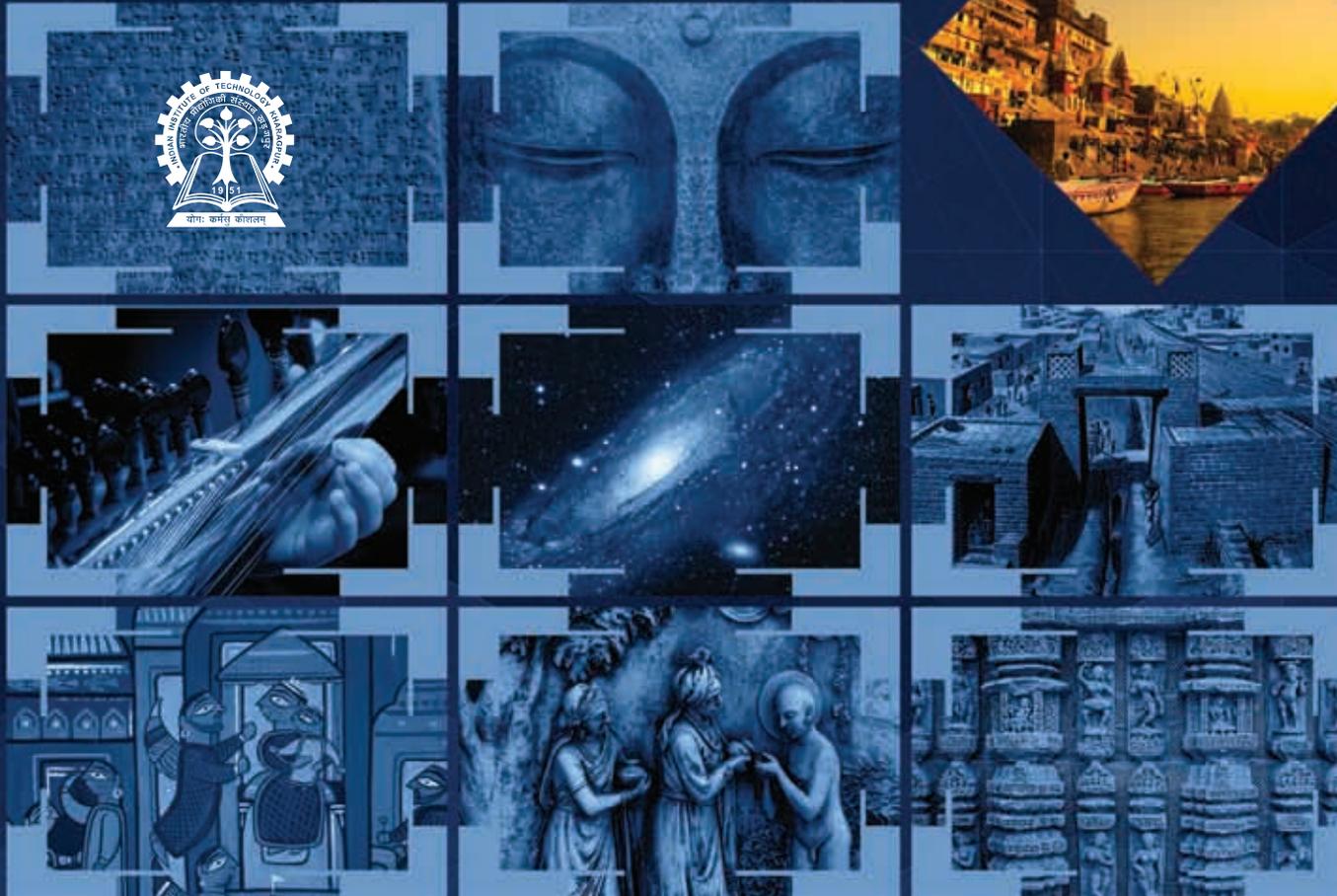


इतर्धेर्ना

A Science-Heritage Initiative

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ALL PROJECTS PROGRESS OVERVIEW REPORT & BOOK OF ABSTRACTS

(Inclusive of a blueprint for Varanasi: a Mega-exploratory project)

भारतीय प्रौद्योगिकी संस्थान खड़गपुर
INDIAN INSTITUTE OF TECHNOLOGY KHARAGPUR

October 2014



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ISBN: 978-93-80813-29-5

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VARANASI – An Eco-Design Blueprint

Acknowledgements

The opportunity and the certitude of being a part of Sandhi is a life-time blessing. Not many are blessed like us. It is a platform which has given us the ways and means to serve our very Motherland – 'India' – the fountainhead of civilization.

The freedom and the camaraderie that we enjoy under the portals of this great Institute, which are built on the bedrock of the sacrifices of our great martyrs, are the first foundations of Sandhi. We feel further blessed to dedicate Sandhi to their hopes, aspirations and the purpose for what they had once stood for.

Our acknowledgements are due to many. Just to mention two from a countless list – One, recollecting a time more than a decade back, it was a rare patronage of Prof. Amitabha Ghosh, our past Director, who had inspired many of us to go ahead with these kinds of holistic and syncretic efforts of inquiry and explorations, though they were just nascent or rather, in a seed form. During that period, i.e., in the year 1999-2000, we had floated an exhibition cum publication called 'Madhu Vidya', meaning a ramification and a revelation on the Heritage of Indian Deep Ecological correspondences and complementarities, which contained the first fruits. Many well-wishers and guardians had shared their blessings – the names of Swami Pravananda, General Secretary, Ramakrishna Math and Mission, Belur Math; Artist-Engineer Sri Arunendu Banerjee; and most significantly, Swami Ramananda of Sadananda Ramakrishna Mission, Dakshineswar are to name a few only. From there we have treaded to our recent times, forerun by the leadership of PPC (Prof. Partha P. Chakraborti), who is our present director. He has been the 'heart and mind'- the master-drive and a perpetual friend in our efforts to capture and shape Sandhi.

We particularly owe a lot to Ms. Amita Sharma, the past Additional Secretary (Technical Education), Ministry of Human Resources Development, Government of India, for her unparalleled support and guidance. Without her, IIT Kharagpur could not have initiated Sandhi. Other IITs followed. In this connection, we sincerely acknowledge an overarching

guidance forwarded by Mrs. Smriti Irani, Honorable Minister-in-Charge, Ministry of Human Resources Development, Government of India, and also for her wonderful wishes and support from her very first day.

I particularly forward our sincere gratitude to Prof. Sunando Dasgupta, Dean, Sponsored Research and Consultancy Cell, IIT Kharagpur, for his silent but uncompromising support and guidance. Particularly, I want to put on the Book of eternal records, the indispensable friendship emanated by two of my esteemed colleagues, Prof. Pallab Dasgupta, Associate Dean of the same Cell and also a key person in Sandhi, and Prof. Priyadarshi Patnaik of our Department of Humanities and Social Sciences. Much of what has been accomplished in Sandhi and much of what you see in this book are because of the two of them.

Finally, a note of deep gratitude has to be forwarded to all our Heads of the Concerned Departments, Centers and Schools; and most important of all, to our excellent team of Principal Investigators and their teamwork to shape 'Sandhi'..... and last but not the least, to the fulfilling contributions of their league of scholars, research associates and research assistants, in the making of this report.

On the behalf of a 'friendship with values' called 'Sandhi, I sincerely seek your continued blessings and support.

Joy Sen
Principal Investigator, SANDHI
October 2014

'The modern physicist experiences the world through an extreme specialization of the rational mind; the mystic through an extreme specialization of the intuitive mind.....to paraphrase an old Chinese saying, mystics understand the roots of the Tao but not its branches; scientists understand its branches but not its roots.

Science does not need mysticism and mysticism does not need science; but men and women need both'

Fritjof Capra
Epilogue: Tao of Physics

'The seer-wisdom realizes that supreme solar world in the form of a Asswattha (pippal) tree, where the branching of the rays of the sun carrying the immortalizing waters (the madhu) reverts back to its roots at night and resurges again to flood the universe with the day light

– This is the eternal truth and they all, who know the truth, are one with their 'Father in the supreme heaven''

Seer Dirgha-tama
Rig Veda: Mandala one, 164:20

Preamble

SANDHI is a major 'Science-Heritage' initiative. It means a 'Scientific Approach to Networking and Designing of Heritage Interfaces'. SANDHI is a recovery and recognition of our heritage through the 'lens of science'. SANDHI is also the augmentation of scientific methodology by incorporating and absorbing inputs and processes embedded in our Indian and global traditional knowledge systems. It is the 'Sandhi', - the spirit of assimilation and integration of the two –Science and Heritage that matters.

SANDHI is sponsored by the Ministry of Human Resources Development, Department of Higher Education, Government of India. It is an inter-institutional and people and ground centric approach. One of the main objectives is to arrive at a holistic process of design systems and pedagogy, by involving students right from the first day and positioning them in real-life piloted projects through the 16 SANDHI projects. IIT Kharagpur is exploring the various SANDHI projects through an Apex body, which consist of Prof. P. P. Chakraborti, Director, IIT Kharagpur; Prof. Sunando Dasgupta (Dean) and Prof. Pallab Dasgupta (Associate Dean), Sponsored Research and Consultancy Cell (SRIC) of IIT Kharagpur and Prof. Joy Sen, of the Department of Architecture and Regional Planning as PI of the SANDHI initiative.

SANDHI has **three bandwidths of projects**. First, it has a deeper level, where Deep science and heritage interface based projects have been designed. Secondly, there are large scaled Geo-exploratory and geo-technical riparian based paleo-hydrological investigation; epigraphic investigation and iconographic-archaeological interpretation; and contemporary application/ tourism revival projects, which is also inclusive of a very Mega iconic project on 'Varanasi'. Varanasi, as we all know, is a living river-based urban civilization of over 3500 years or more. Third and finally, there are creative economic generation projects of which one is to re-explore the application and design of terracotta technology as a building material based on a pilot project in Kumartuli belt, Kolkata.

Under Part one or Level one, which is Deep science and heritage interface based projects, there two language projects, one music project and two iconography-shape grammar based heritage projects. The two language projects will develop a scientific rationale of Indo-European Language Systems (IELS) *applying computational linguistic approach (lab-tested) & cognitive geo-spatial and ethnographic pool-mapping techniques (empirical-graphic) and sonic (etymologic/ articulation based) matching innovations (fresh approach)*.

The music project will conduct Decoding and Exploring Ancient Classification of Indian Classical Music through Machine Learning Methods and Audience Response—a: Decoding

Ancient Classifications of Indian Ragas and b: Audience Response to Indian Classical Music Classification

The two iconographic projects will:

a) establish a scientific correlation between 2-D footprints of Ecologic-Climatic construct and anthropocentric patterns & 3-D systems of iconographic patterns or 'footprints' (Mandala) as evident in design of Temple, Sacred Precincts and General Settlement forms in Indian architecture and also beyond India

[Breadth structure across periods]

b) establish linkages between iconographic re-interpretation of architecture and engineering patterns of Vedic and Buddhist periods based on:

- Identification of underlying common patterns: built-forms; shape grammar; principles of design; styles and continuity embedded in the two layers
- Earmarking a methodology to establish the continuity & re-interpretation of Indian history

[Depth structure between two specific periods]

Additionally there are four other deep exploratory projects namely:

1. The Effect of Meditation, Pranayam and Meditative Sounds on the Cognitive and Emotional Performance of Human Brain: a study using an integrated signal and image-based approach
2. Improving 'End-of-Life Care' (EoLC) for the Elderly by Integrating Indic Perspectives on Ageing and Dying
3. Reconfiguring D na (Generosity) as a new Institutional Financial Mechanism for Social Enterprises based on Indic perspectives
4. Historical Evidence, Myth and Geophysical Modeling to Assess the Tectonic Movement and Risks Associated with the Odisha Coastal 'Heritage' Belt

Level Two has three major Geo-exploratory and geo-technical riparian based projects aiming at paleo-hydrological investigation; epigraphic investigation and iconographic-archaeological interpretation; and contemporary application/ tourism revival projects. They are:

1. To conduct a re-exploratory geo-archaeological –architectural – iconographical study of: Chandraketugrah, East of Kolkata: as a potential site of current and future excavation for re-interpreting the chronology of Indian history (500 BC – 500 AD) based on the textual insights by a) Megasthenes b) Ptolemy and c) Huen Tsang & others
2. To conduct a re-exploratory geo-archaeological –architectural – iconographical study of Vajragiri-Lalitagiri-Pushpagiri belt of Coastal Orissa: a potential site of current and future excavation for re-connecting the historic connections between apparently diverse thought-systems like Kashmir Shaivism, Tibetan Buddhism and others movements in the extended South East Asia/ Indonesia
3. A multi-dimensional exploratory study of the 'Heritage City' of VARANASI for studying the patterns of: Cosmological-Historic footprints (A), geo-morphological footprints (B), habitat of educational systems, ancient physical and social engineering systems + creative economy (C)

Finally as Part three there are four Creative Economy Regeneration projects namely:

1. Assessing the current and future Creative Economic regeneration scope of traditional river-based heritage and Eco-tourism networks in Bengal (Phase I: Hooghly stretch of Kolkata Metropolitan Area) [In association with Kolkata Museum of Modern Arts, Kolkata]
2. An immediate pilot project in the heart of Kolkata (Gariahat area) to re-design and re-resuscitate the livelihood of hawkers + allied informal sectors keeping in mind 'creative economy'. The concern is to boost the background technology of different home-stead, cottage-industrial products to which the Hawkers represent a retail end [In association with Kolkata Museum of Modern Arts, Kolkata]
3. A pilot project on 'Heritage tourism' considering the 'creative economy' of Kumartuli area – a) Terracotta and b) adobe related / reed plastered handicraft and image making. The concern is to re-explore the application and range of Terracotta technology as a building material in contemporary industry. [In association with Kolkata Museum of Modern Arts, Kolkata]
4. A pilot project on 'Educational Heritage tourism' considering the 'creative economy' of College Street area [In association with Kolkata Museum of Modern Arts, Kolkata]

SANDHI aims at putting forth a new order, a greater order in thought and action – by, and for the students. It is not an 'either or' but essentially an integration of science and tradition – assimilating the analytical and deep intuitive sectors of human thinking and action. That always has been the life of India – a very ancient and yet a modern and ever-growing all-assimilating civilization. The spirit of SANDHI comes out best in the following words:

It is probably true quite generally that in the history of human thinking the most fruitful developments frequently take place at those points where two different lines of thought meet.

-Werner Heisenberg

'India of the ages is not dead nor has she spoken her last creative word; she lives and has still something to do for herself and the humane peoples'.....

but still the ancient immemorable SHAKTI recovering her deepest self, lifting her head higher towards the supreme source of light and strength and turning to discover the complete meaning and a vaster form of her Dharma (religion).

-Shri Aurobindo

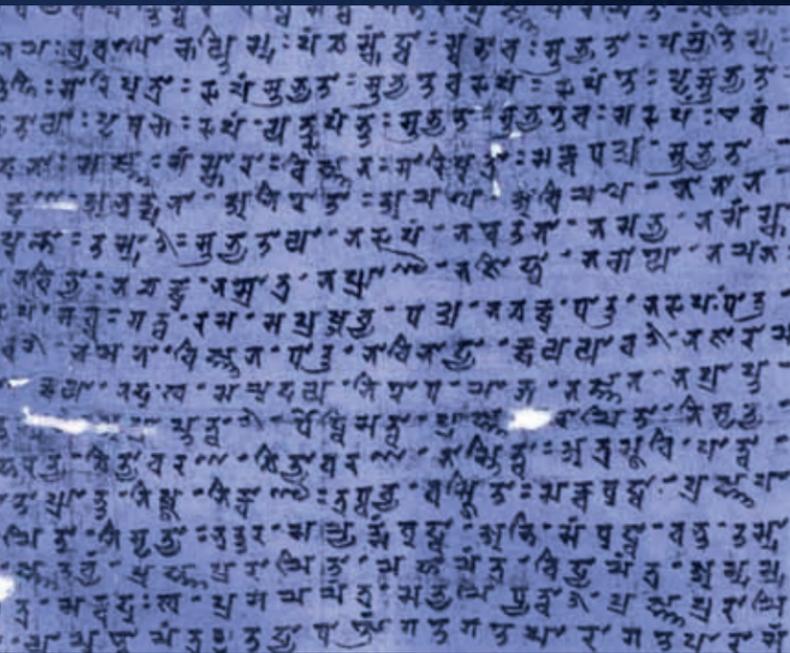
'Foundations of Indian culture

The present Compendium is presented in three parts. The First part forwards a synopsis of Inception cum Progress reports of every project. All PIs along with their team of research associates, scholars and research assistants have diligently worked out this part. The reports are presented in three sections: Section A covering Deep science and heritage exploration project; Section B on geo-exploratory projects and Section C on creative economy projects.

The second part is a testimony to the kind of work and progress. It presents over 45 abstracts satisfying various objectives of the projects as carved out by the scholars working under SANDHI. The third and the concluding parts are on Varanasi, which is inclusive of a blue print. The Compendium presents the various work of the SANDHI Team of IIT Kharagpur which is a part of the October 2014 Review Workshop.

PART - I

Section A



Progress and Review Report
Ten Deep Science & Heritage Exploratory Projects

Language is a process of free creation; its laws and principles are fixed, but the manner in which the principles of generation are used is free and infinitely varied. Even the interpretation and use of words involves a process of free creation.

- Noam Chomsky



To Develop a Scientific Rationale of Indo-European Language Systems

AIP

Principal investigator

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Co-investigators / advisors

Prof. Pallab Dasgupta

Prof. V. N. Giri

Prof. Sudeshna Sarkar

Prof. Pawal Goel

Prof. Haimanti Banerjee

Prof. Mainak Ghosh

Prof. Anirban Dasgupta

Introduction

To summarize the whole truth behind the foundation of Indo-European Language systems having Sanskrit either at the core or the apex of that very system, one may refer to the following words quoted from 'Hymns to Mystic Fire' P I):

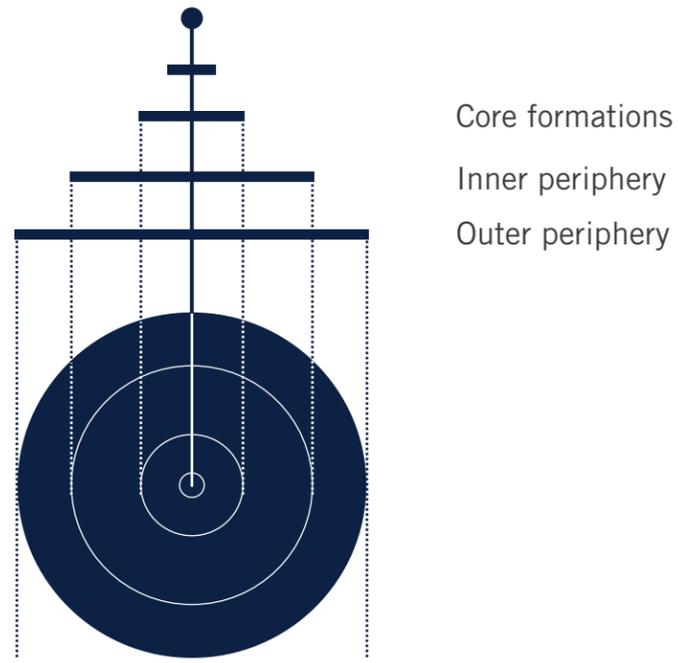
'In ancient times Veda was revered as a sacred book of wisdom, a great mass of inspired poetry, the work of Rishis, seers and sages, who received in their illumined minds rather than mentally constructed a great universal eternal and impersonal Truth which they embodied in Mantras, revealed verses of power, not of an ordinary but of a divine inspiration and source. The name given to these sages was Kavi, which afterwards came to mean any poet, but at the time had the sense of a seer of Truth – the Veda itself describes them as 'Kavya satyasrutah' or 'seers who are hearers of Truth' and the Veda itself was called shruti, a word which came to mean 'revealed scripture'...'

- Sri Aurobindo

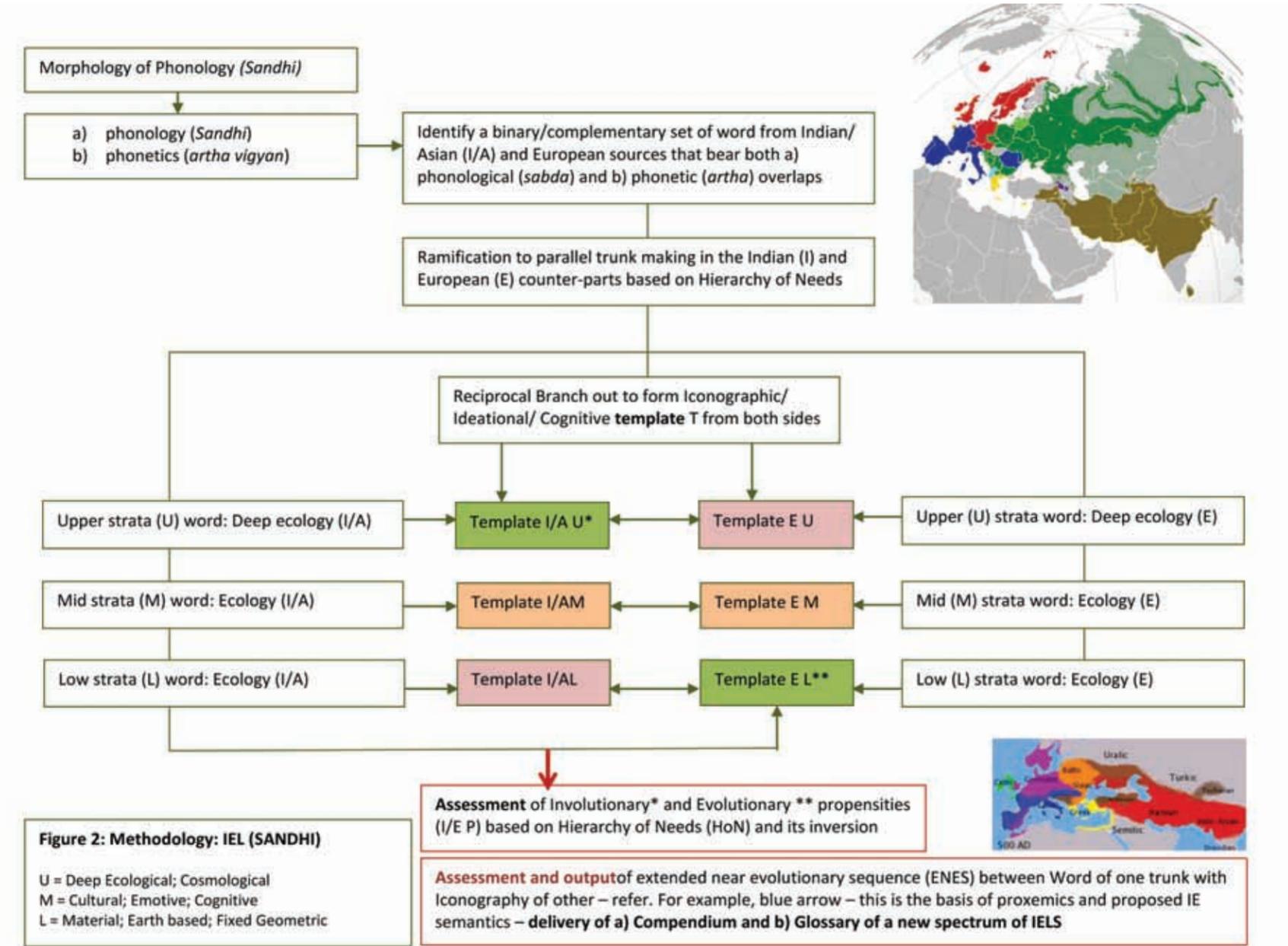
A research abstraction

The abstraction is evident in the Figure 1 below showing a morphological upward evolution, which can be reciprocally structured to counter a downward evolution of language systems from deeper (core) to surface (peripheral) levels. The two-way ladder, in the form of a vertical tree-like structure is suggested on the basis of a three stepped inquiry (refer Figure 2). Sufficient work has been done till date to address:

1. Earmarking an evidence of an upper strata leading to a hierarchy of surface (temporal and personified) and deep (universal) structures
2. Assessing further inter-linkages of 'Shape Grammar' depicting response-stimulus exchanges based on iconography (templates)
3. Establishing morphological evolution .of Language systems based on hierarchy of response-stimulus exchanges through components: vowels, consonants, syllables, etc (bases of varnamala in Project Code: OPP)



Involution of Language systems



*True knowledge is not attained by thinking. It is what you are;
it is what you become.*

- Sri Aurobindo



A Deep Validation Study of Indian Language Systems Based on Patterns of Varnamala

OPP

Principal investigator

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Prof. Haimanti Banerjee

Prof. Mainak Ghosh

Prof. Anirban Dasgupta

Introduction

To epitomize the whole truth behind the foundation of phonological syntax (sabda) and the deeper phonetic semiotics and semantics (artha) systems of Sanskrit and its other derivatives in Indian Philology and etymology it is perhaps necessary to re-visit the following quotation:

“There are two worlds, the microcosm, and the macrocosm, the internal and the external. We get truth from both of these by means of experience. The truth gathered from internal experience is psychology, metaphysics, and religion; (and) from external experience, the physical sciences. Now a perfect truth should be in harmony with the macrocosm, and the macrocosm to the microcosm; physical truth must have its counterpart in the internal world, and the internal world must have its verification outside. Yet, as a rule, we find that many of these truths are in conflict. At one period of the world's history, the internals become supreme, and they begin to fight the externals. At the present time the externals, the physicists, have become supreme, and they have put down many claims of psychologists and metaphysicians.”

- Swami Vivekananda

A suggested research approach: Varanamala and its thermodynamic hierarchy

It is suggested that an inner or deeper hierarchy of a 'thermodynamic' evolution of structural or compositional part of language systems is operational. It is the Varanamala (Garland of letters*: Vowels, consonants and syllables), made hereby evident:

“There is in the Rig-Veda, the oldest human writing in existence, a beautiful passage describing creation, and it is most poetical — “When there was neither aught nor naught, when darkness was rolling over darkness, what existed?” and the answer is given, “It then existed without vibration”. This Prana existed then, but there was no motion in it; Anidavātam means “existed without vibration”. Vibration had stopped. Then when the Kalpa begins, after an immense interval, the Anidavātam (unvibrating atom) commences to vibrate, and blow after blow is given by Prana to Akasha. The atoms become condensed, and as they are condensed different elements are formed. The Akasha, acted upon by the repeated blows of Prana, produces Vāyu or vibrations. This Vayu vibrates, and the vibrations growing more and more rapid result in friction giving rise to heat, Tejas. Then this heat ends in liquefaction, Āpah. Then that liquid becomes solid. We had ether, and motion, and then came heat, then it became liquefied, and then it condensed into gross matter; and it goes back in exactly the reverse way. The solid will be liquefied and will then be converted into a mass of heat, and that will slowly get back into motion; that motion will stop, and this Kalpa will be destroyed. Then, again it will come back and again dissolve into ether.”**

The works of Sir John Woodruff (Arthur Avalon*) and Swami Vivekananda ** on the one hand, and its complementarity with that of French mathematician Jean Baptiste Joseph Fourier on the other hand holds the key. The phonological quality of sound waves is comparable to its thermodynamic property posited in a way that any function whatsoever can be thought of as consisting of a mixture of sine waves, and to this day we refer to the set of sine wave components necessary to make up some signal as the signal's Fourier spectrum. When Fourier came up with this idea he has actually trying to calculate the rate at which heat flow in the medium concerned. Accordingly, the phonological property can be classified from two angles – anthropometry (microcosm based) and thermodynamics (macrocosm based). Major literature review and initial analyses has been done till date to carry forward the intent of the approach suggested in Figure 1.

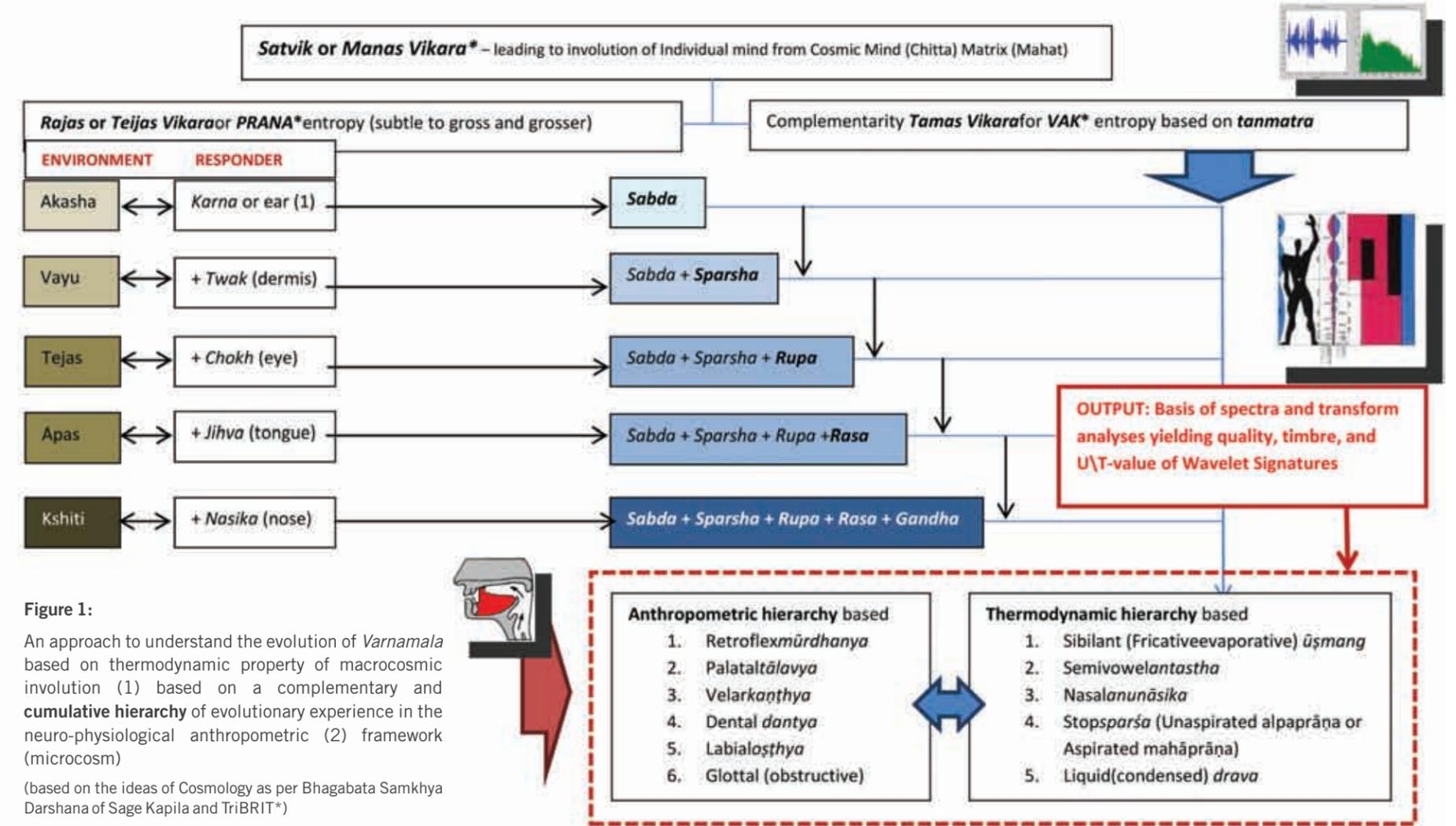


Figure 1: An approach to understand the evolution of *Varnamala* based on thermodynamic property of macrocosmic involution (1) based on a complementary and **cumulative hierarchy** of evolutionary experience in the neuro-physiological anthropometric (2) framework (microcosm) (based on the ideas of Cosmology as per Bhagabata Samkhya Darshana of Sage Kapila and TriBRIT*)

The Sankhyas define it as the equilibrium of three forces, one of which is called Sattva, another Rajas, and the third Tamas. Tamas, the lowest force, is that of attraction; a little higher is Rajas, that of repulsion; and the highest is the balance of these two, Sattva; so that when these two forces, attraction and repulsion, are held in perfect control by the Sattva there is no creation, no movement in the world. As soon as this equilibrium is lost, the balance is disturbed, and one of these forces gets stronger than the other, motion sets in, and creation begins. This state of things goes on cyclically, periodically. In one cycle of cosmos it is a Kalpa.

The magic happens only when the artist serves with love and the listener receives with the same spirit.

- Pandit Ravi Shankar



Decoding and Exploring Ancient Classification of Indian Music Through: (a) Machine Learning And (b) Audience Response

ITA

Principal investigator

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Prof. K. S. Rao

Prof. Damodar Suar

Prof. Sourangshu Bhattacharya

Introduction

In Indian tradition ragas (lit. hue, colour, beauty, melody) are fundamental melodic constructs with their own distinctive grammar, rules of composition and evocation which have come down to us through thousands of years of tradition (*parampara*). Some distinctive aspects of *ragas* are their association with specific times of days, seasons, emotions, colours and even relation to spirituality which can be traced to the notion of *Jati* in the *Natya Sastra*. In this project we propose to explore if there are distinctive and fundamental 'codes' or 'structures' with their own distinctive syntax and associated semantics which make these classifications, associations and evocations successful through (a) MIR and machine learning techniques, and (b) through audience response to music and its evocations.

Research Objectives and Methodology

The main objectives of this project are presented below. The methodologies, where machine learning and audience response use one another's inputs and validate results, are presented in the two diagrams:

- To explore and apply techniques from music information retrieval (MIR) and machine learning for automatic classification of Indian Music; to study hidden features in traditional renditions of various ragas, and to find whether some of these features can be used to explain the classifications of the ragas.
- To explore through "audience response" the various dimensions of Hindustani classical music which evoke a variety of cognitive and emotive responses to music; to understand the deeper underlying principles which govern the generation of "meaning" and "effect" in Indian ragas by the way they are experienced and interpreted by their listeners.

Work Done so Far

- Music feature extraction methods are being evaluated and melody extraction methods are being developed for automatic notation creation of ragas.
- Development of classifiers for automatic detection of ragas through development of feature identifying algorithms.
- In order to be able to model and discover structures that explain the various classifications of the ragasa formal model for the ragas is being developed. Such models will not only help us in explaining the ancient classification of ragas but also enable us to develop several prototypes such as raga identifiers, recommendation systems and discovering rendition styles for various 'Gharanas'.
- Under audience response preliminary research on the influence of timbre of different Indian musical instruments, of the range of emotions and dominant moods of various ragas based on thaat and time are being explored.
- Framework and pedagogy for web-based interactive concept repertoire, educational tutorial and illustrative software and games are being developed for dissemination of Indian classical music.

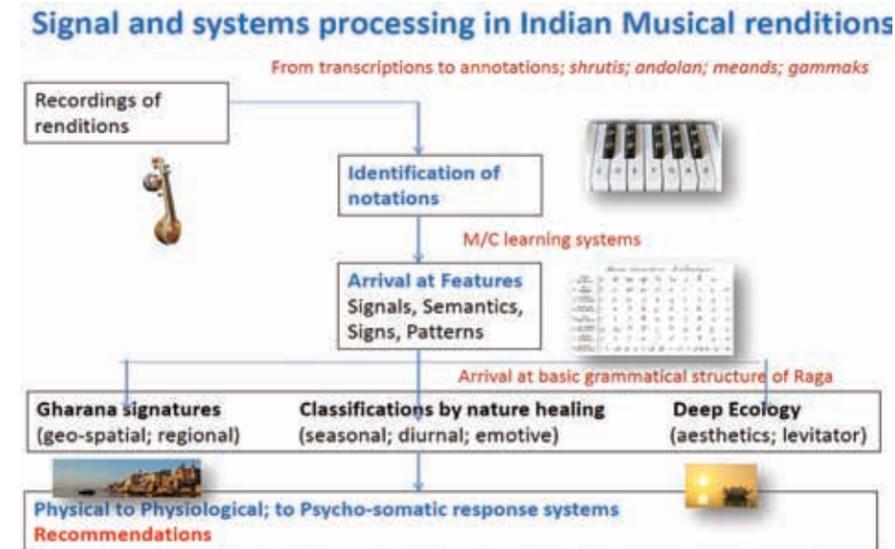
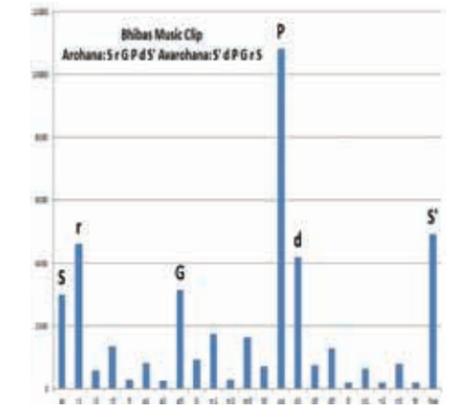
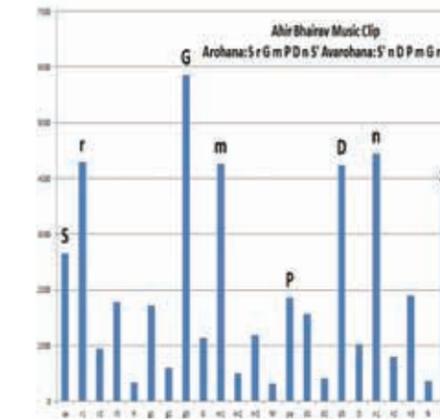
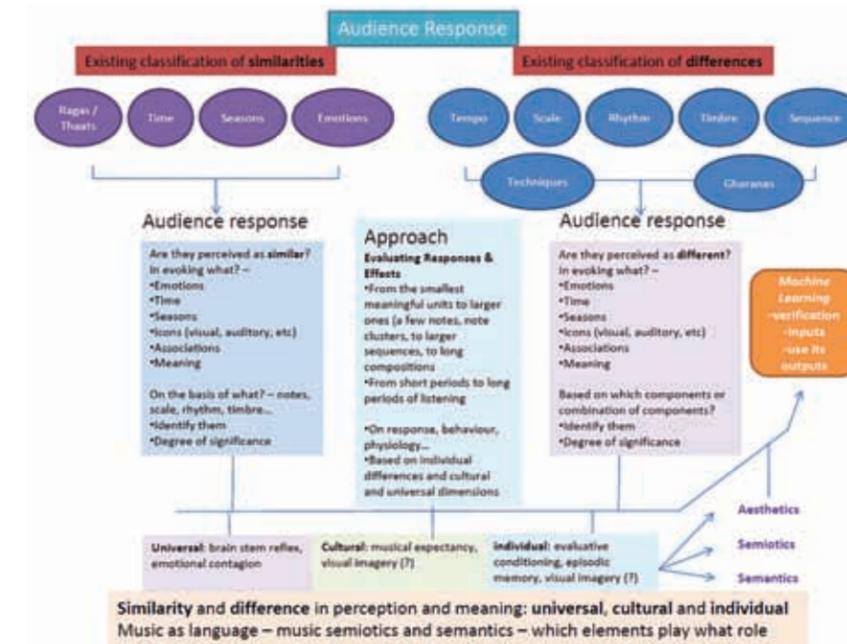


Fig. 1



Fig. 2

Figures 1 and 2: Methodology to be adapted from computational & signal processing approaches to understanding the underlying grammar of Indian classical music and Interactive software to visualize the scales of ragas based on the circle of fifths: To be used as an online interactive tool.



Figures 2 and 3A and B: Methodology to be adapted from audience-response approaches to understanding the underlying grammar of Indian classical music (see top left) and Derived notes of Ahr Bhairav music clip and Bhibas music clip (see top right)

'The ancient artist had a deep feeling of being himself an integrated part of the cosmos and of participating in all its categories and elements, a feeling acquired by innumerable generations in uncounted centuries of meditative experience.'

- Alice Boner



To establish a scientific correlation between
2-D Ecologic footprints and 3-D built formations in Indian architecture

BCW

To establish linkage between iconography representation
of Pre-Buddhist/ Vedic and Buddhist periods

LBV

Principal investigator

Prof. Joy Sen
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Prof. Saikat Kumar Paul
Prof. Mainak Ghosh

Co-investigators / advisors (LBV)

Prof. Priyadarshi Patnaik
Prof. Pallab Dasgupta

Introduction

Indian architectural traditions are synonymous with Indian cosmic traditions having footprints in user's charts and cosmological models as an imprint. The relations are complementarities between Indian building physics and the metaphysics of shape grammars. These relations lead to a footprint derived from the macrocosmic model imprinted on the user or the microcosmic representation (both the deity and the devotee as one).

Research Objectives and Methodology

Initially there are three major steps to trace the ontological connections of 'being' and 'becoming' to satisfy Project BCW:

1. To scan a set of architectural prototypes like a) Vedic Mandala and Temple *ratha* and *vimana*; b) Buddhist Mandala and Stupa; and pattern of Archetype trees-related anthropometrics and the making of Sikharas and so on.
2. To document the cardinal footprints, ecological footprints, built-environmental footprints, and solar orientation footprints of the 3D object under study with constructs of 2D inputs (physical, ritual, mythical, cosmic attributes) representing the design hierarchy/ layers/ holarchy (if any) [Application of orders/ syntax/ algorithms of Cybernetics – I, II, III and IV] as per a four step process (see below). *Cybernetics is a working philosophical matrix of design philosophy, design logic and algorithm, and design dynamics.*
3. To develop working models of relationship between the two to arrive at response-to-stimuli epistemology [Environment-behavior complementarities under some applied Indian and global behavior mechanism studies like generosity, meditation, and altruism]



Figure 1: 4 step cybernetics based inquiries for establishing 2D – 3D linkages of iconography

At the second stage, the project LBV attempts to establish linkages between iconographic re-interpretation of architecture and engineering patterns of Vedic and Buddhist periods based on various start points of Indian history (see Figure 2). Basic literature review and start up analyses have been initiated till date for:

1. Identification of underlying common patterns: built-forms; shape grammar; principles of design; styles and continuity embedded in the two layers
2. Earmarking a methodology to establish the continuity
3. Re-interpretation of Indian history of science linking the two period of remote antiquity

...the way of practising this samādhi is not singular and its actual method of cultivation depends upon the functioning of the mind and mental concomitants (citta-caitta pravṛtti) of each living being (mahat).

- *Mahayana Sutra of the Foremost Shurangama at the Crown of the Great Buddha*

...the word "Chaitya Purusha" for the "Psychic being"...it is the direct portion of the Divine in the human and it is also the being that is behind the Chitta.

- *Sri Aurobindo: Conversations*

...what is the solution of the Vedantist? His solution is that, just as the Sankhyas say, it requires some sentient Being (Chaitya) as the motive power behind, which makes the mind think and Nature work..

- *Swami Vivekananda: The Free soul*

...then the Chaitya (the Principle of sentiency) who is the Kshetrajna (the Knower of the Field as Jiva) enters and the Cosmic Being wakes up.

- *Kapilopadesha in (Bhagabat Puarana) English by Swami Tapasyananda of Advaita Ashrama*

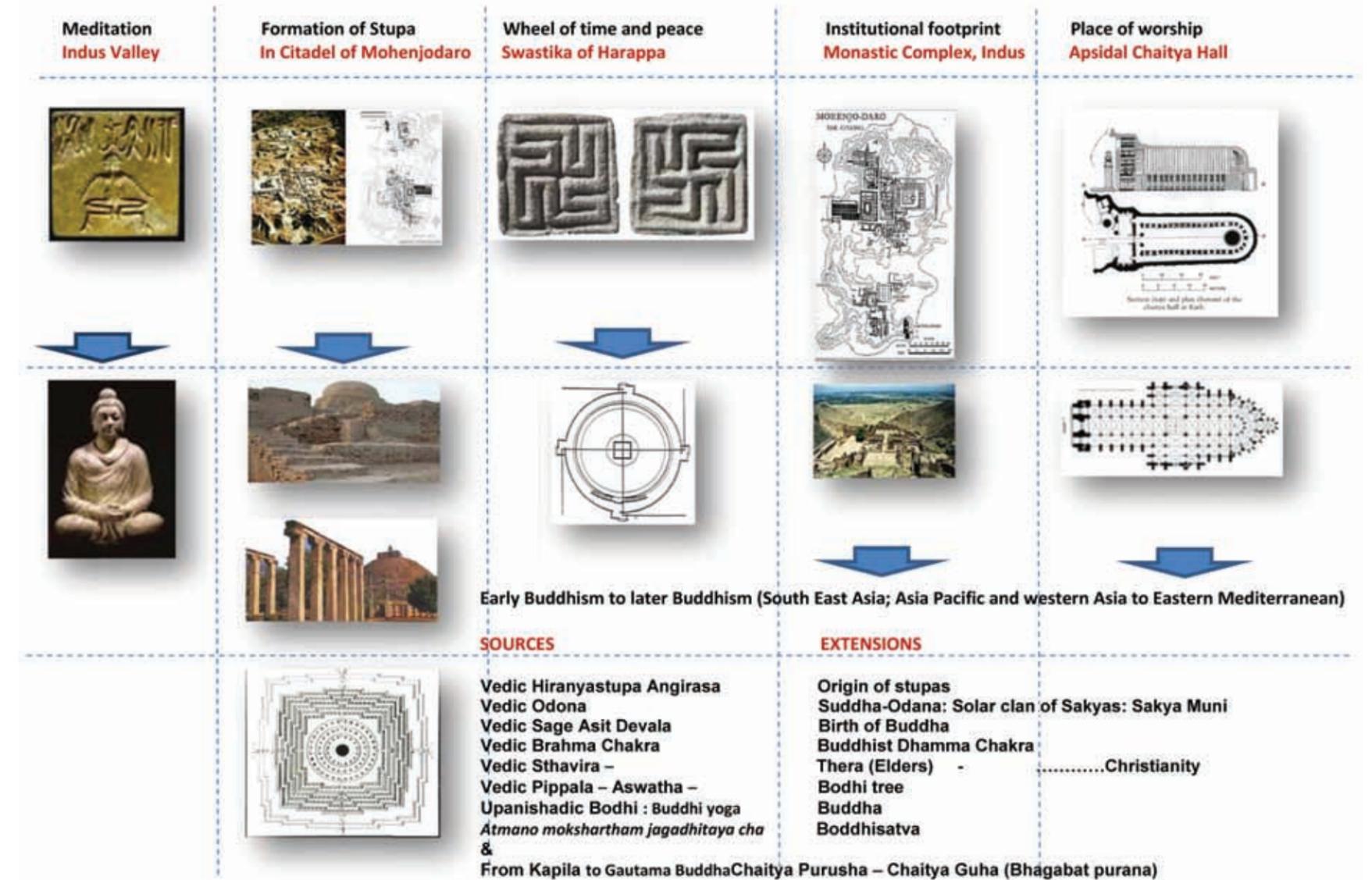


Figure 2: Establishing linkage between iconographic traditions of Vedic and Buddhist periods: Template Approach

*If words are pictures spoken, where sounds weld themselves
into form, then painting is story in form (rup-katha) told by
color and line.*

- Abanindranath Thakur



The effects of meditation, pranayam and meditative sounds on the cognitive and emotional performance of human brain

CEH

Principal investigator

Prof. Aurobindo Routray

Co-investigators / advisors

Prof. Priyadarshi Patnaik

Dr. Rajlakshmi Guha

Preamble of the project

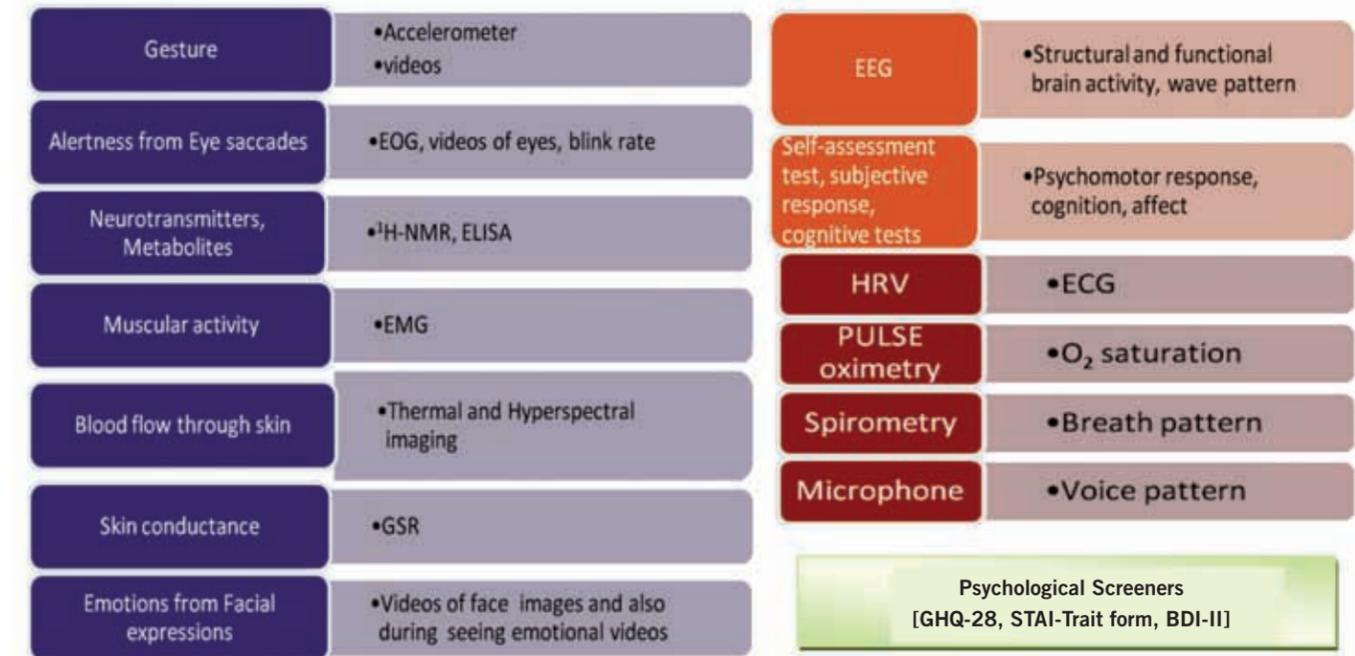
Meditation (including breath, postures, meditative sounds, chants and meditative music) is purported to have beneficial effects on the human body and mind. Many scientific studies suggest that it helps remove stress and regulate body metabolism thereby improving the immune system, energy level, and general wellbeing. Meditation is also reported to improve mental abilities, stabilize emotions and contribute positively to a healthy and happy life. Currently, significant research is being conducted on exploring the physiological and mental changes that occur due to meditation. However, research that is holistic, and includes looking at these issues through a number of parameters such as brain signals, facial and ocular changes, voice signals, physiological changes as well as psychological and cognitive alterations are relatively few. Similarly, studies that look at a wide range of Indian meditation techniques, both ancient and modern are also scarce. Hence there is the necessity for such a holistic, large scale scientific multidisciplinary research.

Research objectives

To identify the nature of psycho-physiological changes that take place during/after (a) very short periods of meditation, (b) short periods of meditation and (c) meditation over a long period of time. These would be explored for different kinds of meditation techniques and traditions of India.

1. In order to assess these changes a multi-pronged approach shall be used to explore changes in the psychological variables such as attention, alertness, working memory and information processing, decision-making, and problem-solving. Changes in mood and affect, changes in perceived stress, frustration-tolerance, emotion-regulation and control, attitude towards and perception of discomfort shall also be explored. In addition the effect of meditation techniques on quality of life and wellbeing, resilience, adjustment to the environment, social cognition, self-esteemself-concept and pro-social behavior shall be explored.
2. To explore if there is any physiological change during and after the meditation process, assessment of body/brain signals will be made to explore changes in ERP, BP, pulse rate, skin conductance, eye movements and fixation, voice parameters, facial expressions and respiration. Thermal and hyperspectral images of facial expressions will also be examined.
3. Attempts would be made to explore if there are correlations between the changes recorded in psychological variables and physiological measures. Alterations in level of metabolites will be investigated by analyzing salivary samples. Behavioral changes and perception of things will also be documented.
4. The research aims to make well researched recommendations, and to develop techniques which will prove effective and beneficial for humans, and which, in the future, can be incorporated into intelligent monitoring systems

Methodology: Study Design:



Work done so far

Literature review/ surveys: Extensive literature review on the effects of meditation, Pranayam and meditative sounds on the human brain has been done. The correlation of meditation with physiological and psychological parameters has been done. Study design for future experiments has been formulated based on literature review.

A review paper on studying the effects of various meditation techniques based on EEG signals has been drafted.

- Mukherjee, R; Chaudhuri, A; Routray, A, Patnaik, P, “Advances in Electroencephalography studies of different meditation traditions during the last decade”.

Initial experimentation: A pilot study comprising 23 experienced Kriya Yoga meditators has recently been completed in Arua, Kendrapada, Odisha. All the physiological measures and psychological assessments have been performed. Earlier a similar experiment was conducted in Puri, Odisha which consisted of Kriya Yoga meditators [n=23] and Non-

meditators [n=10] as well. A conference paper has been published based on these initial experimentation.

- Chaudhuri, A; Nayak, S.; Routray, A, "Use of data driven optimal filter to obtain significant trend present in frequency domain parameters for scalp EEG captured during meditation," Students' Technology Symposium (TechSym), 2014 IEEE , pp.7-12, Feb. 28 2014-March.

Any paper in the making:

1. Shaw ,L; Mishra S; Routray, A, “ Generalised Orthogonal Partial Directed Coherence as a Measure of Neural Information Flow During Meditation”.
2. Shaw ,L; Routray, A, “Efficacy Of Adaptive Directed Transfer Function for Neural Connectivity Estimation of EEG Signal During Meditation”.

The wise man does not lay up his own treasures. The more he gives to others, the more he has for his own.

- Lao Tzu



Reconfiguring DANA (generosity) as a new financial mechanism for social enterprises

DGE

Principal investigator

Prof. Narayan Chandra Nayak

Co-investigators / advisors

Prof. Suhita Chora Chatterjee

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Preamble of the project

The word *Dāna* signifies the act of giving with a desire to promote the welfare of others. It is manifested in both tangible and intangible forms. In India, various customs across religions and social groups have nurtured the tradition of *Dāna* over the ages. It is a key religious practice in many religious traditions including Hinduism, Buddhism and Jainism. In India, *Dāna* has always been an integral part of our daily life though its forms and shapes have changed with time. In modern India, religious and other philanthropic organizations have attracted millions of people to make generous donations. These organizations, in turn, are expected to conduct extensive work in social sector.

Research Objectives and Methodology

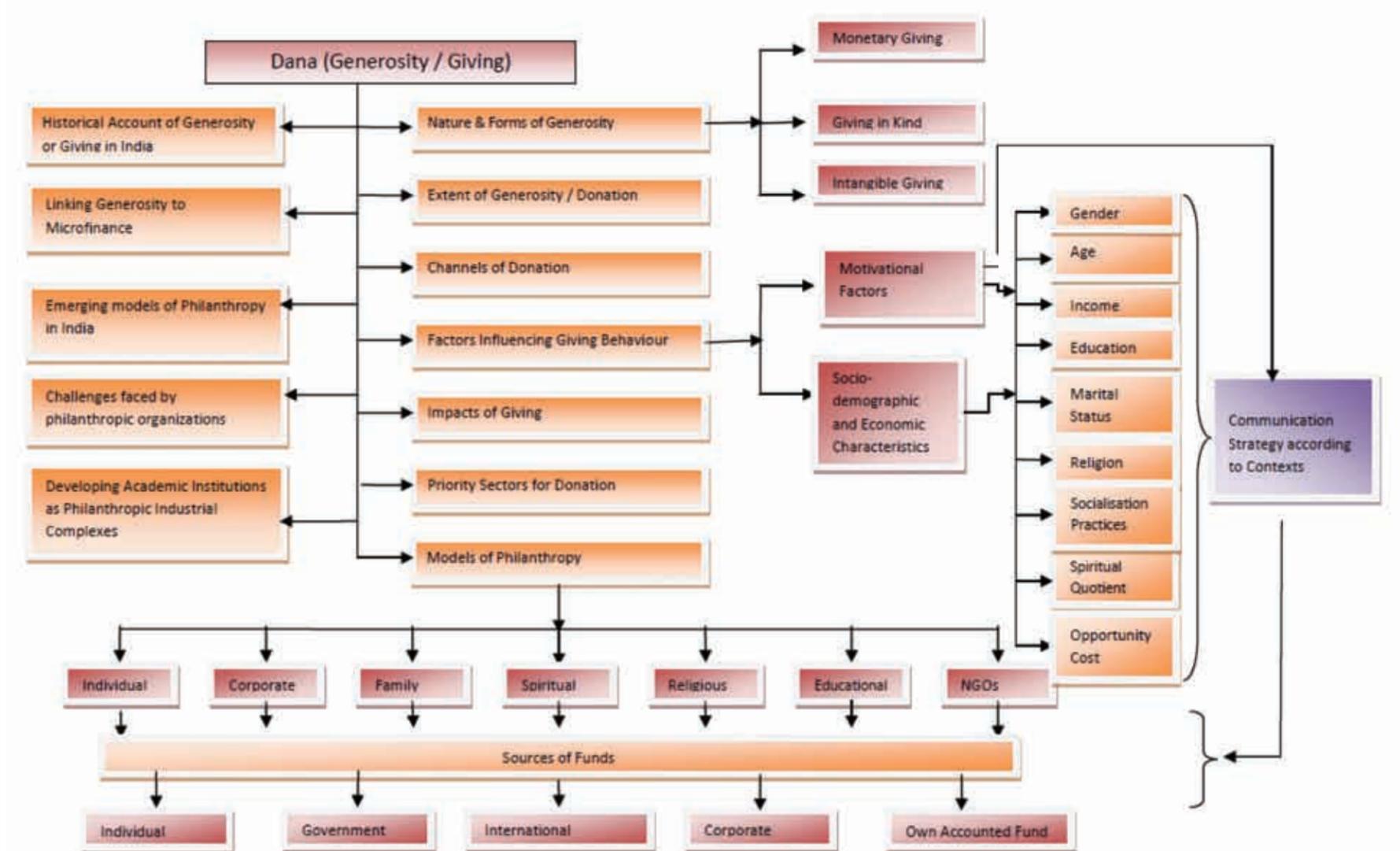
The primary aim of this study is to explore the rich history of giving in India with the hope of adopting some best practices for promoting effective giving. It also aims to explore the tradition of *Dāna* in its historical-traditional context and relate it to *Dāna* as it exists in India today in the form of charity or philanthropy and to propose suitable model(s) for effective utilization of funds generated through the act of giving. In effect, this study attempts to address the following pertinent issues:

- (a) Nature, forms and extent of generosity in India
- (b) factors influencing giving behavior
- © Channels of donations
- (d) Impacts of giving
- (e) Identifying priority sectors for donations and alternative models of philanthropy in India, and (f) exploring the linkage between generosity and microfinance in Indian context.

The study also aims to examine how Indic perspective of *Dāna* is different from/similar to the Western notion. Eventually, the study will attempt to develop a working model of *Dāna* generation and utilization in academic institutions in order to explore the possibility of converting the latter into academic industrial complexes. It is expected that understanding these issues would result in developing self-sustaining models of philanthropy in our cultural context, and in modifying *Dāna* behavior within Indian cultural milieu.

The study is based on both primary and secondary data. Primary data will be collected through primary surveys and interviews. In addition, experiments will be carried out wherever necessary to explore perception and communication, and their relations to giving behavior. A broad outline of the research is presented in Figure 1.

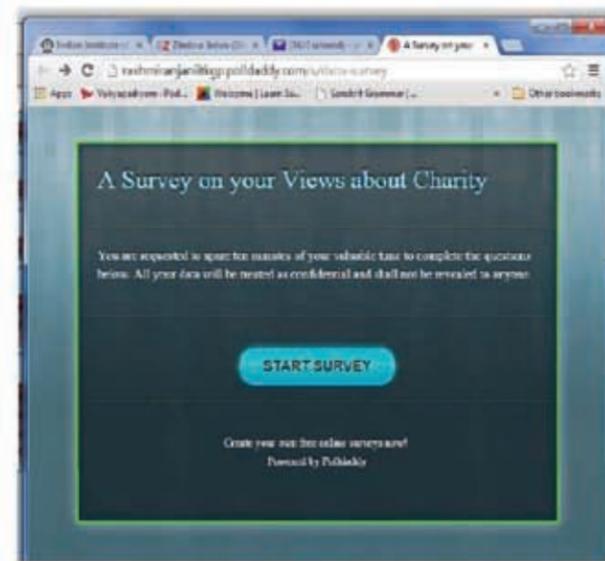
Figure1: Overview of Project Objectives and Areas under Exploration



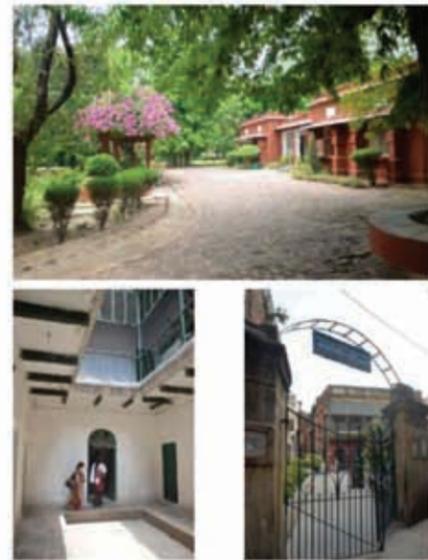
Work done so far

Literature on various aspects of *Dāna* from the perspectives of both historical traditions and modern practices is under review. Especially, studies on economics of philanthropy, experiments on giving behavior, and understanding donors' motivations have been explored. Some preliminary surveys were carried out in Varanasi (Ramakrishna Mission, Krishnamurti Foundation and Kashi Labh Mukti Bhavan) and Puri (Bharat Sevashram. An

interview with Mr. Vinayaak Lohani of Parivaar (a social organization) was also undertaken. All these have given insights into how different kinds of organizations sustain themselves. An experiment on trust and a survey on the giving behavior of IIT students' community are being carried out now. The project has also generated two short reports on 'Religious Giving' and 'Secular Giving' under the summer internship program.



Screen shot of Survey on IIT Students: Focus on both tangible and intangible generosity



Two philanthropy organizations visited At Varanasi: *Mukti Bhavan* and *Krishna Murti Foundation*

Figure 2: Some Surveys and Exploration: Ongoing and in the Past (two philanthropy organizations visited at Varanasi: Jiddu Krishnamurti Foundation and Mukti Bhavan)

Electric motion makes the molecules of a body move in the same direction...Another point from physiology we must remember, that the centre which regulates the respiratory system, the breathing system, has a sort of controlling action over the system of nerve currents.

- **Swami Vivekananda**



Improving End-of-Life Care (EoLC) for the elderly by integrating Indic perspectives on ageing and dying

ELI

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Preamble to the Project

India is going through a demographic and epidemiological transition. As a result, most aged in India are experiencing a highly protracted 'medicalised death' in acute care hospitals. There are also many who are dying in abject neglect. Although a few Palliative centers and Hospices have been set up in some states, yet the entire movement seems to be Western in approach and not suited to Indian socio-structural and cultural needs.

As opposed to the western 'specialization of death', India has for long, mastered a unique art of dying nurtured by a death affirming philosophy and an indigenous healing system which helped the dying to exit peacefully. These Indic concerns need to be revisited within a Public health strategy to End-of-life care (EOLC).

Research Aim and Methodology

The project aims to:

1. Document the traditional and existing dying practices in India in different care settings- Hospitals, Homes, Palliative centers, Old age homes and a few Gerontopolises like Kashi.
2. It intends to develop a Public health approach to EOLC which is suited to local needs and is culturally sensitive.
3. It proposes an Action research involving an Experimental model of EOLC which integrates different components of Indic perspectives--philosophy, spirituality, aesthetics, indigenous medicine, culturally congruent communication strategies, and architectural inputs. The aim is to optimize resources in end-of-life, build a continuum of care structure, create an interface with biomedicine and indigenous healing traditions and empower community to care for the elderly.

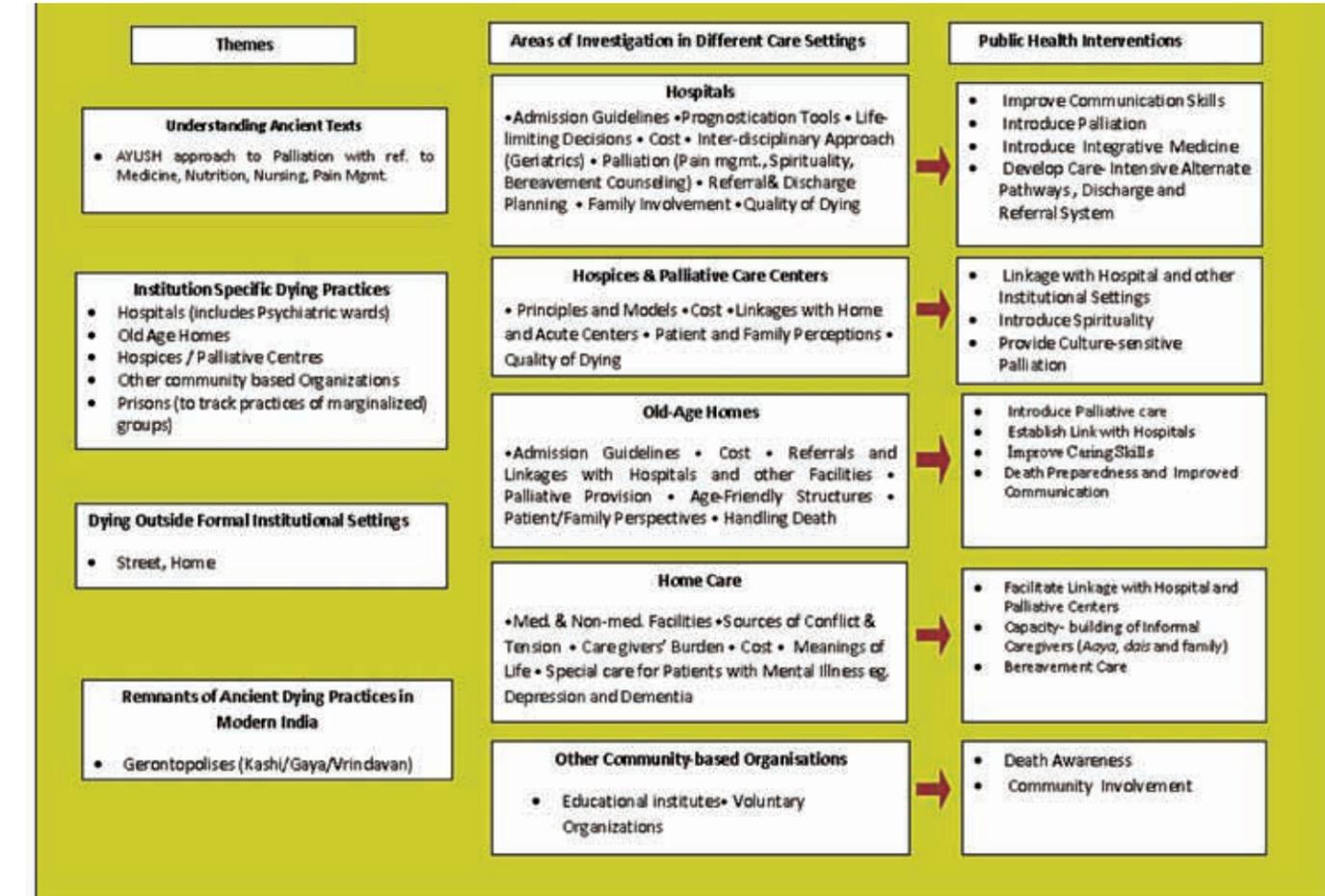
The methodology involves documentations of various kinds - primary and secondary, to understand the Quality of Dying. Primary data is collected through surveys involving questionnaire and interview methods. In addition, the proposed experiments would develop specific observation strategies under controlled conditions.

Work Done So Far

The challenges of dying in old age have been reviewed in all the four settings mentioned earlier. The debate is framed within a global discourse on End-of-life care. The findings are being compiled in a manuscript for a book which would be complete in the next six months. Based on the literature review, Task mapping for the existing project has been completed (see Fig.1) Some of the components have been taken up for primary surveys, for example, a short survey has been conducted on dying destitute in Kolkata and field visits have been made to indigenous dying spaces in *Kashi*. To facilitate understanding of ancient dying practices, a collaborative research plan has been worked out with Sri Ramakrishna Mission. Simultaneously, visits have been made to *Pallium India* (Kerala) and *Koshish* (Jharkhand) to facilitate collaboration with experts on Palliative medicine.

The project is now poised for an Action research centered on the installation of an age-friendly portable cottage in IIT campus. This would act as an Alternate Care Pathway between Home and BC Roy Hospital and facilitate experiments and interviews from various disciplinary perspectives. However, the proposal is subject to clearance from the Institute.

Figure1: Project Objectives and Task-Map for a Public Health Approach to EOLC for the Elderly



Quantum theory thus reveals a basic oneness of the universe. It shows that we cannot decompose the world into independently existing smallest units. These relations always include the observer in an essential way. The human observer constitute the final link in the chain of observational processes, and the properties of any atomic object can be understood only in terms of the object's interaction with the observer.

- Fritjof Capra



Historical Evidence, myth and geophysical modeling to assess the tectonic movement and risks associated with Odisha coastal 'Heritage' belt

HPM

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Preamble to the Project

Odisha, a heavily populated as well as culturally and naturally rich coastal state, is vulnerable to multiple disasters such as tropical cyclones, storm surges, earthquake and tsunamis. The threat of the coastal vulnerability to such hazards has increased manifold with the growing population. Odisha's coastal belt which has one of the richest heritage sites of the world such as Puri and Konark temple is facing a typical problem of coastline erosion. As a result of which the sea embankment, heritage sites and clusters of human settlements near the sea have been the worst affected. This important coastline is witnessing severe natural hazards including heavy erosion, sea-water intrusion and inundation. There are even reports of structural tilting. However there are no comprehensive studies undertaken so far to understand specific processes and factors driving these natural hazards. Given the complexity of the natural system, a comprehensive study has to be undertaken to (a) document history, myth and other cultural practices and sources to identify if in the past there were geo-tectonic changes or river-shifts, (b) find exact causes and (c) possible solutions, and (d) to assess risk to heritage and life through an interdisciplinary team of experts.

Research objectives and methodology

Objectives

- Historical and mythical investigation to assess the existence (if any) of ancient river system, mountains, etc. such as Chandrabhaga and Saradha Bali, Nila Shaila and other such historical/ mythical landmarks
- Scientific Investigation of identified sites and locations by Measurement, Modeling using Machine Learning and Data Analytics to assess Past and neo-tectonic (erosion, tilting etc) activities, Paleo-channels of the extinct river systems, Geohydrology and Geomorphology
- Risk assessment with respect to economic livelihood

Work done so far

- An attempt has been made to find the lost mythological river like Chandrabhaga in and around Konark Sun temple from integrated analysis and interpretation of satellite imagery data and Google Earth using sophisticated software like Arc GIS version 10.2. Initial analysis suggests high probability of a channel near Konark temple.
- An exploration of myths, history, rituals, images, interaction with villagers suggests the presence of a river near Konark. This is endorsed through virtually all the different sources reviewed, documented and analyzed. Moreover, field-trips and interactions with villagers suggest there was a narrow palaeo-channel that was used to transport stone for the construction of the temple.
- A preliminary review of literature on economics of heritage has been carried out to elicit economic implications of heritage sites with special emphasis on coastal heritage. Consequently, a tentative work plan has been developed with particular focus on making an assessment of risks of heritage site erosion on tourism, creative economy, vegetation, etc.

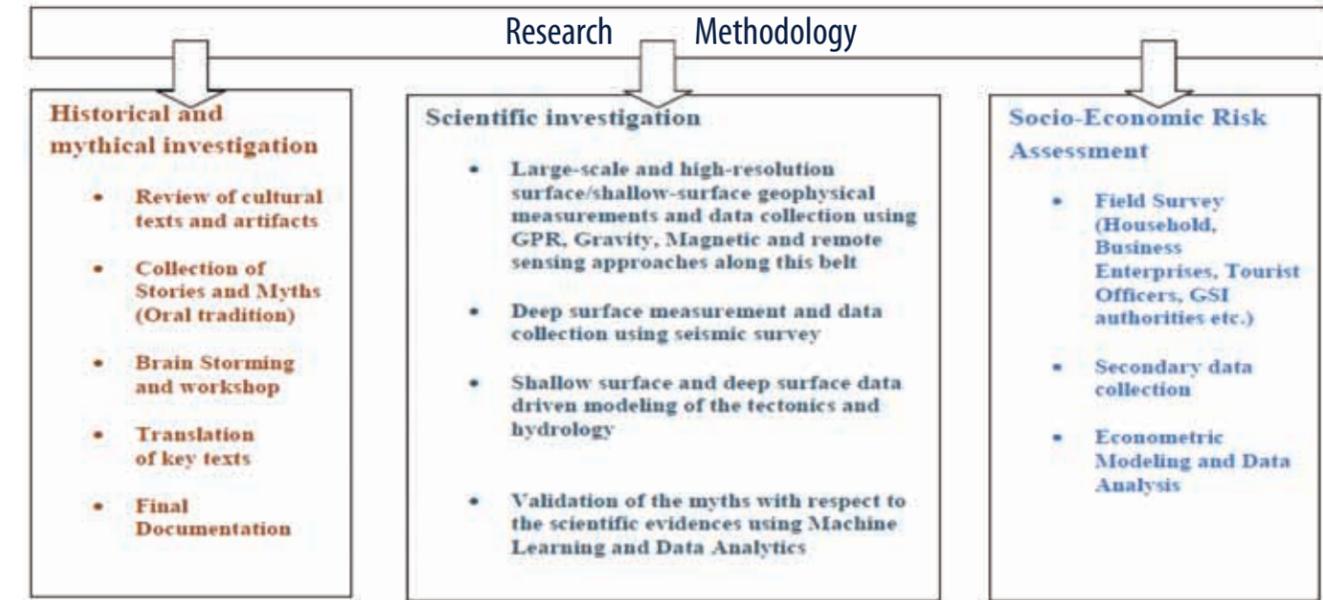


Figure 1



Figure 2

PART - I

Section B

Progress and Review Report

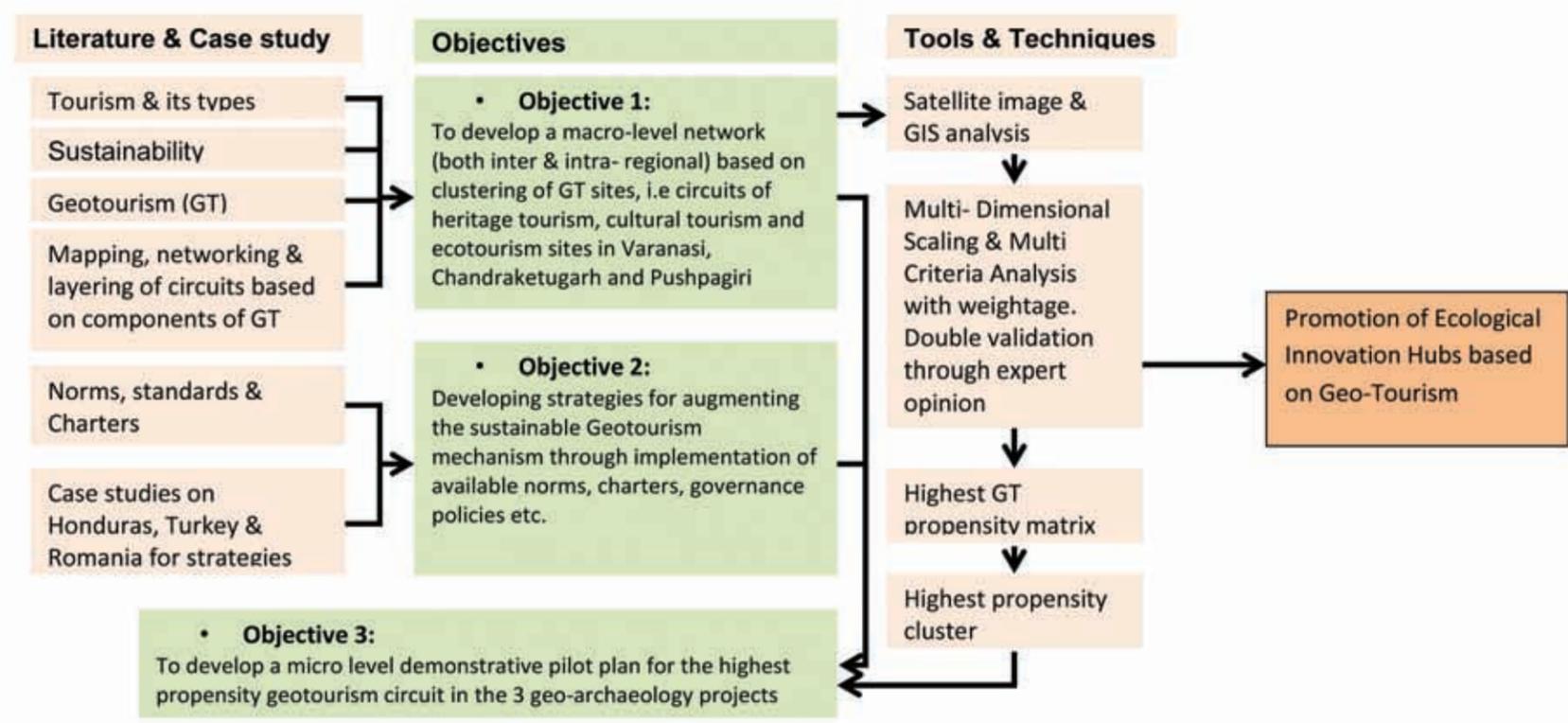


Three Complementary sets of Geo-Quest and Geo-archaeological Urban Exploratory Projects

Project methodology based on Geo-tourism and creation of Ecological Innovation Hubs
Geo-quest project approach for each project

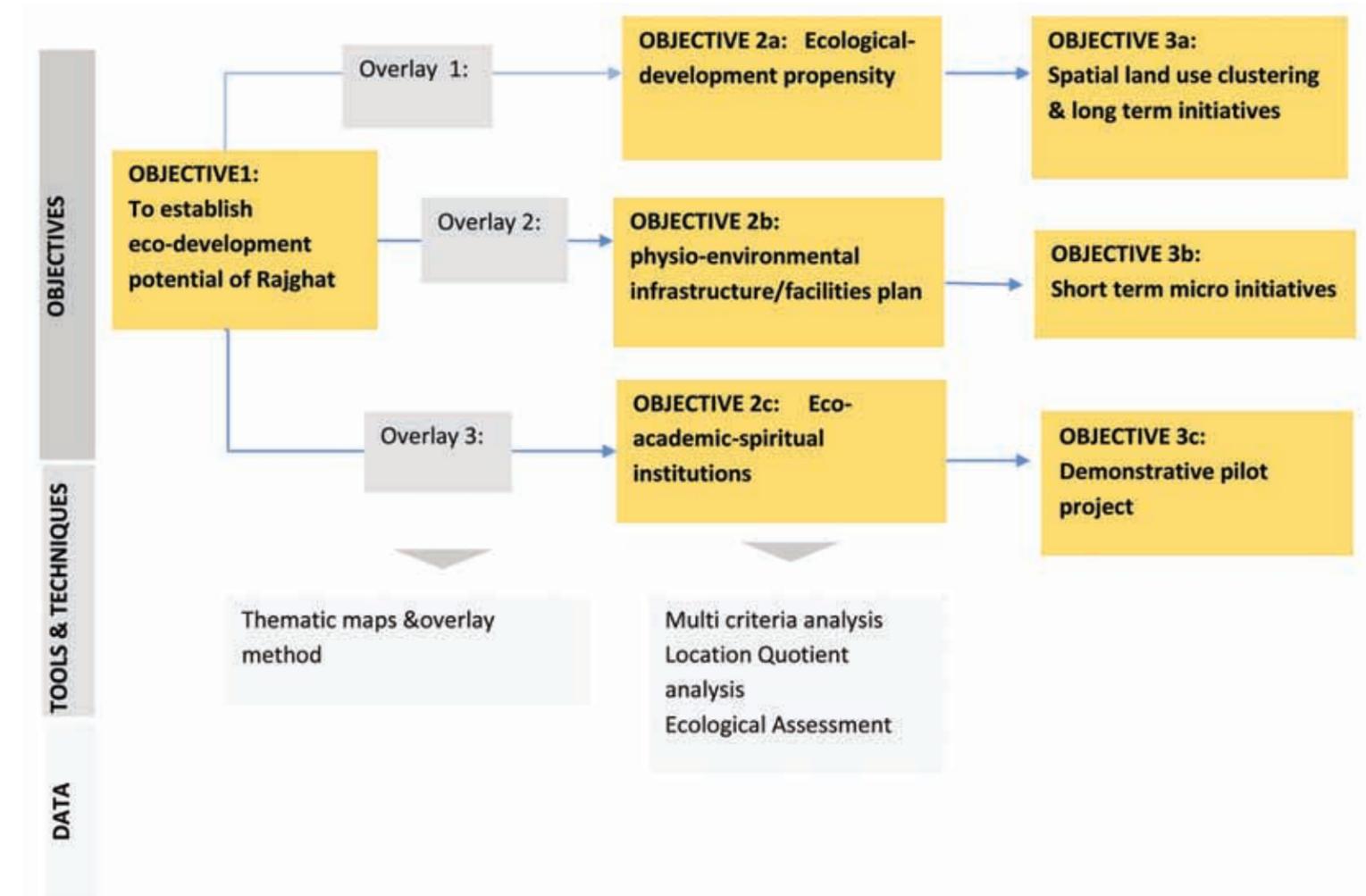
Proposed methodological framework* for initiating and establishing potential Geo-tourism circuits of the 3 Geo-archaeological projects

SANDHI attempts to address Geotourism, a relatively new concept, towards avoiding an undifferentiated global mass tourism brought forward by the National Geographic Center for Sustainable Destinations, is a step not only for sustaining but also enhancing the destination by means of restorative and constructive forms of tourism. The idea of Geo-Tourism can be best applied in all the three cases applying a commonality of three objectives:



*Developed by Ms. Debapriya Chakrabarty (MCP, 2nd year 2014-15) and Joy Sen

Subsequent methodological framework** for establishing potential Ecological-Innovation Hubs circuits in the 3 projects



*Developed by Ms. Mouli Mazumdar (MCP, 2nd year 2014-15) and Joy Sen

Scientists tell us that when time began, fourteen billion years ago, something came from nothing. When you awake to the ground of Being, you realize that when something came from nothing, the nothing didn't disappear. That unmanifest, unborn dimension is the ever-present ground out of which everything is still arising in every moment. It is what the Buddha called "the deathless," and what others call "eternity consciousness."

- Andrew Cohen



(a) Geo-Quest of Varanasi

GQV

(b) Urban planning and engineering exploration of Varanasi

UDE

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Prof. Pallab Dasguta

Prof. Priyadarshi Patnaik

Prof. Abhijit Mukherjee

Prof. Haimanti Banerji

Varanasi

The oldest living city in the world

Overview

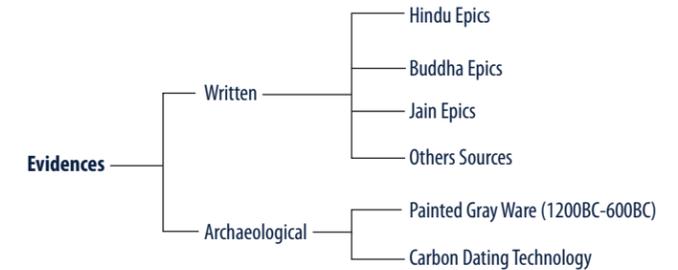
Varanasi is not only one of the oldest cities in the world but also it is considered to be the spiritual and cultural city of India. It has a long history which is full of mystery. Celebrated American Humorist-explorer Mark Twain (1898) commented after experiencing Varanasi, “*Varanasi is older than history, older than tradition, older even than legend, and looks twice as old as all of them put together*”.

Known by its various names like *Benares, Kashi, Avimuktka, Varnavati, Ananavana, Rudravasa*, etc., it is situated on west bank of the river Ganges, bounded by its two tributaries *Varuna* and *Assi*. In Hindu epics, the description of *Kashi* was first found in *Rigveda*, where *Divodasa* is mentioned as the king of *Kashi*. There are various historical and archaeological evidences which establish that Varanasi is the oldest city which attracts people from India and around the world. Visitors have unique experiences in this city and anyone who visits Varanasi once desires to come again and again. For Hindus, it is one of the most important pilgrimages. People wish to take bath in the Ganges to cleanse their sins, and many Hindus wish to die in Varanasi to get *Moksha* (liberation from the cycle of life and death).

Objectives

The objective of the project is to examine systematically Varanasi's long cultural, religious, spiritual and archaeological history from different perspectives. For this purpose, the written and archaeological evidences are being gathered for critical examination. A son of the soil and an experimental writer (Kamal Gupt, 1986) describes the city metaphorically in terms of capturing space, time and tradition: “*Banaras either of the past, or of the present, and would be of the future, was an historically important city of the past, and is of the present, and would be of future. Banaras is not only a city, but a culture in itself...Seeing the city is easy, acquaintance difficult. Touching it is easy, capturing difficult*”.

The following flow diagram shows how further studied will be carried out to understand the origin, culture and other important things related to Varanasi (refer Figures 1 and 2):



Figures 1

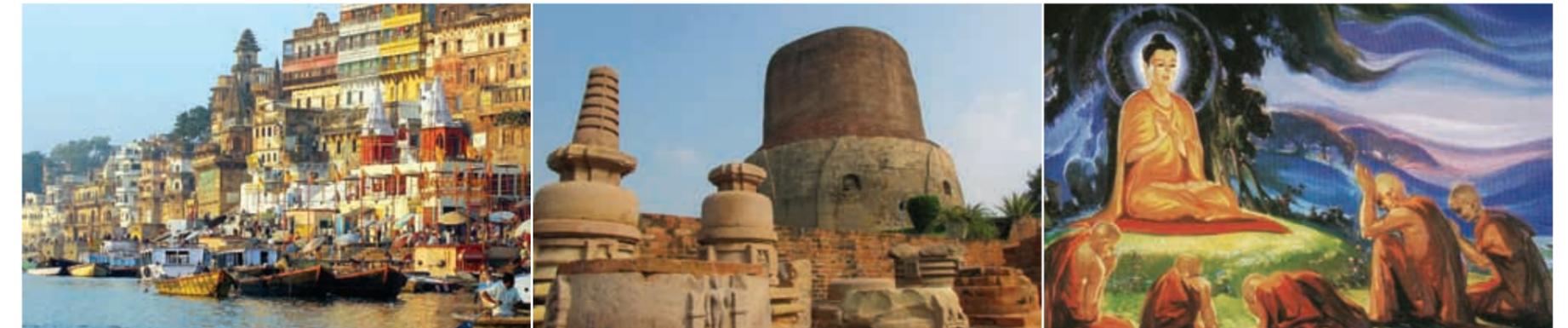


Figures 2

Figures 1 and 2: An approach to understand the origin, culture and other important things related to Varanasi

Work in Progress (Future Plan)

The IIT Kharagpur SANDHI Team in collaboration with IIT BHU Varanasi Team are trying to collect data from various reliable sources to understand the rich cultural heritage of Varanasi. In this context, it is essential that one should take into consideration the faith, attachment and the feelings of the local people, like *Pandas, Mallah* and the *Doms*. These are the people who can help a lot to make the city world class without compromising its rich cultural values. Undoubtedly, there are big challenges like how to maintain cleanliness of the river Ganga and the Ghats of Varanasi. Without active participation and awareness of the local people, it is just impossible to make the city world class with its rich historical and cultural values.



Introduction to Geo-Quest portion of Varanasi project

The city of Varanasi (Banaras or Kashi), located on the north bank of the River Ganges in the Uttar Pradesh state of India, is regarded as one of the holiest cities of ancient religions of Southeast Asia (Hinduism, Buddhism, Jainism). Along with cities like Alexandria, Luxor, Faiyum, Varanasi is regarded as one of the oldest cities of the world that has been continuously inhabited till the present time. The present city probably dates back to 12th Century, which was rebuilt after the destruction of Mohammad Ghauri. The current population of 1.1 million it covers an central area of 3.13 km² (wider urban agglomeration = 112.76 km²).

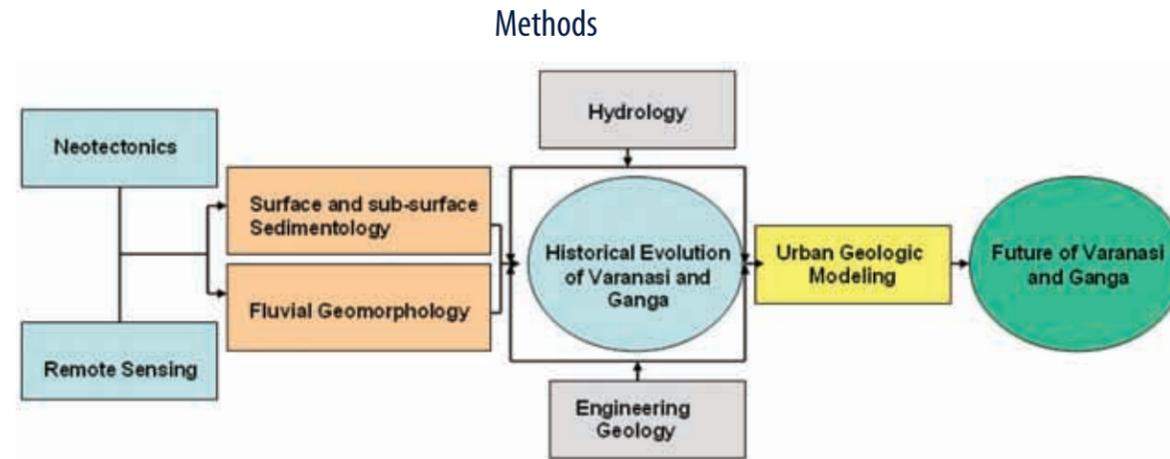
The present project is geared towards looking at the geological control on the inception, evolution and survival of the city through ages. The city is located at the eastern Bank of the Ganga River, which becomes unusually narrow around the city, from a 3-8 km wide NW-SE trending flood plain into a narrow (1-2 km), broadly NE-SW- trending channel. The Ganga channel has two contrasting riverbanks: a higher southeast bank that remains above the level of the river floods and forms part of the Marginal Plain Upland Surface, and a lower western bank, essentially a floodplain that is submerged during the monsoon flood. The Gangetic Alluvial System (GAS) that hosts Varanasi, has formed as a response to tectonics induced sedimentation during syn and post-Himalayan Orogeny. The GAS is the present foreland basin from the rising and eroding Himalayas in the north, and is bounded in the south by the northernmost surficial exposure of Indian craton. This northward turn of the Ganges river has resulted to lot of theological and mythological interpretations and aspirations. The town of Varanasi is located in and around the discharge of the two minor tributaries of the river Ganges, from which it has inherited its name viz. rivers Varuna and Assi (Varuna+Assi=Varanasi).

Objective

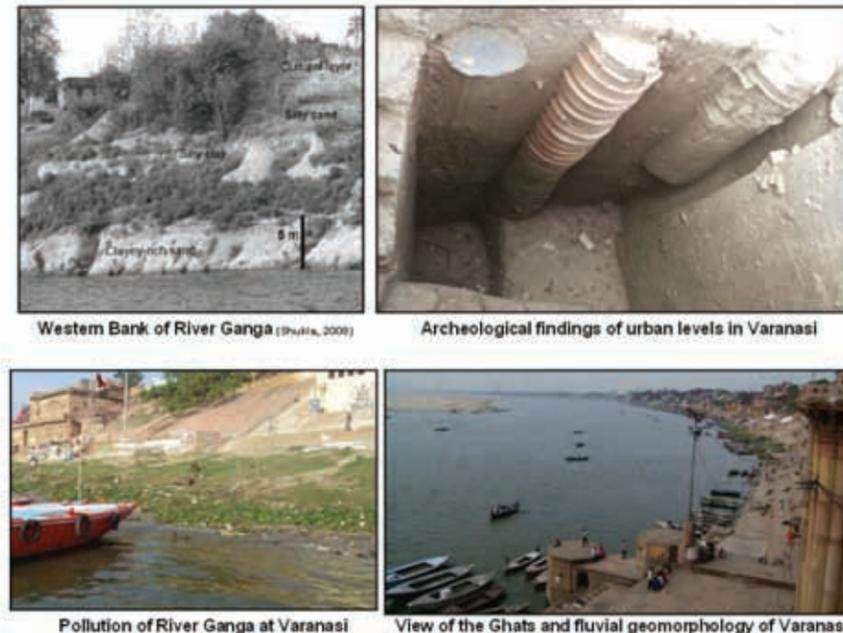
- Application of non-invasive and invasive geo-scientific methods (e.g. geological, geophysical, tectonics, hydrogeological, remote sensing) to delineate the extent of growth phases of Varanasi civilization through ages
- Understanding how the evolution of the river Ganga vis-à-vis the north Indian river systems might have influenced the development and sustenance of Varanasi
- Delineating the quantity and quality of the river and groundwater and their interactions in and around the Varanasi area to understand the usable water resource and rejuvenation of the river Ganga
- Understanding the weathering patterns and restoration of the ancient and historical monuments and ghats of Varanasi

Deliverables

We plan to execute the study by coupled non-invasive and invasive geological and geophysical techniques, along with detailed remote sensing to delineate the various geological and hydrological features that controls the geomorphic / societal evolution of Varanasi, and how those can impact the future sustainability of the city. The work would focus on integrating the local-scale natural features to the development of Gangetic civilization along with growth of the Varanasi city, in the backdrop of the regional geological features across various spatio-temporal scales. The project would also lead to exploration of other riverine civilization sites of northern India and try to relate the inter-dependence and probably transformation/migration between these civilizations. The results of this proposed work, in combination with other parallel works in the SANDHI project, could re-interpret and re-define the known history of the ancient India, which would provide plinth for the future India.



Glimpses from Varanasi study sites



"The secret of health for both mind and body is not to mourn for the past, worry about the future, or anticipate troubles, but to live in the present moment wisely and earnestly.

- Paramahansa Yogananda



(c) Geo-Quest of Chandraketugrah, West Bengal
GTC

(d) Archaeological Planning and Engineering exploration of Chandraketugrah, West Bengal
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Introduction to Geo-Quest portion of Chandraketugarh project

Chandraketugarh, situated at Latitude 22°41'48.28"N and Longitude 88°41'19.38"E in the North 24 Parganas, West Bengal, exhibits remnants of an important port-city that apparently flourished from about 4th century B.C. to Post-Gupta age. The excavated site 'Khana Mihirer Dhipi' at Chandraketugarh is believed to be early medieval. The place was connected with the Bay of Bengal mainly through two rivers: Bidyadhari and Padma (or Padda). It is believed that the city had trade contacts with foreign lands like southeast Asia and the Mediterranean and indirectly with even Graceo-Roman world in the early days. The inferences about the civilization history of Chandraketugarh are at large based on the antiquities found at this place. Although the antiquities like coins, semi-precious stones, terracottas, stone sculptures, ivories etc. found here also occur at all the contemporary settlements of the Indian subcontinent, the quality, diversity and the number of the terracotta and ivory objects discovered in this region point towards a sophisticated ancient urban centre of India. However, issues starting from the origin of the city's name, confirmation about its location on the river bank, the actual area of the site, date of this urbanization in relation to the early historic urban growth in Bengal or of a wider network, etc. are still not fully authenticated by field evidences. This proposed research aims to resolve some of these issues and/or to check/validate the existing inferences by adopting geo-scientific approaches. The research is also to shed light on degradation status of the ancient structures and subsequently on their plausible preservation and/or restoration.

Objectives

- To reframe the evolutionary trend of urban settlement of Chandraketugarh primarily in relation to the early historic urban growth in Bengal and beyond using geo-scientific knowledge.
- To evaluate deterioration status and plausible preservation and/or restoration aspects of the ancient structures.



Location of Chandraketugarh



Chandraketugarh and its surroundings depicting complex geomorphology (A snapshot from Google Earth)

Deliverables

Being situated on the Ganga-Brahmaputra Delta, the site of Chandraketugarh and its surroundings are packed with numerous signatures of palaeo-channels, marshes, palaeo-levee, palaeo-point bars etc., which indicate heavy sediment load and low discharge capacities of the rivers. Earlier research infers that Chandraketugarh and other historic sites of the region are buried sites where early alluvial horizons are buried under thick alluvial depositions because of the influence of active flood plains. With a due need, geomorphological and hydrogeological studies, application of non-invasive and plausible invasive geophysical techniques, engineering geological investigations, study of the sediment characters and sedimentary structures, geochemical studies and sediment dating form the foundation of the proposed investigation in order to address the first outlined objective. Non-destructive index tests would be employed in order to assess the status of degradation of the ancient structures which eventually would enable us comment on plausible preservation and/or restoration aspects with reference to these structures. It should be noted that depending on feasibility, a few other relevant cites in Bengal and beyond are also proposed to be covered in this investigation for obvious reasons.

Glimpses from Chandraketugarh



Khana Mihirer Dhipi



A close look at brick structure (Khana Mihirer Dhipi)



An ASI site of earlier excavation



'Chandraketugarh Sangrahashala' (A museum by Mr. Dilip Kumar Maite)

*You give but little when you give of your possessions.
It is when you give of yourself that you truly give.*

- Khalil Gibran



(e) Geo-Quest of Lalitagiri-Pushpagiri, Odisha

GPO

(f) Archaeological Planning and Engineering exploration of
Lalitagiri-Pushpagiri, Odisha

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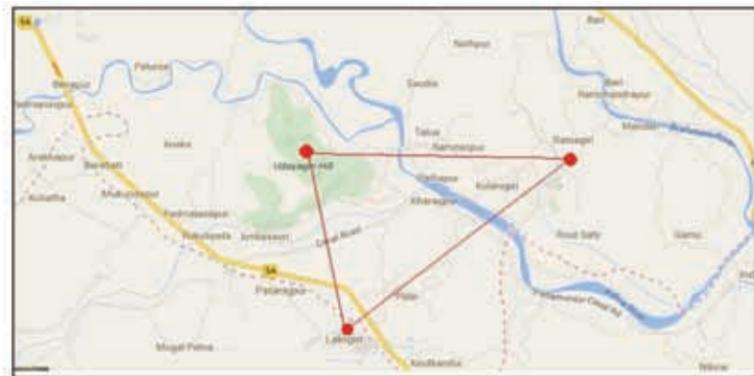
Prof. Probal Sengupta

Prof. Arindam Sengupta

Introduction to Geo-Quest portion of Pushpagiri Project

The Buddhist complex of Pushpagiri, consisting of Udayagiri (the hill of rising sun), Ratnagiri (the hill of gems) and Lalitagiri (the red hill), in the Jajpur district of Odisha, is one of the major archaeological sites of eastern India. The Chinese traveler Hsuan Tsang visited Wu-cha (or Orissa) in the first half of the seventh century AD. At that time, the roads passing through Orissa from North India to South India lay along the seaside. Hsuan Tsang described the site as the Pusi-po-kili monastery in a mountain, in the south-western part of the country, the main stupa of which exhibited supernatural light. Hsuan Tsang referred to it as the Udayagiri hill.. The sea at that time probably reached the foot of these gneissic hills, rising suddenly from the alluvial plain. This conjecture is supported by the fact that water-worn pebbles have been found near the foothill of the mountain. These pebbles are of beach origin, and have not rolled down from the hill.

The Buddhist Monasteries, Stupas and Chaitya grihas, encircled by many votive stupas at Udayagiri, Ratnagiri and Lalitagiri are one of its kind. According to some researchers, the Buddhist sites at Ratnagiri, Udayagiri and Lalitagiri have two wings — archaeology and art history — hardly found elsewhere. The beautiful hills and rice-growing plain lands are home to remarkable Buddhist remains of the Vajrayana sect, set in a wonderful landscape surrounded by green fields. The excavations at the three sites have revealed Buddhist stupas, monasteries, sculptures and Buddha images. Along with Udayagiri and Ratnagiri, Lalitagiri constitutes the Diamond Triangle. The three hills preserve the ruins of the Buddhist complex that once flourished in the state of Orissa.



Map of Pushpagiri Complex

Objectives

- Application of non-invasive and invasive geoscientific methods (e.g. geological, geophysical, remote sensing) to identify the civilization in and around Pushpagiri complex through ages
- Understanding the linkage between Udayagiri, Ratnagiri, and Lalitagiri settlements
- Decipher the connection of sea with this complex
- Understanding the weathering patterns and restoration of the ancient and historical stupas in Pushpagiri complex.

Deliverables

We plan to execute the study by coupled non-invasive and invasive geological and geophysical techniques, along with detailed remote sensing to delineate the various geological, hydrological features that control the geomorphic / societal evolution of Pushpagiri. The work would focus on integrating the local-scale natural features to the development of civilization in and around the Pushpagiri complex, in the backdrop of the regional geological features across various spatio-temporal scales. The project would also lead to establish the connection of Pushpagiri with other Buddhist site in the country and try to relate the inter-dependence and probably transformation/migration between those sites. The results of this proposed work, in combination with other parallel works in the SANDHI project, could re-interpret and re-define the known history of the ancient India, which would also relate the modern India with ancient India.



Ratnagiri



Votive Stupas

Rock cut stepped well at Udayagiri

PART - I

Section C



Progress and Review Report
Four Creative economy projects

A Methodological approach to the Four creative Economy Projects

To explore the area of design knowledge in the grassroots in general and craft in particular for:

- **Understanding measuring systems of low literate designers amongst the creative communities involved in the 4 cases** – The question is how do low to illiterate craftsmen handle measurements related to proportions, sizes and balance in the absence of explicit understanding of mathematics and geometry and access to precision tools? What is their inherent design process that has been handed down with appropriate moderation through ages and generations?
- **Understanding and promoting Pedagogy of the Karkhanas:** Mainstream curriculum often lacks a studio based practice, like the Design Schools or Industrial manufacturing processes. Tacit learning is limited to assignments that mimic principles into practice. But practice has a pedagogy of its own, which craft Karkhanas excel in. In the absence of formal education, learning here is limited to the tacit exchange of knowledge during production itself. Thinking and Production run parallel in the Karkhanas. Can we get a handle on the methods and tools of this tacit pedagogy?



*The wise man does not lay up his own treasures.
The more he gives to others, the more he has for his own.
- Lao Tzu*



Assessing creative economic potential and regeneration in Kolkata Metropolitan Area

TTK

Principal investigator

Prof. Joy Sen

Prof. Saikat Paul

Co-investigators / advisors

Prof. Somnath Sen

Prof. Bhargab Maitra

Prof. Haimanti Banerji

Prof. Pulak Mishra

Objectives, Surveys nature of data processing

Kolkata Metropolitan Area (KMA), the third largest metropolitan region of the country, is uniquely located on both the sides of river Hooghly and consists of urban zones as well as water bodies and large stretches of vegetation. Thus, it uniquely encompasses three distinctive dimensions of tourism, i.e. riparian based creative economy, eco and heritage tourism. However, it is important to identify if these unique attributes have been properly assimilated and developed by the current tourism practices in KMA. Similarly, in the context of the steady rise of population and pollution, it is important to identify the appropriateness of current tourism practices in this region and assess their impact on KMA.

- Create a final overlay map of 1) features ; 2) Signs and Signatures; 3) patterns which finally leads to key nodes/ hubs/ zones having potential of integrated development in the metropolitan region
- Based on the overlay map, prioritize the different tourism zones as per the study
- Final layout with structural (network accessibility maps) – of existing bridges, railway stations, roads, ghats for steamers and ferries and other important attributes (government and trans municipal corporations)
- PART B: Prioritize for piloting

A working methodology of KMA contributes of two parts A & B

A working methodology of KMA contributes of two parts A & B

Part A of the proposed methodology is to

- Part A: Review the existing state of tourism and circuits in the KMA area.
- Chart out three nodal and circuit maps E, H, C that address ecological, heritage and river based tourism of the region
 - that earmark Ecological Resources features (E) (organized and informal green belts; not embanked and shifting areas of river banks; key sacred or symbolic precincts that are natural; extended back water bodies; etc)
 - that identify heritage Precincts and premises – signs and signatures (H) (identify a legend of ancient spots; pre-Islamic times; Islamic and colonial times)
 - earmark prominent areas of Creative economic community patterns (C) which depends on River-based tourism (west bank and east bank)

The study will explore, socio-economically and geo-spatially the role of multitude of rivers in the region to arrive at the pilot project modules of:

- Eco-tourism (E)
- Culture-tourism (C)
- Heritage-tourism (H)

For Creative-economic tourism regeneration based on the river (see Figure 1)

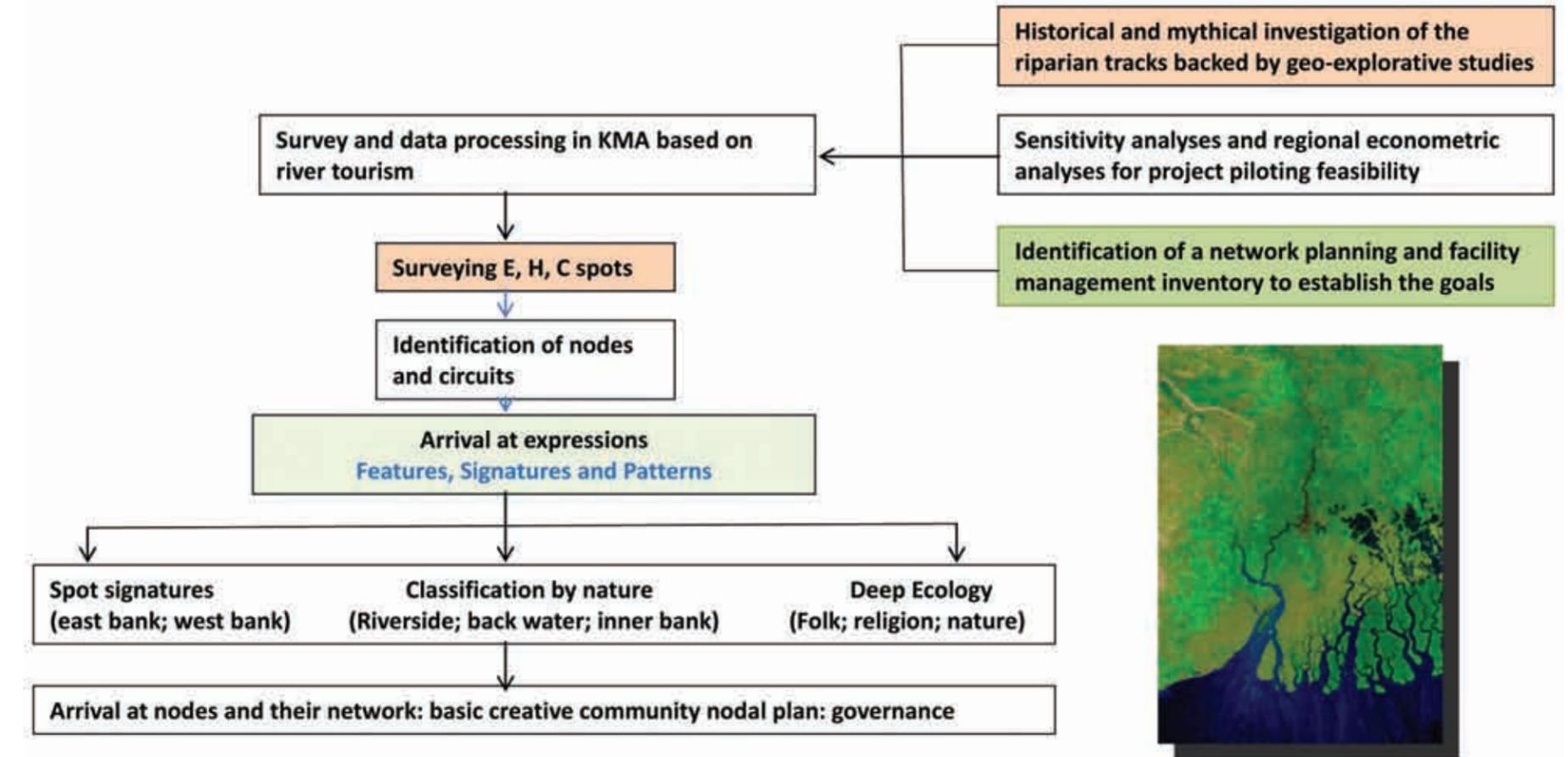


Figure 1: Methodological approach for creative economy regeneration in KMA

History doesn't repeat itself, but it does rhyme.
- Mark Twain



Assessing creative economic and urban design regeneration of Gariahat Area

PAK

Principal investigator

Prof. Joy Sen
Prof. Koumudi Patil

Co-investigators / advisors

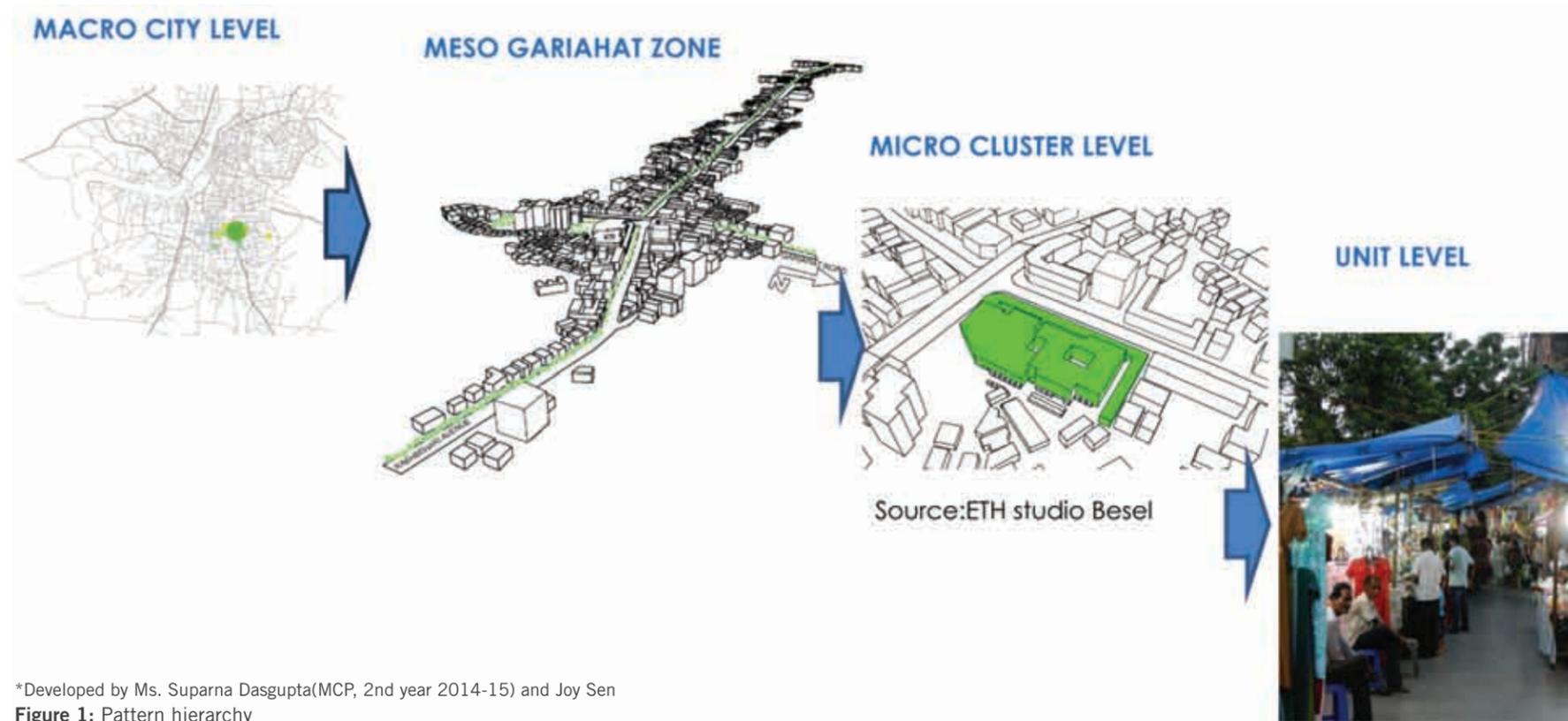
Prof. Bhargab Maitra
Prof. Haimanti Banerji
Prof. Pulak Mishra

Aim

The project aims at creative economic clustering of existing commercial agglomeration through networking & spatial up-gradation of Gariahat Hawkers belt by virtue of a) **pattern hierarchy** and b) **clustering hierarchy**

Objectives

- 1) To map the existing pattern hierarchy of **creative economic clustering** amongst **street vendors** taking into account the existing pattern of agglomeration economics & networking and
- 2) Induct **policies in revived creative economy and urban design patterns in the overall context of Gariahat**
- 3) **To upgrade spatially urban design solutions networking***



*Developed by Ms. Suparna Dasgupta(MCP, 2nd year 2014-15) and Joy Sen

Figure 1: Pattern hierarchy

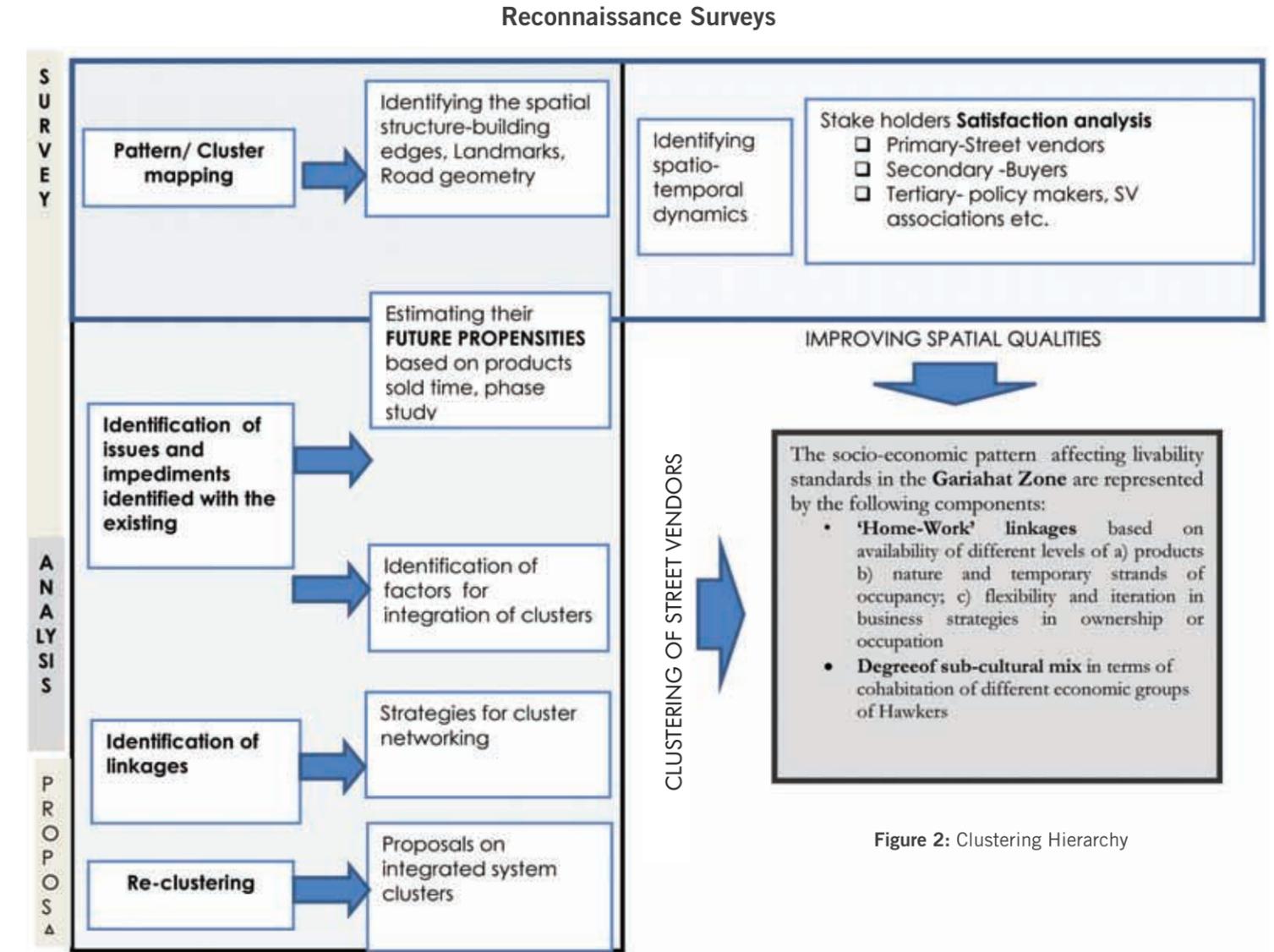


Figure 2: Clustering Hierarchy

The geologist takes up the history of the earth at the point where the archaeologist leaves it, and carries it further back into remote antiquity.

- Bal Gangadhar Tilak



Assessing creative economic and urban design regeneration of Kumartuli area

CKI

Principal investigator

Prof. Joy Sen
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Prof. Priyadarshi Patnaik
Prof. Naranayan C. Nayak
Prof. Mainak Ghosh
Prof. Pulak Mishra

Introduction

Art and Craft as an integral component of the history of civilization, adds meaning and uniqueness to cultural communities evolving through time. Art and craft interface in the metropolitan, social and economic aspects to enriches the structural and aesthetic quality of urban standard of living. It humanizes the built environment and participating activities of public space through the aspect of interactive design approach and free accessibility. Therefore an artist responds to times, they portray their inner vision to the outside world through art, and create a narrative of our collective experience.

Research Concern

To reconstruct the present unorganized situation of the artisans quarters of 'Kumartuli' in north Kolkata, a systematized planning (Figure-2) should be introduced by visual art elements. Application of the research topic is to reconstruct the Kolkata 'Kumartuli' landscape integrated by the contemporary art forms, and media of public art which include sculptural materials, murals, mosaics, digital mediums, etc. Through this process we can establish a link between traditional practices of art forms and modern urban landscape tools to create an infrastructure of art practice environment. While there has been considerable research, focus should be conducted on the indigenous visual arts in urban art space; cityscape designing;

Objectives of the study

- To reconstruct the present unorganized situation of the potters quarter of 'Kumartuli' in north Kolkata i.e. first of quality of life with the beautification of entire physical environment without in any way disturbing or breaking its essence.
- To upgrade quality & quantity of main artifacts of community of 'Durga' idols, through the visual art elements, popular culture and introducing new technology (for working field and marketing) without breaking the continuity of the tradition.



Figure 1: Creative economy zone (CEZ)

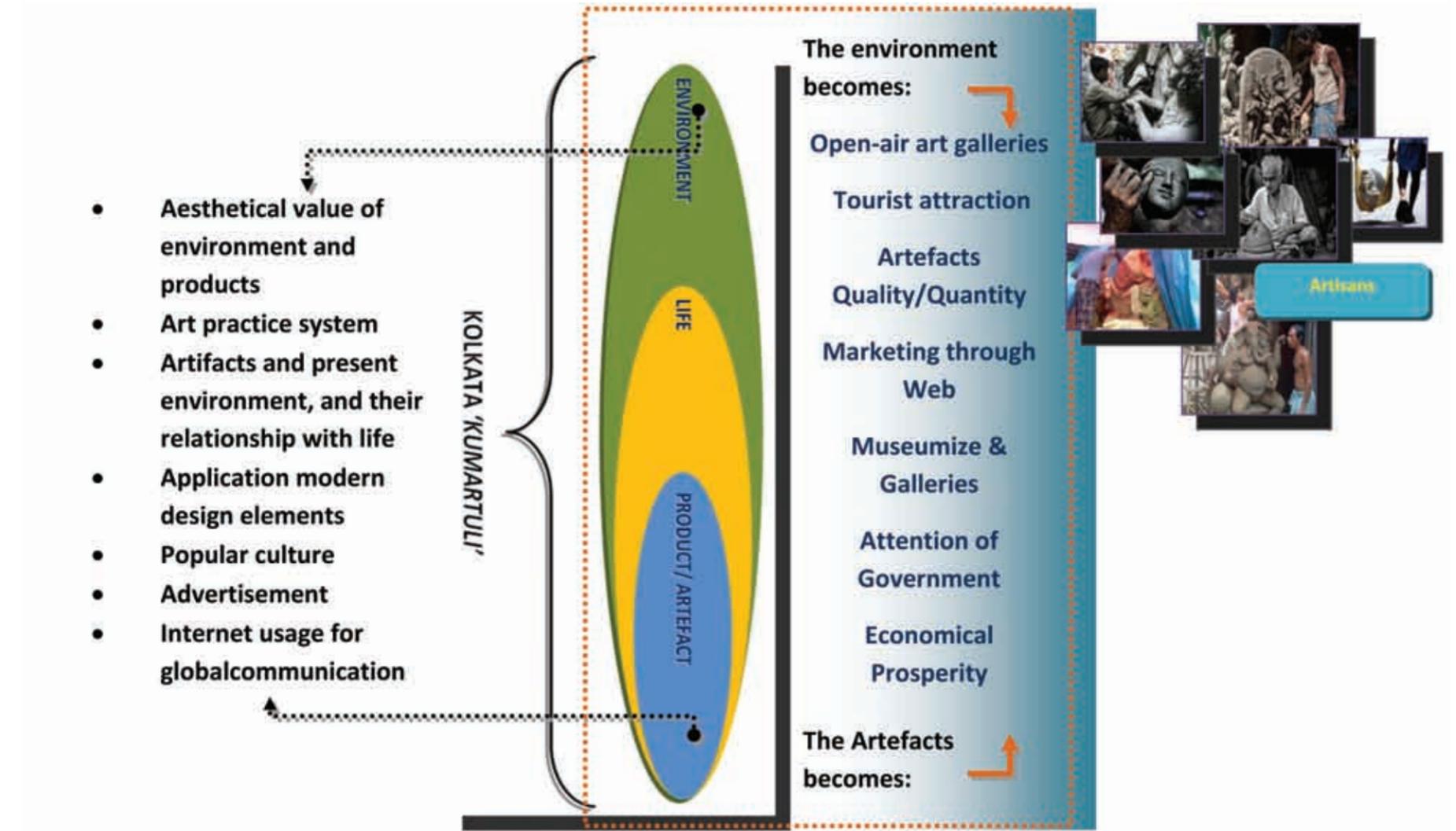


Figure 2: A working methodology* for upgrading Kumartuli area
 *Developed by Shri Tushar Kanti Saha (MS, SANDHI), Joy Sen and Priyadarshi Patnaik

The modern economist ... is used to measuring the "standard of living" by the amount of annual consumption, assuming all the time that a man who consumes more is "better off" than a man who consumes less. A Buddhist economist would consider this approach excessively irrational: since consumption is merely a means to human well-being, the aim should be to obtain the maximum of well-being with the minimum of consumption.

- E F Schumacher



Assessing creative economic and urban design regeneration of Boipara, College Street area

RAK

Principal investigator

Prof. Joy Sen
Prof. Koumudi Patil

Co-investigators / advisors

Prof. Sunando Dasgupta
Prof. Haimanti Banerji
Prof. Mainak Ghosh
Prof. Mainak Ghosh
Prof. J. Barman

Introduction

The present research proposal attempts to conceptualize 'Boipara' (the book colony) as a living art installation having in its own autonomous or self-evolved array of visual elements. It is a living art installation that would be based on its visual landscape assimilated in its educational-cultural and economic connection of book loving communities. The book loving communities have different tastes, modes of communication, and perceptions that directly or indirectly determine or at least, affect (correlation) the zonal classification or categorization of book shops, according to parameters such as, old/new book; size; age; category; subject, guild of publishing house and most importantly language to mention a few. Additionally, the visual elements may stretch up to dimensions of physical design, like parking zone, swimming pool, availability of space to appropriate book oriented materials; and perhaps, the presence of small food corners.

Aim

An attempt to assess '**Art and Its Application in the Design of Visual Culture Based Built-Environment**'; case study: *Boipara*, College Street, Kolkata.

Methodology

The methodology is to sieve out the key parameters which will augment the assessment of 'Art and Its Application in the Design of Visual Culture Based Built-Environment'; case study: 'Boipara', College Street, Kolkata.

The work may proceed in three steps (**from a Book Market to a Visual installation of Walkeapedia**)

1. Identification and organization of visual elements of 'Boi Para' which may comprise of an embodiment of that may either be a plethora or an organized ramification
2. Application of visual elements to test the perception of selected uses to find out whether the place is disorganized or organized, that is, a function of the taste, the priority and the intellect, and often, the heart of the perceiver
3. To organize cultural augmentation through right (user friendly; vendor –friendly; guild friendly) communication (means of transport - design of Boipara transport) using key elements of 'Visual Culture Based Built-Environment'.

Research Concern*

- The organization of visual elements of 'Boipara' may comprise of an embodiment of that may either be a plethora or an organized ramification as a variety of materials/methods of constructions / built styles and the system of relation between whole in an area of site specific art or 'built environment'. The question is to what extent it is an order, and if so, what are the testing grounds?
- The perception whether disorganized or organized, is a function of the taste, the priority and the intellect, and often, the heart of the perceiver. So can there be a testing process to quantify the perception through which the visual elements can be clustered by :
 - Different modes of communication
 - Different perceptions that directly or indirectly determines or at least, affects (correlation)
 - The zonal classification or division of category of book shops, by old book/ new book; size; age; category; guild of publishing house etc.
- Then, cumulatively, can there be a prescription in the a) built level (urban design) b) behavioral guidance through facility induction, such as:
 - The visual elements may stretch up to dimensions of physical design, like near availability of parking zone and the counter-presence of vehicular free zones
 - Availability of space to appreciate book oriented materials; - negative space / positive space – green space / brown space - furnished space / deserted space
 - Street furniture and additional amenities, perhaps like :
 - ♦ The presence of a small food corner
 - ♦ The supportive displays and e-hoarding (day and night shifts of the 'Boipara')
 - ♦ Street vistas / audio visual plug-ins/ add ones
- event management induction - reading culture, fair, political-procession universities-educational institution and heritage buildings
- Cultural augmentation through right (user friendly; vendor – friendly; guild friendly) communication (means of transport - design of 'Boipara' transport).

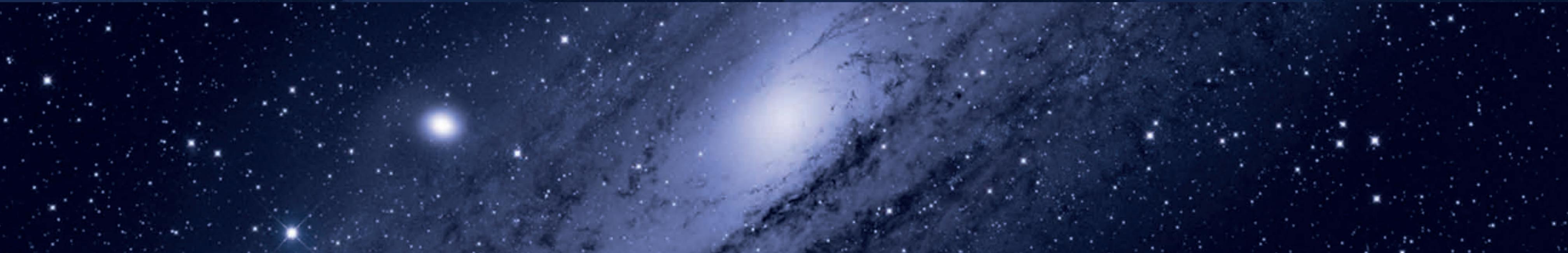
*A Working guideline for upgrading Boipara, College street area developed by Ms. Sadhana Naskar (MS, SANDHI), Joy Sen and Priyadarshi Patnaik



Coffee House: the legendary café witnessing many cultural and political vicissitudes over the decades



PART - II



Book of Abstracts

A Comparative Exploration of the Eastern and Western Branch of Indo-European Words Using Iconographic Application

Apala Sarkar Ghosh, Preeti Pal, Ankhi Banerjee and Joy Sen

A fundamental premise of conducting a comparative analysis of words and their iconographic verbalization can be designed on the bases of the ancient etymological and philological implications of the Vedas and its current interpretations by the Indian seers on the one hand and mental cognition and recognition in linguistics and environmental related thought in the west on the other hand. A mirror based inquiry, based on the eastern and western yardsticks, thereby may lead to a viewpoint that language is the surface manifestation of deeper domains of universal thought and psychic impressions that reflect underlying orthographic layers of articulated words, expressions and behavioural patterns of individuals and societies through time and space.

The study aspires to design and develop a methodology for comparing sets of corresponding pairs of words of Indic (Indian) and European (English) origin having phonological and phonetic affinity and analyse a range of continuum of resemblances through a juxtaposition of iconographic expressions in different cultural habitats often separated by geo-spatial distances. This system of approach intends to formulate a scientific and unbiased method of analysis to trace the evolutionary sequence of Indo-European Language and interpret the orthographic transformational process of articulated words and expressions in languages of divergent societies and cultures across the globe. These iconographic expressions in the way of rituals, symbols, literary works and built forms are of crucial importance in understanding and interpreting the underlying causal factors that influence the outward appearances of behavioural utterance through the historical time line and traversing contemporary societies and cultures.

Keywords

Cognition, phonological, phonetic, orthographic, iconographic expressions, Indo-European Language, orthographic, Vedas, human psychology, behavioural pattern, culture.

Establishing complementary Indo-European language linkages based on historic and allied inquiries: a case study of three words

Preeti Pal, Apala Sarkar Ghosh and Joy Sen

The paper attempts to establish complementary Indo-European language linkages based on historic and allied inquiries. To best forward the complementary linkages, three words from the domain of science, literature and history of trade have been examined. They are: a) autotrophic which means the propensity to self-nourish; b) axiom, which means a directional thinking which is worthy; and c) azure – which stands for a certain kind of stone or gem, or its colour. Through the examination, the paper attempts to forward a larger platform of understanding inclusive of various semantic dimensions, which is necessary to establish the linkages. Additionally, it also makes evident the complementary relationship based on mirroring various patterns of history and allied domains like iconography, mythology and anthropology from the 'satem' (eastern) and 'centum' (western) group of Indo-European language systems.

Keywords

Complementary linkages; mirroring of patterns; 'satem'-'centum' inter-relationships

A pattern hierarchy exploration of the Garland of Letters: Varanamala – based on Samkhya Darshana

Tanaya Mukherjee Sarkar, Parthasarathi Bera and Joy Sen

The paper contains a discussion on the sequence of 'Varnamala" (letters) on the basis of Indian philosophy and science. The discussions are divided into six sections and an appendix. Section One contains the introduction part; Section two contains a brief definition of language. This is followed by a short description about auditory system is discussed in Section three. Historical background of auditory system and Fourier Spectrum are discussed in Sections four and five. The concluding section is on cosmology and Samkhya philosophy based on the works of an ancient Sage Kapila, as contained in its original for in Bhagabata Purana and the Swetaswatara Upanishad and later expanded by Swami Vivekananda and Sri Aurobindo.

The paper attempts to bring together two viewpoints – a pattern hierarchy based explanation of the evolution of universe which is further providing a thermodynamic hierarchy of the creation of varnamala as portrayed by Samkhya Darshana and a complementary view point which may extracted with care from the original works on Fourier series spectra likened to heat flow and its measurement as a property of discrete wavelets, which are otherwise auditory.

Keywords

Samkhya darshana; fourier spectra; pattern hierarchy; garland of varnamala

Automatic Note Identification from Hindustani Classical Music

Rengaswamy Pradeep, Dhara Prasenjit, K. Sreenivasa Rao and Pallab Das Gupta

Pitch, melody, rhythm and timbre are the different attributes that characterize a music signal. Pitch is defined as the perceived fundamental frequency (FO) of a musical recording. Melody corresponds to the sequence of notes with unique aesthetical value. In this work, Zero Frequency Filter based method is used to extract the sequence of pitch values. Musical notes are determined from the sequence of pitch values using Indian tuning theory. Histogram of the notes is also plotted to verify the characteristics of the Raga automatically. The proposed method is evaluated on nine manually transcribed music clips. The evaluation results indicated that the proposed method has been successfully identified the Ragas associated to the chosen music clips for evaluation. However, the proposed method has to be evaluated on exhaustive music corpus consists of varieties of Ragas rendered by multiple singers.

Keywords

Pitch, Melody, Rhythm, Timbre, Fundamental frequency (FO), Zero Frequency Filter, Note Sequence, Raga, Arohana, Avarohana

Developing Web-based Interactive Educational tools on Basic Concepts and Teaching of Hindustani Classical Music: The First Step

Gouri Karambelkar, Palash Nimodia, Priyadarshi Patnaik and Joy Sen, Sourangshu Bhattacharya and Pallab Dasgupta

Currently, there is a dearth of good websites which address the key concepts of Hindustani classical music or give an initiation into exploring Indian ragas in a lucid, comprehensive, interesting and interactive manner. However, in order to develop such a web-based platform, it is necessary to explore existing web portals on Hindustani music to assess their features, explore websites which deal with Western classical music to identify if there are features that can be borrowed and to go for a detailed audience-feedback from a wide range of prospective users – children to adults and from novices to more serious initiates. This work proposes a methodology which (a) reviews existing websites systematically to identify and classify their various features, (b) goes for both web-based and off-line audience-feedback in order to identify usability issues, (c) analyzes the intrinsic quality and nature of Indian classical music, its structure and context, (d) in order to develop a map of concepts and tutorials that are interlinked, hierarchically arranged, with animations, audios, interactions and games so that the fundamental concepts can be properly and lucidly communicated. It thus attempts to address both music pedagogy keeping in mind the culture and context of Indian classical music, and its easy communication to contemporary learners. It proposes to develop some pilot modules and go for a final round of feedback and assessment through audience-feedback before developing the modules. The detailed method of developing this project, the ideology that drives it, and work done so far will be reported in the paper and the presentation. One small interactive online program that uses the concept of the circle of fifths in relation to the notes of various ragas along with audio will also be demonstrated during the presentation.

Keywords

Circle of fifths, educational tools, Hindustanic classical music, pedagogy, ragas, , web-based interactive tool

Hindustani Classical Music and Audience Response: A Review of Existing Literature, Proposed Roadmap and Initial Findings

Gouri Karambelkar, Biki Kundu, Ruchika Sharma, Pratik Patra, Priyadarshi Patnaik, D. Suar, Sourangshu Bhattacharya and Joy Sen

Indian classical music has a rich tradition of texts and musical repertoire which give us insights into its deep-rooted relation to the total human being – emotions, personality, and relation to the cosmos, spirituality, and transcendence. In recent times, there is considerable renewed interest in how music influences people, how people understand, experience and respond to music, as well as on how much of music is cultural and how much is organic. This paper reviews the recent as well as the older work that deal with audience response to Hindustiani classical music using social-science methods and scientific tools. Based on this, it proposes a detailed roadmap for exploring the issues discussed above. It also reports the initial findings of preliminary experiments and surveys conducted so far, and proposes the agenda for further exploration and experimentation.

Keywords

Audience Response, Hindustani Classical Music, Review of Literature, Roadmap, Survey

An appreciation of the Iconography of Borobudur : 3D Visions around a Mandala

Haimanti Banerji and Joy Sen

The specialty and complexity of Borobudur Iconography along with its overwhelming architecture have made it one of the most controversial Buddhist monuments in the world. Borobudur recognized as a multivalent monument very distinctly demonstrates the absolute universality of buddhadharma. The unfinished Buddha in the core of the central stupa resembles Sakyamuni at the moment of enlightenment just as he is about to teach Avatamsakasutra. Borobudur temple (Indonesia), built by the Sailendra Buddhist Dynasty during the 9th CE, who had left India around 4th CE, and had converted from Hinduism to Buddhism.

Structurally, rising by a series of terraces, it resembles Mount Meru of the Buddhist cosmological world. The level represent the stages of life and the finally the stupa, budhologically resembles the fruition stage or the culmination of all stages. The Borobudur stupa is a reliquary of the corporeal presence of Sakyamuni Buddha and also his mortal existence in the impure world. This stupa reminds the visitors of the progress from the mundane to the transcendent and then a sudden back to the mundane – revealing the true nature of enlightenment.

The 72 perforated bell shaped stupa is an important feature of these temples. The dharmachakramudra Buddhas of these see – through stupas symbolically demonstrates the state of Sakyamuni's attainment of five jnanas. The stupa of Borobudur have also borrowed many architectural features which are primarily of Hindu origin such as the 'mandala'. The gradualness and transitional nature of the ritual is reflected in the geometry of these terraces : square, with insets and projections (the shape of the lower terraces), elliptical (the first two upper terraces), and circular. As we move inward from the outer, elliptical terrace, with its thirty two stupas, we move in a decreasing series of eight, rising in height with each new terrace, to the twenty-four stupas of the middle, elliptical terrace, and to the inner, circular terrace, with its sixteen stupas. The stupas on the two elliptical terraces have diamond-shaped lattice work, and square harmikas, while the stupas on the third, circular terrace have square lattice work and octagonal harmikas.

A journey through these three stages from the outer to the inner, constitute the Body, Speech and Mind of the Buddha. The progression of the stupas in the series of eight probably is related to the Eight-Fold Noble Path, the Eight Auspicious. Its architectural symbolism therefore would be celestial in its referents, and this in turn would reinforce the arguments that the primary rituals would have taken place at night, during the Solstice, or perhaps better would have begun during the day, on the lower terraces, and would have progressed up through the temple, to have culminated in the heavenly light of night-time.

Keywords

Buddhology, iconography, mandala

Pre Buddhist and Buddhist Iconography

Abhishek Chauhan, Abhishek Kumar, Akash Modanwal, Ankit Kapoor, Bishnu Kumar Sharma, Dasari Divyanvitha, Deepansh Singh Dongre, Gangula Anwesh, Kevalkumar Sojitra, Madala Hemanth Chowdary, Mukesh Kumar, P. Vamshidhar Reddy, Pratibha Verma, Ravi Kumar, Purushottam Rawke, Soumodip Paul, Subhash Ch. Biruly, Rajeev Ranjan (Sandhi Summer Interns IIT Kharagpur 2014) & Joy Sen

'Buddhism' is one of the schools of thoughts formed in ancient times of India and became integral part of Indian society. Buddhism was formed by spiritual teachings of 'Shakyamuni Buddha' and with the effect of time all his spiritual teachings and way of life was also realized into various modes of illustrations such as texts, relics, visual and artistic expressions. The mode of illustration by visual and artistic manner can be called as 'Iconography' for this study.

In this Iconographic study efforts have been focused to understand iconographic work of Pre Buddhist and Buddhist period. The meaning of iconography has been listened from its reference in literature and 'Etymology'. The following study sees iconographic work under different topics which are 'Legacy of Gautama Clan', 'Legacy of Hiranya Stupa', 'Legacy of Shakyamuni Clan', 'Legacy of Asita Devala', 'Legacy of Bodhisattva', 'Legacy of Siddhartha', 'Iconography of Vajra', 'Iconography of Enlightenment', 'Iconography of Yoga', 'Skambha', etc. This research also gives comparative dimension to fact that depictions of different ways of spirituality from different religions in world are similar highlighting that they give same message or teachings.

Keywords

Vedas; Buddhism; Stupa; Chaitya; Vajra; Gautaa, Boddhisatva



Iconography of Ancient Indus Valley: Case of seals, scripts and sculptures

Husna Begum, K.Vignesh, Priyanka Sahoo, Sagthi Prakash, Karthikey Dwivedi, Riddha DasKeerthi Maaney (second Years, B. Arch) and Joy Sen

This paper focus on a few aspects:

1. Religious beliefs associated with Indus seals: The situation of non-existence of any structural evidence of any religious buildings makes us unaware of the religious tradition followed by the Indus civilisation people. But some of the seals depict some eminent religious forms such as the mother goddess and pro Shiva like form which have been depicted in many seals with animals surrounding the sculpture and involved in some rituals or praying. Some other evidences are the bovid creature and many which give a different interpretation of then existing religious trend.
2. Creative economy of Indus and its overseas trade: Indus had a flourishing trade of pottery, metallurgy, jewellery and stoneware. Indus was flooded with trade products coming from various parts of the world which is evident from the its link with the mesopotamia civilisation, Afghanistan, Iran and central Asia describing long sea routes which was traversed with the help of long wooden boats.
3. Materials and technology of Indus: The major materials used at that time include semi precious stone, metal, terracotta and faience. Most of the artifacts found from Indus civilisation is made of clay and its derivative which could be a influence of their location near river. Most of the clay materials were used in jewellery making and artifacts of that period. As well as the toys and many pottery work was done using clay and its byproducts.
4. Human and animal figures of Indus iconography: The human figures and animals which were normally impregnated in the Indus seals include the Shiva like form and animals such as bull, unicorn, bovid creature, Indian rhino and many. Apart from the seals there are numerous sculptures such as the dancing girl, the red male torso, the priest and the mother goddess forms and many other made exclusively out of clay or stones. This implies that the Indus people had a good skills of sculpture making, respective material use and aesthetic views and ideology.
5. Scripts and signs of Indus: Though there is no clear understanding of their language and signs, but its close relation with some of the old Indian languages such as Tamil, Sanskrit proving it to be ancient to them or having some relation with these languages. Apart it has some close relation with the eastern scripts such as the Japanese scripts proving some of the trade links even with the eastern countries. The signs and symbols are likely to be depictive of the natural animal forms and some standard symbols. Since the complete language is yet to be decoded because of lack of prior knowledge or some related evidences.
6. Geometry and pattern making in Indus seal designs: The seals represent simple geometric designs in repeated simple pattern. Some of the common shapes found in the seal are concentric circles, swastika, cross which implies some kind of movement and energy. Apart from the geometric ideas behind the seals, they also represent some kind of ideology behind it and hidden messages in it. Thus, the Indus seals are some great source of information about the civilisation which lasted for a long period. The various aspects such as the religious beliefs, trade, scripts and technology existed during that reign giving us a rough idea of their culture and ideologies followed by the for a successful survival and proving to be one of the great civilisation which existed during that period.

Chaitya: An Iconography of Physical Built Environ and Cosmic Archetype in Early Buddhism

Tanima Chakrabarty and Joy Sen

The paper is aiming to decipher the hidden elements and their interconnection that reinvigorate the edifice of Sanatana Vedic cultural, architectural and mythical orientation. The iconography of 'Chaitya' as a physical and cosmological archetype has been tapped to which the earliest form of Buddhism is perhaps an original continuity. To best forward the continuity, the iconography of 'Chaitya' has been earmarked to bridge the gap between Vedic period and Buddhism on the longer level of Indian history and provide means to further penetrate deep ecological stratus of individual salvation by analysing the continuum of specific terms and meanings through the interim period. This research has expanded the iconographic enquiry along with Indo-logical convergences between ideologies, philosophy, language and its physical representation.

The paper has mainly concentrated on the term “Chaitya”, both in physical and cognitive levels. An exhaustive literature review accomplishes the initial understanding and textual interpretations enacted as the supportive material. Architectural and symbolical assay of the built form of “Chaitya” can be best stimulated to probe into an understanding of the continuity of the two periods, which is still nascent.

Keywords

Chaitya; the principle of sentiency; Chaitya Hall; Continuity

Tatar-Mongoloid Migration and Asia: A forgotten case in applied cultural anthropology and iconography

Tiyasaha Sengupta and Joy Sen

The phenomenon of migration has been a common and constant feature of human history. Ethnic intermingling, brought about by migration is integral to the development of a civilization, and subsequently, a culture. This paper attempts to map the Tatar-Mongoloid migration between 25,000 B.C and 10,000 B.C with respect to major ancient civilizations of Asia.

The origin of the Tatar-Mongoloids, according to Mirfatykh Z. Zakiev can be located in the Central Asian region (in and around present day Mongolia and Siberia). Consequently, migration to various regions of Asia and beyond followed. The paper will be analyzing various linguistic, textual, mythological and iconographic evidences collected from archives and other secondary sources to study the outcomes and impacts of Tartan-Mongoloid migrations on Asian cultures.

Keywords

Tatar-Mongoloid migration, ancient Asian civilizations, ancient Asia, migration and culture

Meditation, Spirituality and End of Life Communication and Care

Bera Saumya, Patnaik Priyadarshi, Suhita Chopra Chatterjee and Aurobinda Routray

Meditation and spirituality are often associated. But what is the convergence point between the two? Does meditation induce spirituality and its attributes? Does spirituality lead to meditation? How these two are related to the context of end of life care and communication? End of life gives rise to two basic feelings – grief and acceptance both for the dying and the care-giver. Grief can be defined as a multidimensional response or reaction to loss, particularly to the loss of someone or something, who has passed away, to which a bond or affection was formed. Although conventionally focused on the emotional response to loss, it also has physical, cognitive, behavioural, social, spiritual, and philosophical dimensions. While the terms are often used interchangeably, bereavement refers to the state of loss, and grief is the reaction to loss, along with saudade. Acceptance in human psychology is a person's assent to the reality of a situation, recognizing a process or condition (often a negative or uncomfortable situation) without attempting to change it. However, it is generally perceived that both meditation (as a technique which induces a state of mind) and spirituality (as a guiding philosophy and attitude) lead to increase in positive emotions and a reduction in negative emotions. On the other hand, it is generally observed that both for the dying as well as the care-giver or the bereaved negative emotions dominate and there is a need to balance with more positive emotions. Since both meditation and spirituality reduce negative emotions and increase positive emotions, it is felt that they must play a very significant role for the dying.

The paper will attempt to explore the relation between meditation and spirituality, and their use as coping and communication strategy in order to address the dying and the bereaved. This will do so by a review of secondary literature. On the basis of initial findings, it will then try to create a road map for administration of meditation and spirituality for end of life taking into consideration an Indic perspective and communication strategies.

Keywords

Meditation, spirituality, end of life, positive emotions, coping strategies

Effects of Brief Session of Guided Meditation on Metabolic Profile

Rashmi Mukherjee, Anirban Dasgupta, S L Happy, Bibek Kabi, Aritra Choudhury, Aurobinda Routray, Priyadarshi Patnaik, Rajlakshmi Guha

Although long-term meditation has been found to alter metabolites in meditators, the effects of a brief meditation intervention on metabolic variables are relatively unknown. This experiment examined whether a brief session of guided Kriya Yoga meditation intervention would change the metabolic variables when compared to a pre-meditation condition. Twenty one experienced Kriya Yoga meditators (11 males, 10 females), with a meditation experience of 11.11±1.75 years [Mean ± SEM] participated in one session comprising of a 12 minutes guided Kriya Yoga meditation. Heart rate, blood pressure, and psychological variables (State Anxiety Inventory) were assessed before and after the intervention. Salivary samples were collected pre and post meditation intervention. Fourier transform infrared (FTIR) spectra of saliva were obtained in the wavenumber range of 600–4000 cm⁻¹ at 4 cm⁻¹ resolution. 10 spectral peaks corresponding to the carbohydrate, protein and lipid region were significantly altered in post meditation phase [P<0.001; at 95% confidence interval]. 1H-NMR (nuclear magnetic resonance spectroscopy) results showed that serum levels of choline, alanine citrate and lactate were significantly altered in the post meditation phase as compared to pre-meditation. The results suggest that brief meditation session may lead to altered metabolic profile but a larger sample size is required to validate these preliminary findings. Future directions include study on control groups where intervention strategies include relaxation, stress, cognitive and affective activities.

Keywords

Meditation, metabolic profile, Fourier transform infrared spectroscopy (FTIR), nuclear magnetic resonance spectroscopy (NMR)

Designing Experiments for Studying Effects of Meditation on the Cognitive and Emotional Performance of Human Brain: Getting the Right Combination

Rashmi Mukherjee, Anirban Dasgupta , S L Happy, Bibek Kabi, Aritra Choudhury, Aurobinda Routray, Priyadarshi Patnaik, Rajlakshmi Guha

Design of experiments (DOE) facilitates researchers to determine simultaneously the individual and interactive effects of many factors that could affect the output results in any design. DOE also provides better insight into the interaction and correlation between different causes and factors of a given problem. There should be effective planning of experiments so that the data obtained can be analyzed to yield valid and objective conclusions. It is all the more required when we are analyzing a multi-factorial problem. The objective of the project is to identify the nature of psycho-physiological as well as bio-chemical alterations that take place during/after (a) very short periods of meditation, (b) short periods of meditation and (c) meditation over a long period of time. Here, we would be attempting to explore different meditation techniques and traditions of India. Two main groups-Meditators [Group I] and Non-meditators have been included in the study [Group II]. Group I has been further subdivided into 3 groups [1. novice practitioners (0-2 months); 2. Intermediate practitioners (>2 months to < 2 years); 3. Advanced practitioners (2 – 7 years or above)]. A total of 1000 participants will be included. Physiological signals [EEG, HRV, BP, oxygen saturation, EOG, GSR, breath pattern, voice pattern, thermal and visible images], biochemical variables [neurotransmitters, metabolites] and psychological factors will be compared for meditators and non-meditators. Attempts will also be made to explore if there are correlations between the changes recorded in psychological, biochemical variables and physiological measures. On the whole, multidisciplinary research which is holistic, and includes looking at these issues through a number of parameters such as brain signals, facial and ocular changes, voice signals, physiological changes as well as psychological and cognitive alterations in Indian meditation traditions has been planned. This paper reviews existing designs used in meditation research and also looks into the pilot tests done by this team on more than 50 meditators to provide a model that suits the requirements of multi-dimensional measurement and assessment of the effects of meditation.

Keywords

Meditation, Physiological signals, psychomotor tests, metabolic profile, neurotransmitters

Effect of Meditation on Emotion Regulation

Anushree Basu, S L Happy, Aritra Choudhury, Rashmi Mukherjee, Anirban Dasgupta , Bibek Kabi, Aurobinda Routray, Priyadarshi Patnaik, Rajlakshmi Guha

Emotions are one's subjective experiences associated with feelings, moods, affective and cognitive states. These affect various cognitive activities including judgment, social interaction, learning, persuasion, decision making etc. To alleviate stress or emotional instability, the effect of meditation has been studied extensively through different physiological signals. Many studies have confirmed the huge effect impact of meditation on the states of mind. This study aims at exploring the emotion regulation ability of long term meditators through three signals such as electroencephalography (EEG), facial visual signal, and thermal images.

Using emotional visual stimuli, both positive and negative emotions are elicited in meditators before and after a short meditation session. The physiological changes of the subjects are observed using EEG signals and the facial expressions; thermal facial images are recorded during emotion elicitation. From the self-assessment of emotion and the recorded signals, it was observed that the meditators are highly capable of regulating emotions. The temperature of various regions of a person changes under various emotional conditions due to changes in the blood flow rate. A series of cognitive tasks are performed before meditation and the results from the thermal videos show a reduction of stress and anxiety of a person after the meditation session. Analyzing the visual signals, it was observed that the meditators are good at controlling their emotions, both positive and negative. Some meditators did not react to any emotional stimuli at all, whereas a few responded to the positive stimuli and did not show any kind of discomfort to negative stimuli. This suggests reduced effect of negative emotions, reduced anxiety level, and low arousal of long term meditators. The study is further supported by the analysis of EEG signals of subjects.

Keywords

Meditation, thermal imaging, facial visual signal, emotion, electroencephalography

A Novel Study to Identify the Brain States during Indic Meditation through Analysis of Scalp Electroencephalogram (EEG): A modelling approach consisting of - observation of Frequency Domain changes, construction of Vector Fields of Sources, and the use of connectivity measures to model the Neuronal Information Flow

Chaudhuri Aritra, Shaw Laxmi, and Routray Aurobinda, Pattnaik Priyadarshi, and Guha Rajlaxmi

Information transfer in human neo-cortex occurs in the form of Synapses, which in general occurs through formation of current dipoles near the surfaces of all neurons. This dipoles together creates a constantly varying electric field, whose effect is observed in form of potential variations on the scalp surface. To neuroscientists worldwide, the modelling of such fields, which occur during the various cognitive tasks, has been a persisting challenge. Of these cognitive activities, the most intriguing remains to be Meditation, as this have widely been believed to yield a unique state. This work aims to identify and model the brain state corresponding to the Meditative state, such that, the immense mental as well as physical contributions of the Meditation state, especially Indic Meditation, can be established. With this aim, this work has been focusing on these main tasks – classify the Meditation state, Model the Dynamics of the Meditation state as a Vector field, Model the Neuronal Information flow by the use of Connectivity measures. The target dataset for these tasks was a scalp Electro Encephalogram (EEG) database of 33 human subjects during the cognitive activity of Meditation, specifically Kriya Yoga. For control group, the same subject base was asked to rest for similar time durations. The three approaches for the tasks are described as follows –

1) Classification Scheme to Identify Meditative states through Dominant Trends in Frequency Domain –

Information measures such as Renyi, Shannon entropies and Relative Energy of the different EEG Bands such as Alpha, Beta etc. from EEG captured at specific electrodes are calculated for all subjects for the entire duration of Meditation, as well as resting state. These frequency domain parameters are obtained as sequences corresponding to the dynamical activity of Meditation, and similarly for Resting as well. This parameter sequence is found to have a hidden dominant trend associated with the meditative state, albeit presence of many variations. Here use of a data driven optimal filter has been employed to find out the dominant trend, and found to yield a clear monotonic change in the frequency parameters, corresponding to the dynamic activity during Meditation, whereas no such trend prevail for the Resting state. Then, Extrema features, i.e., the features associated with the global extrema's of the trend are extracted, and an artificial neural Network is trained to identify between the two states. As this method relies on frequency band parameters to classify between the brain states of Meditation and rest, this provides a unique insight about this specific classification problem.

2) Vector Field approach to describe Source Localization based Observation of Dipole Changes corresponding to Meditative & Resting Brain State –

By the use of source localization algorithms, such as Standardized Low Resolution Brain Electromagnetic Tomography (sLORETA), to analyze scalp EEG data, these dipole sources may be estimated. These dipoles are found to largely act as rotating vectors, and as such, a vector field approach can be assumed to describe the sources. This work attempts to visualize these sources as vectors, and the magnitude variations of these vectors can be used as a basis of description of a vector field. The difference between this two vector fields, corresponding to this two states of Meditation and Rest have been outlined in this work. Future scope of this work includes, establishment of a modelling structure for these vector fields, and outlining the difference between the models.

3) Coherence Connectivity Estimation as a Measure of Neural Information Flow during Meditation –

Neural information flow and its application on brain signals during meditation, can be addressed by connectivity measures. Estimation of functional connectivity aims to obtain a neural connectivity measures in terms of a strictly causal time varying Multi-Variate Auto-Regressive (MVAR) model fitted to the multichannel brain signal obtained during meditation. The time varying Granger Causality based connectivity estimators like PDC (Partial Directed Coherence), gPDC (generalized Partial Directed Coherence), OPDC (Orthogonalized Partial Directed Coherence), g-OPDC (generalized Orthogonalized Partial Directed Coherence), etc. are calculated using the estimated time varying MVAR parameters. The time varying MVAR model is provided with data using Adaptive Autoregressive (AAR) model algorithm which uses Kalman Filter. The method like g-PDC and g-OPDC, has been used to scale invariant connectivity measures for quantifying neural information flow between EEG channels. In addition g-OPDC is also immune to volume conduction artifact and gives better result than g-PDC. Finally, aforementioned methods are utilized to determine the dynamic evolution of transmission of brain activity in terms of

the coherence connectivity measures. The conclusion that can be achieved from this connectivity based study, is that the human brain can be effectively trained to operate with uniformity by wishful engagement in Indic Meditations, as supported by our observation of the occurrence of enhanced brain connectivity in long term meditation practitioners.

Keywords

Meditation, EEG, Source Localization, Information Measures, Robust Extrema Features, sLORETA, Coherence Connectivity Estimation, MVAR model, PDC.

A study on the Effect of Short-term Kriya Meditation on Alertness as observed using eye saccades

Anirban Dasgupta, Anjith George, Aritra Chaudhuri, Rashmi Mukherjee, Anirban Dasgupta , S L Happy, Bibek Kabi, Aurobinda Routray, Priyadarshi Patnaik, Rajlakshmi Guha

Alertness or attentiveness is important for people who have to be alert on their jobs, such as air traffic controllers, drivers or pilots. However, maintaining sustained attention is a challenging task. Meditation is believed to be an effective tool for increasing the alertness level of an individual. In this paper, we study the effect of short term Kriya meditation, on the effect of alertness.

It is a well-established fact that saccadic eye movements are correlated with alertness. Eye saccades are fast movements of both the eye balls in the same direction. The peak saccadic velocity increases with alertness as reported by Ueno et al. In this work, we have conducted experiments on 33 subjects to study the changes in alertness level with respect to short term meditation. The subjects consisted of meditators (experimental group) and non-meditators (control group). The alertness level has been gauged using saccadic peak velocity captured using high frame rate videos of ocular image sequences. The method has been cross-correlated with electro-oculography and electroencephalography-based methods. The results show that there is an increase in the peak saccadic velocities for the meditators in most of the cases, whereas the control group exhibited random results. This indicates increased alertness with short term meditation.

Keywords

Meditation, alertness, saccades, peak saccadic velocity

Nature and Extent of Religious Giving in India

Aditi Sen., Srabani Nath., Narayan Chandra Nayak., Suhita Chopra Chatterjee., Priyadarshi Patnaik., Jitendra Mahakud., and Chandra Sekhar Mishra

Religion in India is characterized by a diversity of religious beliefs and practices. In almost all such beliefs, giving or Dāna is considered as an integral part of one's dharma (religious duty). The present paper tries to focus especially on giving in Hindu temples and religious organizations. Offering money or anything in kind in a temple is viewed as Dāna. The giving tradition among practicing Hindus is immensely diverse and rich. An enormous amount of literature, tales, and folklore inform and sustain this tradition. Temples are said to have made very effective use of donor psychology and have built up a logical structure. Pilgrimage conducted by sincere devotees involves an act of donation with a notion of attaining salvation or 'moksha'. On the basis of a review of literature, the present study thus attempts to examine why people donate to religious organizations. Besides, it explores the nature and extent of religious giving in India. Citing select cases of religious importance, the study examines how the donations generated by the religious organizations get utilized. The outcome of the study will be useful to understand the nature and significance of religious giving in India and explore the prospective channels to direct such funds towards promotion of social enterprises.

Keywords

Hindu, religious giving, religious organizations, social enterprises, temples

Generosity Behavior of High-Net-Worth Individuals of India

Runa Sen Chatterjee., Antara Chakrabarti, Narayan Chandra Nayak., PriyadarshiPatnaikand Jitendra Mahakud

In recent times, India has achieved the coveted status of having the highest share of super-rich people globally who intend to make a positive impact on society by giving back to the local communities in many areas of societal importance including health, education, and women and child welfare. According to an estimate of the World Wealth Report 2014, more than 90 per cent of India's high-net-worth individuals (HNWIs) seek to achieve more than just monetary returns while managing their wealth. Since the last century, India's HNWIs have been contributing in diverse ways to let the country grow by leaps and bounds. However, with the spurt of individual wealth, the new generation of HNWIs is found to have taken up philanthropy as one of their noblest duties and has taken it to a newer scale. Consequently, their contributions have become the major source of strength towards ensuring improved social welfare. This paper thus aims to examine the giving patterns, trends, priorities, perceptions, motivations, donor strategies and giving outcomes of some of the major HNWIs of India. On the basis of literature survey, the paper also tries to explore what roles HNWIs can play in engineering large scale social change in India.

Keywords

High net-worth individuals, philanthropy, donor strategy, social welfare

Designing Advantageous Communication Strategies by Assessing Components of Trust and Uncovering Giving Pattern/Behavior amongst Youth

Rashi Ranjan Behera, Priyadarshi Patnaik, Suhita Chopra Chatterjee. Narayan Chandra Nayak and Jitendra Mahakud

'Trust'is one of the most important components in any transaction – social, economic or political; and dana as a socio-economic transaction involves trust as one of its foremost components. The objective of our research is to design advantageous communication strategies by assessingcomponents which elicit trustfor a certain category of doners – educated youth with relatively small resource/income to spare.

In the study, the 'trust components' used were identified through literature reviews and interviews with student communities and the identified 'trust components' were employed to design messages (a combination of both verbal and visual messages). Eight different components/variables that contributed to overall trust building were identified; i.e., brand value, endorsement, sympathy, active role of donor, success stories/past records, transparency, urgency and novelty-freshness; and eight different sets of messages corresponding to each component/variable were framed. Two random groups were chosen to conduct the experiment where students were presented the messages and asked to donate in a hypothetical situation and then justify their reasons for making donations. A total of 69 students participated in the experiment and the initial findings show that educated young tend to donate more to organizations which are very transparent and clear in their financial transactions, and out of sympathy. Motivations include feeling that their contribution is meaningful and is being aptly used. On the other hand, endorsement and brand elicit the least amount of donations. Youth perceive that well established organizations (brand) as well organizations with endorsement (hence existing resources) do not need their help. Both these findings reiterate the focus of the youth to make an impact and to bring about change. Content analysis also revealed that they were more strongly influenced by the images than by the texts.

These initial findings point at both at the types of philanthropy and strategies that might capture the generosity of educated youth. We propose to design a number of other experiments based on these findings and to use a wider sample to validate initial results. These would help develop communication strategies and identify segments for eliciting different kinds of generosity.

Keywords

Dana, trust components, brand value, endorsement, sympathy, active role of donor, success stories/past records, transparency, urgency and non-brand/newness, communication strategies

Alterative Models of Palliative Care: A Critical Review

Chandrima Chatterjee, Narayan Chandra Nayak, Suhita Chopra Chatterjee, Priyadarshi Patnaik, Jitendra Mahakud

End-of-Life Care, formally known as palliative care, is a care giving approach to dying patients in which the quality of life of the patients is improved by reducing pain and sufferings through some unique and effective methods. Though India is not much familiar with the word 'palliative care', across the globe, several palliative care models are followed and implemented. This research work attempts to identify those models of palliative care which are economically and socially viable in the context of India. The study is initiated on the basis of reviewing literature on palliative care. While in international context, most of the palliative care models are found to be either government funded or community-run. In case of India, there is hardly any provision for government funded palliative care programmes. However, a community-run palliative care set up for elderly people is found only in the state of Kerala. Family caregivers approach is most common in India. Other palliative care models followed across the globe are consensus model, public-private-partnership (PPP) model, NGO model and many more. The present research, while finding out the merits and demerits of such models, examines their structure, funding and administration aspects. The study will be useful to understand the model(s) best fitted in Indian context in terms of cost effectiveness and/or welfare maximization.

Keywords

Consensus model, cost-effectiveness, family caregiver, Palliative care

Challenges in Home Care for the Dying Elderly in Kolkata

Jaydeep Sengupta, Roopa K.L, Tulika Bhattacharya and Suhita Chopra Chatterjee

Western studies related to End-of-Life Care recommend 'home' as an ideal place to provide care for those who are ageing and dying. However, the complexity of home care in resource constrained countries like India has not been carefully examined. Many homes lack basic amenities for care. On the other hand, there are homes which import hospital infrastructure around the death-beds due to the prevalent culture of 'medicalised dying'. Recently, a few attempts have been made by palliative care teams to provide less invasive care at home as a measure to curtail cost.

The study examines the relevance of 'home' within the existing underdeveloped and fragmented public health framework in India. It also presents few representative case studies of elderly patients suffering from cancer and dementia, who are receiving palliation in and around the city of Kolkata. It tries to assess the overall quality of dying for such elderly. The study concludes by identifying some of the barriers in care-giving and suggests measures to integrate home within a continuum of care.

Keywords

End-of-life care, Home care, Palliative care, Public health

Palliative Care in the Ayurvedic Text 'Kashyapa Samhita or Vriddhajivakiya Tantra'

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Palliative care is both explicit and implicit in numerous texts of Ayurveda. These inputs can be broadly classified as:

1. Inputs regarding medicine in palliation
2. Inputs regarding nursing in palliation
3. Inputs regarding psychological care in palliation
4. Inputs regarding nutrition and diet in palliation
5. Inputs regarding architecture or housing for palliation

In the palliative care of a person, particularly the elderly, certain ailments are commonly encountered. The conventional treatment of such ailments often leads to side-effects and other complications. Ayurvedic treatment of these ailments alleviates pain and offers great relief. The Kashyapa Samhita or Vriddhajivakiya Tantra offers many treatments for ailments common among the elderly. It also gives treatment methods for psychological disorders. This paper attempts to bring out these insights, particularly from the perspective of palliative care.

The Kashyapa Samhita offers treatments and cures for hyperacidity, indigestion, fevers, and other ailments common in terminally-ill patients. A section deals with the analysis of various dreams, leading to the treatment of various psychological illnesses. This text also deals with various diets catering to different physiques. Also dealt with are the changes of physical conditions depending on the different seasons.

The best part of the Kashyapa Samhita is that the solutions offered are cost-effective and easy to administer. They also do not need much infrastructure. Thus, this text provides an easy indigenous approach to a holistic palliative care.

The Search for the Lost River/s at Konarka Temple: An Integrated Exploration using Myth, History and Remote Sensing Data

Chirashree Srabani Rath, Rashmi Ranjan Behera and Priyadarshi Patnaik

This paper focuses on the identification, analysis, documentation and translation of various myths, legends, oral traditions, folklores and cultural practices that indicate the existence of river(s) around Konark, located near a small town in the state of Odisha which lies on the east coast by the Bay of Bengal. While tradition talks of a holy river known as Chandrabhaga near Konark, currently there are no rivers there. Did a river exist? Where was it located? What role did it play in community life? How did it possibly disappear? The methodology proposed for the work is (a) identification and reviews of ancient and contemporary texts; (b) analysis and reviews of folk tradition and Hindu beliefs; (c) identification and analysis of socio-cultural practices; (d) identification and documentation of archaeological evidences, paintings and photographs; (e) and correlation of the findings that emerge with scientific evidences. The challenge is to go through conflicting indicators, identify consistent components and to come up with a working hypothesis with the support of scientific evidences. This would both contribute to history (as opposed to myth) and to further scientific explorations.

The paper attempts a comprehensive review of ancient and contemporary texts, oral traditions and folklores, epigraphic documentations, old illustrations and photographs and interviews with the elderly people of local communities to arrive at the conclusion that there is a very high probability that a river existed near Konark. This is endorsed by the existing scientific data

(examined in the same project) including satellite images and remote sensing which also suggest the existence of past palaeo-channels in the vicinity. Interestingly, interaction with nearby community and an initial examination of some sites and river-based temples suggest that a narrower (and may be man-made) palaeo-channel also probably existed which was used to transport stone for the construction of the temple.

Keywords

Myths, oral tradition, folklore, socio-cultural practices, cultural heritage, coastal heritage belt

The Search for the Lost River/s at Konarka Temple, Odisha, India: An Integrated Exploration using Myth, History, Remote Sensing and GIS

Subhamoy Jana and William K. Mohanty

The east coast of India stretching from Tamil Nadu in the south to west Bengal in the north is vast landmass of world heritage temples, monuments and historical places. Odisha is one such state in the east coast where every year many tourists come from different region to visit the historical as well as mythical places like Puri and Konark. Konark, which is located 65km from Bhubaneswar in the east coast, is famous for the 13th century Sun temple. Presently this temple is mostly in ruin state. Mythological literature like Samba Purana, Madala Panji, Baya Chakada, Sarala Mahabharat speak about the existence of holy rivers such as Chandrabhaga besides Konark temple. However, presently the river is reduced to a dry bed or narrow trickle. Therefore the present article emphasizes finding this lost river using integrated study of myths, history and geology. Satellite images such as Landsat, Shuttle Radar Topographic Mission (SRTM), snapshots from Google Earth, spatial profile generated in SRTM data prove to be helpful in identifying the channel. Image Enhancement technique like Histogram Equalization and other techniques like Normalized Difference Vegetation IndexNDVI, Hill shade analysis throw some light on the existence of the channel. The criteria for paleo-channel like thermal data, elevation data, NDVI data, anomaly data, geology data, and tectonics data are integrated by putting their respective weight in the GIS platform. Analysis of data suggests that a palaeo-channel did run close to Konark temple in the past, thus confirming the myths, legends and rituals.

Keywords

Paleochannel; Histogram Equalization; Normalized Difference Vegetation Index (NDVI); Gravity Anomaly; SRTM; GIS

Assessment of Risks and Benefits Associated with the Odisha Coastal “Heritage” Belt

Sweta Sen, Narayan Chandra Nayak., Priyadarshi Patnaik

Many cities in developing countries are cradles of history and culture, abounded with heritage buildings and sites. In many cases, they are also the areas where economic, social and environmental problems are concentrated. Puri and Konark are two such integrated coastal heritage sites, which have the distinct features of being considered amongst the historically and culturally significant coastal heritage sites of the country. In course of history, these heritage sites have, however, witnessed serious challenges of gradual extinction or erosion of their several important monuments. There have also been reported cases of coastal erosion leading to increasing threats of losing such monuments and the associated socio-cultural and economic activities in such heritage sites. This study thus aims to find out the risks associated with such happenings and estimate the benefits of protecting and managing the coastal heritage belt of Puri and Konark. It attempts to undertake an economic valuation of coastal heritage in Puri and Konark. In effect, it will make an assessment of the probable risks on tourism, creative economy, vegetation, etc. It may be important to state that preservation of heritage sites largely depends on people's willingness to pay. The latter, in turn, may depend on the extent of risk people perceive and other factors. This study thus aims to find out the determinants of the willingness to pay in the context of Puri and Konark heritage site conservation. However, as a preliminary effort, the present study, following available literature, will examine the possible implications of a coastal heritage site from the perspectives of the effects of heritage loss on two inter-related economies viz. heritage economy and coastal economy.

Keywords

Coastal Heritage, coastal erosion, creative economy, environmental risk assessment, willingness to pay

Methodological framework for establishing potential Geotourism circuits of Kendrapara- Jajpur- Cuttack belt, Odisha

Debapriya Chakraborty, Priyadarshi Patnaik and Joy Sen

Geotourism, a relatively new concept, towards avoiding an undifferentiated global mass tourism brought forward by the National Geographic Center for Sustainable Destinations, is a step not only for sustaining but also enhancing the destination by means of restorative and constructive forms of tourism.

The coastal belt of the state of Odisha has ample scope for eco-tourism, heritage tourism and cultural tourism. The state attracts tourists from the neighboring states as well as foreign tourists. Odisha being a part of the Gondwana supercontinent can boast of the oldest rocks in the Indian subcontinent having the richest sites of fossils mostly in the Mahanadi and the Ib river basins. A rich forest cover including National Park and Crocodile Reserve at Bhitarkanika, Elephant Reserve at Chandaka and the bio- diversity of Chilika Lake are just glimpses of what the region has to offer to ecotourism. Besides it is mouth of huge system of rivers namely the Mahanadi, Brahmani, Baitarani and their numerous distributaries. The region has been a seat of many ancient folklore and tribal traditions to which the Hindu and Buddhist cultures and monastic settlements were added as the formal ones in the ancient times and such are still continuing to flourish. The community has been successful in passing on the legacy of its traditional dance form, art forms and the scripts. All these add up to contribute to heritage and cultural tourism realm. Kendrapara- Jajpur- Cuttack belt of Coastal Odisha can hence offer its visitors an enriching experience through participation of the host community and ultimately sustaining the elements that combine to form the 'sense of place'.

This paper deals with the methodological framework of organizing information & networking of sites aimed at planning and management of sites from the geotourism potentials.

Keywords

Geo-tourism, community framework, Buddhism, Gondwana supercontinent

An assessment of the Geospatial Setting of Chandraketugarh based on a historical review of current works and research

Oindrilla Bose, Arindam Basu, Abhijit Mukherjee, Probal Sengupta and Joy Sen

Chandraketugarh or an urban centre, perhaps located as a key part of the ancient state of Gangaridai had been excavated where the trans-Bengal region (interface of West Bengal and Bangladesh) lies today. The description has been found from various sources of travelling account of the writers and travelers in their different piece of works. The position of Chandraketugarh has been acknowledged on the basis of Maritime-Land route evidences and textural-historic evidences obtained from within India and also from the eastern and western parts of Asia. The antiquity of Chandraketugarh dates back to eras as early as the 5th century BCE, a period much prior to the Mauryan era, from where various relics of the subsequent Sunga-Kushana period, Gupta age, followed by Pala-Sena age have been unearthed.

This study focuses on various ways and means to assess the geospatial setting and chronological shifting of the river courses of this area. Reviews and outputs are taken on the basis of geo-spatial setting with respect to the chronological shifting of the river courses, based on the outputs obtained, a detailed study approach has been further outlined.

Keywords

Chandraketugarh, Gangaridai, maritime-land route, textural-historic, geo-spatial setting

An Approach to assess the Creative Economic Potentials based on River Tourism A Case: Kolkata Metropolitan Area

Arundhati Patnaik, Ankhi Banerjee, Ankita Mandal and Joy Sen

Tourism lately has been coming up as a major vibrant industry in India. One of a major part of the GDP is coming from the tourism industry. The richness of cultural heritage resources in India has remained as one of the major attractions for the people from inside the country as well as outside to take up travel or tourism as one of the major activities, to its various states. West Bengal as a part of this culturally rich country has an immense potential for the development of ecological, heritage and river based creative economic tourism. Though enriched by the riparian tract of river Hooghly and its other tributaries, West Bengal i.e. Kolkata is predominantly flanked by a long legacy of pre-Islamic, Islamic, colonial and post-colonial assets of creative economic potentials. To best forward the evidence, the case study of its principal city i.e. the Kolkata Metropolitan Area has been assessed.

Accordingly the study attempts to revive and resuscitate the three integrated nodal areas of existing tourism circuits based on ecological resources, the heritage precincts and premises and the creative economic community patterns of KMA through a twofold study sequence:

1. The paper forwards a literature review of resources from the existing researches and tour operations listed zones of tourism circuits from the web.
2. This is followed by a secondary data survey that indicates KMA has immense potential for the development of various forms of tourism which also improves the socio economic conditions of its people without hampering the ecology and environment of the place.

In summary, the paper unfolds an approach to earmark the various integrated nodal points through which all the above mentioned areas can be best integrated and developed into tourism zones by keeping in mind the comprehensive upliftment of the creative community.

Keywords

River Tourism, ecological resources, heritage precincts, creative community - features, signs and signatures, and patterns

A methodology to assess a correlation of Creative Heritage based economy and tourism, based on river-metropolis interface - Case of Kolkata Metropolitan Area (KMA)

Arpan Paul, Ankhi Banerjee, Saikat Paul and Joy Sen

The creative economy is a holistic concept, which delineates activities based on the original ideas and executes the intellectual properties held in common or in private. In all societies, creativity is found with stock of intangible cultural goods and creative industries. If we look at the world economy, the creative industries are getting more dynamic and beneficial sector and highly transfiguration in terms of income generation, job creation, export earnings and overall well being of the society.

In the present context, the emerging harmony between cultural heritage based economy and tourism is the raising theme in the tourism market economy. To promote destinations and boosting their attractiveness, Culture and creative industries are using and culture has progressively connected to tourism as a means of creating jobs and raising incomes. Heritage tourism is an integral part of cultural industries. This also makes a positive economic and social impact, through conservation of cultural resources; tourist's experience, and revenue generation etc. So the cultural heritage tourism is not only concerned with identification, management and protection of the heritage values, but it must also be involved in understanding the impact of tourism on the communities and the local economy.

This paper earmarks the metropolitan region of Kolkata, having a rich cultural heritage. To examine the way to preserve these cultural heritages of its landscape and the heritage based on the creative economy along the river Hugli with a focus on the betterment of the local and regional economy.

Keywords

Cultural Heritage, Creative Economy, Tourism

An approach to assess the opportunity of a walkable space to promote creative economy: Case of Boipara, College Street, Kolkata

Prerona Mondal, V. N. Giri, Haimanti Banerjee and Joy Sen

The Environmental Protection Agency (EPA) notes that, 'To remain competitive, communities will need places that respond to changing attitudes and behaviors driving people and businesses toward the center of metropolitan areas.' By understanding the space syntax of a given area the connectivity and integration of surrounding spaces and elements can be analyzed. The analysis may further result in developing strategies for better infrastructural support for the creative economical activities flourishing in the area. Studies show that the cognitive complexity of an area or network describes the user preferences to a greater extent. However, Pedestrian movements in and around, as well as consumer preferences depends upon other indicators such as imageability, enclosure, connectivity, availability of choices. In order to assess the momentary changes through space syntax, a case of college street- Boipara in Kolkata have been selected. The area comprises of key educational sectors & business centers along with various creative support infrastructure. Due to its prime location of various educational centers for disseminating the knowledge, it has generated scope for various creative economies since its development from the colonial period. The study of its dynamic demand and characteristics of high-end readers and buyers is needed for preserving, strengthening, and survival of an old creative space with rich historical background. The major concern arises from the diminishing traditional culture of the creative economy generated by the status quo of the distributors, publishers, book sellers, high-end readers due to deviation from the correlation between its social effects and spatial layouts. In this paper, an approach to apply space syntax to predict this correlation will be undertaken in order to understand the impacts and needs of the creative space for the local economy of the selected area.

Keywords

Space syntax; pedestrian movement; creative economy; high-end users; dynamic demand; Boipara-College Street; infrastructure; creative space; correlation.

Planning For Creative Economic Clustering. Case study: Gariahat Street Vendors, Kolkata

Suparna Dasgupta and Joy Sen

Creative economy combines of traditional knowledge, technology & development of skills benefitting the contemporary world forward products & services that respond to the consumer needs. Networking local enterprises to form clusters can open new market opportunities while ensuring prosperity long term sustainability of the enterprise.

Furthermore, networking enterprises based on a right agglomeration of typology of goods, carrying capacity of trade and space available to showcase the products in a dense urban area actually ensures long-term sustainability of the enterprise (as an individual) and its embedding into whole (cluster).

This right agglomeration represents a “pattern“, which may range from small design detail (micro) to large urban spaces (meso). Thus concept is applied to cluster existing economic agglomerations of hawkers at Gariahat. The Sir Christopher Alexander's technique of pattern hierarchy as a tool for cluster identification & linking them two tiers of small (micro) and large (meso) designs & finally to the city (macro). The paper forwards the ground reality showing “how” without much direct physical intervention an approach can be planned to re-cluster them based on creative strategies. The paper presents the process of identification of clusters & regrouping them based on pattern hierarchy and cluster hierarchy.

Keywords

Creative economy; pattern hierarchy; cluster hierarchy

A systems approach to re-organize artisans of 'Kumartuli' by visual elements

Tushar Kanti Saha, Priyadarshi Patnaik and Joy Sen

Culture and creativity play a significant role to bridge creative communities and the worldwide marketplace. Their impact is evident not only on the economy but also on environment, through people's efficiency and organic intelligence. The SANDHI in IIT Kharagpur has taken an initiative to rebuild Creative Economy (CE) based on integrates of research and practice. The initiatives of SANDHI have addressed the twofold activities, namely exploring the socio-cultural nature and systematizing approach of creative opportunity zone (COZ) by developing both theory and process of application.

In the above context research concern, the present paper concentrates on the traditional cultural zone of Kumartuli in North Kolkata. The paper aim reconstruct the present unorganised situation of traditional artisans' colony, the kumartuli landscape and upgrading qualitative & quantitative artefacts through the visual art elements.

The methodological procedure of research consists of two broad areas:

1. To study the various stages of traditional *Kumartuli gharana* and their modern art practicing system and technology. Those approaches will lead to modernize the *Kumartuli* landscape through the visual art elements integrated by the popular culture, contemporary art forms and by introducing new methods, technologies etc. The region of *kumartuli* has a cultural property of its own and in general has a traditional impact on craftsmanship. The factors encouraging this is its evolutions of historical relationship between art product and society, of artisan's fine craft excellence, practices, beliefs, life ways, visual individuality or social institutions of a living community.
2. The artefact value of finesse expressions and depictions of polished embroideries which have been remarkably appreciated all over the world.

Thus the paper aim assess historical craft pathways (HCP), social importance of cultural prosperity and global sustainability of the creative community by highlight the traditional kumartuli gharana, an environment for tourist attraction, their economical upliftment and their global participation through a long lasting tradition of local activities.

Keywords

Visual art elements, cultural property, traditional artefacts, craftsmanship, popular culture, contemporary art, Creative Economy

An identification of visual elements rendering a living and dynamic educational installation; case study – Boipara, Kolkata

Sadhana Naskar, V. N. Giri, Priyadarshi Patnaik and Joy Sen

Boipara is the paradise to all book lovers whether it is organized or disorganized; it grows to be a living installation with its organic wholeness. Since the foundation of Boipara is a living installation of knowledge repository as the knowledge is based on the thought installation and book is the most important vessel of that thought. There are many individual elements that have created an essence of rhythmic system in this living culture as well as visual culture as seen in its location, landscape, buildings, heritage, books and book-shops, publishing houses, book related materials, transportation, long-standing 'adda' of coffee house as well as the integrated relations between publishers-buyers-poet-writer-teachers-students-all kind of audience. This materialistic assemblage renders Boipara its identity and all are connected harmoniously between each other.

Secondly, Boipara has become an organic symbiosis of the University and the book market and also the place of exchanging knowledge between them. This typical environment of Boipara creates a nostalgia which gives it uniqueness in sharp contrast to the westernized version of metropolitan book market.

The paper unfolds a series of installation elements that forwards a perception of the spontaneous function of the taste and the sentiment of the perceiver to quantify the perception. If also shows how there elements augment, visual and communicational strength despite unorganized component and plethora the renders a organic wholeness.

If finally suggests a working methodically of how Boipara can be transformed to a 'dynamic' environment to book lovers and could grow to be an open library as well as an open air gallery so that the knowledge-space can be transformed to a wisdom-place.

Keywords

living installation, cultural augmentation, book and knowledge, nostalgia, taste of perceiver, heritage, plethora, organized ramification

PART - III

Varanasi: A Mega Exploratory Project



Book of Abstracts

Abstract of presentation on Project Varanasi

Prof. D. Singh and Prof. R. K. Mishra, IIT BHU

The Project Varanasi seeks to undertake the study of the extra-ordinary city of Varanasi and its surroundings in all its aspects -- the living aspects as well as the dead, contemporary as well as the immortalized, its knowledge of the inner world as well as its indifference to the external conditions, its glory as well as its wretchedness.

- It will address its communities as well as the individuals, its crafts as well as the industry and its relation with its traditions as well as with modernity.
- It would connect with the local surroundings ranging from the city of Varanasi to the larger eastern region of India. It can draw its topics from the city and the region, and their relation with the country and outside. It will require creative scholarship to be carried out through a critical enquiry, cutting across disciplines. It would promote synergistic studies connecting humanities with science and technology. Such studies undertaken for a city and the Eastern region would, hopefully, throw new light on existing issues and problems of the other region, the country and the contemporary human society. Such a study would also help create a new generation of people rooted in a new ethos. People with such an ethos would be better connected to society, and are likely to be better professionally.

It would also serve as a platform for engineering students for creative combination of humanities with science and technology. Such a platform would create conditions for unearthing interdisciplinary insights and confluence of disciplines. Theory should help with practice, and practice should lead to theorizing. In this work, it is proposed to carry out a large number of carefully selected projects falling in the following areas (I) History & Civilization, (ii) Culture, (iii) Development Studies, (iv) Language, Literature, Linguistics& Cog. Sc., (v) Philosophy, and (vi) Education

The research projects would collectively create a larger picture of times and society. Five example group projects which have started are (I) Ganga, (ii) Varanasi City, (iii) Craft Communities, (iv) Ramayana & Literature, and (v) Sarnath.

On the above lines following progress has been made so far. A separate unit along with its coordinator has been created at the institute. The unit has identified few projects related to above group projects. Three specific tasks have been identified (with some progress) under this project are as follows. (a) Survey of Varanasi ghats, (b) Some projects on linguistics, (c) Pilot sewage treatment plant (d) documentation of craft and cultural/religious practices and (e) prototype design and development of innovative objects useful for varanasi. Proposal for this pilot project was prepared under this project. This proposal was presented at “Green cities and Ganga” workshop which has been funded by HRD.

Issues on Infrastructure Development of Varanasi City

Prof. Brind Kumar, Transportation Engineering Group, Civil Engineering, IIT (BHU), Varanasi

Literature suggest that Kashi used to be a vibrant habitation with well knit road network that commensurated with its rich economy, culture and tradition. It occupied a unique place among contemporary habitations, near and far, for its niche in religion and education. The place was blessed with liberal contributions from various rulers that contributed to the physical and spiritual content of the city. Varanasi was among the first city to be selected by the British government for establishing modern sewage disposal system. As of now, the city survives with the same old system.

With the passage of time and change in the size of vehicles and volume of traffic, the road network including the arterial roads have become choked and congested to the extent that during peak flow, the traffic literally crawls. With about 15,000 vehicles being added to its roads every year, Varanasi traffic is gradually witnessing longer hours of traffic jams. Encroachment of road land; near absence of footpaths; establishment of temporary vending huts; indifference of municipal, police and local administration; lack of planning by Varanasi Development Authority (VDA) and Awasth Vikas Parishad; lack of interest by state and central governments has led to the present level of chaotic situation in terms of highly unplanned infrastructure development.

It is reported that about 200 illegal residential colonies have cropped up and the VDA is incapacitated in regularizing them. Such residential colonies have narrow right-of-way (RoW) of the order of 4'(1.2m), 8'(2.4m), 15'(4.5m) and 20'(6.0m) which is contrary to the standards set forth by the Indian Roads Congress (IRC). Such illegal residential colonies are developed haphazardly by local colonizers acquiring land from farmers with scant regards to civic amenities like road, water supply and sewage system. Ironically, the local farmers prefer selling land to such developers rather than the government agencies. The number of illegal and unplanned residential colonies is many folds higher than those residential colonies developed by the VDA. The carelessness of the state government can be gauged from the fact that the Varanasi Master Plan 2011-2031 is yet to be notified and the city is forced to decide its development as per Master Plan 1991-2011.

Once a vibrant city of Kashi has drooped down to become a city full of garbage, unplanned residential colonies lacking basic amenities, narrow arterial roads full of potholes and overflowing sewage, lack of social security etc. which are reminiscent of uncultured and wild society. Needless to say that some serious thinking needs to be done and issues of development cannot be left to the convenience of governments. Following suggestions are considered appropriate for achieving the right balance of population and infrastructure development of Varanasi city:

1. To set right all un-authorized residential colonies made in past 30 years as per standard norms of urban development. However, care should be taken to preserve such old and heritage buildings which are reminiscent of the cultural heritage of Kashi.
2. All services including power and telephone cables; water supply, sewage and gas line should be made underground and finished with pavement and footpath on the top by adopting the integrated pavement approach. This will eliminate the repeated cycle of cutting and covering the road land by various agencies and also add to the revenue base of the local municipality.
3. The Panchkoshi road should be made 4-lane with divided carriageway. It has huge religious importance and is flanked with Shiv Lings which devotees traverse bare footed during Panchkoshi Yatra and make religious donations.
4. Inner ring road is almost in place with the exception of the Samneghat bridge which needs to be completed in a targeted time frame. This is a 4-lane divided carriageway and covers vital business and industrial areas. However, the road lacks side drains in many places which need to be put in place.
5. Work for construction of the outer ring road should start at the right earnest with a bridge at Baluaghat located at about 2 km downstream of the present Malaviya bridge. All intersecting NHs should be by-passed with flyovers to achieve un-interrupted traffic flow. This should be 6-lane divided carriageway with service lane on both sides. Outer ring road will facilitate development of new residential (smart city), commercial and industrial establishments.
6. All NHs within the city limits demarcated by the VDA should be made 4-lane irrespective of the present carriageway width. They should be flanked by service lanes on both sides.
7. Removal of encroachments from all intersections and their extension, modernization and beautification. Removal and relocation of all police posts from the RoW. Increase the strength of traffic police and train them to be conducive to tourists.
8. All roads within the habitation areas to be of Cement Concrete (CC) only. Capacity development of engineers and contractors for making good quality CC roads. Narrow lanes in the old city to be of CC with saucer type drains.
9. Modernisation of Cantt. Railway Station in terms of redesigning its points and turn-outs to facilitate handling of any train at any platform. The concourse and circulating area should be remodeled and developed for multi-function activity. It should be clean, make one feel safe and comfortable, and provide the best of what Varanasi can offer to tourists.
10. Runway of LBS Airport should be extended by 300m so as to operate large aircrafts. The concourse should be remodeled with such commercial usage that will offer the best of Varanasi to the tourists.
11. Bus stands should be relocated at the outskirts of the city adjacent to the NHs and integrated with the Cantt. Bus Stand which will provide for shuttle and city services.
12. Extension of Chowkaghat flyover up to Kamlapati Tripathi Girls High School and its 4-laning.
13. Establishment of STP of adequate capacity to have service tenure of 50 years with matching apparatus and appurtenances.
14. Heritage zone of 200m along the Ganges needs to be developed for tourist activities. It should have richshaw, bi-cycle, tonga and battery operated auto-rickshaw in traffic. Wide and elegant footpaths with tree shades. Clean and well lighted ghats. Should offer the best of life, culture, sweets, beads that Varanasi may offer along with comfortable stay. Intense afforestation in the habitation zone.
15. Creation of Varanasi Metro Rail Corporation for development of modern and reliable public transport system. Survey may be conducted for the following trunk routes with change over at Sanskrit Vishwavidyalaya:

Babatpur – Sanskrit Vishwavidyalaya – Benia park = 25 km., **Sarnath** – Sanskrit Vishwavidyalaya – DLW = 25 km.

Settlement Pattern of Communities and their Role in Creative Economy of Varanasi: Past and Present

Swasti Mishra, Indian Institute of Technology (BHU)

The paper attempts to study the settlement pattern of various communities of Varanasi city and their role in creative economy by the comparative analysis of past and present scenario. The heritage city Varanasi is also known as the “Cultural Capital” of India. As it has adopted different cultures and communities so perfectly that it gives the glimpses of “Mini India” by blending various religions, cultures, traditions, rituals etc. flawlessly over centuries.

Varanasi has its unique pattern of settlement. Every community has its specific habitat and remains conscious to maintain it. At Varanasi one can feel the changing patterns and movements in the course of history. The city presents an exceptional social and cultural blend, traditional and linguistic pluralism. At Varanasi one gets to explore the city of affluences, intellectuals, oral traditions, cast and costumes, personalities and communal harmony.

Varanasi also has been a leading centre of trade and commerce from centuries by maintaining its position as the wholesale market of eastern India. It has attained the international status for its handicraft works. In order to retain this distinction till date all these communities have contributed a lot and are still contributing. Each community has its own sector of trade which has played an important role in the creative economy of the city. In the course of time few shifts and switches have also been noticed.

This paper attempts to identify the root cause of these shifts and their impact along with the suggestions for possible remedial measures to finalize the necessary action plan.

Keywords

Settlement pattern, Varanasi, communities, culture, tradition, creative economy, trade and commerce.

Present Condition of Slums in Varanasi city

Dwivedi Amrita, Indian Institute of Technology Banaras Hindu University

In developing countries, the problem of both housing and living space calls for urgent solution. This is because of increase in the world population and large influx into the urban areas. Rapid and uncontrolled urbanisation have caused a series of complex problems, ranging from shortage of housing, sanitation, environmental pollution, the quality of life affecting the moral and social attitudes and values and the morbidity associated with urban life. Like other cities, Varanasi also faces pressure on housing stock due to rapid population growth and migration from surrounding area. Rapid growth of population and fast urbanisation have resulted in continuous growth of slums in Varanasi city. It has also witnessed faster growth of slums more specifically in outer parts of the city. It has further deteriorated the quality of housing in Varanasi. Deficit of houses and ever flowing migrants in the city from surrounding area as well as neighbouring states have further worsened the crisis. For analysing the socio-economic condition of slum dwellers in Varanasi, 12 identified slums by District Urban Development Authority (DUDA) have been intensively surveyed. We have covered slums distributed in different parts of the city according to their nature and type.

According to Varanasi Development Authority (VDA), there are 227 slums spread all over the city on government and private lands Total population of slums in Varanasi is about 4,53,222 according to 2001 census, which is about 41 per cent of the total city's population. This slum population increased to 4,57,568 in 2006. These 227 slums have been grouped into 36 community development centres (CDC), which are responsible for the overall development of the slums along with Slum Urban Development Authority (SUDA). Population of these slums varies from 200 to almost 9,000 persons with varied densities. Rapid growth of slums in Varanasi has put enormous pressure on the existing land resources and infrastructure. It has also caused deterioration of its physical environment and unhealthy living conditions. In this paper, we analyse and discuss the condition of slums in Varanasi city and their possible remedies.

Keywords

Slum, Environmental pollution, Sanitation, Urbanisation.

A Representation of Project Varanasi through Web-Portal: Modification and addition of New Modules

Manmeet Singh Raina, IIT BHU

The aim of this paper is to give suggestions and discuss the objectives, necessity, and the importance of designing a web-portal for the Project Varanasi. Varanasi being one of the oldest heritage cities of the world has been of utmost importance.

Moreover the Varanasi city has been centre of many activities related to various fields such as culture, education, religion, trade and commerce etc since long back. As a result, of this we have an enormous amount of rich information and documentations, but all these basic and static valuable information are scattered. Web-portal is an attempt to bring all these scattered information under one framework, enabling the people to share or exchange knowledge and views, day to day activities specific to development of Varanasi city.

Keeping all these factors in view the attempt will be to include the following features—

- 1) To provide a virtual platform for people to communicate and connect with each other via blogs, emails, comments, polls etc.
- 2) To identify and add new modules related to the various aspects of Varanasi. Such as exploring the city via games, ITS facility etc.
- 3) The use of efficient Web technologies in order to improve the performance, optimization, fast loading, SEO-friendly, multiple browser compatibility, incorporating responsive design feature, adding the security and authentication features for sensitive and confidential information.

Keywords

Web-portal, web technologies, Varanasi, blogs, information, virtual platform, modules.

Comparative study of Traditional Industries and Craftsmanship between two historic and culturally rich cities of Asia – Varanasi(India) & Kyoto (Japan)

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This paper attempts to make a comparative study between the traditional cottage industries and craftsmanship in two historically important, culturally rich cities which were also economic hubs and manufacturing centres of unique products, exquisite articles and exotic goods for many centuries. Since times immemorial, Varanasi has been hailed as a leading centre for some of the finest Indian craftsmen and artisans. The most renowned craft of Varanasi is silk weaving of 'Benarasi Saris'. Textile designing, brassware, copperware, stone and clay artworks and exquisite gold jewellery are some of the other crafts Varanasi is famous for. Similarly, Kyoto, the seat of power for 1200 years and the cultural hub of Japan, has many traditional industries whose crafts combine functionality and beauty passed down by generations of skilled craftsmen and artisans. Nishijin textile, Kyo-yuzen textile dyeing and Kyo-yaki pottery are the world famous crafts unique to Kyoto. 17 items including these have been designated Traditional Crafts Product of Japan.

At present the silk weaving industry has been threatened by the rise of power looms, computer-generated designs and competition from Chinese silk traders. Globalisation, FDI and reluctance of artisans to mould their skills with latest manufacturing machineries meanwhile traditional industries in Kyoto mechanised themselves and craftsmen where quick to learn new skills in Meiji Restoration Period. Thus, whereas traditional industries in Varanasi has declined in their markets, production capacity and skilled craftsmen base; Kyoto continued to increase its production and manufacturing of traditional crafts and goods even in today's changing markets. This paper seeks to understand the reasons for these trends and what Varanasi can learn from Kyoto.

Keywords

Traditional Industries, Crafts, Artisans, Weavers, Benarasi Sari, Kyoto, Varanasi, Nishijin, Kyo-yuzen, Kyo-yaki

A literature Review: Concepts of 'Regional Aerotropism' for of Heritage -Cities global economic generation – case of Varanasi / Heritage cities

Sunny Bansal and Joy Sen

The concept of “*aerotropolis*” or “airport city” has evolved as now the airport is not only a hub for movement but has also become a driver of business location and regional growth, and integrates the global economy. Economic scenario of a region has always been a key factor for the growth in air service demand, and air transportation itself can be a strategic cause and facilitator of a region's economic growth. The fact becomes even more significant in the development of Regional Aerotropism for Heritage Cities as still the existent and true economic potential of these cities has not been truly realised. In addition, the aerotropism also advances the region's accessibility and overall social development and assures the modern needs of the traditional city.

This paper presents a review of literature defining the concepts of Regional Aerotropism and Airport Logistics in relation to Heritage Cities and recognizes the major catalytic impacts spawned by its development. The impacts include generation and enhancement of regional economic competitiveness by promoting export activities and tourism activities; improving market connectivity; boosting business operations and productivity; and influencing business' location and investment decisions. The paper attempts to bring together the identified components in a synergistic manner and further analyse their impacts on one another.

Keywords

Regional Aerotropism; Heritage City; Airport Logistics; Economy Generation

A methodology to assess Creative Economy based Heritage Tourism at Land-River Interface: Case – Varanasi

Deepanjan Saha, V. N. Giri, Priyadarshi Patnaik and Joy Sen

Creative and Cultural Economy is one of the rapidly growing sectors today. Such a form of economy is deeply rooted in the context where it originates and flourishes, and the communities which it engages. The present paper attempts to explore and map the impact of land-river interface upon the development of creative and cultural industries which further grow as assets to tourism. Growth of cultural industries and that of heritage tourism reciprocate each other. And in the process, besides economic benefits, various non-economic developmental goods are also accrued to communities.

In this regard, Varanasi places itself as an excellent case-study, as it provides a unique land-river interface along the River Ganges which is believed to be a sacred geography. The city itself is a repository of traditional knowledge in art, crafts, literature, science and philosophy amounting to development of varied creative and cultural products over centuries (such as weaving, toy making and others), which further have induced heritage tourism over here. Finally, the potential of culture as a tool for integrated development has been explored, taking the case of Varanasi.

Keywords

Creative Economy; Cultural Industries; land-river interface; Heritage Tourism; Varanasi

Varanasi: Historical and Archaeological Evidences of its Origin

Saurabh Sharma, Vijai Nath Giri, Priyadarshi Patnaik and Joy Sen

Varanasi, one of the oldest living cities of the world, has a long history which is full of mystery. Known by its various names like Benares, *Kashi*, *Avimuktka*, *Varnavati*, *Ananavana*, *Rudravasa*, etc., it is situated on north bank of the river Ganges, bounded by its two tributaries *Varuna* and *Assi*. In Hindu epics, the description of Kashi was first found in Rigveda, where Divodasa is mentioned as king of Kashi. The time period of *Rigveda* is considered about 1500BC- 800BC. According to Jain epics (*Anguttaranika* and *Dighanikaya*), Thirthankar Parshvanathji (born in 850BC) was the son of Vamadevi and Ashvasen, king of *Kashi*. According to Buddhist Tripitaks, Buddha gave his first sermon in 'Sarnath', near Varanasi in 528BC. These Tripitaks define about a cultured civilization in this area with 16 Mahajanpads theory which is also in Vedas and Jain epics which proves the theory and time period of origin of Kashi. Other sources like *Kautilya's 'Arthshastra'* and *Megasthenes's 'Indica'* also give the evidences about Kashi. In archaeological evidences, the wares found in the exploration of sites in Varanasi, is defined as 'painted grey wares'. The period of such wares is considered to be during 1200BC – 600BC, which is also called the '*iron age*'. Some scholars think that the *ganges valley civilization* developed in the iron age. In recent excavations, the archaeological remains found at *Akatha* suggest that it had a settlement in 1800 BC while *Ramnagar* had settlement in 1750 BC. Thus, the present paper attempts to examine the various sources related to the origin of Varanasi.

Keywords

Kashi, Rigveda, Sarnath, Buddhist Tripitaks, Arthshastra

Growth of Varanasi city from history to recent times – contribution of River Ganges: Palaeocurrent Analysis

Prerorana Das, Abhijit Mukherjee and Joy Sen

The river Ganges begins at the confluence of the Bhagirathi and Alaknanda rivers at Devprayag. It flows along the northern part of India following a trend of north-west--south-east. At Varanasi the river flows from south to north and the city is along the western bank of the river. The river along Varanasi city is banked by slabs of shale attached with iron clips. The eastern bank of the meandering river is entirely consisting of point bar deposit resulting in a thick pile of sediments. Along the cross section of the river the sediment composition show drastic changes. Initially, in the era of 1000-500 BC, the city was very small; Northern part was bordered by the Varuna river and southern part by the Asi river. Now it has grown radially more than 1550 sq km. To get an idea of the chronological development of the city the subsurface features have to be taken into account with aid of either grid method or radial bore-hole method. Since the city has grown radially the second method would be more idealistic. First the remote sensing data would provide us the total plan view of the place. Then the bore-hole data will provide the cross sections of the whole area. Now dating the sediments, correlating them with the recent sediments and the cross section will provide a clear idea about the migration of river Ganges and growth of the city accordingly. These bore-hole cores would also provide us with different historical anthropogenic items, dating and correlating which will give a good overview of the old Varanasi that stayed buried underground since the Vedic age.

A methodological framework to establish eco-innovation development potential of greater Rajghat zone , Varanasi

Mouli Majumdar and Joy Sen

Over the last few decades innovation of knowledge based economy aiming at symbiosis of high order human development and environmental-ecological preservation is being considered as a major aspect of sustainable development. For ages, India has turned to nature for it's source of regeneration, intellectual growth & creative expression. It's belief that the best ideas have come where humans are in communion with nature, reflected through expressions of the ecological-humane exploratory labs like that of Rabindranath Tagore in form of 'Shantiniketan', Mahatma Gandhi in form of 'Sabarmati ashram' and of Aurobindo in form of 'Auroville' are to name just a few.

So it is better to strengthen the existing intellectual clusters of Varanasi rather than dispersing it following the current trends of urban sprawling in her peripheries. This paper would explore through a possible methodological framework, the potential of greater Rajghat zone which holds the strength and the opportunity of being developed as a high order ecological-innovation zone.

The paper starts with an assessment of eco-development propensity of the greater Rajghat zone through three overlays or integration:

- 1) Mapping a land use/population density validation
- 2) The earmarking of an inventory of the rich ecological resources/infrastructure facilities augmentation on the basis of
- 3) A final earmarking of knowledge/innovation clusters in the form of (I) academic (ii) spiritual (iii) livelihood/creative economy generating centers or holistic centers which will promote all three together.

Rounding it off with spatial clustering of land use, long term initiatives, short term initiatives and a demonstrative pilot planning in a selected area of greater Rajghat zone, the long term goal of ecological innovation potential constitutions the integration of natural, human and technological resources with deep ecological planning can be best targeted.

Keywords

Ecological innovation; Integral planning; Rajghat-Sarnath belt

Designing an eco-innovation Hub in greater Rajghat zone, Varanasi

Akshata Mohanty and Joy Sen

Being an on-going process, innovation needs to be encouraged as a culture. Hence, the goal of the thesis is to establish a model physical framework for a new-age community centre promoting holistic development of individuals through encouragement of innovation. Such a framework has been considered as a tripartite structure dealing with Ecological, Academic and Social and Entrepreneurial Innovation.

Ecological Innovation concentrates on the basic physiological development of an individual – by uniting the self and nature using spaces like Contemplation Hubs, Horticulture Innovation spaces, Fitness Centre etc

Academic Innovation connects the self with the world – by focusing on developing varied skill sets and acquiring traditional knowledge. It propagates interaction with peers and collaborations hence satisfying the human need for appreciation and esteem. Spaces like Multipurpose skill development zones - for music, art, dance forms, linguistics and crafts (workshops), Private silent spaces for working alone or in small groups, Library and Documentation cum Dissemination Centre will be present here.

Social and Entrepreneurial Innovation satisfies the third and highest dimension of human needs. It provides an incubation centre for people to come together for social projects in order to give back and contribute to the society. Public Display Galleries, Social Entrepreneurship Training Cell – with lecture halls and brainstorming rooms to support group projects and Counseling Centre populate this level of innovation.

Benares: Reconnected

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Indian towns over time have been characterized by the clustering of buildings, each juxtaposed with the other, with balconies overlooking streets, and courtyards providing public space within the house, and with a scatter of terraces permitting yet another set of activities. Houses had both public and private space; yet in many ways this space was different from that in the changing towns of the present day.

- Brian Taylor

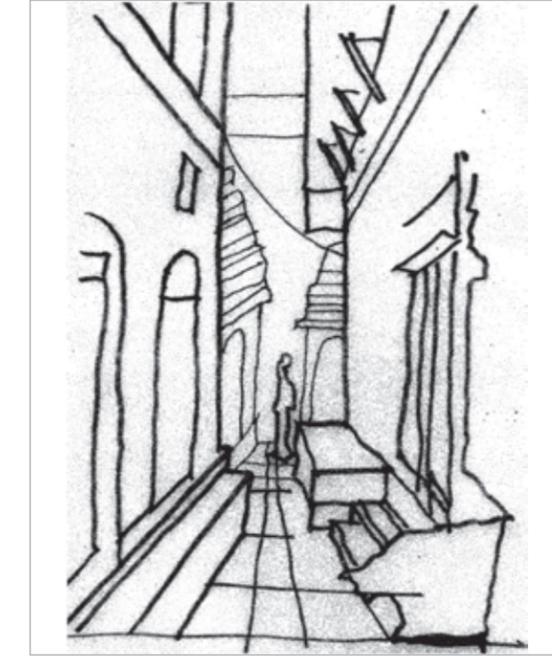
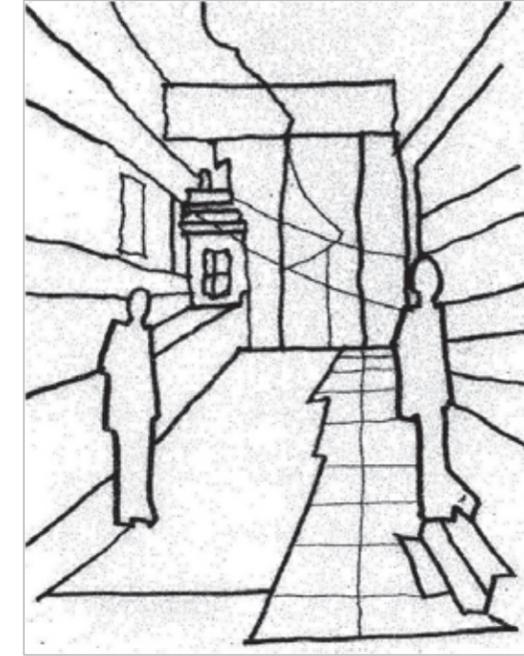
Similar yet distinctly unique, the religious city of Varanasi on the *Ghaats* of river Ganges is a spontaneous and organic organization of meandering streets and informal layering of form. The entire city, developed as a connection to the holy river does not boast of dramatically great forts and palaces or exquisitely carved temples but it has the people who embody one of the oldest religions of the world i.e. Hinduism. The city is undoubtedly unique in its architectural, artistic and religious expressions of traditional Indian culture. Aptly put by Mark Twain: *'Benares is older than history, older than tradition, older than even a legend, and looks twice as old as all of them put together.'*

The traditional part of the city lies between the *Ghaat* at the river Ganges and the modern Varanasi city, as an ensemble of narrow streets and lanes which are primarily pedestrian, at times crowded and also claustrophobic. Majorly residential, interspersed with commercial activities surviving on the *Ghaat* activities, the layout is punctuated with numerous temples acting as nodes binding the whole system together in soul and spirit.

The narrow lanes widen at junctions and other places to form squares that house the more commercial and community activities. This hierarchical networking propels the movement - pausing, at the more important nodes- the squares whose scale and proportion are exemplary for comfort and relaxation having *chabutras* and platforms supporting the activities. The two to three storied courtyard dwelling units clustered in an informal pattern face the naturally hierarchical streets and create a close sense of community where the opposing neighbors are also able to touch each other at extremely narrow sections. One can observe the gradual layering of space from the inside to the outside also visible from the transition from the *'aangan'* (courtyard) to *'deodhi'* or external platform and then the *'gulli'* or street to the informal squares.

Approachable both from the *ghaats* and the squares the streets of the residential neighborhood are not restrictive but the meandering and changing scale from the public to the extreme private discourages thoroughfare and trespass. Primarily pedestrian the streets have limited vehicular access hence giving priority to the people on foot. The sense of territoriality and belonging is remarkable at certain places due to the same.

Almost all the lanes create changing frames of extraordinary variety of activities and the changing built mass negotiates with the sky and ground at every point. In the gullies the windows and doors can be seen shuttered drying laundry and saris draped over balconies which form the only bright color against the pastel shaded buildings. Changing planes of light and shade provide interest and unifying character to the heterogeneous street facades. The solid and voids, *chajjas* balconies and also bridges connecting houses across lend an inherent character to the blocking.



The built and open relationship of the traditional city neighborhoods is suggestive of the dominance of the closed with respect to the open behaving as controlled relief spaces that largely contribute to the social wellbeing and interaction of the residing community. The spatial hierarchy and character of the neighborhood spaces is natural and progressive leading to movements and pause. The wider and larger squares, named on the basis of the primary activities taking place there, direct to narrower lanes and pathways where sometimes is almost impossible to maintain the sense of direction in the maze of man-made gorges, at times gloomy at turns, torpid with humidity, suffocating with the entrapped heat or strangely liberating at other places. The proportion and scale of these spaces modifies from 2:1 to 1:4 producing visual variety and changing degrees of enclosure. The articulated built edges provide ample alcoves and platforms favorable for interaction.

Though set in a composite climate where heat is a predominant problem as a result of winding narrow lanes the informal low scale clustered settlements never experience direct heating though in the humid months the funneled air from the river edge is a respite on balmy evenings. In winters sunny areas are located at strategic locations and house the maximum activity and interactions. Daylight is limited and welcome in summers but cloudy days lead to more uncomfortable conditions both outdoors and indoors. BENARES: MUTUALLY SHADED COMFORTABLE NEIGHBORHOOD SPACES

Over the years the original form of the neighborhoods have altered and become denser. Movement patterns have also changed and the automobile has infringed the inherent privacy. The substance of the buildings is crumbling, foundations have sunk, walls are dramatically bowed, and everywhere is an air of age and decays yet the essence of the space remains. The neighborhoods spaces thrive on the basic principles of hierarchy transition and comfort.

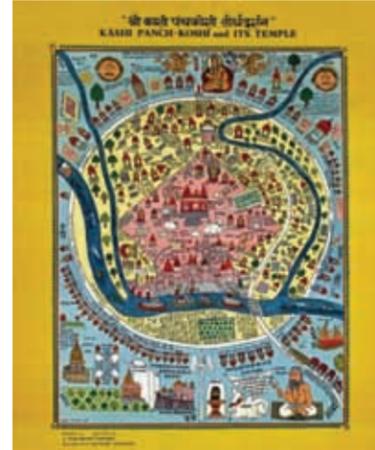
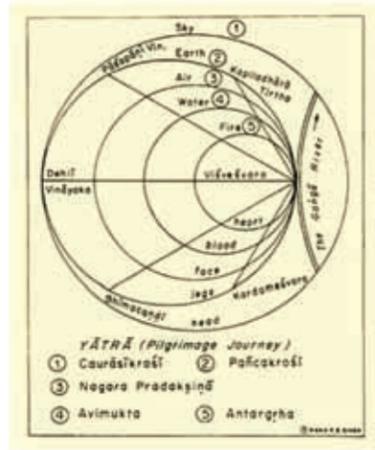
The tangible and intangible in the architecture of Benaras

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Benarasexists in our minds as an intangible ideamore than it physically manifests itself as a tangible city. It has been accepted by devout Hindus as a formless idea of the 'center of the cosmos' since times immemorial. At the same time, it is a thriving city sustaining livelihoods and aspirations of its inmates and the outsiders. *Benaras* exists in its formal manifestation as a traditional city of *ghats* that connect it to *Gangaji* and simultaneously as a formless idea of the center of the cosmos.

In *Benaras*, the four states of materiality- Earth, Water, Air, Fire that can be interpreted as solid, liquid, gaseous and energy manifest in the inexpressible expression of the pre-manifest. The four physical states are metaphors or symbols for four “worlds” in which humanity either potentially or actually exists. Namely, the solid earth as the physical world; secondly, the liquid or water experience as symbol of the emotive psychic world; thirdly, air or the gaseous state as the symbol of the unseen world of mind or the intellect and fourthly the radiant or world of “Fire” being the inspirational domain of the spirit.

The architecture of *Benaras* alludes to the infinite through its timeless quality, ritualistic motifs or the culmination of the sequence in movement to the axis mundi. The comprehension of the idea of infinite in the context of *Benaras* also manifests in the philosophy that is based on the cyclical Indian view of time and concept of the *bindu* as 'imploding'. The *mandalas* or the cosmographs that represent the universe in time are physically manifested in the concentric *parikramas* or pilgrimage routes, which comprises of a series of sacred spaces / shrines and also act as boundaries that define the *temenos* (sacred territorial boundaries) in *Benaras*. This system of spatial manifestations depicts the gross and the subtle, the *sthul* and the *sukshma*, the plenum and the abyss, the notion and reality simultaneously in *Benaras*.



Cosmic Layout of the Hindu Sacred City, Varanasi (Benares) by Rana P.B. Singh (see top left)
<http://lasur.epfl.ch/revue/A&C%20Vol%209%20No.2/SINGH.pdf>.

Concept of Kashi: World within a World (see top middle)
<http://eyeburfi2.tumblr.com/post/73801457903/a-20th-century-pilgrimage-map-of-varanasi-based>

Ritual in Vishwanath Gali (see top right)
 Photo by Vandana Sehgal

Architecture can be experienced / perceived simultaneously with many dimensions of our consciousness. For the sake of analysis, one can address them individually as-

- Dogmatic mode - Perception through faith
- Skeptical mode - Logical perception
- Paradoxical Mode - Perception through heart

These, when seen in unison explain the relationship of this architectural construct with the cosmos. There is a duality of existence in *Benaras*. The part to whole relationship is not a hierarchical structure but a symbiotic one giving each component and each ingredient under it a freedom to exist. The collective resolution, however, still remains a chemistry of all the sub-components. The immediate parallel strip of architecture along the *Gangaji* comprises the *ghats*, which are a series of steps that leads to and from the river. The morphology of these 'steps' is such that it directs the movement and attention to the river unlike any promenade. Each *ghat* has its own function / event / ritual that defines it.



Manikarnika Ghat (see top left)
http://commons.wikimedia.org/wiki/File:Cremation_in_Process_at_Manikarnika_Ghat.jpg
Dashashwamedha Ghat (see top right)
 Photo by Vandana Sehgal

The event that defines the *manikarnika ghat* is “death”. The living bring the dead for the last rites and assigning their ashes in the *Ganga*. This is the only activity that happens, has happened and will happen at this *ghat*. The activity has a permanence and continuity in time and consequently the space organization on the *ghat* caters to the cycle of rituals that are associated with the final journey of the 'body' and 'soul'. The event of the 'journey' occurs in the 'in-between' between the 'land' and 'water', which is constituted / punctuated with smaller events that cannot be circumvented. The tangible and the intangible of the object (body and soul) is translated into the activity (rituals) and the spatial construct (*gali* and the *ghat*).

The *Dashashwamedha Ghatis* the main podium to the *Gangaji* to witness and to be part of the morning ritual of the bath and the *suryanamaskar*, which is the obeisance to the Sun with *gangajal*. In the evening, the *ghat* is lit up with pyramid like oil lamps and prayers are chanted as veneration to the river. The events / rituals that punctuate the space of the *ghat* the whole day are about birth, *janeu* (christening) and death. Spatially all the *ghats* are sequence of steps similar in nature but very dissimilar in slope, scale and length, the insertions and juxtaposition of ritual platforms, mini shrines and temples. The *galis* or streets that lead to the ghats are lined with commercial and residential spaces. The narrow lane unceremoniously leads to a temple precinct or makes a shrine part of its spatial order. The commerce happens simultaneously and on occasions the *gali* becomes a stage for the monthly or yearly ritual.

Benaras is known to be the city of Lord Shiva and his consort *Parvati*. He is manifested in the innumerable temples as the *lingum* the *garbagriha*. In the urbanscape, the notion of Shiva is perceivable in roadside shrines under the trees, clay replicas of the *lingum* on the edge of the river as physical symbols but notionally, it pervades the very soul of the city in the very fact that life and death co-exist in the most material expression and at a sublime level that connotes the transition from land to water through the in-between realm of fire, steps and ritual.

The narrow streets havespaces that make a transition zone between the inside and the outside, the personal and public through a small platform that negotiates the activity of small retail outlet for selling groceries or makes an interesting space for the housewife to peel the vegetables for a meal. The space that widens at the junction almost always has one or two cows relaxing in the shade. Locals, pilgrims and dead bodies pass by to reach the *ghats*. To comprehend this extremity and the duality of the mundane and tangible in *Benaras*, it is necessary to understand the belief, the faith, and the philosophy that defines the intangible.

PART - IV

ॐ त्र्यम्बकं यजामहे सुगन्धिं पुष्टिवर्धनम्
उर्वारुकमिव बन्धनान् मृत्योर्मुक्षीय मामृतात्।

"Om! let the whole universe worship the Lord of Rudras, the three-eyed one, the TRIAMBAKA, the Lord, who is perpetually linking everything (space) in the continuum of time, and also the very one, who is fragrant in spiritual essence and who nourishes and fosters all beings.

May he sever our bondage of samsara i.e., our attachment to the wheel of worldly life, so that like a fruit or cucumber is set free and hence severed from the bondage of its creeper or branches; the Supreme liberate us from the fear of death, by making us realize that we are beyond our little personality and never ever separated from our immortal expression i.e., our interconnected cosmic and transcendental natures"

*Hymns to Maruti-Rudranath
Rig Veda: 7.59.12*



**A Blueprint: Bases of Action Plans for
Varanasi: A Mega Exploratory Project**

Varanasi

Its unfathomable genesis

"The eleven universal god heads (Viswadevas) in the Earthy plane (Prithvi); the next eleven is in the link world (Antariska); and the final eleven in the celestial (Dyava) constitute the thirty-three petals of a single eternal divinity - they all are in one; here, they are ONE"

*Sages in the lineage of Seer Divodasa
Rig Veda: Mandala 1: 139.11*

One of the oldest references of Kasi – 'The city of eternal divine light' emanates from the legacy of King-Sage Divodasa, whose pioneering lineage finds an exemplary mention in the Rig Veda where the City becomes a microcosm of all universal godheads (Viswadevas). From that time of remote antiquity, the line of kings which ruled Kashi and the Mauryan dynasty, an empire that ruled the Indian sub-continent from 320 BCE to 185 BCE claimed descent from Kusha, who descends from the Ramayana. The Rig Vedic Kaushitaki-Brahmana Upanishad refers to a dialogue between a Gargya generation Brahmin named Balaka, and an older King named Ajatsatru, the then emperor of Kashi. The story is also mentioned in one of the most antique of all Upanishads, the Sukla Yajur-vedic Vrihad Aranayak Upanishad 2.1 and the place 'Kashi' is re-mentioned in the same Upanishad 3.8.2. Additionally, the Atharva Vedic Pranagni-hotra Upanishad bears a direct reference to Kashi in the name of 'Varanasi'. Thousands of years, another emperor by the same name Ajatsatru, rules parts of greater Kasi, who was also contemporary to Gautama the Buddha and Mahavira the Tirthankara.

The Adi Parva of the Mahabharata narrates about Amba's swayamvara, who was the eldest daughter of the king of Kashi (Varanasi), who organized a *swayamvara* (a ceremony of choosing a husband from among assembled suitors by the bride) for his three daughters which was organized by Bhishma, the son of the Kuru King Shantanu of Hastinapur and his wife Ganga, the living goddess - the spirit of river Ganges (called Ganga in India). Of the later Puranas, there are special mention in the various chapters of the Agni Purana (119); the Padma Purana (14.191); the Kurma Purana (1,31,35); Matsya Purana (191); Linga Purana (92); and particularly, at length, in the entire fourth chapter of the Skanda purana, which is called 'Kasi Mahatyam' (the Glory of Varanasi).The Buddhist Anguttara Nikaya (100 BCE), at several places gives a list of sixteen great nations or regional

confederations of which one is Kashi. The Digha Nikaya or 'Collection of Long Discourses' is a Buddhist scripture, the first of the five nikayas, or collections, in the Sutta Pitaka, which is one of the 'three baskets' that compose the Pali Tipitaka of Theravada Buddhism, also mentions Kashi as a predominant confederation. The Jaina Bhagavati Sutra (300 AD) also mentions Kasi as one of the sixteen Mahajanapadas.

A very important event is the coming in of Siddhartha the Gautama to Varanasi looking to revive its sacred cosmic geography, turn the 'wheel of dhamma', and re-establish its green paradise for the Sages (Rishipatana), called 'Saranath' (Mrigadave or Deer's park), and named after the Unicorn Sage of Ramayana, Saranganath or Rishya-Sringa. From that archaic period to centuries till date, Varanasi, India's celebrated Spiritual Capital has continuously unfolded within a single bud (*Karnika*) an uninterrupted and sustainable urban lineage constituting many layers, embedding many traditions, and assimilating many schools of spiritual and intellectual legacies. As celebrated American Humorist-explorer Mark Twain commented after experiencing Varanasi:

*"Varanasi is older than history, older than tradition, older even than legend,
and looks twice as old as all of them put together."*

Now, a Pan-IIT-SPA joint initiative is heading forth to take up Varanasi: as a mega-exploratory project. The goal is to explore in full depth a four phased design recovery (cybernetics), encompassing the entire flow of Varanasi's unique land-river interface at all levels of eco-innovation.

Varanasi - A travelogue

*By Shambhobi Bhattacharya and Joy Sen**



Eternal spirit of Varanasi through day and night

Prologue

Varanasi, the holiest of the Hindu pilgrimages is the microcosm of Hinduism. This is very evident as soon as you enter the city. The tradition, the cultures, the myths, the legends seem to creep into you unknowingly. Even for someone who has not given a thought about religion in her life before, Kashi made me question ideals. There's something in the air there, something intoxicating. Talk about the colors, the random affairs along the streets, the mouthwatering food, the maze like Galis, the music, the dance, the architecture Kashi is way different from the cities I've visited before. The divinity of 'Kashi' and the quest to attain eternal oneness of the body and soul, has attracted worshippers and pilgrims to this holy land from time immemorial. Not only have they been attracted, they have been made to feel so at home, that people come back again and again. Even though this was not our exact reason to approach the place, Kashi was very successful in engraving its roots deep down in our hearts and minds.

On reaching Kashi around 5 in the evening, we drove straight away to the BHU campus. BHU or Benaras Hindu University is the oldest and the largest residential campus in India. It was initially established to promote the study of the Hindu shastras and Sanskrit literature, with learning and research in arts and science. In recent times, the university's engineering section has been turned to an IIT. We checked into the IIT guest house and decided on heading to Assighat, a few kilometers away from the BHU campus.

Now, Assighat is the southernmost ghat in Benaras. Situated just beside the Assi River, Assighat is now primarily used for laundry. It was very dark when we reached Assi, the whole place had an eerie feel to it. Lights emanated only from the temples, the streetlamps and the media mobs that had horded the place carrying out their election coverage. Being the very extent of Benaras, the ghats of Assi gave a beautiful view of all the ghats towards the left of it. We could see small boats in the water catering tourists who wanted to row around the place at night. The college students of BHU were all perched on stairs, on the ghat slabs, beside small chai shops enjoying the breeze. There were sadhus resting their heads on tree trunks, old people grouped up talking about the latest political agenda; some artists silently sketching the haveli situated beside the ghat. We even spotted some graffiti on the walls of the old building, one particular one said 'fearless', a term that defined the place. Just beside Assi, we discovered this book shop called Harmony book store. A beautiful cozy store, run by two German men seemed like a quiet corner shop to sit down and read without any pretense. Perfect for books on spiritual knowledge, there I finally bought my copy of 'Benaras-The city of lights', a book by , this book is said to be the most concise book on Kashi. It's very easy to understand and it is abundantly informed. As the sun went down, we wrapped up day 1 taking shelter in the lovely lush green abode of the university.



Interaction with Experts, Advisers, Head of Associations in Varanasi

**The various trips to Varanasi by the IIT Kharagpur Team were just not surveys. They were living experiences of an Indian epitome – by our very youth. The days and evenings of sojourn on the ghats; the visits to an array of place of sacred value and meaning; meeting great and simple-hearted people of Varanasi and encountering their fantastic expertise; and last but not the least, spending memorable times in IIT BHU were all heart-felt and heart-filling. The experiences helped us to emerge as better human beings and they gave us a growing capacity to apply science and technology having a prerequisite of the respect for the eternal traditions of our motherland.*



IIT Kharagpur team surveying Assi Ghat with IIT BHU Team

Day 2

Day 2 started off at 5 am with us driving to Rajghat. Rajghat is the other extent of Varanasi near the Malaviya bridge. The place is a complete contrast to the other ghats in Varanasi. Rajghat houses the village settlements in Varanasi. Watching the sunrise at Rajghat was a surreal affair. The boatmen sitting on their boats silently contemplating their lives, little kids playing around, people from the city with bikes enjoying the little peace before starting off their hasty day – all adding to the 'elements of built and unbuilt design experience'!

Rajghat is just beside the Varunariver which like Assi has become a very thin stream of water making its way into the huge mass of the holy waters of the Ganga. Crossing the bamboo bridge, we walked through the villages protected by the Krishna Murti foundation. The little settlements looked like a typical village with small temples, cows, pigs and dogs roaming around. Krishnamurti foundation offers small jobs to these people, the women are employed in making handicrafts, the men have been employed as boat rowers mostly. From Rajghat, travelling through the galis through Varanasi, we set off to the Panchaganga ghat. The lonely planet states Varanasi as one of the seven best places to

get lost wandering. The galis of Varanasi is a true example of why so. The meandering galis showcase the basic life of a typical Kashi resident. You come across numerous tea stalls, lassi shops where people are laying out their morning dahi. You cannot miss the Kachori shops selling hot round kachoris, the best kind in the country. The paanwallahs with scarlet lips talking in a funny weird tone. The numerous temples along the road, the ashrams with small kids playing around. There are slabs all around these galis for people to sit down and socialize. These slabs can be folded back whenever required. These small adda groups that line the galis are the best places to strike a conversation with a cup of tea. Even 15 minutes of their chatter will sweep you into this interesting place. A few anecdotes, a little politics, histories of Varanasi, the conversation doesn't cease to stop. Along the way we gorged on some very tasty dishes, the jalebis with dahi smeared over, the hot kachoris and some hot Varanasi chai. Not to forget some sweets to end the morning meal.

**In Rajghat, we evolved with a growing experience. We could feel the spirit of a place which has sustained the ravages of time. Tracing the ancient times, when Lord Buddha had alighted here to walk a few more miles to Sarnath to our own times, when Jiddu Krishnamurti and revered Annie Besant had re-selected this place as a zone of ecological and humanitarian innovation, there is always something that emanates from here which can be tapped and re-built. Here we may begin to earmark a greater zone embracing Sarnath's eternal Rishipattana or the 'Green park for the Sage-mind', where institutions can again come up with the right mix of built and unbuilt density and attitude, and where the new youths of India can be shaped in a place-folk-work triad ready to raise a 4th – the 'spirit of where the mind is without fear and the head is held high'.*



Interaction between IIT Kharagpur team and Experts at Varanasi

Panchaganga ghat is primarily a bathing ghat. Many people come over here to take a holy dip. Just beside the ghat, the usual everyday life of the men here presides. A man doing his laundry, a little kid getting his head shaved bald, a widow trying to make it up painstakingly to her abode, a swimming class going on in full swing with little kids wearing white plastic boxes behind their backs as substitutes for floaters, the random traveller going up to a Sadhu for a little prayer and then taking out her massive DSLR and taking that perfect portrait. Panchaganga also served a lovely view of the Dashashwamedh ghat with the famous Vishwanath temple in the backdrop, also the rising smoke coming from the Manikarnikaghat could be seen with people brining in dead bodies by the minute.....

**In Panch-Ganga Ghat, we could see a balance – a balance of the quietness of a place and the smooth hustles in its narrow alleys and their eventual high density opening to the Mother – the Ganga. After experiencing the ancient archaeological mounds of Rajghat, which is dead and gone, we experienced the living throb just a kilometer away, in Panch Ganga, which is sustained. This is a Varanasi – an experience where everything has changed and yet, nothing has changed. Where hard reality co-exists with the soft aspirations of human mind and all that has been perpetual because of many hidden reasons – and one could be an ever flowing attitude of the Indian average mind towards 'plain living and high thinking'. We could spot premises and precincts where great minds had lived – from Sages to raised minds of a higher intellectual order, this has been Varanasi of the aeon. We were beginning to think of tours and circuits within these alleys – tap a heritage corridor and expose the craft and creative economy that are intertwined. More important than these is to revive that attitude en-masse, that slowly but steadily transcends all turmoil of the material and its possession, and moderates all tensions characteristic of our modern times. Can we call that 'Green living'? Yes, it is – Varanasi taught us that.*



Experiences at Rajghat Archaeological Mound and Pancha-Ganga Ghat: with IIT BHU Team and Experts from Jnana Pravaha, Varanasi

Day 3

Our plan was to visit two more ghats on Day 3. Kedar Ghat and Lalighat, the very centre of the ghats lined along the Ganga. Just beside the Harishchandra ghat, Kedar Ghat houses some very holy temples along its sides. We reached just when the sun took its ascent, a beautiful sunrise painted in red offered a surreal background to disciples engaged in their morning yoga. The sound of the mantras playing in the background, the ganga like a little baby, silent and austere, the white saris blowing in the wind, Benaras was making me fall in love in its simplicity, its divineness. Just beside the ghat there was this tunnel kind of place where poor old women were resting in the shades and begging for alms. I read in the books that it was a common practice in the old days to abandon Hindu widows in Varanasi as destitute, sometime with a little token pension, in old age homes to spend the rest of their living days in the refuge of God. But in many cases young widows would also find their fate taking them to Varanasi denied of their share of the family property or castigated from the society. Not sure about the stories of these women but most of them looked really old and might have been spending the major part of their lives here. We trotted back through the serpentine lanes to our vehicles, I was suddenly reminded of the Feluda flick, Joy Baba Felunath, where Feluda was attacked by the accomplices of the villain Maganlal Meghraj in one such sneaky lane. So basically throughout the morning we witnessed all types of people starting from the ferrymen calling out to the tourists to priests doing sacred post-funeral rituals, where the kindred of the bereaved perform “shraddh” and offer “tarpan”, to body builders and wrestlers undergoing their daily exercise routines, to massage men looking out for customers, to “sadhus” just passing their idle time smoking “ganja” and so on and so forth.....



IIT Kharagpur team experiences Varanasi

**In Varanasi, we witnessed a paradox. And that paradox can be a feature of our life, our preparations to design a design process. Actually in Varanasi, we do not have to change much and do much. All we have to do is to revive our respect for the City and understand what she have had stood for through the ages. Bridging the hard lined formal institutions on the one hand and the sparse meditation coves of Sarnath on the other; linking death and immortality through the sacred connections of her river and her ghats; and providing a setup for enjoying the bliss of the highest kind with preparation of the simplest of things – Varanasi has made us reach the fulcrum – the 'Libra'. She liberates us from the dichotomies and differences of 'what we get and we do not want' and 'what we do not get but we do want'. She shapes a third nature and opens our inner beings to be simple instruments to her wish – the guardian Mother Anapurna – to whose lotus feet even Lord Shiva is an aspirant, a son, a beggar with a begging bowl. So what must we seek in from her, here in her city?*

Our evening plan was to visit the famous Dashashwamedh ghat. We reached the ghat a little late and the “sandhyaaarti” had already begun. It is the ghat nearest to the Kashi Vishwanath temple and remains crowded with devotees all day long and in the evening a group of priests perform the “sandhyaaarti”. All the front row seats (the steps of the ghat nearer to the river Ganga) were taken and we had to sit a few meters away in the middle. Five priests were performing some rituals and chanting some mantras. After some time the priests began jugglery with large lamps along with some dancing steps. Soon, a trance began to spread and at last people could concentrate on the “aarti” rather than the tea vendors and the roaming cows. The large zoom lens helped, I couldn't take very many good snaps from that distance but the magnificent view remained in my memory. The “aarti” was followed by setting afloat small lamps along the river that created a magical scene.

**We are shaping a new green plan for Varanasi. We are planning to keep the core city intact and not change much. From the north, i.e., Greater Rajghat, we are planning to bring forward a green belt that may run through the city as her inner periphery. In response to that, we are planning to extend the agglomeration of intellectual centers in the south, like BHU, Sampurnanda University, Jnana Pravaha and many more - as out-bound band, which may eventually flow northwards as the outer periphery – as an array of low dense network of institutions serving the lifeline of the city and merging with the countryside. These thoughts are broadly outlined in the blueprint that one will find after this note. In the making of this BLUEPRINT, the contributions and support of the IIT BHU and BHU Team have been paramount. The simplicity and greatness of its Director and VC, Prof. Rajeev Sangal; that of Prof. R K Mishra and Prof. D. Singh and the whole team comprising of Swasti madam, Amrita Dwivedi, Phulkit, Nishant and many others have been indispensable to foster our humble ways and means to shape Varanasi's future. In fact, Varanasi is shaping us, our lives and thoughts, deeply and unknowingly.*

Epilogue

The vacation was over and it was time to make the journey back to Kolkata. Though we missed out on some of the places due to dearth of time, nevertheless we were content since we came to get a hold of the pulsating character of the city and we were lucky to experience the vibrancy of the city which is still very much alive and lively even after all these thousands of years.

**We think and perhaps, we know, deep in our heart of hearts that we shall come back to her again and again. Increasingly, we shall experience her 'innermost resplendent light'!*



A blue-print for Varanasi based on an Eco-Design approach

A systems methodology in Ecological Design, or in short, 'Eco-Design' can be best forwarded if the discrete design steps and the features of an evolving design process are first worked out and then it is followed by a pattern hierarchy where the various steps or levels of the design process covering iterations, flexibilities and innovations in the hierarchy are integrated based on a systems approach. Given this initial understanding, the present blue print is forwarded in three steps:

1. The evolution of relationship between user-environment in a systems approach called Cybernetics
2. The application of the approach through a case study of Varanasi: an ancient but continuously sustainable urban habitat based on a pattern hierarchy of such relationships and interactions
3. Significance of the research and scope of further exploration in 'Eco-Design'

The blue print is based on a four step cybernetic evaluation of Varanasi involving the two – the external environment, which is built, discrete, particulate and measurable and the internal intangible human activity patterns, which is often un-built, wave-like and pattern based.

Key Words: Cybernetics of design; co-evolution; systems approach; pattern hierarchy; actions plans - groups A and B

1. The evolution of relationship in a systems approach

A System's Approach (SA) is a way of understanding how things or events or both, which are located across a large space influence one another through a sequence of long stretches of interconnected events. In this sense, SA constitutes a holistic understanding of a super system of which individual things and events are parts or sub-systems. In SA, long stretches of events constitute timelines and timeline are often integrated with large space settings. SA therefore represents an integral dynamism of both, i.e., its spatial and temporal dimensions or 'patterns' of the sub-systems.

In the present blueprint, the Design Methodology is based on an approach called Cybernetics, which is defined as the study of control within a system, typically using combinations of feedback loops or 'cyclical' relationships. As an evolving order –

Cybernetics is mainly addressed in four stages, the First, Second, the Third and at times, exceptionally, the Fourth. They are as follows:

1. First order Cybernetics relates to closed systems, and a common example may be that of the 'Carnot's cycle' of an air-conditioner and a living space or that of the relationship between a 'Flywheel' as a free-energy supplying another design system. 'Hierarchy' and 'evolution' are the normal design features at the initial level.
2. The second order is an expansion of the First order where the observer perspective is involved imparting a role and reflection of human consciousness in the evolution of the so called 'materially designed world'. Thus 'participation' through 'grouping' or Ecology of design process is emphasized leading to 'interconnections' or multi-collinear relationships.
3. In third order Systems Approach in Cybernetics the two, that the role of human consciousness and various systems in the material world bears phenomena of co-evolution. It is when a whole system acknowledges its surroundings in its growth and evolution leading to 'reciprocal interconnections' and 'non-linear dynamism'.

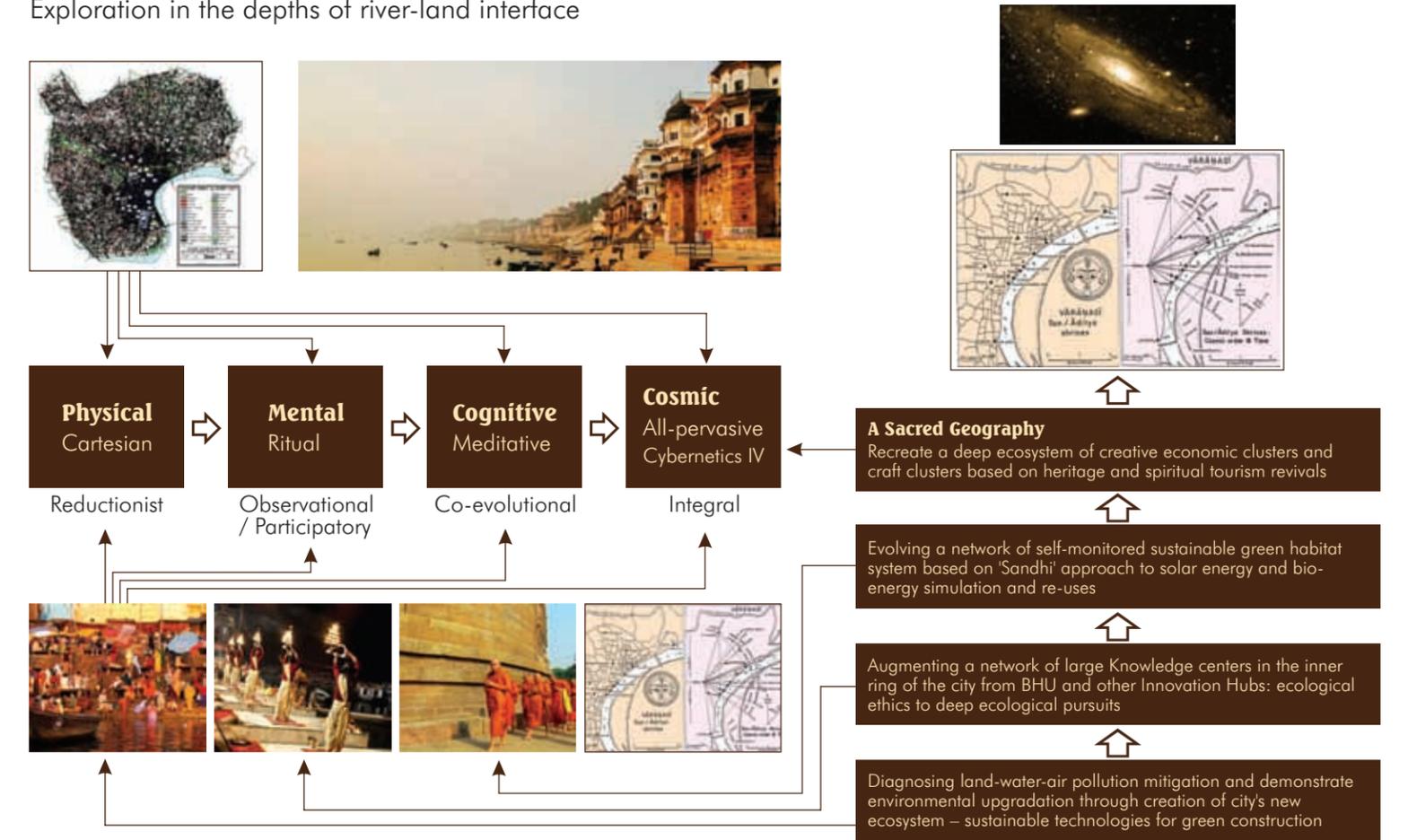
A full maturity of the third order is the Fourth order, which leads to a Whole implying a 'Holarchy' (as opposed to hierarchy in the system). This state is comparable to a state of rapture. It implies a full embedded relationship between the objective function or the process as one, the object in target as two, and the subject who perceives as three. In other words, in the language of statistics, the process of correlation and the two, the dependent and independent variables coalesce as one unity or as one system. This state, though, almost unquantifiable in classical mathematical abstraction, is the subject of non-linear sciences. Such a state or rapture is the state of complete embedded wholeness. Often, the state is comparable to a spiritual state, which is the subject matter of oriental thought and philosophy of meditation like Zen, for instance.

1.1 Delineating a four stepped approach

Over the last few decades, there has been a growth and development of 'Eco-Design' approaches through innovation of knowledge based economy aiming at symbiosis of high order human development and environmental-ecological preservation, and the symbiosis

Varanasi: a four phased co-evolving design flow (cybernetics 1 to 4)

Exploration in the depths of river-land interface



is being considered as a major aspect of sustainable development. For ages, India has turned to nature for its source of regeneration, intellectual growth and creative expression. It's belief that the best ideas have come where humans are in communion with nature, reflected through expressions of the ecological-humane exploratory labs like that of Rabindranath Tagore in form of 'Shantiniketan', M. K. Gandhi in form of 'Sabarmati ashram' and of Shri Aurobindo in form of 'Auroville', are to name just a few.

So it is better to strengthen the existing intellectual and deep ecological clusters of Varanasi rather than dispersing it following the current trends of urban sprawling in her peripheries. The present study has taken such an approach to recognize the four steps of cybernetics approach to Eco-Design, namely:

1. An initial understanding of Varanasi through its physical-Cartesian layers often comparable to the 'reductionist' approach of looking at the City mostly from the point of view of its discrete physical features – the river, the ghats, the array of temple structures, the various boat structures that ferry and many more.
2. A subsequent probe into the next layer of mental or 'ritual' spaces that may be mapped from observational and participatory dimensions. Here, the user enters the second layer of interaction. The basic questions are why are the ghats aligned to a crescent shape of the river (see Figure 1)? Why are there are arrays of upstream and downstream flows of the river? Why the rites on these ghats follow a ritual sequence based on alternations of days and nights; and variations in nature that are cyclic and renewable? The answers to these questions make the participatory dimension evolve.

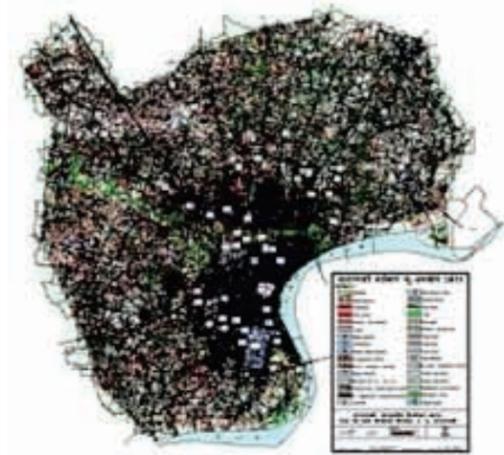


Figure 1: Urban morphology and shape of Varanasi

3. As next or third emerges an even deeper or the cognitive layer. The question here is how the cognitive or 're-cognitive' layers of spaces and feelings emerge based on a response-to-stimuli interaction between the physical built environ of Varanasi and the deeper religious or even spiritual yearnings of the very aspirant? Why did Buddha, for example, chose Varanasi almost 2600 years back as the citadel of the 'turning the wheel of Dhamma', based on some deeper cognition of the place, the folk and the different kind of activity pattern of the ancient city, which is perhaps still continuous today?
4. Once, the three layers unfold as a pattern hierarchy, the user-perception reaches a deeper most layer – i.e., the cosmological and the all-pervasive. The emerging questions here are – why the seasonal layers of Varanasi's experiences are reciprocated with the deeper cognitive understanding of the user? And how that pattern of reciprocity, over time and space; over countless generations and ages, is sustained as a living cycle of life, death, salvation and re-birth? Why and how these patterns of reciprocity begin to portray a deepest sacred geography of the place which is the culmination of centuries of deep contemplation and their embedded experiences, of which the built and the tangible is the outermost, mundane and quantified expression? In that sense, how Varanasi has always begun to represent, through ages, a sustainable 'Eco-Design' of infinite life-cycles of experiences- both covering and transcending generations.

So it is better to understand the deep ecological and historical strength of the ancient urban habitat, which is described in the following section.

2. The application of the 'Eco-Design' approach in a case study of Varanasi

Varanasi is one of the most ancient and continuously inhabited, and henceforth, sustainable habitat in the world. It is an Eco-Design that has evolved withstanding the passage of over 4000 years of urban legacy and civilization based on higher orders like empathy, generosity, ecological ethics and spirituality.

A very important event is the coming in to City at around 650 BCE, of Siddhartha the Gautama to Varanasi looking to revive its sacred cosmic geography, turn the 'wheel of Dharma' (the cycles of higher way of life), and re-establish its ancient green paradise for higher intellectual and contemplative pursuits in a green expanse called 'Saranath'. From that archaic period to centuries till date, Varanasi, India's celebrated Spiritual Capital has continuously unfolded within a single seed an uninterrupted and sustainable urban lineage constituting many layers, embedding many traditions, and assimilating many schools of spiritual and intellectual legacies. As celebrated American Humorist-explorer Mark Twain commented:

'Varanasi is older than history, older than tradition, older even than legend, and looks twice as old as all of them put together.'

The blueprint hereby proposes both a research and action initiative on Varanasi: as a mega-exploratory project. The goal is to explore in full depth a four phased design recovery (Cybernetics), encompassing the entire flow of Varanasi's unique land-river interface at all levels of eco-innovation.

The beauty and depth of the Eco-Design approach is that every part of the ancient urban habitat is a derivative of the deeper. Even the layers of creative and Cultural Economy, which is one of the rapidly growing sectors of the City expresses its sacred foundations. The 'festival of lights'; the boat-rides on the river following the sacred geography of the city covering various ghats in a certain patterns of seasonal iterations and cyclicity; the ritual elements and the habits of design and culture that are all born out of that are continuity of that theme. Such forms of economy is deeply rooted in the context where it originates and flourishes, and the communities which it engages. The present BLUEPRINT attempts to explore and map the impact of land-river interface upon the development of creative and cultural industries which further grow as assets to tourism, and ultimately which is founded as the bases of Eco-Design of the place. In this regard, Varanasi places itself as an excellent case-study, as it provides a unique land-river interface along the River Ganges which is believed to be a sacred geography. The city itself is a repository of traditional knowledge in art, crafts, literature, science and philosophy amounting to development of varied creative and cultural products over centuries (such as weaving, toy making and others), which further have induced heritage tourism over here. Finally, the potential of culture as a tool for integrated development has been explored, taking the case of Varanasi.

Given this backdrop, a four stage Eco-Design pattern hierarchy is suggested:

3. Eco-Design of the first order

Here the BLUEPRINT proposes a platform for diagnosing land-water-air pollution mitigation and demonstrate environmental up gradation through creation of city's new ecosystem – sustainable technologies for green construction.

4. Eco-Design of the second order

Next, it proposes a further stage for augmenting a network of large Knowledge centers in the inner ring of the city from Banaras Hindu University (BHU) Campus and other Innovation Hubs: pursuing a goal of deep ecological ethics to deep and living ecological pursuits. These centers will cultivate the higher levels of cognition amongst its students and aspirants (Dhyana or meditation) based on community interconnectedness and the green ethics of collective generosity (Dana and End-of-life care) and humanitarian spaces.

5. Eco-Design of the third order

At the third level, the design process will lead to a network of self-monitored sustainable green habitat system based on an integral approach to solar energy and bio-energy simulation on the one hand and the contemplate use of inner solar principles of ethics, rites, purgation and contemplative therapy (meditation) on the other hand.

6. Eco-Design of the fourth order

Finally, there is a culmination of the three orders that merge to recreate a deep ecosystem of interconnected creative human clusters based on the deep heritage and spiritual tourism revivals centering the ancient Urban Habitat aiming at very high Quality of Life and human security systems standards. The final goal is to unveil and integrate the built and the unbuilt – i.e., the 'sacred geography' of Varanasi with a 'sacred ecology', reflected or realized by aspiring users and pilgrims.

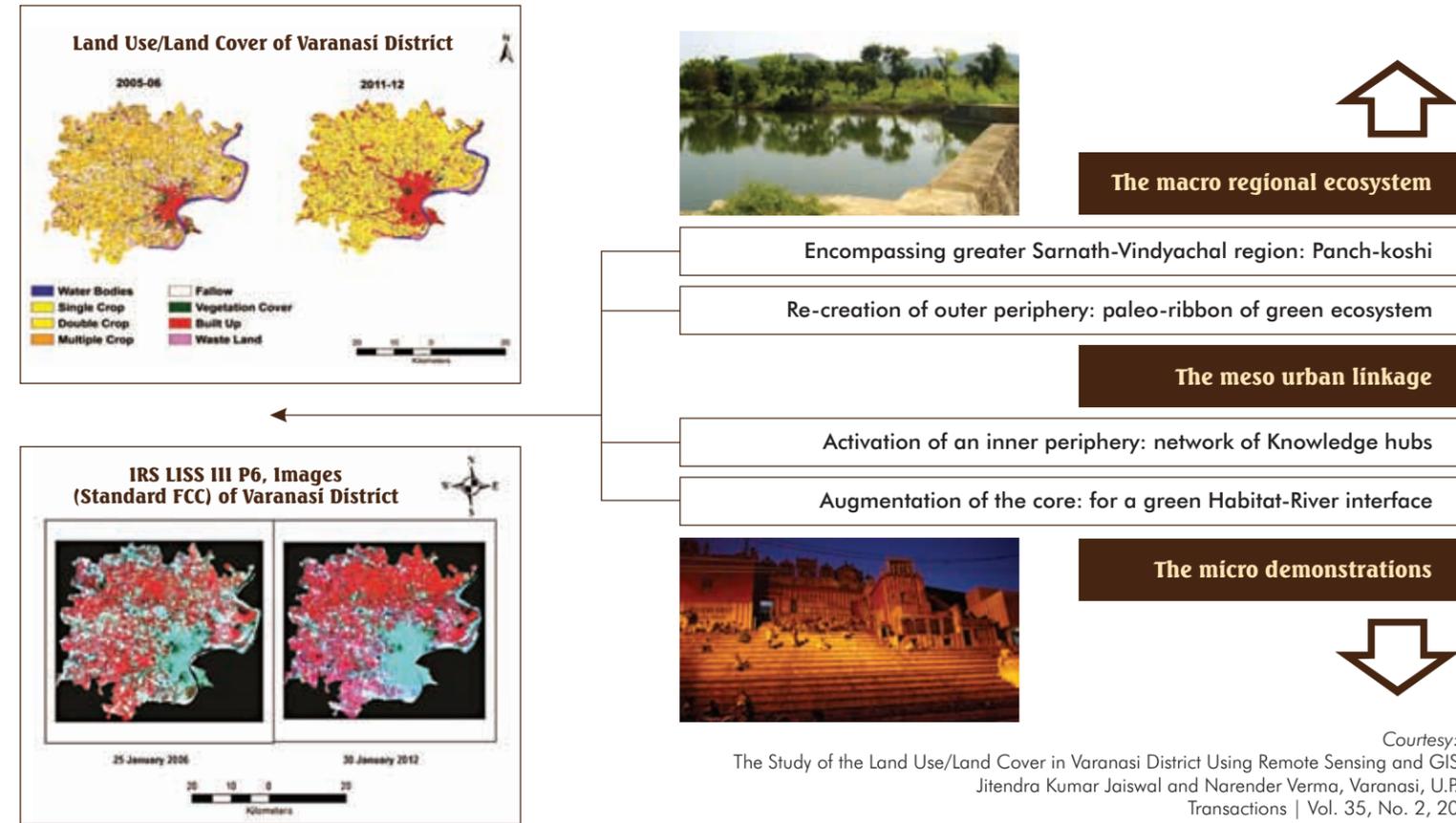
7. Significance of the research and scope of further exploration

As a whole, the BLUEPRINT suggests 'Co-evolution' is an extremely important dimension of a 'systems view of urban life' as it explains a process of complementarities and interdependence between bio-ecological or environmental and technological process cycles. The systems view of life integrates micro and macro dimensions of innovative and adaptive processes in terms of the complementarities and interdependence. As a result, cross-linkages between the part and the whole constitute a sustainable dynamism of the co-evolution itself. It uses the living example of an ancient Habitat as a living laboratory of human relationships.

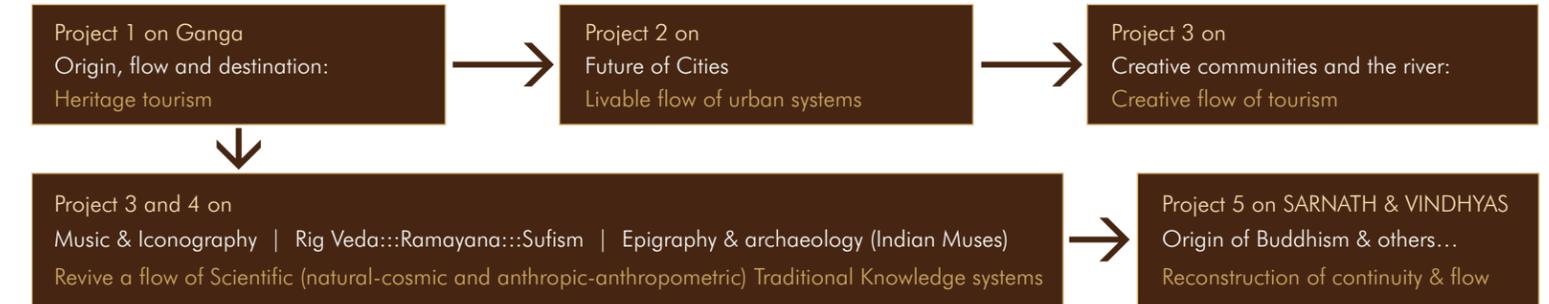
Traditional sciences and technology usually describe evolution or building up of higher orders of innovations in microevolution and shun the macro-evolutionary aspects. But a systems view of co-evolution cross-links the two and represents them as complementary aspects of unified evolutionary or innovation-making processes. The present BLUEPRINT attempts the co-evolution of 'Eco-design' involving both the evolution of built physical design with the counter inner evolution of human consciousness through higher participation, cognition, human services and security, public generosity, philanthropy and realized altruism. The case study of the ancient Habitat of Varanasi is a co-evolutionary example of a living systems' approach to eco-design integrating the entire pattern hierarchy physical-biotic and human environments as one whole.

Being an on-going process, innovation needs to be encouraged as a culture. Hence, the goal of this construct is to establish a model physical framework for a new-age community center promoting holistic development of individuals through encouragement of innovation. Such a framework has been considered as a tripartite structure dealing with

A Sandhi approach to levels of piloting and final 'Design' integration: Future of Varanasi



In summary: Sandhi of Future of Varanasi City Themes



Varanasi-Specific Exploratory Initiatives

Study of Flows	'Water' and capacity Building of boat-based Tourism in the context of Varanasi, and its spirituality and culture
Capacity building of Urban Livelihood Urban Renewal Mission project	Living creative communities of Varanasi On Varanasi's urban design, various public spaces around ghats, network planning, pedestrian micro zoning, and urban services and transportation engineering
Urban Heritage Mission on temples and people	Urban Heritage Mission on temples and people and their behavior at market place based on creative communities, their work places, their graphic designs, as well as social relations within and outside the community
Urban Epigraphy documentation, dissemination and cultural studies	Sacred texts and their <i>parampara</i> from the city of Varanasi having national as well as universal complementarities
World Heritage and Eco-tourism Mission project around the twin centers of Varanasi-Sarnath	Based on Art, Cultural studies, Iconography, philosophy, history and sciences – based on related Buddhist communities of Tibet, Bhutan, SE Asian countries and Japan, Korea and China
Capacity Building and Recognition Programs and Institutional Augmentation Workshops	Based on Ayurvedic traditions, Musical traditions, Epigraphy recitation tradition in relation with Guilds, Patronage & Popular themes of Varanasi
Creation and Capacity Building of Varanasi Integrated Informatics and Analytics Lab	To promote the City Scope as a Living Continuity of Indian Habitat Tradition and Heritage

Ecological, Academic and Social and Entrepreneurial Innovation. The approach in Varanasi is geared at four, consecutive and successive steps, following the cybernetics approach having four orders. It is by means of:

1. Diagnosing at the physical level, the land-water-air pollution mitigation and demonstrate environmental up gradation through creation of city's new ecosystem – sustainable technologies for green construction. At this level, community based intervention strategies based on a network of community based organizations, non-governmental organization and private-public partnership based associations are required to best arrive at the grassroots self-governance in operation and maintenance strategy of the urban environment. It is the physical level, portraying the first order approach to Eco-Design.
2. Augmenting a network of large knowledge centers in the inner ring of the city from BHU and other Innovation Hubs: ecological ethics to deep ecological pursuits. At this level, the rituals of the city dwellers – the movements and associations with the river and the various intellectual activities bordering on natural and organized religious beliefs that have grown over a span of countless generations have to be mapped and tapped. The second order cybernetics to Eco-Design, in here, essentially, discovers the surface belief systems and rites that have been repetitive and participatory over the ages and their many generations.
3. Evolving a network of self-monitored sustainable green habitat system based on a symbiotic 'modern-tradition' interfaced approach to solar energy and bioenergy co-evolution that will bring forward both the ancient cognitive implication of the concept of energy and reuse and its role in the modern world. Eventually, Varanasi is the city of the 12 suns, or the 'Adityas' (Sun) and they carry forward both the meanings from the material level to the cognitive and meditative layer. The third order of Eco-Design cybernetics will basically bring out this essence.
4. Earmarking a Sacred Geography of the city by recreating a deep ecosystem of creative economic clusters and craft clusters based on heritage and spiritual tourism revival. The Fourth and final order of Eco-Design cybernetics will finally say why this City has been sustainable through ages and why it is considered as a 'cosmic imprint' of which every user and dweller is an integral-participatory part.

In summary, the BLUEPRINT has forwarded the three subsequent discussions to best arrive at the application of the evolution and relationship in a systems approach and the application of the approach has been carried out through a case study of Varanasi: an ancient but continuously sustainable urban habitat based on interactions between land-water (river) built interfaces and the deeper or intrinsic layers of un-built economical-ecological symbiosis and human activities. In effect, the BLUEPRINT has forwarded a methodology, a four step cybernetic evaluation of the case study of Varanasi involving between the cumulative growth and interaction between the two – the external environment or the macrocosm and internal human activities or the microcosm. As an 'Eco-Design', Varanasi may be seen as a living epitome of the highest representation of that interaction between user and environment.

8. Action plans ahead

Subsequent to the October 14 – 21, 2014 Workshop at IIT Kharagpur in association with IIT BHU and other Institutes, three Action groups A, B, and C will be activated during the November-December 2014 on ground Workshop at Varanasi. AssiGhat and the Temple Complex have been chosen as the pilot project sites.

The three action groups will be activated so that by February-march 2015, a appropriate detail Urban engineering action plan is activated to stage a pilot 'Sonnet-e-luminaire' show in AssiGhat, which may be activated step by steps in other ghats and eventually, in the entire stretch of Ganga, the very life line of Varanasi.



Through the integration of modern technology and ancient belief system of the people of Varanasi, 'SANDHI' will forward a 'Eco-Design' revival of her 'place-folk-work-and-spirit'.

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It is probably true quite generally that in the history of human thinking the most fruitful developments frequently take place at those points where two different lines of thought meet.

- Werner Heisenberg



Three mountains stand as typical of progress — the Himalayas of Indo-aryan, Sinai of Hebrew, and Olympus of Greek civilisation. When the Aryans reached India, they found the climate so hot that they could not work incessantly, so they began to think; thus they became introspective and developed religion. They discovered that there was no limit to the power of mind; they therefore sought to master that; and through it they learnt that there was something infinite coiled up in the frame we call man, which was seeking to become kinetic. To evolve this became their chief aim. Another branch of the Aryans went into the smaller and more picturesque country of Greece, where the climate and natural conditions were more favorable; so their activity turned outwards, and they developed the external arts and outward liberty. The Greek sought political liberty. The Hindu has always sought spiritual liberty. Both are one - sided. The Indian cares not enough for national protection or patriotism, he will defend only his religion; while with the Greek and in Europe (where the Greek civilisation finds its continuation) the country comes first. To care only for spiritual liberty and not for social liberty is a defect, but the opposite is a still greater defect.

Liberty of both soul and body is to be striven for.

- Swami Vivekananda

Our Key Contributors

The movement called 'Sandhi' has become impossible without these names. They are the 'inner core' of 'Sandhi'. Ultimately, the youth of India have to take up the great responsibility of 'Sandhi' – the process of bridging modernity and tradition, from their heart, through their greater presence of mind, and finally, on their shoulders. A starting point of a list of names is a small but a definite signature of the progression:

- | | | | |
|--------------------------|---------------------------|----------------------------|---|
| 1. Aditi Sen | 16. Debapriya Chakraborty | 31. Rashi Ranjan Behera | 46. Tanaya Mukherjee Sarkar |
| 2. Anirban Dasgupta | 17. Deepanjan Saha | 32. Roopa K. L. | 47. Tanima Chakrabarty |
| 3. Anjith George | 18. Gouri Karambelkar | 33. Ruchika Sharma | 48. Tiyasaha Sengupta |
| 4. Ankhi Banerjee | 19. Jaydeep Sengupta | 34. Runa Sen Chatterjee | 49. Tulika Bhattacharya |
| 5. Antara Chakrabarti | 20. Laxmi Shaw | 35. Sadhana Naskar | 50. Tushar KantiSaha |
| 6. Ankita Mandal | 21. Mouli Majumdar | 36. Saumya Bera | 51. Sandhi UG Summer interns (2nd years: batch of 2013-14): |
| 7. Anushree Basu | 22. Oindrilla Bose | 37. Saurabh Sharma | Abhishek Chauhan, Abhishek Kumar, |
| 8. Apala Sarkar Ghosh | 23. Palash Nimodia | 38. Shambhobi Bhattacharya | Akash Modanwal, Ankit Kapoor, Bishnu Kumar |
| 9. Akshata Mohanty | 24. Pradeep Rengaswamy | 39. Sharanya Mukherjee | Sharma, Dasari Divyanvitha, Deepansh Singh |
| 10. Aritra Choudhury | 25. Prasenjit Dhara | 40. S. L. Happy | Dongre, Gangula Anwesh, Kevalkumar Sojitra, |
| 11. Arpan Paul | 26. Pratik Patra | 41. Srabani Nath | Madala Hemanth Chowdary, Mukesh Kumar, P. |
| 12. Arundhati Patnaik | 27. Preeti Pal | 42. Subhamoy Jana | Vamshidhar Reddy, Pratibha Verma, Ravi Kumar, |
| 13. Bibek Kabi | 28. Prerona Das | 43. Sunny Bansal | Purushottam Rawke, Soumodip Paul, Subhash Ch. |
| 14. Biki Kundu | 29. Prerona Mondal | 44. Suparna Dasgupta | Biruly and Rajeev Ranjan |
| 15. Chandrima Chatterjee | 30. Rashmi Mukherjee | 45. Sweta Sen | |



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ISBN 978-93-80813-29-5



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