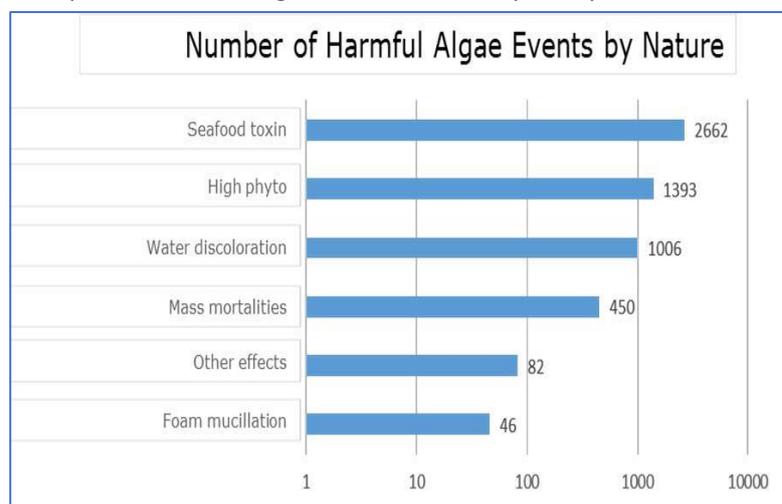


## HARMFUL ALGAE BLOOMS – TOO MUCH IS NEVER GOOD

While algae are important species in water ecosystems by recycling nutrients and thus providing food for other organisms, rapid growth of them, referred to as an algae bloom, can be harmful not only to the ecosystem itself but also to branches of the economy relying on the good quality of water.

Certain species of algae can produce toxins which, if above a concentration, can have harmful effects on **human health**. Settlements obtaining potable water from open reservoirs may face the challenge of algae blooms and related toxins in the water with the advancement of climate change. There are already a handful of cases reported when cyanobacteria produced mycotoxins that contaminated the water supply and, in order to avoid health risks including death, supply needed to be ceased until the situation resolved.

Nevertheless, toxins are not only dangerous when consumed with water, direct contact with skin or conjunctiva can also have health impacts. This phenomenon indicates that **tourism** is also impacted by algae blooms. Apart from the health impacts, harmful algal blooms can keep away tourists from a recreation destination by causing discoloration of water, accumulation of dead fishes on beaches and the smell coming from decomposition of algae and other types of biomass. While the direct economic impact is difficult to estimate, a study that records the economic losses in the tourism/recreation sector due to eutrophication of freshwater estimated at \$1.16 billion the annual value loss in the United States of America (USA).



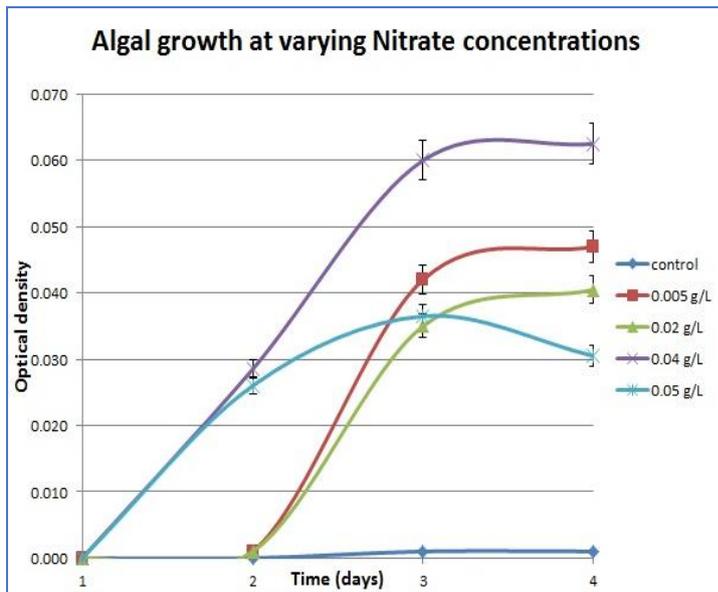
Number of Harmful Algae Events by nature reported globally during the period 1980-2015 to the Harmful Algal Events Dataset (HAEDAT)

Often, harmful algae blooms can be associated to **certain species of algae**, making monitoring targeted and focused on a group of species. For example, in Florida harmful algal blooms are linked to the activity and concentration of the dinoflagellate *Karenia Brevis* owing to a typical and easy-to-recognize shape. This algae produces brevetoxins, a form of harmful neurotoxin, released into the water. While this already means a risk, brevetoxins can become airborne, thus spreading also by wind, enhancing the risk of direct contact and irritations for everyone around the shores.

Toxins by algae are not only affecting humans, thus their presence from harmful algae blooms can damage **fisheries and restaurants** serving local sea food, too. As for brevetoxins, those cause fish mortality and the possibility of Neurotoxic Shellfish Poisoning (NSP) in humans if contaminated shellfish are eaten.

Harmful algal blooms are strongly correlated to economic losses in **fish market**, affecting both fresh and sea water **fisheries and aquaculture**. Those events can lead to loss of the whole fish stock – not only because of direct fish mortality by poisoning and oxygen depletion but fish contaminated by toxins means risk for health due to different poisoning it may cause when consumed by humans. While symptoms can have varying severity, treatment may need even hospitalization. Therefore, affected fisheries may be forced to give up trading if fish absorbs toxins presence due to algae blooms. Apart

from causing direct financial losses in the magnitude of million dollars, consumers may also shift from risky seafood leading to longer term decrease in demand.



The **ultimate solution** would be to keep under control the composition of the waterbodies and limiting the substrates of algae (such as N and P forms) to an acceptable level. However, as this is not possible in most of the cases plus accelerating climate change will provide more favourable conditions for algae blooms, **monitoring of algae growth** and timely inhibition of it can secure economic activities amid growing challenges. As most of the harms caused by blooms are associated with certain species of algae and toxins,

exposed sectors such as water supply, tourism and fisheries, need to invest into proper and online monitoring tools. These tools and solution need to become standard in order to reduce risks of algae toxins.