



## Technology Integration and Eco-tourism Promotion for Tribal Welfare: The Case of Kerala Knowledge Economy in Digital India

Manoj P. K.<sup>1</sup>, P. S. Aithal<sup>2\*</sup>

<sup>1</sup>Cochin University of Science and Technology, Kochi, Kerala – 682022 INDIA

PDF Scholar, Srinivas University, Mangaluru, Karnataka – 575001 INDIA

Email: manojj@gmail.com- ORCID: 0000-0002-5710-1086

<sup>2</sup>Director, Poornaprajna Institute of Management, Udupi, Karnataka– 576101 INDIA

Former Vice Chancellor, Srinivas University, Mangaluru, Karnataka – 575001 INDIA

\* Corresponding Author Email: [emailathall@gmail.com](mailto:emailathall@gmail.com) - ORCID: 0000-0002-4691-8736

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### Abstract:

Despite the commendable status of Kerala State in India as a whole in the public health sphere, the health situation of the tribals in this State needs to improve even though the same is far ahead of tribals elsewhere in India. The health indices of tribals in Kerala are significantly ahead of the national average in India, yet the same are much lower than those of the non-tribals in Kerala; the latter being mostly the benchmarks at the national level and are comparable with the advanced nations of the world. Improving the health status of tribals being an issue to be addressed in a holistic manner with due regard to other health-related aspects like habitat, housing and living conditions, means of livelihood, etc.; their socio-economic and educational status including financial and digital literacy being particularly relevant, this paper follows an integrative approach to the health and living conditions of tribals and suggests strategies to improve the same to the level of the non-tribals; and for this purpose suggests the ecotourism model, especially CBET – the community based ecotourism. The pervasive use of ICT and other advances like AI, AR and VR; not only in tourism development but also in the day to day life of the tribals to enable digital financial inclusion, digital healthcare etc. is suggested for the health and other living conditions of the tribal population in Kerala.

## 1. Introduction

Relative superiority of the State of Kerala in the public health front is widely recognized and this State is far ahead of the national average in respect of India as whole. Kerala's public health situation as above has been continuing even during the ongoing Post-Covid scenario, as was the case before Covid also. Kerala's potential to effectively leverage the State's strong ICT infrastructure to strictly contain the spreading of Covid-19 is globally acknowledged also. However, despite the generally superior public health scenario in Kerala as a whole as noted above, the scenario in respect of the health conditions of the tribal population in general and tribal women in particular are far lagging behind that of the non-tribals in the State; even though their case is ahead of the tribal counterparts at the national level. In this regard, Jose et. al. (2014) have pointed out that 85 percent alone of Kerala's tribal women was able to

use the maternal healthcare facilities fully as against 100 percent of Kerala's non-tribal women; mainly due to the lower educational level and the absence of transport facilities available to the tribal women in the State [1]. Govt. of Kerala (GOK) in its recent (Jan. 2025) report Economic Review 2024 has admitted certain facts [2]. Thus, special attention needs to be given to address the health needs of the tribal groups.

Of late, GOK has also observed that waterborne disease in Kerala mainly arise due to the lack of safe drinking water in many parts of Kerala, especially in the tribal and coastal areas of the State. (Economic Review 2024, p.378) [2]. Also, health statistics on tribal health in Kerala show that they face many health risks, like, high malnutrition rates, infectious diseases, non-communicable diseases, and such other health challenges. Besides, tribals face disparities in their access to healthcare and various

unique social and economic challenges that impact their health.

### Significance of the Study

As regards many studies done earlier, one common conclusion has been that the health issues of the tribals should be addressed holistically and in an integrative manner from a broader perspective, i.e. address their health issues from their own broader and allied issues like housing and living conditions through secured livelihood which ensures economic security by way of regular earnings. This may be from gainful enterprises or occupations which in turn arises from better education and training. Besides, financial literacy equips them to avail the financial assistance from the Government by ICT means (e.g. Direct Benefit Transfer, or DBT) as in the case of the payments under MGNREGS and similar schemes under the Govt. of India (GOI). The most recent study by Manoj and Aithal (2025), has also noted the vital need for an integrative and holistic approach to solve the healthcare problems of the tribals, especially the tribal women, in a comprehensive manner [3]. Accordingly, digital financial inclusion is vital in this era which in turn needs digital literacy to effectively use ICT-based devices, like mobile phones, kiosks etc., to meaningfully derive the returns from schemes like MGNREGA as well as to effectively undertake farming and allied activities using the support of scientific inputs. Also, by associating themselves with civil society organisations (CSOs), like, the Kudumbashree project of the GOK that seeks to attain poverty alleviation as well as empowerment of its members (women) tribal women have the scope for acquiring socio-political empowerment too, and not just familial and economic empowerment alone. In this context, models like CBET (Community Based Eco-Tourism) and that too with due regard for ICT-integration assume significance. The economic empowerment is ensured from the regular earnings that is backed by secured livelihood or gainful occupation on the one hand. Financial and digital literacy together with adequate education and training supported by the collective strength of women groups ensure socio-political empowerment on the other hand (e.g. SHGs of women members under Kudumbashree). In sum, only through the overall and integrative welfare of the tribals, especially tribal women, their health issues can be duly addressed comprehensively. The special need for focusing the tribal health issue can be found in GOK's acknowledgement of the tribal health issue by stating 'Special attention is given to the health needs of groups such as tribal groups [2]. Though Kerala is far ahead of India as a whole (national average) regarding most of the vital health

parameters [like, Maternal Mortality Rate (MMR) and Neonatal Mortality Rate (NMR) are 19 and 4 for Kerala, as against 97 and 20 for India (national average)] there is an utmost need for critically analysing the much poorer health status of tribals in Kerala, especially tribal women, vis-à-vis the non-tribals. By following an integrative and holistic approach to solve the tribal healthcare from a broader perspective of CBET whereby attainment of improved health conditions becomes one among the multiple goals (housing situation, working and living conditions, livelihood options etc.) especially by associating with CSOs like the Kudumbashree initiative under the GOK. The attainment of Sustainable Development Goals (SDGs), particularly the SDG-3 that deals with Good Health and Wellbeing, demands addressing the health issues of the tribals in Kerala, especially women. Nationally, Govt. of India (GOI) has accorded top priority to all-pervasive ICT adoption (e.g. Digital India drive by the GOI, many GOI schemes insist on DBT mode of payments). So also, in Kerala, GOK strives to transform Kerala into a knowledge economy in the world [2].

The policy of 'all pervasive ICT thrust' both by GOI and GOK has given another dimension to issues of tribals in Kerala [2]. For instance, digital health (E-health) has attained top priority in Kerala and the State could duly leverage its vast ICT potential during the Covid-19 days; this is globally acclaimed too. In a state like Kerala, besides the ICT imperative (which is a global trend today), environmental preservation is vitally significant, because of an 'Ecological Overkill' that is going on in Kerala and accordingly natural resources have already been lost irreversibly [4]. Besides, the Kerala's special entitlements, like its world reputed healthcare brand of Kerala Ayurveda or the unique tribal life experience offered at En Ooru tribal heritage village at Wayanad etc. need to be duly considered while designing a holistic models for tribals in Kerala as above. In this context, this study on the relevance of CBET for holistically addressing the tribal health issues is significant, as it looks into tribal health issue from a broader context of various allied factors that influence health; thus, housing and habitat, their living and working conditions as well as their socio-economic, cultural and educational setting; also considering the immense role that ICT plays in ensuring healthcare for all in this era of e-health.

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Though Kerala is far ahead of India as a whole (national average) regarding most of the vital health parameters [like, Maternal Mortality Rate (MMR) and Neonatal Mortality Rate (NMR) are 19 and 4 for Kerala, as against 97 and 20 for India (national average)] there is an utmost need for critically analysing the much poorer health status of tribals in Kerala, especially tribal women, vis-à-vis the non-tribals. By following an integrative and holistic approach to solve the tribal healthcare from a broader perspective of CBET whereby attainment of

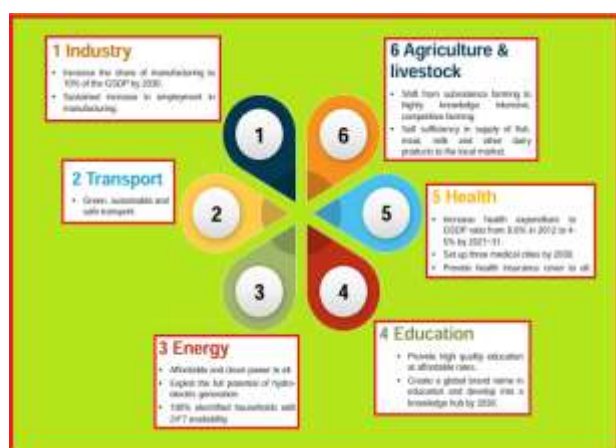
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### Analysis and Discussion

In fact, Kerala could attract global attention during the Covid-19 days by effectively leveraging and meticulously using the State's vast ICT infrastructure so as to curb the spread of this global pandemic. Before the Covid-19 pandemic (which burst out in the late 2019 and early 2020 throughout the globe), during the peak period of this global pandemic in 2020 and afterwards, and even after the devastating effects of this pandemic across the globe including the ongoing era (early 2025) the public health situation in the State of Kerala has been intact throughout. Actually, Kerala has always been far ahead of the overall scenario in India (i.e. national average of India as a whole), and at present the

State's Kerala Vision 2030 seeks to greatly augment the State's healthcare expenditure so as to increase its share as a percentage of the State's GDP (i.e. GSDP of Kerala) to the level of 4 to 5 percent by 2027-2031 period; the same being as low as 0.6 percent of Kerala's GSDP in 2012. Similar to Kerala's ambitious plans in the healthcare front to raise its share to the level of 4 to 5 percent of the State's GSDP by about 2030, as already noted (Figure 1, Item 5), Kerala has similar visions in many other sectors as well. Accordingly, Kerala seeks to increase the State's share in the manufacturing front to as high as one-tenth of its GSDP (i.e. 10 percent of GSDP of Kerala State) by the year 20230 (Item 1, Figure 1); and so also are the State's ambitious plans in allied sectors, like, Transport (Item 2, Figure 1) and Energy (Item 3, Figure) etc. Thus, Kerala State seeks to ensure clean and affordable electric power to all its households by the year 2030 and hence to attain 100 percent electrified households and that too '24 hours in 7 days' availability by 2030. In respect of another vital sector viz. Education the State seeks to provide high quality education at affordable rates and also to transform Kerala into a global knowledge hub by 2030. (Item 4, Figure 1). Regarding the primary sector in the State viz. Agriculture (including Livestock) the State seeks to migrate from sustenance agriculture to an extremely knowledge intensive and hence highly competitive farming which in turn can tremendously contribute to the State's GSDP and also garner sizeable foreign exchange earnings through the exports of high-tech agricultural produce as well. (Item 6, Figure 1). So, Kerala's public health infrastructure is sought to be developed holistically with all the allied sectors. (Figure 1).



**Figure 1.** Kerala Vision 2030 (Source: Adapted from, IBEF (2024), Kerala, State level report, Oct. p. 8)

The relatively better public health indices in Kerala than the national average for India is pointed out in recent (Jan 2025) report of the GOK [2]. Economic Review 2024, wherein a comparison of Kerala's

indices with those at the national average (India as a whole) is made. Thus, it has been pointed out that Kerala has been far ahead of India's national average in respect of most of the performance indices.

The case of maternal mortality rate (MMR) is a classic example whereby Kerala's MMR of 19 is very much lower than an MMR of 97 – India's national average. Kerala's very low MMR indicates the high level of hospitalization facilities as well as other public health infrastructure which are available in the State of Kerala as against the rest of India, and hence the very low MMR of 19 for Kerala as against 97 at the national level (India as a whole). Besides MMR, regarding many other indices too (Life Expectancy, Deaths Receiving Medical Attention, etc.) Kerala has striking superiority vis-à-vis other States or India's national average. So, Kerala's Life expectancy is at 75 years which is 5 years more than India's national average. For, males in Kerala it (71.9 years) is more than 3 years an average case of an Indian male (68.6 years); and for females in Kerala it (78 years) is over 6 years higher than the average for a typical female (71.4 years) in India. A sex ratio of 1084 in Kerala suggests that 1084 female births (i.e. 84 females more than) every against 1000 male births; whereas for India as a whole there are only 943 female births (i.e. 57 less than) every 1000 male births. Actually, Kerala is an Indian State wherein the sex ratio is over 1000, i.e. where the female child births are more than male child births. In respect of the percentage of deaths receiving medical attention, Kerala has 43.3 percent (Government) which is more than 13 percent more than India's national average of 29.9 percent. Regarding Private medical attention, the difference between Kerala (37.4 percent) and the average for India (18.9 percent) is more glaring as Kerala's status is over 18 percent more than India's average. The average growth in decadal population in India is 17.7 percent (2011 Census) whereas the respective figure in respect of Kerala is only 4.9 percent. Likewise, as against a birth rate of just 13.2 in Kerala, the same is much higher at the level of 19.5 percent, i.e. India's national average. Manoj and Aithal (2025) have noted that these public health indices of Kerala suggests the State's obvious superiority over the rest of India, in their recent paper [3]

Regarding Kerala's superior public health situation, it is worth pointing out that public health situation in respect of females is strikingly better than India's national average for females. Kerala's very low MMR of 19, Life expectancy (females) of 78 years which is more than 6 years higher than that of the India's national average, a unique sex ratio higher than 1000 are examples. Kerala's IMR (Infant Mortality Rate) is also much lower than India's

national average. Regarding the specific situation of child mortality in Kerala vis-à-vis India's national average also, Kerala's clear superiority over India's national average situation in respect of child mortality is more glaring. Accordingly, the Infant Mortality Rate (IMR) in respect of Kerala State is as low as 6 whereas for India as a whole the national average is as high as 28. Here also, as already noted above in respect of the public health situation of females in Kerala that is very strikingly different from the rest of the nation, in respect of IMR of females in Kerala too which is as low as 3, the same is as high as 28 for India as a whole (national average); the relative difference viz. 25 is much more pronounced than in respect of IMR in respect of males in Kerala where the variation is between the two is lower i.e. at the level of 18 only; the respective figures being 10 in respect of Kerala and is 28 for India as a whole (average figure). Besides, regarding the Neonatal Mortality Rate (NMR) also, there is a very striking difference between Kerala and India's national average; Kerala's NMR is only 4 whereas the same is at the level of 20 for India. Regarding the Perinatal Mortality Rate (PMR) also Kerala has got a striking superiority vis-à-vis India's national average; accordingly PMR of Kerala is 8 the it is as high as 18 for India as a whole. It is also observed that Kerala's Child Mortality Rate (CMR) is only one-fourth as that of the average for the whole of India, it being 2 for Kerala as against 8 for India. Besides, the 'Under 5 Mortality Rate' of Kerala is as low as 8 whereas it is 32 for India as a whole. Likewise, other indices of Kerala also suggest its marked superiority, like, Post NMR (2 and 8 respectively), Early NMR (4 and 15 respectively), Late NMR (0 and 5 respectively) etc. In short, Kerala's superior public health status is beyond doubt and the case of female health is more glaring; and so also are Kerala's Child Mortality indices vis-à-vis India's national average [3].

Now, considering the relative status of Kerala's tribals vis-à-vis India's tribals as a whole, it is noted that as against a sizeable 8.6 percent tribal population in India, Kerala's share is 1.45 percent. Still, while the decadal growth in India's tribal population is 23.7 percent, Kerala's decadal growth in the population of tribals is at a significantly higher level of 33.1 percent; suggesting that Kerala's tribal population is growing at a faster rate. Also, the child population of tribals in Kerala is 11.2 percent whereas the child population (tribals) is 16 percent in India (national average) – almost 4 percent higher than that of Kerala State. Strikingly, Kerala's literacy rate (tribals) of 75.81 percent is almost 17 percent higher than that of India's national average in this regard of 58.96. More striking is the literacy in respect of tribals (females) in Kerala which is as

high as 71.1 percent and is nearly 22 percent higher than the female literacy rate (tribals) of only 49.35 percent in India as a whole (national average). Regarding the male literacy (tribals) in Kerala also, there is a vast difference of more than 12 percent, the relevant figures being 80.76 percent for Kerala and just 68.53 for India as a whole (national leverage). In short, the socio-economic situation of Kerala's tribal populace is far ahead vis-à-vis India's national average in this regard.

While the fact that tribals in Kerala are characterized by a health status and socio-demographic profile which is far ahead of India's tribal population in general (i.e. national average), the fact is that the relative situation of Kerala's tribals vis-à-vis Kerala's non-tribal population is significantly lower according to the official statistics of the GOK [2]. Also, Kerala-based empirical studies too indicate this fact. For instance, a study done by Shabeer and Krishnan (2017) in Kerala in the pre-Covid era has noted a high hospitalization rate of about 127 percent for the tribal population as a whole and also that there is wide disparity among the different tribal groups, which varies from 158.27 percent (Kuruman) and 90.16 percent (Muthuvan) [5]. The very high hospitalization expenses prevalent among the Kerala's tribals, as revealed by the above field-based study is just one dimension of the health issues of tribals.

The high hospitalization rate as noted in Kerala's tribal population is duly supported by their high morbidity too. As in the case of hospitalization, in respect of morbidity too there is wide variation across the diverse tribal groups. One out of four tribals (25 percent) has got very high need for healthcare and this is the highest in respect of Mala Arayan group (43 percent). Based on the self-reported health status of tribals, as per the study of Shabeer and Krishnan (2017), over one-third of the tribals have got a 'High' need for healthcare. Also, for two groups (Muthuvan and Uraly Kuruma) such a 'High' healthcare need is felt by nearly half (46 percent) [5]. As high as 41.33 percent of the tribals feels only 'Low' healthcare need; Irular being the group with the highest share (54 percent) in this category. There is high variation across the diverse tribal groups in their healthcare needs; and their health status is relatively very high for the group Muthuvan (nearly half, 46.43 percent, have 'Very Good' status) and the same is relatively poor for the group Uraly Kuruma (30.76 percent have 'Very Bad' status). It is noted that only 6 percent of the tribals have reported their health status as 'Excellent', 27.67 percent of them have reported it as 'Very Good' and 28.67 percent as 'Good'. The rest 37.67 percent have reported their health status as either 'Bad' (27.67 percent) or 'Very Bad' (10



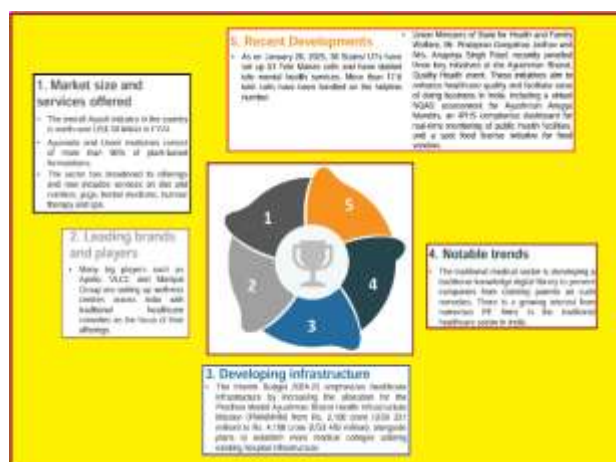
percent). So, the self-reported health status of the Kerala's tribals is poor, though their status may be better than tribals elsewhere in India.

The above analysis suggests the need for specific remedies to enhance the health situation of tribals in Kerala. Tourism models, especially CBET, is one such measure for the welfare of tribals in the State. Environmental preservation needs to be treated as a cornerstone as far as the tourism sector in Kerala is concerned, given the utmost need for ensuring sustainability in tourism initiatives. Many studies support this fact. A macro level study by Manoj P K (2008), has noted the vital need for maintaining environmental sustainability from an international view [6]. Paul and Nimmi (2022) have noted that RT (responsible tourism) clearly leads to the social, cultural, economic, cultural and environmental wellbeing of the local community; and this is very relevant in respect of tribal welfare [7]. Traditional healthcare like the unique health treatment practices of the tribals are fast re-emerging in India. (Figure 2).

There is utmost relevance of CBET for empowering the tribals, including preserving their unique health treatment methods and practices, because CBET can ensure their holistic empowerment by way of conserving and preserving their natural habitats, culture, various customs and practices etc. Keerthana and Kubendran (2025) have noted that the tribal communities in Kerala are concerned a healthcare system that suits their culture (i.e. one which is 'culturally accepted', in other words) as well as 'sensitive' too to their unique requirements and living conditions should alone be encouraged [8]. Accordingly, the above authors have suggested in their research study such a integrative system in the specific case of the palliative care for the tribal population in Kerala; their specific study being one that is related to the tribal population in Kerala who need palliative care.

Further, it is also noted that their suggestion as above is well-supported by the broad policy directions being evolved today in the healthcare front in India, in general. Or, the broad policy prescription in general, regarding the health sector priorities at the macro level that are being recommended and adopted accordingly now a days, are in line with the findings of the field-based study done among the tribals in Kerala [8]. Today, in India there is an imminent trend of the re-emergence of the traditional healthcare system. One major dimension of this trend is the process of developing a comprehensive digital library comprising of traditional knowledge, with a view to curb companies from claiming patents based on such traditional healthcare remedies. In fact, the indigenous and traditionally acquired healthcare treatments and remedies that are available with the tribal population need to be preserved to the extent possible and duly applied for their own welfare. Any encroachments into such traditional systems need to be prevented also, so that the 'culturally accepted' healthcare that they often prefer can be ensured. At the same time, the advances in modern medicine, including the treatments based on technological advancements (e-health or digital health) also need to be ensured in times of need. Tribal population being sensitive to such developments, the most appropriate blend between the traditional remedies and latest advancements in modern medicine need to be provided and that too using the immense potential of ICT and other advances like AI (artificial intelligence) including GIS (geographical information systems) and allied techniques. Moreover, as noted earlier, any healthcare intervention in respect of the tribal populace should be done in a holistic and integrative manner after duly considering their living and working environments as well as housing and habitat conditions, etc. This is due to the fact that all these factors have profound influence on the health status of the tribals. So, housing and allied conditions also need attention in the context of tribal health.

Now, considering the case of CBET (community based eco-tourism) and its capacity for tribal development in Kerala, it is noted that State's CBET focuses on responsible travels which ensure benefits to the local populace (including, tribal populations in the vicinity of some destinations) and also conserve the adjoining natural landscape. This approach of the State could offer avenues for livelihoods for the tribals (as well as other local people) in the tourism locations, mostly in ecotourism spots and responsible tourism spots in the State. Accordingly, the local people including the tribal populace would get enough opportunities for participating in various tourism management activities, such as planning,



**Figure 2: Traditional Healthcare is re-emerging in India (Source: Adapted from IBEF (2025), Feb. p.20)**

execution and day to day monitoring and control of various tourism-related tasks in the respective tourism destination. The salient features of CBET with reference to the State of Kerala include, inter alia, are the following.

(i) Involvement of Local Populace: CBET ensures that the local community in ecotourism destinations, who are substantially the tribal communities, get adequate avenues to involve in the planning and control of various ecotourism initiatives in the respective locality. Accordingly, the fruits of developments can be shared by the tribals also and that too in a sustainable manner.

(ii) Sustainability in Tourism Practices: CBET ensures the sustainability in tourism practices which in turn means minimal environmental impact as well as optimal regional economic development in the locality. Sustainability, here, also means uninterrupted livelihood as well as socio-political and other sorts of empowerment for the local community including the tribal populace in that tourism spot.

(iii) CBET Facilitates Cultural Immersion: CBET provides an avenue for cultural enthusiasts as well as tourists to get themselves 'immersed' in the special socio-cultural life of the tribals and such others. Projects like 'Ente Oooru' in Wayanad tourism spot sponsored by the Govt. of Kerala is an example.

(iv) Regular Earnings and Avenues for Livelihood: CBET ensures regular earnings to the local people, especially the tribals, and hence livelihood avenues are assured from ecotourism activities. Stability in earnings and rise in livelihood and living standards empower the tribals in the tourism locality. Such livelihood avenues are particularly relevant in protected areas e.g. Periyar Tiger Reserve (PTR) in the Idukki district and Vazhachal tourism spot in Trichur district in Kerala are examples.

(v) Conservation of Natural Resources and Biodiversity: CBET, or any other ecotourism type for that matter, seeks to conserve the bio-diversity and natural resources in the locality while at the same time ensuring that the benefits from the tourism activities reach the local community. This special feature of ecotourism in general and CBET in particular is helpful to the respective tribal populace.

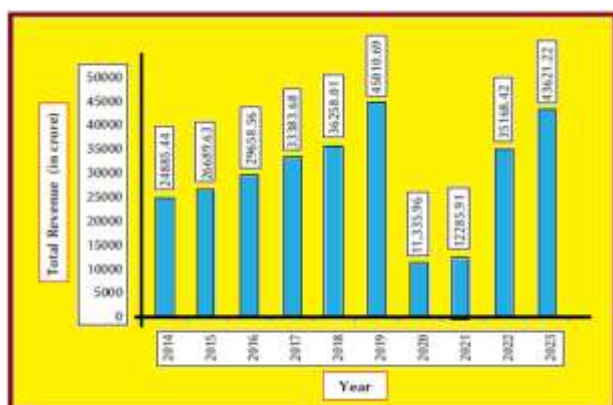
Some major examples of CBET in the Kerala context are briefly noted here. Wayanad is a northern district in Kerala that is famous for tourism in general and CBET in particular. The special features of Wayanad's CBET include wildlife sanctuaries, nature trails, eco-friendly resorts, etc. Wayanad offers opportunities for exploring the ancient petroglyphs and trekking through the forests. Wayanad is the district in Kerala with the highest share of tribal population of 18.5 percent, which in

turn accounts for over one-third of the total tribal population in Kerala. Thrikkaipetta Bamboo Village (known as 'Uravu') in Wayanad could ensure sustained rural livelihoods through tourism, by way of promoting various kinds of bamboo-based products with the help of the tourists in the locality. Idukki is the district in Kerala with the next highest share of tribals in Kerala (after Wayanad) and the renowned Periyar Tiger Reserve (PTR) is in Idukki district. PTR offers excellent potential for the growth of ecotourism, especially through the CBET model. Besides the PTR ecotourism destination in Idukki, its tourism attractions include boat rides along with sightseeing. Here, the tourists can watch various types of wildlife (elephants, deer etc.) in their own unique natural habitats and that too in an eco-friendly manner; fully supporting the efforts towards conservation. Thekkady is another very promising destination in Idukki district which is located near to the PTR spot, and tribal communities co-operate with the forest officials for initiating and developing various ecotourism projects that ensure regular earnings (livelihood) for the tribal people. Kumbalangi village in Ernakulam district is the first model tourism village in India; this village too has high prospects for being developed into a promising CBET destination in Kerala. The serene village environment here coupled with its scenic backwaters is also reputed for its unique bioluminescence in backwaters at the night (known as 'Kavaru') and it attracts foreign and domestic tourists equally well.

The vital benefits of ecotourism include its potential to empower the tribals, and hence empowering their health situation also; because health status cannot be considered in isolation with other allied factors like their living and working conditions, housing and habitats etc. Models like ecotourism in general and CBET in particular are especially suitable for the overall empowerment of tribals, including their health status, because CBET strives to conserve the natural environment as well as to preserve their indigenous culture, unique health treatment methods etc. of the tribals. Such a holistic approach as provided by CBET ensures physical, mental, emotional and social wellbeing (holistic health) of the tribals. In this regard, there is the vital need to leverage the potential of ICT to fully take advantage of CBET. Manoj et.al. (2023) "Women empowerment in digital India and the Kerala knowledge economy" has pointed out the utmost significance of using the immense potential of ICT for empowering women, and this applies to CBET too. Manoj, P.K. (2017) has pointed out that a well-designed and clearly planned strategy is required to attract the tourists into Kerala which in turn must be done by duly segmenting the tourists and targeting tourist segments with suitable 'tailor-made' products

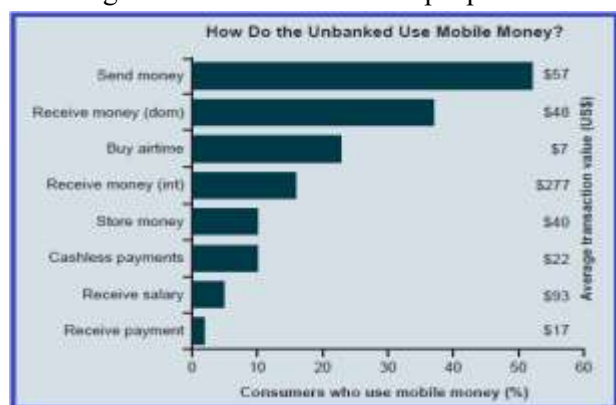
that meet the specific needs of each group (segment) [9].

For promoting CBET also, such a segmentation strategy is essential given the fact that Kerala tourism yet to recover fully to regain its pre-Covid status even in the early months of 2024, as per the official status released by the Govt. of Kerala in Jan. 2025 (Figure 3).



**Figure 3.** Total Tourism Earnings of Kerala State (2014 to 2023) (Rs. in Crore) [2]

Equally important is the need for leveraging ICT and allied technologies (like, AI, VR, AR etc.) for promotion of tourism. Sarojkumari et. al. (2023), “Health Monitoring Based Cognitive Iot Using Fast Machine Learning Technique” has clearly noted such a need. Balaji Rao P.S.V et. al. (2025), have noted the vital relevance of community resilience in urban planning and the utmost need for integrating social capital while framing development strategies [10]. Global experiences as in Philippines [11] prove the key benefits of ICT adoption. (Figure 4). All these developments show an ICT imperative in Kerala for its equitable growth, especially the holistic growth of the State’s tribal people.



**Figure 4.** ICT Adoption for Inclusive Growth – the Case of Philippines [11]

## Major Findings and Concluding Remarks

In view of the foregoing it may be noted that even though the health status of tribal communities in Kerala, is noted to be better than that of India’s national average, there is enough scope for further improvement. This in turn requires a holistic approach that ensures an overall empowerment in their living and working conditions, housing and habitats, and even their culture as well as customs and practices. The healthcare practices and treatment methods of tribals need to be preserved while at the same time ensuring modern medical facilities including the ICT-based treatments through e-health and other channels. Many research studies have pointed out the vital need for ICT-integration in healthcare as well as in tourism promotion. ICT-based promotional measures (like, in tourism, hospitality, etc.) are more environment-friendly also. In a State like Kerala, the ecotourism models in general and the CBET model in particular are very advisable for tribal development in a holistic manner, including ensuring better tribal healthcare for them. The Government should play the role as an enabler of CBET development by way of ensuring a conducive environment for its faster growth. Provision of ICT-based infrastructure facilities, including e-Health and allied services in tribal settlements would promote not only CBET but also the general socio-economic conditions of the tribals. Governmental projects like the Kudumbashree project needs to be especially encouraged to take up the cause of CBET in major ecotourism destinations in the State.

The need for promotion of financial literacy, especially digital financial literacy, among the tribal populace including tribal women, is vitally important in this ICT era while promoting models like CBET. ICT-based healthcare through means like e-Health ensures that the tribals get the benefits of modern technological advances in times of need, while at the same time preserving their own unique indigenous healthcare practices. Kerala could prove the wise use of its superior ICT-based infrastructure in the case of healthcare during the Covid-19 days, for very effectively containing the spread of the pandemic. The same ICT-based strategy be applied in tribal welfare too, including in tribal healthcare, in the future,

## Author Statements:

- **Ethical approval:** The conducted research is not related to either human or animal use.
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