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# *Recreational Value of Coastal and Marine Ecosystems in India: A Partial Estimate*

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# Recreational Value of Coastal and Marine Ecosystems in India: A Partial Estimate

**Pranab Mukhopadhyay and Vanessa da Costa**

## Abstract

*Recreation is an important ecosystem service in coastal and marine ecosystems. The methodology for valuing recreational services is well developed in the literature. To the best of our knowledge, this is the first attempt at estimating a country-wide value for this service. Using the zonal travel cost method we estimate the partial value of this service to be Rs 531.7 billion in 2012-13 for domestic tourists when consumer's surplus component is not added. Therefore, this represents a floor value. This constituted about 0.49% of the GDP (at current prices in that year). It is expected that the final value of these services will be higher than what this estimate suggests as it constitutes only what the consumers (recreational visitors) spent in their travel by way of cost of travel, accommodation and income forgone (opportunity cost). The main purpose of this exercise is to understand how these ecosystems services are valued by individuals as there is no direct way to recognize their value. It then helps us to allocate resources better and conserve natural capital.*

**Keywords:** *Recreational Services in India, Travel Cost Method, Coastal and Marine Ecosystems*
**JEL Codes**: *Q26, Q57*

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# INTRODUCTION

According to the Millennium Ecosystem Assessment (MA), coastal systems begin from the inland areas which are 100km from the coastline or 50m elevation (whichever is closer) to the coastline, to less than 50m water depth. Marine systems are waters from the depth of 50m and more to the high seas. Coastal and Marine ecosystems similarly are categorised as: (i) marine fisheries systems and inshore coastal systems; and (ii) coastal communities.

India's coastal and marine ecosystems are an integral part of our economy, society, culture and religion. About 275 million live in the coastal districts of nine maritime states (West Bengal, Odisha, Andhra Pradesh, Tamil Nadu, Kerala, Karnataka, Goa, Maharashtra, Gujarat), and four Union Territories (two in the mainland -- Puducherry and Daman and Diu, and two islands – Lakshwadeep and Andaman & Nicobar). According to the CMFRI Census 2010, there are 3,288 marine fishing villages and 1,511 marine fish landing centres. India's coastline is 8118 km long with the Bay of Bengal in the East, the India Ocean in the South and the Arabian Sea in the west. The coastal zone includes wetlands covering 40,230 sq. km., 97 estuaries, 34 lagoons, 31 mangrove areas and 5 coral reef areas (Yadava, Mukhopadhyay, and Bhatt 2015). The distribution of coastal ecosystems is as below (see Table 1):

The economic importance of coastal zones lies in the fact that they provide livelihood support to fishers, and provide benefits of commerce, navigation and recreation. Coastal and Marine fishing produced 3.32 million tonnes and inland fishing contributed 5.72 million tonnes of fish catch together contributing Rs. 780.53 billion to the GDP (at current prices) during 2012-13 (GoI 2015).

In the MA classification, ecosystems provide provisioning, regulating, cultural and recreational, and supporting services.

Provisioning services includes what humans receive as direct livelihood support in terms of food, energy resources, and medical services among others. Regulating services include coastal protection from storms and floods, shoreline stabilization, climate regulation, hydrological services, carbon sequestration, etc. Supporting services are those that provide habitat and soil formation services, and cultural and recreational services include aesthetic, spiritual, and religious values, tourism and recreation (UNEP-WCMC 2011).

In the light of the discussion in this paper coastal and marine ecosystems provide the following benefits as listed in Table 3. The rest of this paper is arranged as follows: Section briefly recounts the relevant literature on coastal and marine ecosystems – both theoretical and empirical contributions. The methodology followed for valuing recreational services using the Travel Cost method in this paper is described in Section 3 and the estimates are discussed in Section 4. The paper concludes with a short discussion in Section 5.

## LITERATURE SURVEY

It is one thing to identify the ecosystem service and know its magnitude— how much the physical flows and stocks are, but quite a different proposition to figure out how much of its use would be sustainable. An exercise in valuation is helpful in arriving at these crucial decisions. But this is easier said than done. The problem arises on two counts – a) many natural resources are not directly traded in the market and therefore do not have a direct market price, and (b) when the market price does exist, it may not reflect the true social value.

There are a number of techniques in the economist's tool-box that allow us to value natural resources but these are classified into two broad categories – the revealed preference and the stated preference methods. The revealed preference methods infer values from actual

observed behaviour and, therefore, are least controversial when observation and analysis is based on them. Stated preference methods place hypothetical but realistic situations to the respondent (consumer or producer) and infer values based on their responses.

If there are existing market prices then direct valuation can be done as in the case of fisheries. However, on other occasions proxy measures using indirect (non-market) methods come in handy. The production function approaches, the hedonic models, travel cost methods are the most popular (see Table 4).

There are various occasions when revealed preference is not feasible – specifically when markets don't exist which is very often the case when we think of environmental services. Then one does not have any option but to rely on stated preference methods. In the early years, stated preference methods were treated with suspicion. This was primarily because they were done with poor techniques, and the values generated differed widely from other revealed preference methods. However, following the National Oceanic and Atmospheric Administration (NOAA) guidelines of "good practice", norms in conducting stated preference valuation have been established (Arrow et al. 1993). Increasingly, stated preference values seem to be in the near vicinity of comparable revealed preference values (Carson 2012).

The stated preference methods have come to be synonymous with Contingent Valuation (CVM) among economists. Apart from the CVMs, contingent choice models and Conjoint Analysis Method are also used for ranking of choices (Farber and Griner, 2000).

Often, in the absence of or to compare the estimates from the methods described above, a widely used method is the value (or benefit) transfer method. Values are taken from previously done studies from

different geographical zones and contextualized to generate values for a local area.

The Total Economic Value (TEV) framework is widely accepted for resource valuation (Krutilla and Fisher 1975; Pearce and Turner 1990). It anticipates that ecosystems have multiple "use" (direct and indirect) and "non-use" benefits. To get a comprehensive estimate of the value of an ecosystem, the different benefits could be added up.

Given the huge interest in valuation studies and the manner in which some are conducted, there have been concerns that researchers need to be careful in their estimation techniques. One common error that arises is of double counting. When following the MA (MA 2005) classification, ecosystem values are summed across different categories – supporting, regulating, provisioning and cultural. This could lead to over-valuation due to double counting. Caution also needs to be exercised to distinguish between intermediate services and final services. Valuation should focus on benefits from final services (Boyd and Banzhaf 2007; B. Fisher, Bateman, and Turner 2011). For example, in the coastal and marine systems, water regulation, mangrove generation and soil formation are intermediate services whereas storm protection, clean water provision are final services that accord benefits like protection of property and life, recreation, greater fish catch, etc. (Brendan Fisher, Turner, and Morling 2009).

**Macro Estimates**

It is not possible here to summarise or even attempt a review of the literature, but it is worth mentioning that most of the studies are local and geographically specific. While this is most practical and efficient, macro level assessments assume importance especially when one is dealing with national level policies and global interventions for sustainable use of resources. The attempts at Green Accounting are an attempt in this direction. And yet National or international level studies

are still rare. An early attempt at valuing the global ecosystem service flows, which were not accounted for in the regular national income accounts, was about US$ 33 trillion per year (when the global GDP was US$ 18 trillion in 1997 at 1994 US$ US prices) (Costanza et al. 1997). Coastal and marine ecosystems which formed a part of this was estimated to be US$ 20.9 trillion per year (excluding wetlands). In 2014, the annual flow of ecosystem services was estimated to be US$145 trillion per year (in comparison to global GDP of US$ 75.2 trillion per year in 2011 at 2007 US$ prices) and coastal and marine ecosystems contributed US$ 60.5 trillion per year (Costanza et al. 2014).

**Indian Assessments**

The literature on valuation of ecosystem services in India is rather thin (Mukhopadhyay and Shyamsundar 2015; Parikh et al. 2012). The most widely used searchable compilation of peer reviewed valuation studies is the Ecosystem Services Valuation Database (ESVD) (van der Ploeg and de Groot 2010). Of the 1310 listed studies here only 62 were from South Asia and 24 from India. If one were to focus only on the coastal and marine systems, we would find 518 studies listed under the following biomes ecosystems: coastal wetlands, coral reefs, coastal and marine, which cover the following ecosystems: coastal and marine, open oceans, swamps/marshes, tidal marshes, multiple ecosystems, mangroves, coral reefs, continental shelf sea, estuaries, seagrass and algae beds, shores and salt water wetlands. India accounts for only 9 of the listed studies (Yadava, Mukhopadhyay, and Bhatt 2015).

There are some studies available outside the TEEB database. One such widely cited study concluded that mangroves reduced deaths by 54% from wind and storm damages during the super-cyclone of 1999 in Orissa (Das and Vincent 2009). A valuation exercise of Ashtamudi Estuary in Kerala, a Ramsar site by Anoop and Suryaprakash (2008) estimated the Option Value of the estuary to be Rs. 3.88 million and the present value of the estuary to be Rs. 87.1 million. The use values (direct

– fishery, husk retting, inland navigation and recreation; and indirect benefits – carbon sequestration and shrimp larvae protection) emanating from the same estuary was estimated to yield net benefits amounting to Rs. 1924 million (Anoop et al. 2008). The Coral Reefs of Gulf of Kachchh was estimated to provide ecosystem benefits worth Rs. 2200.24 million (2007 prices) at the rate of Rs. 7.95 million per $km^2$ from five services (fisheries, recreation, biodiversity and protection against salinity ingress and erosion) (Dixit et al. 2010, 2012). The recreational value of Indian Sunderbans, a UNESCO World Heritage and a Ramsar site was estimated by (Guha and Ghosh 2011) to be approximately to US$ 377,000 (in the year 2006).

There are however, no national level estimates available in India for coastal and marine ecosystems. And therefore any attempt to arrive at some estimate is an important pursuit. A consortium of researchers from the Goa University, Madras School of Economics and National Centre for Sustainable Coastal Management, are attempting to provide a consolidated estimate of coastal and marine ecosystem services in India. As part of this exercise, this paper proposes to estimate the benefits derived from recreation from coastal and marine ecosystem services.

## METHODOLOGY

The most widely used method for estimating recreational benefits is the travel cost method (TC). It relies on estimating a demand curve for visitation with respect to cost of travel. This helps in calculating the welfare value per visitor or household (depending on the unit of analysis). The utility function is integrated between the present price faced by the household for the complementary good and the choke price, i.e., the price at which the quantity demanded goes down to zero. The travel expenditure places a floor price to what the consumer is willing to pay for recreation.

A popular TC method is the Individual Travel Cost method (ITCM). For this method to work well data collection is done at the individual visitor level and relies on the visitor to make multiple visits to the same site in a specified time. The demand curve then is derived by correlating the number of visits (visitation rate) with the cost of travel to the site. If well implemented this can generate a reliable demand curve from which predictions on willingness to pay for change in quality of the site can be predicted.

Even though this method is more accurate, it is very data intensive. A less data demanding alternate method is the Zonal Travel Cost Method (ZTCM) which instead of asking how many times an individual visitor comes to a site, relies on how many visitors come from a region (also called a zone). The visitation rate from a region is estimated by dividing the number of visitors by the population of the originating region/zone. The visitation rate is expected to be dependent on the cost of travel from the region among other characteristics of that region. The empirical estimation of the demand relies on a Trip Generating Function (TGF) and the number of data points is determined (and equal to) the number of zones.

The issues that require consideration are:

(a) A suitable functional form for the TGF. Linear and log-linear forms are most oft used.
(b) Optimum number of zones: In our study the optimum number of zones was defined by the number of states for which state of origin data was available.
(c) Issue of multipoint tourists: The issue of multi-point tourists is a vexing problem in the TCM and no satisfactory solution exists in the literature. However, in our study we ourselves are dealing with a collection of multiple point visits though restricted to the coast. Effectively it reduces visits to two points – coast and non-coast. We have assumed that the amount of time and money

spent by a visitor in the coast is directly related to proportion of the population in the district.

(d) Foreign tourists: In order to incorporate foreign travelers we picked data from the 8 most popular origins of foreign visitors (apart from Bangladesh who are largely not recreational visitors). We treated the foreign visitors as multi-point visitors in India so we did not include the cost of their international travel. However, we included cost of domestic travel from the most distant state. In each state's estimate it was the state of origin with the highest distance that was used to compute their cost on travel. Since separate data is not available for country of origin in each state we clubbed all foreign tourists into one set and calculated their weighted TGF and income for the country. In order to further calibrate for over estimation we used half this value as the per capita income of an average foreign visitor as a large proportion of visitors come from countries that do not have as high a per capita income as USA or UK (like Spain or Italy). Thereafter the same calculation steps were followed as was done for domestic tourists.

(e) Zero zonal visitation rate: This was avoided by dropping zones from where there was no visitation or clubbing states to create acceptable zones.

(f) Uneven distributional variance (heteroskedasticity) in zonal data: In order to control for hetroskedasticity one could use robust standard errors to get corrected parametric values. However since in this paper we do not attempt any regression we leave this for a later occasion. This paper has a much narrower objective.

There have been some applications of the ZTCM in parts of India, namely, the Keoladeo National Park (India) (Chopra, 2004) and the Sunderbans (Guha and Ghosh, 2013). However, there is no country wide

estimate of the recreation value of coastal and marine eco-systems and this study therefore is the first such attempt.

The Travel Cost Method was introduced by Hotelling (1947). It plays on the idea that the amount of money a visitor pays for recreation is a floor value of the recreational value for the site. Like all other normal goods, visitation is expected to be inversely related to the cost of travel. The recreational demand can be estimated using travel cost after adjusting for other socio-economic factors. If travel cost increases with distance, then the distance from different zones would determine the visitation to the site. In the absence of further information, it is implicitly assumed visitors across regions have similar tastes and preferences.

**Model of Zonal Travel Cost Method**

Suppose $N_i$ is the estimated number of visitors from zone 'i' and $P_i$ is its total population. Then visitation rate for zone 'i' is defined as

$$V_i = (N_i / P_i) \quad (1)$$

The average travel cost from each zone is calculated depending on data available. Typically, if a survey was being carried out then it would be collected from the sample of visitors being interviewed from that zone. The travel cost is calculated 'per visitor' inclusive of all actual expenses from visitor's originating point, entry-fee (if any) as well as his/her opportunity cost of time. If $T_i$ is the average travel cost from zone 'i', then visitation from zone 'i' ($V_i$) is supposed to be functionally related as

$V_i = f ( T_i , Z_i)$, where $Z_i$ is a vector of variables characterizing each zone that could affect $V_i$.

The relationship between V, T and Z is known as the Trip-Generating Function (TGF). Demand function for each zone can be

obtained by putting the corresponding value of $Z_i$ in the estimated TGF. The aggregate demand can be obtained as the sum of zonal demands.

The value of the recreational services offered by the site is the Consumer Surplus (CS) of the visitor, estimated as the area under the demand curve and above the price-line representing visitors' actual travel cost.

Every zone is expected to have a 'choke-price' which represents that maximum of all the demand prices from that zone (i.e., that value of $T_i$ for which estimated $V_i$ falls to zero). If $T^0$ is the average (actual) price paid by visitors and $T^C$ is the choke-price, then consumer surplus (per thousand people, or any other scale used for computing $V_i$) is:

$$CS = \int_{T^0}^{T^C} V \, dT \qquad (2)$$

We next discuss the data used in the estimation.

**Data**

In this section we elaborate how the database was collated for estimating the Recreational Value in the 9 coastal states in India for domestic visitors. These estimates exclude estimates of Puducherry, Andaman & Nicobar, Lakshwadeep and Daman and Diu due to lack of adequate data. These estimates also currently exclude the consumer's surplus (CS) received by recreational visitors.

***Estimates***

The current exercise was to estimate recreational values for foreign and domestic tourists for the year 2012-13. This year was chosen for assessment because estimates from this exercise is expected to fit in with

and be comparable with benefit estimates from other ecosystem services being done by colleagues at MSE and the NCSCM.

Even though tourism is well developed service sector, secondary data availability in the tourism sector is still sparse for our kind of analysis. Therefore we have had to rely on numerous sources for putting these variables in a usable format. There were primary surveys conducted as part of a larger exercise across many Indian states by the Ministry of Tourism, Government of India. These however, do not cover all the coastal states and it was a one shot exercise (for details see Table 5). As the data for different states was for different years we had to extrapolate for the relevant year 2012-13. The details of methods used are described in Table 7.

In order to estimate the actual travel cost three different broad categories of expenses were computed – expense on travel, expense on accommodation and food, and opportunity cost of spending time on recreation. These three were then added to arrive at the actual total cost of travel from different zones to a particular destination. Finally, these were totaled for all the 9 states to arrive at the aggregate value for the country.

**(a) Estimation of travel expense:** This value was obtained by multiplying the distance from the state of origin to the most visited recreation site of the host state by the cost per unit (kilometer) travelled. The per kilometer rate of travel which was assumed to be Rs. 8/km -- the reason for taking Rs. 8 was that the government approved rate of travel is Rs. 16. But for long distance this was considered very high. So we decided to use half that value for estimating travel expense to balance of people travelling by different modes of travel to the host state.

**(b) Expense on Accommodation and food, etc.:** Data is available from different sources on the number of days/nights overnight visitors spend in the host state and how much on average a visitor spends there. While for three states (Karnataka, Andhra Pradesh and Maharashtra) data is available for 2009-10, for two states (Goa and Odisha) it is available for 2005-6 from surveys. We multiplied this figure (which is a common number for all originating states as there is no state-wise data available) with the per capita income of the origin state to adjust for differences in expenditure patterns.

**(c) Opportunity cost**: One of the continuing debates in empirical estimation has been the valuation of travel time – the opportunity cost of travel, much after Clawson and Knetsch (1966) raised this half a century ago. A number of approaches have been adopted in the literature to deal with this issue which fall under two broad categories: (a) exclude opportunity cost, and (b) include opportunity cost as a fraction of the respondent's wage rate (some have used 100% of forgone wages).

We have used the per capita income for 2012-13 for each originating state and multiplied it by the number of visitors to the host state. Since there is a wide range of incomes earned within each state, the fractioning of incomes is likely to have been achieved by taking the average of income of the state.

Each of the above figures was multiplied by proportion of population in coastal districts (except for Goa where this was done at the *taluka* level). The population of coastal districts was divided by the population of the state to obtain this number. It was assumed that the distribution of the recreational visitors to coastal states would follow a pattern exhibited by the distribution of population of the state. This was

further multiplied by the percentage of recreational visitors wherever this data was available.

### *Discussion and Conclusion*

The estimates for each state are presented in Table 8 below. These are floor level values as they do not include the estimates of consumer's surplus. Our estimates suggest that the extent of ecosystem services on account of recreation is about Rs. 531.8 billion in 2012-13 prices. Since we do not have any other study in India against which to benchmark our estimates we are unable to say whether our estimates are high or low at this point. In 2012-13, the contribution from "Hotels and Restaurants" in India to GDP was Rs. 1360.8 billion when India's GDP was estimated at Rs. 93888.76 billion.

Interestingly, Kerala topped the recreational services followed by Goa – both being much smaller states than their neighbours both on the eastern and western coasts. However, both these states have had the advantage of being popular and long stay tourist destinations with the bulk of the tourism concentrated along the coast. These estimates are critically dependent on the quality of the data collected from secondary surveys. The authors hope that these estimates will provide a way and encourage further research on estimation of macro estimates of ecosystem services. It is expected that the final value of these services will be higher than what this estimate suggests as it constitutes only what the consumers (recreational visitors) spent in their travel by way of cost of travel, accommodation and income forgone (opportunity cost). These estimates therefore should be treated as a partial analysis and a floor value.

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# ANNEXURE 1

**Table 1: Coastal Ecosystems in India**

| Coastal Ecosystem | Area (km2 ) |
|---|---|
| Tidal/ Mud flats | 23,621 |
| Sandy beaches/ bars/ spits | 4,210 |
| Mangroves | 4,445 |
| Coral reefs | 2,375 |
| Estuaries & backwaters | 1,711 |
| Salt marshes | 1,698 |
| Lagoons | 1,564 |
| Other vegetation (including seagrass beds) | 1,391 |
| Aquaculture ponds | 769 |
| Salt pans | 655 |
| Creeks | 192 |
| Rocky coasts | 177 |
| Total | 42,808 |

**Source:** (Parikh et al. 2012).

**Table 2: The MA Classification of Different Services**

| Type of Service | Description |
|---|---|
| Provisioning | Direct goods and services for consumption |
| Regulating | Environment modulation |
| Cultural and Recreational | Tourism, Recreation, aesthetic, and spiritual benefits |
| Supporting | Services that enable maintenance and delivery of services |

**Source:** (MA 2005).

**Table 3: Various Values Provided by Coastal and Marine Ecosystems**

| Use Values | | Non-use Values |
|---|---|---|
| **Direct Values** | **Indirect Values** | **Existence and Bequest Values** |
| Fishing | Nutrient retention and cycling | Cultural heritage |
| Aquaculture | Flood control | Resources for future generations |
| Transport | Storm protection | Existence of charismatic species |
| Wild resources | Habitat for species | Existence of wild places |
| Water supply | Shoreline stabilization | |
| Recreation | | |
| Genetic material | | |
| Scientific and educational opportunities | | |

**Source:** (Barbier 2012, 3).

**Table 4: Typology of Valuation Methods**

| | Revealed Preference | Stated Preference |
|---|---|---|
| Direct | Competitive market prices | Contingent valuation |
| Indirect | Production function<br>Travel cost method<br>Hedonic models<br>Avoided cost<br>Replacement cost<br>Factor incomes | Contingent valuation<br><br>Contingent choice<br><br>Conjoint analysis |

**Source:** (Freeman, 2003).

**Table 5: Data Sources for States' Tourist Data**

| Sr. No. | State | Data Source | Data period (Source) |
|---|---|---|---|
| 1 | Andhra Pradesh | Nielsen, ORG, and MARG (Undated) | July 2009 to June 2010 |
| 2 | Goa | (Datamation Undated) | April 2005 to March 2006 |
| 3 | Gujarat ,West Bengal, Tamil Nadu | (NCAER 2014a; NCAER 2014b; NCAER 2014c) | 2009-10 |
| 4 | Karnataka | Nielsen, ORG, and MARG (Undated) | May 2005 to April 2006 |
| 5 | Kerala | GoK (2012) | April 2009 to March 2010 |
| 6 | Maharashtra | Nielsen, ORG, and MARG (Undated) | July 2009 to June 2010 |
| 7 | Odisha | Nielsen, ORG, and MARG (Undated) | April 2005 to March 2006 |
| 8 | All states | (GoI 2014) | |

## Table 6: Foreign Tourist Adjustment Factors

| Sr. No. | Country of origin | Number of visitors in 2013 from top 8 countries | Population in 2013 | TGF=Number of visitors/Population | Per capita income in 2012-13 in USD | Per capita income in 2012-13 in INR – Rs. 62.7 for 1 USD |
|---|---|---|---|---|---|---|
| 1 | USA | 1085309 | 322,583,006 | 0.003364 | 52,980 | 3321846 |
| 2 | United Kingdom | 809444 | 63,489,234 | 0.012749 | 41,777 | 2619418 |
| 3 | Russian Fed. | 259120 | 142,467,651 | 0.001819 | 14,487 | 908334.9 |
| 4 | Canada | 255222 | 35,524,732 | 0.007184 | 52,733 | 3306359 |
| 5 | Germany | 252003 | 82,652,256 | 0.003049 | 46,255 | 2900189 |
| 6 | France | 248379 | 64,641,279 | 0.003842 | 42,627 | 2672713 |
| 7 | Malaysia | 242649 | 30,187,896 | 0.008038 | 10,628 | 666375.6 |
| 8 | Japan | 220283 | 126,999,808 | 0.001735 | 38,633 | 2422289 |
| 9 | Foreign visitors | Number of visitors | Population | Weighted TGF=(Number of visitors of a country/Totall foreign visitors)*Population of the country | Weighted Per capita income in 2012-13 in USD | Weighted Per capita income in 2012-13 in INR – Rs. 62.7 for 1 USD |
| 10 | All Total | 3,372,409 | 868,545,862 | 0.006028747 | 42065 | 2637495 |
| Source: | | (GoI 2014) | World Bank | Own calculation | World Bank | Own calculation using World Bank data |

**Table 7: Variables Used in the Estimation and their Source**

| Sr No. | Variable | Source |
|---|---|---|
| 1 | Number of visitors to each state | The data from different states was corrected to reflect 2012-13 figures by increasing each state's arrivals by a factor corresponding to the overall increase in domestic tourism arrivals into the host or recipient state.<br><br>To estimate from 2009-10 to 2012-13 we used a multiplication factor of 1.56441 and to estimate from 2005-06 to 2012-13 we used a multiplication factor of 1.665944. These were obtained from calculations based on aggregate data available in (GoI 2014, 12) |
| 2 | Number of nights spent by an average visitor, | See<br>Table 5 for details. |
| 3 | Proportion of day and night visitors | Proportion of day and night visitor data is only available for Andhra Pradesh and Maharashtra |
| 4 | Population of state/zone from which the tourist have originated | Census 2011 |
| 5 | The distance travelled | We took the distance from the state's capital (origin zone) to the most visited site in the host state using Google Maps |
| 6 | Average expenditure by each tourist (night visitors + day visitors) | See<br>Table 5 |
| 7 | Percentage of recreational visitors to coastal sites | See<br>Table 5. It was assumed that the distribution of the recreational visitors to coastal states would follow a pattern exhibited by the distribution of population of the state. |

*(Contd … Table 7)*

*(Contd … Table 7)*

| Sr No. | Variable | Source |
|---|---|---|
| 8 | Percentage of population in coastal districts | District level data was computed for the coastal states. The population of coastal districts was divided by the population of the state to obtain this number. |
| 9 | Per capita income of the state at current prices | Reserve Bank of India web site – at current prices |
| 10 | Travel expense | This value was obtained by multiplying the distance with the per kilometer rate of travel which was assumed to be Rs. 8/km. The reason for taking Rs. 8 was that the government approved rate of travel is Rs. 16. But for long distance this was considered very high. So we decided to use half that value for estimating travel expense. |
| 11 | Accommodation expense | This was calculated by multiplying the average expenditure by each tourist by the average number of days spent (e.g it was 2.8 in Odisha) to the average expenditure per day multiplied by the number of night visitors, proportion of coastal population and the percentage of recreational visitors. |

**Table 8: Estimates of Recreational Value (Travel Cost) of Coastal and Marine Ecosystems in India**

| Sr. No. | State | Total Travel Cost (Travel Expense + Accommodation Expense + Opportunity Cost) in Rs. Billion (for 2012-13) without estimates of Consumer's surplus | Total Travel Cost (Travel Expense + Accommodation Expense + Opportunity Cost) in $ Billion (for 2012-13) without estimates of Consumer's surplus |
|---|---|---|---|
| 1 | Andhra Pradesh (including Telangana) | 95.7 | 1.5 |
| 2 | Goa | 142.3 | 2.3 |
| 3 | Gujarat | 1.6 | 0.03 |
| 4 | Karnataka | 1,5 | 0.02 |
| 5 | Kerala | 209.2 | 3.3 |
| 6 | Maharashtra | 77.7 | 1.2 |
| 7 | Odisha | 3.8 | 0.06 |
| 8 | Tamil Nadu | 55.3 | 0.9 |
| 9 | West Bengal | 6.6 | 0.1 |
| 10 | **Total (9 Coastal states)** | **531.7** | **8.5** |

**Source:** Author's estimates; Exchange rate used is Rs. 62.7: $1 (www.xe.com). Rounded to nearest one decimal place.

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