Source Netflix Documentary Seaspiracy: Netflix approved use.

FOCUS: ASIAN REGION

Dr. Susan Bliss Educational Consultant

Curriculum Links: Geography 7–10

Water in the World and Liveability

Biomes (Marine), Food Production and Food Security

Environmental Change and Management (Human-Induced Changes, Coast and Marine Environments and their Management, Human Wellbeing)

Elective Geography

Cross Curriculum Priorities

Asia and Australia's engagement with Asia

Sustainability (United Nations Sustainable Development Goal (SDG) 14)

Aboriginal and Torres Strait Islander histories and cultures

IMAGINE THE WORLD WITHOUT FISH

The movie 'End of the Line' claims the oceans will be fished out by 2048 impacting adversely on future food security.

About 60 years ago seas were fished to a depth of 50 metres, however with advanced technology such as the Geographical Information System (GIS) and super trawlers with deep sea long-line fishing equipment, oceans are now fished to depths of over 200 metres.

Source: https://www.nationalgeographic.com/animals/2006/11/seafood-biodiversity/

The World Bank's Director of Agriculture and Environmental Services, Juergen Voegele, said that 'supplying fish sustainably — producing it without depleting productive natural resources and without damaging the precious aquatic environment — is a huge challenge.'

Source: http://www.fao.org/news/story/en/item/213522/icode/

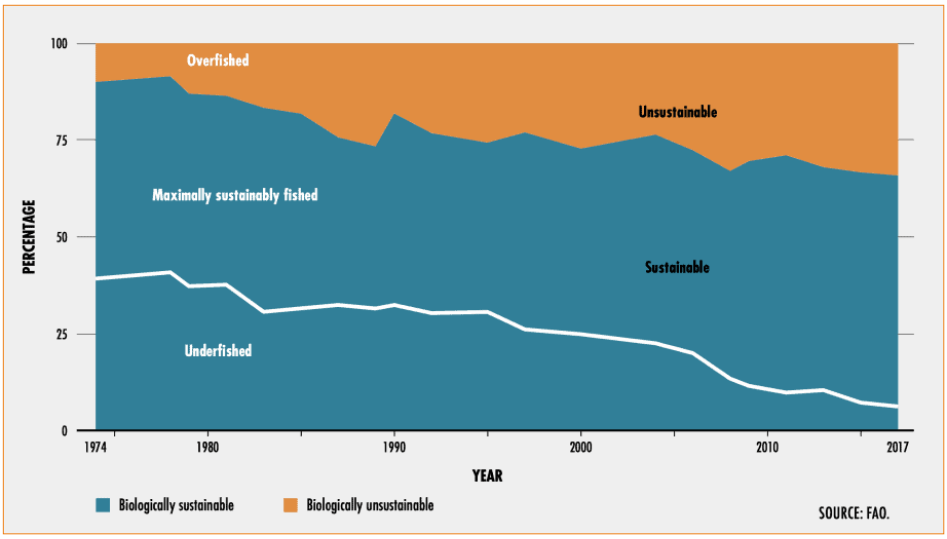
Sustainable fishing guarantees there will be populations of ocean and freshwater wildlife in the future.
https://www.nationalgeographic.org/encyclopedia/sustainable-fishing/

FAO: Status of global fishery resources

'… the fraction of fish stocks that are within biologically sustainable levels decreased from 90 percent in 1974 to 65.8 percent in 2017. In contrast, the percentage of stocks fished at biologically unsustainable levels increased, especially in the late 1970s and 1980s, from 10 percent in 1974 to 34.2 percent in 2017.'

2020 The State of the Worlds Fisheries and Aquaculture
http://www.fao.org/3/ca9229en/ca9229en.pdf

Figure 1: Global trends in the state of the world's marine fish stocks 1974–2017



From 2020 The State of the Worlds Fisheries and Aquaculture
http://www.fao.org/3/ca9229en/ca9229en.pdf and https://sustainablefisheries-uw.org/fao-state-of-world-fisheries-2020/

GLOBAL OVERVIEW 1

Human impacts

* **40% of world's oceans are severely affected by human activities**, such as pollution, overfishing and loss of coastal habitats (eg wetlands for cities).
* **80% of marine and coastal pollution originates on land** such as fertilisers, pesticides, plastics and sewage.
* 21% of fish species are deemed at risk of extinction.
* From 1974 to 2018 the percentage of fisheries within biologically **sustainable levels decreased from 90% to 65.8%**
* **The most unsustainable fisheries** are located in the Mediterranean and Black Seas (62.5% of overfished stocks), Southeast Pacific (54.5%) and Southwest Atlantic (53.3%).

Image source: Wikimedia Commons – Plastic_Pollution_in_Ghana.jpg

GLOBAL OVERVIEW 2

Ocean values

* Oceans cover **75% of Earth's surface.**
* 97% of Earth is water.
* Oceans **absorb 30% of carbon dioxide** cushioning impacts of climate change.
* 91% of ocean species are unclassified.
* 95% of the ocean remains unexplored.
* Marine resources are worth $3 trillion per year or 5% of global GDP.
* 38% of fish caught or farmed is traded globally.
* Over 3 billion people directly and indirectly depend on marine and coastal biodiversity for their livelihoods.
* Over **60 million people are directly employed by seafood production –** 85% in Asia.
* **Asia** possesses 3.1 million fishing vessels – **68% of the global fishing fleet.**
* Women consist of 14% of the people engaged in fisheries and aquaculture.
* The **fishing industry supports the livelihoods of 8% of the world's population** with most living in developing countries. The majority are small-scale, artisanal fishers and aquaculture workers.

Image source: https://www.theoceanagency.org

GLOBAL OVERVIEW 3

Challenges and action

* Since 2020, **COVID-19** emerged as a major global challenge making the fight to defeat hunger and poverty more challenging. **COVID-19 had a major impact on the fishing industry** with the closure of fishing ports and fish markets, and reduced patronage of restaurants. Impossibility of crew changes on fishing boats, lack of Personal Protective Equipment (PPE) and restricted and enclosed spaces on fishing boats, led to the spread of the pandemic amongst crew who without medical assistance, died and were frequently buried at sea. Numerous poor unemployed fishermen became victims of forced labour, bonded labour and human trafficking.
* **United Nations Sustainable Development Goal (SDG) 14** relates to **life below water** that aims to conserve and sustainably use the oceans, seas and marine resources for sustainable development. It is committed to restore fish stocks, end overfishing and **Eliminate Illegal, Unreported and Unregulated Fishing (IUUF).**
* The State of World Fisheries and Aquaculture 2020 Report is devoted to **Sustainability in Action**. The sector contributes to securing all the 17 **Sustainable Development Goals (SDG)**.

Image source: Unsplash photo-Jeremy Stenuit.jpg

WORLD FISHERIES: PRODUCTION

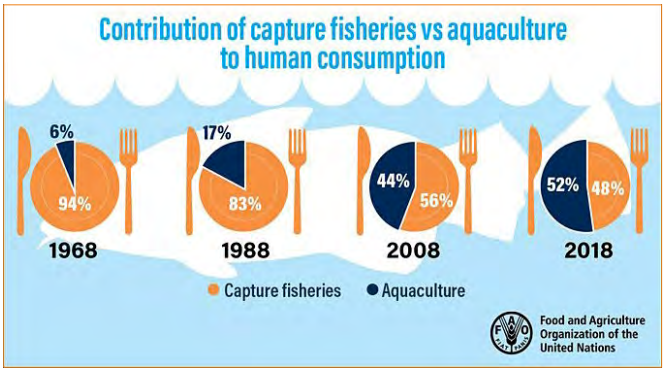
From 1990 to 2018, there was a 14% increase in global fish production and a growing trend for fisheries and **aquaculture** to provide food, nutrition and employment.

Global fish production is divided into **capture** and **aquaculture:**

- **Top fish capture producing countries: China, Indonesia, India,** Peru, Russia,USA and **Vietnam**, accounted for almost 50% of **global capture.**
- **China** accounted for 35% of global fish production and reported about 2.26 million tonnes from its "**distant-water fishery**" such as around coastal South America.
- **Asia** dominates aquaculture production. The region produced 89% of the global quantity during the last 20 years.

As population grows so does demand for fish. Aquaculture could be producing nearly two thirds of global food fish supply by 2030 in response to declining ocean stocks and increasing demand for seafood.

Figure 2: Growing importance of aquaculture



Source: FAO on Twitter https://twitter.com/faobrussels/status/1269964831467200514

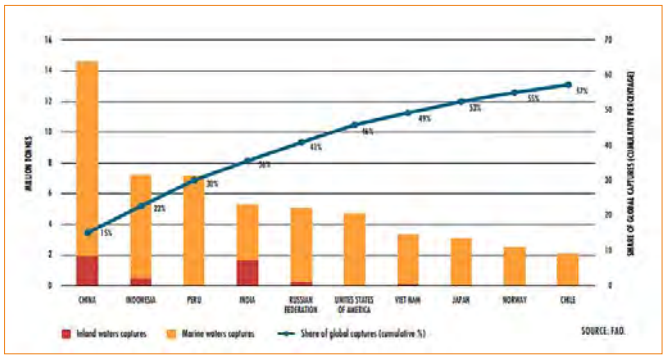
Recreational fishing

The Marine Recreational Information Program (MRIP) collects recreational fishing data and produces estimates of recreational catch. While surveys use peer-reviewed data collection and estimation methods, the statistics should not be viewed as fact…. they are estimates! For example, the exact number and species of finfish caught in saltwater by recreational anglers fishing from shore, private boats and for-hire vessels is impossible to determine.

Production dominated by Asian countries

Across Asia, 13 large marine ecosystems generate about 50% of the global marine fish catch and are a source of nutrition and employment and an essential component of economic and cultural landscapes. Currently, fisheries in these waters have declined due to coastal development, overfishing, pollution, acidification, unsustainable management and climate change. Consequently, there is an urgent need to protect and rebuild marine resources, particularly in the East and South China Seas.

Figure 3: Top 10 global Capture Producers 2018



Source: 2020 The State of the Worlds Fisheries and Aquaculture http://www.fao.org/3/ca9229en/ca9229en.pdf and https://sustainablefisheries-uw.org/fao-state-of-world-fisheries-2020/

WORLD FISHERIES: GENDER

Fishing, once considered men's work, has involved **women** throughout history. Approximately 2.1 million women are involved in **small-scale fishing** in all regions of the world. While 14% of women are employed in harvesting fish approximately 50% are employed in the post-harvest fishing sector although these statistics are debatable given knowledge is sketchy and limited.

Meryl Williams of the World Fish Centre estimates that at least 50 million women living in developing countries are employed in the fishing industry. Most live in Asia, Africa and Oceania. However, their work is often considered **'invisible'** as the macho image of the fisherman has coloured our thinking. Their fish catches are mainly located along shorelines using foot or **small, non-motorised vessels**. Most fish caught is consumed by the family with a small portion sold, making a contribution to their livelihood.

Image source: Shutterstock

Data collected about fishing frequently focuses on large-scale commercial fisheries, paying less attention to small- scale fishing activities, especially those for home consumption.

In Bangladesh approximately 60% of the fish farmers/ aquaculture farmers are women contributing to increased income and reduced poverty in coastal communities. In **Cambodia and Thailand,** the number of female fishers and boat owners is increasing.

Women play a vital role in fishing communities across Asia through fishing, mending nets, processing fish and selling or trading in markets.

Photos Shutterstock.

WORLD FISHERIES: CONSUMPTION

Currently:

- 88% of fish caught was used for **human consumption** and 12% for **non-food purposes**.
- Fish provided 3.3 billion people with about 20% of **animal protein**.
- Fish production consisted of 82.1 million tons of **aquatic animals**, 32.4 million tons of **aquatic algae** and 26,000 tons of **ornamental seashells and pearls**.
- Fish and fish products are vital for **food security** and contributed to eliminating **hunger and malnutrition.** Unfortunately, 35% of global fish harvest is lost or wasted.
- The top fish consuming countries China, Myanmar, Vietnam, Japan, India and Malaysia

Future projections:

- By **2030** the share of fish production destined for **human consumption** is expected to grow by 89%.
- Approximately 62% is anticipated to originate from **aquaculture** and Asia is projected to own 70% of global fish consumption.
- Growth in global population, expanding incomes and increased awareness of the health benefits of fish, will contribute to the expanding consumption of fish and fish products.

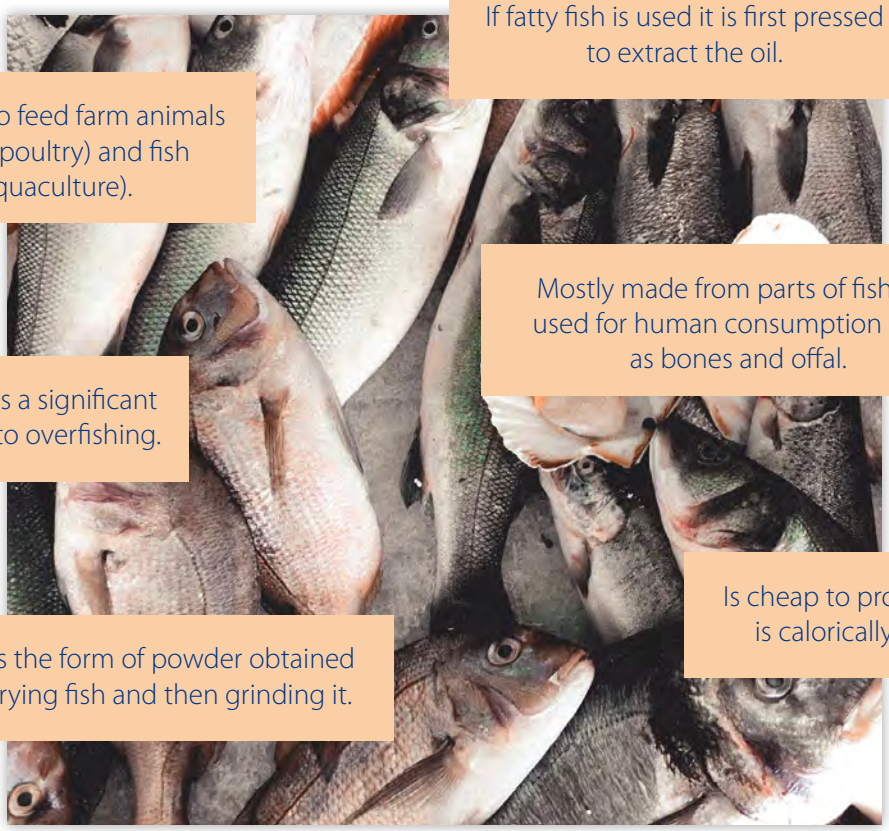
Figure 4: Reasons for increased fish consumption

Source: http://www.fao.org/state-of-fisheries-aquaculture/en/?utm_source=twitter&utm_medium=social+media&utm_campaign=fao

Approximately 25% of fish caught in the ocean does not directly end up on our plates. Instead,they are churned into **fishmeal.** Over the past fifty years the fishmeal and fish oil sector in **South-East Asia** grew significantly. This industry threatens the survival of many coastal fishing communities as more and more fish are purchased by big companies to produce fishmeal and fish oil.

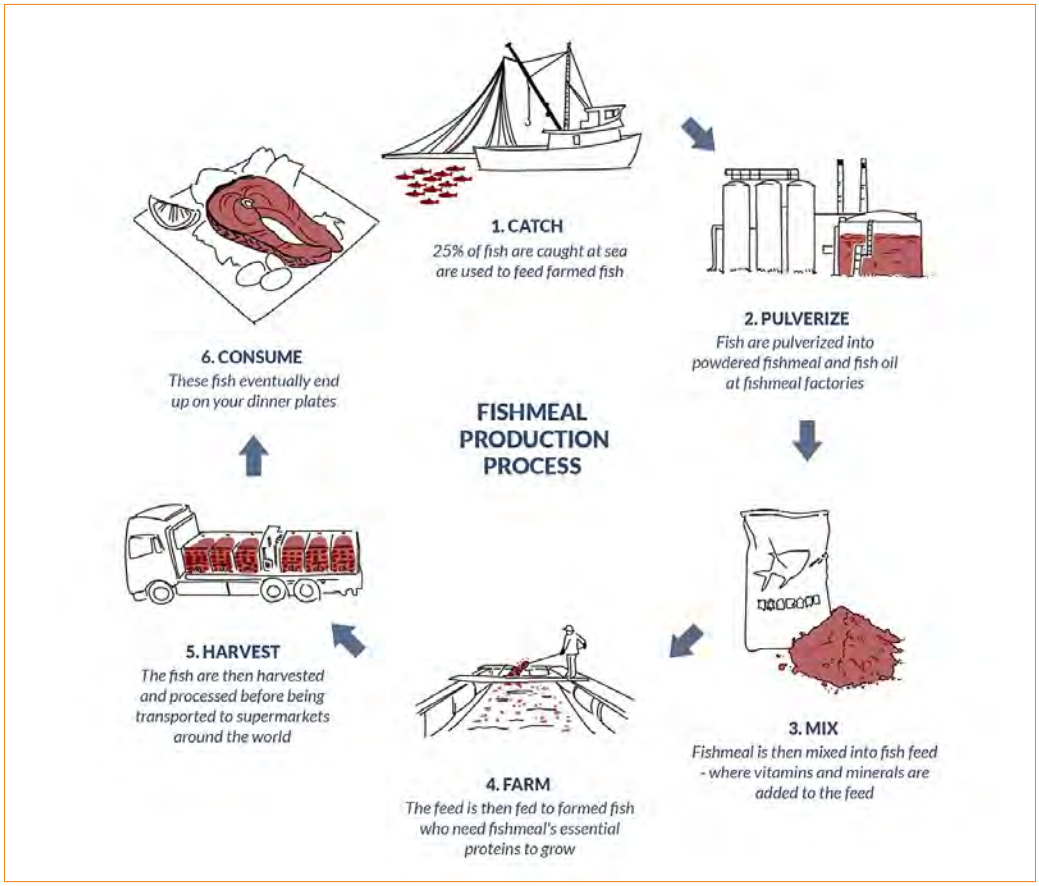
Image source: Wikimedia Commons – Dried_fish_at_Cox's_Bazar.jpg

Figure 5: What is fishmeal?



Source: https://ec.europa.eu/jrc/en/news/how-much-fish-do-we-consume-first-global-seafood-consumption-footprint-published

Figure 6: Fishmeal production for aquaculture



Source: https://globalreportingprogram.org/fishmeal/

WORLD FISHERIES: INDIGENOUS PEOPLES

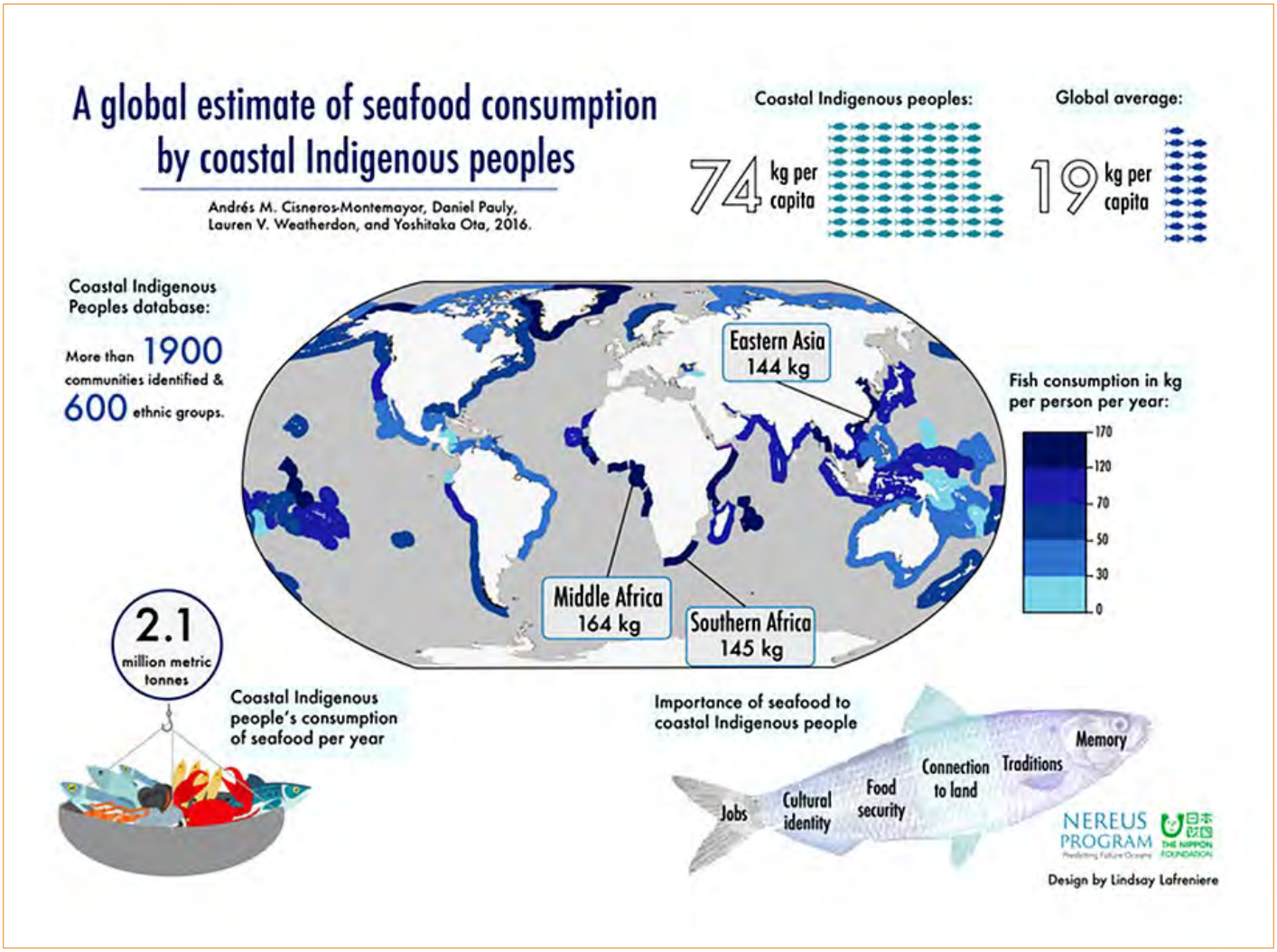
Coastal indigenous people consist of about 27 million people living in approximately 2,000 communities in 87 countries. They eat on average 15 times more seafood per person than non- Indigenous people in the same country.

For these communities the ocean provides a vital source of food and economic security while also shaping cultural heritage and spiritual values. The reliance of indigenous communities on marine resources means they are vulnerable to climate and ecosystem changes.

> *"I grew up always having salmon," Lorraine Loomis, fisheries director for the Swinomish Indian Tribal Community. The Swinomish are called the "People of the Salmon" as their culture is intertwined with the migratory salmon. Salmon feasts mark every phase of life such as naming ceremonies, weddings, funerals and memorials to the dead.*
>
> Source:https://www.washingtonpost.com/news/energy-environment/wp/2016/12/02/coastal-native-people-who-need-fish-the-most-are-losing-them/

> *The United Nations Declaration on the Rights of Indigenous Peoples recognises "the right to the lands, territories and resources which [indigenous peoples] have traditionally owned, occupied or otherwise used or acquired," should also apply to fish and oceans.*
>
> Source: https://phys.org/news/2016-12-seafood-consumption-higher-indigenous-non-indigenous.html

Figure 7: Seafood consumption by indigenous peoples



Source: https://theconversation.com/for-indigenous-communities-fish-mean-much-more-than-food-70129

Traditional fishing practices vary across Southeast Asia

People have fished sustainably across Asia for thousands of years. The Tagbanua people of the Philippines for example, use sustainable methods such as spears and hunt a variety of species at different times of the year to maintain healthy stocks of different fish.

Bajau Laut, or "sea nomads," are an indigenous group dispersed across **Indonesia, Malaysia** and the **Philippines.** They have been successful maritime traders for centuries and still live on houseboats, moving along coasts and fishing for their living. Bajau' Sea nomads' have genetically evolved to become expert divers.

Fishing, using traditional methods, is also followed by coastal communities in **India** and **Sri Lanka**. Over generations the use of traditional crafts and equipment, mostly non-mechanised, draws on **Indigenous Technical Knowledge (ITK)**. In recent years however, fishing using unsustainable methods to service fishmeal and fish oil industries is wiping out India's marine resources, upsetting marine ecology and food security. Indigenous fishing communities across India's coastal regions predict an end to fisheries in the near future.

Young Tagbanua diver with spear.
Source: https://www.nationalgeographic.org/encyclopedia/sustainable-fishing/

Traditional fishing methods: (left) The art of fishing with one leg paddling, Myanmar by Mega Caesaria and (above) Pole fishing in Sri Lanka by Daniel Klien, Unsplash.

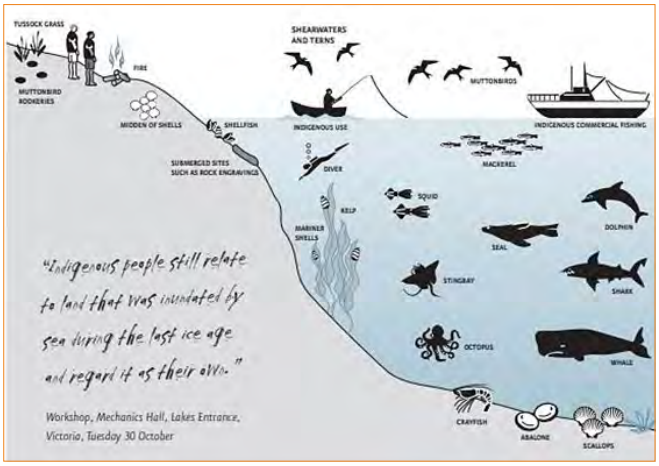
First Nation Australians: Fishing and Sea Country

'Aboriginal and Torres Strait Islanders have harvested marine species for millennia. They still do so, and via a combination of modern and traditional harvesting techniques. What is important to remember is that the cultural responsibilities and rights to harvest remain and that Australia's coasts and seas are an integral part of ongoing Indigenous connection to country and culture.'

https://www.oceanwatch.org.au/uncategorized/indigenous-and-cultural-fishing/

Ancient Aboriginal cave art of a fish. (http://archaeologynewsnetwork.blogspot.sg/2011/06/half-of-all-ancient-aboriginal-rock-art.html#.VFtCaxYkD3Q)

Figure 8: Indigenous use of oceans and marine resources in Victoria.



Source: https://www.environment.gov.au/system/files/resources/271c0bfc-34a2-4c6c-9b02-01204ebc0f43/files/indigenous.pdf

Torres Strait Islanders used large outrigger canoes that could remain at sea for long periods and hold large sea animals such as dugongs and turtles. The canoes allowed them to hunt as far south as the Great Barrier Reef. They have claimed native title for their country.

Creative Spirits, retrieved from https://www.creativespirits.info/aboriginalculture/land

Aboriginal and Torres Strait Islander Peoples view aquatic resources as part of their identity and their fishing practices as benefiting them **culturally, socially,** and **economically.**

Indigenous Australians:

- Possess traditional knowledge to maintain healthy marine ecosystems.
- Focus on the sustainable use of marine resources.
- Fish to fulfil traditional purposes and to maintain their livelihood.
- Use only the fish required to feed family. If more were caught any extra are kept alive and fresh in fish traps for later use.
- Use traditional fishing gear that does not damage the environment such as fishing rods, spears, hooks and nets. They usually use small boats with sails or oars, without an engine, while confronting competition from large or industrial-scale fisheries.

Indigenous communities are increasingly consulted in planning for the sustainable use and management of marine resources around the Australian coast through co – management with government organisations such as National Parks and Wildlife, programs such as the Indigenous Rangers Program and Indigenous communities under their rights to sea country.

WORLD FISHERIES: TRADE

In 2018, 67 million tonnes of fish were traded internationally, equating to almost 38% of fish caught or farmed worldwide.

Source: http://www.fao.org/3/ca9231en/CA9231EN.pdf

It is projected that in the future aquaculture will contribute to a growing share of international trade in fish commodities for human consumption. The bulk of the growth in fish exports is projected to originate from Asia.

Figure 9: Major fish importing and exporting countries

GLOBAL EXPORTS	GLOBAL IMPORTS
China 14%	USA 14%
Norway 7%	**China 9%**
Vietnam 5%	**Japan 9%**
Thailand 4%	Spain 5%
India 4%	Italy 4%
Chile 4%	Germany 4%
USA 4%	France 4%
Netherlands 4%	**South Korea 4%**

Information source: http://www.fao.org/3/ca9231en/CA9231EN.pdf

Live fish trade

The live fish trade refers to the live food fish trade (for human consumption) or to the ornamental fish trade (for aquariums). The live food fish trade is a global system that links fishing communities with markets, primarily in Hong Kong and mainland China. Many of the fish are captured on coral reefs in Southeast Asia or the Pacific Island nations. The live food fish trade is a lucrative business. According to University of Washington Professor Patrick Christie, live fish caught for food export earns approximately $6000 a ton.

Source: https://en.wikipedia.org/wiki/Live_fish_trade

In Hong Kong, where factory space is stacked within skyscrapers, the 15th floor of an industrial block houses vast water tanks containing thousands of rare fish that swim under UV lights. Normally found thousands of kilometres away on tropical reefs, the coral grouper is bred on land in one of the world's most densely populated metropolises to feed a local population that consumes 3.6 times the global average in seafood.

Source http://edition.cnn.com/2011/WORLD/asiapcf/02/08/reef.fish.trade/

Ornamental fish trade

Fish kept in aquariums and home tanks for aesthetic purposes, are considered **ornamental fish**. These fish encompass a wide variety of species of different shapes, sizes and colours.

Every year the ornamental fish industry is responsible for the global movement of a large number of species. About 2 million people worldwide are involved in ornamental fisheries trade. Corals, invertebrates and reef fish are shipped from Southeast Asia to predominantly USA, Europe and Japan. Singapore is one of the world's largest exporters of ornamental fishand the trading hub of Asia.

Source: http://www.fao.org/3/a-bb206e.pdf

Though the ornamental fish market's contribution to world trade is small, the sector contributes to the alleviation of poverty in developing countries as well as marine preservation. Coastal and riverine communities utilise ornamental fish, as a sustainable andrenewable resource, as well as a source of income.

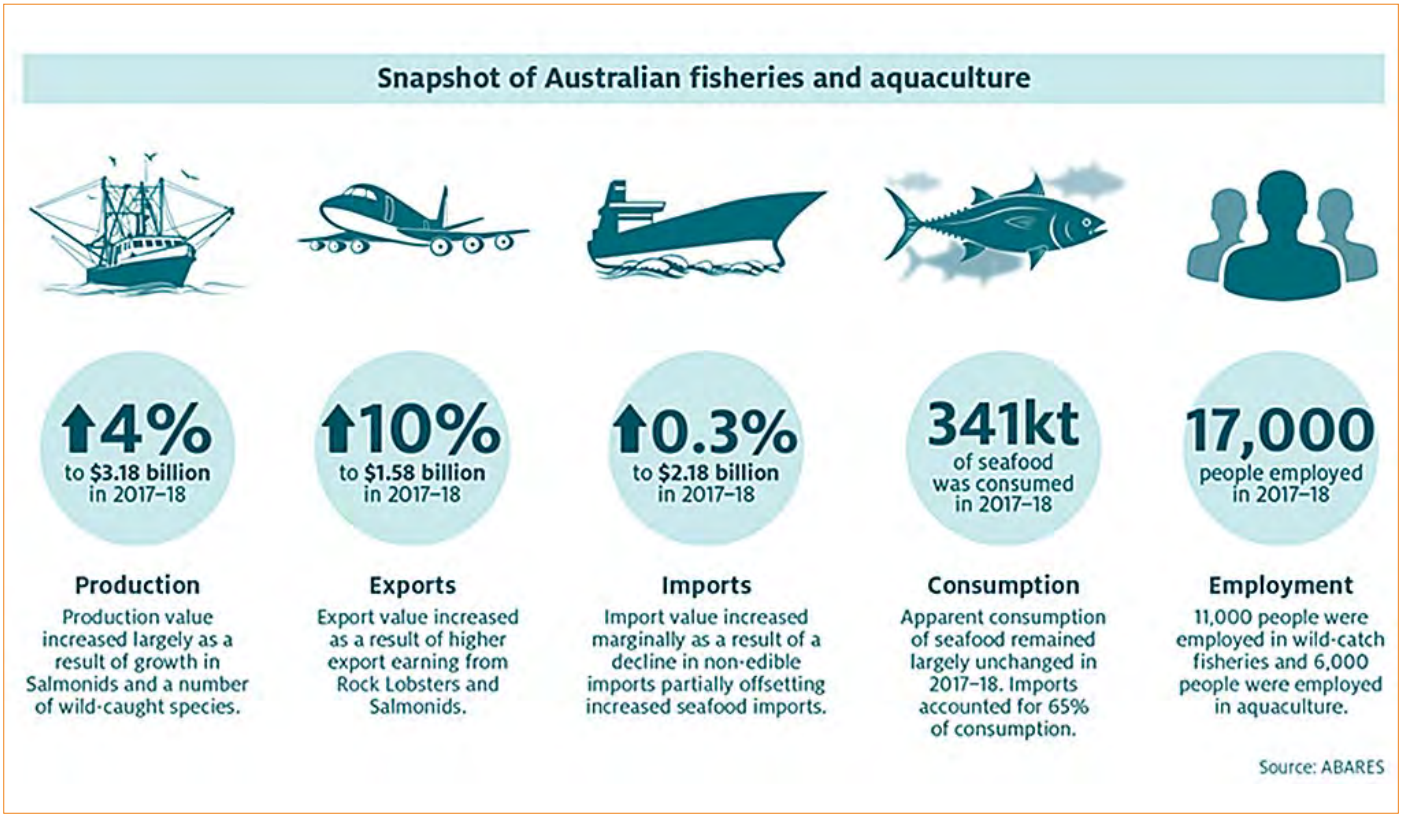
Source: https://upload.wikimedia.org/wikipedia/commons/a/ad/Amphiprion_ocellaris_%28Clown_anemonefish%29_by_Nick_Hobgood.jpg

Australia

Australia's role in global fish trade is relatively minor, with the value of exports and imports accounting for 1% of global trade. Production and trade in the global context Australia is a net importer of fish and fish products. Between 2008 and 2018, exports increased by a total of 16%, while imports increased by 33%. China exports approximately 5% of fish and fish products to Australia. Additionally, Australia is a significant exporter of fish species, including live Rock Lobsters, Bluefin Tuna and Abalone.

Source: https://www.agriculture.gov.au/abares/research-topics/fisheries fisheries-and-aquaculture-statistics/trade-2

Figure 10: Australian fish production, consumption and trade



Source: https://www.agriculture.gov.au/abares/research-topics/fisheries/fisheries-and-aquaculture-statistics

China

China is a key player in global production, consumption and trade of seafood. In addition to **China** being the world's major fish **producer** it is also the main **exporter** of fish and fish products.

Figure 11. Seafood production, consumption and trade in China

China is the world's largest fishing nation in terms of its fishing fleet and number of employees in the fishing industry. The fish sector provides jobs for over 14 million people and aquaculture accounts for over 5 million jobs. The sector also provides jobs in processing and marketing, adding a further employment of 16 million people. However, this does not count people involved in subsistence fishing occurring in poor rural locations aimed at improving food security and reduce hunger.

China is the leading aquaculture producer in the world accounting for 58% of global production. Approximately 90% of freshwater volumes are finfish.

Carp is mainly produced for domestic consumption and tilapia is primarily exported as a low-cost alternative to other whitefish in many countries.
Source: http://www.sciencedirect.com/science/article/pii/S259033222030302X

The development and construction of coastal cities and land reclamation has destroyed wetlands leading to reduced marine biodiversity. Climate change has also resulted in a decline of fishery. Mass coral bleaching has increased the mortality of marine species.

China's fishing industry has become a victim of its own success. The growth in the industry has been largely attributed to over utilisation of the country's limited fishing resources. Chinese fishermen have ventured out into the country's offshore waters, including disputed water in the East and South China Seas, as well as into other countries EEZs and the high seas to catch fish. This brings huge challenges not only to the marine fishery sector but also to regional and global marine security, especially in China's near seas.
Source: http://www.cna.org/cna_files/pdf/china-fishing-industry.pdf

Source: Dr S Bliss. UnSplash photo_SaschaSturm

THE GOAL OF SUSTAINABLE OCEAN FISHERIES

The economic and social and wellbeing of coastal communities in inextricably linked to ocean health and healthy marine ecosystems.

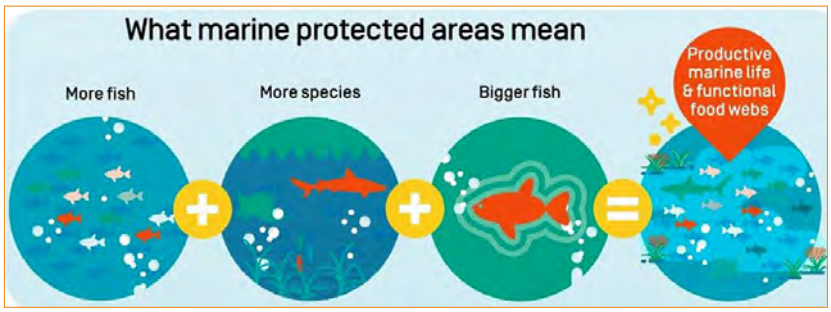
Sustainability in the global fishing industry will only improve through actions such as:

- Preventing overfishing
- Rebuilding decimated ecosystems and depleted fishing stocks
- Taking action at global, regional and local scales to achieve Sustainable Development Goal 14.

Figure 12: How to prevent overfishing

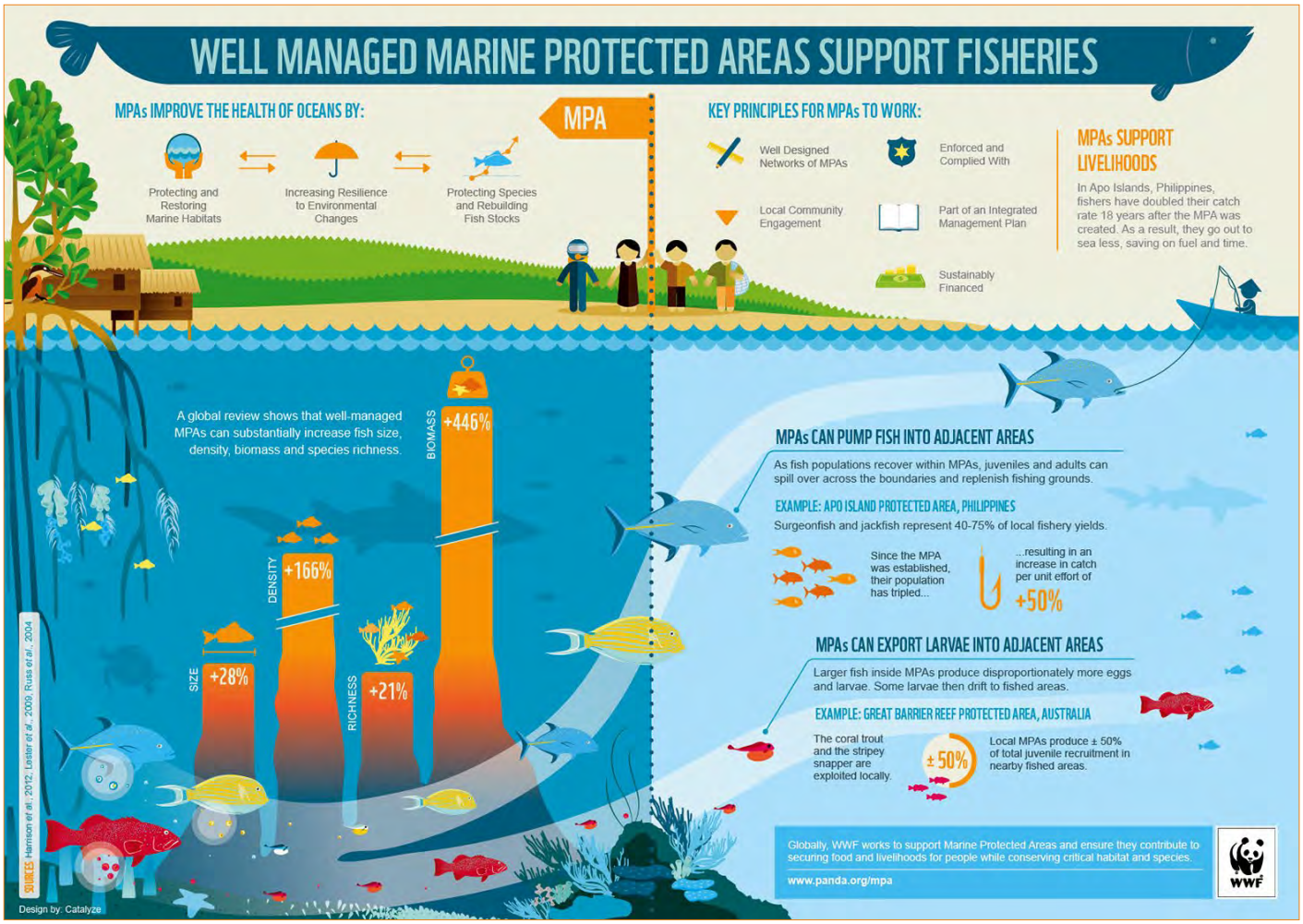
Source: http://www.bbhub.io/dotorg/sites/2/2015/06/How-to-Prevent-Over-Fishing.jpg and https://sites.google.com/a/region15.org/overfishing-prevention-organizatioin/pictures

Figure 13: Benefits of Marine Protected Areas



Source:https://saveourseasmagazine.com/marine-protected-area/

Figure 14: The benefits of Marine Protected Areas to ocean fisheries



https://wwf.panda.org/wwf_news/?244930/INFOGRAPHIC-How-well-managed-marine-protected-areas-support-fisheries-in-the-tropics

Appendices on the GTA NSW & ACT website include:

- Student activities for *Is Ocean Fishing Sustainable?* and *Oceans Surrounding Asia in crises point.*
- Image bank PPTs with Inquiry Questions

Image source: Wikimedia Commons, Giant ocean wave

Geography NESA Accredited PD

GTA's online courses are NESA Accredited PD in the priority area of Delivery and Assessment of NSW Curriculum.

This is what one Geography teacher had to say after completing the new Landscapes and Landforms course: *"This course has been so helpful and reminded me of how to use visual representations in lessons as content or even a hook to a new concept. I have also thoroughly enjoyed looking at other people's ideas. It has been fantastic!"*

If you are a GTA NSW & ACT personal or school member; and between now and 8 October 2021 you register for and complete ONE course, then email gta.elearning@gmail.com and ask for ONE course for free – and that's what you'll get – **Complete ONE and get ONE FREE**. The free course needs to be completed by the same person that completed the initial course.

NOTE: All courses must be completed by **4 February 2022** to be eligible to count towards NESA Accredited PD.

Here are the courses available via https://www.gtansw.org.au/professional-learning/:

- **Geo 141: Teaching *Place & Liveability*** OR
  Geo 241: Teaching *Place and Liveability* (*experienced*) (3hrs)
- **Geo 142: Teaching *Landscapes & Landforms*** (3hrs)
- **Geo 101: Concepts Part 1** (5hrs)
- **Geo 102: Concepts Part 2** (5hrs)
- **Geo 110: Intro to Maps** (3hrs)
- **Geo 111: Intro to Topo Skills** (3hrs)

If a teacher new to Geography wanted to strengthen their capabilities, then a superb program would be to build their content knowledge with Geo 141 or 142, followed by deepening their concept understanding with Geo101, and rounding it out with the skills of Geo 110.

All of the courses are great value at $90, and very flexible. You can pay for your courses using credit card and start immediately. Alternatively, if you are keen for your school to pay for you, see the instructions on this page: https://docs.google.com/document/d/1W52M2Z_ZreiDt39Ypaaj3Ph33Zacm1AvgGTKBhUzSiU/edit?usp=sharing.

Registrations for multiple people and multiple courses are also possible using these instructions.

We look forward to seeing you online!

Dr Paul Batten and
Katerina Stojanovski