

its own markup language (KML) allowing users to display and easily share their data and the easy-to-use interface and quality imagery made it impressive<sup>6</sup>.

All these platforms are virtual representation of planet Earth and enable to explore and interact with the vast amount of natural and cultural information. These virtual globes are the platforms upon which anyone may place certain kinds of images and symbolization, including pictures and videos. These are expected to coordinate and facilitate access to data from a variety of sectors and disciplines. Most of these platforms facilitate the users with limited technical skills to display, visualize, analyse (spatial query) and share information of interest to themselves and their working groups. The fast-changing newer versions are representation of major progress towards the exciting visualization possibilities.

A fairly recent technological development with features and functionalities important for school children and a general audience brings out better appreciation of the areas under browse. In this, the user gets the visual feeling like two-dimensional landscape with attribute and annotation and a variety of attractions. With inclusion of digital elevation model and virtual fly-through, one can appreciate the three-dimensional information content. The intellectual movement demands inclusion of audio to such visualization tools for greater appreciation and feeling about the data under study. The geographically dispersed data can be understood with information about the well-defined locations or information associated with a geographic footprint. For example, routing through a forested landscape or plantations in the midst of a city or town though might have similar geographic visualization, but would certainly be differentiated by the audible attribute. Likewise, when viewed from

space, most human-dominant locations appear as a sprawling mass of concrete structures of varying vertical and horizontal sizes, shapes, and constructions, interwoven with street patterns displaying regularities or irregularities<sup>7</sup>. The user might like or would appreciate a feel of the city complex, traffic conditions and other aspects of township based on audio attribute of the respective location. This will be scientifically, ethically and prospectively correct for the visualization of DE. This will provision interactive connections and will be the basic mode of making us understand and explore the Earth. The proposition is in line with Al Gore's vision of DE, which states 'navigating through both space and time to view natural, cultural and political reality installations in museums, improved access to public domain data'<sup>2</sup>. This could be achieved through listening to oral histories and music, virtual tours, speech recognition and audio capability. The intent here is to house all information with a geospatial element, so that a particular geographic location will be presented in a comprehensive DE system; obviously, that all could and should be<sup>6</sup>.

For this we need technological innovation allowing capture, store, process and display of unprecedented information about the planet and a wide variety of local details<sup>2</sup>. While available information will always be incomplete, we should take full advantage of next-generation technologies, including cloud technology, distributed networking, data mining, navigation and cloud sourcing to increase service to the public with minimum cost<sup>8</sup>. The commercial forces driving concept of DE development makes the changes fast and each user requirement highly adaptable. The notable advances in handling the Big Data interfaces will be useful for inclusion of audio attribute

to the DE system. This can be applied to many efforts and products that have come to present loosely organized international efforts to build comprehensive digital representation of the Earth. Having added audio to DE will be a contributing building-block for a permanent, continually growing and evolving global collective project that provides universal access to the world's information, geographically forming informed society.

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## Indus River dolphin: the survivor of River Beas, Punjab, India

River dolphins occupy the top position in riverine ecosystem and hence act as the fulcrum for maintaining the balance of the ecosystem. But being found in the world's most densely populated human environments, river dolphins are among

the most threatened mammals. Further, their ecological requirements link them to food and water security issues in South Asia<sup>1</sup>. Asian river dolphins have disappeared from much of the historic ranges and are believed to be declining

rapidly in many areas where they still occur<sup>1</sup>. One such species is the Indus River dolphin *Platanista gangetica minor* (Figure 1), locally called 'bhulan', which is endemic to the Indus River system and considered as the second most

threatened river dolphin after Baiji *Lipotes vexillifer*<sup>1</sup>. The Indus River dolphin was found in approximately 3400 km of Indus River and its tributaries, from the foothills of Himalayas to the limits of tidal zone in Pakistan<sup>2,3</sup>. The continuum of its distribution has been wrecked into small fragmented sub-populations. One such population was reported from Punjab (India) in 2007 between Beas city (31°30'30.5"N, 75°18'2.5"E) and Harike Barrage (31°9'6.8"N, 75°57.8'6.5"E) and is believed to be the only surviving Indus River dolphin population in India<sup>4</sup>. According to an estimate, the Indus River dolphin now occupies only one-fifth of its former range<sup>5</sup>. The species is facing challenges for its survival due to pollution, across-river constructions (e.g. dams and barrages), water abstraction and destructive methods of fishing and incidental catches into the gillnets of fishermen<sup>3</sup>. Use of its meat as food is also reported from Sindh Pakistan, hence classified as 'endangered' by IUCN<sup>6</sup>.

Historically river dolphins were found in the wide range of freshwater riverine habitats. Their upstream distribution was limited by rocky barriers and shallow river depth, whereas in the downstream they were found till the estuarine zone where salinity forms a boundary<sup>1</sup>. Populations of river dolphins have declined drastically in the past two decades and the trend still continues<sup>1,7-9</sup>. Destructive anthropological activities further intensify the pressure on their fragmented

small populations. In the current scenario river dolphins and their habitats are facing a series of problems which need to be mitigated. These problems include: (i) extensive fishing throughout their range of distribution which consequently reduces the availability of their prey; (ii) degradation of their habitat through increased sedimentation, which is usually caused due to the deforestation of river basin; (iii) industrial and human waste; (iv) agricultural run-off with high concentration of chemical fertilizers and poisonous pesticides; (v) accidental entanglement in fishing nets resulting in the death of dolphins and (vi) construction of large, cross-river structures like dams and barrages, which cause the isolation of small fragmented sub-populations and perhaps, is a major threat to river dolphins<sup>1</sup>.

The dwindling status of Indus River dolphin populations indicates the ever degrading riverine habitat. The Indus River and its tributaries run through the semiarid and irrigated agricultural landscape. Practices like water diversion into canals for irrigation and riverbed extraction further add stress to the riverine ecosystem. Riverine corridors, throughout the range of distribution of the Indus River dolphins, need protection and the direct dependency of locals on water must be reduced or diverted.

Conservation of the species requires a good understanding of its ecology and distribution. Therefore continuous and regular monitoring to assess the population status and disturbance factors responsible for the decline of the Indus River dolphin is recommended. The reckless fishing has added stress on the existing small population. Therefore we suggest that the government withdraws fishing contracts throughout its range of distribution. The stretch of River Beas from Beas city to Harike Wildlife Sanctuary needs urgent protection measures to reduce the risk of further decline in the dolphin population and focus conservation actions. The River Watch Concept which is being implemented by WWF India since 2010 in Punjab for the conservation of local freshwater biodiversity as a whole needs to be strengthened fur-

ther for the survival of this small sub-population of Indus River dolphin.

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**Figure 1.** Indus River dolphin near Village Filozla along River Beas in Punjab, India.