

Aquatic GIS Applications

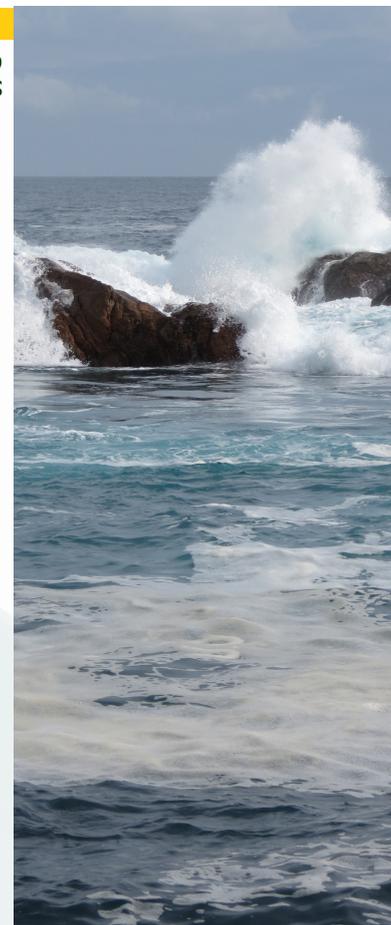
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Geographic Information Systems (GIS) are a tool for making and using spatial information from a diverse array of sources. GIS can be used for the visualisation of data, helping to analyse spatial relationships and interactions and assist in problem-solving and decision making. GIS has also opened up the underwater world of aquatic ecosystems allowing us to track and monitor the environments and species in an entirely new way.

What is GIS

Geographic Information Systems (GIS) is a system designed to capture, store, analyse, manage and present all types of geographical data (Dempsey n.d). GIS works by using spatial data to store information on different points of interest. This data can be collected in a number of ways, such as remote sensing using satellites, monitoring results and field surveys.

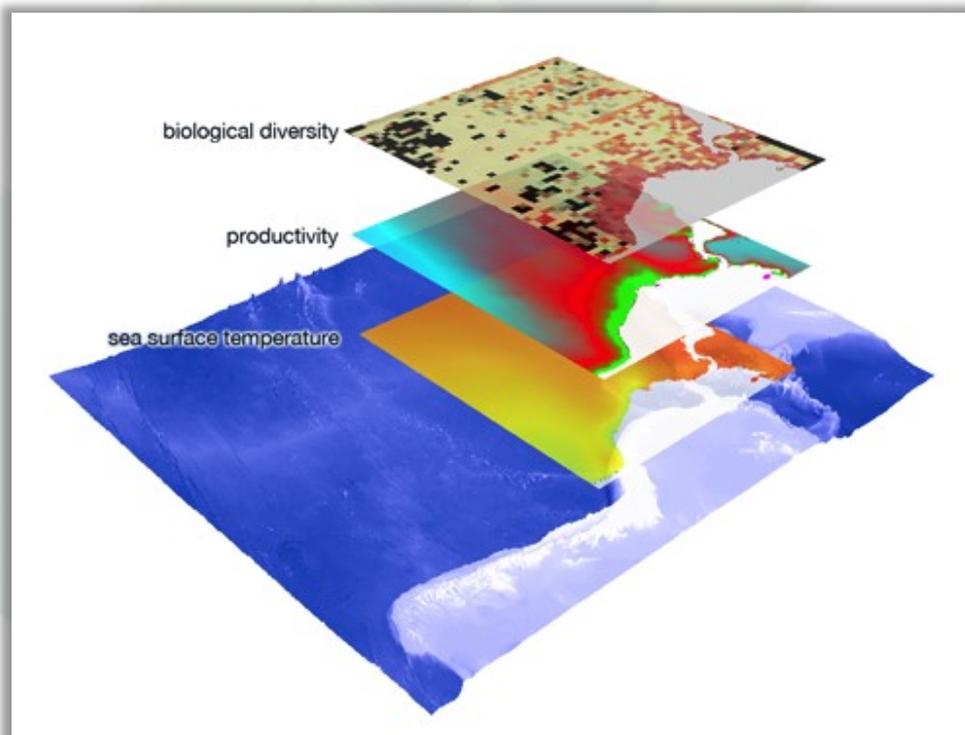
GIS uses two different data types; spatial data and attribute data. Spatial data is data that describes a location of a geographic feature. Attribute data is information which describes the characteristics of the spatial feature. For instance, a school is an example of spatial data, and any additional data on the school, such as the name, number of students and classes is the attribute data. Attribute data is usually stored within a table or database, whilst spatial data can be represented as either a raster or vector layer.



Tracking Sea Life



GIS can be used to track the movements of sea creatures, such as turtles, giving us a greater insight into their life and habits



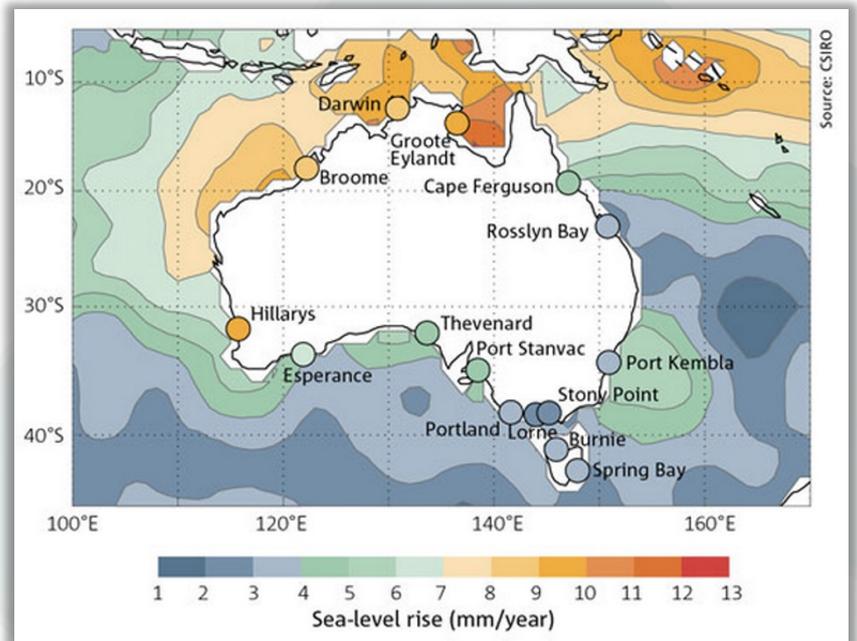
GIS allows for the combination of a number of different spatial data layers into a single image



Uses of GIS

GIS has a number of applications. At the most basic level, GIS can be used to determine the location of features and the relationships between features; however it can be used for much more than that. GIS is an excellent tool for helping with problem-solving and decision making.

In the environmental sector, GIS can be used to assist with putting together practical plans for monitoring, managing and mitigating environmental impacts, or monitoring the ongoing health or size of a specific population (Padua n.d). If enough data is available, it is also possible to use GIS to show how an area has changed over time, for example, the growth and spread of Perth City, or how an area is affected and regrows following a bush fire. Due to the ability to show spatial data visually, GIS is extremely useful when making maps and images of these changes and helping technical specialist and non-specialist communicate and develop better environmental outcomes.

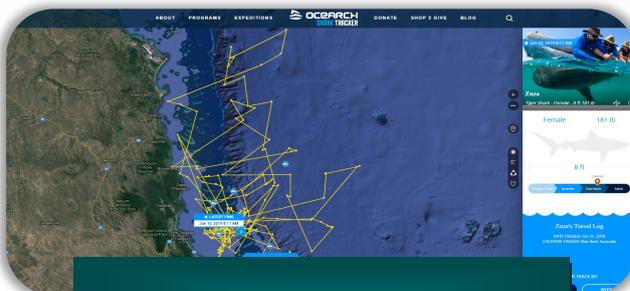


GIS can be used to predict sea-level rises

GIS for aquatic applications

As GIS can be used for many different purposes on land, it can also do the same when used in aquatic environments. In aquatic environments, GIS allows us to 'see-through' water and investigate things that are happening beneath the surface and on the seafloor.

One example of how GIS can be used in the aquatic environment is the tracking of marine mammals. Many large sea creatures such as sharks and whales can be fitted with GPS tagging devices. As the GPS gives off signals, these locations can be mapped using a GIS and, in this way, the migratory, hunting or movement patterns of these species can be tracked (Kaymaz and Yabanh 2017). Knowing this information can then assist specialists in managing populations and environments for the benefit of these creatures. Interactive, real-time tracking of sea creatures can be accessed online at:



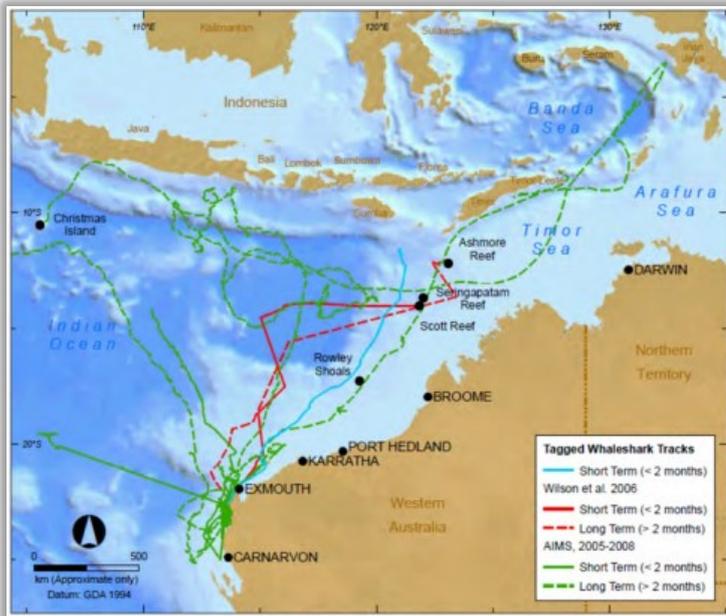
www.ocearch.org/tracker



<http://whales.smartmine.com/>



GIS can also be used to store and monitor data such as sea levels, and in conjunction with other data can provide an insight into the relationships which may occur between sea-level rise and global temperatures (Joshi, et al. 2016). Another example of the use of GIS for aquatic ecosystems is the ability to map coral reefs or seagrass beds. As data is collected over time it is then possible to determine any changes in the extent of these different habitat types.



Satellite tracking of Whale Sharks using GIS

Importance of GIS

GIS is useful for a huge range of reasons. It allows practitioners the ability to 'see' data that they wouldn't otherwise be able to access thanks to the use of satellite imagery. For example, activities such as mapping the seafloor were once near impossible until the developments in GIS technology occurred. It also allows for the combination of a range of different data types and sets so that changes or trends can be observed in any given topic. For aquatic environments, GIS gives us an insight into an otherwise largely unknown world. Without GIS understanding the dynamics of marine areas and the creatures and resources we utilise from our oceans and waterways would be largely impossible.

GIS output help to breakdown communication barrier and can bring people together to make better and more informed decisions.

GIS and Environmental Management

Without GIS, methods of environmental management and monitoring would be much more laborious and time-intensive. GIS gives us the ability to investigate areas of the world that we may not otherwise be able to explore. As technology continues to develop the ways that we are able to use GIS will continue to increase further expanding the ways we can obtain data and the applications this can have.

If you or your company is interested in exploring what GIS can do for you or implementing a GIS tool, give Integrate Sustainability a call on 08 9468 0338 or email enquiries@integratesustainability.com.au as we can provide assistance and advice on cost-effective tools and processes.

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References

- Dempsey, Caitlin. n.d. *Mapping and Geographic Information Systems (GIS)*. <https://researchguides.library.wisc.edu/GIS>.
- Joshi, Santosh R, Marc Vielle, Frederic Babonneau, Neil R Edwards, and Philip B Holden. 2016. "Physical and Economic Consequences of Sea-Level Rise: A Coupled GIS and CGE Analysis Under Uncertainties." *Environmental and Resource Economics* 813-839.
- Kaymaz, Seyma Merve, and Murat Yaban. 2017. "A review: applications of geographic information systems (GIS) in marine areas." *Journal of Aquaculture Engineering and Fisheries Research* 188-198.
- Padua, Dr. Shelton. n.d. *GIS applications in aquatic environment*. Kochi: Central Marine Fisheries Research Institute.

