‘Sharing the Joy of Observing Nature’: A Study of Nature Walks in India

Anjali Bharati[1,2] and V.V. Binoy[1*]

[1] National Institute of Advanced Studies (NIAS), Indian Institute of Science (IISc) Campus, Bengaluru

[2] Manipal Academy of Higher Education (MAHE), Manipal

*Corresponding author - vvbinoy@nias.res.in

Abstract

Nature Walks (NW) - a group of people exploring sites of ecological importance with an experienced guide and involving in informal discussions about various topics is a recognized method to improve environmental awareness and responsible behaviours of the non-experts. In the last decade themed and non-themed NW got much popularity in India. The present study explored various dimensions of NW conducted in India following newspaper analysis, internet and social media studies, and the examination of the academic publications. A participatory study of the 15 NW organised in the city of Bangalore was also conducted. Our results revealed a growing public and media interest in NW in India. However, very few websites and social media handles dedicated to this informal social activity were observed. Furthermore, a lion’s share of academic publications containing the words nature walk used it in the context of tourism, and not even a single study focusing only on these events conducted in India was available in the literature. The organizers aimed to share knowledge about the nature, raise conservation awareness, engage in scientific inquiry, and promote citizen science projects by conducting NW. While curiosity, science learning, conservation, enjoyment, opportunity for socialization and network formation, well-being and photography attracted participants to these events. The need for conducting integrated research on NW in India and formulating guidelines and policies to sustain the contributions from such events

to the areas of health and wellbeing, environmental awareness and conservation and promotion of the tourism without losing its essence - the informality- is discussed under the light of the results obtained.

Keywords: Guided walk, participatory science, informal learning, public engagement, science communication, biodiversity, conservation, urban ecology

Introduction

Walking on a nature trail with an experienced guide (Nature Walk, NW) opens an opportunity to observe and acquaint with flora, fauna, and various non-biotic elements of the environment and learn the interconnectedness and interdependence existing between them (Dickinson, 2013). Along with enhancing environmental knowledge (Santer, 1997) such walks add to pleasant moods (Nisbet & Zelenski, 2011), boost cognitive capabilities such as working memory (Bratman et al., 2015) and improve general well-being (Kotera et al., 2021; Marselle et al., 2014) of the participants. NW brings people from different cross-sections of life, divergent in their interests, knowledge, and experience under one umbrella. It also promotes bidirectional dialogue on various topics between specialists and non-experts in an informal environment. Involvement in such events decelerate the extinction of experience – losing direct contact with nature (Awoyemi et al., 2024), uplift pro-environmental attitudes (Choi & Kim, 2021) and the participants may utilize the 'intelligence of the collective' to find relevant solution for the local environmental problems (Haltofová, 2016). Hence, NW can serve as an efficient medium for communicating serious environmental issues such as biodiversity loss, climate change, injudicious use of natural resources etc. with the public (Floresca, 2019). Furthermore, the direct experience acquired by exploring ecosystems is shown to strengthen connection with nature, increase the perceived value and well-

being of non-human life forms and promote adoption of sustainable behaviours (Barragan-Jason, 2023). NW is recommended also as a brilliant pedagogy to impart environmental knowledge to learners ranging from preschoolers (Praveen, 2021) to college students (Owen, 2016). Participation in NWs improved learning and attitudes of the students in terms of engagement, clarity with the topic and long-term retention of information related to biology and made them aware of the importance of exploration, observation, experiential learning and the environmental stewardship (Owen 2016; Lee & Bailie, 2020).

The last decade witnessed an uptick in the number of NW in India focusing on biotic (various species of plants and animals) and nonbiological elements (rocks, soil etc.) of natural and humanmade ecosystems (Veer, 2023; Datta, 2023; Kole Birders Community Portal, n.d.). Groups of enthusiasts roaming around with notepads, binoculars and long-range zoom lens cameras and discussing various topics have become a common sight in the sites of ecological importance in this nation. Differing from the walks happening in formal settings of the educational or nature trails maintained by the governmental or non-governmental agencies, here interested individuals gather at public places such as parks, lakes, gardens, campuses of the educational institutes etc. and examine, photograph, converse and study various living and non-living things under the guidance of experienced leaders (Datta, 2023; Veer, 2023). Participatory science and communication initiatives are beneficial for a geographically large country such as India showcasing its ecological and biological diversity. Numerous projects belonging to this category such as citizen science (CS) (Sekhsaria & Thayyil, 2022), community science (Sharp et al., 2024), crowdsourcing (Sukhwani & Shaw, 2020) etc. are active in various regions of this nation (Citizen Science India, n.d.). Although CS in India was able to attract the attention of the researchers (Binoy et al. 2017; Sekhsaria & Thayyil, 2022), another form of participatory science and communication the NW remain underexplored to date in this nation. In this context it is important to note that NW are

becoming regular in different cities and places of ecological and tourism importance in India (Agarwal & Parashar, 2023) and mainstream media is covering the news of such events (Jain, 2022) frequently. Examining NW happening in India from multiple angles is essential to pinpoint the direct and indirect assets and liabilities such events bring to society, and hence to come out with strategies and policies to improve the quality, avoid conflict between the stakeholders and ensure the sustainability of these informal environmental education and awareness programme with the potential to support the fight against various environmental problems as well as climate change and its consequences.

By keeping the nature walks in India in focus and following an integrated approach the present study tried to find answers for the following questions,

1. How does newspapers in India project the nature walks?
2. What is the nature of public attention these events receive from India on internet and popular social media platforms?
3. What is the approach followed by the researcher community towards nature walks in India?
4. What is the structure, and dynamics of the interaction between multiple stakeholders in guided nature walks happening in a megacity in India?

Materials and methods

To understand how Indian newspapers approached NWs, articles published on this topic by four national English dailies, The Times of India (circulation - 1872442), Hindustan Times (738154), New Indian Express (595618), and The Hindu (167033), were considered for the analysis. Two English newspapers popular in the city of Bengaluru where we conducted the ethnographic component of the present study (described later) - Deccan Herald (96598), and Bangalore Mirror (41645) were also studied. The details of circulation of each focal newspaper were collected from the websites of the Audit Bureau of Circulations (n.d.) and the Office of Registrar of Newspapers for India (n.d.). All or the first 200 news articles (whichever is highest) that resulted from the

search conducted on the websites of the focal newspapers (till December 2024) using the keyword 'nature walk' were checked manually, and those containing this term were downloaded. From these articles the following information was extracted manually - the theme/s of the events, details of the organisers, target population and the benefits of attending such events attributed. A word cloud was created using the lemmatised text of these news articles.

The keywords "nature walk" and "India" were used for searching internet for the websites of NW or the agencies organising or offering support to conduct such events in different regions of India. We used the most popular search engine in India, Google (StatCounter, n.d.) and the first 100 weblinks appeared were opened and examined manually. The following details - hosting agency, type of walks conducted, registration fee and other financial commitments, details of the guides and resource persons, particulars needed to be carried by the attendees during participation, means of communication and other services offered (if any) were extracted manually from the relevant websites. Since the Virtual Nature Walk (VNW) is getting popularity all over the globe (Calogiuri et al., 2018), Google was searched using the term "virtual nature walk" and India, here also first 100 links resulted were manually checked for the websites related to this form of NW. Google Trends (GT) a tool offered by Google to retrieve information on how people from different geographical locations searched on the internet with a specific keyword was used for studying public attention received by NW from India on internet. Relative Search Volumes (RSV) - the search interest on the internet relative to a maximum popularity of 100 (Cervellin et al., 2017; Jun et al., 2018), and the related queries and interest breakout for the period 1st January 2015 to 31st December 2024 for the search term "nature walk" were generated choosing the geographical area India (Mavragani & Ochoa, 2019).

To get insights into the discussions on NW happening on social media, three platforms popular in India namely Instagram, Facebook and Twitter were explored with the keyword 'nature walk'. The

handles/pages that resulted from these searches were manually scrutinised and individual vlogs, blogs, and pages related to nature photography etc. which included the term 'nature walk' but had not any information related to NW were excluded from further analysis. We also examined the social media pages mentioned on the nature walk websites studied and the posts of such events circulated on different WhatsApp groups related to NWs. Posters of NW available on these social media handles were downloaded and the information it contained - name, date, time, locations, details of the organizers, guides, activities, contact details etc. - were extracted to an Excel sheet. Care was taken to remove duplicates from further analysis. Number of comments received by all posts available on these pages were recorded and the comments were collected manually and categorised thematically. Sentiment score (using AFFIN Lexicon as positive, neutral and negative on an integer scale of –5 to +5, Mhatre, 2020; Nielsen, 2011) was estimated and word clouds were generated using this text after lemmatisation. Emotional content - based on eight basic emotions: anger, fear, anticipation, trust, surprise, sadness, joy, and disgust- of these comments was traced out using NRC Emotion Lexicon (Mohammad & Turney, 2011). Different packages of the statistical tool R, 'tm' 'wordcloud', 'RColorBrewer' 'syuzhet' and 'ggplot2' were used to analyse the comments.

Three popular search engines indexing academic literature, Google Scholar, Web of Science and Scopus were surfed using the keywords "nature walk" and "India". From the first 100 results that appeared, articles published till March 2024 referring to walking activities undertaken in natural surroundings in India were manually segregated and downloaded for further analysis. The title, keywords, and abstracts of the shortlisted papers were physically copied and subjected to thematic analysis to get insights into the nature of research happening on this topic in India. Additionally, using these papers co-occurrence networks of titles, abstracts and co-authorship were generated using the VOSviewer (Arruda et al., 2022).

A field study focusing NW organized by diverse agencies in different locations of the Bengaluru city, Karnataka, India between November 2022 and July 2023 was also conducted. Although, exploration by walking is an integral part of numerous recreational and educational activities ranging from trekking by enthusiasts to the field trips of the students, the current study considered only the walks satisfying the following criteria. The walk should focus on a theme related to ecology or environment, conducted in natural or engineered green spaces present in urban settings, support of an experienced guide(s) is available, duration of the event should not be more than one day and opportunities for informal discussions are ensured. Walking tours (Choi & Kim 2021), treks, hikes, or trails characterized by extended journeys across challenging landscapes, exploratory ventures undertaken by groups of educators and students for their academic requirements, and heritage walks or tours were not considered for the current investigation, although these activities have many elements in common with NW. By following a purposive sampling approach 15 such NW were shortlisted, and an author (AB) participated in all these events, observed and recorded the activities happening at different stages (Cantillon, 2020). The researcher's identity and motivation behind joining the walk were disclosed to both organizers and participants and oral consent to conduct the observational fieldwork was obtained (Guest et al., 2013). Akin to other participants the researcher also took part in all activities proposed by the organizers. The researcher conversed informally with guides of all the 15 NW she attended about their aims and reasons behind organising such an event. She also spoke with a total of 71 randomly selected participants from different walks about their motivations behind attending the event. Detailed field notes and thick descriptions of various activities observed in each walk was prepared and the informal interactions were subjected to thematic analysis.

Results

Our study of the websites of the focal newspapers produced 165 articles related to NW published between October 2009 and December 2024 (Fig. 1). 'The Hindu' published a maximum (94 articles from the first 200 results) followed by the Times of India (36) and Bangalore Mirror (17). The Hindustan Times (10), New Indian Express (3), and Deccan Herald (5) had only less than a dozen articles on this topic to their credit. These news articles published mainly as city news either described an upcoming NW (53; 9, (national dailies; Bangalore newspapers)) or an event completed in the recent past (44; 7). Examination of these news articles revealed that community groups (18 events), educational (9) or environmental organizations (17), parks (18) or forest departments (20), and city authorities (23) were the main organizers of these events and students (21) and the public (34) were the target groups. Along with the location of the event (parks (10) or wildlife reserves (7)) many articles mentioned the guides to be educators (6), experts (9), and naturalists (15) who led the participants during the walk. The newspaper articles were dominated by the words - walk, nature, species, forest, people, biodiversity, students, birds, park, and participants (word cloud analysis; Fig. 2).

The measure of public attention on internet – RSV- for "nature walk" which fluctuated between 25 and 50 until the year 2020 (GT analysis; Fig. 3) ascended from the next year and wavered between 50 and 80. This result revealed a significant increase in the search for nature walk immediately after the COVID-19 restriction was lifted. Further analysis revealed a seasonal variation in the search for this keyword in India post 2020; RSV reached a maximum during June and touched down the baseline in both October-November and April-May. The highest RSV came from the state Uttarakhand (100), followed by Karnataka (76), Uttar Pradesh (69), Himachal Pradesh (61) and Nagaland (53). Interestingly, the improvement observed in the public search for NW on the internet in the last few years was not reflected in the number of websites dedicated to such programmes. We got only 8 websites of NWs operating in India and the majority (5) portrayed

the city of Bengaluru as their site of action (SM1). These websites were mainly hosted by the travel/tour agencies or individuals associated with this sector and offered a variety of walks keeping diverse aspects of the city such as heritage, market, food etc. in the focus, with NW being just one of the many options available. The facilities to choose location, timing, theme etc. of the NW from the list available and to purchase online merchandise such as gift cards, badges, fridge magnets, games, lapel pins, mugs, stickers, t-shirts, books etc. were available on many of these sites. However, none of the websites displayed details of the items to be carried by the participants while attending the walk. Three websites offered NW specifically for schools and colleges with the possibility of customizing the events to match the curriculum and schedule of the interested institutions. They also offered in-class presentations, workshops and interactive tours related to nature for such institutes. Although detailed terms and conditions including the cancellation policy were available, most of these websites did not display details of the registration fee or other financial commitments from the participants. Interested persons need to use the information given on the 'contact us' page containing email IDs and phone numbers of the host for bookings. Many of the NW websites we explored offered free newsletters for the registered participants.

The pages / handles focusing on nature walks in India were minimal on all the three popular social media platforms studied - Instagram (4 pages), Twitter (3) and Facebook (6). Lion's share of these handles was hosted by the environment or research organisations and were not fully dedicated for NWs. Host shared details of webinars, certificate courses, workshops, talks, films, safaris, book screenings and events related to eco-tourism (including those organised by other institutes) along with the posters of NW. The following information was common to the posters of NW that appeared on these pages - name, date, time, location and organizers of the event, theme picture, name of the guide, registration details, and a brief description of the activities or highlights (Fig. 4). Various species of wild animals in action, people interacting with nature (e.g. conducting

observation or discussions in natural surroundings) etc. were the popular theme pictures used. Akin to the websites studied vital information such as expectations from the participants, do and don't during walks, details of the contact person etc. were absent in many posters. The comments received by the posts related to NW appeared on these social media handles could be put under 3 main categories - compliments, request for the details of the events and feedback on the walks attended (Fig. 5). The words associated with positive emotions - "joy" (17%), "anticipation" (21%) and "trust" (32%) had a significant domination (a total of 70%; Fig. 6)) and the sentiment analysis generated a score of '+1'.

We got 26 research articles, 4 reviews, 5 opinion pieces, 6 book chapters, and 1 report (total of 42) containing the terms "nature walk" and "India", that were relevant to the present study (Fig. 7). Although, these articles contained the term nature walk, it was described in the contexts of eco-, adventure-, rural- or cultural-tourism (26 articles). Others portrayed NW as a way to explore biodiversity and get connected with nature, a tool for managing and conserving natural resources, a component of heritage and city walks, a field activity supplementing formal education and an activity people missed during the COVID-19 lockdown. Very few studies mentioned the positive impact NW could have on the health and well-being of the participants and the scholarship on ecology (e.g. by recording new species). The co-occurrence network analysis of the titles (Fig. 8) and abstracts (Fig. 9) revealed tourism and ecotourism as the key themes of these publications. Furthermore, very few authors published more than one article on this topic and there was minimal collaboration among them (Fig. 10). Most important observation from the study of the existing scientific literature on NW was the absence of any publication focusing only on NW in India or exploring this activity in depth.

Depending on the focal themes NW conducted in the Bengaluru city and outskirts largely chose campuses of the educational and research institutes (5 out of the 15 events studied), areas surrounding lakes (4), botanical gardens (2), parks (2), patches of protected forest present in the outskirts of this city (1; Kalkere Arboretum, Bannerghatta road) or experience center (1) for walking. These NW were mainly of two kinds – participants observing and examining anything attracted their attention on the path (non-themed; 6 /15) or exploring the area keeping focus only on a specific biotic or abiotic component of the ecosystem (themed). The second category dominated the NW studied and trees (1), medicinal plants (1), birds (4), insects (1), mammals (1), reptiles (1) etc. were their focal themes. However, only two NW studied abiotic components (soil and its types) of the environment. Individuals (2), community groups (2), research institutes (7), forest department (1) and various organizations (2) and trusts (1) were the main organizers of the NW in Bengaluru. Weekends were the preferred dates, but occasions such as the birthdays of famous naturalists (e.g. Salim Ali), national or world day of the focal species etc. also witnessed such events. Firefly walks happened only during the summer months (May-June) due to the seasonal appearance or abundance of the focal species. Most of the events happened in the morning hours (06:00 - 08:00) and the walks continued for 1 to 3 hours. However, the events focusing on nocturnal organisms such as fireflies and slender loris started at 19:00 and ended around 21:00. All walks were led by one or two experts in ecology or environmental sciences such as birdwatchers, naturalists, coordinators of the CS project or professional researchers. NW leaders known as 'guides' shared information regarding focal theme, biotic and abiotic components of ecosystems, interesting environmental facts and answered the queries of the walkers. The number of participants in a walk varied from 3 to 38 and maybe due to the informal nature of the event individuals were found joining or leaving the walk at different phases. The age of the participants ranged between 6 to 65 years and were school children, college students, researchers,

photographers, engineers, homemakers, businesspersons etc. depending on the focal theme and the location. Interestingly, a noticeable number of people retired from government and private services were observed in many walks studied.

Discussion

The NW was not a popular topic, and all focal newspapers together published less than 10 articles per year on these events till the year 2020. However, from the next year (2021) onwards this trend was found to take a positive turn. Although, the spread of COVID-19 limited outdoor activities during 2020, the interest in events such as NW with the potential to improve physical and mental well-being renewed globally immediately after the pandemic (Beery et al., 2021; Grassini, 2022; Ma et al., 2024; McDonnell & Strayer, 2024; Todorova et al., 2023). Hence, this spike observed in the number of newspaper articles can be taken as the reflection of the upsurge in the number of NW organized by various agencies, as they were reports of either upcoming or completed events. The result of the content analysis points that the newspapers in India projected NW mainly as a tool for promoting environmental awareness and conservation. Furthermore, majority of the news articles (60%) appeared on one newspaper (The Hindu) with a longstanding reputation for covering science and technology (Dutt & Garg, 2000) and environmental and ecological issues (Keller et al., 2020). However, akin to others this newspaper also published news on NW in the section 'city news' limiting its circulation. These results indicate the necessity of making journalists aware of the physical and mental health benefits of participating in NW along with the enhancement of ecological knowledge and improved connection with the environment it offers (Barragan-Jason, 2023). Furthermore, availability of NW can increase the tourism potential of an area of ecological importance and offer livelihood opportunities for local population (Gupta et al., 2023). Hence, people familiar with the benefits of NW such as educational institutions, NGOs, guides etc. sharing their opinions and experiences on the newspapers and publishing houses keeping more space and

prime pages of their media for such articles will be helpful to attract more public attention to this form of people involved science activities.

Akin to the results obtained from the study of the newspaper articles and may be due to the similar reason - people preferring to spend more time outdoor after the restriction induced by the pandemic was lifted - search for "nature walk' on the internet also found increasing from the year 2021. However, analysis of the RSV revealed fluctuations with the festive season (October-November), summer heat (April-May) and vacations for the educational institutions in northern states of India (June) pointing that people considered nature walks as a component of their tourism activities. The result of state-wise analysis of RSV, the related topics and related queries on the internet associated with the term nature walk also supports this argument. The search for nature walks on the internet originated mainly from the states with tourist destinations popular across the country, where scenic beauty such as mountains, beaches, and other natural landscapes provided ample walking opportunities to experience nature. Furthermore, most of the 'related topics' and 'related queries' (SM2) were associated with communicating the experiences of walking at such tourist destinations, e.g. captions for social media, the iconic tourism site Taj Mahal nature walk park etc. Another curious observation was that "Anuhar nature walk" came out as the top related query. Further exploration revealed that it is an apartment complex in Hyderabad. Interestingly, the improvement observed in the public attention to NW on the internet in the last few years was not reflected in the number of websites on NWs in India. The content and format of the available websites resonated with the interest of tourists and offered a variety of walks, with NW as just one of them. These websites also sell merchandise that tourists prefer to buy while visiting such places.

Among the websites of the organizations conducting NWs specifically for schools, colleges, universities and corporations, a few are maintained by groups of professionals with experience in the fields of ecology, environmental science, management etc. If such organizations can develop

quality content and appoint professional guides with experience to lead the walk, their NWs could evolve as a mechanism to support educational institutions in conducting field-based studies effectively. Although environmental education is compulsory in India (Choudhary et al., 2020; Sharma & Menon, n.d.), and ecology, environmental science and social sciences are integral parts of school curriculum of many courses taught in colleges and universities, educational institutions rarely give field experience to their students (Shashi Dream Foundation, 2022). In such context participating in the NW will be useful to foster familiarity with flora, fauna and the methodologies of field study such as observation, identification, field note writing, record-keeping, and data analysis amongst the students. However, educational institutions taking support of such organisations need to be sensitized for choosing the right agencies. Many of the walks we studied were paid events, and the entry fee ranged from INR 75 to 700, revealing that NW is emerging as a lucrative business model. Some news agencies warned people about a 'new scam in the market' related to NW - a company charging a hefty fee of INR 1500 for immersing in a forest environment and hugging trees for healing (DH Web Desk, 2024). Hence, launching dedicated websites or specific pages on the existing website displaying the details of the financial commitment, guidance on the items to be carried and the etiquette to be followed by the participants during the event and post-event responsibilities by the organisations already conducting NW successfully will make such events transparent and trustworthy, and set a model for the agencies interested in organising one. Although, during and after the COVID-19 pandemic VNW - take the audience through the parks, gardens, forests and other ecosystems present in different regions of the planet earth using Virtual Reality (VR) platforms (Bilińska et al., 2023) – got popularity across the globe we did not get any websites providing such services from India. However, making virtual and augmented reality-based VNW aligned with the life experience of the people from this nation will be useful

in familiarizing participants with the procedures of the NW and hence increase its public acceptance.

The popular social media platforms Instagram, Twitter, and Facebook had very few handles dedicated to NW operating in India. Like the websites these handles were also managed by the environmental or research organizations and disseminated information related to NW along with their activities related to eco-tourism, environmental education etc. However, it was noted that many handles used the name of the host organization or locations of NW as their profile names and did not include the term "nature walk," reducing the chance of appearing in the search. The posters of NW present on these handles commonly include name, date, location, and the details of the organizers. Images related to the theme of NW such as wildlife in action or people engaging in field studies were present on most of the posters since such pictures could evoke curiosity and enthusiasm amongst the viewers (Altinay & Williams, 2019). However, akin to the websites of NW very few handles or the posters included critical information, such as guidelines for participants, financial aspects, and contact details. Comments received by the posts on social media handles were few but positive in nature and dominated with the words associated with positive emotions. Although, a detailed study considering the identity and background of people commented on these posts is essential to get an elucidated picture, the nature of the comment received points that main visitors of these social media handle maybe the people associated with nature/ecology related activities. Furthermore, usage of words associated with negative emotions (fear, anger, disgust, sadness; only 23%) were in the contexts of registration issues, non-availability of seats, inability to attend or missing the walk for various reasons etc., which also support for this assumption. It is a well-known fact that social media plays a decisive role in communication especially amongst youngsters (Sachdeva & Tripathi, 2019). Hence organizations and individuals conducting nature walks in India should improve their presence and activities on

social media to reach their messages to a bigger crowd heterogenous in their interests and attract them to the NW.

Although NW is getting popularity in India and discussions are happening on various media platforms, academic community hasn't given the attention to this topic it demands yet. As observed in the case of milling on the internet by the public, academic researchers mentioned NW mainly in the context of tourism. The unpopularity of this topic amongst the academic and research community was evident in the result of the co-occurrence network analysis - very few researchers had more than one article containing the term NW and there was minimal collaboration amongst the authors who discussed topics related to such events. Interestingly, 'heritage walks'- introducing participants to the culture and heritage of an area such as monuments, historic buildings, cuisines or various art forms by walking (Cantillon, 2020; Chauhan & Anand, 2021; Saiyed et. al., 2016) has been studied extensively in India and discussed by the academic community (Fatima, 2024). However, no such attempt to explore NW in this nation in a comprehensive manner has happened yet. Lack of availability of rigorous studies focusing NW could hinder the availability of evidence-based policies for promoting and managing this form of informal science communication and learning. It is expected that soon research integrating the analysis of various dimensions of NW in India such as its health and well-being benefits, role in fostering biodiversity awareness and nature connection, contributions to formal and informal education and societal, economic, and policy dimensions will appear in the literature and fill the existing knowledge gap.

Bengaluru, known as 'garden city', is famous for its botanical garden (e.g. Lalbagh), picturesque parks, numerous lakes and artificial tanks. Our exploration of NW organized in different locations of this city revealed campuses of institutes as the most preferred site. These green institute campuses were not only blessed with the populations of the focal species but also stretched over a large lush green area. For instance, institute where the '*Tree Walk*' was conducted spans over 1205

acres with many endemic and exotic tree species, while the location of *'Medicinal Plant Walk*' had a massive collection of plant species from semi-arid regions of Rajasthan to the forests of northeast India and Western Ghats. Although open to the public, familiarizing members of the institutes with various forms of life present on their campus was the primary aim of such walks. Similarly, the second preferred location, the premises of lakes offered varieties of garden plants, patches of natural vegetation, and trees offering food, shelter and nesting site for numerous terrestrial organisms. These along with the waterbody harboring fishes, insect larvae etc. make it the ideal location for observing biodiversity and discussing ecological phenomena during the walk.

Depending upon the location, focal theme, and online and offline reach of the organizers the number of the participants varied from 3 to 38. The NW conducted at the inner-city locations and outskirts were dominated by the college students and research scholars, and in-service professionals respectively. The middle-aged people keen to learn about the medicinal properties of plants and interested in organic farming outnumbered others in the medicinal plants walks. To enhance the chance of sighting nocturnal animals, organizers of the evening or night walks preferred to keep the group size small (around 20). The participant's motivation to join NW (Fig. 11) included learning science ("*interest in learning about the things around us", "knowing more about the trees"*), enjoyment ("*trying something new"*), socialization ("*meeting new people and building connections"*), conservation awareness ("*get to know about the issues related to the environment"*), physical and mental well-being ("*getting fresh morning air", "therapeutic/stress-relieving"*), connecting with nature ("*being closer to nature"*), and collecting materials to upload on social media or CS platforms ("c*licking good pictures of biodiversity", "adding new species to the profile"*). The organizers and guides were inspired by the concept- "*Getting people to ask questions and come up with scientific ways of answering them'* and described sharing knowledge about nature, spreading awareness on conservation issues, engaging people in scientific enquiry

and promoting CS platforms as reasons behind conducting such events. Participants joining and leaving the walk at different phases without any reluctance restated the informal nature of these systems. All women walk conducted once a month by a group of female volunteers, children centric NW incorporated with fun activities and games, and events specially designed for differently abled children (e.g. conducted on the occasion of the birthday of the Bird man of India – Dr. Salim Ali's in the state Tamil Nadu) etc. point towards NW evolving into a complex social phenomena in different states of India and demand immediate attention from both researches and policy makers.

Differing from the explorations conducted by the individuals, NW promotes the collective detection of plants, animals and objects. The attraction of the attention of the group to something interesting by the guide or participants during the walk often leads to the exchange of experiences, memories, anecdotes etc. mainly in the form of stories. All guides preferred participants who are curious, open-minded, willing to learn, ready to share the knowledge they have and prepared to experience unexpected encounters and diverse aspects of nature. Guides encouraged conversation between the participants but intervened regularly to add scientific information and correct misconceptions. NW focusing on animal species covered only a 1 to 1.5 km transect (on average) due to the time spent on observations and engaged dialogues. NW focusing on trees and medicinal plants covered even smaller areas. Here the guides shared details such as vernacular and scientific names, place of origin, flowering or fruiting seasons, medicinal properties and other benefits of the numerous plants came across. The evening/night NW observed focal animals (reptiles, fireflies, and loris) and discussed their life cycle and ways to identify them using shape, colour, body structure etc. However, the lack of sufficient lighting made it challenging to spot the focal animal under the red light used by the guides during the loris walk. Even after attending the awareness session conducted before the walking activity elucidating the negative effects of artificial white

light on nocturnal organisms many participants were found using flashlights of the mobile phone to see the animals. This observation points to the need for training the participants of NW involving sensitive animals before event starts and implementing mechanisms to keep the reckless participants away.

Although many NW we observed were theme based, the discussions often diverged to a host of related and unrelated topics offering innumerable learning opportunities to the participants. For example, one spike generated by a question from a participant during a bird walk - "*what is the purpose of a bird call*?" lead to a cascade of deliberations on topics such as colours and patterns of plumages, habitats and behaviours of the birds, mate selection, evolution, etc. However, progress of such conversations into full-fledged discussions was decided mainly by the interest of the guide and participants. We also noticed a few situations in which guides were unable to answer the queries of the participants. Such situations were frequent during NW without any focal themes since participants could ask questions about anything they knew or found during the walk. In such contexts, either some experienced member(s) led the discussion, field guide, dedicated mobile apps (e.g. Merlin bird ID) etc. were used or the internet was surfed to find the information required. Hence, informal learning happening in a NW could be considered a form of 'human mediation' where an experienced person facilitates education for a novice by laying down the guidelines for observation and participation as well as elucidating their shared roles (Rogoff, 2003; Zimmerman & McClain, 2016). In such contexts participants make meaning of the novel information they receive by connecting their lived experiences with scientific knowledge and stories shared by the guide and peers (McClain & Zimmerman, 2014; Heimlich & Falk, 2009). Encouraging participants of NW to share their inputs not only fosters an active sense of engagement but people value the stories and facts shared by their peers over evidence-based scientific information while making environmental decisions (Kadykalo et al., 2021a, b; Toomey, 2023). Additionally, favorable

environment created by NW for the informal interaction would improve argumentation skills, open-mindedness, capability to challenge one's own assumptions and beliefs and hence keep the non-expert participants less polarized (Mercier & Sperber, 2011, 2017; Sloman & Fernbac, 2018).

Participants spent the lion's share of time clicking photographs during various NW observed. These pictures, names of the species spotted, and queries were uploaded to the WhatsApp groups made for the event by many members. Experienced peers or guides helped them to find taxonomical status and solve questions making peer learning process started during the NW extending for a long period online. Furthermore, some participants utilised WhatsApp groups as a medium to safely store the collected data. However, heightened enthusiasm to post pictures on social media to attract likes and followers may dilute the objectives of NW- knowledge sharing and learning (Fatima, 2024). For instance, leaders of NWs focusing on plants have expressed concerns, stating - *"People don't find trees as fascinating as other organisms like birds or butterflies, so they rarely pay attention to the greenery".* This behaviour among participants may be attributed to plant blindness - a tendency to overlook plants in daily life (Achurra, 2022) and this bias is often reinforced by the prevalence of social media posts featuring charismatic animal species (Shaw et al., 2022). However, educational interventions can help mitigate plant blindness (Balding & Williams, 2016) and NWs could serve as a valuable tool in this regard, introducing individuals to local flora and fauna highlighting its diverse characteristics and ecological benefits.

NW could also serve as an entry point for non-experts to the CS projects (Bangalore Mirror, 2022). However, many attendants were reluctance to share their data on the websites of such project due to the technical difficulties such as the necessity of converting the information jotted on the notebook into the text format, many CS websites not accepting valid observations without photographs etc. Concerns about disclosing locations of plants and animals leading to the

exploitation by the parties with vested interest, losing enjoyment offered by the informal NW after joining more formal and competitive CS and consumers including professional researchers not giving proper citation while using public generated data available on the CS websites following creative common license also came out as reasons for NW participants keeping a distance from the CS projects. This response of NW attendees resonates with what many CS researchers have reported from different corners of the world- data being an asset of the current century, CS may be seen as a "renewed neoliberal approach" for taking advantage of citizens by making them work for free (Vohland et al., 2021).

NW are evolving into an informal but effective medium for gathering, sharing experiences, communicating and educating the science of environment and conservation, improving the quality of tourism activities etc., especially in the urban and peri-urban regions of India. As a place-based education system NW can cultivate environmental stewardship by elucidating the interplay between history, culture, lifestyle etc. under the lens of the ecology of the participant's environment (Van Der Grinten, 2019), and giving meaning to the local places and strengthening the relationship with it through placemaking and place-shaping (Bertling, 2018; Schild, 2016). A well-managed NW could also function as a watchdog for protecting resources present in an ecosystem. For instance, the local citizen groups keeping an interest in environmental issues such as walkers, birders etc. played a crucial role in the restoration and fought cases to save the lakes and marshlands of Bengaluru from encroachment (Nagendra, 2016). However, if not managed properly NW can become an epicentre of mis- and dis-information. Sometimes the information shared during the walk could be biased or wrong as it is based on the understandings, worldviews and memories of the guide and participants. The inexperienced nature walkers may copy and spread such information orally communicated by the guide and influential participants they trust. Furthermore, many guides are social media influencers and could decide the choices of the participants (Fatima,

2024). The chance of formation of echo-chambers and filter-bubbles (Bruns, 2017; Cinelli et al., 2021) amongst the NW participants restricting the discussions only to the points they like manifold this fear. Our exploration strengthens these arguments since NW in Bengaluru was dominated by nature lovers and citizen scientists and same individuals were observed actively sharing their experience and views at different walks. Tailoring NW by incorporating diverse objectives and themes to engage participants with different interests and backgrounds, encouraging the expression of opposing view with justification and preparing guides to support such bidirectional conversations can help overcome this issue in future.

The trend of organizing NW is spreading across the sites of ecological importance in both urban-rural areas (e.g. Kole Birders Community Portal, n.d.) of India. However, no guidelines are available regarding the qualification of the guides, structure of the events and the financial dimensions, mechanism to store, use and share data collected by the participants, managing the conflict arising between different stakeholders involved etc. We observed heated debates with the potential to escalate into a conflict on many occasions where participants disagreed. Although guides were able to resolve such arguments in most cases there is a good chance that such issues may intensify on the online platforms and outside the venue. Also, a certain level of expertise in the subject, research methodologies, communication and management are essential to facilitate conversations between the attendants and guide the walks effectively. The leaders lacking these abilities may fail in the aim of NW, generating enthusiasm and providing a learning experience to the participants. Hence it is essential to make sure that the guides of the NW are properly prepared for their jobs. The locations of NW in Bangaluru such as parks, gardens and lakes are the places where residents from nearby apartments go for the morning and evening walks, jogging, exercise etc. If not properly managed, large groups of NW participants, mostly strangers to the natives, blocking the narrow paths present in these urban greeneries or overenthusiastic and uncontrolled

participants disturbing the habitat and biodiversity (Ballantyne & Pickering, 2015) may end up in confrontations. Installation of a system to register the NW at the local governing bodies may help in building trust between the localities and participants/organisers. Furthermore, launching a website in the line of *CitSci projects* (a platform showcasing the citizen science initiatives in India) dedicated for NW could function both as a platform for exchanging relevant information between various stakeholders from different states of India associated with such events as well as a repository for the data generated by numerous NW under the licenses preferred by the uploader. Additionally, making guidelines for the organizers and participants, tutorials (both text and video) based on the focal themes and the methodologies followed by the NW, apps and other ICT and AI based tools useful for the walkers etc. on this platform may help in friction free conduction of such events. "*It was refreshing as it was different from other training programmes and environment-related activities where the experts provided a lot of information. Here, we just walked around and collected whatever we liked without any pressure to learn all the things being told*". These words of a participant cautions, formalizing NW may diminish the freedom and opportunity for the informal and free choice learning the hallmark of the NW and subsequent lessening of enthusiasm amongst the participants. Hence an approach built on responsibility, transparency, public involvement, without compromising the informality will only make the NW sustainable.

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Conclusion

NW offering opportunity for meaningful engagement between experts and enthusiasts from different cross sections of life on diverse topics related to environment is getting popularity in India post COVID-19 pandemic. Our study revealed that the newspapers in this nation discussed NW mainly in the context of ecological awareness and conservation, whereas the general public considered it as a supplement for their tourism activities while surfing the internet. The academic

community also studied NW in India as component of tourism and no study comprehending social, health and wellbeing, education and science communication dimensions this informal activity was found in the literature. Our field study focusing NW conducted in Bengaluru reiterated its potential to emerge as an effective mechanism for informal learning, environmental communication and education, tourism activities as well to promote collective action for the protection of natural resources. However, lack of availability of guidelines and policies needs to be considered while organising the NW, training guides, collecting, curating and communicating the data generated during such events, and mitigating conflicts arising between the participants other stakeholders may affect the sustainability of such events. It is expected that future scientific explorations keeping NW in the focus and deliberations involving academicians, policy makers, stakeholders and general public may result into a robust knowledge base on this informal multi-purpose collective activity and policies to manage it without losing its hallmark- the informality.

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Conflict of interest statement

The authors declare no competing interests.

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Figures

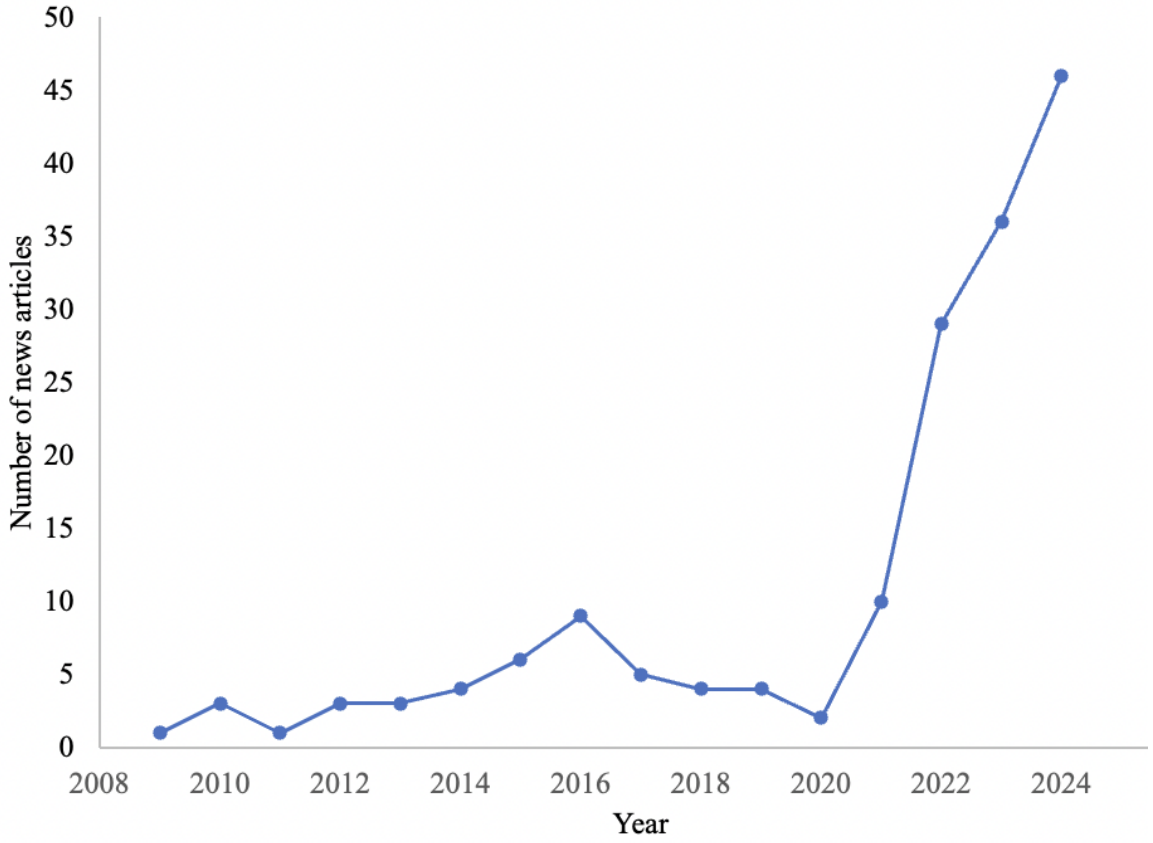


Figure 1. Number of articles on Nature Walk (NW) published by the Indian newspapers studied.

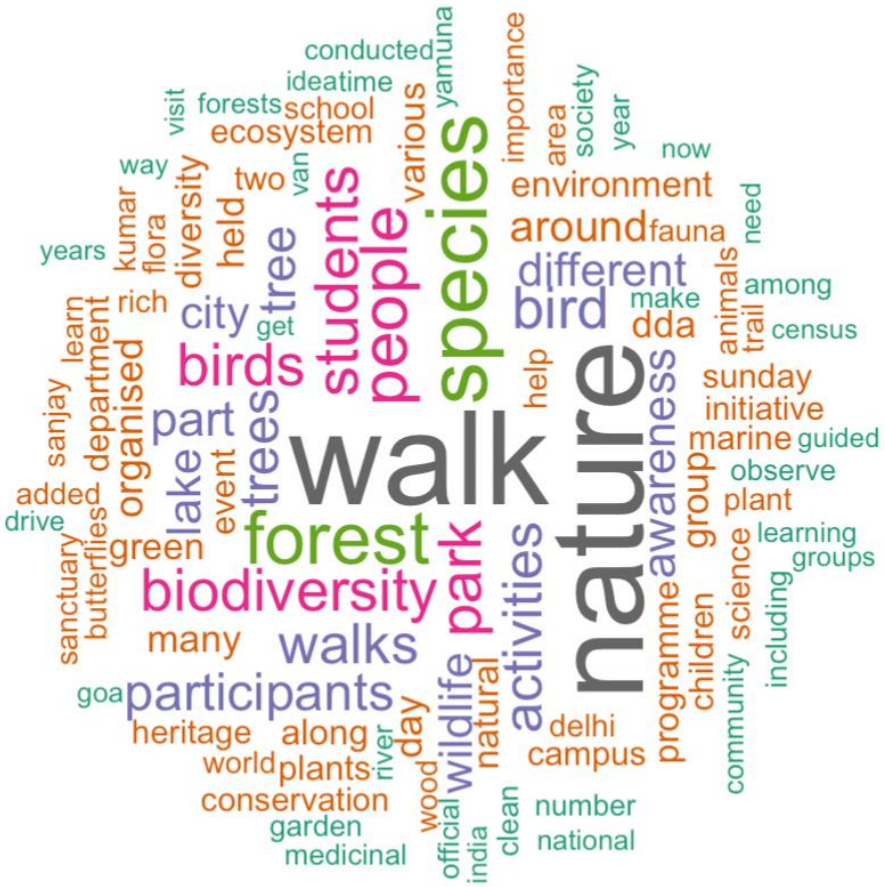
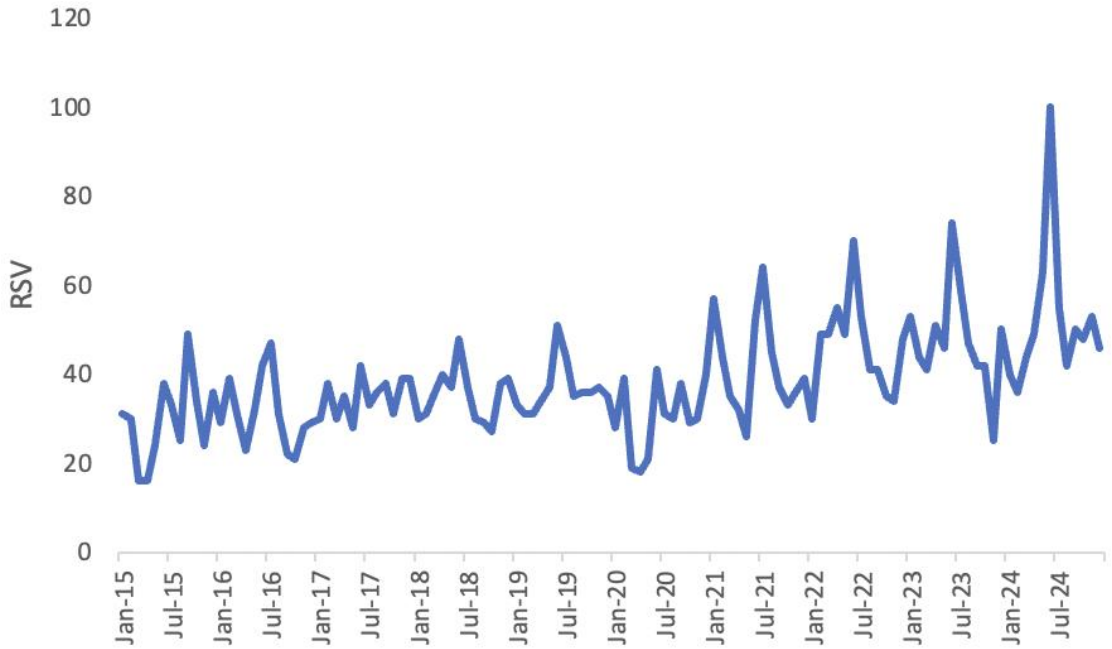


Figure 2. Word cloud of the contents of articles on nature walk (NW) published by the Indian newspapers studied.

A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B

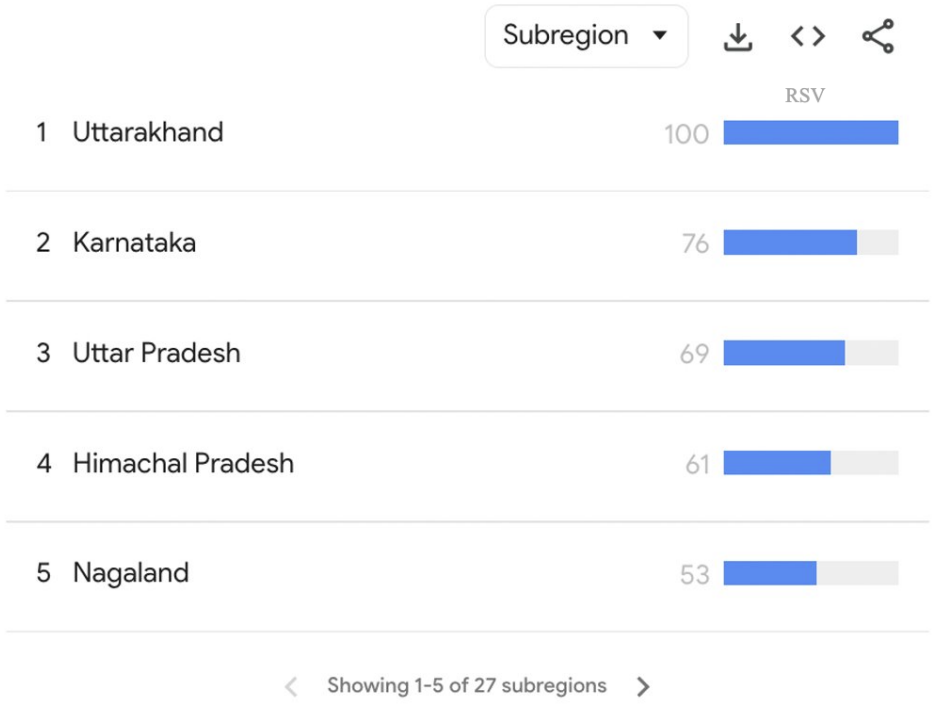


Figure 3. Relative Search Volume (RSV) of the keyword Nature Walk (NW) on Google from India (A) and five states of this nation conducted maximum search using this term (B) during January 2015 to December 2024.

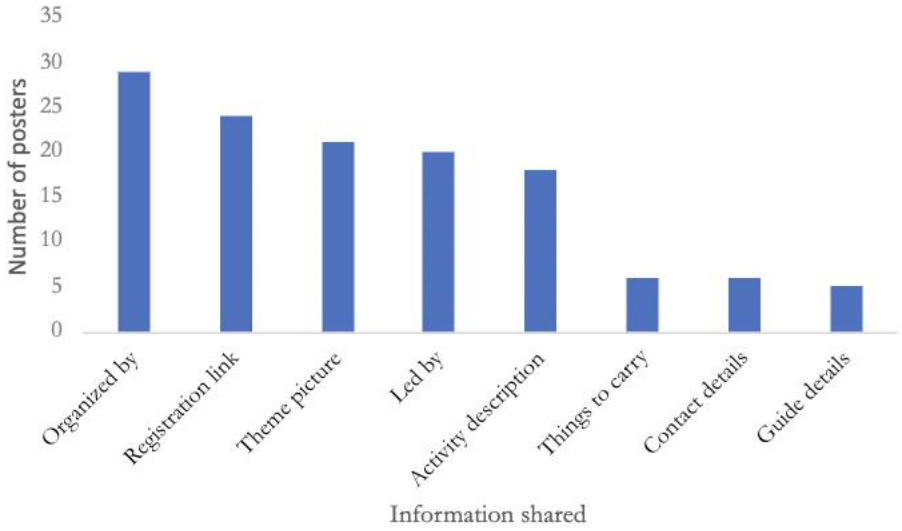


Figure 4. Common features of the posters of Nature Walks (NW) conducted in India uploaded on the three most popular social media platforms in this nation

Figure 5. Word cloud of the comments received by the posts appeared on different handles of Nature Walks (NW) in India on three popular social media platforms.

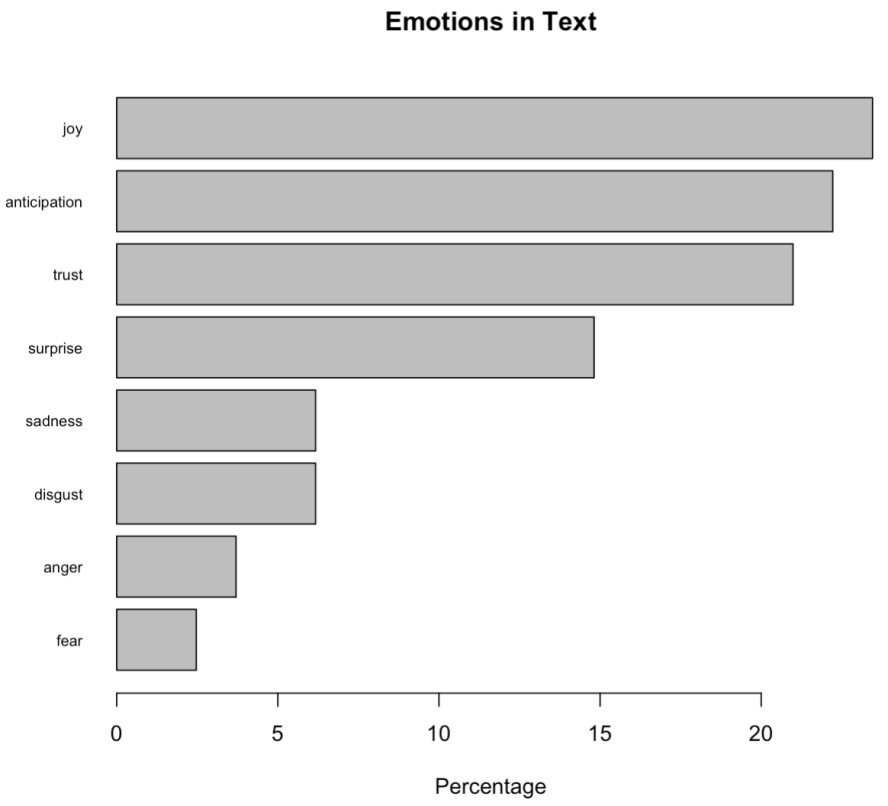


Figure 6. Emotional contents of the comments received by the posts appeared on different handles of Nature Walks (NW) in India available on three popular social media platforms.

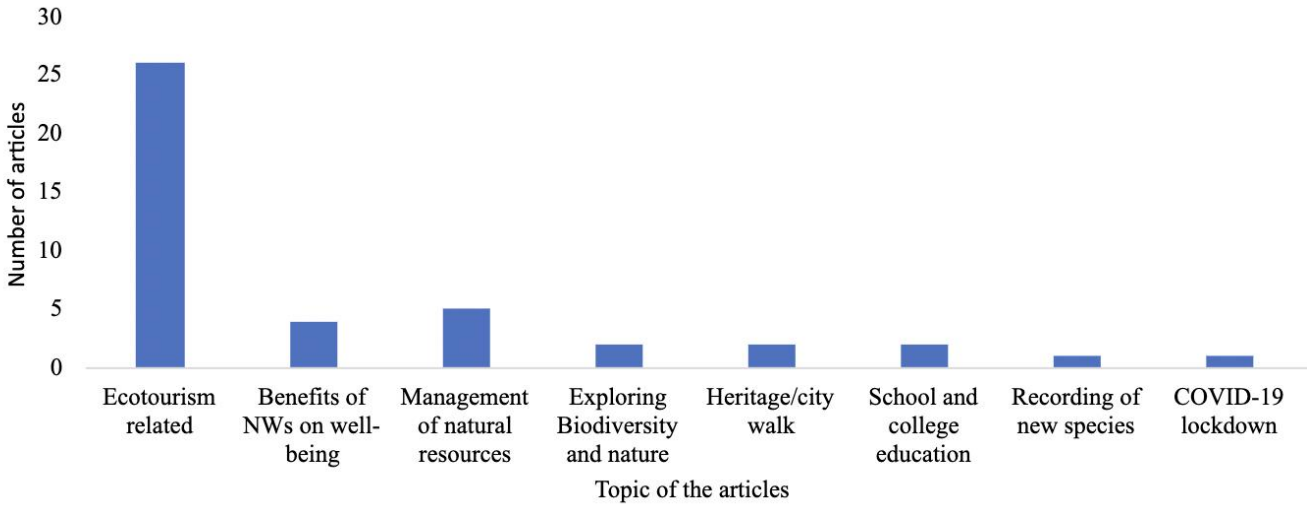


Figure 7. Contexts in which the academic publications containing 'Nature Walk (NW)' are available on three different indexing databases used this term.

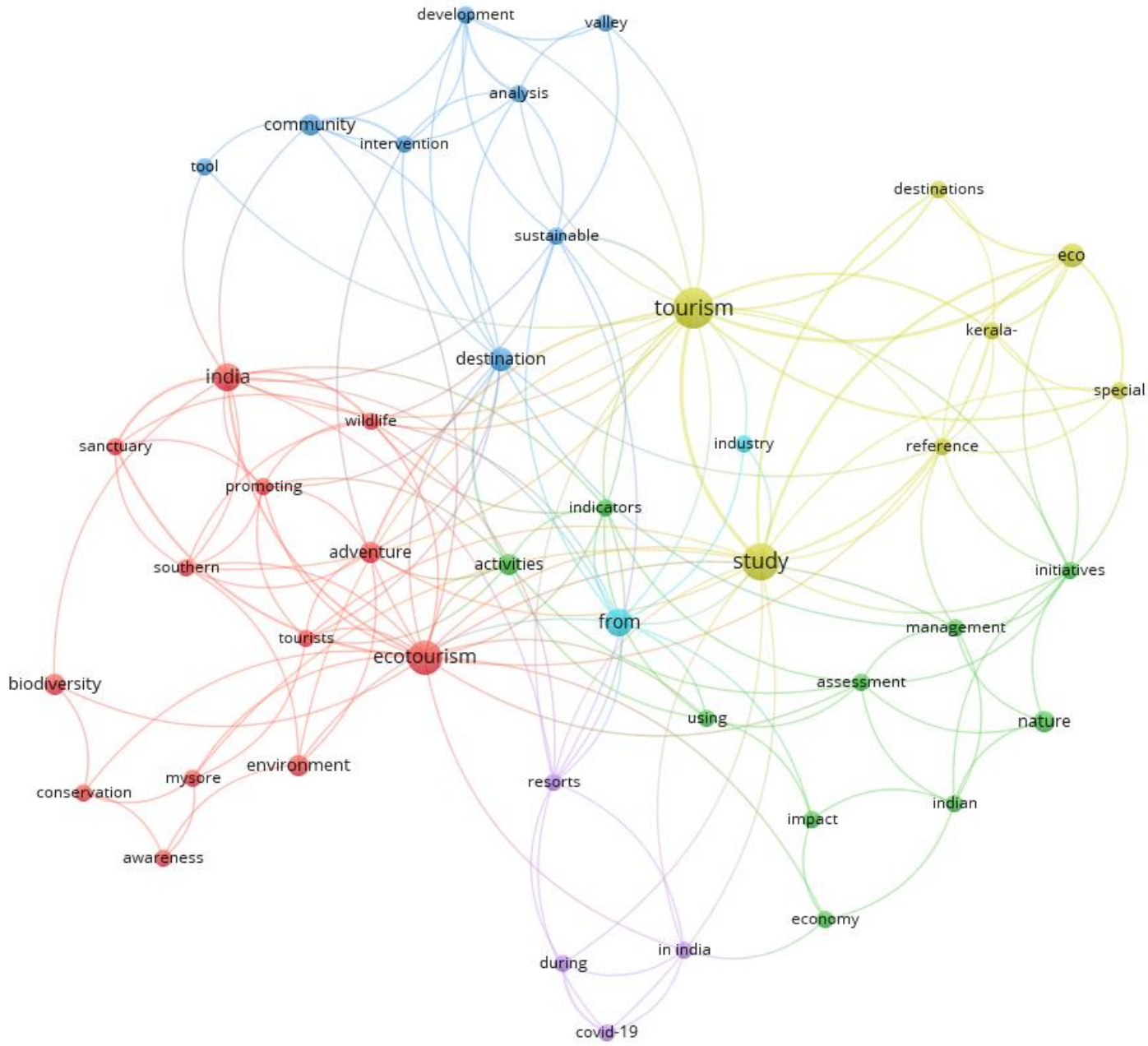


Figure 8. Co-occurrence network of the words present in the titles of the academic publications containing the term Nature Walk (NW) available on three different indexing databases.

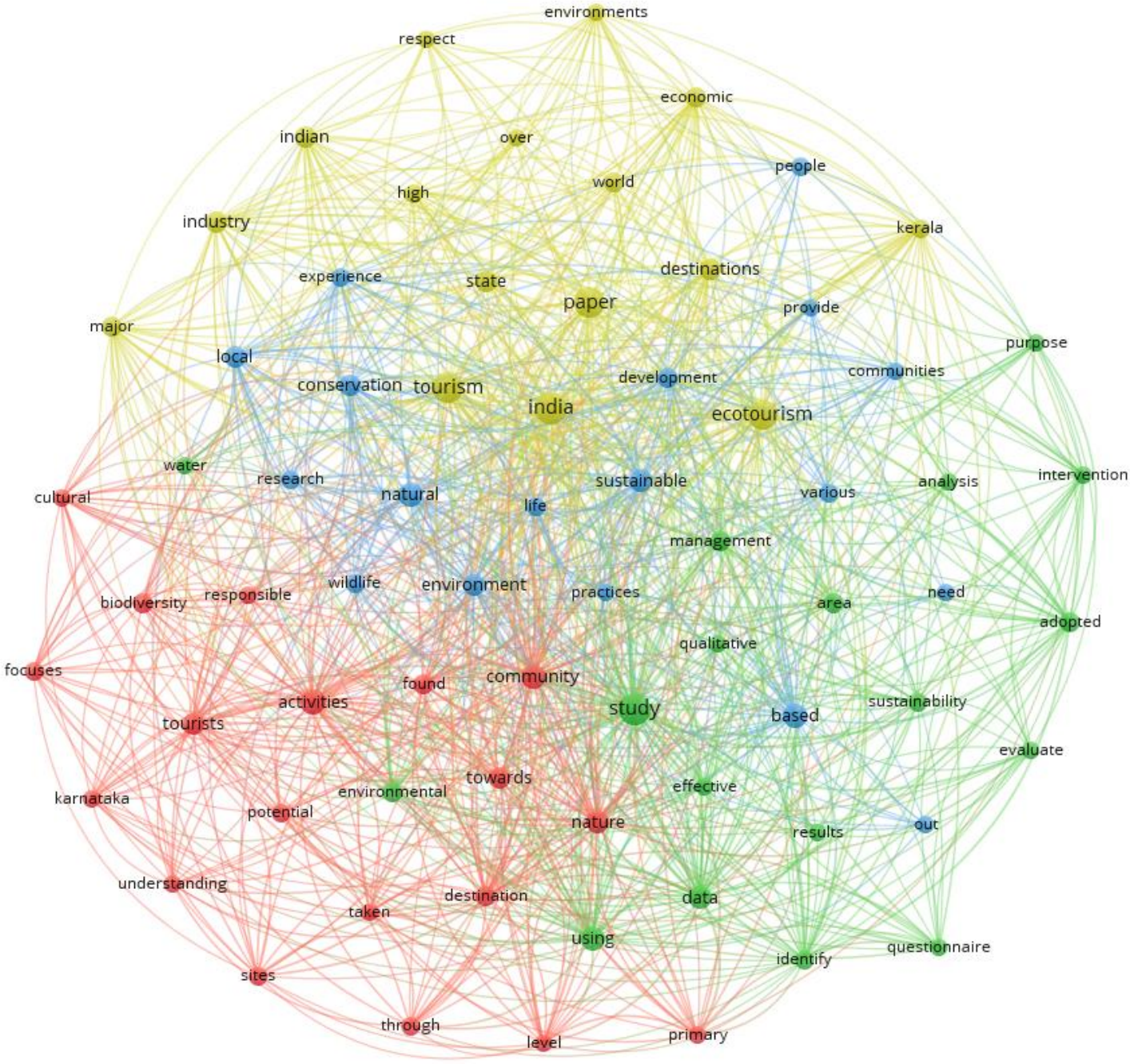


Figure 9. Co-occurrence network of the words presents in the abstracts of the academic publications containing the term Nature Walk (NW) available on three different indexing databases

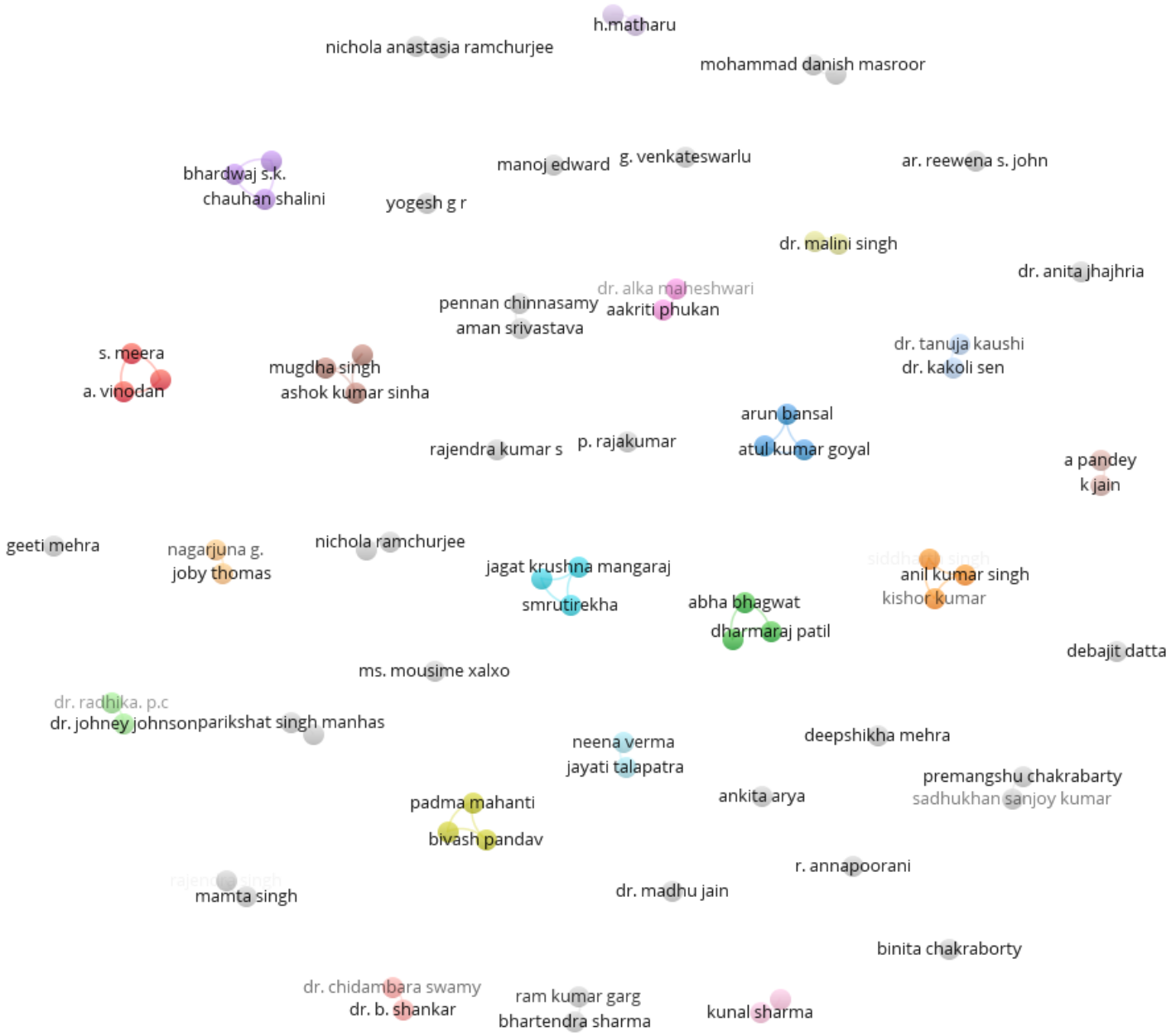


Figure 10. Co-authorship network of the academic publications containing the term Nature Walk (NW) available on three different indexing databases.

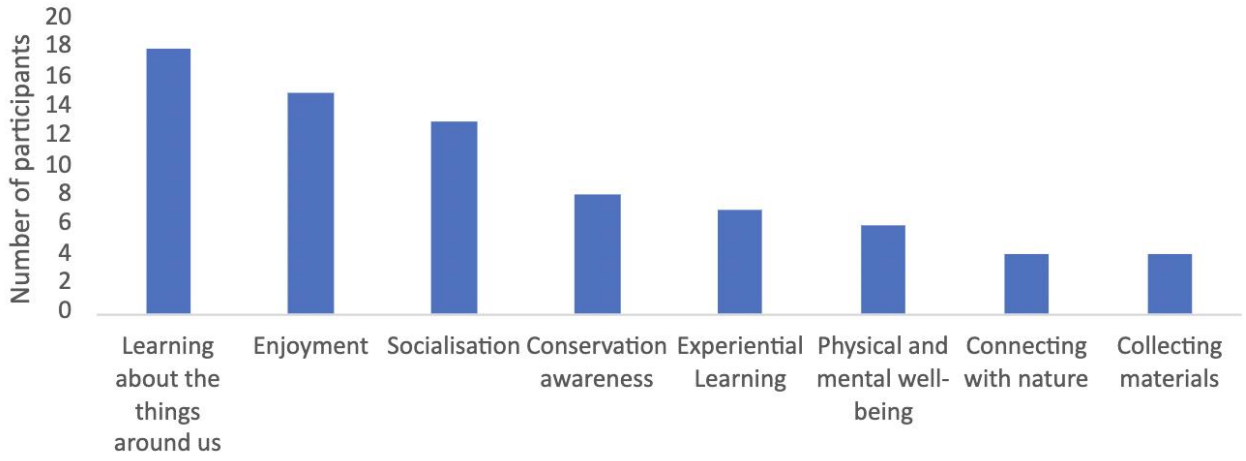


Figure 11. Different reasons disclosed by the participants (n=71) to attend different Nature Walks (NW) organized in the city of Bengaluru studied.

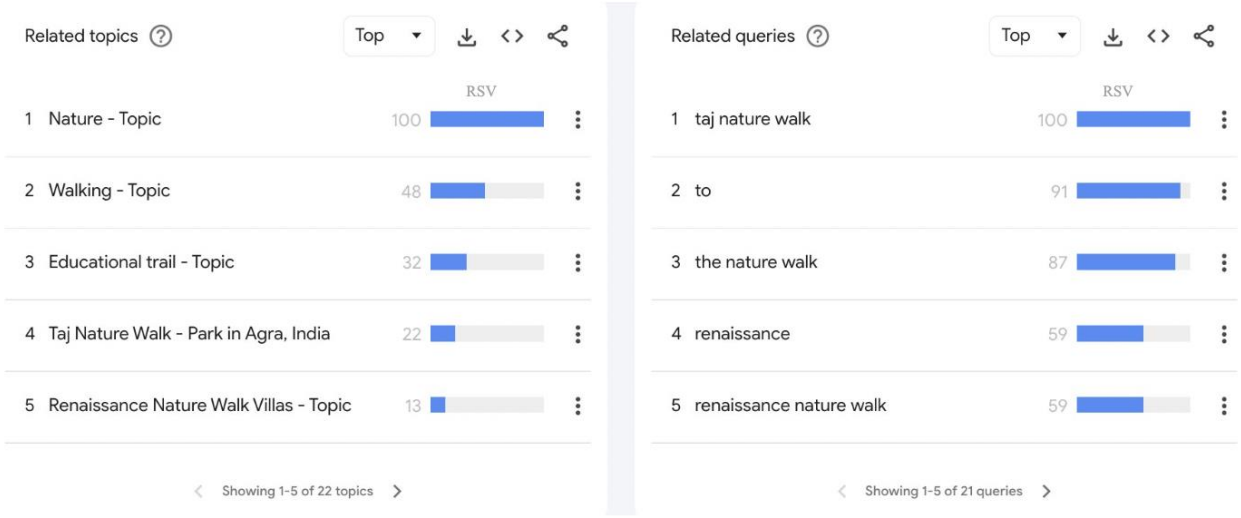
Supplementary materials

SM1: Links to the websites of Nature Walks (NW) operating from India available on the search engine Google. This data was retrieved on 3rd January 2024

- https://delhiwalks.in/club-bond-nature/
- https://www.theserai.in/kabini-resort/blogs/nature-walks-along-river-kabini.html
- https://agreenventure.in/nature-and-tree-walks/
- https://www.unhurried.in/
- https://troveexperiences.com/collections/upcoming/products/forest-bathing-nature-walk-in-bangalore
- https://www.ndns.in/events-list/
- https://www.bangalorewalks.com/
- https://ecoedu.in/category/nature-walk/

SM2: Top related topics and queries by popularity (A) and rising related topics and queries of interest (B)

A



B